II. Where do we stand in achieving the 2020 goal – assessing overall progress and gaps

Closing plenary of the World Summit on Sustainable Development, 4 September 2002, Johannesburg, South Africa

About Part II

Part II provides insights into progress made towards the 2020 goal to "achieve, by 2020, that chemicals are used and produced in ways that lead to the minimization of significant adverse effects on human health and the environment […]". Chapter 1 introduces existing international agreements and frameworks on chemicals and waste. It covers multilateral legally binding treaties, voluntary international instruments, SAICM and relevant Sustainable Development Goals (SDGs) and targets under the 2030 Agenda for Sustainable Development. Chapter 2 features an overview of reporting and indicator schemes under these agreements. Chapter 3 documents progress in achieving the sound management of chemicals and waste, as well as implementation gaps.

Responding to the mandate received from the United Nations Environment Assembly (UNEA), Part II also addresses emerging policy issues identified by the International Conference on Chemicals Management (ICCM) and issues where emerging evidence indicates a risk to human health and the environment. The final chapter of Part II concludes with a discussion of insights and lessons learned in making progress towards achieving the 2020 goal.

Contents

1/ International agreements and frameworks on chemicals and waste

Chapter Highlights

Governments have taken action on chemicals and waste at the national and international level for decades, leading, among others, to adoption of a number of multilateral legally binding treaties.

The multilateral treaties cover different chemicals and different stages of the life cycle and have different goals. They also vary in the number of Parties.

The Strategic Approach to International Chemicals Management (SAICM) is a global voluntary, multi-sectoral, multi-stakeholder policy framework taking a comprehensive life cycle approach.

The International Code of Conduct on Pesticide Management and the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) are non-binding global policy instruments addressing some core capacities for chemicals management.

The 2030 Agenda for Sustainable Development includes a number of Sustainable Development Goals (SDGs) and targets that are directly or indirectly relevant for chemicals and waste.

The Introduction to the GCO-II gives an overview of milestones in international chemicals and waste management, from early action at the beginning of the 20th century to the 2030 Agenda for Sustainable Development. This chapter describes international agreements and frameworks that are relevant to assessing progress towards the 2020 goal in more detail, namely multilateral treaties on chemicals and waste, voluntary international instruments (including SAICM) and the 2030 Agenda. It provides the structure for Chapter 2, which discusses the reporting mechanisms for chemicals and waste.

1.1 Multilateral treaties on chemicals and waste

Since 1987 a number of multilateral treaties have established goals and targets for different aspects of the sound management of chemicals and waste. Complementing soft law approaches such as Agenda 21 (the non-binding action plan adopted at the United Nations Conference on Environment and Development in 1992), the Montreal Protocol and the Basel, Rotterdam, Stockholm and Minamata Conventions (Table 1.1) have created an international chemicals and waste control framework covering the management and elimination of specific chemicals and wastes across all stages of their life cycle. These multilateral instruments have served to identify and address chemicals of the highest concern at the international level.

Table 1.1 gives an overview of the multilateral legally binding agreements related to the sound management of chemicals and waste, including the number of chemical substances addressed (not including isomers of listed substances). Under several agreements (such as the Montreal, Rotterdam and Stockholm treaties) there is an opportunity to add further substances.

Table 1.1 Multilateral agreements related to the sound management of chemicals and waste

Agreement	Adoption and entry into force	Goals	Number of chemical substances addressed	Number of Parties as of 14 January 2019
Montreal Protocol on Substances that Deplete the Ozone Layer	› Adopted at the Conference of Plenipotentiaries on the Protocol on Chlorofluorocarbons to the Vienna Convention for the Protection of the Ozone Layer in Montreal in 1987 › Entered into force in 1989	› Protect human health and the environment against adverse effects resulting, or likely to result, from human activities which modify or are likely to modify the ozone layer; › Protect the ozone layer by taking precautionary measures to control equitably the total global production and consumption of substances that deplete it, with the ultimate objective of their elimination on the basis of scientific knowledge, technical and economic considerations, and the developmental needs of developing countries. (United Nations [UN] 2018)	144	197
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	› Adopted at the Conference of Plenipotentiaries in Basel in 1989 › Entered into force in 1992	› Effective implementation of Parties' obligations with respect to transboundary movements of hazardous and other wastes; › Strengthening the environmentally sound management of hazardous and other wastes; › Promoting the implementation of environmentally sound management of hazardous and other wastes as an essential contribution to the attainment of sustainable livelihood, the 2000 Millennium Development Goals, and the protection of human health and the environment. (Secretariat of the Basel Convention 2011a; Secretariat of the Basel Convention 2011b)	124 groups of wastes, according to Annex I, II and VIII List A, and wastes falling under the criteria of the list of hazardous characteristics in Annex III	187

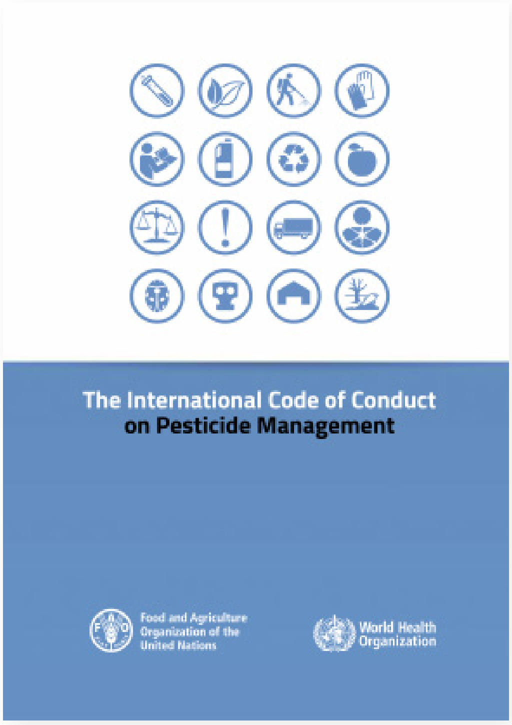
Agreement	Adoption and entry into force	Goals	Number of chemical substances addressed	Number of Parties as of 14 January 2019
ILO Chemicals Convention C170 International Labour Organization	› Adopted at the 77th Session of the International Labour Conference in Geneva in 1990 › Entered into force in 1993	› Reduce the incidence of chemically induced illnesses and injuries at work by ensuring that all chemicals are evaluated to determine their hazards; › Provide employers with a mechanism to obtain information from suppliers about the chemicals used at work; › Provide workers with information about the chemicals at their workplaces, and about appropriate preventive measures so that they can effectively participate in protective programmes; › Establish principles for such programmes to ensure that chemicals are used safely. (ILO 2017a)	Not applicable	21
Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction	› Adopted at the 635th plenary meeting of the Conference on Disarmament in Geneva in 1992 › Entered into force in 1997	› Achieve effective progress towards general and complete disarmament under strict and effective international control, including the prohibition and elimination of all types of weapons of mass destruction; › Exclude completely the possibility of the use of chemical weapons, including prohibition of the use of herbicides as a method of warfare; › Promote free trade in chemicals, as well as international cooperation and exchange of scientific and technical information in the field of chemical activities for purposes not prohibited under the Convention; › Completely and effectively prohibit the development, production, acquisition, stockpiling, retention, transfer and use of chemical weapons, and their destruction (Organisation for the Prohibition of Chemical Weapons 2019)	15 toxic chemicals and 28 precursors	193
ILO Convention concerning the Prevention of Major Industrial Accidents C174 International Labour Organization	› Adopted at the 80th Session of the International Labour Conference in Geneva in 1993 › Entered into force in 1997	Having regard to the need to ensure that all appropriate measures are taken to: › Prevent major accidents; › Minimize the risks of major accidents; › Minimize the effects of major accidents. (ILO 2017b)	Not applicable	18

Agreement	Adoption and entry into force	Goals	Number of chemical substances addressed	Number of Parties as of 14 January 2019
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade ROTTERDAM CONVENTION	› Adopted at the Conference of Plenipotentiaries on the Convention in Rotterdam in 1998 › Entered into force in 2004	› 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. (Secretariat of the Rotterdam Convention 2010)	50 substances and mercury compounds	161
Stockholm Convention on Persistent Organic Pollutants STOCKHOLM CONVENTION	› Adopted at the Conference of Plenipotentiaries on the Stockholm Convention on Persistent Organic Pollutants in Stockholm in 2001 › Entered into force in 2004	› Protect human health and the environment from Persistent Organic Pollutants (POPs); › Eliminate or restrict the production, use, import and export of listed POPs, and require measures to be taken with respect to waste and unintentional releases of POPs. (Secretariat of the Stockholm Convention 2008)	28 POPs and mentioned salts	182
WHO International Health Regulations (IHR) (2005) WHO	› Adopted by the 58th World Health Assembly in Geneva in 2005 › Entered into force in 2007	› Prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade (Article 2). (World Health Organization [WHO] 2016)	Not applicable	196
Minamata Convention on Mercury MINAMATA CONVENTION ON MERCURY	› Adopted on the occasion of the Conference of Plenipotentiaries on the Minamata Convention on Mercury in 2013 › Entered into force in 2017	› Protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. Commitments by Parties include: › Ban new mercury mines and phase out existing ones; › Phase out and phase down mercury use in a number of products and processes; › Establish control measures for emissions to air and releases to land and water; › Environmentally sound interim storage of mercury, and its disposal once it becomes waste. (United Nations Environment Programme [UNEP] 2018)	Mercury and mercury compounds	101

1.2 Voluntary international instruments

In addition to legally binding treaties, several voluntary international instruments adopted by the governing bodies of international organizations address a wide range of chemicals and issues. Prominent examples include the International Code of Conduct on Pesticide Management, the GHS and SAICM.

The International Code of Conduct on Pesticide Management



The International Code of Conduct on Pesticide Management is the pesticide management framework for all public and private entities engaged in (or associated with) the production, regulation and management of pesticides. It was approved by the Conference of the Food and Agriculture Organization of the United Nations (FAO) in June 2013 as the successor to the International Code of Conduct on the Distribution and Use of Pesticides (adopted in 1985 and revised in 2002). The new International Code of Conduct serves as a point of reference for sound pesticide life cycle management practices, particularly with respect to government authorities and the pesticide industry. The voluntary standards it sets out are especially relevant where there is inadequate or no national legislation concerned with pesticide regulation. Among other objectives, the new International Code of Conduct seeks to promote practices, including integrated pest management, that minimize the potential health and environmental risks associated with pesticides while ensuring their effective use (FAO 2018).

The Globally Harmonized System of Classification and Labelling of Chemicals

The GHS is an internationally agreed-upon standard managed by the United Nations. It was first adopted in 2002 and subsequently revised several times (seventh revision in 2017). Against the background of the extensive global trade in chemicals, as well as the significant differences in labels and safety data sheets for the same product across countries, it was recognized that an internationally harmonized approach to classification and labelling of chemicals would provide the foundation for national programmes to ensure their safe use, transport and disposal. The GHS thus aims to provide countries with consistent and appropriate information on the chemicals they either import or produce.

An important core element of the GHS consists of standardized chemical hazard criteria to support government and industry in undertaking chemical hazard classifications. The GHS also features universal warning pictograms and a harmonized approach to the preparation of safety data sheets which provide users of dangerous goods with extensive information. The Johannesburg Plan of Implementation (JPOI), adopted by the World Summit on Sustainable Development in 2002, encouraged countries to implement the GHS as soon as possible, with a view to the system being fully operational by 2008.

1.3 The Strategic Approach to International Chemicals Management (SAICM)

Paragraph 23(b) of the 2002 JPOI called for the development of a "strategic approach to international chemicals management based on the [2000] Bahia Declaration and Priorities for Action beyond 2000 of the Intergovernmental Forum on Chemical Safety by 2005". In 2006 the Strategic Approach to International Chemicals Management (SAICM) was adopted by the first International Conference on Chemicals Management (ICCM1) held in Dubai, United Arab Emirates. SAICM was developed by a multi-stakeholder and multi-sectoral Preparatory Committee. Its overall objective, as described in paragraph 13 of its Overarching Policy Strategy (OPS), is "to achieve the sound management of chemicals throughout their life cycle so that by the year 2020, chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health" (Secretariat of the Strategic Approach to International Chemicals Management [SAICM Secretariat], UNEP and WHO 2006).

SAICM differs from other chemical and waste agreements on several key points: it is a voluntary non-binding policy framework; it supports a comprehensive life cycle approach for all hazardous chemicals; and it allows for active participation by non-governmental stakeholders (Persson, Persson and Sam 2014). SAICM has three main elements, two of which were adopted at the International Conference in Dubai (Box 1.1).

The Dubai Declaration states that, together with the OPS, it constitutes a firm commitment to SAICM and its implementation. These two documents provide the rationale for the creation of SAICM and its overarching principles and goals (Persson, Persson and Sam 2014). The Dubai

Box 1.1 The elements of the Strategic Approach to International Chemicals Management (SAICM)

The Dubai Declaration on International Chemicals Management

The Dubai Declaration, adopted at the 2006 International Conference, expresses high-level political support "for promoting the sound management of chemicals and wastes throughout their life-cycle, in accordance with Agenda 21 and paragraph 23 of the JPOI". The Declaration explicitly states that significant, but insufficient, progress had been made in the implementation of Chapter 19 of Agenda 21 and other relevant international instruments concerning chemicals and waste.

The Overarching Policy Strategy (OPS)

The OPS, also adopted at the Conference, includes sections on the statement of needs, objectives, financial considerations, principles and approaches, implementation, and taking stock of progress.

The five key thematic objectives in the OPS are:

- risk reduction;
- knowledge and information;
- governance;
- capacity building and technical cooperation; and
- illegal international traffic in chemicals.

These thematic objectives are further divided into 46 specific objectives.

The Global Plan of Action (GPA)

The GPA lists possible work areas and 299 associated activities, as well as actors, targets/timeframes, indicators of progress, and implementation aspects. The GPA is a non-negotiated text and therefore has a different status than the Dubai Declaration and the OPS described above. However, the Conference recommended its use and further development.

Declaration also acknowledges that SAICM is a new voluntary initiative in the field of chemicals management, and that it is not a legally binding instrument (SAICM Secretariat, UNEP and WHO 2006).

1.4 Chemicals and waste in the 2030 Agenda for Sustainable Development

A number of targets in the 2030 Agenda for Sustainable Development (which was adopted by all United Nations Member States in 2015) are directly or indirectly relevant to the sound management of chemicals and waste. Several targets, including 12.4, 3.9 and 6.3, contain direct references to chemicals. Some of the Sustainable Development Goals (SDGs) also provide specific development objectives linked to chemicals management. In addition, SDGs and targets that seek to strengthen an enabling environment to advance sustainable development are relevant to chemicals management.

SDG targets focusing on chemicals and waste management

Target 12.4 is directly linked to (and encompasses) successful implementation of the chemicals and waste multilateral environmental agreements (MEAs), the SAICM and other relevant policies and actions. Equally important, Target 3.9 focuses on the ultimate impact of enhanced sound management of chemicals and waste in terms of human health. Target 6.3 sheds light on media-specific dimensions, highlighting the need for reduced pollution to maintain water quality.

- SDG 3 on Good Health and Well-Being, Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.
- SDG 6 on Clean Water and Sanitation, Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally.
- SDG 12 on Responsible Consumption and Production, Target 12.4: By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

Also relevant to the sound management of chemicals and waste are SDG targets concerning environmental and social objectives related to chemicals and waste management action. These include the following:

- SDG 8 on Decent Work and Economic Growth, Target 8.8 on the protection of labour rights and promotion of safe working environments.
- SDG 12 on Sustainable Consumption and Production, Target 12.5 on the reduction of waste generation.
- SDG 14 on Life Below Water, Target 14.1 on the reduction of marine pollution.
- SDG 15 on Life on land, Target 15.5 on the protection of biodiversity and natural habitats.

SDG targets fostering economic development and strengthening the enabling environment

The 2030 Agenda includes a number of SDGs with specific development objectives. Given the indivisible nature of the 2030 Agenda, sound management of chemicals and waste is an important consideration for achieving the development-related SDGs and targets. Like all SDGs and targets, they require consideration and careful balancing of the economic, social and environmental dimensions of sustainable development to ensure that progress on certain indicators does not come at the expense of others. Relevant economic sectors and related SDGs include the following:

- SDG 8 on Decent Work and Economic Growth, Target 8.8 on the protection of labour rights and promotion of safe working environments.
- SDG 2 on Zero Hunger, Target 2.1 on access to safe, nutritious and sufficient food.
- SDG 7 on Affordable and Clean Energy, Target 7.a on clean energy.
- SDG 11 on Sustainable Cities and Communities, Target 11.1 on safe and affordable housing.

A number of SDGs and targets seek to strengthen an enabling environment to advance sustainable development. Putting in place certain enabling conditions can help facilitate the sound management of chemicals and waste and maximize the benefits of chemistry. Relevant enabling sectors and related SDGs include the following:

- SDG 4 on Quality Education, Target 4.7 on education for sustainable development.
- SDG 16 on Peace, Justice and Strong Institutions, Target 16.10 on public access to information.
- SDG 17 on Partnerships for the Goals, Target 17.3 on mobilizing financial resources.

2/ Reporting schemes and indicators under international agreements and frameworks

Chapter Highlights

National reporting, and the use of indicators, are important mechanisms for monitoring and tracking both the implementation and effectiveness of international agreements.

International chemicals and waste agreements have individual reporting processes and indicators, each with its own particular features. There is also a global indicator framework for the Agenda 2030 SDGs and targets.

Participating organizations of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC) collect information about progress on selected indicators.

Reporting rates vary across international agreements. High reporting rates have been achieved for the WHO International Health Regulations (2005); reporting rates under the Basel and Stockholm Conventions have not been optimal and show decreasing trends.

SAICM has the most comprehensive framework for monitoring progress, but reporting rates are not satisfactory.

Building upon the structure provided in Chapter 1, this chapter examines existing reporting and indicator schemes that have been developed under relevant international agreements and frameworks. They include the mechanisms developed under multilateral treaties, voluntary international instruments, SAICM and the 2030 Agenda for Sustainable Development. In addition, the IOMC tracks progress regarding selected activities. The effectiveness and coherence of these reporting schemes and indicators is examined to the extent possible, with findings indicating a fragmented landscape.

2.1 Reporting schemes and indicators under multilateral treaties on chemicals and waste

National reporting: tracking progress, identifying challenges

All the legally binding multilateral agreements related to sound management of chemicals and waste discussed in Part II, Ch. 1 have a reporting obligation, with the exception of the Rotterdam Convention on Prior Informed Consent. The common aim is to measure progress in regard to technical obligations, implementation of legislation, establishment of institutions, and collection of data on the issues addressed by each agreement. The analysis and discussion of national reports - including of their availability as well as their content - are important in order to help understand implementation challenges and opportunities. They are also important for the development of tools to make information exchange and mutual learning effective. The Secretariat of each agreement can play a critical role in identifying barriers to implementation.

The reporting rates, results, content and format of reporting vary with each agreement, although there are a number of similarities. Frequency of reporting is annual in most cases; for the Stockholm Convention it is every four years. Reporting is carried out using electronic formats, although for the WHO International Health Regulations (IHR) (2005) paper copies can be submitted. Questions to be addressed through reporting can relate to activities and/or the outcomes of activities, as well as to information about implementation challenges encountered. In the case of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Stockholm Convention on POPs, and the Minamata Convention on Mercury, reporting addresses activities and outcomes; in the case of the Montreal Protocol on Substances that Deplete the Ozone Layer and the Chemical Weapons Convention, it addresses outcomes; in the case of the IHR and ILO Conventions C170 concerning Safety in the use of Chemicals at Work and C174 on Prevention of Major Industrial Accidents, reporting addresses activities.

Reporting under the Montreal Protocol: a success story

Statistical data on ozone-depleting substances (ODS) for national reports are submitted yearly to the UN Environment Secretariat of the Vienna Convention and its Montreal Protocol (Ozone Secretariat). The compliance of each country with its obligations under the Montreal Protocol is then determined. All Parties report data on the production, export, import and destruction of the nine groups of ODS regulated under the Protocol. Reporting obligations are also established by Meetings of the Parties, which require relevant countries to submit information on specific issues such as uses of ODS as process agents and as feedstocks; approved essential or critical uses; exempted laboratory and critical uses; and reclamation facilities and their capacities. In addition, Parties are required to report every two years on research, public awareness and information exchange activities.

To provide support for the implementation of the Montreal Protocol in developing countries, National Ozone Units (NOUs) have been established in these countries at government level. In addition to submitting ODS data to the Ozone Secretariat annually, NOUs collect data on the production, export, import and destruction of the nine groups of substances regulated by the Protocol. This information is submitted to the Secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol, which continuously monitors activities at the project level. Monitoring of projects involves periodic reporting to gauge a project's progress or lack of it. Projects experiencing delays and those with financial balances are monitored particularly closely and reported on to each Executive Committee meeting (Secretariat of

the Multilateral Fund for the Implementation of the Montreal Protocol 2018).

Beginning in 1990, and at least every four years thereafter, Assessment Panels prepare quadrennial reports on available scientific, environmental, technical and economic information. The Panels present these reports to the Parties to enable them to take informed decisions, with a view to strengthening the Protocol's control measures. There are currently three Panels: the Scientific Assessment Panel, the Technology and Economic Assessment Panel, and the Environmental Effects Assessment Panel. At least one year before each quadrennial assessment, the Parties set out in a decision the terms of reference for the assessments to be prepared by the Panels.

This well-considered preparatory process, and the effective performance of the NOUs, could be responsible for the high rate of compliance of the Parties to the Montreal Protocol with the reporting obligation. There has been a 100 per cent level of compliance with the reporting obligations since 1989, when the Protocol entered into force (UN 2018).

Reporting under ILO Conventions C170 and C174

Reporting is to be carried out on a five-year cycle basis with respect to both ILO Convention C170 concerning Safety in the use of Chemicals at Work, and ILO Convention C174 on Prevention of Major Industrial Accidents. Normally the reporting format is built around the Convention text. Parties are asked to specify actions taken by answering open-ended questions corresponding to relevant obligations. The reporting formats specify that, in the first report, full information should be given concerning each question and each provision of the Convention. In subsequent reports information needs to be given only on new measures taken, and on questions about practical application of the Convention and the communication of the report to representative organizations of employees and workers (together with any observations received from these organizations). The reports should also contain responses to any comments by ILO supervisory bodies. The reporting rate under C170 and C174 has been universal. The ILO reports cannot be accessed online.

The reporting process involves two bodies: the Committee of Experts on the Application of Conventions and Recommendations (CEACR) and the Committee on the Application of Standards (CAS). The CEACR consists of independent legal experts who meet once a year. It provides comments, observations and direct requests on points of non-conformity and directly requests more information (ILO n.d. a). It also examines national reports and provides feedback to countries if it finds that further action is needed in order to give effect to certain provisions of the Conventions. The CEAR can express its satisfaction regarding positive actions taken, in response to comments and to provide an example for other countries addressing similar issues. Input from the CEACR feeds into the CAS, a subsidiary body of the International Labour Conference, which discusses how reporting obligations are fulfilled by countries and addresses serious violations (ILO n.d. b). The ILO has a well-considered structure in place to monitor compliance. Where there have been repeated cases of reporting failure, countries are named in CEACR and CAS reports.

Reporting under the Basel and Stockholm Conventions

In the case of both the Basel and Stockholm Conventions, national reports include specific information on measures taken to implement the Convention; the effectiveness of those measures; designation of focal points to address Convention-related matters; and statistical data on the production, import, export and movement of the hazardous substances concerned and their impact on human health and the environment (Secretariat of the Basel Convention 2011; Secretariat of the Stockholm Convention 2018). In addition, for the Stockholm Convention an evaluation of effectiveness is carried out (see Part II, Ch. 3). An analysis of the process of national reporting under these Conventions can consider three aspects: how the overall group of parties complies with reporting obligations; how the process of national reporting has evolved over time; and how compliance with national reporting differs among groups of countries.

An initial finding has been that reporting rates are relatively low. Not all countries submit the required national reports, while some submissions are delayed, affecting the prompt availability of data to assess performance (Secretariat of the Basel, Rotterdam and Stockholm Conventions 2018). In addition, not all reports are available online. Only in recent reporting cycles (particularly with respect to the Basel Convention) have data been collected through electronic reporting systems. In the case of the Basel Convention, countries have reported an average 52 per cent of the times they were required to do so since 2001, while in the case of the Stockholm Convention they have met this obligation only 44 per cent of these times since 2002 (Secretariat of the Basel Convention 2011; Secretariat of the Stockholm Convention 2018).

Figure 2.1 shows compliance with national reporting obligations under the Basel and Stockholm Conventions in 2016: 19 countries (10 per cent of all Parties) had a 100 per cent reporting rate for the Basel Convention while 20 countries (11 per cent of all Parties) never submitted a report. In the case of the Stockholm Convention, 40 countries (22 per cent of all Parties) submitted all the required reports while

Figure 2.1 Compliance with national reporting obligations, 2016: Basel and Stockholm Conventions

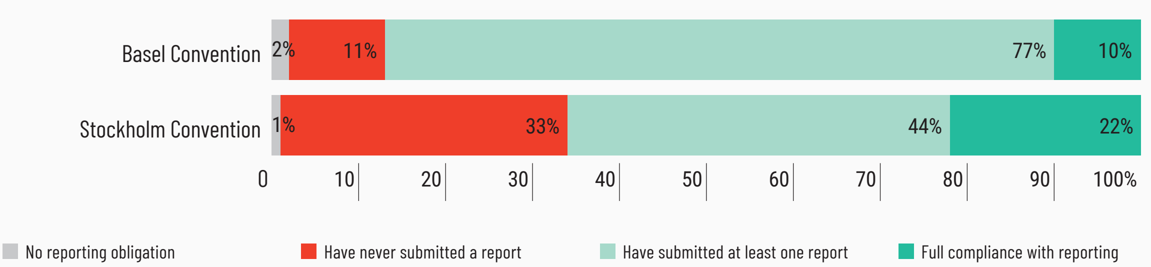
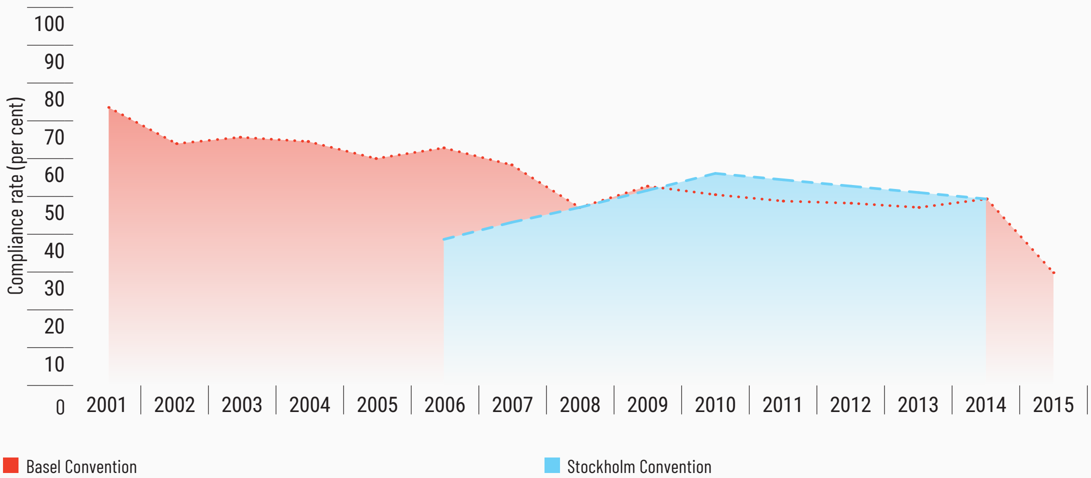


Figure 2.2 **Historical evolution of general compliance with national reporting obligations: Basel and Stockholm Conventions, 2001-2015**

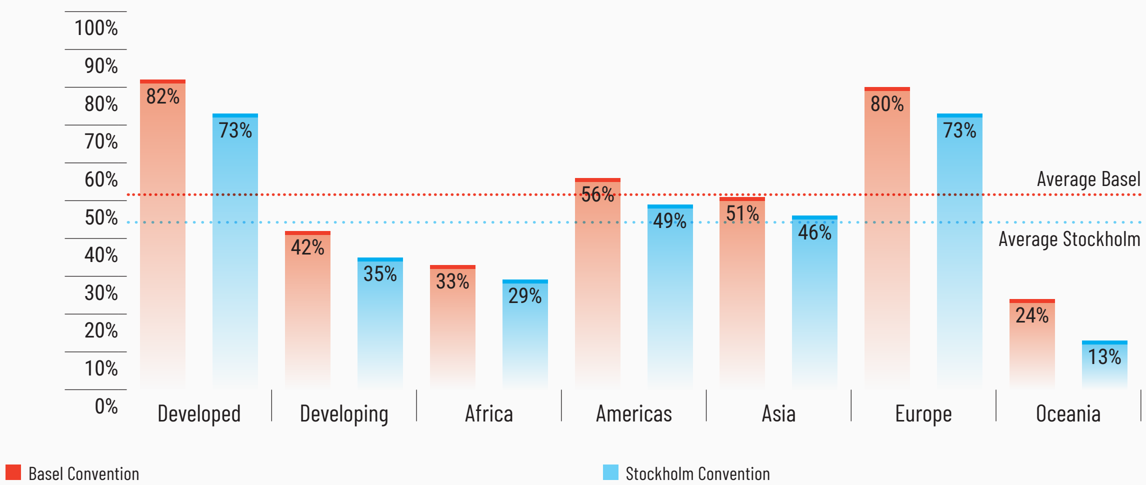


59 (33 per cent of all Parties) never submitted a report.

Figure 2.2 provides an overview of reporting rates between 2001 and 2015. For the Basel Convention the number of countries submitting a report every year fell from 74 per cent in 2001 to 30 per cent in 2015. For the Stockholm Convention there is a more positive trend, with the number of countries that submitted reports increasing from 39 per cent in 2002-2006 to 56 per cent in 2006-2010 and 49 per cent in 2010-2014. However, there is still a significant group of countries for which data are not available.

As shown in Figure 2.3, reporting rates in the period in the period 2001-2016 differ significantly between developed and developing countries, using the country designation of the UN Statistics Division (United Nations Statistics Division 2018). In the case of the Basel Convention, the average national reporting rate for developed countries (82 per cent) has been almost twice as high as that for developing countries (42 per cent). In terms of regions, countries in Europe have submitted reports an average 80 per cent of the time; in Oceania, on the other hand, there has been an average national reporting rate of 24 per cent of countries. In the case of the

Figure 2.3 **Average national reporting rate 2001-2016, by category of countries (developed/developing) and by regions: Basel and Stockholm Conventions**



Stockholm Convention, the rate for developed countries has been 73 per cent compared with 35 per cent for developing countries.

Reporting is a prerequisite for the monitoring and evaluation of implementation. National reporting indicators like those described above illustrate the characteristics of the reporting process and the challenges countries face in collecting the required information and completing reports. Factors such as lack of capacity at the national level, and the frequency of reporting cycles, may help explain some of the challenges. It is important to analyze the information in national reports to determine whether countries have established the institutional, technical and regulatory frameworks that can contribute to the solution of chemicals management problems. Otherwise, it will not be possible to determine the extent to which these agreements are being translated into national policies. It should be noted, however, that while limited data in national reports is challenging, this does not necessarily tell the whole story. Monitoring reports and the evaluation of effectiveness (as was done for the Stockholm Convention) also provide essential information. The outcomes of effectiveness evaluation for the Stockholm Convention are discussed in Part II, Ch. 3.

Reporting under the WHO International Health Regulations (IHR) (2005): active support promotes effectiveness

Governments adopted the WHO International Health Regulations (IHR) (2005) in 2005. They entered into force in 2007. Countries had a five-year period during which to put in place core capacities. The initial reporting framework consisted of 20 indicators, including four performance levels on a continuum of progress. As of 2018, countries agreed to use the new State Party Self-Assessment Annual Reporting Tool which requires them to report on 24 indicators for developing 13 core capacities (WHO 2018a). In this reporting they move from exclusive self-evaluation to approaches that combine self-evaluation, peer review and voluntary external evaluations involving a combination of domestic and independent experts.

A Joint External Evaluation (JEE) framework has also been developed to provide independent analysis of countries' capacity to prevent, detect and respond to public health threats. Countries can request a JEE mission to help them identify the most urgent needs within their health system (WHO 2018b). JEEs are voluntary and assist countries in identifying the most critical gaps and prioritizing opportunities for enhanced preparedness and response. JEE mission reports, which are available online, provide an overview of a country's strengths and challenges, and proposed and/or agreed next steps towards increasing IHR core capacities.

Reporting for the IHR is high, reaching over 80 per cent in 2017 with a 100 per cent reporting rate by countries in Africa. An explanation could be that the WHO follows up directly with countries that have not reported through its headquarters or the relevant WHO Regional and Country Offices, depending on specific regional arrangements. Countries that have not reported are mentioned in the World Health Assembly report, putting peer pressure on these countries to report in the next round. WHO staff also follow up with country delegations that have not reported, which often triggers immediate action and increases reporting the following year.

Box 2.1 The reporting mechanism for the WHO IHR (2005)

Each indicator used in the International WHO IHR (2005) self-assessment process is graded on five performance levels. For each indicator five activities (or attributes) with different capability levels are listed in a checklist format, filled in according to activities at the country level. Attaining a given capability level requires that all the activities at lower levels are in place. For example, it is a prerequisite to have all the level 1 activities before examining activities at level 2. The goal is to reach or maintain level 5 for all 24 indicators. The level of achievement for each indicator is determined in countries, through workshops with stakeholders, and is reported annually.

Because of the involvement of senior officials in country delegations (which are normally headed by the Minister of Health), non-compliance with the IHR receives attention at a high political level.

Reporting under the Minamata Convention on Mercury

Paragraph 1 of Article 21 of the Minamata Convention on Mercury requires each Party to report to the Conference of the Parties (COP) on the measures it has taken to implement the provisions of the Convention, the effectiveness of such measures, and possible challenges in meeting the objectives of the Convention. At the first Conference of the Parties (COP1) agreement was reached on the timing (every four years, with some questions to be reported on every two years) and format of reporting by the Parties, thereby taking into account lessons learned from reporting under other relevant treaties (Secretariat of the Minamata Convention on Mercury 2017).

2.2 Reporting schemes and indicators under voluntary international instruments

The International Code of Conduct on Pesticide Management, the GHS and other activities

The International Code of Conduct on Pesticide Management and the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) are voluntary agreements which are widely used throughout the world. A number of other voluntary activities are also carried out in many countries. The number of countries active in voluntary agreements and activities is reflected in the IOMC indicators (see section 2.4 below). Reporting schemes under non-binding global policy instruments have varying degrees of formality.

Under the International Code of Conduct, governments, in collaboration with the FAO, the WHO and UNEP, are to monitor its observance and report on the progress made. The pesticide

industry is invited to provide relevant reports, while non-governmental organizations (NGOs) and other interested entities are invited to monitor and report on activities related to its implementation. Moreover, the governing bodies of the FAO, the WHO and UNEP should periodically review the relevance and effectiveness of the Code (FAO and WHO 2014). A process is in in place to supplement the provisions of the Code. While some governments and industry stakeholders regularly indicate adherence to the Code, regular reporting by governments and industry under the voluntary scheme has not been forthcoming. In some cases NGOs have submitted reports about cases of non-adherence, which are not publicly available. Furthermore, the relevant intergovernmental organizations track progress in various ways, e.g. through global surveys.

As regards the GHS, the Secretariat (hosted by the United Nations Economic Commission for Europe [UNECE]) collects publicly available information (including reports from members of the GHS Sub-Committee, NGOs, and other UN entities) to monitor the status of implementation (UNECE n.d.). A 2018 Organisation for Economic Cooperation and Development (OECD) Council Decision-Recommendation makes implementation of the GHS by OECD member countries mandatory. Monitoring implementation of this Council Act, as called for in the Act, would therefore include monitoring implementation of the GHS in these countries (OECD 2018; Stringer 2018).

2.3 Reporting scheme and indicators under SAICM

The International Conference on Chemicals Management

The International Conference on Chemicals Management (ICCM), SAICM's oversight structure, carries out periodic reviews of SAICM and seeks to "receive reports from all relevant stakeholders on progress in implementation and disseminate information" (SAICM Secretariat 2018a). In 2009 the second session of the ICCM (ICCM2) adopted modalities for reporting, based on 20 indicators, to review progress towards the 2020 Goal (SAICM Secretariat 2009) (Box 2.2). These indicators were developed to cover the objectives of the OPS and relevant activities (rather than results). A baseline report was prepared in 2011 (SAICM Secretariat 2011). The questionnaire for measuring progress contains a mixture of mandatory and optional questions, with at least one mandatory question for each indicator. Most of the mandatory questions include a list of relevant activities alongside a series of check boxes. The average number of activities per indicator (as a percentage of all possible activities) is reported in the progress report. The same questionnaire applies to all stakeholders, including governments, intergovernmental organizations (IGOs) and NGOs.

To date, three SAICM reporting rounds have been completed for which information is available: 2009-2010, 2011-2013, and 2014-2016 (SAICM Secretariat 2012; SAICM Secretariat 2014a; SAICM Secretariat 2019). Reporting rates under SAICM exhibit a worrying downward trend: among governments, reporting rates dropped from around 40 per cent (78 submissions out of 194 governments) and 43 per cent (83 submissions out of 194 governments) in the first two rounds to 28 per cent (54 submissions out of 193 governments) in the third round, with data lacking in particular from African countries. Overall, reporting rates have been especially low among developing countries. SAICM also benefits from reporting by IGOs, civil society and the private sector, in some cases through collective reporting.

Box 2.2 **SAICM indicators of progress**

A. *Risk reduction*
1. Are implementing agreed chemicals management tools
2. Have mechanisms to address key categories of chemicals
3. Have hazardous waste management arrangements
4. Have activities that result in monitoring data on selected environmental and human health priority substances
5. Have mechanisms in place for setting priorities for risk reduction

B. *Knowledge and information*
6. Are providing information according to internationally harmonized standards
7. Have specific strategies for communicating information on chemical risks to vulnerable groups
8. Have research programmes
9. Have websites that provide information to stakeholders

C. *Knowledge and information*
10. Have committed themselves to implementation of the Strategic Approach
11. Have a multi-stakeholder coordinating mechanism
12. Have mechanisms to implement key international chemicals priorities

D. *Capacity building and technical cooperation*
13. Are providing resources for capacity building and technical cooperation with other countries
14. Have identified and prioritized their capacity building needs for the sound management of chemicals
15. Are engaged in regional cooperation on issues relating to the sound management of chemicals
16. Have development assistance programmes which include the sound management of chemicals
17. Have projects supported by the SAICM Quick Start Programme (QSP) Trust Fund
18. Have projects for the management of chemicals supported by other sources of funding (not QSP funding)

E. *Illegal international traffic*
19. Have mechanisms to prevent illegal traffic in toxic, hazardous and severely restricted chemicals individually
20. Have mechanisms to prevent illegal traffic in hazardous waste

The second progress report identified some gaps in the indicators, including illegal national trade (such as through informal markets); the extent of national funding for chemicals management through government budgets and official development assistance; and the use of non-chemical alternatives and agroecological approaches. The report recommended complementing activity-based indicators with objectively verifiable results-based indicators which quantify reductions in health and environmental impacts of chemical use (SAICM Secretariat 2014a). The third report included for the first time progress on the IOMC indicators of progress, in order to explore the interlinkages with the 20 SAICM indicators, cross-reference the data collected through the SAICM survey, and present a better picture of global progress towards the sound management of chemicals. However, the report noted that it is not possible to present a consistent global picture of progress given the low reporting rate, and the lack of adequate data, across regions (SAICM Secretariat 2019). Since the conclusions are not fully reliable, and are not representative of the true status of global progress towards the sound management of chemicals, the report recommends encouraging greater participation in reporting by governments in the next reporting period.

Relationship between the OPS, the GPA and the SAICM indicators of progress

The SAICM framework for action consists of three main elements (Part II, Ch. 1, Box 1.1). The OPS includes five thematic objectives with 46 specific objectives, while the GPA includes 273 activities (each with an indicator of progress) which have been grouped into 36 work areas. These two documents have a different status, as the OPS constitutes a negotiated outcome and the GPA has not been formally adopted. Their content does not match entirely; for example, the GPA includes work areas which are not covered by the OPS (e.g. regarding integrated programmes, protected areas and contaminated sites). The 20 SAICM indicators of progress, alongside the 299 GPA indicators (which may

Box 2.3 **The SAICM Overall Orientation and Guidance (OOG) (SAICM Secretariat 2014b)**

The following set of 11 basic elements have been recognized in the SAICM's OOG as critical at the national and regional levels for the attainment of sound chemicals and waste management:

1. Legal frameworks that address the life cycle of chemicals and waste
2. Relevant enforcement and compliance mechanisms
3. Implementation of chemicals and waste-related multilateral environmental agreements, as well as health, labour and other relevant conventions and voluntary mechanisms
4. Strong institutional frameworks and coordination mechanisms among relevant stakeholders
5. Collection and systems for the transparent sharing of relevant data and information among all relevant stakeholders using a life-cycle approach, such as implementation of the GHS
6. Industry participation and defined responsibility across the life cycle, including cost recovery policies and systems as well as the incorporation of sound chemicals management into corporate policies and practices
7. Inclusion of the sound management of chemicals and waste in national health, labour, social, environment and economic budgeting processes and development plan
8. Chemicals risk assessment and risk reduction through the use of best practices
9. Strengthened capacity to deal with chemical accidents, including institutional strengthening for poisons centres
10. Monitoring and assessing the impacts of chemicals on health and the environment
11. Development and promotion of environmentally sound and safer alternatives

also be used for certain specific activities), can present a confusing impression with respect to SAICM implementation. The lack of strategic focus resulting from the number of guidance documents – with varying content, emphasis and status – has been cited as one of the weaknesses of SAICM that has hampered implementation and follow-up on progress (Honkonen and Khan 2017; Urho 2018). Most importantly, the 20 SAICM progress indicators and the 273 GPA indicators provide contradictory guidance for monitoring progress.

In 2015 the fourth session of the ICCM (ICCM4) endorsed the Overall Orientation and Guidance (OOG) for achieving the 2020 goal of sound management of chemicals (OOG). The OOG identifies 11 basic elements considered to be crucial at the national and regional levels for achieving the sound management of chemicals and waste (SAICM Secretariat 2014b, paragraph 19). Observers have remarked that the OOG is beneficial to stakeholders, as it consolidates the necessary elements of what is essentially an extremely broad plan encompassing the 299 activities listed in the GPA (Honkonen and Khan 2017). When evaluating the achievements of SAICM, it is therefore essential to understand the monitoring instrument which is applied and its context.

2.4 Activities tracked by the IOMC indicators

An initiative on simple indicators of progress

The Inter-Organization Programme for the Sound Management of Chemicals (IOMC) brings together nine intergovernmental organizations actively involved in chemical safety: the FAO, the ILO, the UN Development Programme (UNDP), UNEP, the UN Industrial Development Organization

Table 2.1 **IOMC Indicators and linkages to other policy instruments**

IOMC indicator	Inherently SAICM	Other voluntary agreement	Binding agreement	Links to Global Plan of Action activities	Links to Overall Orientation and Guidance elements
1. No. of countries with national profiles	o			1, 207, 211	4, 5
2. No. of countries with a Pollutant Release and Transfer Register (PRTR)	o			124-126, 177-180	10
3. No. of countries with a poisons centre	o			35, 221, 237	9, 10
4. No. of countries with controls for lead in decorative paint	o			57	2, 8 ,10
5. No. of countries that have implemented pesticide legislation based on the International Code of Conduct on Pesticide Management		o		23, 31, 189	3
6. No. of countries that have achieved core capacities for chemicals under the International Health Regulations (2005)			o		2
7. No. of countries that have Implemented the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)		o		22, 99-101, 168, 248-250	3, 5
8. No. of Parties to the Basel, Rotterdam, Stockholm and Minamata Conventions			o	169	3

(UNIDO), the UN Institute for Training and Research (UNITAR), the WHO, the World Bank and the OECD. These organizations coordinate their chemicals management activities and have an important role in SAICM, as 80 per cent of the activities of the GPA make reference to the involvement of IOMC organizations (SAICM Secretariat 2014b). In 2015 the IOMC developed a set of indicators to help IOMC organizations track progress relevant to SAICM by analyzing data from verifiable sources for which global data are available. The IOMC participating organizations have undertaken work in all these areas to support countries. The indicators are intended to provide additional information to complement data provided through reporting which has gaps due to low reporting rates. They are in use and are published on the IOMC website (IOMC 2010).

The IOMC indicators address legally binding agreements, but also a number of voluntary agreements such as the International Code of Conduct on Pesticide Management and the GHS, as indicated in Table 2.1. The table shows linkages to GPA activities (because the GPA makes abundant reference to IOMC participating organizations) and to the 11 basic elements of the OOG (because these have been established in SAICM as crucial basic elements at the national and regional level).

