FIFTH EDITION

Information Resources in Toxicology

Edited by
PHILIP WEXLER
Steven G. Gilbert | Asish Mohapatra
Sol Bobst | Antoinette Hayes
Sara T. Humes

VOLUME TWO:
THE GLOBAL ARENA

INFORMATION RESOURCES IN TOXICOLOGY

FIFTH EDITION

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Volume 2: The Global Arena

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The authors and editors have tried to assure that individual chapter information related to NLM resources, as well as those originating elsewhere, is current as we were going to press. Inevitably there is a gap in time between seeing proofs and actual hard copy monograph publication. In short, this note is intended as a caveat for readers to dig further if, for example, a particular resource seems to be no longer available or a URL may not work.

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DEDICATIONS, WITH LOVE

Philip Wexler

To my wife, Nancy; mom, Yetty; dad, Will (in memory of); son, Jake; and spaniel mix, Gigi

Steven G. Gilbert

To knowledge, may it lead to truth.

Asish Mohapatra

To my wife Sarah, daughter Maya, my Mom (Kanak), and Dad (Mahendra)

Sol Bobst

I dedicate this edition to Jessica Culley, for her love and support of my projects and business, and for being gracious with me and my idiosyncrasies.

Antoinette Hayes

To my husband and fellow scientist Martin, my son Tauer, and my daughter Gigi

Sara T. Humes

To my husband Richard and my parents Ed and Maria

As Well As

To the many casualties of the 2020 global COVID-19 pandemic and the brave, caring, and generous people helping us get through it and return to normalcy.

and

With appreciation to the scientists and other good people working to reverse the ravages of pollution and global climate change and take us to a habitable, clean, healthy, and sustainable environment.

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Foreword to Fourth (previous) Edition

Toxicology, like other sciences, has developed in phases. Toxicologists, however, claim that the initial phase of our discipline preceded that of most other biological sciences since it involved recognition by primitive man of the safe and dangerous agents in his environment. The next phase (antiquity and the Middle Ages) was characterized by the use of this information for good (therapeutics) and evil (poisoning). It was during the Renaissance that Paracelsus recognized the importance of the dose–response paradigm, and this marked the beginning of modern toxicology. Today toxicology is focused on molecular mechanisms, and using the Internet to store and exchange this and other information is becoming a key part in the evolution of toxicology. A major problem with using the Internet in toxicology is that the amount of information is overwhelming and that it varies greatly in quality. *Information Resources in Toxicology* addresses this problem by providing a roadmap for today's online enthusiast, and an annotated bibliography for other information sources in toxicology. This book is a gold mine for those of us who make lists of our favorite toxicology and regulatory websites, and will be invaluable to everyone who wants to know where to find general and specific information in all areas of toxicology and risk assessment in the United States and around the world.

The fourth edition of *Information Resources in Toxicology* reflects the exponential growth of our discipline. Despite the book's increased size, it is easier to navigate because its many chapters have been logically clustered into relatively few sections. Each chapter in the global arena and subject categorization sections has been written by a well-recognized expert to insure that it is both authoritative and current. Similarly, the chapters on the Internet and Digital Tools and Special Topics (legal, education, funding, etc.) provide a pragmatic hands-on approach that will be of immense value to scientific researchers not well versed in such ancillary concerns. The section on Other Resources offers chapters on print media (journals, newsletters, bibliographies and similar collections, agency and organization documents and reports, etc.), as well as a delightful chapter on General Interest and Popular Works which nicely supplements the chapters on Scientific Principles and History in the introductory section.

John Doull
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Foreword to Fifth Edition

Toxicology is a paradoxical science; it has been used to kill and to cure. Like a living system, toxicology has a dynamic that reflects the almost daily changes in our understanding of biology and the interests, capabilities, and needs of toxicologists, regulators, and the public. Toxicologists must be involved in the decision-making processes, recognizing the need for scientific understanding, including translation of scientific findings into understandable terms that are suitable for decision-making and ensuring consistent prediction of hazards and risks before the actual exposure has occurred and to permit benefit–risk assessments of the consequences for such exposure.

Remember the scares about artificial sweeteners, pesticide residues in foods, genetically modified organisms, fluoride in toothpaste and drinking water, plasticizers, and flame-retardant chemicals? The problem generally comes from a narrow focus on an effect in isolation without giving equal weight to the biology of the system or species and the exposure. There often has been a lack of caution in extrapolating toxicity to other species and circumstances. How often do we have to relearn Paracelsus' fundamental concept about the primacy of the dose?

