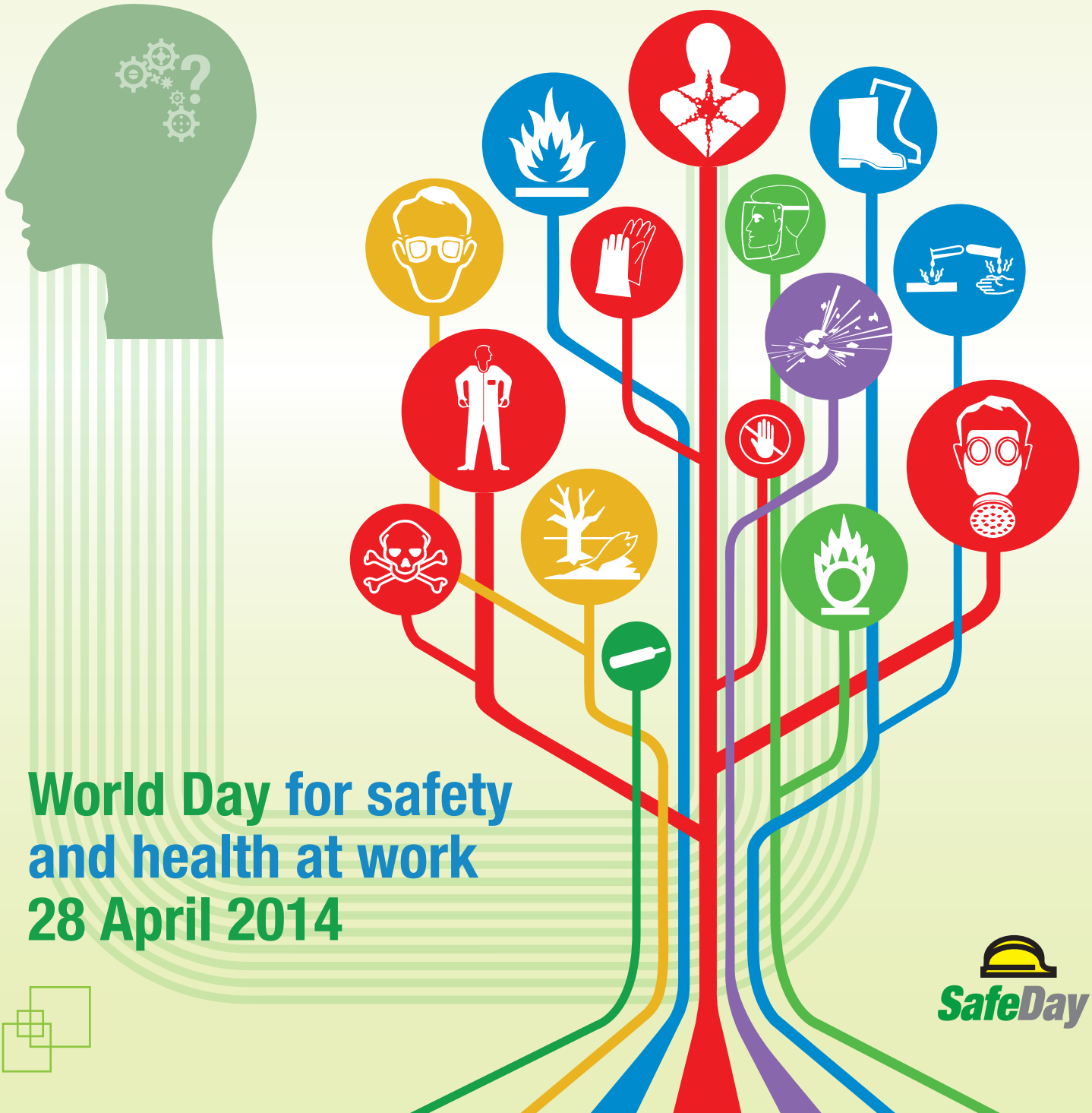
International Labour Organization

SAFETY AND HEALTH IN THE USE OF CHEMICALS AT WORK



World Day for safety and health at work 28 April 2014

SafeDay

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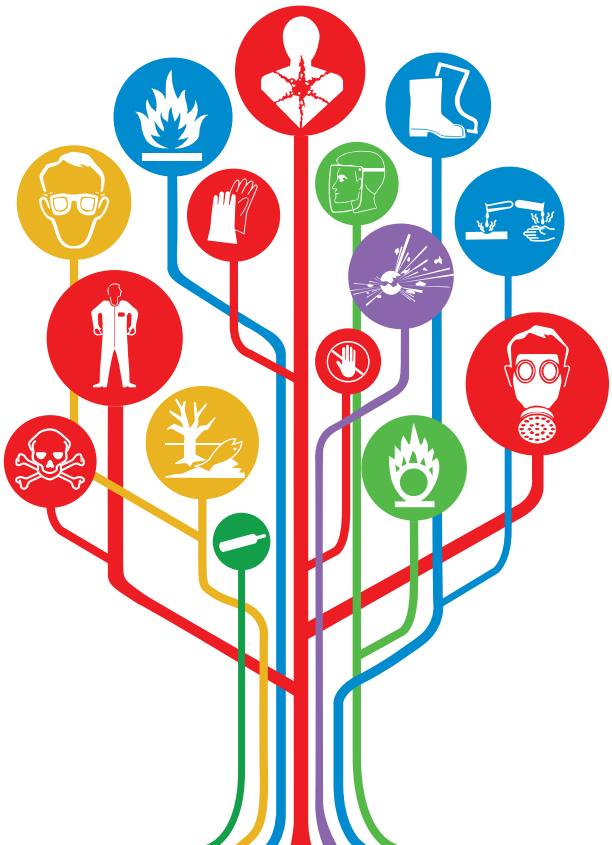

PROTECTING WORKERS AND THE ENVIRONMENT

This report for the 2014 celebration of the World Day for Safety and Health at Work reviews the current situation regarding the use of chemicals and their impact in workplaces and the environment, including various national, regional, and international efforts to address them. The report also presents the elements for establishing national and enterprises' level programmes that contribute to ensure the sound management of chemicals at work.

