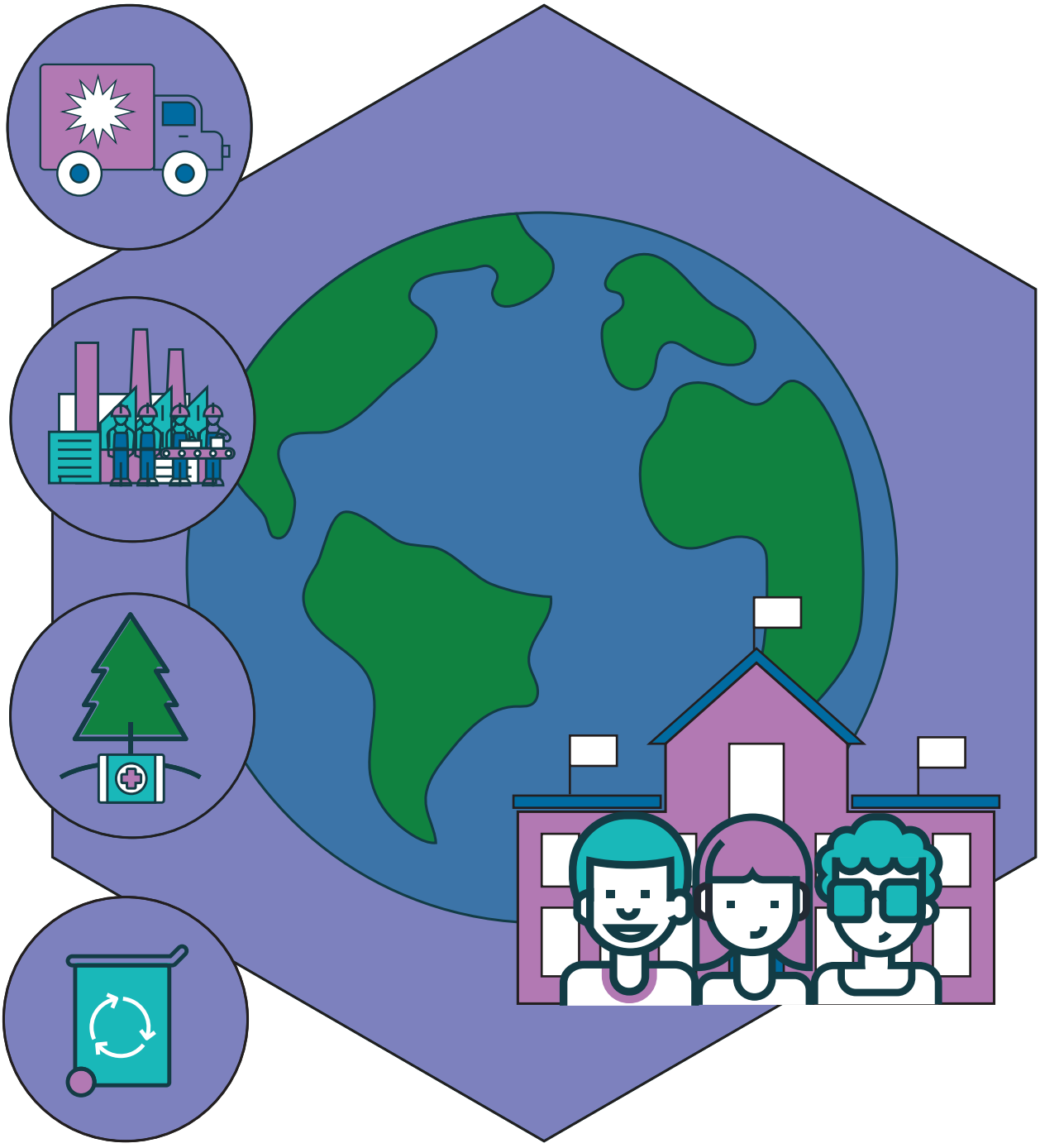
UNEP GUIDANCE

Risk Reduction Tools for Chemicals Control



UNITED NATIONS ENVIRONMENT PROGRAMME

UNEP GUIDANCE

Risk Reduction Tools for Chemicals Control

EXECUTIVE SUMMARY

Tens of thousands of chemicals exist in commercial products and processes, many of which have hazardous properties. Risk reduction measures aim to protect human health and the environment from the adverse effects of these hazardous chemicals.

The establishment and implementation of legal frameworks for industrial and consumer chemicals is an aspect of sound chemicals management still lacking in many countries, especially in developing countries. In most countries, pesticides are covered in separate legislation and are often subject to stringent requirements. The term "chemicals control" is used to refer to the regulation of industrial and consumer chemicals before or at the point when they are placed on the market in a country. In parallel to establishing the legal requirements, the related institutional capacity needs to be established or improved.

Adopting chemicals control legislation and establishing the related institutional capacity to manage chemicals at an early stage is a cost-effective way of strengthening national chemicals management systems. The United Nations Environment Programme's (UNEP) 2015 publication, *Guidance on the Development of Legal and Institutional Infrastructures and Measures for Recovering Costs of National Administration* (LIRA Guidance), offers suggestions on ways to establish chemicals control legislation and institutional capacity.

This guidance document aims to support technical government officials who are working to build government capacity for reducing the potential risk to human health and the environment from chemicals. It supplements the suggestions in the LIRA Guidance, by further describing risk reduction tools for reducing or eliminating these risks. It provides information on the prioritization of chemicals for cost-efficient risk reduction; the range of risk reduction tools for chemicals; and options for choosing appropriate risk reduction tools.

Key concepts of risk reduction in a chemicals control context include:

- **A preventive approach.** This concept is embodied in the "Precautionary Principle" (from the 1992 Rio Declaration), which states that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. A preventive approach reduces costs and is the most effective approach for protecting health and the environment.

- **Implementing GHS.** Implementing the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) in national legislation is the core element of integrating risk reduction into daily operations with chemicals. These resources provide essential information on safe handling and risk reduction in the supply chain.

- **Clear roles and responsibilities.** Legislation should clearly define roles and responsibilities for manufacturers and importers. These include gathering information on chemical properties, hazards and risks; classifying and labelling chemicals in accordance with the GHS; disseminating information on hazardous properties of chemicals, including providing Safety Data Sheets (SDSs) to professional users; complying with bans and restrictions; and adopting safer substitutes for hazardous chemicals when possible. Downstream users of chemicals should comply with risk management measures, choose the safest chemical, and handle the chemicals they use or dispose of in a safe way. Government should ensure that all actors in the supply chain apply relevant risk management measures.

Prioritizing chemicals for risk reduction

Chemicals subject to risk reduction measures to be introduced by authorities can be prioritized based on decisions made in other jurisdictions; the type of hazard; the degree of exposure; or a risk evaluation process.

All chemicals that have already been prioritized under multilateral environmental agreements (MEAs) should be prioritized at the national level. Further prioritization of chemicals for possible risk reduction measures can be based on additional existing lists of chemicals that pose severe and well documented risks.

If prioritization decisions have already been made in another jurisdiction, it is cost efficient to use the information generated through those decision-making processes. Many countries and organizations publish preparatory work and lists of candidates for regulation on their websites.

Chemicals can be categorized and prioritized based on their known or expected hazards. Hazard-based decision-making focuses on addressing the inherent hazards of chemicals through substitution or other approaches, rather than calculating an acceptable level of risk.

Chemicals can also be prioritized based on exposure. This includes identifying use patterns that may create widespread exposure across a population, or intense exposure for a subset of the population.

Risk evaluations that have been generated by other countries or regions should be used whenever possible. If another country has already assessed or acted upon a chemical, information is likely to be available on risk reduction measures that have been adopted, as well as background information for these measures. Countries should allow for the use of data and evaluations from other jurisdictions, as long as they comply with internationally recognized standards, such as guidelines from the Organization for Economic Co-operation and Development (OECD).

A variety of risk reduction resources are available for government and industry employees wishing to find information about chemicals. These include databases on chemical properties and information about safer alternatives. Many of these resources are publicly available; others are available for a subscription fee. These include: OECD Regulations and Restrictions; the eChemPortal; substances restricted under Registration, Evaluation, Authorization and restriction of Chemicals (REACH); California's Proposition 65 List; the Chemical Hazard and Alternatives Toolbox (ChemHAT); Decision Guidance Documents prepared for the chemicals listed in Annex III to the Rotterdam Convention; and Pharos, including the GreenScreen List Translator. For web links and descriptions of these resources, see the full guidance document.

Classification and labelling, bans, restrictions and authorization systems

Implementing the GHS as a legal requirement for all chemicals is a core element of risk reduction. Chemical manufacturers and importers should be responsible for gathering and communicating this information. Use of the GHS ensures international harmonization of the classification and labelling of all types of chemicals.

Official/harmonized classifications from other countries or regions based on the GHS criteria should be used. These are peer-reviewed by expert groups and therefore considered reliable.

Bans and restrictions regulate access to chemicals that are too hazardous to remain freely and openly available, or that a country does not have the national capacity to manage effectively. They can also help to promote the development and introduction of safer alternatives that are technically and financially viable. Bans and restrictions can exist at a variety of levels, including total bans, bans with specific exemptions, or bans or restrictions for a specific use of a chemical.

In an authorization or pre-market approval system, a manufacturer or importer must have authorization, approval or a licence before placing a chemical on the market. While many countries have laws of this kind for pesticides and pharmaceuticals, they are less common for industrial and consumer chemicals as these types of system tend to be resource-demanding both for the authorities and industry.

Additional approaches: Economic and informative instruments

Economic instruments include taxes and fees that are designed to shift markets towards safer chemicals. Economic instruments are not a good choice if the chemical poses an unacceptable risk to health or the environment. They can also be resource-demanding to administer. However, in some cases, well-designed economic instruments can be used to complement other instruments.

An informational tool aims to achieve a voluntary reduction in the use of a specific substance or group of substances. Information can be used to change behaviour and change production. Informational tools can be used as a stand-alone measure if the risk from a specific substance or group of substances is relatively low.

Public procurement requirements can be useful for steering consumption towards reduced use of a substance or product when a specific problem has been identified. They can be used to reduce risks in hospitals, schools and other public places, and to support markets for safer alternatives. Ecolabelling can drive markets towards safer chemicals by empowering consumers to make informed choices, if chemical hazard is included as a core criterion in the ecolabelling system.

Awareness of chemical hazards facilitates the introduction of other instruments. Well-informed consumers can put pressure on politicians to issue legislation aimed at reducing the use of hazardous chemicals. Government authorities play a key role in providing accurate and unbiased information to the general public and public organizations on the impacts of chemicals in the local environment.