The *5th edition* of *Information Resources in Toxicology* helps with many of these misconceptions by guiding the toxicologist, the regulator, and the public health official to the numerous resources on the internet as well as providing a bibliography for an array of other information resources. This guidance directs the reader to both general and specific information in toxicology and risk assessment in the broadest global sense.

This new 5th edition somehow manages to contain the explosive growth of toxicology and risk assessment and the ever-increasing big data explosion in a mere two volumes. They are organized in a logical manner with chapters clustered appropriately, making for an easy read and for readily finding information, especially in exploring online sources. Part III (Other Resources) is unique, and may be the most useful, section of Volume I. Arranged by various resource formats, it complements the other specialized topical chapters. Volume II (The Global Arena) highlights resources available across the globe. The book is well indexed for quick and easy referencing. Chapter authors represent an array of experts, well recognized in the areas for which they have been asked to write. This is a tome that should be on your bookshelf.

A. Wallace Hayes

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Preface

The 1st edition of this work, *Information Resources in Toxicology* (IRT), was published in 1982, almost ancient times by scientific reckoning. Toxicology, back then, although not quite a fledgling science, had yet to achieve maturity. The evolution of its experimental and theoretical underpinnings was gradual and continues to be refined, although its standing as a peer of other scientific disciplines has for some time now been assured.

The societal impact of toxicology lends it a layer of practical relevance that not every science can claim. Given that we cannot avoid interacting with xenobiotics on a daily basis, toxicology is, in a sense, integral to our lives. News reports of toxicological incidents continue to fascinate and alarm. The media regularly reminds us of old and ongoing, or new and emerging, concerns to broad segments of the population, be it the exposure of inner-city residents, particularly children, to lead exposure, the scourge of tobacco and smoking (and now new potential dangers of vaping), human and animal food poisoning, the health effects of pesticides on homeowners, applicators, and their families, or the bourgeoning opioid crisis. Individual incidents whether high profile cases cloaked in intrigue such as the nerve agent poisonings of four people in Britain, victims of a suspected Russian assassination attempt, or the average (perhaps not quite average) Virginia man who pleaded guilty to attempting to kill his 95-year-old mother-in-law by spiking her coffee with methamphetamine, easily grab world and local headlines.

On the scale of the wider environment, chemicals are ubiquitous and adamant in their refusal to respect geographic boundaries. Developing countries with bourgeoning economies are fueling much of this pollution, compromising the health of their citizens and people at a distance. And yet asking the developing world to eschew rapid economic progress in favor of a paced and sustainable approach for the benefit of the Earth and future generations, requires discussion, diplomacy, compromise, and patience. While piecemeal efforts are being made around the globe to limit greenhouse gas emissions and otherwise rein in chemical releases, there is no international coordinated approach available, although the United Nations' Paris Agreement, ratified by 185 Parties as of April, 2019 is a start. Much work remains to be done. Those who ignore the reality of global climate change do so at the peril of the Earth and civilization.

The current 5th edition's (IRT-5) overall structure and goals adhere closely to those established in the previous four editions. The intent remains to provide an extensive annotated bibliography and sourcebook to information in toxicology, a compilation of references to key documents, organizations, and other resources. The extent to which digital versions of these resources, either complementing or replacing traditional paper formats, has expanded, is considerable. It becomes an ever greater challenge to encompass the diversity and multiple nodes of toxicology within a single publication such as this one. However, the editors felt that despite the pervasiveness of information on the Internet, its search capabilities, and free availability, there were still significant advantages to a structured compendium, avoiding much of the extraneous information widely scattered on the Web, and focusing on the relevant, regardless of format. For some, hard copy books, remain the reference tool of choice, even today. But IRT-5's availability on Elsevier's Science Direct gives readers more comfortable with the digital environment, the option of also navigating and searching the book's content in an online environment.

IRT-5 also benefits from being a highly curated work. The resources have been selected by six editors and well over 100 authors, prominent leaders in toxicology with expertise in the various topical and geographical areas represented in the chapters. Readers can feel confident that the resources here have not been indiscriminately thrown together but selected for quality and organized to facilitate efficient retrieval.