2.5 Reporting scheme and indicators under the 2030 Agenda for Sustainable Development

As explained in Part II, Ch. 1, a number of SDGs and targets under the 2030 Agenda are directly or indirectly relevant for the sound management of chemicals and waste. The existence of the SDG targets means new indicators and reporting obligations have been brought into the system of global governance for chemicals and waste. The High-Level Political Forum (HLPF), supported by the UN Economic and Social Council, has been designated as the main follow-up and review mechanism for progress on the SDGs. The HLPF conducts thematic reviews in a four-year cycle. For each meeting of the HLPF, countries are invited to prepare Voluntary National Reviews (VNRs) that are expected to contain useful information, identify best practices and challenges, and provide lessons that will contribute to implementation of the 2030 Agenda. The VNRs can also make it possible to identify opportunities for multi-stakeholder collaboration and the establishment of new partnerships to implement the SDGs.

Table 2.2 shows SDGs related to the management of chemicals and waste, with six targets and 11 indicators. The custodian and partner agencies in charge of the indicator-related work are also shown, as well as linkages to OOG elements (UN 2016; Inter-agency and Expert Group on Sustainable Development Goal Indicators 2018).

To monitor progress on chemicals-related SDG targets, interaction with multilateral agreements and the targets and indicators established by them is critical. Implementation of the chemicals- and waste-related multilateral agreements provides information relevant to Target 12.4 and Indicator 12.4.1 regarding the number of parties to the chemicals Conventions; the IHR provide information on health-related risks under Target 3.

There are clear linkages between the SDGs and SAICM. In 2017 and 2018, in the ongoing SAICM Intersessional process considering the Strategic Approach and the sound management of chemicals and waste beyond 2020, progress reporting, proposed objectives (derived from the OOG), related milestones, and links to the SDGs and the 2030 Agenda were discussed and areas were identified where SAICM indicators could strategically relate to the SDG targets (SAICM Secretariat 2017; SAICM Secretariat 2018b). Furthermore, the WHO has developed a Chemicals Road Map to enhance engagement by the health sector in SAICM towards the 2020 goal and beyond, addressing SDGs 3, 6 and 12 (WHO 2017). The Road Map includes a number of actions related to better measuring progress and improving indicators.

Table 2.2 SDGs 3, 6, 11 and 12 with targets, indicators, custodian and partner agencies, and linkages to OOG elements

Goal	Target	Indicator, with custodian (C) and partner (P) agencies	Linkages to OOG elements
3 GOOD HEALTH AND WELL-BEING	**3.9.** By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	**3.9.1** Mortality rate attributed to household and ambient air pollution *C: WHO; P: UNEP* **3.9.2** Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All [WASH] services) C: WHO; P: UNEP **3.9.3** Mortality rate attributed to unintentional poisoning *C: WHO; P: UNEP*	1 3 5 7 8 10 11
6 CLEAN WATER AND SANITATION	**6.3** By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	**6.3.1** Proportion of wastewater safely treated *C: WHO, UN Habitat, UNSD;* *P: UNEP, OECD, Eurostat* **6.3.2** Proportion of bodies of water with good ambient water quality *C: UNEP; P: UN Water*	1 3 7
11 SUSTAINABLE CITIES AND COMMUNITIES	**11.6** By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	**11.6.1** Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities *C: UN Habitat, UNSD ; P: UNEP* **11.6.2** Annual mean levels of fine particulate matter (e.g. $PM_{2.5}$ and PM_{10}) in cities (population weighted) *C: WHO; P: UN Habitat, UNEP OECD*	3 7 9
12 RESPONSIBLE CONSUMPTION AND PRODUCTION	**12.4** By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment	**12.4.1** Number of parties to international multilateral environmental agreements on hazardous waste, and other chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement *C: UNEP* **12.4.2** Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment *C: UNSD, UNEP; P: OECD, Eurostat*	1 3 4 5 6 7 8 9 10 11
	12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse	**12.5.1** National recycling rate, tonnes of material recycled *C: UNSD, UNEP; P: OECD, Eurostat*	1 3 4 5 6 7 8 9 10 11

3/ Achieving the 2020 goal: what do we know?

Chapter Highlights

Although concerted action has been taken through multilateral treaties on specific hazardous chemicals and issues of global concern, implementation gaps remain.

Progress has also been made through voluntary international instruments, including the International Code of Conduct on Pesticide Management and the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), but implementation gaps remain.

Regional cooperation, including through regional economic integration organizations, has assumed a prominent role in addressing chemicals and waste.

National profiles on chemicals management have produced country baseline information in many countries through multi-sectoral and multi-stakeholder collaboration.

The knowledge base on chemicals has been enhanced, among others through national inventories, hazard assessments, and Pollutant Release and Transfer Registers (PRTRs).

Many countries have made progress in enacting laws; creating programmes and plans; and implementing and aligning policies to create knowledge and to manage chemicals of concern.

The integrated approach to financing has mobilized significant resources, but has not matched the need and demand for support expressed by developing countries and economies in transition.

Illegal international traffic of hazardous waste and counterfeit products remains a priority.

An independent evaluation found the Strategic Approach to International Chemicals Management (SAICM) to be a unique framework, but pointed out weaknesses.

This chapter provides insights into the extent to which progress has been made towards achieving the 2020 goal. As implementation of relevant international instruments was explicitly referred to in the 2002 Johannesburg Plan of Implementation (JPOI), and since the multilateral treaties contribute across the five objectives of the OPS, they are discussed separately in the second section. The subsequent analysis of action taken, including through voluntary international instruments, is organized around the five objectives of the OPS: knowledge and information; risk reduction; governance; capacity building and technical cooperation; and illegal international traffic. This approach follows, with some adjustments, the institutional architecture in the international chemicals and waste cluster. In many cases activities discussed under one of the objectives may also contribute to the achievement of other objectives, as also reflected in the GPA. One such example is the GHS, discussed here under knowledge and information although it also contributes to risk reduction. The chapter concludes with a discussion of insights from stakeholder reporting on SAICM implementation, as well as the independent evaluation of SAICM, to provide additional insights relevant for assessing progress towards the 2020 goal.

Measuring the success of international agreements and frameworks has two aspects. The first concerns activities undertaken by Parties to meet their obligations or (in the case of voluntary international instruments) activities undertaken by stakeholders to implement voluntary commitments or agreed actions. Such activities include adoption of regulations, institutional arrangements, and awareness-raising activities. It is also essential, but more difficult, to obtain insights into whether agreements and frameworks are achieving their impact-oriented objectives (i.e. better protection of human health and the environment). The approach taken here to assess progress takes into account that a consolidated international results and indicators framework for chemicals and waste (which could have been used as an organizing framework to assess progress) is not in place.

3.1 Implementation of multilateral treaties on chemicals and waste

On specific hazardous chemicals and issues of global concern, the international community has taken concerted action through multilateral, legally binding treaties. While some experts agree that multilateral, legally binding treaties are effective, others argue that they cannot fully resolve the problems they were designed to address and point out that they are highly dependent on countries' capacity, political will and resources (Brown-Weiss and Jacobson 1998; Young 2011; Seelarbokus 2014; Sand 2016). As described below, progress towards the 2020 goal has been made through multilateral treaties on chemicals and waste. Yet implementation challenges remain.

3.1.1 The Montreal Protocol

The Montreal Protocol on Substances the Deplete the Ozone Layer (see Part II, Ch. 1, 2) was adopted in 1987, entered into force in 1989 and has 197 Parties. As noted in more detail in Part I, Ch. 5, 7, implementation of the Montreal Protocol has resulted in significant achievements. These include the phase-out of 99 per cent of ozone-depleting chemicals (Secretariat of the Vienna Convention and its Montreal Protocol 2018), averted emissions of 135 billion tonnes of carbon dioxide equivalent (CO_2-eq) to the atmosphere (Molina *et al.* 2009), and avoidance of much more severe ozone depletion (World Meteorological Organization [WMO] 2018a; WMO 2018b). It is particularly noteworthy that 142 out of 147 developing country partners met the 100 per cent phase-out target for chlorofluorocarbons (CFCs), halons and other ODS in 2010 (Rae and Gabriel 2012). Human health benefits achieved by the implementation of the Montreal Protocol have been realized primarily through the prevention of large increases in ultraviolet (UV) radiation in most of the world's inhabited regions. It is estimated that at least 100 million cases of skin cancer and many million cases of cataracts will be avoided by the end of this century as a result of implementation of the Protocol (UNEP 2015) (for more details, see Part I, Ch. 7).

Hydrofluorocarbons (HFCs) have been the most commonly used substitutes for ozone-depleting substances, especially for hydrochlorofluorocarbons (HCFCs). While HFCs do not deplete the ozone layer, they have a high global warming potential. The Kigali Amendment to the Montreal Protocol, which was agreed by Parties in 2016 and will enter into force in 2019, "is projected to reduce future global average warming in 2100 due to [HFCs] from a baseline of 0.3-0.5°C to less than 0.1°C" (WMO 2019).

A number of factors are responsible for the success of the Montreal Protocol (Rae and Gabriel 2012). In addition to a high level of cooperation and commitment by the international community, the following have been cited as determinants of success:

- To encourage countries to join the Protocol (and to prevent companies that manufacture or use CFCs and all other substances controlled by the Montreal Protocol from shifting operations to non-Parties), the Protocol restricts trade in CFCs and CFC-related products with non-Parties. It also contains a number of provisions restricting trade in controlled substances between Parties (Center for International Environmental Law [CIEL] 2015).

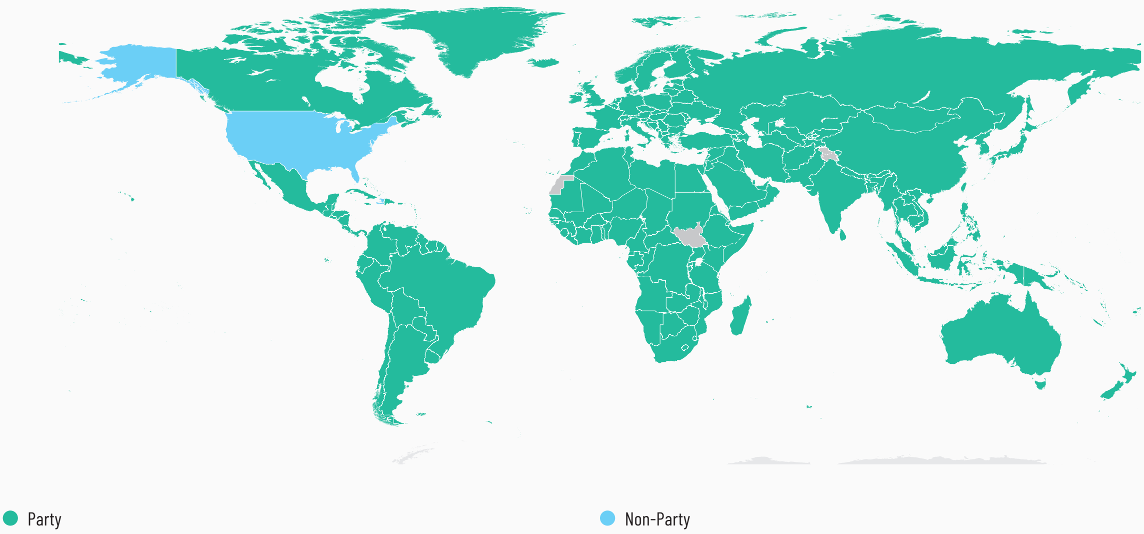
- The Protocol has provided a stable framework, allowing industry to plan long-term research and innovation.

- The three Assessment Panels of the Montreal Protocol (see Part II, Ch. 2) have been the pillars of the ozone protection regime since the beginning of the Protocol's implementation. By providing independent technical and scientific assessments and information, the Panels have helped the Parties reach solid and timely decisions on often complex matters. Panel experts have helped give countries the confidence to start their transition to chemicals that do not deplete the ozone layer. The compliance procedure was designed from the outset to be non-punitive in cases where countries were not in compliance.

- The Multilateral Fund for the Implementation of the Montreal Protocol (see Part II, Ch. 2) provides funding for developing countries to help them meet their compliance targets. It also provides institutional support to help these countries build capacity within their governments.

Even in the case of success stories such as the Montreal Protocol, implementation may present challenges. For example, it emerged in 2018 that the production and use of trichlorofluoromethane (CFC-11), a powerful ozone-depleting substance banned under the Montreal Protocol and also a potent greenhouse gas, may be ongoing (Montzka *et al.* 2018).

Figure 3.1 Parties to the Basel Convention, as at January 2019 (adapted from Secretariat of the Basel Convention 2019a)

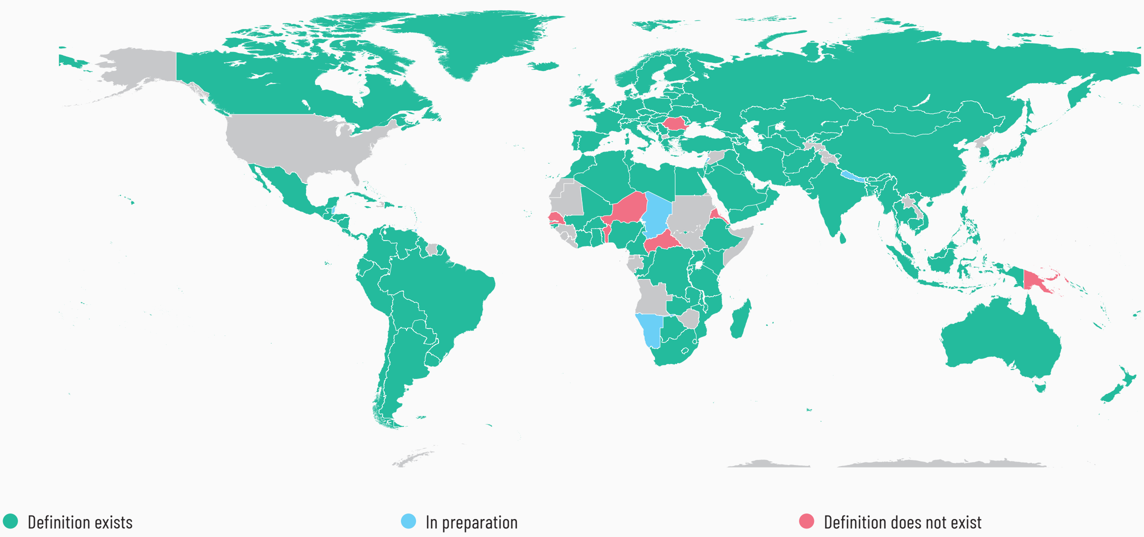


3.1.2 The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal (see Part II, Ch. 1, 2) was adopted in 1989 and entered into force in 1992. It has 186 Parties, compared with 173 in 2010 (Secretariat of the Basel Convention 2019a) (Figure 3.1).

The Basel Convention has an Implementation and Compliance Committee which is a subsidiary body of the Conference of the Parties (COP) to the Convention. The level of implementation can be measured across specific countries and regions. For example, national report templates ask Parties to report on the status of the control procedure for transboundary movements of waste, including through the use of notification and movement document forms. A detailed analysis of their performance shows that many

Figure 3.2 Basel Convention implementation: Parties which have used the option to adopt a national definition of hazardous waste, as at January 2019 (based on Secretariat of the Basel Convention 2019b)



are making important progress. Under the Convention, Parties have the option to adopt a national definition of hazardous wastes. Figure 3.2 shows the extent to which they have used this option (Secretariat of the Basel Convention 2019b).

The Basel Convention has also strengthened Parties' capacity for environmentally sound management of various types of waste through the development of a series of technical guidelines covering, among others, wastes that consist of, contain or are contaminated with (for example) mercury, polychlorinated biphenyls (PCBs), polychlorinated dibenzodioxins and dibenzofurans (Secretariat of the Basel Convention 2011).

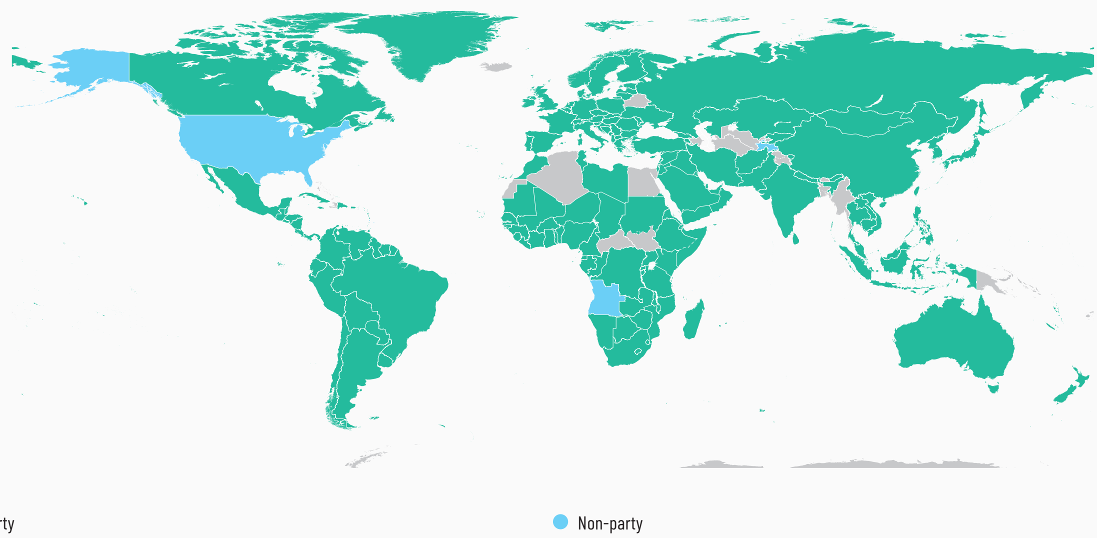
In 2011 the COP adopted a strategic framework for the implementation of the Basel Convention for 2012-2021 consisting of a vision; guiding principles; strategic goals and objectives; means of implementation; indicators for measuring achievement; and performance and evaluation. For the mid-term evaluation in 2016, 35 responses were received from Parties. In its decision BC-13/1, the COP noted the low level of submissions of information to enable the mid-term evaluation and agreed on a new approach to preparing the final evaluation of the strategic framework in time for the 15th meeting of the COP in 2021 (Secretariat of the Basel Convention 2017).

3.1.3 The Rotterdam Convention

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (see Part II, Ch. 1, 2) was adopted in 1998, entered into force in 2004 and has 161 Parties, compared with 140 in 2010 (Secretariat of the Rotterdam Convention 2019) (Figure 3.3). It facilitates information exchange on the international trade of certain hazardous chemicals by providing for a national decision-making process concerning the import and export of such chemicals, and by disseminating those decisions to Parties for collective consideration at the international level in accordance with the procedures of the Convention.

There is no reporting obligation under the Rotterdam Convention. However, the Prior Informed Consent (PIC) scheme is an indicator that reflects the extent to which countries are achieving results on the objectives to which they have agreed. The PIC scheme requires an exporting party to receive prior consent from an importing party before it exports to that country a chemical listed under the Convention. The second progress report in 2013 noted that the Secretariat had received 45 notifications, from 16 Parties, of a final regulatory action to ban or severely restrict a chemical during the reporting period 2012-2013. It also highlighted that a total

Figure 3.3 Parties to the Rotterdam Convention, as at January 2019 (adapted from Secretariat of the Rotterdam Convention 2019)



of 4,500 import responses had been submitted by 135 Parties for Annex III chemicals since the Convention entered into force (Secretariat of the Rotterdam Convention 2013). As the PIC procedure has evolved, there have been several challenges at the national level regarding effective implementation of the obligations. They have included the financial and technical capacity to manage customs systems, and to review all requests for imports and control them.

Article 17 of the Convention requires the COP to develop and approve procedures and institutional mechanisms for determining non-compliance and for the treatment of Parties found to be non-compliant. The topic has been discussed at an Open-ended Ad-Hoc Working Group as well as at each COP. However, to date no final decision has been taken on this matter. The COP, at its eighth meeting in 2017, established a working group to identify a set of prioritized recommendations for enhancing the effectiveness of the Convention, and to identify further steps in this respect for consideration by the Parties.

The Rotterdam Convention has contributed to the establishment of key parameters for the trade of hazardous substances. This is important with respect to the transfer of information to developing countries. The Convention has also created a policy space for collaboration on trade in hazardous substances and materials with other organizations, such as the World Customs Organization (WCO), and with the GHS.

3.1.4 The Stockholm Convention

The Stockholm Convention on POPs (see Part II, Ch. 1, 2) was adopted in 2001, entered into force in 2004 and has 182 Parties, up from 172 in 2010 (Secretariat of the Basel, Rotterdam and Stockholm Conventions [BRS Secretariat] 2018; Secretariat of the Stockholm Convention 2019a) (Figure 3.4).

Article 7 of the Stockholm Convention requires Parties to develop and periodically update National Implementation Plans (NIPs) to meet their obligations under the Convention. Depending on a country's specific situation in the context of the Convention, NIPs could provide information about all measures taken on POPs, such as legislative and policy measures; the preparation of action plans; the setting up of monitoring schemes related to the occurrence and releases of POPs; and efforts to reduce their environmental concentrations. To date, 91 per cent of Parties have submitted NIPs covering the 12 initial POPs (UNEP and Secretariat of the Stockholm Convention 2017a) (Figure 3.5). NIPs are intended to be "living documents" and to be periodically updated as the Convention evolves and new substances are listed in the annexes, provided a Party is bound by the amendment

Figure 3.4 **Parties to the Stockholm Convention, as at January 2019 (adapted from Secretariat of the Stockholm Convention 2019a)**

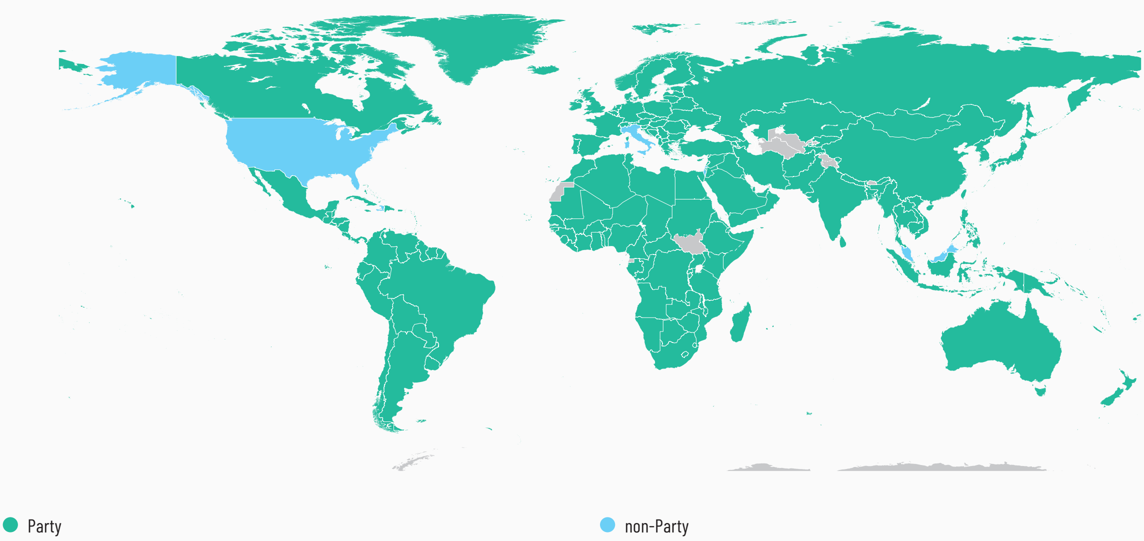
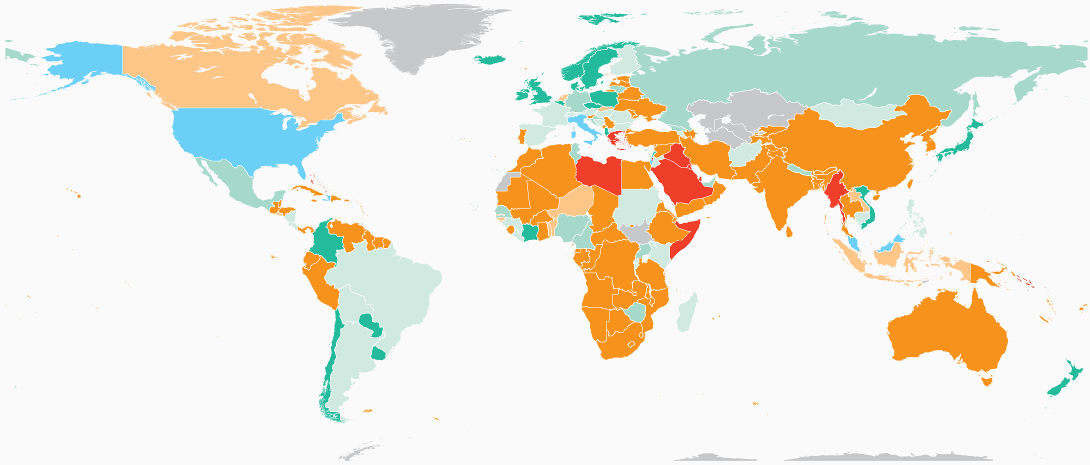


Figure 3.5 Countries with National Implementation Plans (NIPs) under the Stockholm Convention, as at January 2019 (based on Secretariat of the Stockholm Convention 2019b)



or has deposited its instrument of ratification. However, since 2011 only around one-quarter of NIPs have been updated to reflect the inclusion of new substances (UNEP and Secretariat of the Stockholm Convention 2017b).

The Stockholm Convention includes periodic effectiveness evaluations, which have so far been carried out twice, in 2009 and 2017, drawing upon many sources of information including reporting, NIPs, monitoring data and non-compliance information. The 2017 effectiveness evaluation concluded that "the Convention provides an effective and dynamic framework to regulate POPs throughout their lifecycle, addressing the production, use, import, export, releases, and disposal of these chemicals worldwide" (UNEP and Secretariat of the Stockholm Convention 2017b). In addition, it reported that the Convention had put in place the mechanisms required to support Parties. However, the evaluation also noted areas for further work, including lack of regulatory and assessment schemes for industrial chemicals, limited availability of data from national inventories, and the existence of large stockpiles of obsolete pesticides. The evaluation report included recommendations to improve implementation; create procedures and mechanisms to support countries in compliance; and address the challenge of limited reporting and availability of data in national reports and national implementation plans.

The effectiveness evaluation also found that limited progress had been made towards the environmentally sound management of PCBs by 2028 (Secretariat of the Stockholm Convention 2017; UNEP and Secretariat of the Stockholm Convention 2017b) (Table 3.1). An estimated 1-1.5 million tonnes of technical grade PCBs have been produced. Each tonne has generated at least 20 tonnes of PCB waste, posing significant challenges for countries with limited capacity for the environmentally sound management of PCB. It is estimated that 3 million tonnes of PCB liquids and equipment were eliminated by the Parties to the Stockholm Convention by 2015. Most of that progress was made after the Convention entered into force in 2004, indicating its effectiveness. However, it has been estimated that around 14 million tonnes of PCB liquids and equipment still need to be eliminated. This means 83 per cent of the total amount of PCB liquids and equipment remains to be destroyed by 2028 (Secretariat of the Stockholm Convention 2017; UNEP and Secretariat of the Stockholm Convention 2017b).

The Global Monitoring Plan (GMP) was established to provide Parties with a harmonized framework for data collection and monitoring of the presence

Table 3.1 Estimates of progress made towards elimination of PCBs use per UN region, 1990-2015 (UNEP and Secretariat of the Stockholm Convention 2017b, p. 73)

Region	Eliminated		To be eliminated		Total
	Tonnes	Share (%)	Tonnes	Share (%)	
Africa	6,056	2	269,736	98	275,792
Asia-Pacific	2,017,916	14	12,374,821	86	14,392,736
Central and Eastern Europe	111,009	19	482,076	81	593,085
Latin America and the Caribbean	76,772	14	484,768	86	561,540
Western Europe and Others	744,267	64	415,464	36	1,159,731
All	**2,956,019**	**17**	**14,026,865**	**83**	**16,982,885**

of POPs. It is the backbone of the effectiveness evaluation. The GMP provides information on trends in the occurrence of POPs in humans and the environment. The first GMP report (Secretariat of the Stockholm Convention 2009) provided information on baseline concentrations of 12 legacy POPs. The second report (UNEP and Secretariat of the Stockholm Convention 2017a) provided the first indications of changes in concentrations of legacy POPs, as well as baseline information on newly listed POPs. Monitoring results indicate that concentrations of some POPs may be decreasing while trends are mixed for others (see Part I, Ch. 6).

3.1.5 The Minamata Convention

The Minamata Convention on Mercury was adopted in 2013 and entered into force in 2017 (see Part II, Ch. 1, 2). As of January 2019, 101 States and the EU had deposited instruments of ratification (or acceptance, approval or accession) (UNEP 2019a) (Figure 3.6).

Like the Basel Convention, the Minamata Convention has an Implementation and Compliance Committee which is a subsidiary body of the Conference of the Parties (UNEP 2018a). There is also a periodic effectiveness evaluation, as in the case of the Stockholm

Figure 3.6 Parties to the Minamata Convention, as at January 2019 (adapted from UNEP 2019a)

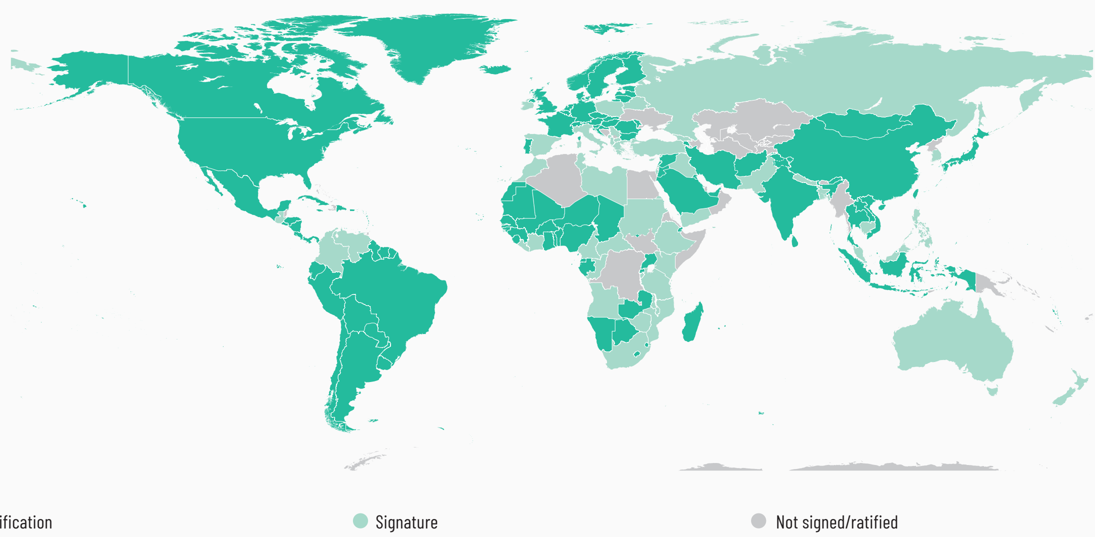
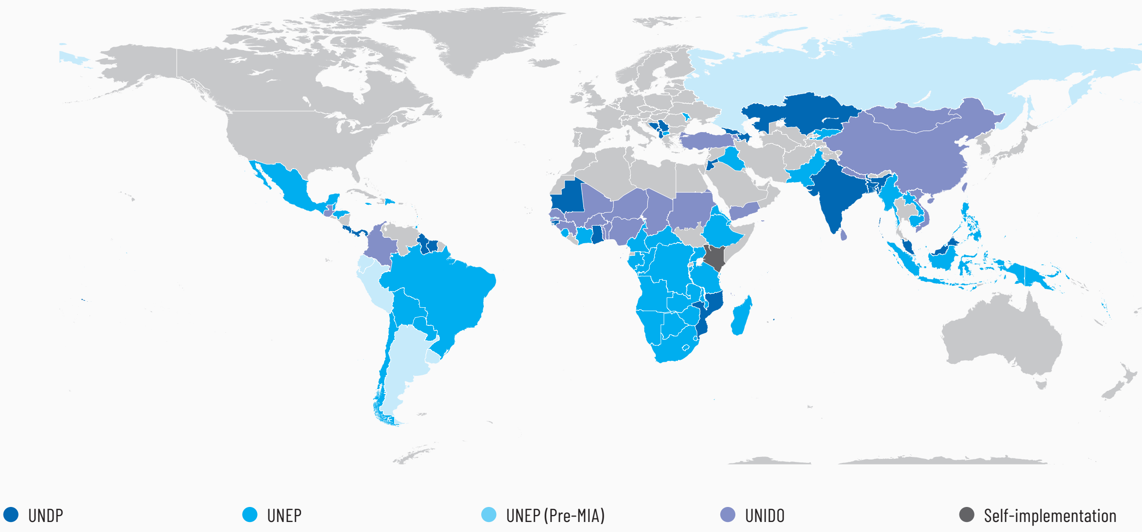


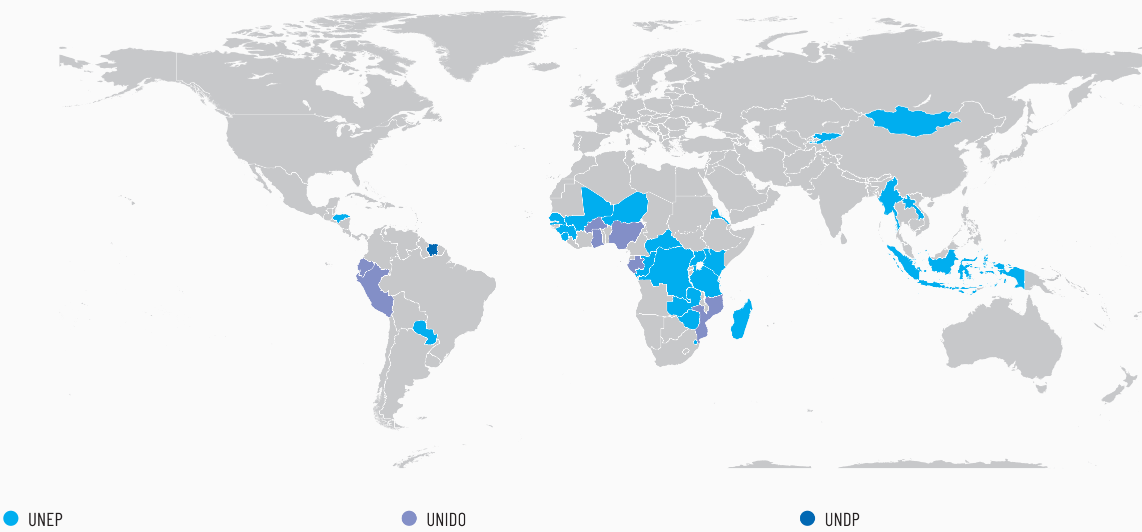
Figure 3.7 **Countries which have undertaken Minamata Initial Assessments (MIAs), as at January 2019 (adapted from UNEP 2019a)**



Convention. The Minamata Convention defines a financial mechanism to support developing country Parties, and Parties with economies in transition, in meeting their obligations. It includes the Global Environment Facility (GEF) Trust Fund and a Specific International Programme (SIP) to Support Capacity-Building and Technical Assistance. The first five projects were approved by the Governing Board of the SIP in October 2018 (Secretariat of the Minamata Convention on Mercury 2018). The GEF supports, among others, enabling activities for eligible Parties to strengthen national capacity towards ratification and build national capacity to meet future obligations, particularly undertaking Minamata Initial Assessments (MIAs) (Figure 3.7).

Artisanal and small-scale gold mining (ASGM) is a major source of anthropogenic emissions of mercury. The Minamata Convention requires Parties with more than insignificant ASGM using mercury to extract gold from ore to develop and implement National Action Plans (NAPs). Figure 3.8 shows the Parties that are developing

Figure 3.8 **Parties with National Action Plans (NAPs) for artisanal and small-scale gold mining, as at January 2019 (adapted from UNEP 2019a)**



Box 3.1 **Synergies across multilateral treaties on chemicals and waste**

In 2011 the COPs to the Basel, Rotterdam and Stockholm Conventions adopted substantively identical decisions to further cooperation and coordination. To create more synergies among the three Conventions, it was decided to hold joint sessions of two or three of the COPs on joint issues. The objectives of holding these meetings in a coordinated manner are to strengthen implementation of the three Conventions at the national, regional and global levels; promote coherent policy guidance; and enhance efficiency in the provision of support to Parties (Secretariat of the Basel, Rotterdam and Stockholm Conventions [BRS Secretariat] 2018).

Regarding the last objective, the Secretariat structure for the Conventions was streamlined. In 2012 the Secretariats of the Basel and Stockholm Conventions, together with UNEP (which is part of the Rotterdam Convention Secretariat), moved from three separate Secretariats with a programmatic structure to a single Secretariat with a matrix structure serving all three Conventions. Greater cooperation and coordination among the chemicals and waste Conventions support capacity building, knowledge transfer, enhanced awareness and efficiency, and improved implementation of the Conventions and of the Sustainable Development Goals.

Synergies also exist between the Basel, Rotterdam and Stockholm Conventions (BRS Conventions) and the Minamata Convention. Provisions under the Minamata Convention addressing the interim storage of mercury and mercury wastes refer to relevant guidelines and definitions developed under the Basel Convention. A number of decisions adopted by the COPs to the BRS Conventions also make specific reference to the Minamata Convention. For example, identical decisions taken by the BRS COPs at their 2017 meetings requested the BRS Secretariat "to continue to enhance cooperation and coordination with the interim secretariat of the Minamata Convention" (BRS Secretariat 2017). Accordingly, Parties to the Minamata Convention have requested the Secretariat to continue to cooperate and coordinate with the BRS Secretariat (Secretariat of the Minamata Convention on Mercury 2017).

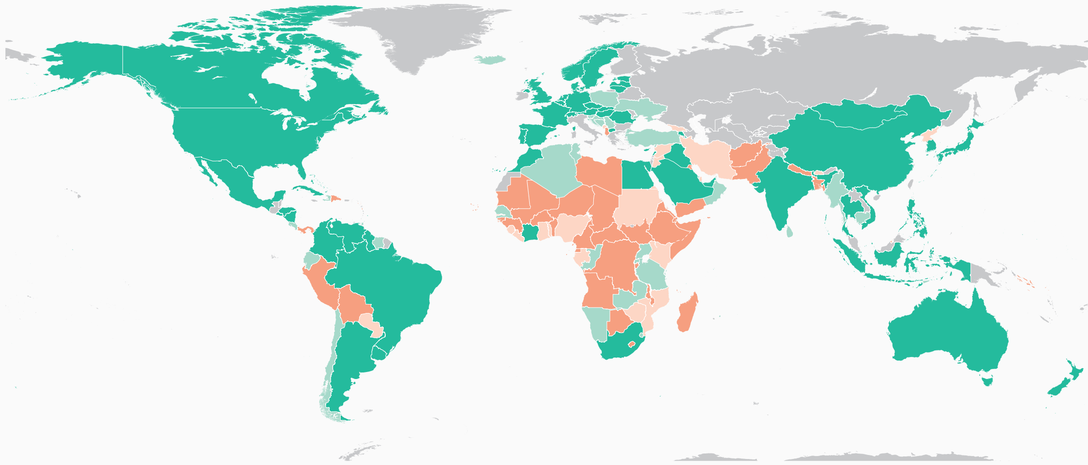
these NAPs (UNEP 2019a). The Convention also has provisions for phasing out the use of mercury in various products and ensuring the environmentally sound management of mercury wastes, among others. Since the Convention entered into force in 2017, it is too early to assess its effectiveness in a comprehensive manner.

3.1.6 ILO Conventions 170 and 174

ILO Convention 170 (the Chemicals Convention) was adopted in 1990, entered into force in 1993 and has 21 Parties; ILO Convention 174 (the Convention concerning the Prevention of Major Industrial Accidents) was adopted in 1993, entered into force in 1997 and has 18 Parties (see Part II, Ch. 1, 2). As mentioned in Part II, Ch. 2, the ILO has a structure of committees that oversee implementation of its Conventions.

In 2007 a Meeting of Experts to Examine Instruments, Knowledge, Advocacy, Technical Cooperation and International Collaboration as Tools with a view to Developing a Policy Framework for Hazardous Substances recommended that a plan of action be developed based on the following fundamental pillars: information and knowledge; preventive and protective systems aimed at the reduction of risks; capacity building; social dialogue; and good governance. This plan of action should be implemented using a variety of instruments, including ILO standards and joint actions, and be based on the principles of the 2003 Global Strategy on Occupational Safety and Health and SAICM, in partnership with workers, employers and governments (ILO 2007). Follow-up activities by the ILO have been summarized in the document *Safety and Health in the Use of Chemicals at Work* (ILO 2013).

Figure 3.9 Countries with core capacities for chemicals under the International Health Regulations (2005), 2018 (adapted from WHO 2018a)



3.1.7 The WHO International Health Regulations (IHR) (2005)

The International Health Regulations (IHR) (2005) were adopted by the World Health Assembly in 2005, entered into force in 2007 and have 196 Parties (see Part II, Ch. 1 and 2). They require monitoring of the development and implementation of defined core public health capacities in order to detect, assess, notify and report events, and to respond to public health risks and emergencies of national and international concern. For example, core capacity 12 covers the detection and alerting of, and response to, chemical events (WHO 2018a). Other capacities include chemical events (e.g. emergencies) legislation and policies, preparedness and response, and strategic coordination.

The Global Health Observatory provides information on the status of implementation, which is indicated across four levels, with 59 countries (30 per cent) having achieved the highest level (75-100), 17 (9 per cent) scoring at the second level, 23 (12 per cent) at the third level and 27 (14 per cent) at the basic level. For 67 countries (35 per cent) there is a lack of data (WHO 2018a). Significant progress was made between 2010, when 38 countries had achieved core capacities for chemicals under the IHR, and 2016, when 60 countries had done so; however, a downward trend materialized by 2017, when only 56 countries had achieved these core capacities (IOMC 2019). Figure 3.9 provides an overview of the development of core capacities for chemicals under the IHR in 2016, illustrating the need for further efforts to achieve full implementation, particularly in the African region (WHO 2018a).

3.2 Progress in achieving the five objectives of the SAICM OPS

3.2.1 Governance

One of SAICM's objectives for "governance" is to "promote the sound management of chemicals within each relevant sector and integrated programmes for sound chemicals management across all sectors" (SAICM Secretariat, UNEP and WHO 2006). Strengthening of appropriate national, regional and international mechanisms, enforcement, relevant codes of conduct and other relevant objectives has, among others, been achieved via the international agreements discussed above. The section below provides additional illustrations of progress at the national and regional levels.

Africa

In recent years, various countries in Africa have made progress in strengthening their chemicals and waste management capacities. For example, Kenya is in the process of putting in place the Environmental Management and Coordination (Toxic and Hazardous Chemicals and Materials Management) Regulations (Hazlewood 2019). Other recent legislative progress in the region has largely been restricted to adoption of legislation addressing specific chemicals, such as the national policy framework for the management of PCBs approved in Nigeria in 2015. Recent

Table 3.2 Examples of regional institutions and initiatives addressing chemicals and waste in the African region

Institution/initiative	Examples of implementation bodies and activities
Southern African Development Community (SADC)	› Technical Regulations Liaisons Committee promote and facilitates implementation of the SADC Technical Regulation Framework › SADC Policy on the GHS › Development of the Code on Safe Use of Chemicals under the Employment and Labour Sector Programme
Economic Community of West African States (ECOWAS)	› Sahelian Pesticide Committee › West African Committee for Pesticide Registration Harmonization of regulations for control of pesticides › Harmonization of chemicals data requirements, test guidelines, risk assessment, registration procedures and risk reduction
East African Community (EAC)	› Development and harmonization of standards and regulations on pollution control and waste management (e.g. EAC Electronic Waste Management Framework and Management of Plastic and Plastic Waste Disposal)

efforts in South Africa to adopt a comprehensive chemicals management law – with provisions for industrial chemicals registration and risk assessment, and seeking to streamline the responsibilities of various government entities – have not materialized to date (Stringer 2017).

In past years a number of African countries have enacted legislation addressing chemicals in products, such as restrictions on certain substances in cosmetics in Morocco (Morocco Ministry of Health n.d.) and Rwanda (Rwanda Ministry of Health 2016) and new toy safety standards in Egypt (European Commission [EC] 2018). As of 2018, 11 countries (Algeria, Burundi, Cameroon, Ethiopia, Kenya, Nigeria, Rwanda, South Sudan, Tanzania, Uganda and Zimbabwe) had legislation and statutes limiting lead in all decorative paints. Waste management continues to be a priority in the region. In 2016 Ghana passed an act to streamline and strengthen waste management and recycling systems, including through the establishment of a fund to provide finance for the management of electrical and electronic waste (Republic of Ghana 2016).

Africa has a dense network of regional political and economic integration organizations. Given often limited national capacities, organizations such as the Southern African Development Community (SADC), the East African Community (EAC) and the Economic Community of West African States (ECOWAS) play an important role in advancing action on the sound management of chemicals and waste, for example through facilitating implementation of the GHS and harmonizing pesticides management (Table 3.2).