The "Substitution Principle" refers to the obligation or option to substitute chemicals for less hazardous ones or apply an alternative technique, when possible. Some regulatory approaches create a responsibility for industry to assess potential options and choose safer alternatives.

Deciding on risk reduction tools

National legislation must be clear about the level at which a decision to reduce the risks from chemicals should be taken. All decision-making begins with collecting information about the problem, identifying risk reduction goals and choosing a risk reduction option. Industry, downstream users, other authorities and NGOs should be invited to contribute to the process.

Factors to take into account in choosing the most appropriate risk reduction instrument include efficiency, sustainability, cost and administrative burden. In choosing a risk reduction tool, countries may consider which actors are using the chemical, as well as the type of chemical hazard.

PREFACE

This document is part of a series of guidance documents that aim to complement the information provided in UNEP's 2015 publication, *Guidance on the Development of Legal and Institutional Infrastructures and Measures for Recovering Costs of National Administration* (LIRA Guidance). More specifically, it provides further information on risk reduction tools that are part of chemicals control legislation.

The approach suggested in the LIRA Guidance is referred to in this series as "chemicals control" and primarily addresses regulation of industrial and consumer chemicals before or at the point when they are placed on the market.

The series is composed of four documents with one document on the benefits of chemicals control and three guidance documents:

- Benefits of Chemicals Control
- National Authority for Chemicals Control: Structure and Funding
- Risk Reduction Tools for Chemicals Control
- Enforcement of Chemicals Control Legislation

By supporting the development of chemicals management frameworks at the national level, the LIRA Guidance and these complementary documents contribute to the priorities developed in the context of the Strategic Approach to International Chemicals Management (SAICM) and the Overall Orientation and Guidance (OOG) document, as well as the implementation of the Basel, Rotterdam, Stockholm and Minamata Conventions, and the Sustainable Development Goals under Agenda 2030.

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CONTENTS

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INTRODUCTION

CHAPTER 1

Chemicals are integral to modern life, and their sound management is a key aspect of sustainable development. Adoption and implementation of chemicals control legislation is an aspect of sound chemicals management that many countries often lack. Risk reduction measures aim to protect human health and the environment from the adverse effects of hazardous chemicals.

In this document, the term "chemicals control" is used to refer to the regulation of industrial and consumer chemicals before or at the point when they are placed on the market. This includes chemicals used in industrial processes; chemicals used in everyday life, such as cleaning products and paints; and chemicals in articles, such as clothing, furniture and electrical appliances (not including pesticides, pharmaceuticals, cosmetic products or food additives). Placing on the market means supplying or making available chemicals, whether in return for payment or free of charge. This includes imports.

Chemicals control can be addressed in free-standing law or it can be built into a broader chemicals management law or other framework legislation related to the protection of health and the environment.

Chemicals control focuses on defining responsibilities for industry in implementing knowledge-based measures as early as possible in the life cycle of chemicals, when there is the greatest opportunity for prevention *before* adverse effects on human health and the environment occur. It complements and supports other aspects of risk management activities, such as worker protection, prevention of accidents, transportation regulation and waste disposal. For further information about the benefits of chemicals control, see the document, *Benefits of Chemicals Control*, in this series.

As reported by the United Nations Environment Programme (UNEP) in the Costs of Inaction report from 2013, the costs from the mismanagement of chemicals can be substantial.[i] Although many countries have laws to regulate the release of chemicals into the environment, to protect workers, and to authorize certain chemicals before marketing and use (pesticides, pharmaceuticals and/or food additives), there are still many countries that lack regulation to control the manufacture and import of industrial and consumer chemicals as they are placed on the market. Early action on risk reduction is often cost efficient.

A chemical that has several uses may be subject to several different laws. In many countries, pesticides are covered in separate legislation and normally have more stringent requirements than chemicals control for industrial or consumer chemicals. Guidance on pesticides is available from the Food and Agriculture Organization of the

United Nations (FAO).[ii] Although guidance on pesticides, pharmaceuticals, cosmetic products and food additives is not directly provided in this document, there is some overlap in elements of risk reduction for all chemical categories – for example, in basing labelling provisions on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

1.1 Background

At the UN World Summit on Sustainable Development in 2002, governments and organizations agreed on "aiming 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" (often called the 2020 goal). The Strategic Approach to International Chemicals Management (SAICM) is a multi-stakeholder and multi-sectoral policy framework adopted in 2006 with the aim of achieving this goal. SAICM recognizes a set of 11 basic elements as critical for achieving the sound management of chemicals, as outlined in the Overall Orientation and Guidance (OOG) document from 2015. These basic elements include legal frameworks; enforcement and compliance mechanisms; strong institutional frameworks and coordination mechanisms; and defined responsibilities for industry across the chemical life cycle.[iii]

In 2015, 17 Sustainable Development Goals and 169 associated targets were adopted by the SAICM Heads of State and Government and High Representatives.[iv] [v] In principle, Target 12.4 reflects the 2020 goal.

To assist countries in the process of establishing chemicals control legislation and related institutional frameworks, UNEP published the LIRA Guidance in 2015.[vi] It provides options for organizing the legal and institutional infrastructures governing the placement of chemicals on the market. It also provides suggestions for ensuring sustainable financing, including cost recovery measures.

1.2 Scope and aim

This document complements the information provided in the LIRA Guidance. Specifically, it provides additional information on different risk reduction tools – legally enforceable as well as voluntary – to reduce or eliminate the risk to human health and the environment from chemicals. This document, as well as the LIRA Guidance, focuses on the risk reduction instruments in chemicals control legislation. It aims to complement the available resources identified in the Internet-based OECD *Toolbox for Implementing Chemicals Safety* (IOMC Toolbox).[vii]

The aims of this document include:

- Provide suggestions on prioritization of chemicals for cost-efficient risk reduction.
- Provide guidance on the main risk reduction tools.
- Assist countries in choosing appropriate risk reduction tools.

This document is intended for countries that are currently working to establish, amend, update or implement chemicals control legislation for industrial and consumer chemicals, and the associated institutional capacity. Specifically, it is directed at technical government officials who are actively working to build government capacity for reducing the potential risk to human health and the environment from chemicals.

This document does not provide information about how to perform a risk assessment. Guidance documents addressing risk assessment are available on the websites of international organizations such as the OECD, World Health Organization, FAO and UNEP; a list of risk management guidance documents is included in Annex 1.

KEY CONCEPTS OF RISK REDUCTION

CHAPTER 2

The key concepts of risk reduction include a preventive approach. Core elements in chemicals control include implementing the GHS; developing and providing Safety Data Sheets (SDS); and identifying a clear division of responsibilities between industry and government, with the main obligations on manufacturers and importers.

Preventive approach. A preventive approach is a key concept of chemicals control, as it reduces costs and is the most effective approach for protecting health and the environment. It complements and supports other aspects of downstream risk management activities, such as worker protection, prevention of accidents, transportation regulation and waste disposal. While measures to address the widespread use of chemicals already on the market are complicated and costly, early action can offer greater efficiencies. The EU's Registration, Evaluation and Authorization of Chemicals (REACH) regulation explicitly cites the Precautionary Principle as a basis for decision-making.[viii]

Box 1. Principles of proactive health and environmental protection

Precautionary Principle is an anticipatory approach that aims to protect human health and the environment against the potential risks from human action. It marks a shift from post-damage to pre-damage control of risks.[ix] An early definition of the Precautionary Principle is found in the Rio Declaration, adopted in 1992. It reads, "[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation".[x] Since then, the principle has been expanded to encompass the protection of human health.

The principle has four central components: taking preventive action in the face of uncertainty; shifting the burden of proof to the proponents of an activity; exploring a wide range of alternatives to potentially harmful actions; and increasing public participation in decision-making.[xi] The principle is referred to in Article 1 of the Stockholm Convention.

Polluter pays principle. The polluter pays principle specifies that the costs of addressing pollution from a wide range of sources should be the responsibility of the industry creating the pollution. Principle 16 of the Rio Declaration states that "[n]ational authorities should endeavour to promote the internalisation of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution with due regard to public interest and without distorting international trade and investment".[xii]

Extended producer responsibility "is a policy approach under which producers are given a significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products. Assigning such responsibility could, in principle, provide incentives to prevent wastes at the source, promote product design for the environment and support the achievement of public recycling and materials management goals", according to the OECD.[xiii] A common example is a takeback programme for electronics, in which electronics manufacturers are assigned responsibility for taking back used electronics and disposing of them in an environmentally sound manner.

Implementing the GHS in national legislation should be a priority, as it creates a system for chemical manufacturers and importers to provide information about chemical hazards and precautions. The GHS is a cornerstone of knowledge-based risk reduction measures as it gives information about the properties of chemicals and how to handle them safely. This is further addressed in Section 4.1.

Clear division of responsibilities between industry and government. Chemicals control legislation should make it clear that industry is responsible for its products. Given the large number of chemicals that exist in commerce, it is essential that the legislation includes general provisions placing responsibility on industry to ensure the availability of health and safety information throughout the supply chain. Information sharing is crucial to ensure that downstream users can safely handle chemicals and that consumers can make informed decisions. Chemical manufacturers are best placed to have or generate the necessary knowledge about the hazards of the chemicals they produce. Importers should be responsible for obtaining the necessary safety information from manufacturers.

Basic requirements for industry should include:

- Gather knowledge and, if necessary, generate new knowledge on chemical properties, hazards and risks.
- Classify and label chemicals in accordance with the GHS.
- Disseminate information on the hazardous properties of chemicals and on safe handling procedures, including providing SDSs to professional users.
- Supply additional information about the products, when necessary, in order to enable and facilitate the best choice of products for downstream users and to ensure the safe handling of the products.
- Ensure that no banned substances are produced, imported or placed on the market.
- Make informed choices about chemicals in order to avoid hazards and risks. Substitute chemicals for less hazardous ones or apply an alternative technique, when possible (the Substitution Principle – described in greater detail below).
- Organize and assure the safe use of chemicals and their storage, transport and appropriate disposal.
- For downstream/professional users of chemicals, comply with risk management measures, choose the safest chemical and handle the chemicals they use or dispose of in a safe way.