The dual stream of advances in the science of toxicology itself and in the information technology to assist in its research and deliver its results has resulted in an array of new tools for generating, capturing, organizing, and disseminating data. These Web tools and resources have been extensively covered in this new edition.

Toxicology's forward scientific advance has resulted in the blossoming of a host of new areas ripe for

further investigation. Emerging subjects, such as "-omics" (including transcriptomics), nanotechnology, high-throughput screening, predictive modeling, alternative test systems, utilizing new biochemical reactivity assays, humans on a chip, etc., are joined with new perspectives on issues rooted in the past (e.g., chemical and biological warfare, animal welfare, effects of mixtures, risk assessment, ethical concerns). The Tox21 initiative (Toxicology in the 21st Century), for example, is a US federal research collaboration aimed at developing methods to rapidly and efficiently evaluate the safety of commercial chemicals, pesticides, food additives and contaminants, and medical products. The US Environmental Protection Agency, the National Toxicology Program, the National Center for Advancing Translational Sciences, and the Food and Drug Administration constitute the consortium which formed Tox 21.

And who can tell what the implications will be of other cutting edge and still to come technologies such as robotics. To what extent, for example, will drones help us monitor and perhaps neutralize carbon emissions and other sources of pollution. Or, for that matter, the recent creation of the world's first 3D printed heart using human tissue may offer a new approach to noninvasively testing toxic agents on human organs.

Although the focus of toxicology has always been on chemicals, the scope of each edition of IRT, including this one, has included biological and physical agents, particularly radiation, since their potentially hazardous effects are widespread and part and parcel of the science.

The online Web environment is now an inevitable part of the professional and personal lives of most of us in the developed world, and remote and economically deprived regions are catching up quickly. Google, Wikipedia, blogs, online social networking, virtual environments, and 5G networks, have entered our daily vocabulary and lives, and offer ever more novel approaches to make sense of raw, sprawling information, offering ways to make it find just what we are looking for whenever, wherever. Toxicology has benefited from these technologies.

IRT-5 also continues the tradition of being as globally encompassing as practicable. We have included virtually all the countries from the 4th edition plus added over a dozen more, highlighting their most significant toxicological information resources. A separate chapter looks at multilateral activities, including international conventions and initiatives relevant to the science.

Thanks are due, foremost, to my five Associate Editors, Sol Bobst, Steve Gilbert, Toni Hayes, Sara Humes, and Asish Mohapatra. Their unparalleled knowledge of the science and significance of toxicology and its information infrastructure proved invaluable. Our overlapping networks of well-informed colleagues from whose ranks we drew chapter contributors, and our ability to work well together, made the creation of this book a smooth and enjoyable process. And, of course, our many contributors, among whom the above editors are also included, form both the backbone of the book and the cement which holds it together.

Additional acknowledgment and praise is due to Kattie Washington, Megan Ashdown, and Punithavathy Govindaradjane, our Acquisitions, Developmental, and Production Editors respectively, and other staff on down the Elsevier line, for recognizing the value of a 5th edition, nudging it through its amorphous beginning and helping it solidify into a well-designed whole.

Editor-in-Chief
Philip Wexler

CHAPTER

1

Overview of international activities

Jens Küllmer and Ulrich Schlottmann

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The risks connected with chemical substances have been assessed in a number of conventions that have aimed to apply restrictions on the use of dangerous chemicals, and control of their worldwide trade. The developments in chemicals policy at the European and world level are discussed, with an insight into the interlaced structure of international cooperation that exists at both the political and the technical level.

Introduction

The industrialization that the world has achieved in the past 200 years is inextricably connected with the production and use of chemicals. According to OECD estimates, sales are twice as high as in the telecommunications sector. Chemical products have undoubtedly contributed to a substantial improvement in the quality of life. Plastics, surfactants, and a large number of basic chemicals are improving the medical and hygienic situation worldwide. However, numerous toxic substances present risks and hazards that occur during the entire life cycle of a substance: during production, during transport and trade, and during storage, use, and disposal. Awareness of environmental and health risks has grown over the last 20 years. Today this is making itself felt in an increasingly complex set of international regulations on chemical safety. The focus is increasingly shifting toward the developing countries and their populations, as people there are less aware of the risks and hazards than those in the industrialized countries. Today the worldwide spread of persistent, bioaccumulating, and toxic chemicals by air or water, their occurrence in places where they are not used, and the destruction of the ozone layer are making it clear to everyone that chemical safety is an international challenge and not just an empty phrase. But it should not be necessary for risks arising from chemicals to assume international dimensions before action is taken. That is why national or European regulations provide an appropriate framework for a large number of chemicals. Moreover, national laws and European Community (EC) legislation are enforceable law. Compliance with this law is monitored, while noncompliance is prosecuted and punished.