Asia and the Pacific

Important recent legislative developments in the Asia-Pacific region include China's 2013 landmark Five-Year Plan for Chemical Environmental Risk Prevention and Control, which established chemicals management principles and featured a list of 58 priority chemicals for risk prevention and control (Chemical Watch 2013a). In addition, in 2018 several ministries jointly issued a list of 22 priority chemicals which would be subject to risk management and control measures (Chemical Watch 2018a). In Japan the Chemical Substances Control Act, often referred to as the "Japanese Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)", was amended in 2009, modifying the approach used to a risk- rather than hazard-based one (Zaman 2016). The Act on the Registration and Evaluation of Chemicals (often referred to as "K-REACH") was adopted in the Republic of Korea in 2013 and entered into force in 2015, with an amendment entering into force in 2019 (Chemical Inspection and Regulation Service [CIRS] 2019).

Table 3.3 Examples of regional institutions and initiatives addressing chemicals and waste in the Asia and the Pacific region

Institution/initiative	Examples of implementation bodies and activities
Association of Southeast Asian Nations (ASEAN n.d.)	› Working Group on Chemicals and Waste (established in 2016) › Establishment of the ASEAN-Japan Chemical Safety Database (launched in 2016)
South Asia Association for Regional Cooperation (SAARC)	› Development of regional standards for chemicals and chemical products › Establishment of a network on waste management initiated via the Dhaka Declaration (2004)
Secretariat of the Pacific Regional Environment Programme	› Projects to strengthen legislative frameworks and waste management capacity

In 2017 Viet Nam issued a Chemicals Decree specifying, among others, requirements for the production and trade of industrial chemicals and requiring classification in accordance with the GHS. The Decree features five lists of regulated chemicals (including lists of banned and restricted chemicals) (ChemSafetyPro 2017).

In India in 2017, the Ministry of Environment, Forests and Climate Change established an expert committee responsible for the formulation of the National Action Plan for Chemicals to address the issues of chemical control, management and pollution in India (Global Business Briefing 2017; Niadu 2017). Thailand is currently streamlining its hazardous substances lists and amending its Hazardous Substances Act, which regulates the import, production, marketing and possession of all hazardous chemicals used in Thailand (Chemical Watch 2013b; ChemSafetyPro 2016a). Regional cooperation on chemicals and waste management led by other organizations supports legislative and policy development in the region. The programme "Toward a Non-Toxic Environment in South-East Asia" has helped to develop a regulatory framework and institutional capacity in the countries of the Mekong region (Swedish Chemicals Agency [KEMI] 2016). Moreover, countries such as Malaysia and Thailand are aligning their policies with guidance provided by the OECD.

Economic and political integration organizations advancing regional cooperation on chemicals and waste management include the Association of Southeast Asian Nations (ASEAN) and the South Asia Association for Regional Cooperation (SAARC) (Figure 3.3). Countries in the Asia-Pacific region have also joined forces under the umbrella of intergovernmental organizations targeting specifically environmental matters. The South Asia Cooperative Environment Programme and the Secretariat of the Pacific Regional Environment Programme, for example, implement projects to strengthen capacities for environmentally sound management of waste and support the development of chemicals management legislation, among others. Another example for regional cooperation on chemicals and waste related issues is the developed a regional roadmap by the WHO South East Asia Regional Office (SEARO) to help Member States develop and implement national antimicrobial resistance (AMR) prevention and containment action plans.

Europe

Chemicals legislation and policies are to a large extent jointly developed by Member States in the framework of the European Union (EU), most notably in the case of the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) Regulation. As REACH applies not only to chemicals produced in the EU but also to those imported, it has had significant economic and legislative effects beyond the Member States. In Central and Eastern Europe (CEE) Russia undertook a significant reform of its chemicals management system in 2016 by adopting a new technical regulation for chemical product safety, to come into force in 2021. It seeks, among others,

to improve the existing chemicals inventory, requesting notification procedures such as those stipulated in REACH for any new substances (ChemSafetyPro 2016b). The effect of the EU's legislative initiatives extends beyond its Member States. Accession candidate countries align their regulations with EU standards, as was recently done by Serbia (Chemical Watch 2018b). Similar developments can be observed in non-candidate countries (e.g. Ukraine) (Chemical Watch 2018c).

The EU is the key regional economic and political integration organization driving the development of a harmonized legal framework in Europe (Table 3.4). The most important and comprehensive legislation governing chemicals production and use in Europe is REACH, which entered into force in 2007 with three deadlines for registration of chemicals in the ensuing years, the last taking effect in 2018. The identification of substances of very high concern (SVHC) is an

Table 3.4 Examples of regional institutions and initiatives addressing chemicals and waste in Europe

Institution/initiative	Examples of implementation bodies and activities
European Union (EU)	› European Chemicals Agency (ECHA) › Development and implementation of joint chemicals and biocides regulations (e.g. REACH; Biocidal Products Regulation; Classification, Labelling and Packaging [CLP] Regulation)
Eurasian Economic Commission (EEC)	› Single registry of chemical materials and substances › Adoption of a technical regulation on the safety of chemical products (2018)
Commonwealth of Independent States (CIS)	› Development of common standards for classification and labelling of chemicals and safety data sheets (SDS) › Harmonization with the GHS › Cooperation on e-waste management

ongoing process. An SVHC Roadmap foresees having all currently known SVHC included in the Candidate List by 2020 (European Chemicals Agency [ECHA] n.d. a). Concerning the assessment and management of the risks of chemicals, REACH shifts responsibility from public authorities to industry. In Central and Eastern Europe the Eurasian Economic Union, the Eurasian Customs Union and the Commonwealth of Independent States are institutional umbrellas for the development of harmonized chemicals management frameworks (Table 3.4). Legislative initiatives on substance management in these associations are mainly aimed at implementing the GHS and managing risks arising from the handling of substances and materials.

Latin America and the Caribbean

Several countries in this region have recently established overarching chemicals management policies, including Guatemala (2013), Honduras (2013), Ecuador (2015), Colombia (2016), Chile (2017) and Costa Rica (2017). Eight Caribbean

Table 3.5 Examples of regional institutions and initiatives addressing chemicals and waste in Latin America and the Caribbean

Institution/initiative	Examples of implementation bodies and activities
Southern Common Market (Sistema de Informacion Ambiental del Mercosur n.d.)	› Ad hoc Group on Environmental Management of Waste and Post-use Responsibility › Ad hoc Group on Environmental Management of Chemical Substances and Products › Action Plan on Chemical Substances and Products (2008); places priority on pesticides, mercury, management of contaminated sites, and implementation of the GHS
Andean Community of Nations (Comunidad Andina n.d.)	› Andean Law on the registration and control of chemical pesticides for agricultural use (created in 1998, modified in 2015) › Action Plan for the Prevention and Response to Emergencies by Hazardous Chemical Products
Regional Intergovernmental Network on Chemicals and Waste	› Identification of regional priorities on chemicals and waste; first Action Plan for 2019-2020

countries (Antigua and Barbuda, Barbados, Belize, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago) are preparing a legal framework for chemicals management through a Global Environment Facility (GEF) funded project supported by the GEF and the Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean Region (BCRC-Caribbean).

In addition, several countries have developed specific policies and programmes on industrial chemicals. Examples include the draft law on industrial chemicals in Brazil (scheduled to be submitted to Congress in 2018), whose intention, among others, is to establish a national chemicals inventory and to establish the process of registering, evaluating and controlling these chemicals (SAICM Secretariat 2018a). Countries in the region are also advancing in the implementation of the GHS, the implementation of PRTRs and the establishment of waste management capacity, including through promoting the concept of extended producer responsibility (e.g. in Argentina and Chile). A strong driver of chemicals management capacity in the region is countries' (imminent) membership in (Chile, Colombia and Mexico), interest in acceding to (Costa Rica) or collaboration with (e.g. Brazil, Jamaica) the OECD (OECD 2017).

Regional and sub-regional economic and political integration organizations such as the Southern Common Market and the Andean Community of Nations (Table 3.5) play an important role in advancing regulatory harmonization and the development and implementation of policy-oriented action plans on chemicals and waste. The Caribbean Community and the Central American Commission for Environment and Development are also actively addressing chemicals and waste issues. Free trade agreements with other regions and countries, such as the Caribbean Forum-EU Economic Partnership Agreement (Mclean and Khadan 2015), have further catalysed regulatory progress in regard to sound chemicals management. At the regional level, an important milestone accelerating implementation of the 2020 goal was the establishment of the Regional Intergovernmental Network on Chemicals and Waste in the context of the Forum of Ministers of Environment in 2016.

North America

In the United States the Frank R. Lautenberg Chemical Safety for the 21st Century Act, in

Table 3.6 Examples of regional institutions and initiatives addressing chemicals and waste in North America

Institution/initiative	Examples of implementation bodies and activities
North American Agreement on Environmental Cooperation	› Commission for Environmental Cooperation supports cooperation to address environmental issues of continental concern

force since 2016, amended the Toxic Substances Control Act. It regulates the introduction of new or already existing chemicals on the market in that country and authorizes the United States Environmental Protection Agency (US EPA) to evaluate potential risks from such chemicals, as well as to restrict their production and use accordingly. Among others, the Amendment requires the US EPA to evaluate the safety of existing chemicals in commerce, starting with those that may present unreasonable risk, and removes a requirement that the US EPA choose the "least burdensome" way to address the unreasonable risk posed by a chemical (United States Congress 2016).

Launched in 2006, the Chemicals Management Plan (CMP) is a Government of Canada initiative aimed at reducing the risks posed by chemicals to Canadians and their environment. The CMP builds on previous initiatives to protect human health and the environment by assessing chemicals used in Canada and by taking action on chemicals found to be harmful. The CMP is delivered jointly by Environment and Climate Change Canada and Health Canada through partnership and engagement with stakeholders. The CMP assesses environmental and human health risks posed by chemical substances, and develops and implements measures to prevent or manage those risks from a broad suite of risk management tools. The Canadian Government is taking action to set new directions and objectives for chemicals management. It has initiated a broad-based engagement with partners and stakeholders to inform the direction of chemicals management in Canada beyond 2020. This engagement will include consideration of many issues, including the approach to "substances of very high concern". The Government has also committed to introducing a bill to amend CEPA in a future parliament (Government of Canada 2018a).

The United States, Canada and numerous other countries are members of the OECD, which has been a critical driver for the development and application of harmonized methods and approaches for testing and assessment of chemicals, risk management, and chemical accident prevention, preparation and response, among others.

Established by the North American Agreement on Environmental Cooperation, the Commission for Environmental Cooperation supports cooperation among Canada, Mexico and the Unites States to address environmental issues of continental concern, including the environmental challenges and opportunities presented by the North American Free Trade Agreement. A Technical Working Group on Pesticides facilitates cost-effective pesticide regulation through harmonization (e.g. a registration system). In February 2011 the Governments of the United States and Canada launched the Canada-U.S. Regulatory Cooperation Council to facilitate closer cooperation between the two countries on the development of smarter and more effective approaches to regulation that strengthen the economy, enhance competitiveness, and protect public safety and welfare (Government of Canada 2017) (Table 3.6).

West Asia

An example of an important recent legislative development with respect to the sound management of chemicals and waste in the West Asia Region is the Turkish Chemical Registration, Evaluation, Authorization and Restriction Regulations. These regulations are modelled

on the EU's REACH Regulation and will streamline several existing chemicals regulations (Chemical Watch 2017a). Turkey is also a member of the OECD. The Gulf Cooperation Council members – Bahrain, the United Arab Emirates, Kuwait, Oman, Qatar and Saudi Arabia – and Yemen recently initiated legislation to restrict the use of certain chemicals of concern in products such as electrical and electronic equipment (Hazlewood 2018), cosmetics and personal care products (Chemical Watch 2017b), toys (Chemical Watch 2013c) and detergents (Chemical Watch 2017c).

The Gulf Cooperation Council is an important vehicle driving the development of the harmonized legal chemicals management frameworks of its members (Table 3.7). Other entities active at the regional levels include the Regional Organization for Protection of the Marine Environment.

Integrated national programmes, national profiles and institutional coordination

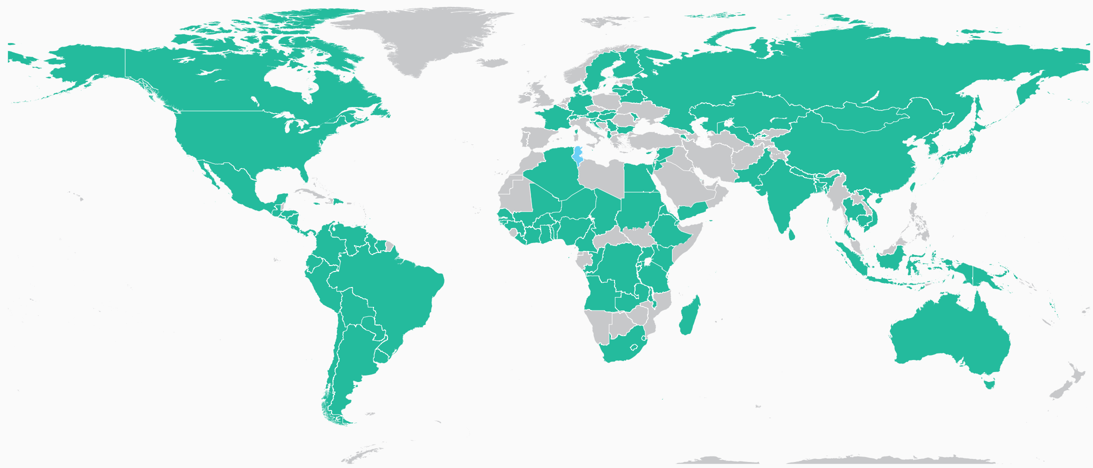
The development of country-driven and country-owned chemical management processes is among the topics prominently featured in the Overarching Policy Strategy of SAICM. Under governance, the OPS features as a specific objective promoting the development of "integrated programmes for the sound management of chemicals across all sectors".

Under the work area "Implementation of integrated national programmes" the GPA elaborates elements of such programmes

Table 3.7 Examples of regional institutions and initiatives addressing chemicals and waste in the West Asia region

Institution/initiative	Examples of implementation bodies and activities
Gulf Cooperation Council	› Common System for the Management of Hazardous Chemicals (2002) established minimum legislation for the member states in dealing with hazardous chemicals › "Green Gulf 2020 Project" implemented to help achieve the vision of an environmentally friendly Gulf by the year 2020

Figure 3.10 National profiles to assess the chemicals and management infrastructure, 2018 (adapted from UNITAR 2018a)



including, among others, the development of a comprehensive national profile; formalizing inter-ministerial and multi-stakeholder coordination (including coordination of national government and multi-stakeholder positions in international meetings); and developing national chemical safety policies, outlining strategic goals and milestones towards reaching the 2020 goal agreed at the Johannesburg Summit in 2002. The specific indicator for this work reads as follows: "All countries have developed integrated national programmes for the sound management of chemicals within a five-year timeframe (2006-2010)".

National profiles have fostered country-driven processes to strengthen chemicals management

The national profile concept, developed through collaboration of countries, stakeholders and IOMC participating organizations (with UNITAR in the lead), involves the development of a national baseline document concerning chemicals management through a process involving all concerned ministries and stakeholders. A national profile provides the status and identifies gaps in areas such as chemical legislation, institutional responsibilities and coordination, and information systems (UNITAR 2018a).

As of 2016, 116 countries had produced a national profile and many had developed a second or third edition. This represents a modest increase in numbers compared to the 106 countries in 2010 (IOMC 2019). The regional distribution of the preparation of national profiles in 2016, as compared to 2010, is as follows: Africa (39, up from 34), Asia-Pacific (23, up from 20), Central and Eastern Europe (CEE) (17, up from 16), Latin America and the Caribbean (LAC) (24, up from 23) and the Western European and Others Group (WEOG) (13, the same as in 2010) (Figure 3.10). The relatively small number of national profiles prepared or updated in the past years may be explained by the absence of stable funding. For example, the Quick Start Programme (QSP), which provided support for a number of countries to develop or update their national profile, does not exist anymore. The GPA had set a target/timeframe of 2006-2010 for the development of national profiles, which has thus not been met in many countries.

Integrated national programme and SAICM Implementation Plans

In a number of countries the process of developing a has led to the establishment of formalized inter-ministerial coordinating committees, and fostered development of a programmatic and integrated approach to advance the sound management of

Box 3.2 **SAICM Implementation Plan for Guyana (Urho 2018)**

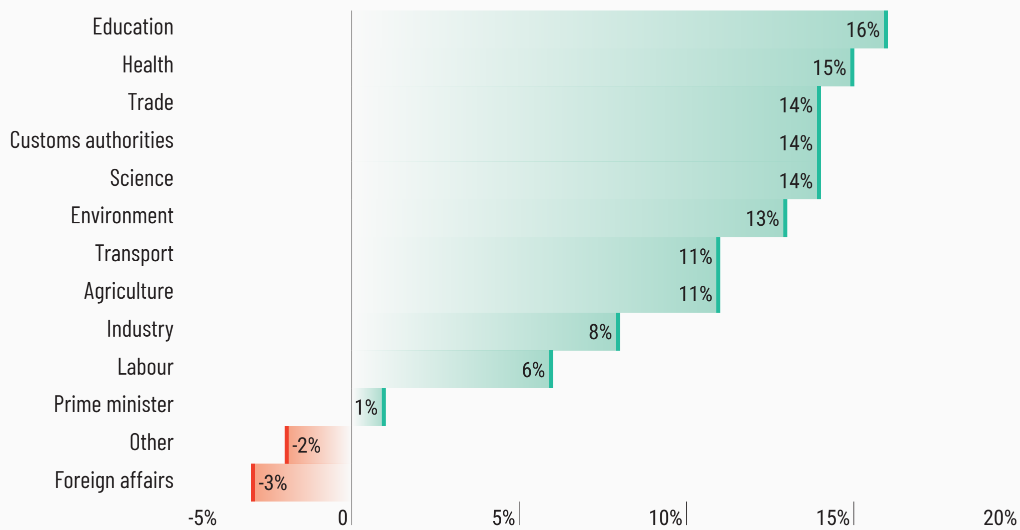
The SAICM implementation Plan for Guyana (2012-2015) aimed to strengthen national policies, programmes, networks and other mechanisms to ensure sound management of chemicals. The plan was based on a multi-sectoral approach involving all institutions, organizations and disciplines that took part in chemicals management in Guyana. It identified seven priority areas of work deriving from the GPA, including risk assessment, research and laboratory capacities, waste management, education and awareness-raising, stakeholder participation, prevention of illegal trafficking, and emergency planning. The Plan builds on valuable work done by the preceding QSP project on "Developing an Integrated National Programme for the Sound Management of Chemicals and SAICM Implementation in Guyana", which enabled, among others, the establishment of an inter-ministerial committee and the preparation of a national chemicals profile to take stock of existing national efforts and to prepare a national capacity assessment to identify priority work areas. Thus, through the implementation plan a logical continuum of prior work helped to establish necessary institutional capacities to deliver an action-oriented plan.

chemicals and waste (UNITAR 2004). National profiles have also served as a starting point in some countries for the development of action plans to support implementation of other international agreements. For example, national plans to support implementation of the Stockholm Convention were developed with funding from the GEF in more than 80 countries (Bengtsson 2010). Another spin-off has been the development of SAICM implementation plans, starting in 2009 with support from the QSP and based on guidance developed through collaboration of the SAICM Secretariat, UNITAR and IOMC (SAICM Secretariat 2009a). A case study on a SAICM Implementation Plan for Guyana (2012-2015) is described in Box 3.2. Urho (2018) discusses the implementation of this work area, but points out that a comprehensive analysis of integrated national programmes, national profiles and SAICM implementation plans is lacking.

Sectoral engagement in national coordination mechanisms

The engagement of relevant sectors in national coordinating mechanisms encouraged through the OPS is monitored through SAICM indicator 11, which focuses specifically on education and health sector engagement. Figure 3.11 illustrates

Figure 3.11 **Engagement of sectors in coordination mechanisms, comparing results for 2009-2010 and 2011-2013 (adapted from SAICM Secretariat 2015a, p. 11)**

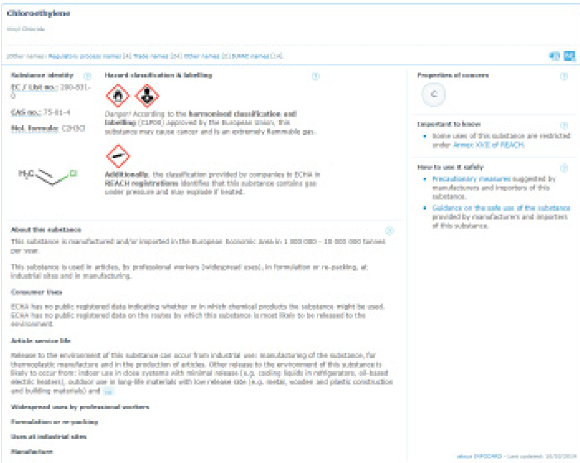


the trend for engagement of a wide range of key sectors in national coordination between the two reporting SAICM periods. Engagement of the education and health sectors increased by 16 and 15 per cent, respectively.

3.2.2 Knowledge and information

The SAICM objectives for “knowledge and information” include a range of measures. They emphasize, among others, the need “to ensure that knowledge and information on chemicals and chemicals management are sufficient to enable chemicals to be adequately assessed and managed through their life cycle”. Action by governments and other stakeholders to achieve this objective (in addition to those already carried out under more specialized agreements) are briefly outlined below.

Chemical inventories have been established in a number of countries



A number of governments have made efforts to compile chemical inventories in order to obtain a better understanding of the number of chemicals on the market. Examples include the following:

- As of 2017, there were 140,000 chemical substances in the EU’s CLP Inventory (ECHA 2017).
- The US EPA maintains an inventory covering about 85,000 chemicals sold in the United States (US EPA 2018a).
- When first published in 1994, the Canadian Domestic Substances List (DSL) contained some 23,000 substances manufactured in, imported into, or used in Canada on a commercial scale (Government of Canada 2018b). Substances have been added since its inception: there are now approximately 28,000 substances in the DSL.
- The Inventory of Existing Chemical Substances in China listed 45,612 substances in 2013 (ChemSafetyPro 2015).
- In 2018 Viet Nam launched the national chemicals database, which includes more than 170,000 substances (Kawanishi 2018).

Knowledge on chemicals in commerce is growing, but gaps remain

A report has been jointly developed by UNEP and the International Council of Chemical Associations (ICCA) to, among other purposes, improve the understanding of the number of chemicals in commerce (UNEP and ICCA 2019). The findings of this report include the following:

- There are an estimated 40,000 to 60,000 industrial chemicals in commerce globally.
- An estimated 6,000 of them account for more than 99 per cent of the total volume of chemicals in commerce globally.
- A number of factors contribute to uncertainty in estimates of the numbers of chemicals, including a lack of chemical inventories for many countries.
- Environmental, health and safety (EHS) data exist for the majority of the highest production volume chemicals, while knowledge gaps still exist for many lower-volume chemicals.
- There is a need for more and better chemical use and exposure information, particularly from developing countries, to improve risk assessment and risk management.

Major initiatives have generated knowledge on the hazards of industrial chemicals

On chemicals applied for specific purposes (e.g. pharmaceuticals, pesticides and food additives) extensive hazard data are generally available. As discussed in section 3.1.2 above, the GHS is a harmonized system for classifying chemicals according to their potential hazards at the international level. National and international initiatives have generated a growing body of knowledge on the hazards of industrial chemicals.

- The OECD's High Production Volume Chemicals Programme, designed to challenge chemical manufacturers to assess the hazards of their chemicals, originally listed 5,235 chemicals and screened more than 1,200 before it was reformed into the Cooperative Chemicals Assessment Programme (OECD n.d.).

- Canada has addressed some 3,534 of the 4,300 chemicals it identified as priorities for action by 2020-21. The Government of Canada has found over 457 existing substances to be harmful to the environment and/or human health, and is now in the final phase of addressing these substances through its Chemicals Management Plan (Government of Canada 2018c).

- The EU's REACH and CLP requirements have generated large amounts of information on the health and environmental hazards of chemicals. In 2018 the ECHA reported receiving chemical dossiers from a total of 88,319 registrations, covering 21,551 unique substances under REACH. Of these, 2,575 chemicals were manufactured in (or imported into) the EU in quantities of over 1,000 tonnes per year (ECHA n.d. b).

Many chemicals in commerce still have limited data sets and incomplete characterizations

Despite the substantial hazard data generated for thousands of chemicals, knowledge of chemical hazards, common exposure pathways, and human health and environmental effects for many chemicals is absent or insufficient. In a review of national efforts to implement chemical risk management actions, the OECD observed that "information gaps regarding the properties for many existing chemicals hampered risk assessment and management and subsequently, these chemicals may not have been appropriately risk managed" (OECD 2015). This analysis is consistent with studies in the past years pointing to data gaps in identifying human health and environmental hazards of many chemicals on the market (Grandjean *et al.* 2011; Egeghy *et al.* 2012; Strempel *et al.* 2012; Buonsante *et al.* 2014; Stieger *et al.* 2014; Bernhardt, Rosi and Gessner 2017).

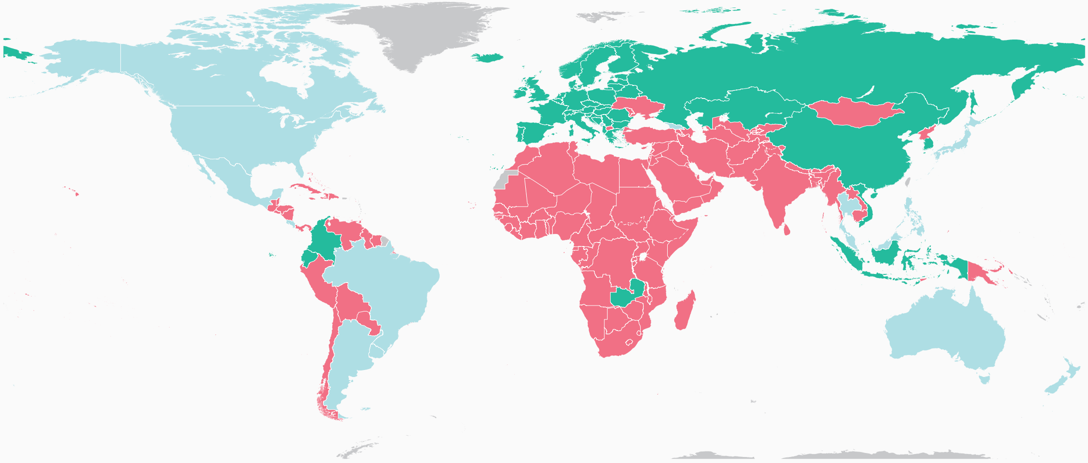
When the ECHA released its assessment of eight years of REACH implementation, it noted that "a significant proportion of registration dossiers are still not of a sufficient quality" (ECHA 2016). In 2017 the ECHA evaluation noted that 69 per cent of the dossiers received lacked complete hazard information. Of some 4,500 chemicals considered high priority by the ECHA, some 3,000 are considered to be in a "grey zone" where there is insufficient information to decide about the risks they pose (ECHA 2018). Recognizing this insufficiency of information, the OECD estimates that between 20,000 and 100,000 existing chemicals with historical approvals or notifications have not received a sufficient risk assessment or reassessment (OECD 2015).

The Globally Harmonized System of Classification and Labelling of Chemicals

The GHS was adopted in 2002 and has been updated periodically since. GHS implementation was encouraged in paragraph 23c of the JPOI, with the objective of having this system fully operational by 2008 (UN 2002). The GHS was later included in the SAICM Overarching Policy Strategy (OPS), adopted in 2006. The Dubai Declaration and the SAICM OPS refer to the implementation of the GHS. It is one of the basic elements of the SAICM Overall Orientation and Guidance (OOG) adopted at ICCM 4 in 2015.

The GHS covers four sectors: transport, workplace (industrial), consumer and agricultural. Implementation of the GHS has three stages: formal adoption by countries; incorporation into national legislation; and facilitation and

Figure 3.12 **Global GHS implementation status, 2018 (adapted and updated based on Persson *et al.* 2017, p. 8)**



enforcement of the uptake and use of GHS by companies and any other relevant actors. GHS implementation can be done using a "building block" approach, in which building blocks correspond to the different hazard classes and categories used to describe the nature of the hazards of hazardous substances/mixtures (UN 2005).

Figure 3.12 shows the global status of GHS implementation. To date, 51 countries have fully implemented the GHS and 16 have partially implemented it. While this shows progress compared to the total of 41 countries which had fully or partially implemented the GHS in 2010, 126 countries have not yet implemented it (updated based on Persson *et al.* 2017). Despite the long history of GHS implementation, there are significant disparities in implementation between developing and developed countries. Full legal GHS implementation is most common in Europe and parts of Central Asia, East Asia and Southeast Asia. In Latin America two countries, Ecuador and Colombia, have implemented the GHS fully; in Africa only Zambia and Mauritius have done so. The target established in the JPOI for full implementation of the GHS in all countries by 2008 has not been achieved in 2019. Persson *et al.* (2017) attributed insufficient progress to, among others, a lack of financial and regulatory

© UNITAR/Andrea Cararo, coal power plant in Ulaanbaatar capacities, as well as lower trade openness, in many countries.

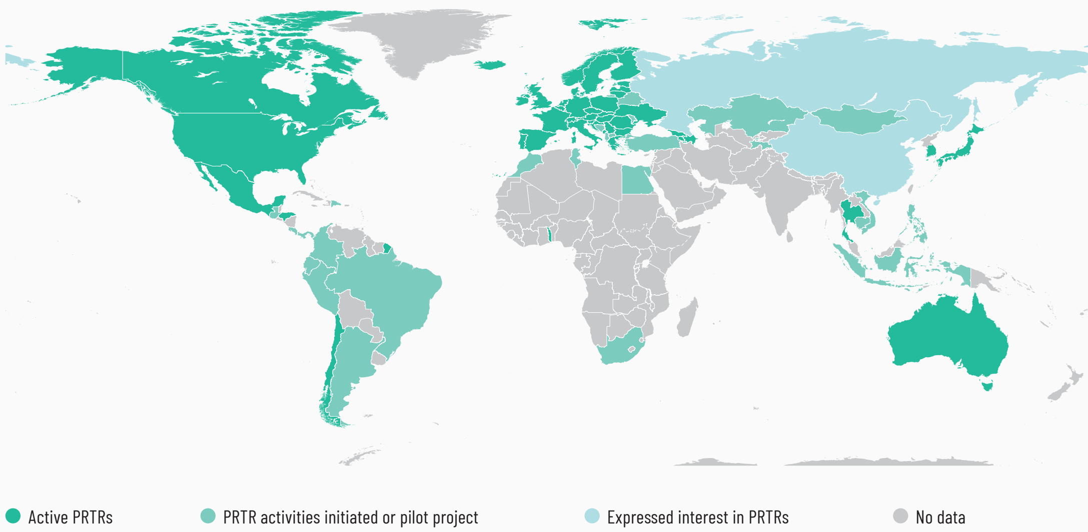
Pollutant Release and Transfer Registers

A Pollutant Release and Transfer Register (PRTR) is a publicly accessible database, or multi-media inventory, of chemicals and pollutants released to air, water and soil and transferred off-site for treatment or final disposal. PRTRs bring together information, usually reported on an annual basis, about which chemicals are being released, where, how much and by whom. While the number of chemicals and the number of sources covered by a PRTR are limited, it is a useful basis for agencies and the public to compare releases from different sources and consider follow-up discussions with the releasing parties. PRTRs are not a tool for regulating emissions. However, the public information on point sources (e.g. of releases from industries) and diffuse sources (e.g. of releases from transport and agriculture) often helps create an incentive for companies to avoid being identified as major polluters and to voluntarily invest in making emission reductions.

The rationale for the establishment of PRTRs was established in 1992, when the importance of public access to information on environmental pollution, including emissions inventories, was recognized in Agenda 21 at the United Nations Conference on Environment and Development. Principle 10 states that "each individual shall have appropriate access to information concerning the environment that is held by public authorities" as well as "the opportunity to participate in decision making processes", and that countries shall "encourage public awareness and participation by making information widely available". Ten years later the Johannesburg Plan of Implementation called for action at all levels to "encourage development of coherent and integrated information on chemicals, such as through national pollutant release and transfer registers" (UN 2002).

Public access to information on chemical releases and transfers is a central PRTR characteristic, which contributes to achieving SDG 12.4 by helping to track progress concerning pollutant releases to air, water and soil. PRTRs have also been recognized as instruments for the collection and dissemination of information on estimates of the annual quantities of POPs (Article 10, Secretariat of the Stockholm Convention 2008). In 2017 the Minamata Convention on Mercury entered into force. Its Article 18 encourages Parties to promote and facilitate PRTRs as tools for the collection and dissemination of information on estimates of the annual quantities of mercury and mercury compounds that are emitted, released or disposed of through human activities.

Figure 3.13 **Pollutant Release and Transfer Registers, 2018 (adapted from UNITAR 2018b)**



As of 2010, 35 countries had PRTRs in place; by 2016 this number had increased to 50. Significant gaps therefore still exist (IOMC 2019). In Europe and North America PRTRs are in place or are in the process of being established. Progress is also being made in the LAC region, although gaps remain. According to available data, in the Asia-Pacific region only Australia, Japan and the Republic of Korea have PRTRs, and in West Asia and Africa no country is known to have a PRTR in place. Interest in PRTRs exists in some countries, notably China and Russia. Figure 3.13 shows the global status of the development of PRTRs (UNITAR 2018b). The target set in the GPA for PRTRs to be established in all countries by 2015 has thus not been achieved.

Environmental and health monitoring

"Monitoring and assessing the impacts of chemicals on health and the environment" is element 10 of the Overall Orientation and Guidance (OOG). The latest SAICM Progress Report found that there had been an increase in health and environmental monitoring since 2009. A number of parameters were used to measure this, including monitoring of chemical incidents, poisonings, human biomonitoring, occupational diseases and environmental monitoring systems. With respect to human health, the average increase was 5 per cent, a result similar to that obtained for environmental monitoring (SAICM Secretariat 2015a) (Figure 3.14).

International bodies and initiatives working on science assessment to support policymaking

A number of international bodies and mechanisms that bring together scientists and policymakers have been established to ensure that policymaking is informed by the latest scientific evidence. A report prepared by the IOMC in 2018 gave examples of science policy bodies and mechanisms active in chemicals and waste issues (WHO *et al.* 2018). For example, the WHO has established a Chemical Risk Assessment Network. One of its objectives is to assist in the identification of emerging risks to human health from chemicals. Under the intersessional process to prepare recommendations regarding the

Figure 3.14 **Progress in environmental and health monitoring, comparing results for 2009-2010 and 2011-2013 (adapted from SAICM Secretariat 2015a, p. 6)**

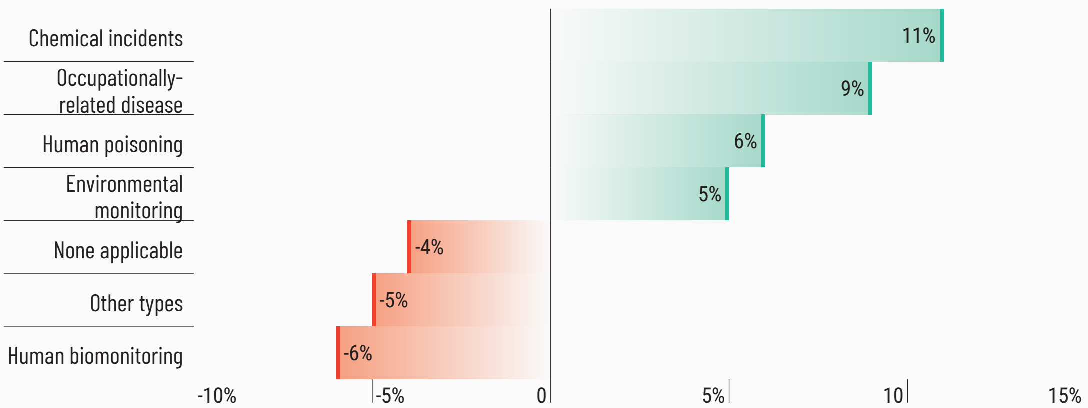


Table 3.8 **Examples of science policy bodies and mechanisms (based on WHO *et al.* 2018)**

Body/initiative	Activities/scope
Persistent Organic Pollutants Review Committee (PORC) of the Stockholm Convention	Reviews Parties' proposals for listing new chemicals, decides whether a proposed chemical is likely to have POPs characteristics warranting global action, evaluates possible control measures taking into account socio-economic considerations, and makes recommendations for listing.
Basel Convention's Open-ended Working Group	Provides advice on issues relating to policy, technical, scientific, legal and other aspects of the implementation of the Convention; expert working groups develop guidelines on specific waste-related issues, e.g. e-waste, or to address other issues as mandated by the COP.
Rotterdam Convention's Chemical Review Committee	Reviews proposals for listing severely hazardous pesticide formulations.
Scientific Assessment Panel (SAP) of the Montreal Protocol	Assesses the status of the depletion of the ozone layer and relevant atmospheric science issues; any emerging scientific issues of importance are brought to the attention of the Parties.
FAO/WHO Codex Alimentarius Commission	Charged with protecting the health of consumers and ensuring fair practices in food trade through the development of a broad range of voluntary standards, guidelines and codes of practice under the Joint FAO/WHO Food Standards Programme.
FAO/WHO Joint Meeting on Pesticide Management (JMPM)	Advises countries on matters pertaining to pesticide regulation, management and use, and alerts them to new developments, problems or issues that otherwise merit attention.
WHO Chemical Risk Assessment Network	Aims to improve chemical risk management globally through facilitating sustainable interaction between institutions on chemical risk assessment issues and activities; decisions may lead to WHO guidelines, etc.
OECD Test Guidelines Programme	Development of internationally agreed testing methods used by governments, industry and independent laboratories to identify and characterize the potential hazards of chemicals.
Global Environment Facility´s Scientific and Technical Advisory Panel (GEF STAP)	Provides strategic scientific and technical advice on GEF policies, areas of work, projects, and programmes; builds networks with the science and policy communities of the Conventions which the GEF serves; brings to the GEF's attention priorities which may not be covered by the Conventions.

Strategic Approach and the sound management of chemicals and waste beyond 2020, stakeholders have shown interest in addressing the topic of "science-policy interfaces", which was one of the agenda items during the second meeting on the intersessional process (WHO *et al.* 2018). Table 3.8 shows bodies and mechanisms working on science policy issues which are listed in the report. Some of these bodies play an important role in the identification and prioritization of chemicals and emerging issues. For example, the POPs Review Committee (POPRC) reviews and provides recommendations on the listing of new POPs.

The conclusions of the IOMC report include that a variety of fora already exist for the provision of scientific or technical advice on a wide range of issues, and that there is a great deal of scope within current organizational structures and mandates to create new committees or panels to cover a broad range of chemicals related aspects (WHO *et al.* 2018). The need for strengthened engagement by scientists and a stronger role for scientific research has been emphasized by various stakeholders (International Panel on Chemical Pollution 2018).

The IOMC report also includes reference to SAICM's ICCM, which brings together governments, IGOs, industry, NGOs and academia (WHO *et al.* 2018). Under SAICM, a process has been established to identify and call for appropriate action on emerging policy issues (SAICM Secretariat 2009b) through the ICCM. This has resulted in

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Box 3.3 Potential considerations for the selection of future issues of global concern

In defining possible future priorities related to specific issues or chemicals of concern at the international level, questions of potential relevance for consideration by stakeholders may include the following:

- Which methodologies could facilitate the identification of possible future priorities at the international level in a systematic manner (e.g. using information on health and environmental impacts and harm caused, and by drawing on information from risk assessments)?
- Could a possible science-policy interface have a role to play in determining future priorities?
- Should priorities be set for individual chemicals (or groups of chemicals)?
- Should they cover broader management issues?
- How could a nomination process be designed, including clear criteria?
- How would the role of science in identifying and agreeing on issues/priorities be organized?
- How can commitment by key actors to take action be mobilized?
- What are criteria for sunsetting the issues?

Box 3.4 Identified challenges in creating a coherent global knowledge base: lessons for strengthening the science-policy interface

While a wealth of data, information and knowledge on chemical production, releases, concentrations and effects has been generated, the GCO-II has encountered challenges in collecting coherent data and knowledge, developing global baselines and identifying trends. Data gaps at national, regional and global level include: the number and volumes of hazardous chemicals already on the market and those newly entering it; complete data sets concerning the hazard potential; and environmental, health and safety data, in particular for many lower-volume chemicals. Knowledge is also limited regarding outdoor and indoor releases of chemicals both during production processes and from products; chemical exposures in varying contexts; concentrations of hazardous chemicals in environmental media; and the adverse impacts of chemicals, including costs of inaction and benefits of action.

Significant progress has already been made in some areas to harmonize data generation, for example in testing chemicals. Yet challenges remain in facilitating coherent data collection and availability across time and countries, particularly in developing countries. This makes the identification of baselines, trends, emerging issues, priorities and progress at the global level challenging. It also renders comparability across time and countries or regions difficult, for example for chemical releases and concentrations. Research is often undertaken using different protocols and methods, for example using different units of analysis, or in determining the effects of chemicals on human health and the environment and translating these effects into economic costs and benefits. Promising progress is being made in harmonizing biomonitoring across countries, and could be extended to other areas.

Various barriers pose challenges in improving the scientific basis for informed decision-making. For example, scientists are not necessarily given incentives for producing policy-relevant knowledge. Another potential challenge is that policymakers may have short windows of opportunity for scientific input while related research may require longer timeframes. Moreover, policymakers and scientists may use different language, suited to the respective target audiences. Insufficient communication may also result in scientists not being sufficiently informed of policy needs and vice versa (Hering *et al*. 2014; Agerstrand *et al*. 2017).

Further examining and addressing some of the challenges noted above may be relevant for future assessments related to the sound management of chemicals and waste. Related discussions could also feed into the ongoing discussions on the science-policy interface.

the identification of eight emerging policy issues (EPIs) and other issues of concern to date (see Part II, Ch. 4). The "Paper by the Co-Chairs of the intersessional process on the Strategic Approach to International Chemicals Management and the sound management of chemicals and waste beyond 2020" (prepared for the third meeting of the Open-ended Working Group of the ICCM) includes as a strategic objective that "issues of concern that warrant global action are identified, prioritized and addressed", noting in the considerations that "the intention is to cover topics similar in nature to those covered by the Strategic Approach, emerging policy issues and other issues of concern, as well as topics such as managing specific chemicals, the burden of disease and financing" (SAICM Secretariat 2019a).

3.2.3 Risk reduction

The SAICM objectives for "risk reduction" include the need to "minimize risks to human health, including that of workers, and to the environment throughout the life cycle of chemicals". Among others, stakeholders also aim "to implement transparent, comprehensive, efficient and effective risk management strategies" (SAICM Secretariat, UNEP and WHO 2006). Significant progress towards achieving this objective has been made via the international agreements on chemicals and waste discussed above. Further areas of progress are noted below.

Countries have prioritized chemicals for risk assessment and management

In addition to and often preceding international efforts to prioritize chemicals, a number of national and regional regulatory bodies have undertaken risk assessments and, subject to the results, undertaken risk management action for a number of identified priority chemicals. Many countries have regulations on the use of prioritized chemicals, including lead, cadmium, chromium, mercury and various highly hazardous pesticides. Major initiatives to prioritize chemicals for risk assessment and management include the following:

- The EU, under its REACH Regulation, had included as of February 2019, 197 chemicals on its "Candidate List of substances of very high concern for Authorisation". Special authorization for production or use is required for 43 chemicals (as of February 2019) and certain restriction conditions are in

place for 69 chemicals (ECHA n.d. c). The ECHA maintains a Community Rolling Action Plan that lists priority substances for evaluation by Member States. By March 2018 the list contained 108 chemicals (ECHA 2018).

- In 2017 the Chinese Ministry of Environmental Protection published the Prioritized List of Substances Subject to Control. The use of the substances included on the list (currently 22 entries) is subject to restrictions, and enterprises are encouraged to opt for safer alternatives (CIRS 2018).

- Based on a screening process examining combined hazard, exposure and persistence and bioaccumulation characteristics, the US EPA currently lists 90 chemicals/groups of chemicals in its Toxic Substances Control Action Work Plan. For selected chemicals/groups of chemicals (10 to date), the agency will conduct risk evaluations. Those conditions of use determined by the risk evaluation to present an unreasonable risk to health or the environment will move immediately into risk management, where restrictions will be imposed to eliminate such risk (US EPA 2018b).