The European Chemicals Agency provides information for industry on assessing hazard and risk. It states that companies need to consider the following regulatory, scientific and technical requirements:

- Gather information on uses and current conditions of use from the supply chain. Contact your industry association for best practice in your sector.
- Collect hazard data as requested by REACH information requirements triggered by the tonnage and uses of the substance.
- Assess the coverage and quality of the hazard information about the substance available within the SIEF [Substance Information Exchange Forum].
- Define a strategy to fill in any resulting data gaps (e.g. carrying out new studies, justifying missing information using scientifically solid read-across, data waivers, etc.).
- Agree classification and labelling within the SIEF (based on the hazard data).
- Record all hazard data and classification in the registration dossier.
- If manufacturing or importing more than 10 tons per year, carry out the chemical safety assessment (CSA) and record it in a chemical safety report (CSR).[xiv]

The International Council of Chemical Associations (ICCA) has developed a "Responsible Care" commitment as part of its contribution to the SAICM. Through Responsible Care, global chemical manufacturers commit to pursuing the principles of safe chemicals management, and to supporting companies to contribute to achieving the 2020 goal.

The role of government is to ensure that all actors in the supply chain apply relevant risk management activities within their field of responsibility. Government does this by issuing relevant legislation and recommendations; enforcing existing laws; and providing information and guidance. For chemicals where risks to human health or the environment may occur, governments should have the authority to implement risk-reduction measures.

Governments should therefore:

- Adopt framework legislation clarifying the roles and responsibilities of industry, as well as those of the national administration.
- Adopt legislation implementing the GHS as a requirement.
- Introduce bans and restrictions for substances when needed.
- Supervise and enforce compliance with existing national measures, as well as any international obligations regarding chemicals management and control.

PRIORITIZATION OF CHEMICALS FOR RISK REDUCTION

CHAPTER

3

The legislation should require industry to take responsibility for reducing the risks from the chemicals they produce, import and use. Implementation of the GHS requires industry to classify and label their hazardous chemicals appropriately before placing them on the market. Product and transport labelling and SDSs provide information to users about the hazards and how to handle the chemicals in a safe way how to protect oneself and the environment. For many chemicals, provisions for communicating information in the supply chain provide sufficient risk reduction. However, for certain hazardous chemicals – for which disseminating information is not sufficient for handling the risks to human health or the environment – the authorities should introduce more stringent risk reduction measures. There are several options for prioritizing such chemicals or groups of chemicals.

3.1 Implementing Multilateral Environmental Agreements

All chemicals that have already been prioritized under multilateral environmental agreements (MEAs) should be prioritized at the national level. Countries are responsible for fulfilling their obligations under MEAs related to chemicals. For example, under the Stockholm Convention on Persistent Organic Pollutants (POPs), the Minamata Convention on Mercury, or the Montreal Protocol on Substances that Deplete the Ozone Layer, parties have a responsibility to ban, phase out or restrict chemicals that are recognized as high priority at the international level. Adopting such requirements domestically is best done via legislation that implements the provisions in the MEA, including introducing bans or restrictions on the production and use of a specific chemical. It is important to remember that the legislation will probably need to be updated as further progress or new decisions are made.

3.2 Further prioritization

Chemicals can be prioritized based on prioritization or regulation decisions that have already been made in other jurisdictions; the degree of hazard; levels of exposure; or a risk evaluation process. Successful prioritization approaches often employ more than one of these options.

As previously noted, legislation should require industry to take responsibility for the chemicals they produce, import and use in order to reduce the risks to human health or the environment. However, in cases where such requirements in the legislation – including disseminating information in accordance with the GHS (see further discussion on Page 17) and taking the necessary precautions – are inadequate for managing risks from chemicals, authorities

should introduce more stringent measures to address these substances or groups of substances.

While these substances might be identified through cases of pollution and poisoning, it is advisable to try to identify potentially problematic chemicals before any harm has occurred.

Adopting a national chemicals policy identifying the types of substances that should be prioritized for action could support the work of government, as well as that of industry. Such policy contributes to greater certainty for industry and provides guidance on what kinds of substances should be avoided in order to reduce risks.

If there is a particularly high likelihood of exposure due to national conditions, this should be taken into account in the prioritization process. Preferably, these substances should be identified before any harm (cases of poisoning or pollution) has occurred. A systematic approach would build on the prioritization of substances that, due to their known or assumed hazards and/or use patterns, are likely to give rise to risks that need to be eliminated.

3.2.1 Actions of other jurisdictions

Actions taken and priorities set in other countries can be an important and cost-saving resource when making prioritization decisions.

If prioritization decisions have already been made in another jurisdiction, it is cost-efficient to use the information already developed through that particular decision-making process. There is no need to re-assess hazard if a chemical has already been assessed. The inherent properties of chemicals are always the same, regardless of the place, type of production and use.

For example, within the US, a state will often use the work already completed in other states, to decide on which chemicals to prioritize. This is more efficient than each state creating a new list from first principles. Internationally, countries can draw upon prioritization approaches in other countries, and make use of information such as the list of Substances of Very High Concern (SVHCs) defined under REACH. Canada has categorized all of the chemicals on the Canadian market; see Canada's Domestic Substances List.[xv]

Many countries publish preparatory work and lists of candidates for regulation on their websites. This information can be valuable for other countries. It often includes useful background information on why a substance is a candidate for risk reduction. One example of such information is the REACH Candidate List of substances that could be subject to authorization within the EU.[xvi] On the European Chemicals Agency (ECHA) website, information on chemicals under consideration for harmonized classification and labelling, and bans is accessible to countries outside the EU. The US Environmental Protection Agency (EPA) also publishes information on substances of concern. For example, US EPA's 2014 update of the Toxic Substance Control Act (TSCA) Workplan for Chemical Assessments is a valuable resource, providing an overview of dozens of chemicals considered to be priorities for assessment and action.[xvii]

The information available under the Rotterdam Convention can help a country make a decision as to whether they wish to take further action to restrict or ban a chemical. For all parties to the Rotterdam Convention, export of the listed chemicals should be accompanied by information about the chemical, including information for classification and labelling. Such notifications give the importing country valuable information about the decisions of other countries to ban and restrict the chemical, and give them an opportunity to consider the need to introduce similar measures.

The Rotterdam Convention requires each party to notify the Secretariat when it has adopted a final regulatory action to ban or severely restrict a chemical;[xviii] this provides information about chemicals that have been identified as priorities by individual countries. The EU has a Prior Informed Consent (PIC) procedure governing exports

from the EU of any substance that is banned or severely restricted within the EU.[xix] This lengthy list, which has more than 180 chemicals, can also be a good resource for any government interested in identifying high-priority chemicals for regulatory action.

Box 2. The Rotterdam Convention focuses on information exchange and currently includes 50 chemicals that are subject to the PIC procedure. These chemicals have been identified by the international community as presenting a severe hazard to human health or the environment, and are already banned or restricted in many parts of the world. For these substances, a decision guidance document is available, which contains valuable background information on the substances and their properties.[xx]

Box 3. Additional examples of resources for lists of restricted substances

OECD Regulations and Restrictions:
http://www.oecdsaatoolbox.org/Home/Regulations

ECHA, Substances Restricted under REACH:
https://echa.europa.eu/substances-restricted-under-reach

State of California, US: The Proposition 65 List:
https://oehha.ca.gov/proposition-65/proposition-65-list

3.2.2 Hazard-based prioritization

Hazard-based decision-making focuses on addressing inherent hazards through substitution or other approaches, rather than calculating an acceptable level of risk. Reducing the use of the most hazardous chemicals can lead to cost savings and other financial benefits, in addition to protecting human health and the environment. One useful source of hazard information is the GHS classifications of CMR (carcinogenic, mutagenic or toxic to the reproductive system) substances or other serious hazardous properties.

By identifying hazard-based prioritization criteria, governments can provide clear, transparent signals to industry, allowing manufacturers and importers to make informed decisions about which chemicals to invest in, use and import, as well as decisions about possible chemical substitutions.

For chemicals whose inherent properties can cause severe or irreversible effects, hazard information should be sufficient for risk reduction decisions. This would apply, for example, to chemicals that are persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB); carcinogenic, mutagenic or toxic to reproduction (CMR), meeting the criteria for the GHS CMR category 1A or 1B (especially those without a non-threshold for effects); or associated with other severe and irreversible health effects.

vPvB substances accumulate in the environment and in organisms over time, even if emissions are small. In many cases, vPvB chemicals have been found to be toxic after they have already accumulated in the environment and human tissue. Therefore, prioritization would be an appropriate measure. Similarly, substances that are CMR may be prioritized based only on hazard, as these have very severe effects, and it cannot be assumed that all potential users will handle these substances safely.

Under the European Union's REACH regulation, chemicals that are CMR category 1A or 1B under the GHS; PBTs; vPvBs; and other substances of equivalent concern are defined as SVHCs and are prioritized for regulation.

Box 4. SAICM Objective for Risk Reduction

In the Strategic Approach to International Chemicals Management (SAICM), the Objective for Risk Reduction (paragraph 14) states that chemicals or chemical uses that pose an unreasonable or otherwise unmanageable risk to human health and the environment are no longer produced or used. Examples of groups of chemicals that might be prioritized for such assessment are PBTs; vPvBs; chemicals that are carcinogens and mutagens or that adversely affect, among others, the reproductive, endocrine or nervous system; and mercury and other chemicals of global concern.

3.2.3 Exposure and risk-based prioritization

Chemicals can also be prioritized based on use patterns that are likely to create conditions of widespread exposure across a population, or intense exposure for a subset of the population.

National-level exposure data may be important as an additional factor in raising concern about a chemical if particularly high exposures exist in a given country. The volume of a substance produced or imported can be used as a simple proxy for potential exposure. Similarly, if there is a large number of producers and/or users, or the chemical is widely available to the general public, extensive exposure is likely. A lack of detailed exposure data should not prevent authorities from taking appropriate action to protect human health and the environment.

Use patterns can be a consideration in elevating the level of concern about a chemical – for example, if the chemical is likely to be used by pregnant women, by children, by individuals who are illiterate, or to a large extent in the informal sector or by other vulnerable parts of the population. Additionally, if monitoring or surveillance studies have documented widespread exposure, this could provide a reason to prioritize the chemical, even if little information is available on inherent hazard.
Risk evaluations that have been generated by other countries or regions may sometimes be useful as well. This information can be augmented, when appropriate, with information on use and exposure domestically, in order to tailor the evaluations to the conditions in a specific country.