International activities

Protocols and conventions

The Montreal Protocol

The gaps in the ozone layer over the polar region present a threat to humans, animals, and plants, because of the increase in UV-B radiation reaching the surface of the earth.

This natural protective shield has been damaged by the worldwide use of ozone-depleting substances (ODS), such as chlorofluorocarbons (CFCs) and halons, which are used for fire protection materials. The Montreal Protocol (MP) is the international contractual basis for the United Nations worldwide program for discontinuing the use of ODS. The year 2017 marks an important milestone for the MP: it is the 30th anniversary of the treaty's signature. It is thus an opportune time to reflect on why the MP is well on its way to achieving its goals.

Thirty years ago, 46 countries undertook to stop producing and using substances that were damaging to the ozone layer. In the meantime 191 countries have signed this protocol. The signatory states are responsible for a total of over 90% of the consumption of these substances. The original target (from 1987) of halving

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the consumption of CFCs by the year 2000 has since been raised considerably on a number of occasions in light of the alarming reports on the status of the ozone layer. For example, the production of CFCs in the industrialized countries was discontinued at the beginning of 1996. The amendment to the MP that was passed in Peking in 1999 states that from 2002 onward the production and use of the substance bromochloromethane, which can be used as a solvent and fire extinguisher, is to be totally banned in the signatory states. This amendment and the treaty modifications adopted at the same meeting were transposed into European law by decree of the EC Council. It follows from the reasons given for this decision that additional steps must be taken to monitor trade in ODS, especially partially halogenated CFCs and new substances. Methyl bromide remained unnoticed by the public for a very long time; this is despite the fact that one atom of bromine destroys 80 times more ozone than a chlorine atom (Zellner, 2001). Thus the bromine content of a compound such as methyl bromide is more reactive and has a greater impact on stratospheric ozone than the chlorine content of CFCs. This pesticide has nevertheless been in use for decades as a preferred means of treating arable land. In Germany its use in the agricultural sector was banned in 1982 owing to its harmful effects on the groundwater. Since then most of the industrialized countries have banned the use of methyl bromide. Under the MP, the United States agreed a ban on methyl bromide in 2005 and the developing countries by 2015.

The MP is closely linked to the Convention on Climate Change (Kyoto Protocol, into force since February 2005). The climate protection already achieved by the MP is far larger than the reduction target of the first commitment period of the Kyoto Protocol (Velders et al., 2007). Additional climate benefits that are significant compared with the Kyoto Protocol reduction target could be achieved by actions under the MP, by managing the emissions of substitute fluorocarbon gases and/or implementing alternative gases with lower global warming potentials (http://www.uneptie.org/ozonaction).

The Stockholm Convention (POPs)

The POPs Convention implements international prohibition and restriction measures with regard to certain persistent organic pollutants (POPs). The core of the Convention is that 12 particularly dangerous POPs for the environment are to be prohibited or reduced until they are totally eliminated. The dynamic design of the rules of the Convention allows the original POPs substances to be joined by further substances that meet the four criteria of persistency, bioaccumulation, long-range transport potential, and harmful properties. The POPs Convention prohibits the following chemicals: aldrin, dieldrin, endrin, chlordane, mirex, toxaphene, heptachlor, hexachlorobenzene, di(para-chlorophenyl), trichloroethane (DDT), polychlorinated biphenyls (PCBs), polychlorinateddibenzodioxins, and polychlorinated dibenzofurans. With the exception of DDT, which may still be produced and used on a country-specific basis for combating malaria, and of unwanted by-products, all other substances are listed in the Appendix (Appendix A) to the Convention, which regulates the phasing out of the production and use of these substances. The production and use of DDT for vector control will remain necessary until inexpensive alternatives become available. The relevant countries must inform the United Nations Environment Program (UNEP) on Chemicals and the World Health Organization (WHO) about the use of DDT. The Secretariat, in cooperation with WHO, holds reviews periodically to gather information about the amounts of DDT used by Parties, the conditions of such use and its relevance to that Party disease management strategy. The use of DDT as a pesticide in the agricultural sector is however prohibited.