- Through Categorization, the Government of Canada identified approximately 4,300 of the 23,000 chemical substances on its Domestic Substances List as meeting the criteria for further attention, and launched the Chemicals Management Plan (CMP) to address these priorities. Of the 4,300 substances, those that have been assessed and found to be toxic as per the Canadian Environmental Protection Act, 1999 (i.e., harmful to human health and/or the environment) have been further prioritized for development and implementation of risk management measures, such as regulations, pollution prevention planning notices, codes of practice and guidelines. Since the launch of the CMP in 2006, the Government of Canada has implemented over 90 risk management actions for existing chemicals (additional tools are in development) and received approximately 5900 notifications for new substances prior to their introduction on the Canadian market. These notifications have been assessed, and over 290 risk management actions have been taken to manage potential risks to human health or the environment. (Government of Canada 2018a)

The International Code of Conduct on Pesticide Management

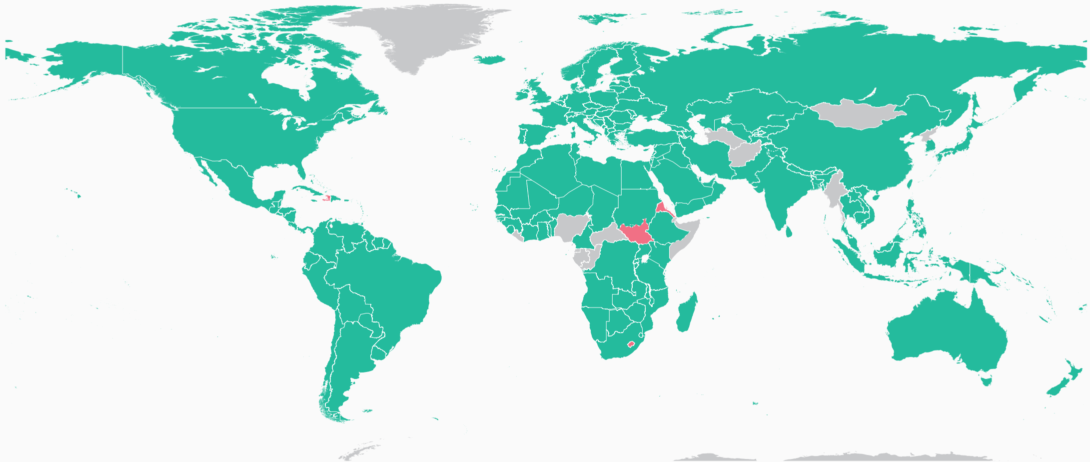
The first version of the Code of Conduct on Pesticide Management (see Part II, Ch. 1, 2) was adopted by the FAO Conference in 1985; the fourth version was approved by the Conference in 2013. The WHO adopted the Code in 2014 as its reference framework for international guidance on pesticide management. The guidelines on pesticide legislation are an important tool for operationalizing the Code of Conduct by helping to make necessary legislative changes (FAO and WHO 2014).

The FAO hosts FAO-LEX, an on-line repository of national legislation relevant to agriculture (FAO 2019). Almost all countries have implemented pesticide legislation in accordance with the WHO/FAO Code of Conduct. According to a global survey undertaken by the FAO in 2017, 173 FAO member countries had developed pesticide legislation based on the Code of Conduct while five had not yet done so (three from the African region and two from the LAC region). For 18 countries no data were available. Figure 3.15 shows countries that have pesticide legislation based on the Code of Conduct (FAO 2018). Progress in this area is promising, but significant further work is needed to fully implement best practices and minimize adverse effects from the use of pesticides, in particular highly hazardous pesticides, as further explored in Chapter 4.

Asbestos

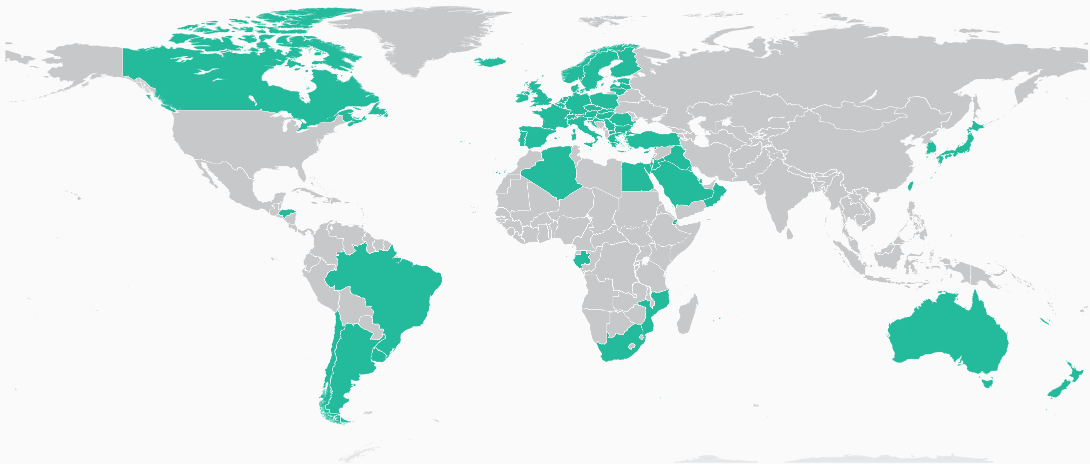
For a decade the Chemical Review Committee of the Rotterdam Convention has recommended listing chrysotile asbestos (the most common type of commercial asbestos) in Annex III of the Convention in order to make it subject to the Prior Informed Consent (PIC) procedure in international trade, but the COP has not yet agreed to this. Altogether 56 countries have enacted legislation to strictly ban all uses of asbestos, as shown in Figure 3.16. However,

Figure 3.15 Countries with pesticide legislation, according to FAO data collected in the context of the Code of Conduct, February 2018 (adapted from FAO 2018)



Active   Not active   No data

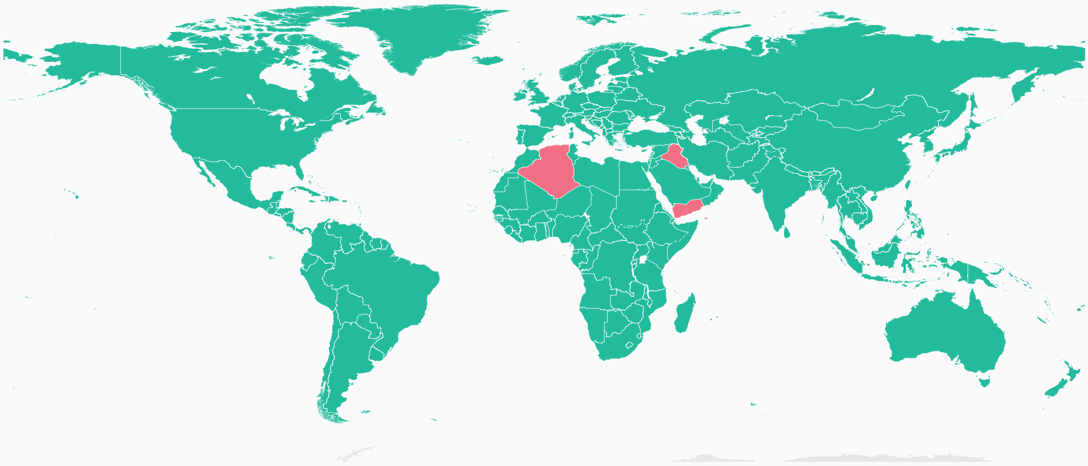
Figure 3.16 Countries that have banned the use of asbestos, August 2018 (updated and adapted based on Kazan-Allen 2018)



Asbestos banned   Asbestos not banned

© Mashava asbestos mine

Figure 3.17 Global status of phasing out lead in gasoline, March 2017 (adapted from UNEP 2017, p. 1)

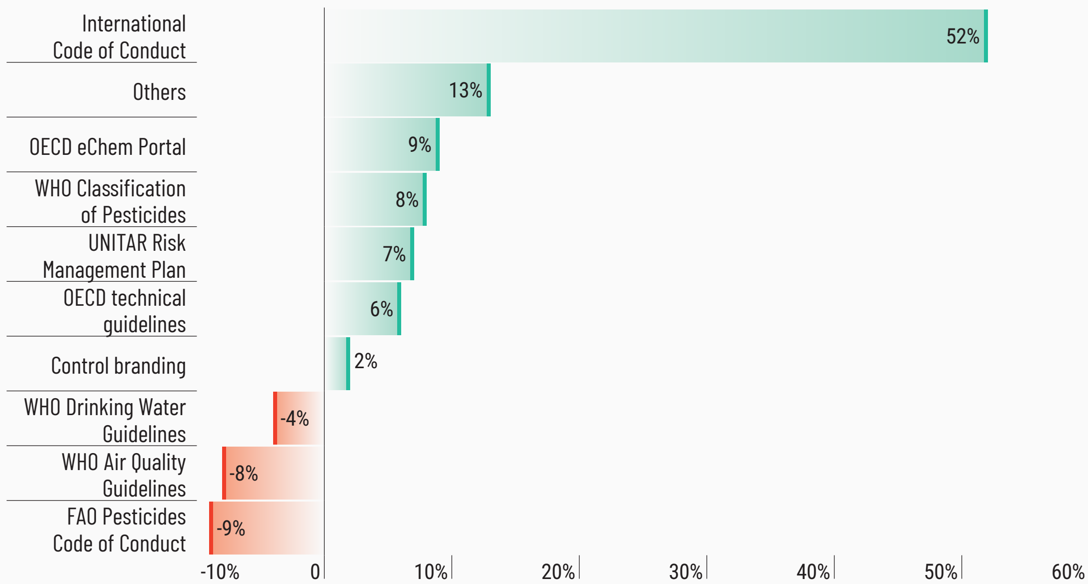


many countries outside Europe have not (yet) undertaken such action. Risk management of asbestos throughout its life cycle can be seen as contributing to OOG element 8.

Lead in gasoline

In addition to regulatory action or bans, voluntary initiatives can be instrumental in achieving progress if they are taken seriously and tackled in innovative ways by all actors. While a number of countries took regulatory action to phase out lead in gasoline, UNEP worked with a Partnership for Clean Fuels and Vehicles, involving 120 civil society organizations, governments and major oil and vehicles companies, to support over 80 countries in the phase-out of lead in transport fuel (UN 2011). This can be seen to contribute to OOG element 8. This commitment is also reflected in many later documents, including SAICM's GPA. Progress has been steady and, as of March 2017, lead in gasoline had been phased out in almost all countries. While phasing out lead in gasoline can be considered a success story, it

Figure 3.18 Trends the in use of IOMC tools for risk reduction for the reporting period 2011–2013 (adapted from SAICM Secretariat 2015a, p. 6)



also demonstrates that eliminating commonly used substances requires time and large-scale investment (UNEP 2017) (Figure 3.17). Progress in eliminating lead in decorative paint is explored in Chapter 4.

Use of IOMC tools for risk reduction

Risk assessment and risk reduction through the use of best practices is reflected in OOG element 8. A number of IOMC organizations have developed guidance material which can be used by countries as tools for risk assessment and reduction. Some trends in the use of these tools are shown in Figure 3.9. In general, there is increased use of these tools, particularly concerning the International Code of Conduct on Pesticide Management. The tools shown in Figure 3.18, and many others, can be found in the IOMC Toolbox (OECD 2018a).

Poisons centres

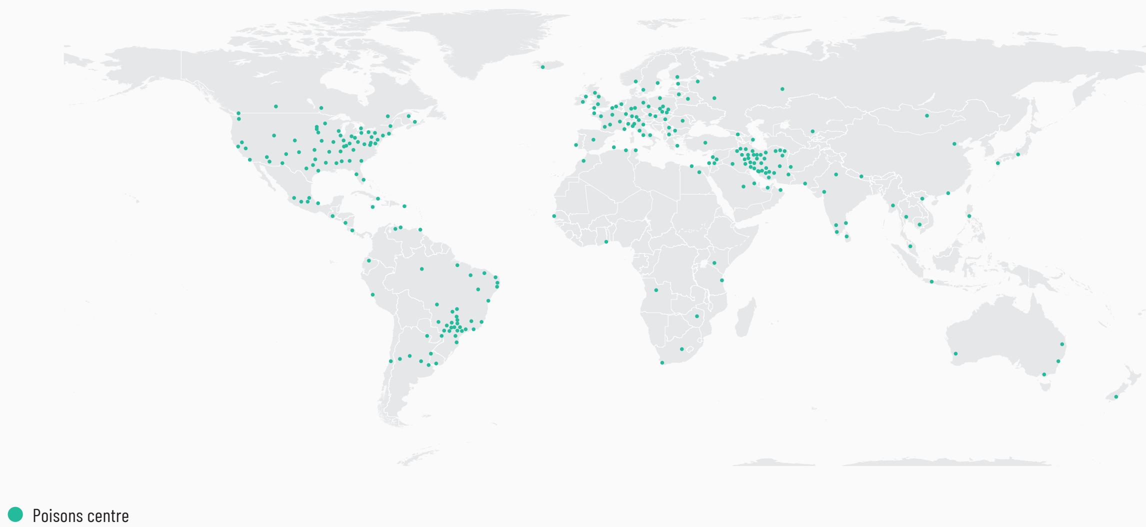
A poisons centre is a specialized unit that advises on, and assists with, the prevention, diagnosis and management of poisoning. The WHO has developed guidance and training materials on poisons centres and their operations and periodically organizes training workshops (WHO 2018b). Element 9 of the SAICM OOG calls for strengthening "capacities to deal with poisonings and other chemical incidents" by establishing poisons centres, which is also underlined in a number of GPA activities (SAICM Secretariat 2015b).

Figure 3.19 shows the global distribution of poisons centres as of September 2017. There has been limited progress in establishing these centres. Less than half of countries have a poisons centre, with the most notable gaps in the African, Eastern Mediterranean and Western Pacific regions (WHO 2017). While 91 countries had a poisons centre in 2010, only 90 countries had one in 2016, the only IOMC indicator for which a downward trend can be observed (IOMC 2019). The GPA target to have poisons centres established in all countries by 2010 has therefore not been achieved.

3.2.4 Capacity building and technical cooperation

SAICM's objectives of "capacity building and technical cooperation" include the need to increase the capacity for sound chemicals management, especially in developing countries and countries with economies in transition, through partnerships and mechanisms for technical cooperation, among others. SAICM is also to call upon existing and new sources of financial support to provide additional resources (SAICM Secretariat, UNEP and WHO 2006). The section below provides an indication of the

Figure 3.19 **Existence and distribution of poisons centres, September 2017 (adapted from WHO 2017)**



progress made towards this objective, in addition to the capacity building and financial support provided through international agreements.

The SAICM Progress Report (SAICM Secretariat 2015a) found an increase of around 10 per cent in the number of middle-income countries reporting that their development assistance programmes included chemicals, and increases of up to almost 80 per cent and 60 per cent for lower- and upper middle-income countries, respectively, compared with the first SAICM Progress Report. Moreover, progress was noted in the provision of financial and technical resources: 57 per cent of countries reported the provision of bilateral financial assistance, compared with only 34 per cent in the first reporting period. Similar progress was observed in the provision of technical assistance. Yet the same report also found that, among the five objectives of the OPS, there had been least progress towards achieving capacity building and technical cooperation (SAICM Secretariat 2015a).

As an important element of capacity building, the integrated approach to financing sound management of chemicals and waste was adopted by the UNEP Governing Council in 2013 and welcomed by the UN Environment Assembly (UNEA) at its first session in 2014. This approach has three mutually reinforcing components to supplement and complement domestic resources mobilized by countries, in order to implement convention obligations and other commitments at the national and regional level: mainstreaming, industry involvement, and dedicated external finance.

3.4.2.1 Mainstreaming

Mainstreaming chemicals and waste occurs when governments, both recipients and donors, integrate sound management of chemicals and waste into their development plans and/ or priorities. The overarching objective of mainstreaming is to align regulations, economic instruments and other policy instruments, with a view to correcting market failures and ensuring that the costs of environmental degradation are covered according to the polluter pays principle. Various activities have been implemented to support mainstreaming, including the UNEP and UNDP partnership initiative, which was found to have been successful in introducing the sound management of chemicals into development planning processes in some countries but less so in others (SAICM Secretariat 2015c). A number of countries which participated in the initiative succeeded in engaging new stakeholders, including in economic development sectors, finance and development planning (UNEP 2016).

The summary report on progress in the implementation of the Strategic Approach for the period 2011-2013 (SAICM Secretariat 2015a) found below-average levels of progress on mainstreaming chemicals into national development plans. The impact evaluation of the Quick Start Programme (Nurick and Touni 2015) found that in many cases QSP projects succeeded in "mainstreaming chemicals management" into national legislation, policies and institutions. However, in a few countries projects were followed up through resources allocated from national budgets/resources. The draft independent evaluation of the Strategic Approach from 2006-2015 (SAICM Secretariat 2018b) highlighted Zambia as a particularly successful example of mainstreaming chemicals and waste into national financing as a result of a QSP mainstreaming project. The Zambian Environment Management Authority retained fees raised through licensing of chemicals manufacture and registration, importation and export, and used them for monitoring and enforcement.

In reviewing existing projects, the UNEP *Report on the Implementation of the Integrated Approach to Financing the Sound Management of Chemicals and Waste* (UNEP 2016) identified a number of factors considered to be critical in further advancing mainstreaming, namely:

- align the chemicals mainstreaming activities with the policy cycle for national development planning processes;
- ensure high-level buy-in by government departments at the outset of activities;
- integrate the sound management of chemicals into chemical-intensive sector plans to ensure acceptance by the sector; and
- make advice and guidance on economic analysis available.

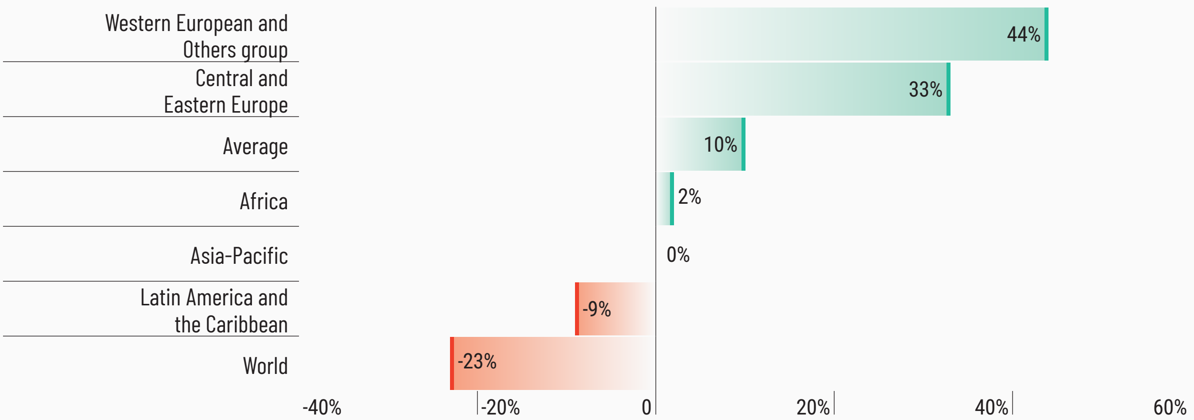
Given the limited progress in mobilizing financial resources in many countries, the report on *Financing the Sound Management of Chemicals and Waste beyond 2020* (SAICM Secretariat 2018c) recommends exploring a range of new opportunities including, among others:

- tapping into global sector funds related to sustainable development (e.g. those concerned with climate change or occupational safety);
- mobilizing philanthropic finance from private individuals, foundations and other organizations;
- exploring the potential of public pension funds and sovereign wealth funds;
- strengthening engagement of the financial sector and investors; and
- creating linkages with the implementation of the 2015 Addis Ababa Action Agenda of the Third International Conference on Financing for Development.

3.2.4.2 Industry involvement

Industry involvement, in the context of the integrated approach, has been understood as referring to financial resources for the chemicals and waste agenda generated by the involvement of industry when, among others, industry internalizes the costs of complying with chemicals and waste regulations; economic instruments are used to recover and shift costs to the private from the public sector; industry transfers technology; industry pays taxes to governments; and industry takes innovative steps to "green" chemicals and waste throughout their life cycles. The private sector is an important driver of progress, for example in light of the importance of the significant resources it can mobilize. At different stages of the chemical life cycle relevant industries may have different roles to play in chemicals management, for example with respect to the application of the polluter pays principle and extended producer responsibility. As highlighted in a report on industry involvement, based on a consultative

Figure 3.20 **Trends in private sector financial support comparing results for 2009-2010 and 2011-2013 (adapted from SAICM Secretariat 2015a, p. 13)**

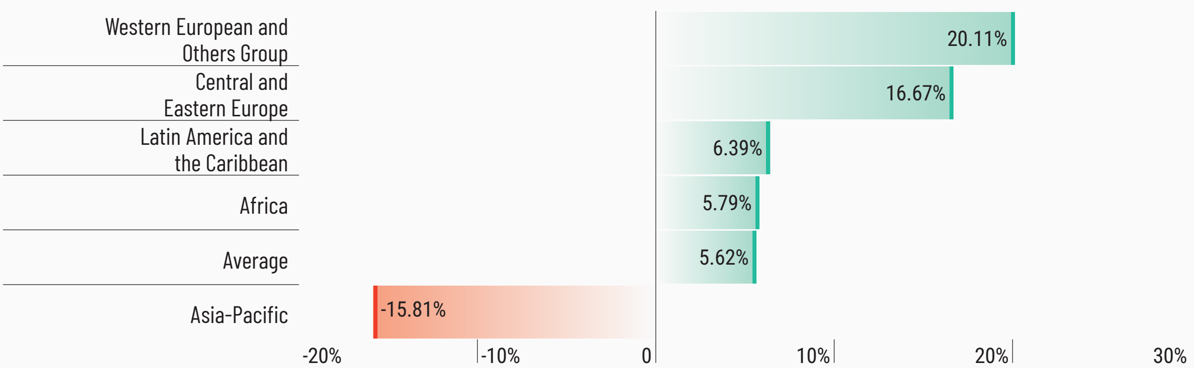


Note: World = IOMC and global organizations; Average = average for all regions and world categories of respondents

process facilitated by UNEP, "chemical producers have a specific responsibility" and "it is equally important to ensure that all others involved in the value chain recognize their responsibility and act accordingly" (SAICM Secretariat 2015d).

While a very small number of respondents reported accessing private sector finance in the first SAICM reporting period, a 10 per cent increase during the second reporting period represents a doubling of the total number; however, this was mainly driven by the Western European and Other States (SAICM Secretariat 2015a) (Figure 3.20). Stakeholders also reported that industry participation in multi-stakeholder committees increased on average by 6 per cent (SAICM Secretariat 2015a) (Figure 3.21). The consultative process facilitated by UNEP highlighted that chemical producers already contribute to the sound management of chemicals in various ways, including through testing of substances; development of exposure scenarios; development of Material Safety Data Sheets; meeting labelling and packaging requirements; sharing information with downstream users; and voluntary product stewardship initiatives. However, it also found "significant gaps in practice" regarding the contribution of producers (SAICM Secretariat 2015d). The process made a number of recommendations to advance industry involvement, including that governments adopt and implement legal instruments that

Figure 3.21 **Trends in industry participation in multi-stakeholder committees comparing results for 2009-2010 and 2011-2013 (adapted from SAICM Secretariat 2015a, p. 13)**



Note: Average = average for all regions and world categories of respondents define responsibilities and that industry further incorporate sound chemicals management in corporate governance.

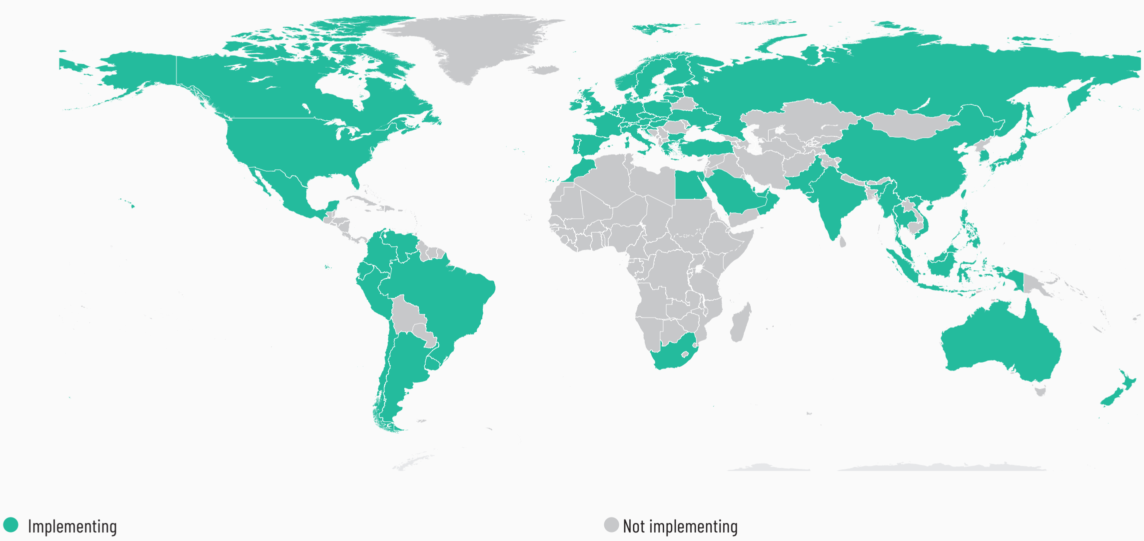
The Responsible Care® Global Charter is described as the backbone of the global chemical industry's voluntary Responsible Care® programme. It outlines nine key elements intended to enhance partners' health, safety, and environmental performance. The Global Charter has been signed in 68 countries by 580 companies, comprising 96 per cent of the largest chemical companies (ICCA 2015a) (Figure 3.22). However, there are significant regional variations in the implementation of the Responsible Care® programme. Gaps, especially in Africa and Latin America, are explained partly by the lack of major chemical company operations in many countries in these regions, and partly by the difficulty of engaging local and regional chemical companies in Responsible Care®. The target set in the GPA (SAICM Secretariat, UNEP and WHO 2006) for the implementation of Responsible Care® in all relevant countries by 2010 has thus not yet been fully achieved.

Industry is also involved in a number of activities related to chemicals and waste (including SAICM) at the international level, for example through partnerships such as those between UNEP and the ICCA and the Mobile Phone Partnership Initiative of the Secretariat of the BRS Conventions. The chemical industry has also contributed financial resources amounting to around US dollars 299,000 to the SAICM Secretariat (SAICM Secretariat 2018b). The Quick Start Programme impact evaluation (Nurick and Touni 2015) found industry involvement in QSP project coordination and delivery to be common if not universal, with provision of information constituting an important contribution by industry stakeholders. More substantive industry involvement has been achieved through projects with industry-relevant themes (e.g. GHS projects which involved importers, while Chemical Accident Prevention Plan projects involved users of chemicals). However, a very small minority of countries reported examples of the development and introduction of economic instruments to promote industry participation in financing for chemical management. Some limited examples of clarification of responsibilities are also described. In Nepal, for example, the introduction of a ban on lead in paint resulted in the establishment of private sector laboratories to meet the demand from the paint industry to test paints for lead concentrations (Nurick and Touni 2015).

3.4.2.3 External financing

External financing complements the components of mainstreaming and industry involvement through a financial mechanism to support recipient countries in implementing their legal

Figure 3.22 Countries with a chemical industry which have implemented the Responsible Care® programme as of March 2017 (adapted from ICCA 2019, p. 26 and 27)



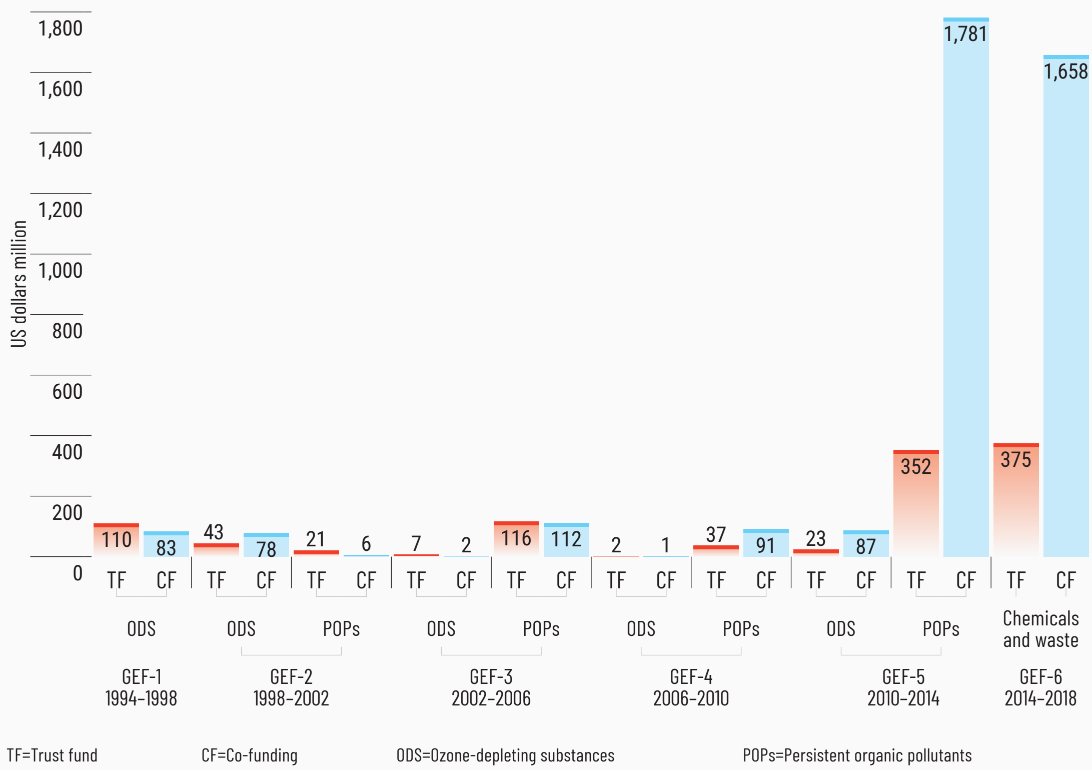
obligations and other commitments for the sound management of chemicals and waste. The external financing component of the integrated approach comprises the establishment of national chemicals and waste units in all recipient countries, as well as the creation of an integrated chemicals and waste focal area under the GEF, as established in GEF-5 (2010-2014). Strengthening sustainable chemistry technology innovation and financing is discussed in Part IV, Ch. 3.

The Global Environment Facility

The Global Environment Facility (GEF) strategy to address chemicals and waste has changed significantly over time, and funding has increased substantially since its first Operational Strategy in 1995. At that time funding was restricted to action under the Montreal Protocol. In GEF-2 a dedicated programme for POPs was first introduced, as the GEF became an official funding mechanism under the Stockholm Convention. In GEF-4 separate focal areas for POPs and ODS were maintained, while support for sound chemicals management was made explicit for the first time through a cross-cutting strategic objective on sound chemicals management. Mercury was addressed to a limited extent by one of the strategic programmes under the International Waters focal area.

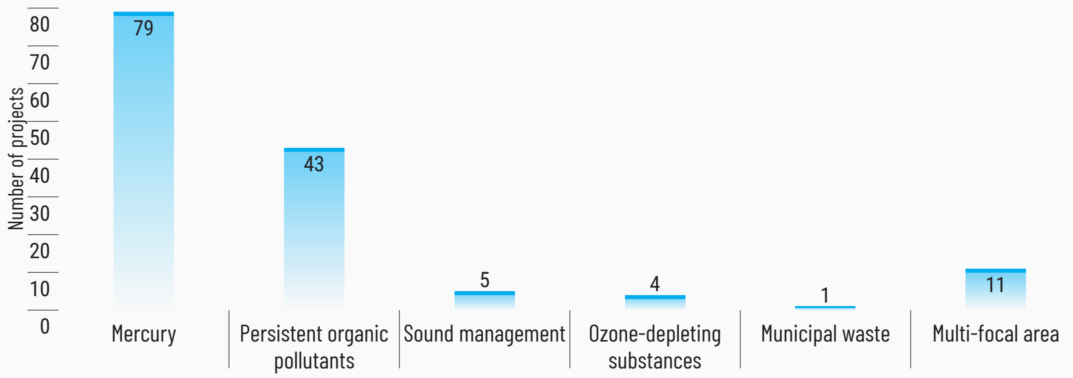
Subsequently, under GEF-5, a Chemicals Strategy offered a unifying framework to support the POPs and ODS focal areas, as well as for sound chemicals management and mercury (projects on sound management and mercury were

Figure 3.23 **Resource allocations for chemicals and waste by GEF round, 1994-2018 (based on GEF projects online database [GEF 2018])**



The figure shows the total value/cost of all single-focal area projects (unless ODS and POPs are combined, in which case the project values were summed in the POPs focal area). For GEF 1-4 only the value/cost of completed projects are included in the calculation. The value/cost of cancelled projects and projects submitted to the GEF Secretariat but not (yet) approved were not included in any replenishment cycle.

Figure 3.24 GEF-6 projects by chemical group (based on GEF projects online database GEF 2018)



Multi-focal area projects that include chemicals and waste among other focal areas have been counted. Excludes cancelled projects and projects submitted to the GEF Secretariat but not (yet) approved.

included in the POP Focal Area). GEF-5 (2010-2014) established an integrated chemicals and waste Focal Area under the GEF. For GEF-6 the GEF Assembly created a single Focal Area for chemicals and waste, replacing the POPs and ODS focal areas. The GEF-6 Strategy shows increased attention to mercury, covered under four of its six programmes, consistent with the progress in negotiations of the Minamata Convention (Figure 3.23) (Independent Evaluation Office of the Global Environment Facility 2018). Under GEF-7 chemicals and waste objectives can also be achieved through impact programmes, for example on sustainable cities.

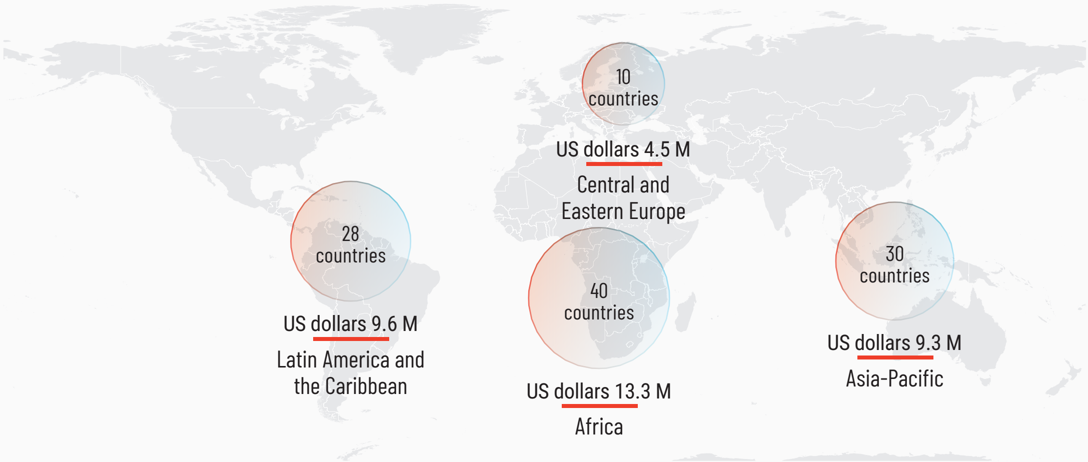
The programming targets for the chemicals and waste focal area under GEF-6 consisted of US dollars 554 million, compared to US dollars 425 million for GEF-5, to support implementation of the Stockholm Convention, the Minamata Convention, the Montreal Protocol and SAICM (in order of magnitude). This represents 12.5 per cent of total GEF-6 replenishment (GEF 2014) As of August 2018, US dollars 375 million was allocated to projects and almost US dollars 2 billion in co-financing was mobilized. The majority of direct funding was allocated for projects in Africa, while Asia mobilized the highest amount of co-financing. GEF-7 has an indicative allocation of US dollars 599 million, representing a slight increase compared to GEF-6, which is entirely for the Minamata Convention, while the other recipients from GEF-6 received less.

The Quick Start Programme

The Quick Start Programme (QSP) was established in 2006 by the International Conference of Chemicals Management (ICCM) at its first session to support initial capacity building activities for the implementation of SAICM. Subject to certain conditions, civil society networks participating in SAICM are eligible for QSP projects.

From the date it was established to December 2017, the QSP mobilized over US dollars 47.6 million. This amount includes approximately US dollars 39.4 million in cash contributions to the QSP Trust Fund and over US dollars 9.7 million in cash and/or in-kind contributions from project implementers and Executing Agencies. The largest share of the projects was implemented in Africa, followed by Asia-Pacific and LAC (SAICM Secretariat 2018d) (Figure 3.25). The QSP impact evaluation (Nurick and Touni 2015), which reviewed 158 projects funded by the QSP Trust Fund as of October 2014, found the Trust Fund to be a unique funding stream. Many projects developed externally funded projects that effectively continued QSP projects (e.g. with funds from GEF, UN agencies, NGOs and donors). However, challenges were encountered in leveraging further resources. The QSP has been terminated.

Figure 3.25 **Overview of the Quick Start Programme since 2006 (adapted from SAICM Secretariat 2018d)**



Total of 184 QSP projects in 108 countries.

The Special Programme to Support Institutional Strengthening

The Special Programme to Support Institutional Strengthening supports country-driven institutional strengthening at the national level, in the context of an integrated approach to address the financing of the sound management of chemicals and waste (taking into account the national development strategies, plans and priorities of each country) to increase sustainable public institutional capacity for the sound management of chemicals and waste throughout their life cycle. Institutional strengthening under the Special Programme will facilitate and enable the implementation of the Basel, Rotterdam and Stockholm Conventions, the Minamata Convention and the Strategic Approach to International Chemicals Management (SAICM). Its terms of reference were adopted by the UNEA at its first session in 2014.

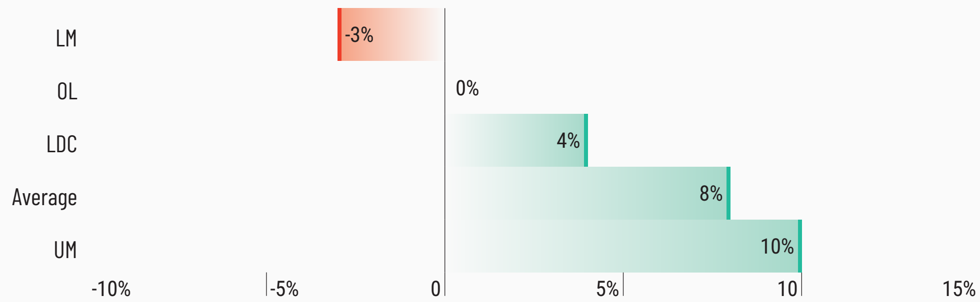
Support from the Special Programme is available for developing countries (taking into account the special needs of least developed countries and Small Island Developing States) and for countries with economies in transition, with priority given to those with least capacity. Eligible countries must be a Party to any one of the relevant conventions or have demonstrated that they are in the process of preparing for ratification of any one of the Conventions. Countries also have to identify the associated domestic measures to be taken, in order to ensure that the national institutional capacity supported by the Special Programme is sustainable in the long term. As of August 2018, the Special Programme had received contributions of US dollars 17 million. It has processed two rounds of applications and is currently funding projects in 24 countries in Africa, CEE, Asia-Pacific and LAC with a total budget of US dollars 6.85 million.

3.2.4.4 Other capacity development support

International bodies

In line with their respective mandates, the nine IOMC participating organizations have made significant efforts to strengthen national and regional capacities for the environmentally sound management of chemicals and waste. A large number of projects have been implemented over the years, including technical assistance and guidance to reduce reliance on chemicals in agriculture; promotion of occupational health and safety; facilitation of environmentally sound disposal of POPs; and development of

Figure 3.26 **Increase in percentage of developing country governments with development assistance programmes that address chemicals comparing results for 2009-2010 and 2011-2013 (adapted from SAICM Secretariat 2015a, p. 13)**



LDC: Least Developed Countries; LM: Lower Middle-income countries; OL: Other Low-income countries; UM: Upper Middle-income countries (DAC List of Official Development Assistance Recipients) (OECD 2018b); Average = average for all regions and world categories of respondents

inventories. An overview of the large number of activities on chemicals issues of the IOMC participating organizations in countries is compiled in a database (WHO 2018c).

An important contribution to support national capacity is the development of the IOMC Toolbox for decision-making in chemicals management. The internet-based Toolbox enables countries to identify the most relevant and efficient tools (e.g. guidelines, protocols and data sheets) to address specific national problems in chemicals management, covering among others a national management scheme for pesticides, an occupational health and safety system, and a chemical accident prevention, preparedness and response system. Since 2009 the IOMC participating organizations have also taken an active role in addressing the SAICM emerging policy issues, either leading or co-leading the activities. Moreover, these organizations have continued to provide assistance to countries, at their request, to implement the QSP project.

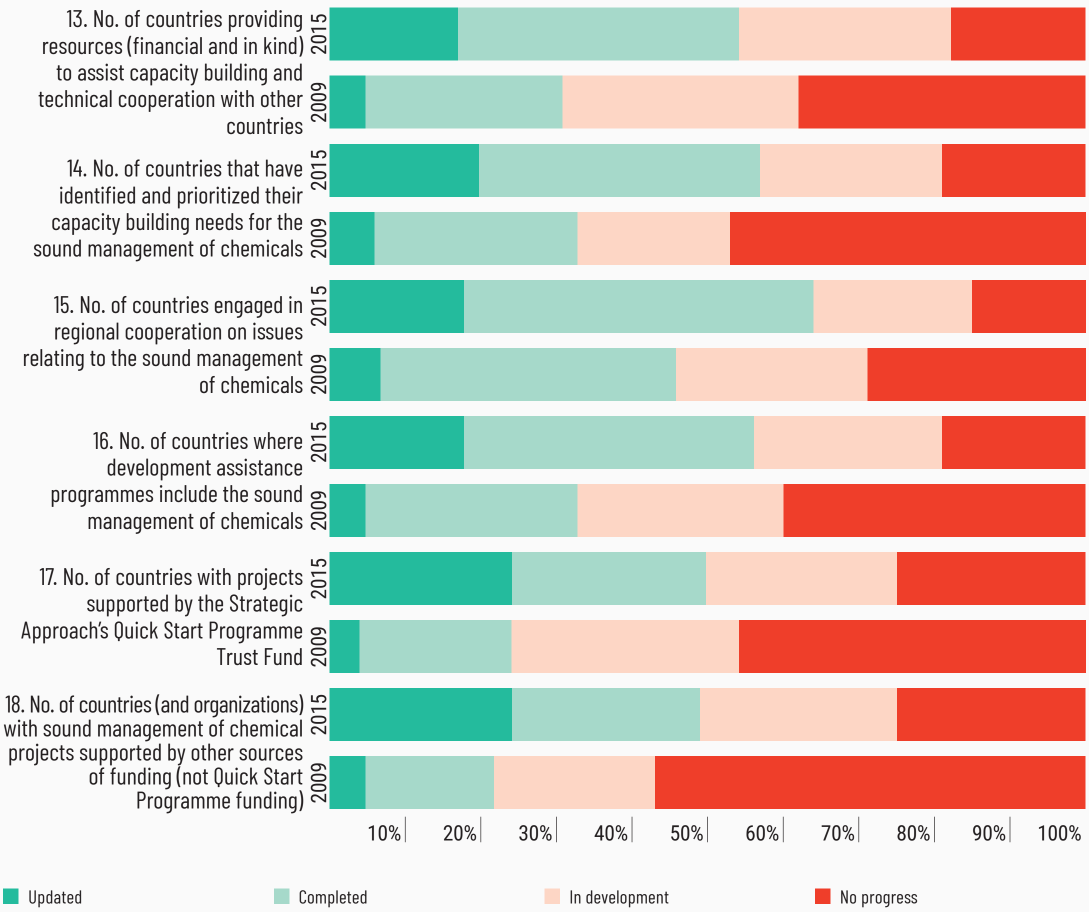
Bilateral development assistance

A number of countries provide direct capacity-development support and technical assistance to facilitate sound chemicals management. For, example the Chemical Safety Convention Projects of the German Association for International Cooperation (GIZ) feature a number of projects in developing countries covering, for example, capacity building courses for SMEs on work safety and disposal of obsolete pesticides (GIZ 2014). Another example is the Swedish Chemicals Agency (KEMI) programme "Towards a Non-toxic South-East Asia", which aims to reduce health and environmental risks in several countries by, among others, strengthening capacity to innovate and scale up integrated pest management (KEMI 2016). Developing countries have also made progress in incorporating chemicals management in development assistance programmes (SAICM indicator 16) (SAICM Secretariat 2015a) (Figure 3.26).

Civil society activities

A number of civil society organizations implement projects across the world, particularly in developing countries with limited capacity for the environmentally sound management of chemicals and waste. Examples include the International SAICM Implementation Project led by the International POPs Elimination Network (IPEN), under which more than 100 activities have been implemented in 50 countries to raise awareness, provide sectoral support, engage civil society in regulatory and institutional reforms, and build capacity for the sound management of chemicals and waste (IPEN 2018). Among numerous other initiatives facilitated by civil society organizations are those implemented by Health Care Without Harm and the Pesticide Action Network.

Figure 3.27 Comparison of results of the 2015 ICCA progress report with the 2009 baseline for SAICM indicators under capacity building and technical cooperation (adapted from ICCA 2015b, p. 7)



Private sector activities

In its fifth update report on implementation of SAICM, the ICCA (ICCA 2015b) highlighted the chemical industry's contribution to building capacity for the environmentally sound management of chemicals and waste through initiatives such as Responsible Care® and the Global Product Strategy. Reporting collected from its member associations indicated significant progress in advancing indicators under the OPS on capacity building and technical cooperation (Figure 3.27). Other examples include training farmers in developing countries in the responsible use of pesticides, facilitated by CropLife (CropLife International 2018a).