Canada uses a pre-market approval process, with the government responsible for risk assessment for a prioritized number of industrial and consumer chemicals. Their priorities and risk assessments can provide useful information to other countries.[xxi]

Box 5. Prioritization of chemicals for risk assessment in Costa Rica

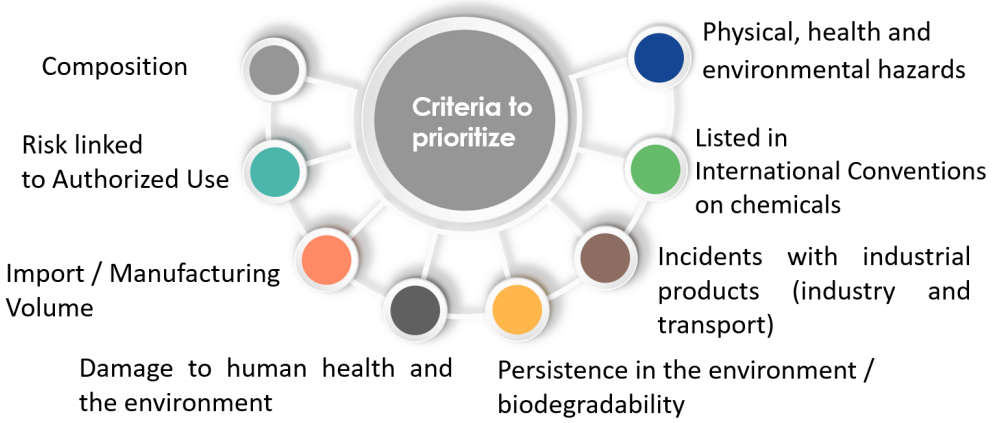
Costa Rica developed Guidelines for Prioritization of Industrial Chemicals in 2018. The guidelines were developed as part of the country's commitments to the process of accession to the OECD. The prioritization of chemical products is the first step in a new process for assessing the safety of existing chemical products.

The guidelines provide a methodology for prioritization: a relative value will be obtained for each chemical, based on a set of criteria, which will then be used to determine if that product requires a subsequent risk assessment. The selected criteria for the evaluation are:

- Import/production volumes
- Potential harm to human health and the environment
- Persistence in the environment (biodegradability)
- Listed in international agreements
- Reported emergencies
- Potential risk of damage, whether physical, health or environment-related (aquatic environment and/or ozone layer) as established in the GHS

Following an initial "screening", a list of candidate chemicals will be generated for risk analysis; based on the results, a set of preventive and corrective actions will be developed.

Source: Jordi Pon and Costa Rica workgroup, personal communication, 2018



Criteria for prioritization of chemicals in Costa Rica; from "Report on Costa Rica's Industrial Chemicals Management Programme".
Source: Jordi Pon and Costa Rica workgroup, 2018

3.2.4 Data and information supporting prioritization

ECHA maintains information on as many as 135,000 chemicals. These include all substances subject to registration under REACH, as well as all substances placed on the market that are classified as hazardous.[xxii] Under REACH, chemicals must be registered if they are placed on the EU market at a volume above 1 ton/year.[1] The Toxic Substances Control Act provides information on reporting requirements in the United States.[2]

Manufacturers and importers are responsible for gathering and conveying knowledge on hazards and necessary precautions. The costs of testing and assessing chemicals for hazardous properties will vary. Importers can obtain this information primarily by requiring it from their suppliers in other countries. This can include ecotoxicological and toxicological data. Within the EU, sharing of data and of testing costs among companies is formalized and is a legal obligation.

If another country has already assessed or acted upon a chemical, information is likely to be available on the risk reduction measures that have been adopted, as well as the background for these measures. Information is also often available on additional concerns that are still under consideration. All of this information can be useful for a country in its initial assessments of a chemical. In all cases, it is essential to make use of existing data sources rather than reinvent the wheel.

Countries should make use of data and evaluations in other jurisdictions, as long as they comply with recognized standards, such as guidelines from the OECD. Data on chemical properties is shared through various platforms, such as the OECD eChemPortal and the ECHA databases. Existing GHS classifications are another important source of information. Database resources that are available internationally include databases of chemical hazard information; regulatory information; and ingredients in consumer products. Section 3.2.5 and Annex 2 provide information on a number of such resources.

1 As of June 2018, the ECHA registration database contained 21,551 unique substances. Registration of a substance indicates that manufacturers or others intend to continue supplying it to the EU market. The tonnage threshold for registration means that there is an unknown number of chemicals on the European market with production volumes under 1 ton per year.
2 https://www.epa.gov/tsca-inventory/tsca-inventory-notification-active-inactive-rule

Box 6. Mutual Acceptance of Data (MAD) For assessment purposes in chemicals management can help to minimize the costs of laboratory tests. The OECD Council adopted a decision in 1981 on MAD. It states that "test data generated in any member country in accordance with OECD Test Guidelines and Principles of Good Laboratory Practice (GLP) shall be accepted in other member countries for assessment purposes and other uses relating to the protection of human health and the environment". Additional OECD Council Acts "establish procedures for monitoring GLP compliance through government inspections and study audits", as well as a framework for international liaison among monitoring and data-receiving authorities; and set out "a step-wise procedure for non-OECD countries to take part as full members in this system".[xxiii]

Annex 3 of LIRA provides some further examples of sources of information or databases for chemicals management. As discussed in the LIRA Guidance 3.3.3.1, the databases also include information on exposure, accident reporting and safer alternatives.

An issue that may arise when collecting the relevant data and information is confidentiality. Several resources are available for regulators that can help determine how to balance protecting a company's confidential business information (CBI) with colleting the necessary data and information. An ECHA manual provides information on online access to information on registered chemical substances, and on the content and assessment of confidentiality requests.[xxiv] ECHA is required to publish information on registered substances on its website, in the "Information on Chemicals" section. However, in some cases, information can be withheld if the registrant requests that it be kept confidential and provides a justification for why publishing it might harm their commercial interests or those of another party. ECHA must then make a decision on such requests.

While the case can be made for some information to remain confidential because it may affect a company's competitiveness, the criteria for determining such requirements need to be clear, and firms need to provide credible justifications. Such proprietary protections should also have time limits and periodic reapplication procedures. Governments should require that health and safety information be ineligible for CBI protection, and grant access to CBI data to workers for safety purposes; to health professionals; and to states, provinces and foreign countries for administrative and law enforcement purposes.[xxv]

A publication from the US Department of Treasury describes best practices for regulatory data collection. Following such best practices can help to protect CBI. The advice includes defining the business purpose for collecting the data; developing clear and precise definitions; and creating collection specifications.[xxvi]

3.2.5 Resources for information on chemicals

A range of resources are available for government and industry employees wishing to find information about chemicals. Many of these resources are publicly available; others are available for a subscription fee.

The list below provides information on a number of these resources. For general information about chemical hazards and other properties, resources such as ChemHAT, the ECHA REACH registration database, and Pharos can be useful. The University of Massachusetts Lowell Toxics Use Reduction Institute's (TURI) webpage on Environmental, Health and Safety Data Resources can also help direct the user to relevant resources that are most useful for particular health or environmental endpoints. For existing GHS classifications, see additional information in Section 4.1. Below are brief descriptions of many of these resources. For web addresses, see Annex 2.

- **Chemical Hazard and Alternatives Toolbox (ChemHAT).** ChemHAT was initiated through a partnership between the Industrial Division of the Communications Workers of America and the BlueGreen Alliance, and has

since incorporated the work of university and government experts, among others. It is an online database that aims to provide easy-to-use information for workers, families and other interested parties, to help protect themselves from the harm that chemicals can cause. It provides answers to the question: "Is there a way to get this job done without using dangerous chemicals?"

- **Chemical Hazard Data Commons.** This resource is built on the Pharos platform (described below) and helps users identify "problematic chemicals and collaborate to find safer alternatives".

- **Decision Guidance Documents** prepared for the chemicals listed in the Rotterdam Convention. These contain basic information on chemicals, including hazard classifications, additional sources of information and possible alternatives.

- **ECHA Classification and Labelling Inventory**. This resource provides classification and labelling information for all chemicals that have been notified or registered under REACH. It is also a good resource for reviewing the EU's approach to harmonized classifications, and it includes an Excel file showing an up-to-date list of chemicals with their harmonized classifications.

- **ECHA REACH Registration Database**. This website offers users a "Chemical Property Data Search". Data comes from registration dossiers submitted to ECHA.

- **ECHA, Substances Restricted under REACH**. This resource provides a table of substances for which use is limited or banned in the EU.

- **Hazardous Substances Data Bank (HSDB).** Part of the US National Library of Medicine, HSDB is, according to its website, "a toxicology database that focuses on the toxicology of potentially hazardous chemicals. It provides information on human exposure, industrial hygiene, emergency handling procedures, environmental fate, regulatory requirements, nanomaterials and related areas. The information in HSDB has been assessed by a scientific review panel."

- **OECD eChemPortal.** This web resource provides information on physical chemical properties, ecotoxicity, environmental fate and behaviour, and toxicity.

- **OECD Regulations and Restrictions.** This resource provides a table of restricted substances and related laws and regulations organized by geographic scope. The lists provide descriptions of substances and chemicals that are legally or voluntarily restricted or recommended for restriction due to their hazards or that have been examined by jurisdictions based on potential concerns of a similar nature.

- **Pharos.** Developed by the non-profit Healthy Building Network, this website provides health and environmental information about building products. It includes the GreenScreen List Translator, which provides information on toxicological and regulatory classifications. It is only accessible to subscribers, for a relatively small fee.

- **Proposition 65 List.** California's Safe Drinking Water and Toxic Enforcement Act of 1986, commonly referred to as Proposition 65, requires the State of California to publish a list of chemicals known to cause cancer, birth defects or other reproductive harm. The list is updated at least once a year and is available to view or download online.

- **ToxPlanet.** This subscription-based resource provides access to a variety of databases on chemical hazards, properties, regulatory requirements and other information.

- **University of Massachusetts Lowell Toxics Use Reduction Institute** (**TURI**) – **Environmental, Health and Safety Data Resources.** This website provides links to a variety of pages for finding general and/or detailed information on chemicals, including physical properties, health effects and environmental fate.

- **Global Product Strategy, GPS Chemicals Portal** provides access to information on chemicals. Establishing a base set of information and publishing GPS Safety Summaries for chemicals in commerce is part of the commitment of ICCA member companies to the GPS.

CORE RISK REDUCTION TOOLS

CHAPTER

4

Classification and labelling, bans, restrictions and authorization systems comprise the core risk reduction tools in chemicals control.

4.1 Classification and labelling

Implementing the GHS and SDSs as a legal requirement for all chemicals is a core element of risk reduction. Hazard assessments, and classification and labelling should be done in accordance with the GHS because it is internationally recognized and the most widely used standard. Both manufacturers and importers should be held accountable for establishing and maintaining appropriate systems for classification and labelling, and SDSs.