In May 2001 the signatory conference for the POPs Convention took place in Stockholm. The Convention entered into force once it had been ratified by 50 countries. This was the case on May 17, 2004. Up to November 2018 there had been 182 ratifications. April 2004 saw the introduction of Regulation (EC) No. 850/2004 of the European Parliament and the Council on POPs (http://www.pops.int).

The Rotterdam Convention (PIC)

According to estimates by the World Health Organization (WHO), about one million accidents each year are caused worldwide through poisoning from pesticides. The worldwide trade in dangerous chemicals is merely the beginning of the life cycle of a chemical; it is followed by storage, use, and the disposal of residual stocks. That is why steps should be taken as early as the trade stage to ensure that dangerous chemicals do not adversely affect man and the environment. This applies particularly to developing countries, most of which are today suffering from the effects of incorrect usage. For this reason, a meeting of the International Community of States in Rotterdam in 1998 decided to adopt a convention defining binding rules for the trade in dangerous chemicals (PIC Convention). In accordance with the precautionary principle, this convention allows states to impose a ban on imports before a chemical is imported. This does not prohibit trade in chemicals, but makes

it subject to very stringent rules, namely the "PIC procedure," where PIC stands for "prior informed consent." In the context of imports, this means that the potential importing country must be informed about the chemical and take a decision before the chemical is actually imported.

The Convention covers pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons by Parties and which have been notified by Parties for inclusion in the PIC procedure. One notification from each of two specified regions triggers consideration of addition of a chemical to Annex III of the Convention. Severely hazardous pesticide formulations that present a hazard under conditions of use in developing countries or countries with economies in transition may also be nominated for inclusion in Annex III. There are 39 chemicals listed in Annex III of the Convention and subject to the PIC procedure, including 24 pesticides, four severely hazardous pesticide formulations, and 11 industrial chemicals. Many more chemicals are expected to be added in the future. The Conference of the Parties decides on the inclusion of new chemicals. Once a chemical is included in Annex III, a "decision guidance document" containing information concerning the chemical and the regulatory decisions to ban or severely restrict the chemical for health or environmental reasons is circulated to all Parties. Parties have 9 months to prepare a response concerning the future import of the chemical. The response can consist of either a final decision (to allow import of the chemical, not to allow import, or to allow import subject to specified conditions) or an interim response. Decisions by an importing country must be trade neutral (i.e., apply equally to domestic production for domestic use as well as to imports from any source). The import decisions are circulated and exporting country Parties are obligated under the Convention to take appropriate measure to ensure that exporters within its jurisdiction comply with the decisions.

The Convention promotes the exchange of information on a very broad range of chemicals, through:

- requirement for a Party to inform other Parties of each national ban or severe restriction of a chemical;
- possibility for Party which is a developing country or a country in transition to inform other Parties that it is experiencing problems caused by a severely hazardous pesticide formulation under conditions of use in its territory;
- requirement for a Party that plans to export a chemical that is banned or severely restricted for use within its territory to inform the importing Party that such export will take place, before the first shipment and annually thereafter;
- requirement for an exporting Party, when exporting chemicals that are to be used for occupational purposes, to ensure that an up-to-date safety data sheet is sent to the importer; and
- labeling requirements for exports of chemicals included in the PIC procedure, as well as for other chemicals that are banned or severely restricted in the exporting country.

The text of the Convention was adopted on September 10, 1998, by a Conference of Plenipotentiaries in Rotterdam, the Netherlands. The Convention entered into force on February 24, 2004, once it had been ratified by 50 countries. Up to date (November 2018) there are 160 ratifications.

Spring 2003 saw the introduction of Regulation (EC) No. 304/2003 of the European Parliament and the Council on the Export and Import of Dangerous Chemicals. This superseded the existing Council Regulation (EEC) No. 2455/92 (July 1992) concerning the Export and Import of Certain Dangerous Chemicals. No reductions were to be made in the level of environmental and health protection in the importing countries. In order to achieve this goal, some of the provisions go beyond those of the PIC Convention. This conforms with Article 15, Paragraph 4 of the PIC Convention, which states that the contracting parties may take measures that provide more stringent protection for human health and the environment than laid down in the Convention, provided these measures are compatible with the Convention and with international law. The EC also considered it advantageous in terms of practicability that there should be a single agency responsible for contact between the EC, the PIC Secretariat, other contracting parties, and other countries. The Commission has assumed the function of the point of contact for this purpose. Exports of dangerous chemicals that are prohibited in the Community or subject to strict restrictions continue to be subject to a joint export notification procedure. In the case of imports, the EC must take decisions before the importation of chemicals that are subject to the international PIC procedure is allowed. The fact that exporters and importers are obliged to furnish information on the quantities of chemicals in international trade that are covered by this Regulation makes for better monitoring and assessment of the impacts and effectiveness of this Regulation (http://www.pic.int).