3.2.5 Illegal international traffic

Despite progress made, including through the Basel Convention and the Rotterdam Convention, illegal international traffic remains on the international agenda

Despite significant progress made in regulating the transboundary movement of chemicals and waste, including through the Basel Convention and the Rotterdam Convention, illegal international traffic remains a pressing global problem for many countries. Under the heading in the OPS "Illegal international traffic", SAICM aims to prevent illegal international traffic in toxic, hazardous, banned and severely restricted chemicals, including products incorporating these chemicals, mixtures and compounds and wastes (SAICM Secretariat, UNEP and WHO 2006). In 2018 participants in the sixth SAICM Africa

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Regional Meeting emphasized the importance of stopping illegal traffic, as well as the dumping of chemicals and waste, in Africa (SAICM Secretariat 2018e). The need for more work to address illegal trafficking of chemicals and waste across countries was also highlighted at the fifth SAICM Asia-Pacific Regional Meeting (SAICM Secretariat 2018f) and the sixth SAICM CEE Regional Meeting (SAICM Secretariat 2018g). However, data and information on illegal international traffic of chemicals and waste is scarce. This gap is to be addressed in a project led by UN Environment and GRID-Arendal.

Illegal trade in products, pesticides and production processes poses diverse challenges

An important issue receiving the attention of policymakers is the import of products (e.g. cosmetics, toys, jewellery) that may contain banned substances (Chemical Watch 2018d). High concentrations of heavy metals in toys are regularly reported (Environment and Social Development Organization 2013; Ismail *et al.* 2017; Venugopal and Bose 2018). However, capacities for authorities to detect chemical concentrations in consumer products are often limited. Further examples of products containing illegal contaminants are skin lightening creams and soaps. Another emerging topic is the trade of low-quality fuels and fake fuels – products that contain substances in addition to or different from what an authorized seller represents (UNEP 2019b).

The rapid growth of the agriculture industry has led to intensive production and use of pesticides, including illegal pesticides. Trade in fake, obsolete and banned chemicals is taking place in illicit and licit markets. The identification and interception of illegal pesticides, however, is complicated by the vast number of chemicals on the market, low human and physical capacities to inspect shipments, and low awareness about the share of illegal trade. In some countries inadequate and unclear government enforcement responsibilities encourage non-compliance. Furthermore, new challenges emerge with e-commerce.

Some examples reveal that illegal trade of pesticides can be rather high. For instance, Europol conducted a series of three enforcement actions against the illegal trade in chemicals, the latest of which seized 360 tonnes of illegal pesticides including counterfeit pesticides (Europol 2018). Recent EU reports estimate that 14 per cent of pesticides sold in Europe are counterfeit and illegal, causing losses in revenue for the legitimate industry at around euros 1.3 billion annually (European Union Intellectual Property Office 2017; Europol 2018). Another study from India indicates that about 30 per cent of the volume of the domestic pesticide industry was illegal in 2013 (Agarwal and Garg 2015).

Illegal trade is also a challenge in production processes. For example, data available through the Artisanal Gold Council and the United Nations international trade statistics database (United Nations Comtrade 2018) suggest that about half of all mercury used in artisanal and small-scale gold mining (ASGM) is traded illegally or informally.

Initiatives are in place at the global and regional level

Addressing illegal international traffic requires the existence of adequate legislative frameworks and their enforcement, both of which continue to present challenges in many countries including, but not exclusively, developing countries. Efforts and initiatives are under way in many countries to adopt new regulations and strengthen capacities for the control of transboundary movements. SAICM stakeholders have reported significant progress in monitoring traffic; implementation of national legislation preventing traffic; and training border control authorities, among others (SAICM Secretariat 2015a).

A number of governments are scaling up monitoring and control measures for imported products, but such activities still remain very limited. For example, KEMI regularly inspects companies importing products to verify that they are in compliance with existing legislative requirements (KEMI 2017a). It has implemented enforcement projects targeting, among others, trade in products exceeding allowable concentrations (KEMI 2017b). In the context of the Montreal Protocol, a global award has been launched to recognize the critical role of customs and enforcement officers in implementing trade restrictions and bans on HCFCs and HFCs (UNEP 2018b).

At the international level, the Rotterdam Convention is a key instrument providing an international framework to address international trade in certain hazardous chemicals and pesticides. The Convention's PIC procedure aims to ensure compliance of exporting Parties with the decisions of importing Parties as to whether they wish to receive future shipments of chemicals listed in Annex III of the Convention. With respect to the waste dimension of illegal international traffic, the Parties to the Basel Convention adopt decisions providing policy guidance to the Parties on how to prevent and combat illegal traffic. For example, Parties are encouraged to exchange information on their legislation or best practices and to transmit to the Secretariat forms for confirmed cases of illegal traffic. Parties also develop and adopt guidelines on how to prevent and combat illegal traffic. A number of initiatives, soft laws and policy frameworks foster cooperation between and within regions, building the capacities of law enforcers and providing additional knowledge tools, among other activities. Examples include the Green Customs Initiative, coordinated by UNEP, and the Environmental Network for Optimizing Regulatory Compliance on illegal Traffic (ENFORCE) coordinated by the Secretariat of the Basel Convention.

Large amounts of illegal waste are seized by authorities

Awareness and knowledge of the trade of hazardous waste and other wastes between countries with different economies are growing. In 2017 the International Criminal Police Organization (INTERPOL) coordinated a global enforcement initiative to combat illegal transboundary movement of chemicals and waste. As a result of this operation, over 1.5 million tonnes of illicit waste were detected (INTERPOL 2017a; INTERPOL 2017b). The European Network for the Implementation and Enforcement of Environmental Law (IMPEL) regularly conducts coordinated regional inspections to implement the waste shipment regulation. The results of the latest project revealed that 16 per cent of waste-related shipments violated waste shipment regulations (Olley, Ross and O'Shea 2016).

In 2013 a joint operation across Europe and the Asia-Pacific region, Demeter III, was initiated by China Customs and organized by the World Customs Organization (WCO) to target mainly illicit maritime consignments of hazardous and other wastes. The operation netted more than 7,000 tonnes of illegal waste, including hazardous waste and e-waste (WCO 2014).

Action is also taken in the private sector

A number of initiatives taken by, or in cooperation with, the private sector seek to address international illegal traffic. The US EPA has taken a positive step by working out an agreement with one of the largest online retailers to combat illegal trade in pesticides on the basis of inspections and monitoring evidence (US EPA 2018c). A private sector initiative, China Checkup, has attempted to warn customers about fraudulent suppliers on the platform of another major online retailer (Slater 2015). As regards pesticides, CropLife is engaged in anti-counterfeiting activities and works with relevant authorities to ensure that only authentic crop protection products are traded and that they

Table 3.9 Stakeholder perceptions of the degree of success regarding prevention of illegal international traffic in chemicals and waste from 2006-2015, asked between 14 November 2016 to 4 January 2017 (SAICM Secretariat 2018b, p. 31)

Stakeholder group	Very successful (%)	Some success (%)	Little success (%)	Unsuccessful (%)	Don't know (%)
Africa	19	43	10	24	5
Asia-Pacific	0	25	50	0	25
Central and Eastern Europe	14	14	29	14	29
Latin American and Caribbean	0	30	22	4	43
EU/JUSSCANNZ	6	38	13	19	25
UN agencies	0	0	20	20	60
Civil society	12	12	12	35	29
Industry	7	36	21	7	29

JUSSCANNZ: Japan, US, Switzerland, Canada, Australia, Norway, New Zealand and other non-EU countries.

are used in a safe, responsible manner (CropLife International 2018b).

SAICM stakeholders report progress in addressing illegal international traffic

According to the Draft Report of the Independent Evaluation of the Strategic Approach from 2006-2015 (SAICM Secretariat 2018b), 52 per cent of SAICM stakeholders consider that with respect to illegal international traffic (one of the five objectives of the SAICM OPS) some measure of success (very successful, some, little) has been achieved, while 49 per cent do not see a clear measure of success (unsuccessful, don't know). Comparing this to the average of opinions on the four other objectives (86 per cent found there was a measure of success, while 14 per cent did not), it is obvious that this OPS objective has been the most challenging and needs more

© Basel Convention Regional Centre for Asia and the Pacific effort. Opinions on success in the prevention of illegal international traffic among the various stakeholder groups is presented in Table 3.9. Particularly in the Latin American and Caribbean region, in civil society and within the UN agencies, there has clearly been a perception of success (SAICM Secretariat 2018b).

Challenges remain, among others due to differences in regulatory frameworks

National legislation regarding the legality of trade in chemicals differs significantly from jurisdiction to jurisdiction. The Basel Convention allows Parties to define certain wastes as hazardous beyond those listed by the Convention; hence the exact scope of the Convention differs from one country to another, with the consequence that some wastes are legally defined as hazardous in one jurisdiction but not in another. Similarly, maximum residue levels of pesticides are not uniform despite attempts to adopt global standards through the Codex Alimentarius. Food products banned in one country may still be permitted entry in countries that allow higher levels of hazardous substances. Adding to these complexities, existing multilateral treaties allow for certain exemptions and many chemicals that are traded internationally fall outside the scope of multilateral treaties.

Avoiding loopholes: the Ban Amendment and the Bamako Convention

Despite significant progress in international governance, the consequences of illegal international traffic of waste and chemicals are still a burden on human health and the environment. A topic of particular relevance is the distinction between products and waste, which is often not straightforward but highly relevant, as different regulations apply. In many cases hazardous wastes are relabelled and replaced on the market. Hazardous waste, particularly electrical and electronic waste, is frequently falsely declared as second-hand goods for recycling in order to circumvent existing regulations prohibiting the export of hazardous waste to a number of developing countries (Lipman 2015; Garlapati 2016). Obsolete pesticides are also reported to return back to the markets (UNEP 2019b).

Ninety-five countries have ratified the Basel Ban Amendment, which would ban transboundary shipments of hazardous wastes for any reason, including recycling, from the Member States of the EU and the OECD, and from Liechtenstein, to other Parties. However, the Amendment will only enter into force on the 90th day after receipt of the instrument of ratification, approval, formal confirmation or acceptance by at least three-fourths (66) of the 87 Parties at the time the Amendment was adopted in 1995, which has not yet occurred. In addition, the majority of African countries have ratified the Bamako Convention, which prohibits the import of any hazardous waste and which entered into force in 1998.

3.2.6 Additional insights from SAICM stakeholder reporting

Stakeholder reporting on SAICM implementation, as well as the independent evaluation of SAICM, provide additional insights relevant for assessing progress towards the achievement of the 2020 goal. Information gathered via these mechanisms is primarily derived from stakeholder perceptions of progress made in advancing activities relevant for the five objectives of the OPS. It can thus provide additional, although limited, knowledge and complement the analysis of initiatives and actions described in the preceding sections.

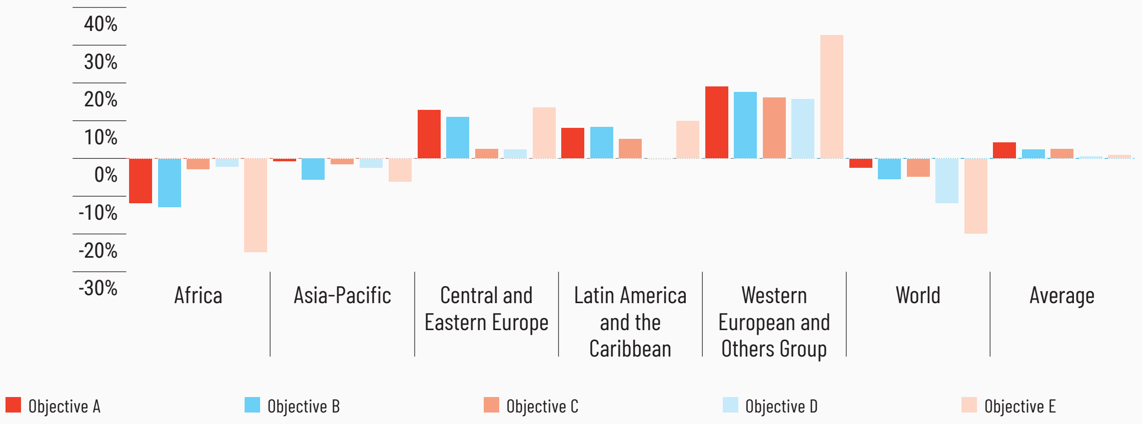
Stakeholder perceptions of progress under SAICM

SAICM was adopted in 2006 at ICCM 1 in Dubai. As stipulated in paragraph 24 of the OPS, the ICCM undertakes a periodic review of SAICM based on reports from stakeholders. A baseline estimates report, covering the period 2006-2008, was prepared in 2011 (SAICM Secretariat 2011). Three progress reports, for 2009-2010 (SAICM Secretariat 2012), 2011-2013 (SAICM Secretariat 2014) and 2014-2016 (SAICM Secretariat 2019b), were subsequently prepared. The Summary Report on progress in implementing the Strategic Approach for the period 2011-2013 was submitted to the fourth session of the International Conference on

Figure 3.28 **Selected SAICM indicators, comparing results for 2009-2010 and 2011-2013 (adapted from SAICM Secretariat 2014, p. 13)**

The figure shows the average number of activities undertaken for each indicator as a percentage of all possible options for activities listed for the given indicator in the questionnaire. The indicators are listed in order of the greatest positive change between the first and the second reporting process.

Figure 3.29 Progress against objectives since the first reporting period, by region for the reporting period 2011–2013 (per cent) (adapted from SAICM Secretariat 2015a, p. 4)



Note: World = IOMC and global organizations; Average = average for all regions and world categories of respondents
Objective A: Risk reduction
Objective B: Knowledge and information
Objective C: Governance
Objective D: Capacity building and technical cooperation
Objective E: Illegal international traffic

International Chemicals Management (ICCM4) (SAICM Secretariat 2015a).

In the second progress report there was a comparison, for selected SAICM indicators, of the results for 2009-2010 with those for 2011-2013. Figure 3.28 shows the average number of activities undertaken for each indicator as a percentage of all possible options for activities listed for the given indicator in the questionnaire (SAICM Secretariat 2014). The greatest increase observed in the number of activities selected was in indicator 3 (hazardous waste management arrangements).

The Summary Progress Report indicates progress by regions since the first report. As shown in Figure 3.29 progress across the regions differs significantly (SAICM Secretariat 2015a). A significant improvement in the range of activities was reported by respondents in the Western European and Other States between the first and second reporting periods. The CEE and LAC regions reported generally higher levels of activity during the second reporting period compared to the first, while the African and the Asia-Pacific regions reported fewer activities.

The SAICM progress reports show that efforts in most countries focus on obligations stemming from legally binding instruments, particularly the Montreal Protocol and the Basel and Stockholm Conventions. Countries also reported a high level of activity on mechanisms to address pesticides and mercury, monitoring activities and national chemicals safety committees. The least commonly selected activities related to accessing finance (SAICM Secretariat 2012; SAICM Secretariat 2014).

Information for a third report on progress in the 2014-2016 period has been collected from stakeholders by the SAICM Secretariat. However, the report notes that the very low response rate does not allow comparison with previous reports, and it is therefore not feasible to measure progress using the information received from stakeholders (SAICM Secretariat 2019b).

Results from the independent evaluation of SAICM

In 2016 SAICM started an independent evaluation of progress at the national and global levels, with the objective of collecting data to inform

Box 3.5 SAICM independent evaluation: on-line survey of stakeholders

The draft Independent evaluation of the Strategic Approach from 2006-2015 was presented to the second meeting of the intersessional process considering the Strategic Approach and the sound management of chemicals and waste beyond 2020 (SAICM Secretariat 2018b). An online survey was designed to capture SAICM stakeholder perceptions of the performance of SAICM. For a variety of SAICM parameters or activities, stakeholders were asked whether they considered work in this field to be very successful; having some success; having little success; unsuccessful; or whether they did not know the extent of success. Between November 2016 and January 2017, 212 respondents completed (or partially completed) the survey, of which 64 per cent were government representatives from across the five regions. The information in Tables 3.2 and 3.3 reflects the stakeholders' perceptions of levels of success.

decisions for the Strategic Approach and the sound management of chemicals and waste beyond 2020 (Box 3.5).

Stakeholder perceptions on achieving the OPS objectives, as obtained through the independent evaluation, are shown in Table 3.10 (SAICM Secretariat 2018b). For all the objectives the majority of respondents indicated that there was "some success". An average of 14 per cent indicated they did not know what the degree of success was, with a high percentage of 31 per cent in the case of objective E on illegal international traffic. The independent evaluation found that perceptions of the level of success in implementing the OPS objectives varied across regions.

Overall, the independent evaluation found that SAICM is unique in its ambition as an inclusive multi-stakeholder, multi-sector voluntary policy framework. It also found that SAICM creates a collaborative space for raising awareness, increasing knowledge and reducing risks. However, it pointed out weaknesses such as insufficient sectoral engagement; the capacity constraints of national focal points; lack of tools to measure progress; limited financing of activities; and insufficient and uneven advances in substantive areas such as illegal international traffic (SAICM Secretariat 2018b).

For each objective, however, and also in the various regions in most cases, the percentage indicating "some success" was highest. Some significant differences concern CEE stakeholders, of which 43 per cent considered implementation of "Objective A. Risk reduction" to be very successful, 71 per cent considered implementation of "Objective B. Knowledge and information" to be very successful, and 43 per cent considered implementation of the capacity building objective to be successful. Among civil society stakeholders, 35 per cent considered implementation of "Objective E. illegal international traffic" to be unsuccessful.

Table 3.10 Stakeholder perceptions of the degree of success in achieving OPS objectives from 2006-2015, asked between 14 November 2016 to 4 January 2017 (SAICM Secretariat 2018b, p. 24)

OPS objective	Very successful (%)	Some success (%)	Little success (%)	Unsuccessful (%)	Don't know (%)
A. Risk reduction	15	56	16	3	11
B. Knowledge- and information-sharing	22	54	14	2	7
C. Governance	16	47	20	5	12
D. Capacity building and technical cooperation	20	40	25	4	11
E. Illegal international traffic	7	27	18	18	31

Table 3.11 Stakeholder perceptions of the degree of success in incorporating the SAICM emerging policy issues (EPIs) and other issues of concern in activities from 2006-2015, asked between 14 November 2016 to 4 January 2017 (SAICM Secretariat 2018b, p. 32)

EPI/issue of concern	Start at ICCM number	(Co-)lead	Very successful (%)	Some success (%)	Little success (%)	Unsuccessful (%)	Don't know (%)
Lead in paint	2	UNEP/WHO	27	29	5	6	34
Chemicals in products	2	UNEP	14	38	13	7	28
HSLEEP	2	UNIDO	12	20	15	11	41
Nanotechnology/ nanomaterials	2	UNITAR/OECD	18	19	14	10	38
PFCs	2	OECD/UNEP	11	27	10	8	44
EDCs	3	OECD/UNEP/WHO	24	22	12	9	32
EPPP	4	UNEP/WHO	8	22	13	10	46
HHP	4	FAO/UNEP/ WHO	22	26	10	6	36

HSLEEP: hazardous substances within the life cycle of electrical and electronic products; PFCs: perfluorinated chemicals and the transition to safer alternatives; EDCs: endocrine-disrupting chemicals; EPPP: environmentally persistent pharmaceutical pollutants; HHP: highly hazardous pesticides

Results from the independent evaluation of the EPIs and other issues of concern

Table 3.11 shows the degree of success respondents considered they had had in incorporating emerging policy issues (EPIs) into their activities, as reflected in the independent evaluations (SAICM Secretariat 2018b). Details on progress with each EPI are given in Part II, Ch. 4. Perceptions of the level of success can differ significantly over regions and stakeholder groups, possibly reflecting the level of activity in the region or the level of engagement of the stakeholder groups involved. Examples are: for lead in paint, 50 per cent "very successful" in civil society and 40 per cent in the EU/JUSSCANNZ (Japan, the United States, Switzerland, Canada, Australia, Norway, New Zealand and other non-EU countries), while this was 0 per cent in the Asia-Pacific region; nanotechnology/ nanomaterials: 27 per cent "very successful" in EU/JUSSCANNZ and 43 per cent "little success" in the CEE region; hazardous substances within the life cycle of electrical and electronic products (HSLEEP): 50 per cent "some success" in the Asia-Pacific region and 50 per cent "little success" or "unsuccessful" in the African region; and endocrine-disrupting chemicals (EDCs): 42 per cent "very successful" in industry and 0 per cent in the LAC region.

The evaluation noted that the identification of (and actions taken on) the eight EPIs and other issues of concern were a major strength and uniqueness of SAICM, and that the IOMC participating organizations have been actively involved in leading activities on the EPIs (SAICM Secretariat 2018b). Nevertheless, it found that progress in implementing the EPIs has been slow, modest and uneven.

4/ Emerging policy issues and other issues of concern

Chapter Highlights

A process has been established under SAICM to identify emerging policy issues (EPIs) and other issues of concern; to date, eight issues have been identified by the international community.

The nomination of the EPIs and other issues of concern has successfully raised awareness, focused the attention of stakeholders and catalysed initiatives; however, challenges remain.

In addressing lead in paint, hazardous substances within the life cycle of electrical and electronic products (HSLEEP) and highly hazardous pesticides (HHPs), further collaborative action can be taken, including at the international level, to further minimize risks.

In addressing chemicals in products, polyfluorinated chemicals (PFCs) and environmentally persistent pharmaceutical pollutants (EPPPs), further awareness-raising and transparency could advance the international agenda and circularity.

Further research and knowledge generation is needed in all regions on nanotechnology and endocrine-disrupting chemicals (EDCs), including through a strengthened science-policy interface

To date, the International Conference on Chemicals Management (ICCM) has identified eight emerging policy issues (EPIs) and other issues of concern, understood to be issues involving any phase in the life cycle of chemicals and which have not yet been generally recognized; are insufficiently addressed or arise from the current level of scientific information; and which may have significant adverse effects on human health and/or the environment. In light of the UNEA mandate to address the EPIs, the GCO-II provides evidence concerning a number of remaining challenges and presents a range of measures to further address existing EPIs and other issues of concern. While no assumptions are made about these potential measures being carried forward in the beyond 2020 process, they are considered to be of relevance for further consideration by stakeholders.

4.1 Emerging policy issues and other issues of concern: a core element of SAICM

In 2016 the second United Nations Environment Assembly (UNEA-2) requested the Executive Director of the UN Environment Programme to "ensure that the update of the Global Chemicals Outlook (GCO-II) addresses the issues which have been identified as emerging policy issues by the ICCM, as well as other issues where emerging evidence indicates a risk to human health and the environment."

One of the functions of the ICCM, set out in the Overarching Policy Strategy (OPS) of the SAICM, is "to focus attention and call for appropriate action on emerging policy issues as they arise and to forge consensus on priorities for cooperative action". In accordance with that function, the ICCM has discussed "emerging policy issues" (EPIs) from its second session (ICCM2, held in 2009) onwards.

The Annex to Resolution II/4 adopted at ICCM2 sets out an open and transparent five-step procedure for the consideration of emerging policy issues:

› *Call for nominations*: Any SAICM stakeholder is free to nominate EPIs. While nominations are possible at any given time, stakeholders are formally invited at specific periodic intervals, e.g. in the lead-up to each ICCM.

› *Submission of initial information*: In nominating an EPI, proponents are required to provide information on why the issue is considered an EPI, in particular how it is consistent with the definition of an EPI (i.e. an issue involving any phase in the life cycle of chemicals and which has not yet been generally recognized, is insufficiently addressed or arises from the current level of scientific information, and which may have significant adverse effects on human health and/or the environment) and how the issue meets the selection criteria (see below), and a description of the proposed cooperative action. Moreover, proponents are encouraged to include a description of proposed actions to be considered in moving forward on the EPI.

› *Initial review and publication of submissions*: The secretariat sets out the results of a screening of the nominated EPI against the agreed criteria and compiles a list of nominations, thereby clustering similar nominations. The list of nominations is made publicly available for comments and thereafter consolidated.

› *Prioritization through consultation and advice from stakeholders and experts*: After publication of the nomination list, the regions may prioritize submissions by engaging formally the full range of their stakeholders.

› *Inclusion of EPIs on the provisional agenda of the Conference*: The Open-ended Working Group will consider the regional inputs and other information to assess the proposals, taking into account the criteria below, and proposes a limited number of priority EPIs to the Conference for its consideration.

To provide a basis for further considering the priority of each nominated EPI, the following criteria were developed:

1. Magnitude of the problem and its impact on human health or the environment, taking into account vulnerable subpopulations and any toxicological and exposure data gaps.

2. Extent to which the issue is being addressed by other bodies, particularly at the international level, and how it is related to, complements, or does not duplicate such work.

3. Existing knowledge and perceived gaps in understanding about the issue.

4. Extent to which the issue is of a cross-cutting nature.

5. Information on the anticipated deliverables from action on the issue.

So far, resolutions have been adopted on the following issues at ICCM2, ICCM3 and/or ICCM4:

› Lead in paint (ICCM2, 2009);

› Chemicals in products (ICCM2, 2009);

› Hazardous substances within the life cycle of electrical and electronic products (ICCM2, 2009)

› Nanotechnology and manufactured nanomaterials (ICCM2, 2009);

› Per- and polyfluoroalkyl substances (PFASs) and the transition to safer alternatives (ICCM2, 2009);

› Endocrine-disrupting chemicals (ICCM3, 2012);

› Environmentally persistent pharmaceutical pollutants (ICCM4, 2015) ; and

› Highly hazardous pesticides (ICCM4, 2015).

4.2 Working towards further risk reduction

4.2.1 Lead in paint: enhanced action required to meet the 2020 phase-out targets

Introduction

Lead is a metal and a potent neurotoxin, whose widespread use has caused extensive environmental contamination and health problems in many parts of the world (WHO 2010a; WHO 2010b). Even though lead in paint[1] is one of the main sources of exposure for children, it continues to be used in over 70, and potentially more than 100, countries to enhance colour, reduce corrosion or reduce drying time (WHO 2010a; UNEP and IPEN 2013; IPEN 2017; UNEP 2017a; WHO 2017a). An estimated 11 per cent of global decorative paint production takes place in countries where its use is not regulated (International Paint and Printing Ink Council [IPPIC] 2015). In addition, some of the world's largest economies which are restricting domestic use of lead paint continue to export lead pigments and lead paint (Kessler 2014; Gottesfeld 2015; IPEN 2016).

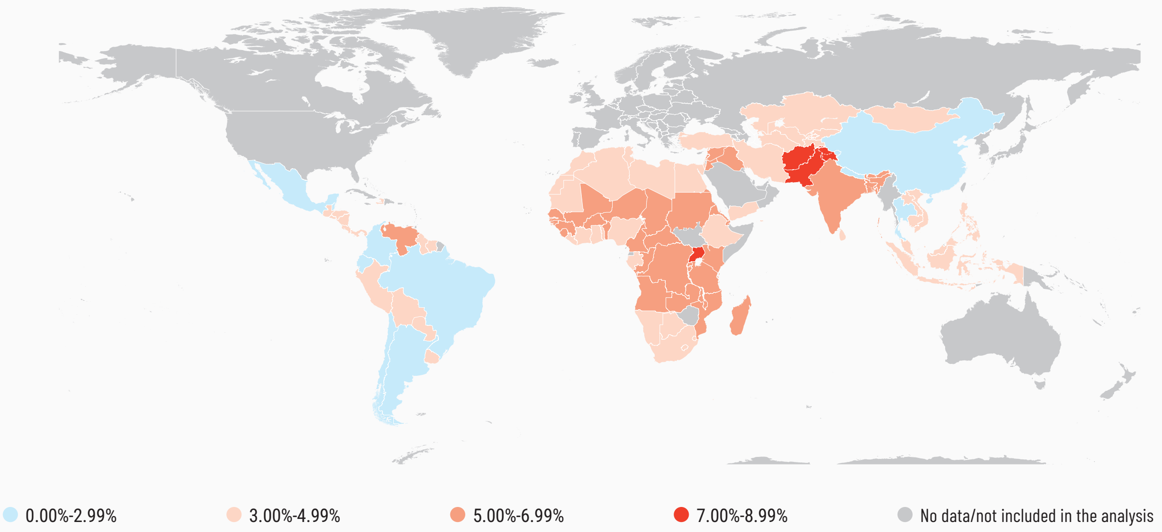
In 2009 the International Conference on Chemicals Management (ICCM) identified lead in paint as an emerging policy issue. The Global Alliance to Eliminate Lead Paint (GAELP), also known as Lead Paint Alliance, was established and included in its business plan the target that by 2020 all countries should have legally binding controls on lead paint (UNEP and WHO 2012). The global target to eliminate lead paint by 2020 was reaffirmed at the Fourth Session of the ICCM in 2015. While considerable action has been taken, the elimination of lead in paint, and the introduction of safe alternatives to lead pigments in paints, remains a challenge in many countries.

State of the issue

No safe level of exposure to lead has been identified. While it is well known that exposure to levels of lead that were previously considered to be acceptable can cause serious and irreversible health effects, including reduced intelligence quotient scores, there is now a scientific consensus that even low levels of exposure to lead are potentially harmful and may cause intellectual deficits (Fewtrell, Kaufmann and Prüss-Üstün 2003; Nevin 2007; Verstraeten, Aimo and Oteiza 2008; WHO and UNEP 2009; WHO

1 The preferred terminology by the Global Alliance to Eliminate Lead Paint (GAELP) is "lead paint", which it defines as "paint to which one or more lead compounds have been added and includes varnishes, lacquers, stains, enamels, glazes, primers and coatings used for any purposes" (WHO and UNEP 2012).

Figure 4.1 Economic costs of childhood lead exposure in low- and middle-income countries (percentage of gross domestic product) (adapted from Attina and Trasande 2013)



2010a; United States National Toxicology Program [US NTP] 2012; Health Canada 2013a; Schnur and John 2014; Evens *et al.* 2015; Gottesfeld 2015; Aizer *et al.* 2018). Health impacts of lead have resulted in significant economic and social costs (WHO and UNEP 2009). Childhood lead toxicity, with lead paint a major source of exposure, has been estimated to cost low- and middle-income countries US dollars 977 billion per year (Attina and Trasande 2013) (Figure 4.1).

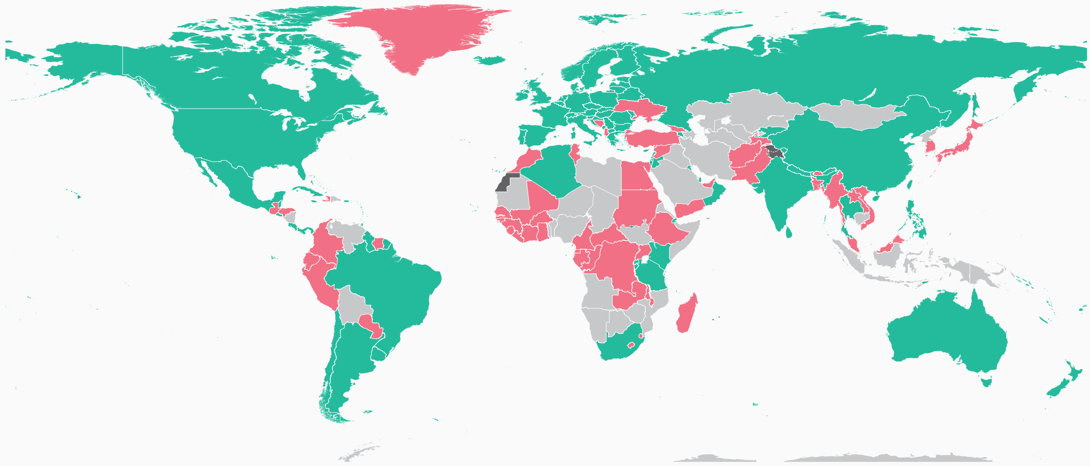
Lead can be harmful to people of all ages, with children, infants and foetuses being particularly at risk. The main sources of exposure for infants and children are food and drinking water, household dust, soil, and mouthing of products containing lead. The most common source will vary based on geography and lifestyle (United States Centers for Disease Control [US CDC] 2010); Health Canada 2013b; UNEP and IPEN 2013; Etchevers *et al.* 2015; US CDC 2016). Recent research indicates that even in countries where lead paint is regulated, high lead concentrations can be found in paint on playground surfaces (Turner *et al.* 2016). Workers are also at high risk, as large quantities of lead can be released during manufacturing, application and removal of lead paint (WHO and UNEP 2009). A significant proportion of housing in developed countries still contains legacy lead paint (US NTP 2012; Dewalt *et al.* 2015).

Policy developments and considerations

The momentum to reduce the use of lead in paints has resulted in a number of countries adopting legislation in recent years (Figure 4.2). As of September 2017, 67 countries had confirmed that they had legally binding controls on lead in paint, 70 countries had stated that they did not have such legislation, and information was unavailable for 56 countries (UNEP 2017a). Even in countries with adequate regulations, weak enforcement has resulted in continued manufacture and sale (Kessler 2014; Gottesfeld 2015; IPEN 2016). Despite significant progress and successful engagement of stakeholders, including through the Lead Paint Alliance, challenges remain, particularly in developing countries. These challenges include the lack of country-specific data, laboratory capacity, public awareness of lead toxicity, and knowledge of alternatives (Kessler 2014; IPEN 2017; UNEP 2017a).

Continued production may be motivated by cost considerations and export opportunities (Kessler 2014). Lead pigments are readily available and relatively easy to manufacture. Moreover, SMEs may lack the knowledge to reformulate (UNEP and IPEN 2013; Kessler 2014; Gottesfeld 2015). However, there is evidence that it is technically and economically feasible to replace lead

Figure 4.2 Status of lead paint regulation worldwide, as reported in 2017 (adapted from WHO 2018a)



additives (IPPIC 2015). Several manufacturers have thus successfully eliminated lead from all paints (Curl 2013; UNEP and IPEN 2013; Kessler 2014; UNEP 2017a). Manufacturers in low-income countries which have successfully switched have described increases in materials costs as insignificant (UNEP and IPEN 2013). Innovative initiatives are also under way: in 2016 a multi-stakeholder group in the Philippines established the world's first programme to certify paints containing less than the recommended 90 parts per million lead (IPEN 2017).

Potential measures to further address lead in paint

Taking into account the preceding analysis, stakeholders may wish to consider the following measures to further address lead in paint:

- Urgently ensure that all countries have legally binding controls in place as an effective and simple means to phase out the manufacture, sale and use of lead in paint.
- Strengthen enforcement at the national level, including through increasing laboratory capacity.
- Address non-consumer use of lead paint and legacies of lead paint in buildings, complementing efforts targeting consumer uses.
- Restrict the export of lead pigments and lead paints to accelerate the transition in countries still using lead.
- Scale up awareness-raising activities and the use of innovative initiatives, such as independent third-party verification schemes.
- Use economic tools and incentives that target both supply and demand, including assistance to small and medium-sized paint manufacturers and the use of levies to increase the cost of lead paint or subsidies for lead-free paint.

4.2.2 Hazardous substances within the life cycle of electrical and electronic products

Introduction

The production and use of electrical and electronic products containing hazardous substances, including substances whose risks have not been fully characterized, is rapidly increasing (Tsydenova and Bengtsson 2011; UNIDO 2015; Scruggs, Nimpuno and Moore 2016; Fowler 2017). End-of-life electrical and electronic products ("e-waste") constitute the fastest growing waste stream in the world, and their recycling rates remain low in many countries (Baldé *et al.* 2017; Cecere and Martinelli 2017).

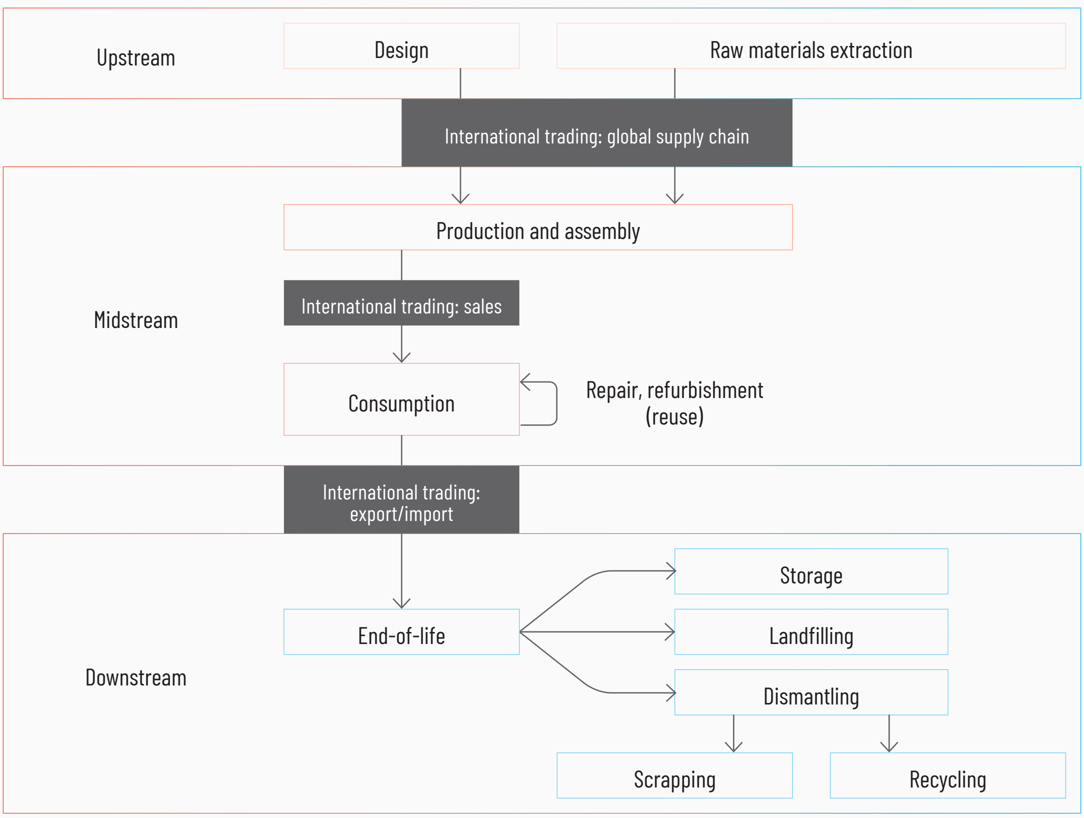
All the countries in the world combined generated approximately 44.7 million tonnes of e-waste in 2016, the equivalent of 6.1 kilograms per inhabitant. Asia generated the largest amount of e-waste, followed by Europe and the Americas. Out of the amount generated, only 20 per cent was recycled through formal channels (Baldé *et al.* 2017). Informal and rudimentary recycling methods, as well as uncontrolled disposal, are releasing chemical pollution, thus creating concerns for human health and the environment (Fujimori *et al.* 2012; Premalatha *et al.* 2014; Awasthi *et al.* 2016; Heacock *et al.* 2016; Baldé *et al.* 2017).

In light of these considerations, "hazardous substances within the life cycle of electrical and electronic products" was adopted as an Emerging Policy Issue (EPI) at the second ICCM in 2009. Conscious that actions are needed up-, mid- and downstream, a life cycle approach (Figure 4.3) was endorsed. Despite valuable efforts made at all levels, significant challenges remain in regard to identifying, disseminating and implementing best practices at all stages of the life cycle, including design, recycling and disposal (Secretariat of the Basel Convention and UNIDO 2011; UNIDO 2015).

State of the issue

In the manufacturing of electrical and electronic products workers may come into direct contact with hazardous chemicals, which can result in significant adverse effects including high cancer rates (Kim *et al.* 2012; Chou *et al.* 2016). Some studies indicate that in some countries women make up the majority of assembly line workers in the electronics industry; therefore, women may be disproportionately affected (Koh, Chan and Yap 2004), which has been reported to have implications for reproductive outcomes (Kim *et al.* 2012; Rim 2017). Consumers also experience

Figure 4.3 The life cycle of electronic and electrical products (adapted from Secretariat of the Basel Convention and UNIDO 2011)



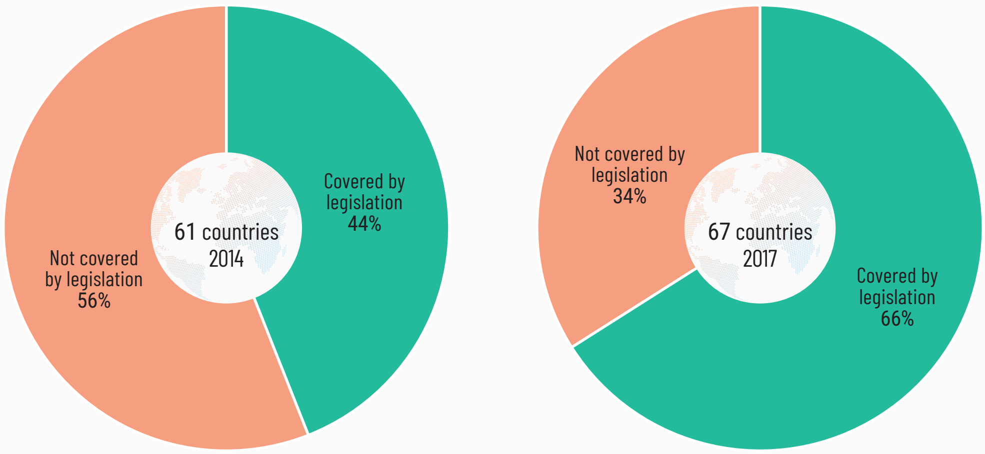
exposures in the use phase, typically in indoor environments (Miller *et al.* 2016; Zheng *et al.* 2017; Kuang, Abdallah and Harrad 2018). This includes children, who may, for example, be exposed to flame retardants in dusts released from electronic products (Danish Environmental Protection Agency 2017). Downstream, hazardous substances can be released from e-waste during disposal and recycling, affecting ecosystems by contaminating the air, water and soil and entering food chains (Wang *et al.* 2005; Duan *et al.* 2011; Fu *et al.* 2013; Yu *et al.* 2016; Anh *et al.* 2017; Klees, Hombrecher and Gladtke 2017; Chakraborty *et al.* 2018).

The adverse effects on human health, particularly among recycling workers in developing countries relying on informal and rudimentary methods, are significant and include increased risks of cancer and negative effects on the reproductive, cardiovascular and immune systems (Tsydenova and Bengtsson 2011; Grant *et al.* 2013; Song and Li 2014; Song and Li 2015; Zheng *et al.* 2016). Women and children, as well as those living in the vicinity of recycling sites, remain among the most vulnerable groups (Eguchi *et al.* 2012; Song and Li 2014; Song and Li 2015; Xu *et al.* 2017; Schecter *et al.* 2018). Lacking or insufficient classification of wastes poses challenges in understanding potential risks and determining appropriate disposal options (Mmereki *et al.* 2016).

Policy developments and considerations

A growing number of countries are adopting e-waste legislation (Baldé *et al.* 2017) (Figure 4.4). This includes, for example, India's E-Waste Management Rules, adopted in 2016 (Ministry of Environment, Forest and Climate Change of India 2016) and the EU Waste Electrical and Electronic Equipment Directive, revised in 2012 (European Commission [EC] 2012a). Legislation targeting the up- and midstream life cycle includes the EU's Restriction of Hazardous Substances Directive (EC 2017a). The global nature of supply chains has prompted a number of countries to develop similar legislation (Selin and Van-Deveer 2006; van Rossem, Tojo and Lindhqvist 2006), including China and the United States (Congress of the United States 2009). International regulatory frameworks focusing on the downstream phase include the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, and the Bamako Convention on the Ban on the Import into Africa

Figure 4.4 **Percentage of the world population and number of countries covered by e-waste legislation in 2014 and 2017 (adapted from Baldé *et al.* 2017, p. 6)**



and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa. However, challenges remain: 34 per cent of the world population is currently not covered by national e-waste management laws, and illegal traffic remains a major challenge even in countries with regulations (Geeraerts *et al.* 2015; Baldé *et al.* 2017).

Several major companies have voluntarily eliminated substances of concern from their product lines (Cobbing and Dowdall 2014). Criteria-based approaches have also been taken by several large electronics companies which could make regulators' tasks in testing and verifying products easier (Nimpuno, McPherson and Sadique 2009). In addition, civil society organizations undertake monitoring activities and inform consumers by ranking consumer electronics companies according to their commitment to, and progress in, eliminating hazardous chemicals from manufacturing and from the product itself (Cobbing and Dowdall 2014; Cook and Jardim 2017). In parallel, strategies are being explored to advance "sustainable electronics" designed for a closed-loop system (O'Connor *et al.* 2016).

Potential measures to further address HSLEEP

Taking into account the preceding analysis, stakeholders may wish to consider the following measures to further address HSLEEP:

- Accelerate regulatory action in all countries to protect workers, consumers and recyclers, including mid- and upstream legislation, criteria-based approaches, extended producer responsibility, and "green taxes".
- Develop a global framework of accountability and close data gaps on the presence, flow and transboundary movement of hazardous substances throughout the life cycle, thereby exploring synergies with the Strategic Approach to International Chemicals Management (SAICM) Chemicals in Products (CiP) Programme.
- Take global action to encourage the design of a new generation of green electronics with minimized use of hazardous substances, longer life spans and increased recyclability.
- Improve understanding of the role and impact of the informal sector and explore concrete steps to reduce the exposure of recycling workers, including through promotion of best practices;
- Scale up voluntary initiatives and sustainable business models.
- Fuel shifts in consumer behaviour through increased awareness.