The Hazard Pictograms in the GHS are internationally recognized

GHS[xxvii] is a system to ensure accurate management and communication of information on chemical properties and safe handling. The "right-to-know" is a fundamental goal of risk reduction activities. This refers to the right to know about chemicals to which one might be exposed. Chemical manufacturers and importers are required to gather and communicate accurate information, and ensure the flow of this information through supply chains. Use of the GHS ensures international harmonization of classification and labelling of all types of chemicals. It also facilitates international trade in chemical substances and products containing chemicals, including facilitating access to markets in compliance with international requirements. GHS applies to chemical substances and mixtures of chemical substances that meet the harmonized criteria for physical, health or environmental hazards under the GHS. GHS uses the following definitions:

Substance means chemical elements and their compounds in their natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities derived from the process used, but excluding any solvent, which may be separated without affecting the stability of the substance or changing its composition.

Mixture means a mixture or solution composed of two or more substances in which they do not react.

When introducing the GHS, it is best to provide a transition period to allow industry to learn how the system works and have time to implement it. It is also necessary to provide a later entry-into-force date for mixtures, as those who are required to classify and label mixtures need to have access to the classification of all ingredients in the mixture.

SDSs should be adapted to the prevailing conditions and circumstances of the country in which the chemical is used. Otherwise, the recommendations may be inadequate or not applicable.[xxviii]

GHS can be seen as the first level of risk reduction, as it provides the necessary information to allow manufacturers and importers, as well as government, to make appropriate decisions. By implementing the GHS requirements, governments create the conditions that will enable the adoption of other risk reduction measures. The intrinsic properties of a chemical, such as its toxicity, must be established first, in order to take steps to regulate and manage it throughout its life cycle.

Many chemical products are incorporated in finished products or articles during the production phase. In some countries, specific substances have been regulated as part of a group of articles but, in general, they are largely unregulated with regards to their chemical content. Examples of chemicals in articles include paints and lacquers in furniture, polymers and metals in electric and electronic products, dyes in textiles, and flame retardants in plastics.

Responsibility for maintaining, updating and promoting the GHS at the international level lies with the United Nations Subcommittee of Experts on the GHS and the UN Subcommittee of Experts on the Transport of Dangerous Goods. This body updates the GHS every second year. Some countries have chosen to implement the system through general legislative text about the obligation to apply the law, as well as referring to a national standard or the UN publication. This approach is likely to be the most efficient way to build the GHS into domestic law, while keeping up with changes. Guidance for GHS implementation is available from the United Nations Institute for Training and Research (UNITAR).[xxix]

As hazards depend on the intrinsic properties of a chemical, which are always the same, official/harmonized classifications using the GHS criteria from other countries or regions should be used, as these are normally peer-reviewed by expert groups and thus can be considered reliable.[xxx] Using this list ensures that the whole market is using the same classification for the same substance. This also ensures that small- and medium-sized enterprises are able to provide accurate information to their downstream users, and international trade is facilitated by using the same official classification as in other countries or regions. Making use of other countries' official lists will reduce the need for additional administrative time and personnel, although it is necessary to ensure that the list is updated regularly.

Examples: GHS implementation: The EU legislation implementing the GHS – the CLP (Classification, Labelling and Packaging) Regulation[xxxi] – aims to ensure that the hazardous properties of chemicals are identified and clearly communicated to all users through labelling and SDSs (the latter applies to professional users only). Classifying chemicals before making them available on the market is the responsibility of chemical manufacturers and importers.

On 7 November 2017, the Ministry of Health, Chile, published the draft of a regulation implementing the GHS. The draft classifies substances and mixtures predominantly in terms of the sixth revised edition of the GHS, and with the same requirements for labels and SDSs. The proposed regulation includes a transitional period of one year to implement the classification for substances and five years for mixtures, once the regulation has been finalized. There is currently no proposed date of adoption or entry into force.[xxxii]

In the US, the GHS focuses on the right of workers to information about chemicals in their workplace, which is required as part of the US Occupational Safety and Health Administration's Hazard Communication Standard.

Costa Rica provides an example of a country that, in introducing the GHS, adapted and improved on existing national labelling systems. In Costa Rica, existing regulations required SDSs that generally followed the GHS guidelines. In June 2017, the Costa Rican Government published a requirement for labelling in accordance with the GHS "for workplace and supplier chemicals", providing a five-year transition period (until December 2022) for compliance.[xxxiii] In November 2017, the government published a requirement that, in order to be registered, hazardous chemicals must have a GHS-compliant Safety Data Sheet; again, transitional periods are provided for renewal of registrations.

A key resource for checking existing GHS classifications is the ECHA Classification and Labelling Inventory, which offers a free, up-to-date list of substances classified by the EU.[xxxiv] This resource shows both harmonized and non-harmonized GHS classifications developed within the EU. For non-EU classifications, a useful resource is Pharos, an independent subscription-based chemical database aggregated from numerous lists generated by various countries for chemicals of concern. If a subscription to Pharos is not available, it is also possible to use the websites listed in Table 1 to view GHS classifications for countries outside of the EU.

Table 1. Additional GHS classification resources that link users to the public GHS classification lists for individual countries

European Union	https://echa.europa.eu/information-on-chemicals/cl-inventory-database
Australia	http://hcis.safeworkaustralia.gov.au/HazardousChemical
Japan	www.safe.nite.go.jp/english/ghs_index.html
Republic of Korea	http://ncis.nier.go.kr/en/main.do
Malaysia	http://www.dosh.gov.my/index.php/en/legislation/codes-of-practice/chemical-management
New Zealand	https://www.epa.govt.nz/database-search/chemical-classification-and-information-database-ccid/

Box 7. Additional resources for GHS implementation: Web pages

GreenScreen List Translator, through Pharos: www.pharosproject.net

Toxplanet: https://toxplanet.com/

eChemPortal: https://www.echemportal.org/echemportal/index.action

UNITAR – in partnership with the International Labour Organization and Inter-Organization Programme for the Sound Management of Chemicals – guidance on GHS implementation: http://www.unitar.org/cwm/ghs

National Institute of Technology and Evaluation – Support Tools for Implementation of GHS: http://www.safe.nite.go.jp/english/ghs/ghsrefs.html

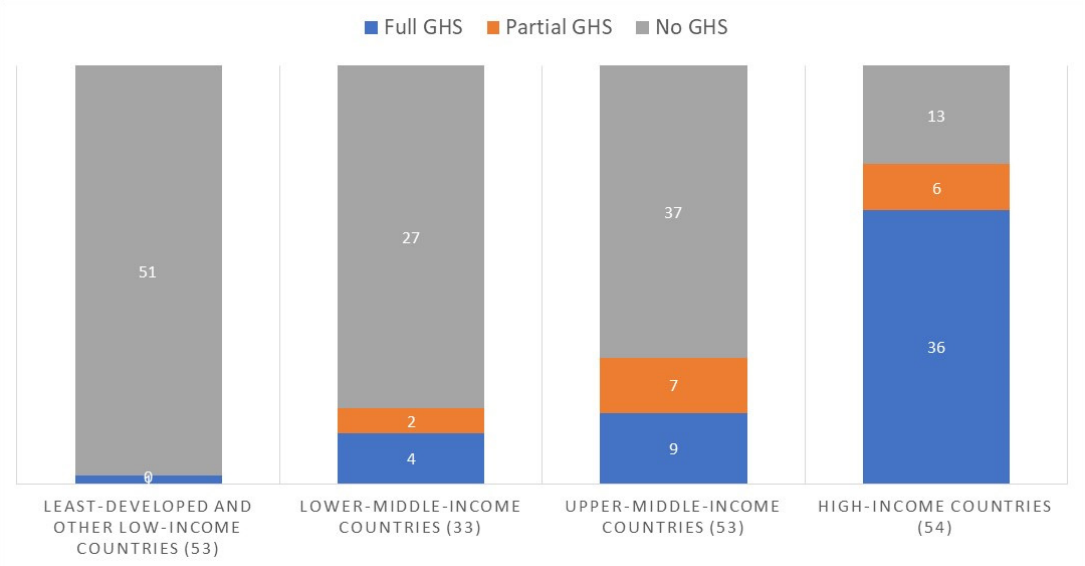
Box 8. Information resources for GHS implementation

There are some subscription-based database services that can help governments to gain quick access to other countries' GHS classifications, among other information. One such resource is the GreenScreen List Translator available through Pharos, a US-based non-governmental organization. The Massachusetts Toxics Use Reduction Institute has compiled a guide covering a wide range of databases, including both publicly available and subscription-based services. Toxplanet, a subscription-based service, is a useful source for both toxicological and regulatory information from many countries. The Chemical Hazard and Alternatives Toolbox (ChemHAT) provides publicly available information in an easy-to-read format. The OECD's eChemPortal provides information on the properties of chemicals, including physical chemical properties, ecotoxicity, environmental fate and behaviour, and toxicity. UNITAR's guidance on GHS implementation describes how countries can assess their capacity for implementing the GHS, engage stakeholders in capacity-building, and develop a national GHS implementation strategy.

Addressing challenges to GHS adoption. UNITAR notes: "The current global situation is a patchwork of sometimes conflicting and diverse national and international requirements…The GHS was created to harmonize the different or lacking hazard classification and communication systems within a country and between countries and regions".[xxxv] Broad implementation of the GHS across countries will lead to information being more consistently communicated via labels and SDSs – with benefits for human health, the environment and business. It is also essential to adopt best practices for confidentiality, with provisions that health and safety information in SDSs be exempt.

SDSs come from suppliers, and the information they contain must be correct. It is critical that information included in labels is easy to understand for all users; labelling requirements must be tailored to the target audience, as well as use internationally recognized pictograms.

The capacity to implement the GHS requires resources for developing legislation and guidance, technical knowledge, and funds for implementation costs and staff time. A study published in November 2017[xxxvi] found that, as of April 2017, 50 countries had fully implemented the GHS; 15 had partially implemented it; and 128 had not. It also found that most countries that have implemented the GHS have a higher gross domestic product per capita than those that have not. Full implementation was most common in Europe and parts of Asia. One country in Latin America, Ecuador, had fully implemented the GHS, as had two in Africa: Zambia and Mauritius. Among the 15 that had partially implemented the GHS, most had implemented the system for workplaces only – not for the consumer and agriculture sectors.



Source: Stockholm Environment Institute Policy Brief, "Reducing chemical risks in low-income countries: strategies for improved coverage of basic chemicals-management legislation", 2018.[xxxvii xxxviii]

The study also finds that regulatory capacity, as measured by government effectiveness indicators, is positively associated with GHS implementation – highlighting the importance of capacity to formulate and introduce legislation. Additional influences may include EU membership or the aspiration to join other international organizations or agreements.