The Basel Convention

The cross-border transport of hazardous wastes seized the public's attention in the 1980s after

misadventures of "toxic ships" sailing from port to port trying to offload the poisonous cargoes.

The Basel Convention regulates the transboundary movements of hazardous and other wastes, applying the "Prior Informed Consent" procedure. Shipments to and from non-Parties are illegal unless there is a special agreement. Each Party is required to introduce appropriate national or domestic legislation to prevent and punish illegal traffic in hazardous and other wastes. The Convention obliges its Parties to ensure that hazardous and other wastes are managed and disposed of in an environmentally sound manner. Therefore Parties are expected to minimize the quantities that are moved across borders, to treat and dispose of wastes as close as possible to their place of generation, and to prevent or minimize the generation of wastes at source. Strong controls have to be applied from the movement of generation of hazardous waste to its storage, transport, treatment, reuse, recycling, recovery, and final disposal. Recently the Basel Conventions handled issues like electronic and electrical wastes (e-waste), mercury and asbestos wastes, and illegal dumping of hazardous wastes. The Convention entered into force May 5, 1992. Up to November 2018 there had been 186 ratifications. For more information: https://www.basel.int.

The Aarhus Convention

The United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters was adopted on June 25, 1998, in the Danish city of Aarhus at the Fourth Ministerial Conference as part of the "Environment for Europe" process. It entered into force on October 30, 2001. The Convention establishes a number of rights of the public (individuals and their associations) with regard to the environment. It provides for the right of everyone to receive environmental information that is held by public authorities, to participate in environmental decision-making, and the right to review procedures to challenge public decisions that have been made.

Autumn 2006 saw the introduction of Regulation (EC) No. 1367/2006 of the European Parliament and the Council on the application of the provisions of the Aarhus Convention in Environmental Matters to Community institutions and bodies. Bodies, offices or agencies established by, or on the basis of the EC Treaty, had to adapt their internal procedures and practices to the provisions of the Regulation until June 28, 2007. For more information: https://www.unece.org/env/pp/introduction.html.

The Minamata Convention on Mercury

The Minamata Convention provides that it shall enter into force on the 90th day after the date of deposit of the 50th instrument of ratification, acceptance, approval, or accession. That milestone was reached on May 18, 2017, allowing the Convention to enter into force on August 16, 2017, once it had been ratified by 50 countries. Up to November 2018 there had been 101 ratifications.

For more information: http://www.mercuryconvention.org.

Intergovernmental forums and activities

The Stockholm Conference

The Stockholm Conference, held June 5–16, 1972, in Stockholm, was an environmental watershed (Engfeldt, 2002). The Conference adopted recommendations for action at the international level. As a result of the Conference, environment ministries and agencies were established in more than 100 countries, a key requirement for carrying forth the results of the Conference. It also marked the beginning of the explosive increase in nongovernmental and intergovernmental organizations dedicated to environmental preservation. The United Nations Environment Program (UNEP) was established.

The Declaration and the Action Plan of Stockholm have been particularly instrumental in the rapid development of international environmental law.

The United Nations Conference on Environment and Development

The first Conference on Environment and Development (UNCED) was held in Rio de Janeiro in 1992, in which the positive experiences of the MP were maintained. Numerous heads of state and heads of government approved Chapter 19 of Agenda 21, which sets out details of the principles for internationally effective chemical safety. This chapter contains objectives for environmentally sound handling and use of chemicals, including measures to prevent illegal international trade in toxic and dangerous products. An important point is the intensification of international cooperation and the coordination of ongoing international and regional activities (www.un.org/geninfo/bp/enviro.html).

The World Summit on Sustainable Development

Ten years after the conference in Rio de Janeiro (UNCED), the World Summit for Sustainable Development (WSSD) in Johannesburg ended with the approval of the declaration tabled by South