4.2.3 Highly hazardous pesticides

Introduction

The FAO and WHO International Code of Conduct on Pesticide Management defines highly hazardous pesticides (HHPs) as: "Pesticides that are acknowledged to present particularly high levels of acute or chronic hazards to health or environment according to internationally accepted classification systems such as the WHO or the GHS or their listing in relevant binding international agreements or conventions. In addition, pesticides that appear to cause severe or irreversible harm to health or the environment under conditions of use in a country may be considered to be and treated as highly hazardous." The FAO/WHO Guidelines on Highly Hazardous Pesticides (2016) list a set of eight criteria: HHPs are defined as meeting one or more of these criteria. The guidelines apply to all pesticides, including agricultural, public health, household, amenity and industrial pesticides. The FAO/WHO Joint Meeting on Pesticide Specifications (JMPS) also developed standard procedures for assessment of pesticide data (WHO and FAO 2016).

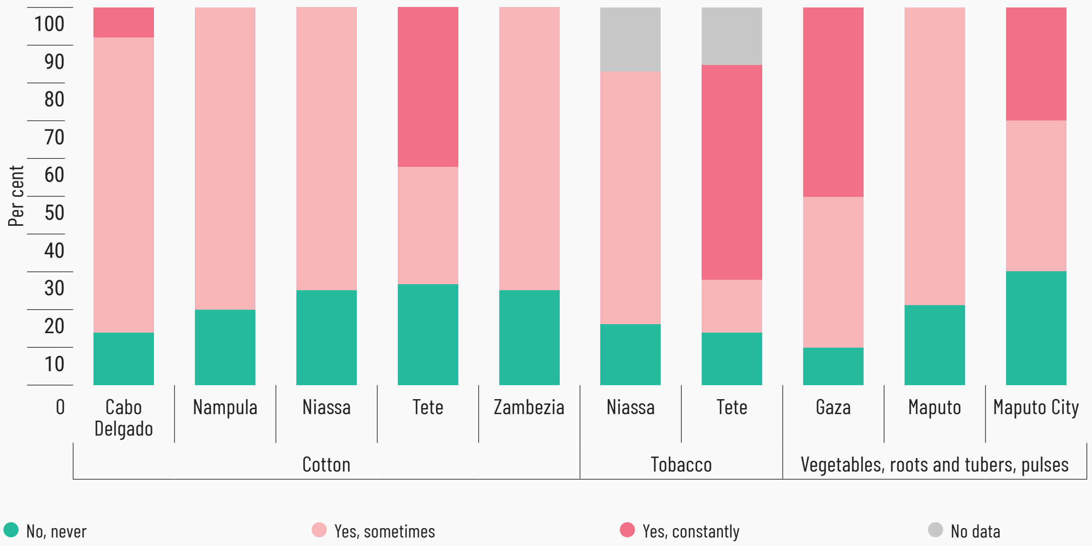
Plant protection products and biocides, when managed safely, can make an important contribution to achieving Sustainable Development Goal (SDG) 2 (zero hunger), SDG 3 (good health and well-being) and SDG 6 (clean water and sanitation), among others. However, HHPs in particular may have adverse effects on human health, the environment and the sustainability of agricultural production, especially in low- and middle-income countries (LMICs). In 2015, therefore, the ICCM adopted a resolution that recognized HHPs as an issue of concern and called for concerted action to address HHPs, in particular through implementation of the strategy that was presented to the Conference (SAICM Secretariat 2015a; SAICM Secretariat 2015b).

State of the issue

Exposure of humans and other non-target organisms has been shown to be high if plant protection products are not used according to best practices (Fan *et al.* 2015), highlighting the importance of education and awareness. This is of special importance in LMICs, where training and adequate knowledge on risks, handling and safety measures, access to and appropriate conditions for use of personal protective equipment (PPE), and potential alternatives might be lacking (Dalvie, Rother and London 2014; Andrade-Rivas and Rother 2015; Weiss *et al.* 2016, Elibariki and Maguta 2017; Rother 2018). A related challenge is the very low rate at which pesticide containers are disposed in an environmentally sound manner. Research in developing countries shows that they are frequently discarded, burned, or reused, for example in toys or to store food or water (Akhter *et al.* 2016; Rengam *et al.* 2018). Another concern is lack of enforcement, whereby uncontrolled access to HHPs has led to unintended uses, and plant protection products that are banned in high-income countries and do not meet international quality standards continue to be marketed in some LMICs (Popp, Pető and Nagy 2013; Rother 2016). Adherence to best practices in the use of biocides is of equal concern.

Certain HHPs can exhibit high acute toxicities on non-target organisms, including plants, animals and humans (Mañosa, Mateo and Guitart 2001; Brühl *et al.* 2013; Kohler and Triebskorn 2013; Fleischli *et al.* 2004). Studies show adverse effects on various animal species (Galloway and Depledge 2001; Mañosa, Mateo and Guitart 2001; Galloway and Handy 2003; Hamlin and Guillette 2010; Hayes *et al.* 2010; Kohler and Triebskorn 2013). Scientific studies have also associated exposure to pesticides with chronic effects in humans, including increased risks for some cancers, birth defects, adverse effects on organs and reproduction, and pulmonary disease (Merhi *et al.* 2007; Vinson *et al.* 2011; Sarwar 2016; Kim, Kabir and Jahan 2017; Mostafalou and Abdollahi 2017). These concerns also apply to biocides, which often contain the same active ingredients as plant protection products and are applied in close proximity to humans (e.g. mosquito repellents) or in the environment (e.g. anti-fouling). Increasing insecticide resistance is another major concern, particularly in the fight against malaria (WHO 2018b).

Figure 4.5 Discomfort or illness experienced during or after pesticide application in Mozambique (per cent) (adapted from Mancini *et al.* 2016, p. 16)



In a field survey undertaken in Mozambique, the majority of farmers reported symptoms of pesticide exposure or poisoning (Figure 4.5). While there are significant data gaps, countries are reporting a significant number of deaths every year from unintentional pesticide poisonings (WHO 2018c) (see also Part I, Ch. 7). A survey undertaken by the Pesticide Action Network (PAN) (Rengam *et al.* 2018) in seven Asian countries found that the majority of surveyed farmers had experience acute poisoning symptoms over a one-year period. Moreover, the WHO estimated that in 2012 around 156,000 suicides using pesticides could have been prevented by sound pesticide management (WHO 2016) (Box 4.1).

Policy developments and considerations

The IOMC, under the leadership of the FAO, supports countries and captures progress in addressing HHPs, including at the regional and national levels. A strong political will to mitigate

Box 4.1 Preventing suicides attributable to pesticides through regulatory measures in Sri Lanka (Manuweera *et al.* 2008; Knipe et al. 2017)

As in many other low- and middle-income countries, a large number of suicides in Sri Lanka can be attributed to access to toxic pesticides. To address this challenge Sri Lanka has taken a range of regulatory measures over the past decades, including import bans on WHO Class I pesticides and endosulfan as well as a more recent phased import ban (2008-2011) on three additional pesticides. Studies suggest that these restrictions can be associated with a significant decrease in pesticide suicide mortality and overall suicide mortality in Sri Lanka. While restricting access to HHPs cannot solve the global challenge of suicides, data show that it decreases the number of suicides at least in the short to medium term. The bans were found not to have resulted in productivity loss or changes in the costs of production.

the impact of HHPs has been built in Africa and Asia and the Pacific. A significant step forward with respect to regional strategies in South Africa, East Africa and the Pacific has been taken in the context of three large regional consultations held in 2018.

In the context of a project implemented by the FAO, Mozambique cancelled the registrations of 61 pesticide products containing 31 different active ingredients and announced risk reduction measures for another 52 pesticide products (FAO 2016). Botswana, Malawi, Tanzania and Zimbabwe have developed short lists of HHPs and started to reduce their risks. Further examples include China, where 23 highly hazardous pesticides have been banned from use, and Ecuador, where all pesticides classified as extremely or highly hazardous by the WHO were banned in 2010 (FAO and WHO 2010). According to a list developed by the PAN, a total of 370 pesticide active ingredients or groups of actives considered to be still in use have been banned in at least one country (PAN 2016). Some pesticides have been internationally banned under the Stockholm Convention on POPs due to their toxicity, persistence, bioaccumulation, and potential for long-range transport. However, the enforcement of bans remains a challenge in LMICs (Khan, Mahmood and Damalas 2015; Yadav *et al.* 2015; Weiss *et al.* 2016; Elibariki and Maguta 2017; Thompson *et al.* 2017).

Several international instruments and initiatives exist to support stakeholders in managing pesticides and addressing risk associated with pesticides. These include the Joint FAO/WHO Meeting on Pesticide Management (JMPM) recommendations on the conditions of use of HHPs (FAO and WHO 2007), the International Code of Conduct on Pesticide Management (FAO and WHO 2014a), the FAO/WHO Guidelines on Highly Hazardous Pesticides (FAO and WHO 2016) and the FAO Pesticide Registration Toolkit (FAO 2018a), and the OECD Best Practice Guidance to Identify Illegal Trade of Pesticides (OECD 2018a). Some have raised concerns about cases of non-compliance with some of these tools, for example regarding the distribution of HHPs (Public Eye 2017). Although efforts have been made to broaden the scope of existing instruments and initiatives beyond plant protection products (e.g. the updated Code of Conduct of 2014 incorporates public health pesticides and vector control [FAO and WHO 2014b]), biocides have so far received limited international attention.

Industry is addressing the issue among others through risk mitigation and capacity building initiatives such as training of farmers (e.g. CropLife International 2018); measures to address the counterfeit pesticide market; and voluntary portfolio review to withdraw products meeting the Code's HHP hazard criteria from the market (FAO/WHO 10th JMPM 2017). Civil society stakeholders contribute among others by monitoring of the conditions of use and adverse impacts, awareness-raising; the promotion of additional health and environmental criteria for the identification of HHPs (such as pollinator toxicity); and a proposed list of pesticides considered to be highly hazardous (Rengam *et al.* 2018).

Given the recommendation to reduce reliance on pesticides as the first step in risk reduction (FAO and WHO 2016), research and the implementation of alternative practices have gained momentum. Integrated pest management combines various management strategies and practices in order to grow healthy crops and minimize the use of pesticides (FAO 2018b). Similarly, integrated vector management is a process for decision-making when carrying out disease vector control interventions for control of vector-borne diseases (FAO and WHO 2014b). Agroecological approaches aim at pest prevention and promote agricultural practices adapted to local environments in order to build long-term fertility and soil health (Huang *et al.* 2014; Reddy 2016; United Nations Human Rights Council 2017). A recent meta-study in France found that total pesticide use could be reduced by 42 per cent without loss of productivity and profitability (Lechenet *et al.* 2017). There is also ongoing scientific advancement in the development of bio-pesticides (Senthil-Nathan 2015). Moreover, there are ongoing discussions, including in the context of the JMPM meetings about the use of the "Hierarchy of Control" approach for pesticide risk reduction; however, no consensus and common understanding has emerged to date (FAO and WHO 2017). According to the Guidelines on Highly Hazardous Pesticides (FAO and WHO 2016), the approach to pesticide risk reduction comprises three main steps, namely to 1) reduce reliance on pesticides; 2) select pesticides with the lowest risk; and 3) ensure proper use of the selected products. Possible measures to reduce the use of biocides have also been proposed (German Environment Agency [UBA] 2014).

Potential measures to further address HHPs

Taking into account the preceding analysis, stakeholders may wish to consider the following measures to further address HHPs:

- Strengthen international and national action to speed up ending use of highly hazardous pesticides (HHPs) based on a risk and needs assessment and reduce their use in food production and supply chain, including via implementation of the strategy to address HHPs in the context of the Strategic Approach to International Chemicals Management (SAICM).

- Support the development and scaling-up of approaches that may help to reduce the use of highly hazardous pesticides, such as IPM and agroecological approaches, including development and use of non-chemical alternatives and other good agricultural practices, among others via awareness-raising and training of users.

- Strengthen legislative frameworks and enforcement for the regulation of pesticides in general, and HHPs in particular, throughout the life cycle and improve capacity for enforcement.

- At the local level, provide basic infrastructure and training, particularly in developing countries and economies in transition, to promote comprehension of pesticide labels, best practices in handling and application, and the use of and access to personal protective equipment (PPE).

- Increase efforts to synthesize available information and make it more easily available to the public and to decision makers, e.g. via the establishment of knowledge hubs featuring relevant information on HHPs.

- Advance discussions on issues related to biocides and measures to address and reduce the use of biocides, including though regulatory action, and strengthen awareness.

4.3 Working towards improved transparency and awareness raising

4.3.1 Chemicals in products

Introduction

Chemicals are important components in many of the products modern society uses and relies on (Goldenman *et al.* 2017). They may be released at any stage of the product life cycle, resulting in potential exposures of humans and the environment, including from both newly produced articles and articles already present in society (Fantke *et al.* 2016; Reihlen 2017) (see Figure 4.6). The Swedish Chemicals Agency (KEMI 2015) has stated that sharing, tracking and using reliable chemical information throughout the supply chain is a prerequisite for a non-toxic and resource-efficient product life cycle.

In light of these considerations, Chemicals in Products (CiP) was identified as an emerging policy issue at the second meeting of the ICCM (ICCM2) in 2009. Stakeholders of the Strategic Approach to International Chemicals Management (SAICM) also identified four priority sectors: textiles, toys, building products and electronics (SAICM Secretariat 2009a). In 2015, at ICCM4, stakeholders adopted the SAICM Chemicals in Products (CiP) Programme and agreed on three main objectives for CiP information exchange (UNEP 2015):

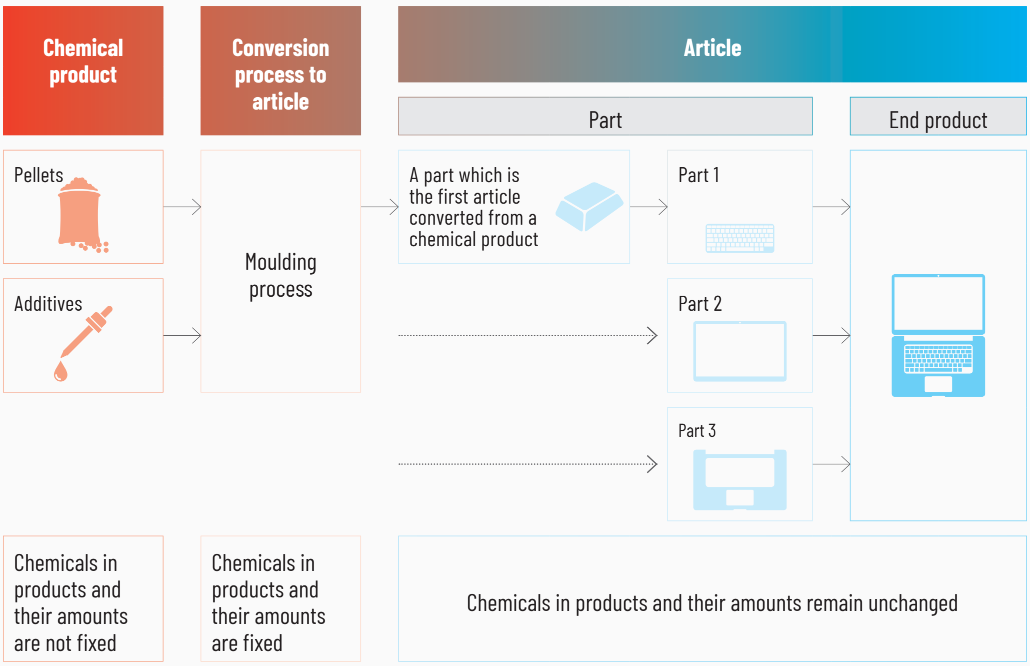
- within supply chains, to know and exchange information on CiP, associated hazards and sound management practices;
- to disclose information of relevance to stakeholders outside the supply chain to enable informed decision making and actions about CiP; and
- to ensure that, through due diligence, information is accurate, current and accessible.

To support these efforts, guidance on CiP for stakeholders was developed (UNEP 2015). ICCM4 encouraged participants to consider this guidance as appropriate (SAICM Secretariat 2015b).

State of the issue

The exchange of important aspects of CiP information throughout the supply chain has been advanced by diverse stakeholder action. A number of countries and state jurisdictions have put in place CiP policies and legislation, including on the CiP programme priority sectors, but also going beyond. For example, regulations such as REACH Article 33 in the EU, and Proposition 65 in the State of California in the United States, require producers to pass certain CiP information on to consumers in the supply chain (EC 2006; Office of Environmental Health Hazard Assessment of California [OEHHA] 2018). The EU Waste Electrical and Electronic Equipment (WEEE) Directive and other similar directives, such as China's on WEEE, regulate communication between producers, consumers and end-of-life

Figure 4.6 Conversion process from chemical products to articles in the supply chain (adapted from ©Joint Article Management Promotion-consortium 2018, p. 12)



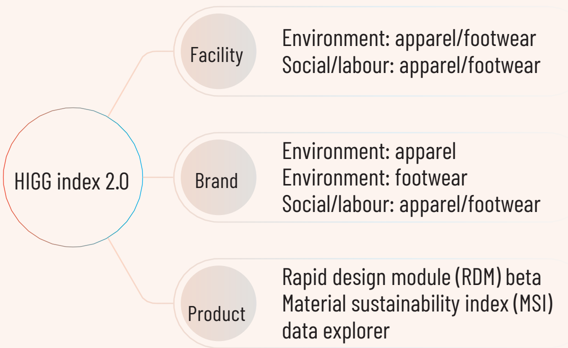
users (Mishima 2017). For cosmetics and personal care products in the EU, the United States and Japan, separate regulations require producers to communicate all ingredients to the consumer (Japan External Trade Organization [JETRO] 2011; Cosmetics Europe 2018; United States Food and Drug Administration [US FDA] 2017). Other examples of tools for communication between producers and customers include the declarations of performance according to the European Construction Products Regulation (EC 2011a) and use of the CE marking for the safety of toys (EC 2009a).

In the private sector examples of sector-specific systems include the International Material Data System (IMDS), an information system developed by the automotive industry, and BOMCHECK, the joint declaration platform for the electronics industry. In the United States the Toy Safety Certification Program was initiated in response to new Federal Toy Safety requirements (Kogg and Thidell 2010). To foster transparency, some companies are making their safety data sheets (SDS) publicly available (Scruggs *et al.* 2014). Moreover, some electronics multinationals have encouraged their suppliers to report pollutant release and transfer data across supply chains (DiGangi 2018). In the apparel industry, the Higg Index is being used by over 2,000 members of the Sustainable Apparel Coalition (Box 4.2).

Non-regulatory actions to advance the objectives of the CiP Programme include consumer awareness projects, certification programmes, and the publication of restricted substance lists (RSLs). In 2017 CVS Health published its full list of restricted chemicals by product category (CVS Health 2017). Consumer awareness projects provide information on chemicals of concern in certain products and help consumers make informed choices. An example is the "Mind the Store" initiative, which evaluates retailers' progress in tackling chemicals of concern, including their policies to collect chemical ingredient information from suppliers and make relevant information publicly available (Safer Chemicals, Healthy Families 2017). Certification programmes are voluntary initiatives in which companies can participate to communicate that their products meet certain requirements, while not revealing confidential business information. These programmes may include RSLs and requirements for chemical analysis.

Box 4.2 The Higg Index: advancing sustainability in the apparel industry (Hughes, Kibbey and Rudgeway 2014)

The Higg Index is a suite of self-assessment tools for measuring the environmental and social impact of apparel, footwear and home textile production. It encourages companies of all sizes in the fashion industry to adopt sustainable practices and to integrate sustainability information into their reporting cycle. The assessments cover brands, retailers, facilities and products, thus helping members to adopt a holistic, consistent approach to managing sustainability performance.



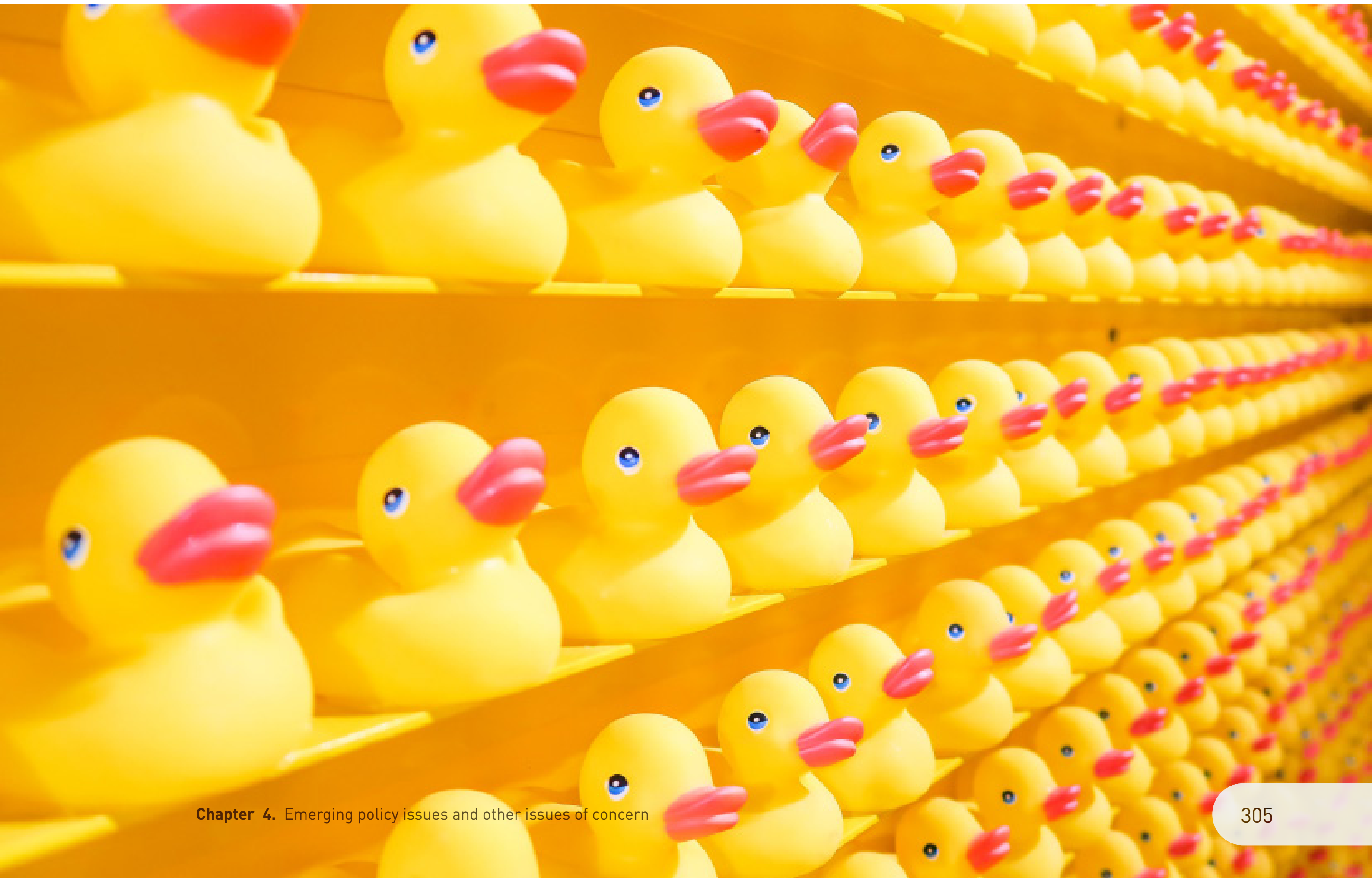
The index also allows downstream and upstream information exchange across the value chain, increasing transparency and encouraging stakeholders to improve performance. Currently, over 2,000 members of the Sustainable Apparel Coalition are using the Higg Index.

Information technology (IT) solutions have also improved the quality and reliability of data in supply chains. New opportunities are emerging, such as the use of block chain technology in tracing chemical information throughout the supply chain (Casey and Wong 2017). Models (e.g. the UN Environment/Society of Environmental Toxicology and Chemistry Lifecyle Initiative's USEtox model) support the characterization of human and ecotoxicological exposures to CiP. The CiP Programme has developed an indicative list of information exchange schemes and tools that already existed in different sectors.

Despite these advances, gaps remain. For example, while chemical information is often available in the upstream of the supply chain (UNEP 2011), downstream companies have reported difficulties in identifying chemicals in materials and products "because relevant information was not communicated to them in usable forms in their supply chains" or was "lost in the supply chain" or was "protected by trade secrets" (Scruggs *et al.* 2014). Furthermore, lack of data on the concentration of chemicals in products is considered a main limitation in assessing exposure to chemicals in products (Fantke *et al.* 2016). Another potential challenge is that consumers who lack knowledge on chemicals of concern may not be able to use the information that is made available in an informed manner.

Policy developments and considerations

Recent years have seen a momentum in transparency requirements by governments across products and supply chains and towards circularity (e.g. Goldenman *et al.* 2017). At the international level the implementation of chemicals and waste conventions, and of the SAICM CiP Programme, provide drivers for meeting CiP Programme objectives and for information sharing. In addition, the OECD has compiled techniques to estimate releases of chemicals from products to help address "a lack of product use related information in PRTRs" (OECD 2017a). The draft report of the independent evaluation of the Strategic Approach 2006-2015 recognized some success in the implementation of the CiP EPI (SAICM Secretariat 2018). At the same time, the CiP Programme has seen only limited activities by stakeholders to share their actions globally.



Opportunities for standardized systems. Stakeholders have expressed an interest in, and commenced actions to develop, harmonized standards to reduce individual communication efforts, such as collection and sharing of material data for articles across sectors (Goldenman *et al.* 2017; Stringer 2018). Given the interlinkages of supply chains across sectors, such standards would reduce transactions costs significantly. Harmonization may include, for example, shared lists of RSLs, pooled resources, and standardized formats for collecting, managing, reporting and communicating CiP information. Sector-specific discussions and solutions are also needed in this context. Industry associations are likely to be well-placed to support these efforts. A successful example of this approach is the IMDS used by the automotive industry (UNEP 2011).

Handling confidential business information: In balancing confidential business information with stakeholders' right-to-know, one way to handle this information is through non-disclosure agreements, either directly between business partners or through a third party that gathers relevant information and provides proof of compliance without revealing confidential business information (UNEP 2011). The SAICM OPS acknowledges the need to ensure that confidential commercial and industrial information and knowledge are protected, while noting that information on chemicals relating to the health and safety of humans and the environment shall not be regarded as confidential.

Getting the information to end-of-life users: CiP information is relevant for all stages of the supply chain, including for the recycling and waste handling industry to better understand potential exposure and to consider whether the recycling of relevant products could (re) introduce contaminants into the supply chain (Goldenman *et al.* 2017). Given current gaps, opportunities exist for improved communication between producers and the waste and recycling sector (Kogg and Thidell 2010). The European Chemicals Agency (ECHA) will establish a new database on the presence of substances of very high concern in articles, primarily for use by waste treatment operators and consumers (ECHA 2018).

Legislative gaps and lack of enforcement: The development of material declaration requirements concerning toxic substances along the supply chain could ensure better flow of CIP information (UNEP 2011). While some regulations exist, legal information on chemicals in products cover only a few sectors, such as the electronics and the automotive industries, and to a limited extent (Goldenman *et al.* 2017). Equally relevant, enforcement is needed to ensure that stakeholders comply with these regulations. Increased efforts to monitor compliance through random tests and control measures could increase compliance rates and stimulate increased substitution actions and information provision (Kogg and Thidell 2010; Goldenman *et al.* 2017).

Awareness-raising and capacity building: Most of the existing CiP information systems have been initiated in developed countries and therefore often do not take into account conditions present in low- and middle-income countries (Scruggs, Nimpuno and Moore 2016). Scaling up education and capacity building could complement legislative requirements and help stakeholders manage the collection and transmission of CiP information according to the different information requirements they have to meet. Moreover, experiences and lessons learned from the implementation of CiP systems in developing countries may be of value in developed countries, particularly for developing country industries seeking to enter the international market.

Potential measures to further address CiP

Taking into account the preceding analysis, stakeholders may wish to consider the following measures to further address CiP:

Strengthening global CiP approaches:

- Explore harmonized cross-sectoral CiP information sharing protocols to collect, manage, report and communicate chemicals in products information (e.g. shared restricted substance lists [RSLs], standardized information management systems) across supply chains in each sector, including the waste sector.

- Include CiP elements in extended producer responsibility policies.
- Integrate toxicity considerations into life cycle analysis for products and increase awareness of product designers of chemical selection consequences along the supply chain to advance design of safer products and circularity.
- Develop criteria for information disclosure and protecting confidentiality where reasonable.
- Strengthen capacities to estimate releases from products (e.g. through Pollutant Release and Transfer Registers (PRTRs).
- Scale up and replicate non-disclosure agreement projects, consumer awareness projects and certification programmes.
- Explore how the use of emerging digital technologies can enable information sharing along the value chain while protecting confidential data (e.g. Blockchain).

Further develop the SAICM CiP Programme:

- Identify new partnerships in the priority categories (toys, textiles, construction products, electronics) (e.g. link electronics, occupational health and safety, and waste treatment).
- Develop guidance on integrating CiP objectives within corporate sustainability reporting.
- Work with other bodies to stimulate development of harmonized protocols to collect, manage, report and communicate CIP information.
- Coordinate the development of digital applications (in tracing chemical information on toxicity, eco-toxicity, resource demand (energy and materials) and transport of chemicals throughout the supply chain.
- Take action to share lessons learned, and to scale up education and capacity building, in developing countries and countries with economies in transition.

4.3.2 Per- and polyfluoroalkyl substances (PFASs) and the transition to safer alternatives

Introduction

PFASs are a family of thousands of chemicals widely used in industrial and consumer applications since the 1950s, most often where extremely low surface energy or surface tension and/or durable water and oil repellency is needed (e.g. in various fire-fighting foams and for surface treatment of textiles). Some PFASs have been produced and used on a scale of thousands of tonnes or greater annually (Prevedouros *et al.* 2006; Wang *et al.* 2017a).

Numerous efforts have been made to assess the risks associated with PFASs, with a focus on so-called "long-chain" perfluoroalkyl acids.[2] Consequently, long-chain PFASs have been widely recognized as contaminants of high global concern due to their high persistence, bioaccumulation potential, toxicity, and ubiquitous distribution in the global environment, biota and humans (OECD 2013). In two recent cases, chemical companies paid settlements in the range of hundreds of millions of US dollars as a result of injuries caused through large releases of PFASs to local water supplies (Stegon 2017; State of Minnesota 2018). Widespread efforts are now under way to phase out and replace long-chain PFASs with alternatives. In 2009, at the second session of the ICCM, "Perfluorinated chemicals and the transition to safer alternatives" was recognized as an issue of concern under SAICM.

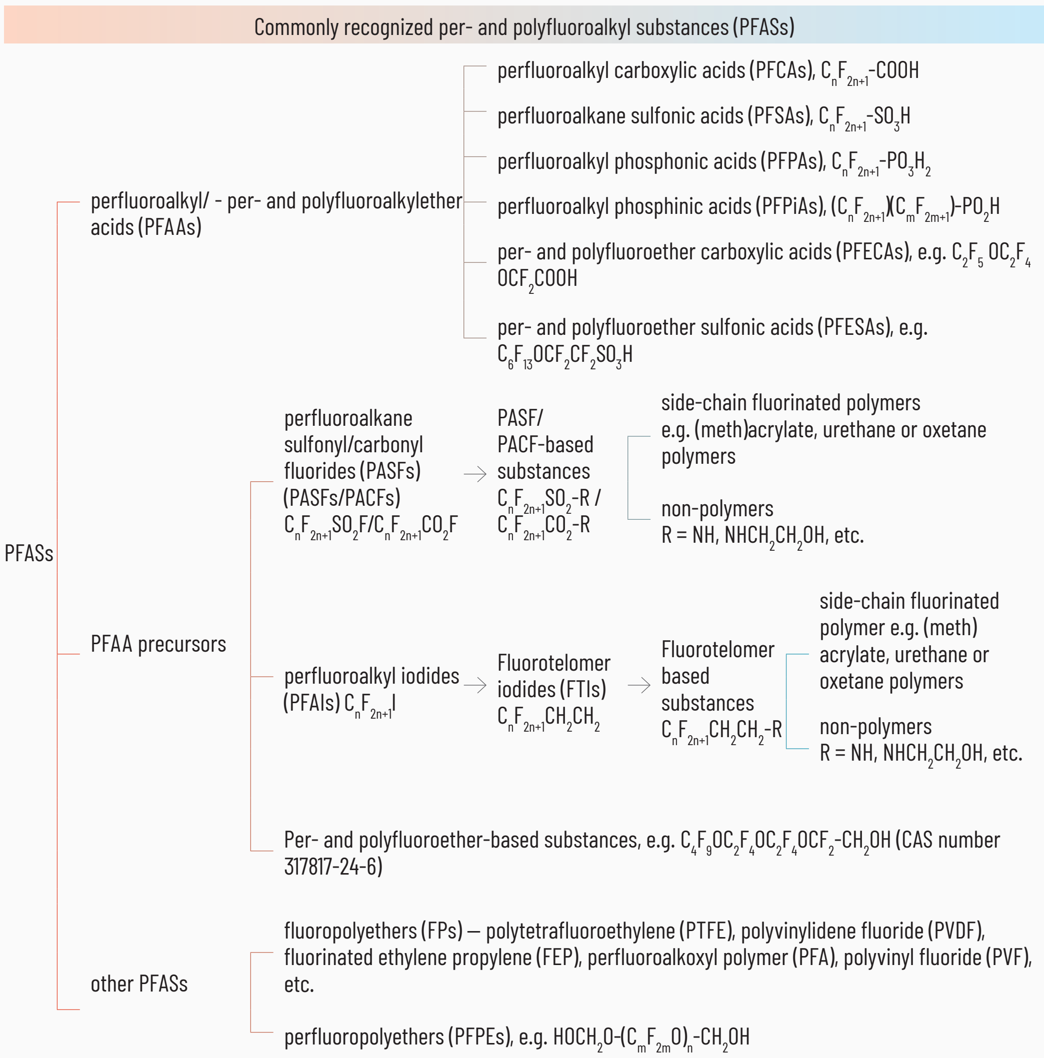
State of the issue

The OECD maintains a global database of PFASs (OECD 2018b). To date, more than 4,700

2 PFCAs, $C_nF_{2n}COOH$, n≥7), perfluoroalkane sulphonic acids (PFSAs, $C_nF_{2n}SO_3H$, n≥6) and their major precursors.

Chemical Abstracts Service (CAS) numbers have been identified which can be associated with a large variety of PFASs that (may) have been on the global market and in the environment (Figure 4.7). Meanwhile, a complete account is still lacking due to an absence of transparent, quantitative information on the production and use of PFASs, and lack of analytical standards in the public domain (Wang *et al.* 2017b; OECD 2018b). While substantial progress has been made in understanding the hazards, exposure, risks and treatment of some long-chain PFASs,

Figure 4.7 **Schematic overview of the structure categories of identified PFASs (adapted from OECD 2018b, p. 17)**



Other highly fluorinated substances that match the definition of PFASs, but have not yet been commonly regarded as PFASs

perfluorinated alkanes (C_nF_{2n+2})

perfluorinated alkenes (C_nF_{2n}) and their derivatives (e.g. $[(CF_3)_2CF]_2C{=}(CF_3)(OC_6H_4SO_3Na)$, CAS number 70829-87-7)

perfluoroalkyl alcohols ($C_nF_{2n+1}OH$; e.g. $(CF_3)_3C$-OH, CAS number 2378-02-1), perfluoroalkyl ketones (e.g. $C_nF_{2n+1}C(O)C_mF_{2m+1}$) and semi-fluorinated ketones (e.g. $C_nF_{2n+1}C(O)C_mH_{2m+1}$)

side-chain fluorinated aromatics, e.g. C_nF_{2n+1}-aromatic rings

perfluoroalkyl phosphonic acids (PFPAs), C_nF_{2n+1}-PO_3H_2

some hydrofluorocarbons (HFCs, e.g. C_nF_{2n+1}-C_mH_{2m+1}), hydrofluoroethers (HFEs, e.g. $C_nF_{2n+1}OC_mH_{2m+1}$) and hydrofluorooelfins (HFOs, e.g. C_nF_{2n+1}-$CH{=}CH_2$) that have a perfluoroalkyl chain of certain length other PFASs and non-fluorinated alternatives have received limited attention (Holmquist *et al.* 2016; Wang *et al.* 2017b). Information on the hazards of many non-fluorinated alternatives to PFASs is lacking (Holmquist *et al.* 2016); hence scientists, regulators and civil society organizations are increasingly calling for effective and efficient assessment and management of overlooked and novel PFASs and for research on non-fluorinated alternatives to PFASs (Scheringer *et al.* 2014; Blum *et al.* 2015; Borg *et al.* 2017; Wang *et al.* 2017b; Brendel *et al.* 2018; Ritscher *et al.* 2018).

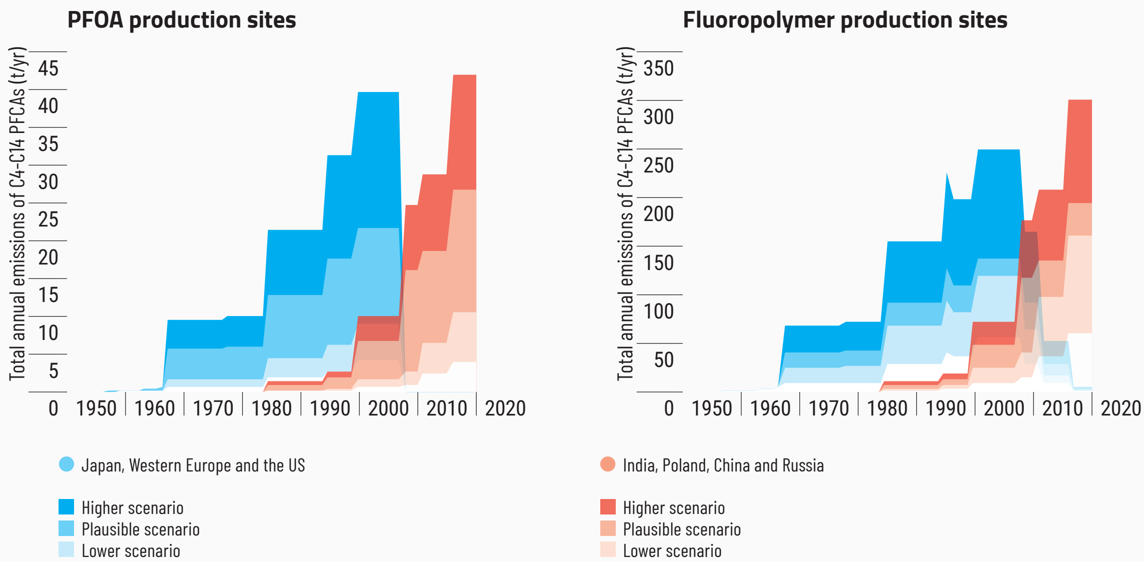
Recent studies suggest that many overlooked and novel PFASs possess some of the same properties as structurally similar long-chain PFASs, including toxicity, high persistence, mobility in the environment and modes of action (Scheringer *et al.* 2014; Birnbaum and Grandjean 2015; Blum *et al.* 2015; Wang *et al.* 2015; Wang *et al.* 2016; Gomis *et al.* 2018). In addition, recent studies show that many PFASs, particularly those with short perfluoroalkyl(ether) chains, cannot be removed from contaminated water by using conventional and many advanced treatment technologies (e.g. Sun *et al.* 2016; Xiao *et al.* 2017; Ross *et al.* 2018).

Most producers in developed countries and in some in developing countries have phased out long-chain PFASs and moved to chemical and non-chemical alternatives (OECD 2015; POPRC 2016). The resulting market gap has been filled by other producers in developing countries and economies in transition (Wang *et al.* 2014) (Figure 4.8), leading to a number of developments with respect to human and environmental exposure in different regions (Wang *et al.* 2014; Land *et al.* 2018): While perfluorooctanesulfonic acid (PFOS) and perfluoroctanoic acid (PFOA) show clear trends regarding concentrations in humans (declining in North America and Europe, but increasing in China), no clear pattern can be identified for other substances (Land *et al.* 2018).

Policy developments and considerations

PFOS, its salts, and perfluorooctanesulfonyl fluoride (POSF) are listed in the Stockholm Convention under Annex B on the restriction

Figure 4.8 **Estimated annual releases of PFCAs from PFOA production sites (left) and fluoropolymer production sites (right) in the United States, Western Europe and Japan (blue), as well as in China, Russia, Poland and India (orange) (t/yr), 1951-2015 (adapted from Wang *et al.* 2014, p. 19)**



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PFCAs: perfluorinated carboxylic acids; PFOA: perfluorooctanoic acid of production, use, import and export. PFOA, perfluorohexanesulfonic acid (PFHxS) and related substances are at different stages of the evaluation process for listing. International efforts to address some long-chain PFASs and to transition to safer alternatives are being complemented by initiatives in various countries. Examples of regulatory actions taken on PFOA include those in the EU, Canada and Norway (Norwegian Environment Agency 2013; Government of Canada 2017a; EC 2017b). Moreover, PFHxS has been recognized as a substance of very high concern. In China a research and development project on alternatives to PFOS in certain applications has been initiated, among other actions (OECD 2015). Moreover, the US EPA launched a voluntary PFOA Stewardship Program in 2006 aimed at eliminating emissions and product content levels of long-chain PFASs by end of 2015 (US EPA 2018). Existing efforts largely follow a chemical-by-chemical management approach for the large family of PFASs, which has been described as requiring significant time and resources (Cousins *et al.* 2016; Wang *et al.* 2017b).

Significant efforts have also emerged whose purpose is to raise awareness and initiate actions on PFASs other than long-chain PFASs (Borg *et al.* 2017; ECHA 2017; Australian Department of Health 2018a; Brendel *et al.* 2018). New concept(s) are emerging, such as the persistent, mobile and toxic (PMT) concept (Neumann and Schliebner 2017). Moreover, since 2002 there has been a trend among global manufacturers to replace long-chain PFASs with short-chain or non-fluorinated products (OECD 2013). Several furniture retailers, fast food companies, food packaging manufacturers and apparel companies have taken a precautionary approach to either phase out or restrict the use of certain PFASs in their product lines (Cobbing, Campione and Kopp 2017; IKEA 2017; Chiang, Cox and Levin 2018; Gore-Tex 2018; Bergans n.d.). Some non-fluorinated alternatives have been developed by major PFAS producers in several applications including fluoropolymer (Chemours 2016) and textile finishes (Chemours 2018). Substantial progress has also been made in the management of downstream PFAS contamination (Interstate Technology and Regulatory Council 2017).

Potential measures to further address PFASs

- Taking into account the preceding analysis, stakeholders may wish to consider the following measures to further address PFASs:
- Ensure that PFASs already identified as concerns are adequately managed.
- Generate further knowledge and advance international action on short-chain PFASs and non-fluorinated alternatives.
- Develop approach(es) to assess and manage PFASs and alternatives, including the chemical grouping approach and the differentiation between essential and non-essential uses, and gather additional data to conduct assessments.
- Scale up development of alternatives to PFASs, including nonfluorinated alternatives, for PFASs in currently essential uses where no alternatives are available.
- Support scientific efforts to assess alternatives in order to determine the safety of both short-chain PFASs and non-fluorinated alternatives; where sufficient evidence is available, consider the development of a "white" list of PFASs that are preferable alternatives.
- Strengthen the engagement of downstream industrial users and retailers to complement regulatory efforts and enhance the capacity of wastewater treatment plants.
- Enhance information exchange and cooperative research, to fill knowledge gaps and ensure that basic and consistent information on all PFASs as well as potential alternatives is available.

4.3.3 Environmentally persistent pharmaceutical pollutants

Introduction

Pharmaceuticals are indispensable for human and animal health. However, certain pharmaceuticals may cause undesired adverse effects, including endangerment of certain species of vultures, endocrine disruption such as reproductive failures in fish, and the development of antimicrobial resistance due to the wide use of antibacterial agents in human and veterinary medicine (Green *et al.* 2004; Kümmerer 2004; Oaks *et al.* 2004; Santos *et al.* 2010; BIO Intelligence Service 2013; Berkner *et al.* 2014). Pharmaceuticals designed to be slowly degradable or even non-degradable present a special risk when they enter, persist or disseminate in the environment. Such substances are referred to environmentally persistent pharmaceutical pollutants (EPPPs) (SAICM Secretariat 2015c). There are also so-called "pseudo-persistent pharmaceutical pollutants", which are degradable although continuous emissions to the environment can lead to their constant environmental presence (Daughton 2002).