In the case of Zambia, "it seems that sustained capacity-building and donor support for the GHS implementation have served as a factor of importance. Zambia has received support from UNITAR under the SAICM Quick Start Programme (QSP)" and from other donors, according to the study. "Indeed, the need for capacity-building and awareness-raising for successful GHS implementation in low-income countries has been long standing on the agenda of international collaboration..."[xxxix] Similarly, Viet Nam's chemicals management efforts have been supported by several donors and organizations; the outcome was the establishment of the Viet Nam Chemicals Agency. This support is likely to have influenced GHS implementation through parallel institutional strengthening and broad chemicals management capacity-building efforts.

Chemicals in Products Programme. The GHS system is designed for classification and labelling of individual chemicals and chemical mixtures. The system does not provide information on the occurrence of specific chemicals in an article (e.g. toys, electronics, clothes).[3][xl] To address this gap, a voluntary information programme called Chemicals in Products (CiP) has been developed within the framework of SAICM. It aims to identify chemicals in articles/products and the means for improving the sharing of this information through the supply chain, including with recyclers/waste managers.[xli]

This voluntary programme is intended for use by companies, to provide information to downstream users, including final customers, on the content of specific chemicals in products and articles. This information is also important for creating a circular economy[4] in which waste and pollution are reduced and resources can be recycled in a safe way.

4.2 Bans and restrictions

Bans and restrictions regulate access to chemicals that are too hazardous to remain freely and openly available, or which a country does not have the national capacity to manage effectively. According to the LIRA Guidance,[5] bans and restrictions "set forth a schedule, or list, of specific compounds which are considered to cause unacceptable risk to human health and/or the environment. While bans strictly prohibit the production, sale and/or use of the substance, restrictions limit the availability of the chemicals to specific uses/condition". They may apply to the manufacture, import and/or use of a chemical. They may apply to a substance as such or to a substance in a mixture or in an article.

Bans and restrictions can exist at a variety of levels, including total bans, bans with specific exemptions, or bans or restrictions for a specific use of a chemical. In some cases, a ban or restriction may cover just the manufacture and use of a chemical in the country, while in other cases it may also apply to imported products or articles. An example is the EU's ban on nonylphenol ethoxylates (NPEs), a group of chemicals mainly used as cleaning agents, but also added to plastics and rubbers, pesticides, pharmaceuticals, cosmetics, paints and coatings, agro-chemicals and chemicals used in paper making.[xlii] However, they remained present in the environment as many imported products, such as textiles, continued to include the substance, which could be emitted during washing.[xliii] This triggered the need to ban or restrict their presence in articles as well.

Bans or restrictions can also help to promote the development and introduction of safer alternatives that are technically and financially viable. Substantial innovation often occurs during the phase-out period. It is often useful to involve stakeholders when designing a ban, increasing the likelihood that it will be designed in a way that facilitates compliance.

3 "Article" is defined in the EU REACH regulation as an object that is given a special shape, surface or design during production which determines its function to a greater degree than does its chemical composition.
4 A circular economy is an economy where the value of products, materials and resources is maintained for as long as possible, and the generation of waste minimized. Definition from COM (2015) 614 final, Communication from the Commission to the European Parliament. 'Closing the loop – An EU action plan for the Circular Economy'
5 UNEP, LIRA Guidance, section 4.4.3

Box 9. Efforts to eliminate lead in paint

Infants and young children are particularly vulnerable to the effects of lead. The Global Alliance to Eliminate Lead Paint (GAELP) is working to promote a phase-out of the manufacture and sale of paints containing lead, and to eventually eliminate the risks that such paints pose.[xliv] Activities include catalysing the design and implementation of prevention-based programmes and identifying paint manufacturers.[xlv] GAELP has produced a Toolkit for Establishing Laws to Control the Use of Lead in Paint. The Toolkit provides a variety of resources for countries working to establish legal controls on lead paint.[xlvi]

UNEP has developed guidance and a model law for regulation of lead in paint. Elements include legal limits on total lead content; penalties for violation of these limits; and a requirement to use applicable elements of the GHS for any activities related to transport, storage, disposal or other activities related to lead-containing paint.[xlvii] Nevertheless, WHO reports that only "34% of countries have confirmed that they have legally binding controls on the production, import, sale and use of lead paints".[xlviii] According to WHO data, 67 countries report that they have legally binding lead controls; 69 report that they do not have legally binding lead controls; and 58 countries have provided no data.

A 2016 report by the International POPs Elimination Network (IPEN) describes gains that have been made in eliminating lead paint. Data on lead paint is available in 46 countries; binding regulatory controls limiting the lead content of paint have been enacted or are pending in six Asian countries and four African countries; the East African Community has adopted mandatory standards restricting the use of lead paint in its five Member States; and the world's largest paint producer reported that it had removed leaded ingredients from its consumer paint brands and products in all countries.[xlix]

According to the IPEN report, data on the presence of lead paints on the market is available in just 23 of the 126 countries that do not have regulatory controls. IPEN notes that "much more needs to be done" in order to reach GAELP's target date for all countries to adopt legally binding requirements.[l] Challenges for many countries include a lack of legislative authority, a lack of regulatory experience, and slow rule-making processes. Countries that have adopted regulatory controls may also encounter difficulties related to enforcement, according to IPEN's report.

As noted in the LIRA Guidance, a government's authority to impose a ban or to restrict the supply or use of chemical substances should generally be established in framework legislation (also referred to as primary legislation). Framework legislation identifies basic principles and obligations, while leaving details to further legislation, programme development or other government activities. Details, such as the list of substances banned or restricted and the schedule for restricting their supply, can be included in secondary legislation, also referred to in some cases as regulations.[6] Manufacturers and importers are responsible for understanding and complying with existing bans and restrictions, and must not produce, import or market banned products, or sell restricted products, except as permitted by the legislation.

Bans and restrictions have proven effective in controlling or eliminating the use of hazardous substances. For example, bans on the use of lead in petrol/gasoline have been essential in reducing rates of lead poisoning. Similarly, bans on the use of certain persistent organic pollutants (POPs) have reduced body burdens of these chemicals in many parts of the world.

4.3 Authorization or pre-market approval systems

Authorization or pre-market approval systems provide another – but more resource-demanding – means to control which chemicals are allowed on the market. In such a system, a manufacturer or importer must have authorization, approval or a licence before placing a chemical on the market. Many countries have laws of this kind for pesticides and pharmaceuticals. They are not common for industrial and consumer chemicals as the system is complex and resource-demanding, both for the authorities and industry. Licensing systems can be used for sale, manufacture and import, in addition to use. For ozone-depleting substances, some countries use an import licensing system. Under such a system, restricted chemicals can be imported only if the importer has a licence.

6 UNEP, LIRA Guidance, section 4.4.3

In the European Union, the authorization approach is used for industrial chemicals that are considered to be Substances of Very High Concern and that are prioritized for further action. In these cases, use is prohibited unless an explicit authorization is provided for the specific use in question.[li]

Canada uses a pre-market approval process, with the government responsible for risk assessment for a prioritized number of industrial and consumer chemicals.[lii] Substances that meet certain criteria may be considered for various risk-management measures, including regulations, guidelines or codes of practice to control aspects of the substances' life cycle. The Domestic Substances List (DSL) contains approximately 23,000 substances. Additional lists identify various priorities for action for the chemicals on the DSL; about 4,000 chemicals are to be assessed and considered for risk management measures. These pre-approval efforts could provide useful information for industry and governments in other countries in implementing cost-efficient and knowledge-based risk reduction measures.

ADDITIONAL RISK REDUCTION TOOLS

CHAPTER 5

In addition to the main administrative risk reduction instruments described above, a government may decide to use additional approaches. These options may include economic instruments and informative instruments, or tools to influence business or consumer behaviour, including chemical requirements in public tenders and support for substitution for safer alternatives.

5.1 Economic instruments

An economic instrument can consist of taxes or fees that must be paid for the use of a specific substance that is considered to create health or environmental problems. To promote the use of less hazardous substances, different forms of subsidies can be considered. Taxes and fees as economic policy instruments must be based on legislation in the same way as the traditional risk reduction instruments. They also need the same basis for decisions and socioeconomic considerations, as well as a system for control and enforcement. There needs to be a pre-existing system for the collection of taxes and fees in the country; otherwise it will be difficult to establish an efficient economic instrument.

In general, economic instruments are not an important element of chemicals control in developed countries as they can be resource-demanding to establish and maintain effectively. Therefore, it is important to assess the accompanying administrative costs, both for the authorities and for industry, and compare them to other options before considering the introduction of an economic instrument.

Economic instruments are not a good choice if the chemical poses an unacceptable risk to health or the environment. It should not be possible to pay for the right to use or release a substance that is highly hazardous.

However, economic instruments that are correctly designed might usefully complement other instruments – for example, where there is a need for a reduction in the use of moderately hazardous substances, but a total phase-out is not needed. In such cases, market forces may be harnessed to help reduce use while keeping costs low. Economic instruments can be used to accelerate a process of substitution and innovation, and to support safer alternatives, helping them to reach the market or increase their market share. For example, a tax or fee on the use of a chemical of particular concern can help to encourage substitution for safer alternatives. Differentiated fees based on different properties could create incentives to seek out less harmful alternatives. However, these potential advantages can be undermined by increased administrative burden.

When there are good opportunities to increase the market share of alternatives – that are less harmful in terms of health and/

or the environment – economic instruments may be a suitable complementary measure. Lead in petrol, for example, was phased out with an environmental tax (often in combination with a subsequent ban) in many countries. The most successful uses of economic instruments have been in the European Union – to address air pollutants such as sulphur oxides and nitrogen oxides. For a limited period, Sweden used an economic instrument to address cadmium contamination in fertilizer, adding an additional cost to bring the price of cadmium-containing fertilizer up to the price level of safer fertilizer.

5.2 Informative instruments

An informative instrument aims to achieve a voluntary reduction of the use of a specific substance or group of substances. It aims to change behaviour and change production. Informative instruments can be used as stand-alone measures if the risk from a specific substance or group of substances is relatively low but still needs to be reduced. It is sometimes possible to see more immediate results with informative instruments than with a ban or a restriction.

An informative instrument could be used:

- to encourage the reduction of the use and the substitution of a substance or a group of substances with unwanted properties that pose a moderate risk to human health and/or the environment.
- to speed up the elimination of a specific substance or a group of substances before a ban or a restriction is adopted and/or enters into force.
- to inform industry, at an early stage, of substances that might require measures due to the emerging weight of the evidence.