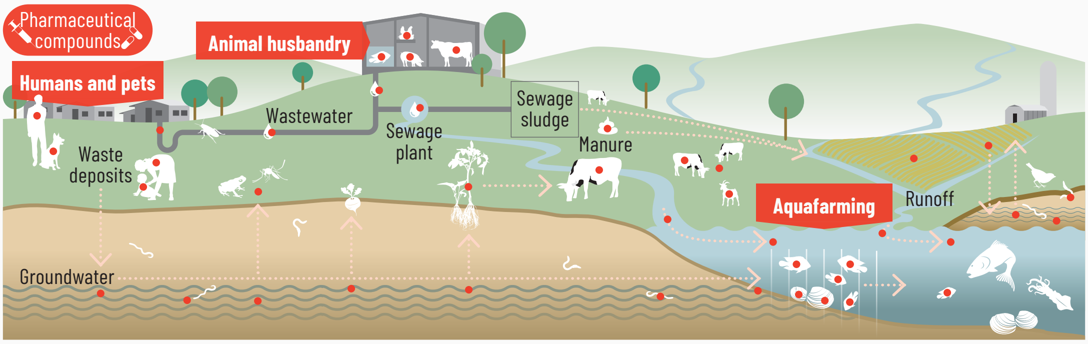
Dozens of new pharmaceuticals are placed on the market every year, with more than 7,000 compounds currently under development (IFPMA 2017). Due to their increasing use and following increasing attention in both the scientific community and public media, policymakers have initiated various actions to address pharmaceuticals in the environment (Boxall *et al.* 2012; Beek *et al.* 2016a, Williams *et al.* 2016, Blair, Zimny-Schmitt and Rudd 2017). As a significant milestone, EPPPs were recognized as an emerging policy issue (EPI) at the fourth session of the ICCM in 2015 (SAICM Secretariat 2015c). The WHO (2014) has described antimicrobial resistance as a growing public health threat and warned about a post-antibiotic era in which common infections and minor injuries may be fatal.

State of the issue

Pharmaceuticals, including antibiotics, and their metabolites can enter the environment through a variety of pathways, including manufacturing sites, untreated wastewater from households and hospitals, wastewater treatment plants, and municipal waste streams, animal husbandry, sewage sludge and aquafarming (Kümmerer 2009; Monteiro 2010; Lapworth *et al.* 2012; Rastogi *et al.* 2015; Haiß *et al.* 2016; Lübbert *et al.* 2017; Kümmerer *et al.* 2018; Kümmerer *et al.* 2019). Figure 4.9 shows pathways of antibiotics in the environment (Berkner *et al.* 2014) (antimicrobial resistance is further discussed in Part I, Ch. 7). Understanding the contribution of each emission source is a complex endeavour, which varies across regions and pharmaceuticals. Several

© FAO/Domingo Caro, antibiotics use in animal husbandry

Figure 4.9 Pathways of antibiotics for human and veterinary use in the environment (adapted from Berkner, Konradi and Schonfeld 2014)



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studies suggest that municipal wastewater is the main emission source for human pharmaceuticals globally (Heberer and Feldmann 2005; Verlicchi, Galletti and Masotti 2010; Verlicchi *et al.* 2010; Boxall *et al.* 2012; Beek *et al.* 2016a). Veterinary pharmaceuticals are found in manure, dung and airborne dust and bioaerosols in the vicinity of livestock farming (Klatte, Schaefer and Hempel 2017; WHO 2017b).

A wide range of treatment techniques have been developed to remove pharmaceutical pollutants in the aquatic phase. However, the removal efficiency varies considerably and no single technique has been found to remove all relevant pollutants from wastewater (Hollender *et al.* 2009; Behera *et al.* 2011; Melvin and Leusch 2016). Hundreds of substances have been detected in countries in all regions and across different environmental media (SAICM Secretariat 2015c; Beek *et al.* 2016a, Beek *et al.* 2016b). Transformation products, including as a result of effluent treatment (Boix *et al.* 2016), may have higher toxicity and a higher potential for accumulation than the parent compound (Kümmerer 2009). Higher concentrations of pharmaceutical pollutants have been found in lower-income countries, possibly due to lack of wastewater treatment infrastructure (Segura *et al.* 2015) and lower regulatory standards. Although analytical techniques have been continuously improved, challenges remain and monitoring, especially in developing countries, still lacks coverage and frequency (Buchberger 2011; Puckowski *et al.* 2016; Madikizela, Tavengwa and Chimuka 2017).

Policy developments and considerations

In a number of developed countries, pharmaceuticals need to be subject to a tiered environmental risk assessment prior to approval, including risk-benefit analysis (US FDA 1998; Bound and Voulvoulis 2004; EC 2004; Küster and Adler 2014). Action focusing specifically on environmentally persistent pharmaceuticals is yet to be initiated. Given the large number of pharmaceuticals detected in the environment, some have suggested prioritizing those pharmaceutical pollutants that may pose the greatest threats. Several prioritization approaches have been developed in academia to support decision-making (Boxall *et al.* 2012; Roos *et al.* 2012; Donnachie, Johnson and Sumpter 2016; Guo *et al.* 2016) (Box 4.3). At the international level, the World Health Assembly, in 2015, endorsed a global action plan to tackle antimicrobial resistance, including antibiotic resistance (WHO 2015).

Efforts with respect to "green/sustainable pharmacy" are also gaining momentum. These efforts aim, among others, to create more easily degradable pharmaceuticals (Lubick 2008). The idea is to consider biodegradability and the characteristics of drugs, with a view to minimizing the excretion of the active ingredients as an important property starting from the early drug

Box 4.3 Helping doctors to make informed prescription choices

In the county of Stockholm, Sweden, human pharmaceuticals are assigned a score indicating environmental persistence, bioaccumulation, toxicity and risk. These scores are used to give prescription recommendations for common diseases. Doctors can choose to prescribe more environmentally friendly pharmaceuticals where medically equal alternatives exist. In 2009, 77 per cent of doctors were reported to have adhered to the recommendations (Gunnarsson and Wennmalm 2008; Gustafsson et al. 2011; Stockholm County Council 2014).

design stages (Kümmerer 2009; Kümmerer and Hempel 2010). Studies have demonstrated that biodegradability is not in contradiction with effectiveness (Rastogi *et al.* 2015). In this context, existing pharmaceuticals are also revisited and enhanced in terms of their biodegradability. Moreover, there are initiatives to advance sustainable procurement of pharmaceuticals in order to create an incentive for manufacturers to strive towards the production of more "green" products, as well as to integrate environmental criteria into manufacturing practices (SAICM Secretariat 2015c).

Potential measures to further address EPPPs

Taking into account the preceding analysis, stakeholders may wish to consider the following measures to further address environmentally persistent pharmaceutical pollutants (EPPPs):

- Strengthen regulatory requirements and capacities for waste treatment and management, including effluent standards, implementation of disposal and take-back programmes, and adherence to best available techniques and best environmental practices.
- Provide incentive structures to incentivize green and sustainable pharmacy for human and veterinary use, including through sustainable procurement and other innovative schemes.
- At the international level, establish a clear definition and identification criteria for EPPPs, explore the potential of prioritization approaches, and consider the potential relevance of pseudo-persistent pharmaceutical pollutants.
- Implement the WHO global action plan on antimicrobial resistance and WHO Guidelines on the use of medically important antimicrobials in food-producing animals.
- Continue efforts to fill knowledge gaps and share information globally regarding the behaviour, fate, occurrence and effects of pharmaceuticals in the environment, including by upscaling the monitoring of pharmaceuticals in the environment.
- Ensure that relevant interventions address the whole value chain, including research and development, production, prescription and use, and treatment and disposal.
- Enhance the training of doctors and medical staff to help them make informed prescription choices and improve hygienic standards in hospitals while ensuring adequate health control.

4.4 Working towards further developing the science and information sharing

4.4.1 Nanotechnology and manufactured nanomaterials

Introduction

Nanotechnology includes the manufacture, use and manipulation of materials at the nano scale (CIEL 2014). While there is no internationally agreed definition, nanomaterials have been described as in the size range of 1 to 100 nanometres (EC 2011b; International Organization for Standardization [ISO] 2017). The global nanotechnology market is expected to grow at an annual rate of around 17 per cent between 2017 and 2024, when it has been estimated to reach US dollars 125 billion (Research and Markets 2018). Manufactured nanomaterials are now used in many industry applications and consumer products, providing important benefits in areas such as medicine and environmental management.

Despite multiple benefits associated with the technology, concerns have emerged regarding potential risks posed by manufactured nanomaterials to human health and the environment (Jones *et al.* 2017; WHO 2017c). In light of these concerns "Nanotechnology and manufactured nanomaterials" was designated an emerging policy issue at the second session of the ICCM in 2009. Stakeholders stressed the need to close knowledge gaps; to understand, avoid, reduce and manage risks; and to review the methods used for testing and assessing safety (SAICM Secretariat 2009b).

State of the issue

Consumers may be exposed to nanomaterials via a wide range of products, including food packaging, textiles and personal care products, and workplace exposure to nanoparticles may occur in various types of industries (Nowack *et al.* 2012; Ding *et al.* 2017). Their small size gives nanoparticles properties that may allow for increased penetration of biological and environmental barriers, as well as increased reactivity, making them potentially a more effective source of exposure compared to bulk materials (Hartemann *et al.* 2015; SCENIHR 2009). Potentially adverse effects, including cardiovascular and pulmonary disease, have been identified for a number of manufactured nanomaterials (Gwinn and Vallyathan 2006; Schulte *et al.* 2016; WHO 2017c).

As regards releases to the environment, while in many applications nanoparticles are not present as freely dispersed particles, large fractions may go to landfills, soils and sediments at the end of the life cycle, and smaller fractions to water, and air (Keller *et al.* 2013). Nanopesticides may also be a potential source of significant environmental releases (Khot *et al.* 2012; Kah *et al.* 2013; Kookana *et al.* 2014). Depending on the product lifetime, large stocks may build up from which nanoparticles can be released over long periods of time (Song *et al.* 2017; *Sun et al.* 2017). Once released to the environment, nanomaterials may undergo many transformations, potentially altering their fate, transport and toxicity (Lowry *et al.* 2012). Most nanomaterials do not undergo biological degradation and can therefore persist in the environment (Schwirn and Völker 2016).

Scientific research into nanomaterials and their properties has strongly increased since the 1980s. While much progress has been made in closing knowledge gaps, methods and findings are still often fragmented (Krug 2014; Maynard and Aitken 2016). So far, evidence of nano-specific hazards seems to be lacking (Donaldson and Poland 2013; Dekkers *et al.* 2016) although discussions are ongoing (Lynch, Feitshans and Kendall 2015). There is still a paucity of precise information on releases, fate and transport, concentrations, exposure and effects of nanomaterials (Klaine *et al.* 2008; Montaño *et al.* 2014; Vance *et al.* 2015; Hansen *et al.* 2016; Hansen 2017; Praetorius *et al.* 2017; WHO 2017c) (See Box 4.4).

Policy developments and considerations

The regulatory approach in the United States includes an information-gathering rule for new and existing nanomaterials in commerce, as well as premanufacture notifications for new nanomaterials (US EPA 2017a). The nanotech initiative of the US-Canada Regulatory Cooperation Council identified common principles for the regulation of nanomaterials to help ensure consistency for industry and consumers in both countries (Government of Canada 2017b). Provisions for specific labelling obligations are in place in the EU for cosmetic products, food and biocides containing nanomaterials (EC 2009b; EC 2011c; EC 2012b). In 2013 the OECD adopted a legal instrument (a Recommendation of the OECD Council) which recommends the application of existing chemical regulatory frameworks when managing the safety of nanomaterials, while recognizing that some Guidelines may need to

Box 4.4 First standardized test method specifically for nanomaterials adopted by the OECD

In 2017 the OECD adopted its first Test Guideline describing a test procedure for obtaining information on the dispersion stability of manufactured nanomaterials in simulated environmental media (OECD 2017b). This has been described as an important element for the adaptation of nano-specific requirements for environmental risk assessment (Schwirn and Völker 2016; UBA 2017). In addition, two existing Test Guidelines for inhalation toxicity studies have been updated to allow for the determination the toxicity of inhaled nanomaterials (OECD 2018c; OECD 2018d). Further OECD Test Guidelines and Guidance Documents for the testing of nanomaterials are in progress or being planned.

be adapted to take into account the specific properties of nanomaterials (OECD 2017c).

More recently in the EU, a proposed amendment under REACH would introduce the overarching principle that each nanoform or set of similar nanoform is treated as if it were a separate chemical substance, requiring specific hazard, exposure and risk assessments (EC 2017c). At the global level, the applicability of the Globally Harmonized System of Classification and Labelling (GHS) criteria for nanomaterials is currently being reviewed and the WHO is already advancing classification exercises in the area of workers' health (WHO 2017d). Nanomaterials are also receiving increasing attention in developing countries, however limited regulatory action has been identified to date (Karim *et al.* 2015; Karunaratne 2015; Jain *et al.* 2018; Borges *et al.* 2018).

Potential measures to further address nanotechnology and manufactured nanomaterials

Taking into account the preceding analysis, stakeholders may wish to consider the following measures to further address nanotechnology and manufactured nanomaterials:

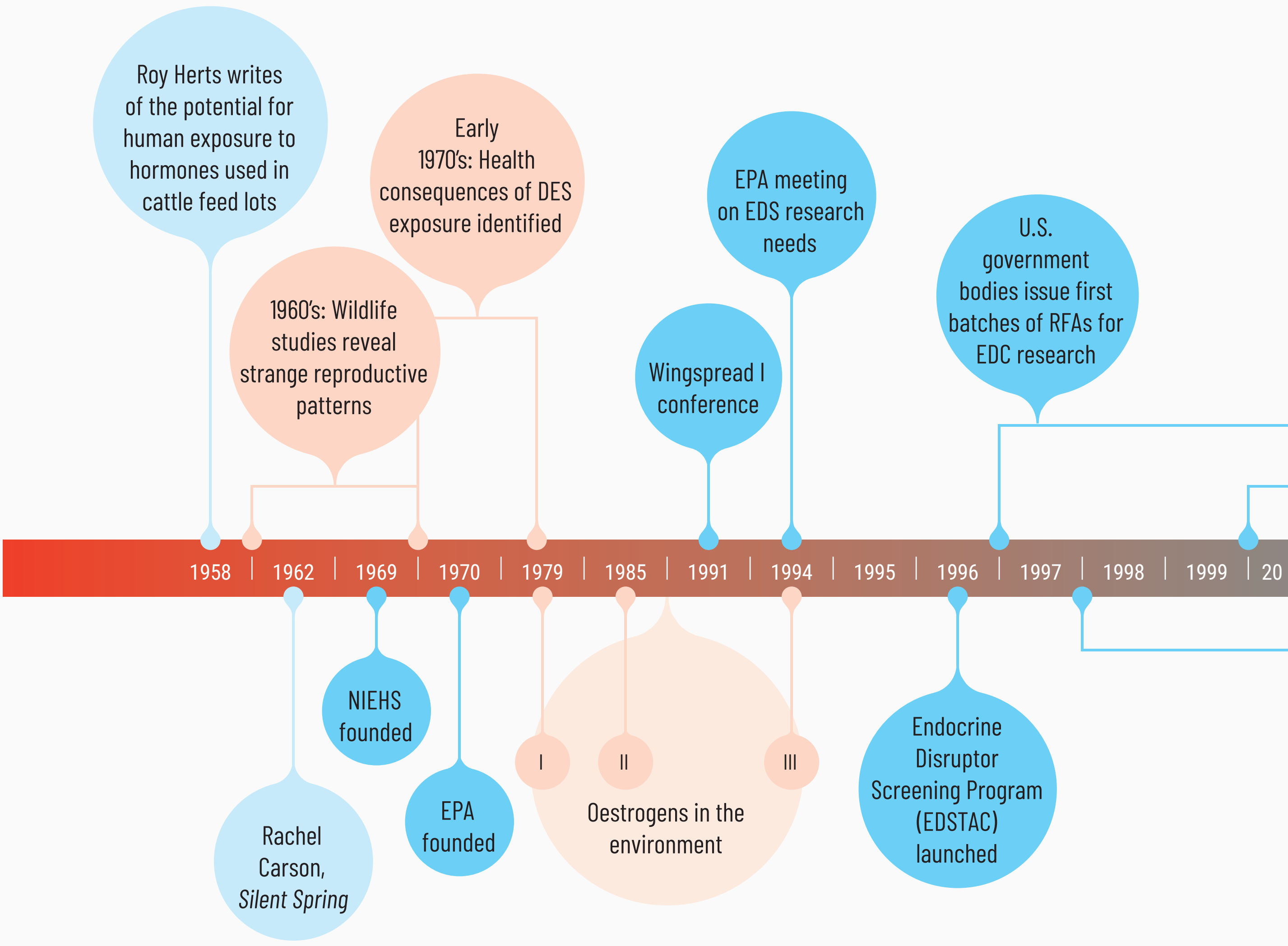
- Enable systematic assessment of the risks of manufactured nanomaterials by further developing standardized tests.
- At the international level, further harmonize methods to facilitate comparison and reliability of data.
- Take global action to enhance hazard communication by applying the Globally Harmonized System of Classification and Labelling (GHS) to nanomaterials and product labelling schemes.
- Adapt regular data requirements to take into account the properties of nanomaterials and facilitate hazard and risk assessments.
- Advance regulatory action, including to protect workers and to ensure that legally binding definitions of nanomaterials are consistent and operational.

4.4.2 Endocrine-disrupting chemicals

Introduction

An endocrine disruptor is defined by the WHO/International Programme on Chemical Safety (IPCS) as "an exogenous substance or mixture that alters the function(s) of the endocrine system and consequently causes adverse effects in an intact organism, or its progeny, or (sub) populations". A potential endocrine disruptor is defined as "an exogenous substance or mixture that possesses properties that might be expected to lead to endocrine disruption in an intact organism, or its progeny, or (sub)populations" (WHO 2002). According to the European Commission (2016a), there is consensus on the use of this definition for identifying endocrine disruptors. Known endocrine-disrupting chemicals (EDCs) include, among others, PCB, DDT, PBDE and some phthalates (see also Part II Ch. 5) (Bergman *et al.* 2013; Schug *et al.* 2016; UNEP 2017b).

Figure 4.10 **Milestones in the development of the EDC field, 1958-2013 (adapted from Schug *et al.* 2016, p. 835)**



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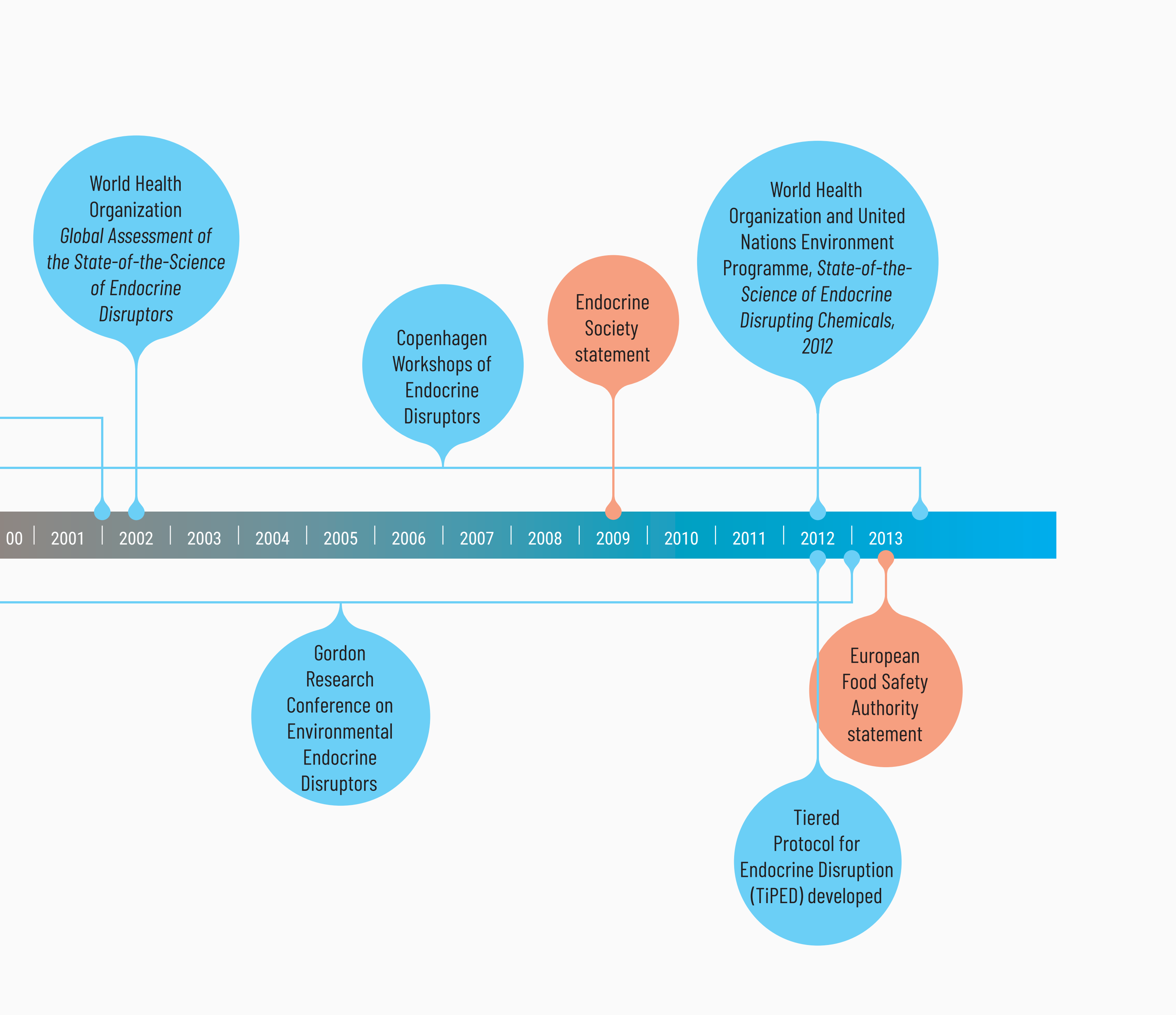
However, no commonly accepted criteria for the identification of EDCs are yet available.

EDCs have become a topic of significant international interest. Substantial efforts have been made over the past decades to develop a better scientific understanding, to identify EDCs and develop scientific approaches to support risk management (Figure 4.10). An important milestone was reached in 2012, when the third session of the ICCM recognized EDCs as an emerging policy issue (EPI).

State of the issue

While uncertainties remain, a number of laboratory and epidemiological studies have suggested associations between exposure to certain EDCs and adverse effects in humans, including reproductive dysfunctions, cancers, neurodevelopmental disorders, diabetes and metabolic disorders, among others (European Environment Agency 2012; Bergman *et al.* 2013; Gore *et al.* 2015; Kabir, Rahman and Rahman 2015; Schug *et al.* 2016). Some studies also



suggest that certain chemicals have endocrine-disrupting effects on wildlife, including feminization of some species (Lange *et al.* 2009; Flores-Valverde, Horwood and Hill 2010; Annamalai and Namasivayam 2015; Baines *et al.* 2017).

Consensus is emerging on scientific principles for the identification of EDCs (Solecki *et al.* 2017). In this context, it has been noted that "non-specific effects [...] are not considered appropriate for identification of endocrine disruption [and] endocrine activity on its own should not trigger a chemical's identification as an endocrine disruptor". Challenges remain with respect to assessing the impact of EDCs. Areas of uncertainty include low-dose exposure, thresholds and potency (i.e. the dose at which a substance has an effect and whether there a safe threshold exists) and potential non-monotonic dose-response relationships, meaning that severity of effect and exposure are not proportional (EEA 2012; Vandenberg *et al.* 2012; Beausoleil *et al.* 2013; Bergman *et al.* 2013; US EPA 2013; National

Research Council of the National Academies 2014; Lagarde *et al.* 2015; Solecki *et al.* 2017). Moreover, variation in species sensitivities in vulnerability has been noted (Ottinger and Dean 2011). The European Commission (2016a) noted that "four modalities (pathways) are relatively well known and internationally agreed tests exist (the oestrogen, androgen, thyroid and steroidogen modalities) [but] there are other modalities which are not yet well known and for which no internationally agreed tests exist. For these modalities, still under discussion, science is under development and there is no consensus on the extent of evidence (e.g. diabetes) available".

While there are well established general exposure models for humans and wildlife, there is limited knowledge regarding their application during critical periods of development; potential mixture effects; sensitive windows of exposure; and delayed effects (EEA 2012; Beausoleil *et al.* 2013; Bergman *et al.* 2013; US EPA 2013; Menard *et al.* 2014; National Research Council of the National Academies 2014; Lagarde *et al.* 2015; Giulivo *et al.* 2016; Solecki *et al.* 2017).

Policy developments and considerations

A number of countries have enacted laws and policies, and initiated scientific assessments, to identify and manage EDCs. In the United States the Endocrine Disruptor Screening Program is in place. Potential EDCs are identified and assessed using a two-tier screening programme, followed by a regular risk-based assessment (US EPA 2017b). EDCs are explicitly addressed in the regulatory frameworks on pesticides, drinking water safety and drugs (US EPA 2017c). In the EU several pieces of legislation address EDCs, including the Plant Protection Products Regulation (with a potential amendment currently under discussion), the Biocidal Products Regulation, REACH, the Toy Safety Directive, the Cosmetics Regulation and the Directive on water policy (EC 2000; Scholz 2016). Efforts are ongoing regarding the stepwise establishment of a list of priority substances for further evaluation of their role in endocrine disruption. In a first assessment, clear evidence of endocrine-disrupting activity combined with high exposure concern was noted for 60 substances (EC 2016b). Since then, additional data has been generated in the context of the development of

biocides and plant protection legislation (EC n.d.). In 2017 and 2018, the European Commission adopted scientific criteria for identifying EDCs in biocidal products and plant protection products, respectively (EC 2017d; EC 2018). A guidance document for the implementation of the criteria pursuant to the Biocidal Products Regulation and the Plant Protection Products regulation was also developed and published in 2018 (Andersson *et al.*2018). Efforts to identify EDCs are also ongoing in other countries, including Australia, Brazil, Canada, China and Japan (Ministry of the Environment of Japan 2010; Brazilian Ministry of Foreign Affairs 2017; State Council of China 2016; UNEP 2017c; Australian Department of Health 2018b).

There is lack of systematically gathered data, as few countries have included data requirements for detecting endocrine disruptors in regular data requirements for assessing the hazards and risks of chemicals. Under the auspices of the OECD, efforts are ongoing to further develop standardized test and data interpretation methods to enable a systematic screening and identification of EDCs by regulators. In 2018 new and updated OECD Test Guidelines for chemicals safety testing were adopted, including inclusion of endocrine-related endpoints in two Test Guidelines (OECD 2018e). The OECD Conceptual Framework for Testing and Assessment of Endocrine Disrupters, last revised in 2017, is a guide on available standardized tests available that can provide information on the assessment of endocrine activity and which are grouped in five levels, depending on the information the tests are generating (OECD 2018f). In addition, the OECD has developed a guidance document to interpret the results from the Test Guidelines that were developed (OECD 2018g).

Efforts are also under way to screen chemicals rapidly for bioactivity in several endocrine pathways, as well as to reduce the use of animals in testing through the use of high-throughput screening assays and computational models for evaluation and screening (US EPA 2017d). In addition, stakeholders are further exploring the use of Adverse Outcome Pathways (AOPs), with the aim of providing a plausible mechanistic understanding of the key events linking a mode of action with an adverse outcome caused by an EDC (Ankley *et al.* 2010; Kramer *et al.* 2011; Tollefsen *et al.* 2014; Becker *et al.* 2015; Conolly *et al.* 2017).

Potential measures to further address EDCs

Taking into account the preceding analysis, stakeholders may wish to consider the following measures to further address endocrine-disrupting chemicals (EDCs):

- Enable systematic screening and identification of EDCs by implementing scientific data requirements and assessment as part of national chemicals legislation.
- At the global level, use and further develop standardized testing methods and criteria to enable identification of EDCs, including to distinguish non-specific effects.
- Continue efforts to reduce remaining uncertainties, including on thresholds, potency, and non-monotonic dose-response relationships.
- Scale up research and epidemiological studies to identify exposures of concern that may lead to health impacts in humans.
- Implement standard data requirements in regular chemicals regulation to improve knowledge on the endocrine-disrupting properties of certain chemicals and multiply available assessments, which could be reused by countries.

5/ Other issues where emerging evidence indicates a risk

Chapter Highlights

In responding to the UNEA-2 mandate, "other issues where emerging evidence indicates a risk" were identified based on a specific set of criteria and to foster knowledge-sharing.

In recent years, assessments and regulatory risk management actions have been taken by public bodies on various chemicals/groups of chemicals not addressed at the international level.

The agreed criteria resulted in the identification of issues for: arsenic, bisphenol A (BPA), glyphosate, cadmium, lead, microbeads, neonicotinoids, organotins, polycyclic aromatic hydrocarbons (PAHs), phthalates and triclosan.

For some of these, concerns had existed for a long time and recent regulatory action has been taken in several countries in light of new evidence on lower thresholds for adverse effects or additional evidence related to specific uses.

In other cases, additional or new evidence has emerged in recent years.

In yet other cases, some countries have taken precautionary action based on existing knowledge.

In 2016 the second United Nations Environment Assembly (UNEA-2) requested the Executive Director of the UN Environment Programme to "ensure that the update of the Global Chemicals Outlook (GCO-II) addresses the issues which have been identified as emerging policy issues by the International Conference on Chemicals Management (ICCM), as well as other issues where emerging evidence indicates a risk to human health and the environment." Emerging policy issues (EPIs) are addressed in the previous chapter (Part II, Ch. 4). "Other issues where emerging evidence indicates a risk to human health and the environment" are addressed in this chapter.

5.1 Methodology

Selection criteria and scope

Several approaches to identifying and categorizing these other issues have been explored. They have included considering broader management issues – which is, to some extent, compatible with the list of potential emerging policy issues (EPIs) (see Part I, Ch. 4) – and identifying actions initiated by public bodies to regulate a chemical (or group of chemicals) or to conduct a full risk assessment or reassessment based on emerging evidence indicating a risk.

The relevance of other international prioritization efforts/initiatives and studies, developed through different approaches and methods, has been taken into account (e.g. the Global Environment Facility [GEF] *Guidance on Emerging Chemicals Management Issues in Developing Countries and Countries with Economies in Transition* (Bouwman 2012) and the WHO's 10 chemicals of major public health concern (WHO 2018a). As discussed in Part II, Ch. 3, a number of international bodies and mechanisms exist at the international level to identify emerging issues.

In considering various options, it became clear that, without refining the approach, a large and potentially unmanageable number of other issues would emerge (although they would all potentially be compatible with the mandate to address "other issues where emerging evidence indicates a risk"). Therefore, the following approach was identified for the selection criteria (i.e. entry points and necessary conditions for inclusion): At least two countries/regional economic integration organizations have recently (since 2010) undertaken of these two types of action, including at least one regulatory risk management action:

- There has been a regulatory risk management action on a chemical or group of chemicals, based on emerging evidence indicating a risk to human health and the environment.
- A full risk assessment or reassessment action for the same chemical or group of chemicals has been completed or initiated.

Chemicals/groups of chemicals comprehensively covered by existing multilateral environmental agreements,[1] and issues covered by the Strategic Approach to International Chemicals Management (SAICM), are not included. It should furthermore be noted that a number of governments have taken risk assessment or regulatory risk management action prior to 2010, both on chemicals/groups of chemicals identified here as well as one many other chemicals/groups of chemicals.

Through drawing upon various types of action by public bodies in UN Member States, a weight-of-evidence approach is brought to the process. It is important to note that the approach taken does not aim to conduct and deliver an international science-based assessment of specific chemicals or groups of chemicals. Rather, it is meant to facilitate international sharing of knowledge on specific actions recently taken based on emerging evidence indicating a risk. By undertaking a meta-review and drawing attention to existing risk assessment and regulatory risk management action, the objective is to facilitate understanding of issues of potential interest to governments and other stakeholders, which could facilitate future action in other countries or internationally.

For some of the chemicals/groups of chemicals discussed in the following sections, concerns had existed for a long time (e.g. about lead, which continues to be widely used in applications other than paint) recent regulatory action has been taken in several countries in light of new evidence on lower thresholds for adverse effects or additional evidence related to specific uses. In other cases, additional or new evidence has emerged in recent years, prompting regulatory action (e.g. on microbeads). In yet other cases, some countries have taken precautionary action based on existing knowledge.

Information provided

For each of the "other issues", two to three paragraphs are featured covering the following information:

- basic information about the chemical/group of chemicals;
- areas of use/application and economic information/market developments;
- hazard classification and human health and environmental concerns; and
- risk management/risk assessment action taken by countries.

1 Thus chemicals currently being evaluated under the Stockholm Convention are not considered, nor are chemicals listed under Appendix V of the Rotterdam Convention PIC [prior informed consent] Circular, i.e. chemicals not listed in Annex III of the Convention, but for which the Secretariat has received one notification verified as complete. These chemicals are not considered because knowledge exchange at the international level has already been initiated.

In addition, for each of the "other issues" the following supplementary information is included in a table (see Annex):

- regulatory action taken since 2010;
- (re-)assessment action and reports published and initiated since 2010; and
- possible inclusion in existing prioritization initiatives.

These issues are presented in alphabetical order.

5.2 Arsenic – potential risk to health and environment

Arsenic is a naturally occurring element that is widely distributed in the Earth's crust. It is used in wood preservatives, pesticides, batteries and semiconductors, among other purposes (United States Agency for Toxic Substances and Disease Registry [US ATSDR] 2007). Global production has been relatively steady in recent years, at 37,100 tonnes in 2016 (United States Geological Survey [USGS] 2018).

The primary route of arsenic exposure for the general population is via ingestion of food, including fish, rice and dairy products, or of water (IARC 2012a; WHO 2018b). Arsenic is highly toxic in its inorganic form and classified as carcinogenic to humans (IARC 2012a). It has been associated with cardiovascular disease, diabetes, and adverse effects on the nervous, respiratory, immune and endocrine systems (United States National Institute of Environmental and Health Sciences 2014). In the environment arsenic can induce a variety of toxic effects in wildlife (Tokar, Xu and Waalkes 2015). Examples of recent regulatory actions are a restriction on the sale and use of arsenic in anti-fouling, water treatment and wood preservation in Turkey, and new limits on arsenic levels in rice in the EU (see Annex).

5.3 Bisphenol A in products – potential risk to health and environment

Bisphenols are a group of synthetic organic compounds primarily used as a building block in the production of polycarbonate plastics and epoxy resins, which are used in a wide variety of products including water bottles, sports equipment, medical devices, household electronics, thermal paper receipts, and food and beverage cans (Carlisle *et al.* 2009; Liao and

© Cgoodwin, Part of the remains of arsenic processing plant, Ottery mine, Tent Hill, NSW. Arsenic compounds can be seen coating the surface of the brickwork CC BY-SA 3.0

Kannan 2011). The global bisphenol A (BPA) market is expected to experience a compound annual growth rate (CAGR) of approximately 6.5 per cent between 2018 and 2023 (Research and Markets 2018).

BPA has been detected in thermal paper at high levels of up to 3-22 g/kg (Mendum *et al.* 2011, Biedermann, Tschudin and Grob 2010) as well as in paper currencies (Liao and Kannan 2011). Polymers degradation is the dominant mechanism responsible for bisphenol releases from products (Mercea 2009). The primary source of exposure to BPA for most people is through food and beverages, by migration from containers (Carlisle *et al.* 2009); 1.4 and 2 times higher levels of daily intakes have been observed for pregnant woment and for children compared to adults (Huang *et al.* 2017). Between 2004 and 2012, median urinary levels of BPA in the US population decreased (US CDC 2017a). The omnipresent body burden to BPA in many population groups has been confirmed in various human biomonitoring studies (Koch *et al.* 2012).

A number of studies provide evidence that BPA is an endocrine disruptor (Rochester and Bolden 2015). Other potential effects, such as adverse behavioral outcomes (Ejaredar *et al.* 2017), obesity and type 2 diabetes (Stojanoska *et al.* 2017; Hwang *et al.* 2018), are under investigation and further research is needed, for example to understand effects on human health at low environmental exposures (US CDC 2017b). BPA may also be a causal agent in cardiovascular diseases, diabetes, metabolic disorders, prostate cancer, and immune system alterations. Bisphenol S, which has been used as an alternative to BPA, has been identified in the literature as a regrettable substitution (see Part III, Ch. 5). In recent years a number of countries in Asia, Europe and North America have banned or restricted the production and sale of some products containing BPA (see Annex).

5.4 Glyphosate in agriculture and residential use – potential risk to health and environment

Glyphosate is an organophosphorus compound without anti-cholinesterase activity. It is an active ingredient in herbicide formulations that are widely used for agricultural, forestry, and residential weed control. The glyphosate market has grown rapidly since 1994 and is expected to continue to experience strong growth in the next years (Benbrook 2016; Markets and Markets 2017).

Information on the extent of exposure to glyphosate among various populations is still limited and the need for further research, including to understand temporal trends, has been noted (Gillezeau *et al.* 2019). A study on time trends in glyphosate exposure undertaken in Germany found the data to mirror increasing glyphosate application and suggest possible exposure reduction after 2012 (Conrad *et al.* 2017). The scientific debate regarding adverse potential risks to human health are ongoing. For example, a 2013 study (Chang and Delzell 2016) and a 2016 study (Acquavella *et al.* 2016) reviewing the literature could not find evidence for a causal relationship between glyphosate exposure and Non-Hodgkin lymphoma. According to a 2019 study (Zhang *et al.* 2019), a meta-analysis of human epidemiological studies suggests a compelling link between exposures to glyphosate-based herbicides and increased risk for Non-Hodgkin lymphoma in humans.

A number of bodies have assessed glyphosate, in particular with a view to potential cancer risk to humans. In 2015 the International Agency for Research on Cancer (IARC) classified glyphosate as "probably carcinogenic to humans" (IARC 2015); however, this is a hazard identification. Later in 2015, the European Food Safety Authority (EFSA) concluded that "the substance is unlikely to be genotoxic (i.e. damaging to DNA) or to pose a carcinogenic threat to humans" (EFSA 2015). In 2016 the ECHA Committee for Risk Assessment (RAC) found that glyphosate causes serious eye damage and is toxic to aquatic life with long-lasting effects; however, the RAC did not find evidence to classify glyphosate for specific target organ toxicity or as a carcinogen, as a mutagen, or for reproductive toxicity (ECHA 2017). Also in 2016, FAO/WHO Joint Meeting on Pesticide Residues (JMPR) concluded that "glyphosate is unlikely to pose a carcinogenic risk to humans from exposure through the diet" (FAO and WHO 2016). In 2017 Health Canada concluded that registered glyphosate products do not present unacceptable risks to human health or the environment, or present carcinogenic risk to humans, when used according to revised use directions (Health Canada 2017a). According to Health Canada, "no pesticide regulatory authority in the world currently considers glyphosate to be a cancer risk to humans at the levels at which humans are currently exposed" (Health Canada 2019). Some countries have taken regulatory and/or assessment actions on glyphosates (see Annex).

5.5 Cadmium – potential risk to health and environment

Cadmium is a soft, silver-white metal naturally found in the Earth's crust. The largest use of cadmium is in batteries, predominantly rechargeable nickel-cadmium batteries. It is also widely used in pigments, coatings and electroplating (US ATSDR 2012). Global production, most of which is located in the Asia-Pacific region, has increased since 2010, reaching 23,900 tonnes in 2016 (USGS 2018). An important application driving the growth of cadmium production is solar cells (Transparency Market Research 2015; World Energy Council 2016).

The non-smoking general population is exposed to cadmium primarily via ingestion of food (IARC 2012b). Several studies have found cadmium (at levels up to 188 ppm) in plastic toys sold in various countries (Kumar and Pastore 2007; Omolaoye *et al.* 2010; Korfali 2013). Cadmium containing waste also poses challenges (Friege, Zeschmar-Lahl and Borgmann 2018). Cadmium is classified as carcinogenic to humans (IARC 2012b). Exposure to cadmium mainly affects kidney function and has, among others, been linked to reduced lung function as well as damage to bones, with children particularly at risk (US ASTDR 2012). Adverse effects on animals and plants have also been identified (Kumar and Singh 2010; Gallego *et al.* 2012). The UNECE Protocol on Heavy Metals under the Convention on Long Range Transboundary Air Pollution addresses cadmium among other heavy metals. In recent years a number of regulatory agencies, including in China, the Eurasian Economic Union (EEU) and the EU, have taken action to restrict the use of cadmium in electrical and electronic equipment, paints and fertilizers (see Annex).

5.6 Lead – potential risk to health

Lead is a heavy metal that occurs naturally in the Earth's crust. Historically, important uses of lead and lead compounds have included in gasoline, pipes and many other products. Lead continues to be used in paints, toys, furniture, ammunition and batteries, among others. World production of lead in 2017 was 11.3 million tonnes, with lead-acid batteries reportedly accounting for around 80 per cent of consumption (International Lead and Zinc Study Group [ILZSG] 2018). Increasing production of electric cars and bicycles is likely to boost demand for lead to be used in batteries during the next couple of years (ILZSG 2018), with this market expected to continue to grow in the medium term (PR Newswire 2018).

Lead levels of up to 1,445 ppm have been found in some toys (Omolaoye, Uzairu and Gimba 2010). People can be exposed to lead through inhalation of lead particles in air, drinking water, eating foods, or swallowing dust or dirt. Children can have higher exposure to lead in dust, soil or object coatings/paints due to frequent hand-to-mouth or object-to-mouth activities (O'Rourke *et al.* 1999). Significant reductions in lead exposure and blood lead concentrations have occurred in many high- and some middle-income countries (Landrigan *et al.* 2018). However, there are still several important pathways of occupational and community exposure, particularly in developing countries, such as lead-glazed pottery, lead pipes and informal recycling of lead-acid batteries. The health effects of exposure to lead include hypertension, renal failure, cardiovascular disease and stroke, especially among workers, while neurodevelopmental toxicity constitutes the most important consequence of lead toxicity in children (Landrigan *et al.* 2018).

According to the WHO, there is no known level of lead exposure that is considered safe (WHO 2018c). Estimates from the Global Burden of Disease (GBD) study indicate that lead was responsible for 0.5 million premature deaths and 9.3 million DALYs in 2015 (GBD 2015 Risk Factors Collaborators 2016). The UNECE Protocol on Heavy Metals under the Convention on Long Range Transboundary Air Pollution addresses lead among other heavy metals. While lead in gasoline has largely been banned across the world and lead in paint is being addressed as an emerging policy issue (EPI) under SAICM (with many countries having taken regulatory action), a number of countries have recently taken further regulatory actions to restrict the use of lead in other products such as jewelry, toys and electronics (see Annex).

5.7 Microbeads in personal care products and cosmetics – potential risk to the environment

Microbeads are a type of primary (i.e. intentionally added) microplastics (commonly considered to be micrometre-sized particles less than 5 mm in length) intentionally used in personal care products, other consumer applications, and various industrial applications. (e.g. scrubs, toothpastes) (Environment and Climate Change Canada 2015; United States Food and Drug Administration 2017; United States National Oceanic and Atmospheric Administration 2018). Exfoliating agents, for example, may contain more than 10 per cent microbeads (Brande-Lavridsen n.d.).

Studies show that the majority of microplastics[2] released to the oceans are secondary microplastics originating from the degradation of larger plastic items, in particular textiles and tyres (Boucher and Friot 2017), while microbeads from personal care products and cosmetics represent a relatively small source of microplastics in the environment (Essel *et al.* 2015; UNEP 2016), estimated in one study at 2 per cent (Boucher and Friot 2017). Although modern wastewater treatment plants may capture up to 99 per cent of microplastics (Magnusson and Noren 2014), significant amounts may nevertheless enter waterways, depending on the existence and efficacy of wastewater treatment facilities (Murphy *et al.* 2016; UNEP 2016).

2 While primary microplastics are intentionally added to products, secondary microplastics are generated from the breakdown of larger plastic items. Given the focus on microplastics rather than microbeads (a type of microplastics) in the literature, most of the information provided in this section refers to microplastics.

Aquatic organisms may be exposed to microplastics through direct ingestion, consumption of prey that have ingested the plastics, and dermal exposure (Beaman *et al.* 2016). Humans can be exposed to microplastics through ingestion of contaminated food and drinking water (Crampton 2017). A study found that humans may consume up to 11,000 plastic particles per person per year from shellfish alone (Van Cauwenberghe and Janssen 2014). Given the relatively small share of microplastics in the oceans originating from cosmetics, it is likely that only a small share of exposure can be thus attributed. Hydrophobic chemicals, such as PCBs and DDT, have been found to sorb to microplastics (Nerland *et al.* 2014; Gallo *et al.* 2018; Lassen *et al.* 2018). While evidence suggests this may constitute a relatively minor impact on contaminant exposure compared to other exposure pathways, further research could be warranted (Beaman *et al.* 2016; UNEP 2016; Lassen *et al.* 2018).

Studies have shown various adverse effects on aquatic organisms (Beaman *et al.* 2016; Brande-Lavridsen n.d.). A state of the science summary (Environment and Climate Change Canada 2015) concluded that the continuous release of microbeads may result in long-term effect on biological diversity and ecosystems. The potential risks of microplastics to human health are largely unknown (Crampton 2017). The limited evidence available suggests that microplastics in seafood might not currently represent a substantial health risk, although uncertainties remain (UNEP 2016). Several countries have recently taken regulatory actions to restrict the manufacture, import and sale of microbeads in cosmetics (see Annex).