Informative instruments are, however, not suitable as stand-alone measures when there is a severe hazard or when target groups are difficult to reach.

A drawback with informative instruments is that the outcome is less certain than with administrative measures such as classification and labelling requirements or controlling the entry of a chemical on to the market. For risk reduction to be sustainable, it is necessary to continuously follow up activities over a longer period of time. This should not discourage the government or other authorities from carrying out such activities, especially if they are combined with other measures such as introducing legal restrictions at a later stage.

5.2.1 Public procurement

Government entities can help support the market for safer alternatives by specifying safer options for public purchasing. Many governments now have Environmentally Preferable Purchasing (EPP) programmes.[7] In the United States, many state governments, as well as local municipal governments, have EPP programmes. In the EU, criteria are available through the Green Public Procurement programme.[46] Since 2014, it has been possible for EU authorities to set specific environment-related criteria in public procurement, according to the EU Procurement Directive.[liii]

Municipalities and other agencies who put out calls for tenders, should be able to set well-founded requirements in relation to chemicals. To support them in this, central authorities can provide criteria and guidance. Such criteria could, for example, contain requirements that substances or mixtures meeting specific GHS criteria cannot be used for the purpose of a tender. One way to reduce risks from hazardous substances used in public procurement is to request ecolabelled articles and services, or products with equivalent documentation.

5.2.2 Ecolabelling

Ecolabelling can drive markets towards safer chemicals by empowering consumers to make informed choices, if chemical hazard is included as a core criterion in the ecolabel system. This is a voluntary method or system of certifying or identifying more environmentally preferable products.

7 See, for example, Washington (https://www.ecy.wa.gov/Regulations-Permits/Guidance-technical-assistance/Sustainable-purchasing) and California (http://www.calrecycle.ca.gov/epp/).

For example, in Germany, the Blue Angel ecolabelling system evaluates products in relation to health, climate, water and resource goals.[liv] The EU ecolabel regulation specifies criteria to be used in the EU ecolabelling system.[8] The US Environmental Protection Agency has ecolabelling programmes including ENERGY STAR™, WaterSense® and Safer Choice, which identify products that meet certain benchmarks for energy efficiency, water efficiency and green chemistry. Examples of non-government ecolabelling programmes are EcoLogo and Green Seal, which are used to identify more environmentally preferable cleaning products.

Ecolabelling has become a useful tool for governments to encourage sound environmental practices, and for businesses to identify and establish domestic and, sometimes, international markets for their environmentally preferable products. The requirements for ecolabels need to be clear, unambiguous and objectively verifiable in order to ensure transparency and fair competition for the suppliers in the procurement processes. It is important to understand the criteria used for a particular ecolabel, as it is possible that a product that is deemed environmentally friendly could still pose a risk to human health.

5.2.3 Awareness-raising

General awareness-raising. Authorities play a role in providing accurate and unbiased information to the general public and public organizations on chemicals in the everyday environment. Detailed information on how to handle a specific chemical in a safe manner and to enable people to make informed choices needs to be supplied by the manufacturer or importer. Civil society also has an important role to play in generating, using and disseminating information about chemicals.

The authorities can support general awareness-raising about chemicals and their effects, and how to handle them – for example, in school curricula and through general information material, websites, etc. Broad awareness-raising supports all other risk-reduction instruments because general awareness about chemicals and their potential effects provides the basis for achieving the intended effects of the instruments. Many countries and organizations have developed websites and/or printed material to inform the general public about chemicals and their risks. When needed, informational material, including press releases, is issued for specific issues of concern.

Targeted information for a specific problem. Information pamphlets, websites, press releases and other similar material can be used to educate the public about chemical hazards. This can contribute to a reduction in the use of harmful substances, as it can affect the demand from downstream users as well as the general public. Greater awareness of a problem might trigger questions on the availability of alternatives and how to avoid buying products containing specific substances. In this way, public awareness might trigger substitution as well.

It is valuable to inform downstream users of the need or the desirability to substitute a specific type of substance for one that is less hazardous; in this way they can put pressure on their suppliers to provide alternatives.

Well-informed consumers can put pressure on national and local politicians to issue legislation that aims to reduce the use of hazardous chemicals and create a less toxic local environment. Depending on the resources available to the authority, information provided directly to consumers by government authorities or non-governmental organizations regarding particular substances, or the substances used in mixtures and articles, can be considered. Such efforts can lead to well-informed, stronger consumer groups that refuse to buy products that contain specific hazardous chemicals. Their behaviour can put pressure on downstream users and, through them, the primary suppliers, to substitute such chemicals with less hazardous ones. Targeted information from authorities aimed at private consumers about a specific problem is an effective

8 For general EU ecolabel information, see: http://ec.europa.eu/environment/ecolabel/index_en.htm.
For the regulation itself, see: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010R0066&from=EN.
ECHA Strategy to promote substitution to safer chemicals through innovation

informative instrument, where the desired result is to promote substitution of the target substance.

The aim could also be to raise awareness of the effects and properties of chemicals, and how to use and handle them correctly. Consumers in many countries are increasingly asking for information to enable them to make safer choices with regard to hazardous substances in products and articles.

5.2.4 Substitution and safer alternatives

The Substitution Principle[9] refers to the obligation or option to substitute a hazardous chemical for a less hazardous one, or apply an alternative technique, when possible. The assessment of alternatives is a process for identifying, comparing and selecting safer alternatives to replace hazardous chemicals, with the objective of promoting sustainable production and consumption.

Some regulatory approaches create a responsibility for industry to assess and choose safer alternatives to banned or restricted chemicals. In some cases, governments may require businesses to use the least hazardous alternatives available. For example, under the EU's REACH regulation, if a substance is subject to authorization, businesses must adopt safer alternatives, unless they are able to make the case that there is an important need that cannot be met by any other chemical or process. But in these cases, they must show that they have fully assessed the alternatives.

In the United States, the states of California and Maine have laws requiring businesses to carry out alternatives assessments, under certain circumstances. The US Environmental Protection Agency (EPA) notes that alternatives assessments can "encourage industry to move to safer alternatives, complement regulatory action by showing that safer and higher functioning alternatives are available, or point out the limitations to chemical substitution for a particular use".[lv]

Governments can encourage businesses to develop solutions ahead of legislation. Within the REACH regulation there is a process for identifying the most hazardous chemicals – defined as SVHCs – and subsequently placing them on the Candidate List; EU Member States have decided that the use of these substances should be strictly limited. This list can be used by companies and others to identify which chemicals to start moving away from.

Businesses may also be encouraged or required to use non-chemical methods (process changes). For example, for businesses using toxic solvents in degreasing applications, toxic chemicals can sometimes be phased out by working within the supply chain to substitute the contaminant in the part that requires cleaning, or by exploring alternative materials to prevent contamination and cleaning altogether. The role of industry can include conducting alternatives assessments, supporting and promoting research on safer alternatives, facilitating the commercialization of safer alternatives, and adopting non-chemical alternatives (process changes) when possible.

Governments can also promote research and development for safer alternatives and create incentives by providing criteria for potential future bans or restrictions.

Box 10. Options for building substitution capacity

The OECD Substitution and Alternatives Assessment Toolbox compiled an inventory of chemical hazard assessment tools and data sources. A listing of non-hazard assessment tools, case studies and regulations that are driving the increase need for substitution and alternatives assessment approaches are also available.[lvi]

A University of Massachusetts Lowell project was set up to identify specific priorities that the European Chemicals Agency and other government authorities could support in the near term in order to advance chemical substitution programmes and practices among EU Member States. Recommendations included expanding ECHA and Member State authority staff capacity over time, to support substitution through training and recruitment; coordinating EU and Member State grant mechanisms and private/

9 ECHA Strategy to promote substitution to safer chemicals through innovation January 2018; https://echa.europa.eu/documents/10162/13630/250118_substitution_strategy_en.pdf/bce91d57-9dfc-2a46-4afd-5998dbb88500; Substituting hazardous chemicals (ECHA website) https://echa.europa.eu/substitution-to-safer-chemicals

public funds to invest in innovative research to support alternatives development; building structures to provide technical assistance to companies; and expanding chemical substitution as part of government sustainability procurement programmes.[lvii]

The Swedish Chemicals Agency's web-based tool, PRIO, is an example of a website that supports industry actors to choose appropriate chemicals – helping to reduce the health and environmental risks from chemical substances.[lviii] The aim of PRIO is to support industry in the assessment of health and environmental risks from chemical substances so that people who work as environmental managers, purchasers and product developers can identify the need for risk reduction. In order to achieve this goal, PRIO provides a guide for decision-making that can support in setting risk-reduction priorities.

The SIN (Substitute It Now!) List[lix] consists of chemicals that have been identified as SVHCs, based on the criteria defined within REACH. It also serves as a tool for companies and others to identify which chemicals to start moving away from before they are classified as SVHCs and placed on the Candidate List. The SIN List is developed by ChemSec (International Chemical Secretariat) in collaboration with scientists and technical experts, as well as an NGO advisory committee of leading environmental, health and consumer organizations. The list is based on publicly available information from existing databases and scientific studies, as well as new research. The SIN List is implemented in procurement requirements all over the world. Health, environmental and consumer NGOs are using the SIN List as a tool for prioritizing individual chemicals or groups of chemicals as part of their campaigns for safer products and stronger chemicals regulations.

5.2.5 Dialogue with industry

An important objective of dialogue between authorities and industry is to increase awareness and knowledge about the risks of using hazardous substances – on their own or in mixtures or articles – and to encourage continuous substitution of hazardous chemicals with less hazardous alternatives, whenever possible. Industry-sector dialogue can be useful to speed up the elimination of a specific substance or group of substances before a ban or a restriction is adopted and/or enters into force. Dialogue with prioritized industry sectors can also be very useful for reducing the use of a specific substance or group of substances with unwanted properties that cause a moderate risk to human health and/or the environment.

Dialogue between the authorities and industry is an ongoing, long-term process. The initial stage involves establishing contact and building trust between the different parties; it is important to allow all actors to exchange views on the difficulties and possibilities of implementing chemicals control. Dialogue also gives the participating authorities a better understanding of the conditions faced by different industries. An effective dialogue can hopefully lead to ongoing work within industry towards reducing risks from the use of hazardous substances, without the involvement of authorities in the future.

A practical approach to carrying out a dialogue would be to concentrate on a specific group of articles, such as toys, textiles or electronics that might contain a number of chemicals that need to be reduced. It is also useful to involve, if available, sector-specific organizations because they can reach a broader group of companies.

In some cases, discussions and dialogue with industry might result in a voluntary commitment from industry to substitute a hazardous substance with a less hazardous alternative substance or an alternative technique. However, it is important to follow up on these discussions, to verify that any proposed actions are actually taken and continue over time.

Authorities should avoid committing to doing something in return for a commitment from industry (i.e. enter into a mutual agreement). This is legally complex, and in some countries, it is not even legally possible.

The voluntary programme, Chemicals in Products (CiP), mentioned in section 4.1, was set up to promote more effective information sharing about chemicals in articles (e.g. toys, electronics, clothes) in the supply chain.[lx] This programme can be promoted by national administrations for use by companies to enhance their knowledge base and capacity to provide information to downstream users, including recyclers/waste managers. The programme aims to improve information sharing between companies and downstream users about

specific chemicals in products and articles that users should be aware of – for example, when there is a need for proper handling during the use and/or disposal of the chemical or product. Such information can enable/influence downstream users' choice of chemicals and encourage producers to substitute for less hazardous chemicals.

CHOOSING RISK REDUCTION TOOLS

CHAPTER 6

Factors to take into account in choosing the most appropriate risk reduction instrument may include the type of hazard and the level of risk; actors using the chemical; efficiency and sustainability over time; and the administrative burden and costs.

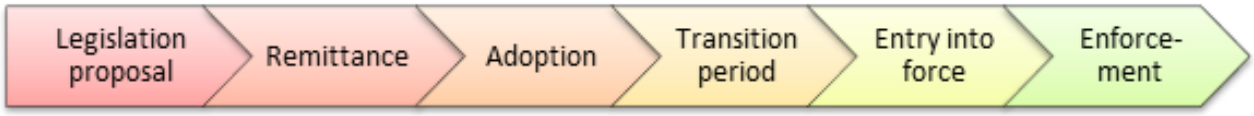
Decision-making normally begins with collecting information about the problem, identifying risk reduction goals, and choosing a risk reduction option. When phase-out of a substance such as mercury has been identified internationally, national efforts should focus on applying risk reduction measures.

National legislation must be clear about the level at which a decision to reduce the risks from chemicals should be taken. In some cases, an agency or other authority is mandated to make these decisions in regulations, often referred to as secondary legislation; while in other cases, the decision rests at the level of the legislature.

The rationale behind the decision to introduce risk-reduction measures and the choice of instrument should be described in a way that can be easily understood by both decision makers and stakeholders. Industry, downstream users, other authorities and NGOs should be invited to contribute to the process. When it comes to introducing safer alternatives, downstream users can provide important perspectives. The recycling and waste sector is also an important stakeholder, as reducing the use of hazardous chemicals can facilitate waste management. In general, risk reduction tools are most effective if a range of stakeholders representing different groups within the sector are involved in their development. A clear process for involvement in the development of the legislation and adoption of risk reduction measures – as well as transition periods before they take effect – facilitates compliance.

In developing approaches to risk reduction, it is essential to maximize transparency. For example, any assumptions involved in developing a risk reduction measure must be clearly specified.

General scheme of the legislating process



Some basic assessment of the regulatory socioeconomic impact may be needed. It is often sufficient to identify the industry sectors that are likely to be affected by the ban or restriction. Effective communication with the relevant industries helps to facilitate an assessment. If the chemical has already been successfully banned or restricted in other parts of the world, making use of information about other countries' socioeconomic experiences can help save resources.[lxi] [10]

A transition period prior to entry into force helps to ensure that stakeholders have time to understand the requirements and come into compliance.

In choosing a risk reduction tool, it is important to consider the administrative burden and costs over time for both the government and the industry. Any country introducing new legal requirements will need to consider how the law will be enforced. Any instruments that are chosen require administrative capacity; and for legal instruments, capacity for effective enforcement is a prerequisite. For more information, see *Enforcement of Chemicals Control Legislation: Guidance Document.*

The effectiveness of different risk reduction instruments needs to be compared and evaluated in the national context. The implementation of the GHS is a very effective measure for reducing the risks from any hazardous substances handled in the workplace and/or used by consumers. For highly hazardous chemicals, bans or restrictions are often the appropriate tool. Substitution for safer alternatives or methods is then a high priority. In cases where there are suspicions of severe adverse effects from a substance, but full scientific evidence is lacking, precaution should be applied.

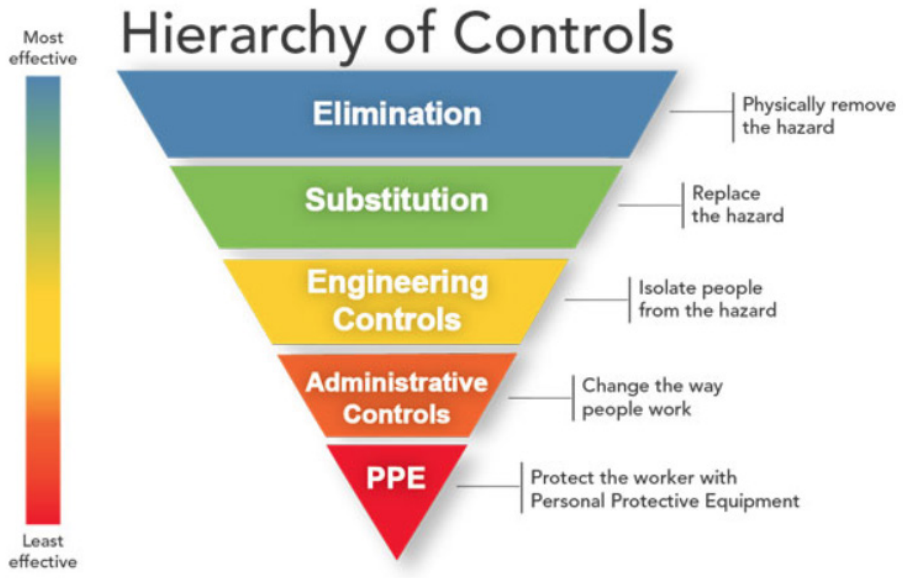
Many countries have a large informal sector that uses and sells chemicals. In assessing the need to regulate a chemical, it is important to assess its marketing and use in both the informal and formal sector. When a hazardous chemical is marketed or used predominantly in the informal sector it may be difficult or impossible to control exposure due to a lack of engineering controls, personal protective equipment and training on correct handling. In this instance, bans and restrictions on supplying the chemical may be suitable.

If the risk from a specific substance or group of substances is relatively low but the use still needs to be reduced, an economic or informative instrument could be more appropriate – either on its own or combined with other measures.

Hierarchy of Controls

The concept of a "hierarchy of controls" is used frequently in the occupational health and safety field. The hierarchy of controls makes clear that the most effective way to protect against harm from hazardous chemicals is to eliminate chemicals of concern. Substitution for a safer alternative is the next most effective approach. The least effective approach, which should be used when no other options are available, is to rely on personal protective equipment (PPE). Adopting and implementing chemicals control legislation helps to make clear which chemicals need to be eliminated or substituted. It also ensures that accurate information flows through the supply chain when there is a need for measures lower down the hierarchy (engineering controls, administrative controls and PPE). A diagram of the hierarchy of controls is shown below.

10 Regulatory Impact Analysis (RIA) is a systematic approach often used by OECD countries. For more information, see: OECD, Regulatory Impact Analysis, www.oecd.org/gov/regulatory-policy/ria.htm. However, this approach can be administratively and technically challenging.



Source: US Center for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH). 2016. "Hierarchy of Controls". Viewed at https://www.cdc.gov/niosh/topics/hierarchy/, February 2018.

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Additional risk management guidance documents

European Commission, Seveso Directive – Technological Disaster Risk Reduction: http://ec.europa.eu/environment/seveso/

International Labour Organization, C170 – Convention Concerning Safety in the Use of Chemicals at Work (1990): http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C170

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IOMC Strategy for Strengthening National Chemicals Management Capacities (2011): http://www.who.int/iomc/publications/strategy_english.pdf?ua=1

IOMC: Assisting Countries with the Transition Phase for GHS Implementation (2008): http://www.who.int/iomc/publications/ghs_impl_english.pdf?ua=1

Inter-Organization Programme for the Sound Management of Chemicals (IOMC), IOMC Toolbox for Decision Making in Chemicals Management (updated 2017): https://iomctoolbox.oecd.org/Default.aspx?idExec=58d24f84-e109-473a-a80a-a9895d8a77a7

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OECD Substitution and Alternatives Assessment Toolbox: http://www.oecdsaatoolbox.org/

OECD Guiding Principles for Chemical Accident Prevention, Preparedness and Response http://www.oecd.org/env/ehs/chemical-accidents/Guiding-principles-chemical-accident.pdf

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Annex 2:

Chemical information resources

Chemical Hazard and Alternatives Toolbox (ChemHAT)	http://www.chemhat.org/en	General information – designed for workers
Chemical Hazard Data Commons	https://commons.healthymaterials.net/	Hazard and regulatory information
Decision Guidance Documents, Annex III to the Rotterdam Convention	http://www.pic.int/TheConvention/Chemicals/DecisionGuidanceDocuments/tabid/2413/language/en-US/Default.aspx	Hazard information
ECHA Classification and Labelling Inventory	https://echa.europa.eu/regulations/clp/cl-inventory https://echa.europa.eu/regulations/clp/harmonised-classification-and-labelling https://echa.europa.eu/information-on-chemicals/annex-vi-to-clp	Includes GHS classifications
ECHA REACH Registration Database	https://echa.europa.eu/information-on-chemicals/registered-substances	General information
ECHA, Substances Restricted under REACH	https://echa.europa.eu/substances-restricted-under-reach	Regulatory list, includes GHS classifications
Hazardous Substances Data Bank (HSDB)	https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm	General information – hazards and other properties
OECD eChemPortal	https://www.echemportal.org	General information
OECD Regulations and Restrictions	http://www.oecdsaatoolbox.org/Home/Regulations	Overview of resources from multiple countries, hazard information
Pharos, including GreenScreen List Translator	https://www.pharosproject.net/	Hazard and regulatory information, subscription-based
Proposition 65 List	https://oehha.ca.gov/proposition-65/proposition-65-list	Regulatory list – hazard information
ToxPlanet	https://toxplanet.com/	Hazard and regulatory information, subscription-based
University of Massachusetts Lowell Toxics Use Reduction Institute (TURI) – Environmental, Health and Safety Data Resources	http://guides.turi.org/beyondmsds	Overview of multiple data resources
GPS Chemicals Portal, ICCA	http://icca.cefic.org/	The GPS Safety Summaries provide product safety information from companies on the chemical products they manufacture

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