5.8 Neonicotinoids in outdoor agriculture – potential risk to the environment

Neonicotinoids are a class of neuroactive insecticides chemically related to nicotine. Seven neonicotinoid insecticides are on the market, of which imidacloprid is the most widely used (Jeschke *et al.* 2011). Neonicotinoids currently account for 24 per cent of the global market and their use is increasing globally (Duchet, Kraft and Stark 2018). Neonicotinoids are not only used as plant protection products but also as biocides.

A review found "a growing body of evidence demonstrates that persistent, low levels of neonicotinoids can have negative impacts on a wide range of free-living organisms" (Wood and Goulson 2017). Another review of the literature predicts "substantial impacts on biodiversity and ecosystem functioning" from present concentrations of neonicoitnoids (van der Sluijs *et al.* 2015). It has been suggested that effects may differ between honeybees and bumblebees (Rundlöf *et al.* 2015). Several studies have found adverse effects on wild bee populations from exposure to certain neonicotinoids (e.g. Woodcock *et al.* 2016). Further studies found neonicotinoids to be negatively affecting pollinator health under realistic agricultural conditions (Tsvetkov *et al.* 2017; Woodcock *et al.* 2017).

Some have highlighted the difficulties entailed in such assessments, noting the multifactorial nature of bee declines (de Miranda and Nazzi 2017). Efforts are under way to address remaining uncertainties regarding field-realistic conditions (Rortais *et al.* 2017). Despite the significant progress made in recent years in further assessing risks to pollinators, further research is needed, for example to assess risks of multiple stressors (Rortais *et al.* 2017). Moreover, a need for further studies on the potential effects of neonictonids on human health has been suggested (Cimino *et al.* 2017). Extensive assessments have been undertaken by relevant authorities (e.g. Health Canada 2017b). As an example of regulatory action, in 2013 the EU prohibited the use of three neonicotinoids in bee-attractive crops (see Annex).

5.9 Organotins as biocides – potential risk to health and environment

Organotins are organic compounds that contain at least one tin-carbon bond. There are four main groups of organotin compounds, which are used in various applications including as biocidal agents in wood preservatives and disinfectants, catalysts, sealants and stabilizers US ASTDR 2005; KEMI 2018). Various uses have been restricted by regulatory agencies, e.g. use as biocidal agents, or banned, e.g. use as antifouling paints on ships. Production of organotins has increased significantly during the past decades (Cole *et al.* 2015).

Organotins have been found in water bodies (e.g. US ASTDR 2005; Deng *et al.* 2018). The organotin compound tributyltin (TBT) is considered among the most hazardous substances released into the marine environment, primarily from use in anti-fouling systems, with levels in some areas posing significant environmental risk (Andersen *et al.* 2010). In addition to occupational exposure, the general population can be exposed to some organotins through ingestion of food and contact with household products containing organotin compounds (Sousa *et al.* 2014; National Pollutant Inventory of Australia 2019). Depending on the compound, exposure to organotins has been reported to cause skin, eye and respiratory irritation, neurological problems, and effects on the immune system (National Pollutant Inventory of Australia 2019; KEMI 2018; Nunes-Silva *et al.* 2018). Adverse effects on animals have also been observed, including endocrine disruption (National Pollutant Inventory of Australia 2019; Puñal de Araújo *et al.* 2018). Examples of recent regulatory action include restriction in China and the EU of the use of anti-fouling systems containing organotin compounds as biocides (see Annex).

5.10 Polycyclic aromatic hydrocarbons in products – potential risk to health

Polycyclic aromatic hydrocarbons (PAHs) are a group of more than 100 different chemicals that occur naturally in coal and crude oil, but are also formed as a by-product during the incomplete burning of coal, oil, gas, wood, garbage and other organic substances (US CDC 2017c).

A number of PAHs are classified as carcinogenic, mutagenic and/or toxic for reproduction (CMR) substances. Some are also persistent, bioaccumulative and toxic (PBT) for humans and other organisms, and/or are of concern because they are very persistent and very bioaccumulative. The majority of the PAHs that reach consumers come from tar oils, from specific oils from petroleum refining added as softeners to rubbers and plastics, and the use of industrial soot (carbon black) to dye plastic (UBA 2016). Products that contain PAHs include shoes, bicycle handles and tyres. Following concerns about potential exposure of consumers, several studies have been undertaken to determine emissions of PAHs from products (e.g. Paschke *et al.* 2013; Geiss *et al.* 2017). An example of regulatory action includes the listing of eight PAHs under the EU's REACH restriction list (see Annex).

5.11 Phthalates in consumer products – potential effects on health

Phthalates are a group of plasticizers with softening and elastic effects. They are used in products such as vinyl flooring, adhesives, detergents, lubricating oils, automotive plastics, plastic clothing and personal care products (US CDC 2017d). Phthalates accounted for 65 per cent of global consumption of plasticizers in 2017 and are forecast to account for 60 per cent in 2022; consumption of phthalate plasticizers is forecast to grow at an average annual rate of 1.3 per cent during 2017-22, while that of other plasticizers (terephthalates, epoxy, aliphatics, trimellitates, polymerics, benzoates and phosphates) is forecast to grow at an average annual rate of 5.8 per cent in the same period (IHS Markit 2018).

Phthalates are semi-volatile organic compounds (SVOCs) with concentrations of typically 1-40 per cent in flexible vinyl and other products (Biedermann-Brem *et al.* 2008; Goldsmith *et al.* 2014). They possess low volatility, high binding with polymer matrices, and high sorption to dust, indoor surfaces and skin (Hopf *et al.* 2014; Sugino *et al.* 2017). The main human exposure pathway is oral via food (US CDC 2018). Other pathways include direct mouthing (toys), house dust ingestion and dermal gaseous absorption. The highest urine concentrations of phthalates are observed in the young population (Frederiksen *et al.* 2013; Hartmann *et al.* 2018). A study found that less than 3 per cent of surveyed children had a DEHP[3] level exceeding the health-based guidance value (Den Hond *et al.* 2015), which may reflect significant action already taken to reduce its use.

Phthalates are a family of chemical compounds whose characteristics may differ, among others depending on their molecular weight. Some phthalates may be linked to developmental toxicity and adverse effects on reproductive function in humans, as well as in aquatic invertebrates, fish and birds (European Chemicals Bureau 2008; Watkins *et al.* 2017). While a number of phthalates have so far been found to present a limited risk of harm to human health and the environment (Ventrice *et al.* 2013), others have been shown to be plausible endocrine disruptors (e.g. Saillenfait *et al.* 2013; Albert and Jégou 2014).Under REACH, DCHP, DEHP, DIBP, DBP and BBP have been included on the Candidate List of substances of very high concern for authorization due to toxicity for reproduction and endocrine disrupting properties in humans. Restrictions on the use of certain phthalates in some applications have been put in place in recent years in several countries, including in Canada, China, the Republic of Korea and the United States and in the EU. (see Annex).

5.12 Triclosan in hygiene products – potential risk to health and environment

Triclosan is an antibacterial and antifungal agent widely used in a variety of products, including cosmetics (e.g. toothpaste and soaps). It can be released to the environment via various pathways and has been detected in surface, ground and drinking water (Dhillon *et al.* 2015). Triclosan biodegrades relatively slowly in freshwater and sediments (Huang *et al.* 2014; Huang *et al.* 2015), but more rapidly by photolysis (Morrall *et al.* 2004; Latch *et al.* 2005; Aranami and Readman 2007).

Exposure to triclosan occurs primarily through the skin or mouth during the use of triclosan-containing products, with only a minor contribution via environmental exposures. A study detected triclosan in the urine of around 75 per cent of people tested in the United States (US CDC 2017e). According to a recent consensus statement by more than 200 scientists and medical professionals (Halden *et al.* 2017), triclosan is toxic to aquatic organisms and is an endocrine disruptor in mammals. Further studies have also found endocrine-disrupting properties and other potential adverse effects (e.g. Wang and Tian 2015; Feng *et al.* 2016; Olaniyan, Mkwetshana and Okoh 2016). However, current levels of use may not pose a major threat to human health (Ena *et al.* 2018). In recent years the United States, Canada and the EU have taken action to restrict the placing on the market and use of triclosan. Canada has also assessed and published its assessment of triclosan under the Canadian Environmental Protection Act (see Annex).

3 Bis(2-ethylhexyl) phthalate.

6/ Overall progress towards the 2020 goal: what have we learned?

Chapter Highlights

Significant progress has been made towards the implementation of the 2020 goal at the national, regional and global level, and by all stakeholders.

Countries have strengthened their capacities for governance, knowledge generation, risk reduction and control of illegal international traffic; however, progress has been uneven.

Progress has been made through multilateral treaties and voluntary international instruments, but gaps in implementation remain.

Opportunities exist to create synergies between different international prioritization processes.

The development of an integrated national programme based on a national profile, as called for by SAICM, could help to strengthen national chemicals management in a coordinated way.

A coherent and impact-based results framework with meaningful indicators could inform national action and capacity development, reporting, and tracking of progress towards the 2020 goal.

This chapter synthesizes the information presented throughout Part II relevant for assessing progress towards the 2020 goal, which has provided an important aspirational goal at all levels and for all stakeholders. While it is difficult to measure progress in a systematic way, given the absence of a comprehensive indicator and reporting framework, it is nevertheless possible to identify certain trends, gaps and opportunities, as well as lessons learned that point towards areas for action.

6.1 Progress has been made towards the 2020 goal at the national, regional and global level

Significant progress has been made towards the five objectives of the SAICM OPS

Many countries have made important headway in enacting laws, creating programmes and implementing policies to achieve the sound management of chemicals and waste. SAICM, with its multi-stakeholder and multi-sector approach, has provided a space and opportunity for government and non-government actors to jointly discuss overarching issues, develop national capacities through the QSP and address emerging policy issues. Governments, the private sector, civil society and other stakeholders, through activities implemented at the local, national, regional and global levels that are complementary to, and often catalysed by, international agreements have made important headway towards the five objectives identified by the OPS:

- *Governance*: Many countries have strengthened their legal and institutional capacities. All regions, although in varying degrees, have made significant progress in recent years with the adoption of overarching chemicals management legislation. Regional institutions have proven an effective tool to strengthen capacity. Often prepared through multi-sectoral and multi-stakeholder collaboration, national profiles have led to the establishment of inter-ministerial committees in a number of countries; led to the production of country baseline information; and facilitated the identification of priority action.

- *Knowledge and information*: Various initiatives have generated data and improved our understanding of the hazards and risks of chemicals of concern. Monitoring systems have been established in many countries and generate important insights. The number of countries implementing the GHS and establishing PRTRs is increasing. Moreover, drawing on existing bodies, science-policy interfaces have been established and strengthened, providing important insights to inform policymaking.

- *Risk reduction*: Regulatory bodies in all regions have taken action to identify, assess and manage a number of priority chemicals of concern, including through bans or restrictions on production and use. Progress in the implementation of legal frameworks, based on the International Code of Conduct on Pesticide Management, is promising. Use of the IOMC tools for risk reduction by stakeholders is increasing, while poisons centres have been established in many countries.

- *Capacity building and financing*: Some progress has been made in mainstreaming chemicals and waste management into national development plans and budgeting. A number of countries have clarified responsibilities between the public and private sector; promoted extended producer responsibility and the internalization of costs by industry; and used fiscal instruments. Industry involvement has also been important in mobilizing resources and has built capacity. As regards external financing, the GEF, the QSP and the Special Programme, as well as bilateral donors, have provided significant resources.

- *Illegal international traffic*: International and national efforts have been ongoing in this field. Various initiatives and agreements at the regional and global level have helped to monitor, reduce and control, to a certain extent, illegal international traffic in chemicals and waste. Countries are cooperating to strengthen regulatory frameworks and build capacity for enforcement to minimize illicit transboundary movement of hazardous waste and to tackle counterfeit products.

Countries save resources by aligning and harmonizing their policies

Policy learning and alignment is advancing across countries and organization. Many countries are saving resources by aligning their approaches with those of other countries or with internationally agreed guidance. Such guidance includes that developed by the OECD and the WHO. These alignments and harmonization efforts create cost savings through benefiting from progress made in regions with advanced schemes, sharing workloads and facilitating trade. Care should be taken, however, to avoid the human health impacts of manufacturing being shifted through international trade from countries that import goods to those that produce them (Normile 2017).

Numerous success stories showcase how regional institutions and organizations have advanced regulatory harmonization and the development and implementation of policy-oriented action plans across regions. Regional economic and political integration organizations have assumed a particularly prominent role in addressing chemicals and waste in all regions. Close trade relationships create opportunities

for collaboration and harmonization, while maintaining a high standard of protection.

Specific hazardous chemicals and issues of global concern are successfully addressed through multilateral treaties.

The international community has taken concerted action, through legally binding treaties, on specific hazardous chemicals and issues of global concern. These treaties have catalysed selected regulatory actions, raised awareness, and succeeded in reducing some exposures to the targeted chemicals and wastes.

The Montreal Protocol has been successful in removing ozone-depleting substances from the atmosphere and protecting the ozone layer, thus avoiding more than 100 million cases of skin cancer; the Basel Convention has successfully strengthened national capacities for the environmentally sound management of hazardous wastes; the Rotterdam Convention has facilitated the exchange of critical information on the trade of hazardous substances; and the production and use of a number of POPs has been restricted or eliminated under the Stockholm Convention. The Minamata Convention on Mercury is also expected to achieve positive results, for example through phasing out the use of mercury in various products.

6.2 Significant implementation gaps remain

Overall progress towards achieving the sound management of chemicals and waste is uneven across countries, regions and actors

Overall progress is insufficient, pointing to an urgent need to take concerted action to develop basic chemicals management systems in all countries. Developing countries and economies in transition, in particular, still lack basic chemicals and waste management systems. Major gaps remain, for example, in the implementation of the GHS, in the establishment of PRTRs and poisons centres, and in capacities for hazard and risk assessment and risk management. Gaps are particularly prevalent for industrial chemicals and consumer products. Further work is also needed to address pesticides. Moreover, even if regulations for specific chemicals are in place, implementation may pose challenges. Similarly, industry involvement has not been sufficient and challenges have been noted regarding voluntary industry standards and initiatives.

Provision of financing, technology transfer and technical assistance has not met needs

Limited progress has been made in integrating chemicals and waste considerations in policymaking. Few success stories are known in which relevant projects were followed up by the allocation of resources from national budgets/resources. Moreover, further efforts are needed in many countries to adopt legislation to internalize costs, as well as to expand the use of economic instruments. External funding has also not matched the need and demand for support, expressed by developing countries and economies in transition, for building basic chemicals and waste management systems. Further action is therefore required to achieve full implementation of the integrated approach with respect to all three components.

Strengthening integrated national implementation, a priority but challenging

SAICM's quest to support the development of an integrated national programme based on a national profile has sought to align national processes to strengthen chemicals and waste management in a systematic and coordinated way. While valuable work has been undertaken by countries through the development of national chemicals management profiles and plans, there has been a loss of momentum, marked by lack of sufficient funding for developing countries and economies in transition to develop basic capacities. Urho (2018) points out that the lack of one single mechanism for working towards strategically prioritized national action results in an ad-hoc and diffuse approach, which makes it challenging to assess collective progress.

Implementation gaps remain regarding multilateral treaties and SAICM

The extent to which the objectives of a number of treaties have been achieved is uncertain. Further efforts are needed to achieve full implementation, for example to address gaps in regulatory schemes under the Stockholm Convention and to fully implement the chemicals dimension of the IHR (2015). Given that treaties are designed to address specific chemicals and issues – for example, some mainly focus on specific stages of the life cycle or specific issues (e.g. ILO C174), individual chemicals (e.g. the Minamata Convention) or groups of chemicals (e.g. the Stockholm Convention) – many hazardous substances are beyond their scope. Moreover, not all treaties have been universally ratified. SAICM suffers, among others, from insufficient sectoral engagement; the capacity constraints of national focal points; lack of tools to measure progress; limited financing of activities; and insufficient and uneven advances in substantive areas. Progress has also been slow, modest and uneven in implementing the EPIs, with the exception of lead in paint.

International prioritization processes are diverse and independent from each other

A diverse set of mechanisms has been established at the international level to identify emerging issues and set priorities for action. This includes processes under chemicals and waste MEAs, the process under SAICM for identifying emerging policy issues and other issues of concern, and regional processes. Moreover, UNEA called for the GCO-II to address "other issues where emerging evidence indicates a risk". These international mechanisms and processes follow different procedures and base the identification and prioritization of chemicals and emerging issues on different criteria. In addition, different organizing frameworks are used, with some targeting specific chemicals/groups of chemicals and others targeting broader management issues. Some of the instruments rely on scientific/technical bodies to provide scientific input to inform identification and prioritization. Synergies may exist among these mechanisms, and there may be value in considering the lessons learned from the respective processes in deliberating options available to identify and prioritize issues under a beyond 2020 framework.

6.3 A coherent global results, indicator and reporting framework is lacking

Reporting rates are not satisfactory

Reporting rates under several agreements are low, particularly among developing countries and economies in transition. In some cases reporting rates exhibit a downward trend (e.g.

under the Stockholm Convention and the Basel Convention). Reporting rates under SAICM have also been disappointing. They show a worrying downward trend, with data lacking particularly from the Africa region. By contrast, reporting compliance has been high or even universal under ILO Conventions, the Montreal Protocol and the IHR. Further efforts are needed to fully understand the reasons for significant divergences in reporting rates and to share lessons learned.

Reporting mechanisms are fragmented

A range of different reporting mechanisms have been established across the various instruments in the international chemicals and waste cluster. Relying on this diverse set of parameters and indicators makes it challenging to develop a baseline and derive informed insights on the overall progress. Data from the various instruments are currently scattered in different Secretariats and databases, making it difficult to track overall progress in a systematic manner. The co-chairs' overview paper prepared for the second meeting of the intersessional process on the sound management of chemicals and waste beyond 2020, held in March 2018, stated that "countries have been burdened by their reporting obligations under different regimes" and noted that "reporting under the beyond 2020 structure should take this into account when determining reporting mechanisms" (SAICM Secretariat 2018). The low response rate for the third SAICM Progress Report emphasizes that such a reporting system is in need of a revision.

Output-based indicators versus impact-based indicators

Most of the indicators currently used to monitor progress with the implementation of the different instruments are activity-, output- or instrument-based. These indicators do not provide information on the results achieved in protecting human health and the environment from the adverse effects of chemicals and waste. The activity-based indicators and related responses to questionnaires may also be subjective and open to a variety of responses. Consequently, it is often not possible to ascertain whether the health and environment related objectives of the agreements are actually achieved (Urho 2018). When using the results chain to assess progress, it can be concluded that a large number of activities and outputs are being/have been implemented. In the framework of SAICM, stakeholders have made progress by developing a set of 11 basic elements recognized as critical at the national and regional level to the attainment of sound chemicals and waste management, as outlined in the OOG for achieving the 2020 goal. However, these indicators do not provide conclusive insights regarding progress in minimizing the adverse impacts of chemicals and waste.

Annex: Other issues where emerging evidence indicates a risk

Arsenic

	Action	Scope	Concern
Regulatory actions	• Eurasian Economic Union (EEA) 2010, application of sanitary measures within the Customs Union	• Prohibits arsenic in milk dummies and pacifiers from silicone polymers and latex • Limits arsenic in diapers and baby swaddling bands	• Potential health effects (risk to infants)
	• EU, EC 2015, Regulation (EC) No 2015/1006 amending Regulation (EC) No 2006/1881 on maximum levels for certain contaminants in foodstuffs	• Limits levels of arsenic in rice and restricts sale	• Potential health effects (risk to consumers, infants and young children)
	• Canada, 2016, Health Canada Expansion Gates and Expandable Enclosures Regulations, Cribs, Cradles and Bassinets Regulations and Toys Regulations, Canada Consumer Product Safety Act	• Limits the amount of arsenic in these sources	• Protection of human health with a special focus on children's health
	• Canada, 2016, Regulations under the Canada Food and Drugs Act for foods, drugs (2016) and natural health products	• Specifies maximum levels of arsenic in these products	• Protection of human health
	• Turkey 2017, Ministry of Environment and Urbanization (MoEU), KKDIK regulation (REACH-like regulation)	• Restricts the sale and use for use in anti-fouling, water treatment, wood preservation	• Potential effects on health and environment (risk to humans and animals)
Assessment actions and reports	US 2016, FDA Center for Food Safety and Applied Nutrition, Arsenic in Rice and Rice Products Risk Assessment Report		
	EU 2017, ECHA, Committee for Risk Assessment (RAC) Opinion on Arsenic acid and its inorganic salts		
Inclusion in existing prioritization initiatives	Global Environment Facility (GEF) Scientific and Technical Advisory Panel (STAP), *GEF Guidance on Emerging Chemicals Management Issues in Developing Countries and Countries with Economies in Transition* (2012) WHO's chemicals of major public health concern Norway Environment Agency's List of Priority Substances (as of 2017)		

Bisphenol A (BPA)

	Action	Scope	Concern
Regulatory actions	• Canada, 2010, Bisphenol A added to the Canada Consumer Products Safety Act, Schedule 2	• Prohibits the import, sale and advertising of polycarbonate baby bottles containing BPA	• The concern is the health of newborns and infants under 18 months of age
	• China 2011, Ministry of Health Ban on the Use of BPA in Infant Food Containers	• Bans production of any BPA-containing baby bottles or other food and drink items for children	• Potential health effects (risk to people; children, infants and foetuses)
	• Malaysia 2011, Ministry of Health	• Bans production, import and sale of feeding bottles containing BPA	• Potential health effects (risk to people, children, infants and foetuses)
	• EU, EC 2011, Regulation (EC) 10/2011 amending Directive 2002/72/EC on plastic materials and articles intended to come into contact with food	• Limits the amount of BPA allowed to leach out of materials	• Potential health effects (risk to people, children, infants and foetuses)
	• EU, EC 2011, Regulation (EC) 321/2011 amending Regulation (EU) 10/2011 as regards the restriction of use of Bisphenol A in plastic infant feeding bottles	• Prohibits BPA in the manufacture of polycarbonate infant feeding bottles	• Potential health effects (risk to children and infants)
	• EU, EC 2016, Regulation (EC) 2016/2235, amending Annex XVII to Regulation (EC) No 1907/2006 (REACH Restriction List)	• Prohibits sale of thermal paper containing BPA	• Potential health effects (risk to workers, consumers, unborn children of pregnant workers)
	• EU, EC 2017, Directive (EU) 2017/898, amending Appendix C to Annex II to Directive 2009/48/EC on the safety of toys, as regards bisphenol A	• Lowers applicable specific limit value for BPA in toys	• Potential health effects (risk to children)
	• Turkey 2017, Ministry of Customs and Trade Amendment to the Safety of Toys Implementing Regulation Gazette number: 30025	• Restricts the amount of BPA permissible for use in toys • Mandates use of safety warning	• Potential health effects (risk to children less than 36 months old)
	• Canada 2017, Ministerial Condition No. 19233 of the Canadian Environmental Protection Act, 1999	• Bans manufacture or import of consumer products with fatty acids, tall oil and reaction products containing BPA • Regulates handling and disposal	• Potential effects on health, environment and biodiversity (risk to pregnant women, infants and foetuses)
	• EU, EC 2018, Regulation EC 2018/213, Bisphenol-A amendment to Regulation (EU) No 10/2011 on plastic and food contact material. To apply from September 2018	• Restricts use of BPA in in varnishes and coatings	• Potential health effects (risk to consumers)

	Action	Scope	Concern
Assessment actions and reports	Canada, 2012 Health Canada's Updated Assessment of Bisphenol A (BPA) Exposure from Food Sources		
	EU 2015, EFSA, Scientific Opinion on the risks to public health related to the presence of bisphenol A (BPA) in foodstuffs		
	EU 2016, EFSA, A statement on the developmental immunotoxicity of bisphenol A (BPA): answer to the question from the Dutch Ministry of Health, Welfare and Sport		
	Sweden 2017, Swedish Chemicals Agency (KEMI), Bisphenols – a survey and analysis		
	EU 2017, Next EFSA Re-assessment on toxicity of bisphenol A (BPA) in 2018		
	US 2018, FDA National Toxicology Program (NTP), 2018, draft CLARITY-BPA Core Study Research Report		
Inclusion in existing prioritization initiatives	Global Environment Facility (GEF) Scientific and Technical Advisory Panel (STAP), *GEF Guidance on Emerging Chemicals Management Issues in Developing Countries and Countries with Economies in Transition* (2012) Chemicals/groups of chemicals on which the US EPA issued a Chemical Action Plan (2011) Norwegian Environment Agency's List of Priority Substances (as of 2017)		

Glyphosate

	Action	Scope	Concern
Regulatory actions	France 2014, Loi n° 2014-110 du 6 février 2014 visant à mieux encadrer l'utilisation des produits phytosanitaires sur le territoire national	Forbids use of pesticides by the French state, local authorities and public bodies for the maintenance of public spaces, forests and roadsides	Potential health effects
	Netherlands 2016	Bans sale of glyphosate to private parties	Potential health effects
	Italy 2016, Ministry of Health Restrictions on Glyphosate use	Prohibits use of glyphosate in public areas and pre-harvest use of glyphosate. Restricts non-agricultural use of glyphosate in soils	Potential effects on health and environment (risk to children and the elderly)
	Sri Lanka 2018	Use of glyphosate banned except for tea and rubber cultivation	Potential health effects on farmers (kidney disease)
Assessment actions and reports	EU 2015, EFSA Peer review of the pesticide risk assessment of the EDC properties of glyphosate		
	Canada 2017, Re-evaluation Decision RVD2017-01, Glyphosate. Catalogue number: H113-28/2017-1E-PDF		
	US EPA 2017, Draft Human Health and Ecological Risk Assessments for Glyphosate. Review docket EPA-HQ-OPP-2009-0361		
Inclusion in existing prioritization initiatives			

Cadmium

	Action	Scope	Concern
Regulatory actions	• EU 2011, Directive 2011/65/EU, restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment	• Restricts sale of electrical and electronic equipment (EEE) above certain cadmium levels	• Potential health effects (risk to consumers)
	• Canada 2016, Health Canada Surface Coating Materials Regulations, Glazed Ceramics and Glassware Regulations, Children's Jewellery Regulations, Expansion Gates and Expandable Enclosures Regulations, Cribs, Cradles and Bassinets Regulations and Toys Regulations, Canada Consumer Product Safety Act.	• Limits the amount of cadmium in these sources	• Protection of human health with a special focus on children's health
	• EU, EC 2016, Regulation (EC) 2016/217, amending Annex XVII to Regulation (EC) No 1907/2006 (REACH Restriction List)	• Restricts placing on the market of paints	• Potential effects on health and biodiversity (risk to humans and aquatic life)
	• EU, EC 2016, Circular economy package: rules on organic and waste-based fertilizers in the EU	• Restricts limits for cadmium in phosphate fertilizers	• Potential effects on health and environment (risk to humans and soils)
	• Republic of Korea 2016, Act for Resource Recycling of Electrical and Electronic Equipment and Vehicles	• Restricts production and import • Restricts levels of cadmium and its compounds in electrical products and vehicles	• Potential health effects (risk to consumers)
	• China 2017, Ministry of Environmental Protection (MEP), List of Priority Chemicals for Management (first batch), Notice No. 83 of 2017	• Restricts production and use of cadmium • Mandates disclosure of use or release of cadmium; mandates an application for a disposal permit	• Potential health effects and environment
	• UAE 2017, Emirates Authority for Standardization and Metrology RoHS regulation, Decision No. 10 of 2017	• Restricts sale of electrical and electronic equipment (EEE) containing cadmium	• Potential health effects and environment (risk to consumers)
	• Eurasian Economic Union (EEU) 2018, alignment with EU (RoHS)	• Restricts sale of EEE containing cadmium	• Potential effects on health and environment (risk to humans and animals)
	• UK 2013, Food standards Agency, Final Report: A Survey of Cadmium in Brown Crabmeat and Brown Crabmeat Products		

	Action	Scope	Concern
Assessment actions and reports	Norway 2015, Norwegian Scientific Committee for Food Safety (VKM), Risk assessment of dietary cadmium exposure. VKM 2015: 12		
	EU 2016, Impact assessment, limits for cadmium in phosphate fertilizers. An accompanying document to a proposal for an EC Regulation		
	Global Environment Facility (GEF) Scientific and Technical Advisory Panel (STAP), *GEF Guidance on Emerging Chemicals Management Issues in Developing Countries and Countries with Economies in Transition* (2012) WHO's chemicals of major public health concern		
Inclusion in existing prioritization initiatives	-		

Lead

	Action	Scope	Concern
Regulatory actions	• The Philippines 2013, Department Administrative Order No. 2013- 24, Chemical Control Order for Lead and Lead Compounds	• Restricts import, manufacture, processing, sale, distribution, use and disposal • Bans use in production of 7 types of consumer products	• Potential health effects (risk to children)
	• EU, EC 2015, Regulation (EU) 2015/628 amending Annex XVII to Regulation (EC) No 1907/2006 (REACH Restriction List)	• Expands scope of lead restriction from jewelry articles to articles or accessible parts of articles for the general public	• Potential health effects (risk to children)
	• Canada 2016, Health Canada Children's Jewellery Regulations, Canada Consumer Product Safety Act, SOR/2016-168	• Limits lead content in children's jewelry	• Potential health effects (risk to children)
	• Canada 2016, Health Canada Surface Coating Materials Regulations, Glazed Ceramics and Glassware Regulations, Kettles Regulations, Cribs, Cradles and Bassinets Regulations and Toys Regulations, Canada Consumer Product Safety Act	• Limits the amount of lead in these sources.	• Protection of human health with a special focus on children's health
	• Canada, 2016, Regulations under the Canada Food and Drugs Act for foods, drugs and natural health products	• Specifies maximum levels of lead in these products	• Protection of human health

	Action	Scope	Concern
	• Singapore 2016, Ministry of the Environment and Water Resources, Environmental Protection and Management Act amendment	• Restricts manufacture, import and sale • Restricts lead levels in certain electrical and electronic equipment (EEE)	• Potential health effects (risk to consumers)
	• United Arab Emirates (UAE) 2017, Emirates Authority for Standardization and Metrology RoHS regulation, Decision No. 10 of 2017.	• Restricts sale of electrical and electronic equipment (EEE) containing lead to a maximum concentration of 0.01 per cent	• Potential health effects (risk to consumers)
Assessment actions and reports	US 2012, US Department of Health and Human Services National Toxicology Program (NTP), NTP Monograph Health Effects of Low-level Lead Evaluation		
	Canada 2013, Health Canada, Final Human Health State of the Science Report on Lead		
	US 2013, EPA, Integrated Science Assessment for Lead		
Inclusion in existing prioritization initiatives	Global Environment Facility (GEF) Scientific and Technical Advisory Panel (STAP), *GEF Guidance on Emerging Chemicals Management Issues in Developing Countries and Countries with Economies in Transition* (2012) World Health Organization (WHO) chemicals of major public health concern Norwegian Environment Agency's List of Priority Substances (as of 2017)		

Microbeads

	Action	Scope	Concern
Regulatory actions	• US 2015, Microbead-Free Waters Act (114-114)	• Prohibits manufacture, packaging and distribution of rinse-off cosmetics containing plastic microbeads	• Potential effects on the environment and biodiversity (risk to water supply, waterbodies and fish/wildlife)
	• France 2017, Ministry of Environment, Energy and the Sea, Décret no 2017-291	• Bans rinse-off cosmetic products for exfoliation or cleaning that contain solid plastic particles	• Potential effects on environment (marine environment, waterbodies and food chain)
	• Canada, 2017, Microbeads in Toiletries Regulations (SOR/2017-111)	• Prohibits manufacture, import and sale of toiletries used to exfoliate or cleanse that contain microbeads	• Potential effects on the environment and biodiversity (risk to freshwater, marine ecosystems and non-human species)
	• Taiwan 2017, EPA Waste Management Division, Administrative order	• Bans manufacture, import, use and sale of microbeads	• Potential effects on the environment
	• New Zealand 2017, Ministry of Environment, Plastic microbeads ban, 2017/291 amending the 2008 Waste Minimization Act	• Bans sale and manufacture of wash-off products containing plastic microbeads	• Potential effects on the environment (risk of non-biodegradable microbeads)

	Action	Scope	Concern
	• UK 2017, Department for Environment, Food & Rural Affairs, The Environmental Protection (Microbeads) (England) Regulations, 2017 No. 1312)	• Bans manufacture and sale of cosmetics and rinse-off personal care products with plastic microbeads	• Potential effects on biodiversity (risk to marine life)
	• Sweden 2018, Ministry of the Environment and Energy	• Bans sale of cosmetics and rinse-off personal care products with plastic microbeads	• Potential effects on biodiversity (risk to marine life)
	• UK: Northern Ireland 2018, Department of Agriculture, Environment and Rural Affairs	• Prohibits use of microbeads as an ingredient in manufacture of rinse-off personal care products and sale of any such products containing microbeads	• Potential harm to living species in the marine environment
	• UK: Scotland 2018, Marine Scotland	• Prohibits use of microbeads as an ingredient in manufacture of rinse-off personal care products and sale of any such products containing microbeads	• Potential harm to living species in the marine environment
	• UK: Wales 2018, Marine and Fisheries Division	• Prohibits use of microbeads as an ingredient in manufacture of rinse-off personal care products and sale of any such products containing microbeads	• Potential harm to living species in the marine environment
Assessment actions and reports	Canada, 2015, Microbeads – A Science Summary		
	UK 2016, the government is to conduct an investigation into the impact on human health of microplastic particles found in shellfish and other marine animals		
	Denmark 2017, Danish Environmental Protection Agency, Partnership on Microplastics in wastewater 2017		
	Sweden 2018, Swedish Chemicals Agency (KEMI), Microplastic in cosmetic products and other chemical products Report 2/18		
Inclusion in existing prioritization initiatives	Included in AMAP's Chemicals of Emerging Arctic Concern (2017)		

Neonicotinoids

	Action	Scope	Concern
Regulatory actions	• EU, EC 2013, Regulation 485/2013, amending Regulation (EU) No 540/2011 (clothianidin, thiamethoxam and imidacloprid)	• Prohibits use in bee-attractive crops	• Potential effects on biodiversity (risk to bees)
Assessment actions and reports	EU, EC 2012, EFSA pesticide risk assessment for bees for three neonicotinoids		
	EU, EC 2011, ECHA Assessment report of Imidacloprid in insecticides		
	Canada, 2012, Health Canada, Pest Management Regulatory Agency, Re-evaluation of Neonicotinoid Insecticides		
	EU, EC 2012, ECHA Assessment report of Thiamethoxam in wood preservatives and insecticides		
	EU, EC 2014, ECHA Assessment reports of Clothianidin in wood preservatives and insecticides		
	EU, EC 2014, ECHA Assessment report of Dinotefuran in wood preservatives		
	US EPA 2016, ongoing review and risk assessment to be completed in 2018/2019 (pollinator-only assessment for clothianidin, thiamethoxam, dinotefuran; updated preliminary risk assessment for imidacloprid)		
	Canada, 2016, Health Canada, Pest Management Regulatory Agency (PMRA), Proposed Re-evaluation Decision PRVD2016-20, Imidacloprid		
	Canada, 2017, Health Canada, Pest Management Regulatory Agency (PMRA), Update on the Neonicotinoid Pesticides		
	Canada, 2017, Health Canada, Pest Management Regulatory Agency (PMRA), Proposed Re-evaluation Decision PRVD2017-23, Clothianidin and Its Associated End-use Products: Pollinator Re-evaluation		
	Canada, 2017, Health Canada, Pest Management Regulatory Agency (PMRA), Proposed Re-evaluation Decision PRVD2017-24, Thiamethoxam and Its Associated End-use Products: Pollinator Re-evaluation		
	Canada, 2018, Health Canada, Pest Management Regulatory Agency (PMRA), Proposed Re-evaluation Decision PRVD2018-12, Imidacloprid and Its Associated End-use Products: Pollinator Re-evaluation		
	Canada, 2018, Health Canada, Pest Management Regulatory Agency (PMRA), Proposed Special Review Decision PSRD2018-01, Clothianidin: Special Review of Risk to Aquatic Invertebrates		
	Canada, 2018, Health Canada, Pest Management Regulatory Agency (PMRA), Proposed Special Review Decision PSRD2018-02, Thiamethoxam: Special Review of Risk to Aquatic Invertebrates.		
	EU 2018, EFSA, Evaluation of the data on clothianidin, imidacloprid and thiamethoxam for the updated risk assessment to bees for seed treatments and granules in the EU		
Inclusion in existing prioritization initiatives	-		

Organotins

	Action	Scope	Concern
Regulatory actions	Canada, 2012 Prohibition of Certain Toxic Substances Regulations (Tributyltins , which contain the grouping (C4H9)3Sn added in 2013)	Prohibits the manufacture, use, sale, offer for sale or import of the substance, and products containing it	Potential effects on the environment or its biological diversity
	EU, EC 2014, Regulation 1257/2013 on ship recycling and amending Regulation (EC) No 1013/2006 and Directive 2009/16/EC	Restricts use of anti-fouling systems containing organotin compounds as a biocide	Potential effects on health and marine environment
	China 2015, Merchant Shipping (Control of Harmful Anti-Fouling Systems on Ships) Regulation, L.N. 54 of 2015	Bans organotin compounds acting as biocides in anti-fouling systems of ships	Potential effects on health and marine environment
	Thailand 2017, Department of Labour Protection and Welfare of Thailand, notification on concentration limits of dangerous chemicals. Gazette: Book 134 Special Episode 198	Limits concentration of cyhexatin (tricyclohexyltin hydroxide) in the workplace and in hazardous chemical storage facilities	Potential health effects (risk to workers)
	Canada, 2018 Guideline for the environmental management of tin stabilizers in Canada in 2018	This guideline addresses in-plant handling methods for tin stabilizers and also the management of tin stabilizer packaging.	Harmful effects to aquatic organisms if allowed to enter the aquatic environment
Assessment actions and reports	Canada 2010, Health Canada, Pest Management Regulatory Agency (PMRA), Re-evaluation Decision - Tributyltin Compounds (RVD1017-01);		
	Canada 2010, Health Canada, Pest Management Regulatory Agency (PMRA), Proposed Re-evaluation Decision, Tributyltin Compounds (PRVD2010-11); Canada 2002, Health Canada, Pest Management Regulatory Agency (PMRA), Special Review Decision, Tributyltin Antifouling Paints for Ship Hulls (SRD2002-01)		
	Denmark 2013, Danish Tributyltin compounds (TBT) assessment, Environmental Project No. 1524, 2013		
Inclusion in existing prioritization initiatives	Global Environment Facility (GEF) Scientific and Technical Advisory Panel (STAP), *GEF Guidance on Emerging Chemicals Management Issues in Developing Countries and Countries with Economies in Transition* (2012)		

Polycyclic aromatic hydrocarbons (PAHs)

	Action	Scope	Concern
Regulatory actions	EU, EC 2014, Regulation 1272/2013, amending Annex XVII to Regulation (EC) No 1907/2006 REACH Restriction List (8PAHs)	Restriction extended to rubber and plastic components of article with direct and prolonged or short-term repetitive contact with skin or mouth	Potential health effects (risk to consumers and children)

	Action	Scope	Concern
	Germany 2014, Product Safety Commission, "Testing and Assessment of PAHs" (18 PAHs)	Restricts PAH content in articles and consumer products	Potential health effects (risk to consumers)
	EU, EC 2015, Regulation 2015/1933, amending Annex XVII to Regulation (EC) No 1907/2006 (REACH Restriction List)	Restricts sale and sets maximum levels PAHs in certain foodstuffs	Potential health effects
	Turkey 2017 Ministry of Environment and Urbanization (MoEU), KKDIK regulation (REACH-like regulation) Annex 17 (8 PAHs)	Restricts PAH content in articles and consumer products	Potential health effects (risk to consumers and children)
Assessment actions and reports	Denmark 2013, Danish EPA, Polyaromatic Hydrocarbons (PAH) Evaluation of health hazards and estimation of a quality criterion in soil, Environmental Project No. 1523, 2013		
Inclusion in existing prioritization initiatives	Global Environment Facility (GEF) Scientific and Technical Advisory Panel (STAP), *GEF Guidance on Emerging Chemicals Management Issues in Developing Countries and Countries with Economies in Transition* (2012) Norwegian Environment Agency's List of Priority Substances (as of 2017) Arctic Monitoring and Assessment Programme (AMAP) Chemicals of Emerging Arctic Concern (2017)		

Phthalates

	Action	Scope	Concern
Regulatory actions	• Republic of Korea 2014, Ministry of Food and Drug Safety, Regulations on medical device approval, notification and examination (3 phthalates: DBP, BBP and DEHP)	• Prohibits the production, import sale or use of intravascular administration medical devices containing phthalates	• Potential health effects (risk to lactating women, pregnant women, newborn babies, infants, children and the elderly)
	• EU, EC 2015, Directive (EU) 2015/863, amending Annex II to Directive 2011/65/EU (4 phthalates: DEHP, BBP, DBP, DIBP)	• Restricts use in all electrical and electronic equipment (apart from medical devices and monitoring and control equipment)	• Potential health effects (risk to workers)
	• China 2015, General Administration of Quality Supervision, Inspection and Quarantine and the Standardization Administration, New Safety Technical Code for Infants and Children Textile Products (6 phthalates: DEHP, DBP, BBP, DINP, DNOP, DIDP)	• Restricts use in infants' and children's textile products	• Potential health effects (risk to infants and children)
	• China 2016, National Food Safety Standard GB9685-2016 (4 phthalates: DMP, DIBP, DIOP, DIDP)	• Prohibits use as additives in food contact materials	• Potential health effects (risk to consumers)

	Action	Scope	Concern
	• Canada, 2016, Canada Consumer Product Safety Act, Phthalates Regulations (6 phthalates: DEHP, DBP, BBP, DINP, DIDP, DNOP)	• Restricts concentrations of DEHP, DBP, and BBP to 1 000 mg/kg in the vinyl of a toy or child care article • Restricts concentrations of DINP, DIDP, and DNOP to 1 000 mg/kg in the vinyl in any part of a toy or child care article that can be reasonably be mouthed by a child under four years of age	• Potential health effects
	• United States (US) 2017, Consumer Product Safety Commission (CPSC), Prohibition of Children's Toys and Child Care Articles Containing Specified Phthalates under section 108 of the Consumer Product Safety Improvement Act of (2008) (5 phthalates: DIBP, DPENP, DHEXP, DCHP, DINP)	• Prohibits children's toys and child care articles containing more than 0.1 per cent of certain phthalate chemicals	• Potential health effects (risk to males, infants and children)
Assessment actions and reports	US 2012, EPA, Phthalates Action Plan		
	EU 2013, European Chemicals Agency (ECHA), Evaluation of new scientific evidence concerning DINP and DIDP in relation to entry 52 of Annex XVII to REACH Regulation (EC) No 1907/2006		
	India 2016, Ministry of Health and Family Welfare, Report of the Committee to assess the health and environmental impact of the use of Polyethylene Terephthalate (PET) or Plastic containers for primary packaging of drug formulations		
	Canada 2017, Draft Screening Assessment for the Phthalate Substance Grouping		
	EU 2018, ECHA, Committee for Risk Assessment Opinion proposing harmonized classification and labelling at EU level of DINP		
Inclusion in existing prioritization initiatives	Global Environment Facility (GEF) Scientific and Technical Advisory Panel (STAP), GEF Guidance on Emerging Chemicals Management Issues in Developing Countries and Countries with Economies in Transition (2012) Chemicals/groups of chemicals for which the US EPA issued a Chemical Action Plan (2011) Norwegian Environment Agency's List of Priority Substances (as of 2017) Arctic Monitoring and Assessment Programme (AMAP) Chemicals of Emerging Arctic Concern (2017)		

Triclosan

	Action	Scope	Concern
Regulatory actions	• EU, EC 2014, Regulation (EU) No 358/2014 of 9 April 2014 amending Annexes II and V to Regulation (EC) No 1223/2009 of the European Parliament and of the Council on cosmetic products	• Restricts maximum concentration of triclosan in certain cosmetic products	• Potential health effects
	• US 2016, Food and Drug Administration (FDA) final rule on safety and effectiveness of antibacterial soaps	• Restricts placing on market of over-the-counter (OTC) consumer rinse-off antiseptic wash products containing triclosan and 18 other active ingredients	• Potential health effects
	• EU, EC 2016, Implementing Decision (EU) 2016/110 of 27 January 2016 not approving triclosan as an existing active substance for use in biocidal products for product-type 1	• Restricts use of triclosan as an active substance in human hygiene biocidal products	• Potential effects on the environment (unacceptable risks for surface water and secondary poisoning of non-target species)
	• Canada, 2018, Triclosan was added to the List of Toxic Substances of the Canadian Environmental Protection Act, 1999.	• An instrument is currently under development to manage the risk triclosan poses to the environment	• Potential effects on the environment and biodiversity
Assessment actions and reports	Canada, 2016, Environment and Climate Change Canada Health Canada, Assessment of Triclosan - found that it is toxic to the environment above certain levels, but is not toxic to humans at current levels of exposure		
	EU 2015, ECHA. Opinion on the application for approval of the active substance: Triclosan Product-type: 1		
Inclusion in existing prioritization initiatives	Norwegian Environment Agency's List of Priority Substances (as of 2017)		

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