Why are chemicals important in the workplace?

The production and use of chemicals in workplaces around the world present one of the most significant challenges in workplace protection programmes. Chemicals are essential to life, and their benefits are widespread and well-recognized. From pesticides that improve the extent and quality of food production, to pharmaceuticals that cure illnesses, and cleaning products that help establish hygienic living conditions, chemicals are key to healthy living and modern convenience. Chemicals are also a critical part of many industrial processes to develop products that are important to global standards of living. However, controlling exposures to these chemicals in the workplace, as well as limiting emissions to the environment, are tasks that governments, employers, and workers, continue to struggle to address.

What create the dilemma are the risks associated with exposure to these chemicals. The pesticide that helps grow food by producing more and better crops may result in adverse health effects in workers involved in producing the pesticide, in applying it in the fields or exposed to their residues. Residues of pesticide production and use may also cause adverse ecological effects persistent in the environment for many years after use. The pharmaceutical that saves the life of a patient with a serious health condition may produce adverse health effects in the workers exposed while producing or administering the chemical. The cleaning products that create good hygiene can also adversely affect those who work with the products, and are exposed to them daily. Chemicals pose a broad range of potential adverse effects, from health hazards such as carcinogenicity, and physical hazards like flammability, to environmental hazards such as widespread contamination and toxicity to aquatic life. Many fires, explosions, and other disasters result from inadequate control of their physical hazards.

Over the years, chemical safety has been one of the areas in which more work has been carried out in the field of occupational safety and health (OSH). However, even if significant progress has been made in recent years concerning the regulation and management of chemicals; and governments, employers and workers continue their efforts to minimize the negative effects of the use of hazardous substances both at national and international levels, it is still insufficient. Serious incidents continue to happen and there are still negative impacts on both human health and the environment. Workers who are directly exposed to hazardous substances should have the right to work in a safe and healthy environment, to be properly informed, trained and protected.

What is a chemical?

According to the ILO Convention on safety in the use of chemicals at work, 1990 (No.170) the term chemical refers to chemical elements and compounds, and their mixtures, whether natural or synthetic such as those obtained through production processes.

Hazardous chemicals are classified according to the type and degree of their intrinsic health and physical hazards. The hazardous properties of mixtures composed of two or more chemicals are determined by assessments based on the intrinsic hazards of their component chemicals.

A coherent global response to the continuous scientific and technological progress, global growth in chemicals production and changes in the organization of work is necessary. Likewise, it is important to continue developing new tools to make information about chemical hazards and associated protective measures more readily available, as well as to organize and use that information to structure a systematic approach to safety and health in the use of chemicals at work.

How widely are chemicals used in the workplace?

There is no reliable way to determine exactly how many chemicals are used and how many workers are exposed to them around the world. Chemicals are readily associated with industrial facilities such as petrochemical refineries, construction sites or automobile manufacturing. A number of chemicals, such as paints, lacquers, thinners, adhesives, crystalline silica, and welding fumes are just some of the chemicals to which workers may be exposed in workplaces in the construction sector. However, virtually every type of workplace in every sector uses chemicals, and thus a broad range of workers are potentially exposed. Therefore chemicals are potentially a concern in every type of work performed. While the amount of effort needed to address the specific situation will vary with the degree of exposure and quantity handled, there is no sector that can simply be exempted from having an approach to prevention and control of hazardous substances. For example, there have been increased concerns in recent years about the chemicals used in hair and nail salons (such as methyl methacrylate). Many of them are quite hazardous, particularly because they are used without appropriate preventive and protective measures such as proper ventilation, protective equipment, or workers' training. While consumers are also exposed in these facilities, those exposures are infrequent and for short duration, this is unlike the exposures of the workers who use the chemicals all day, every day. Even office settings have exposures to ink toner and similar chemicals, and may have staff assigned to print shops or other operations within the facility that have more chemical exposures. Cleaning and custodial staff in office buildings also experience chemical exposures.

There are also some sectors that have special impacts on the environment, and this must be considered when designing preventive programmes. For example, in the agricultural sector, pesticides are applied in the environment to crops, and thus are immediately released into the air, or can travel to water sources or persist in the ground for many years. The worker applying them may be immediately exposed, but the potential exposure of others in the surrounding community must also be accounted for in determining how to perform this operation safely. ILO Convention on Safety and Health in Agriculture, 2001 (No. 184) and its Recommendation (No.192), provide for risk assessment measures and the sound management of chemicals in agriculture.

The Chemicals Convention, 1990 (No. 170) defines the term **use of chemicals at work** to cover any work activity which may expose a worker to a chemical, including:

- the production of chemicals;
- the handling of chemicals;
- the storage of chemicals;
- the transport of chemicals;
- the disposal and treatment of waste chemicals;
- the release of chemicals resulting from work activities;
- the maintenance, repair and cleaning of equipment and containers for chemicals;

It is difficult to determine how many chemical substances are in workplaces globally; this is further complicated by the fact that these substances are also to be found combined into mixtures. These chemical mixtures may be intentionally produced for commercial purposes. However, when considering workplace prevention and protection programmes for chemicals, it must also be assumed that unintentional mixing of chemicals in the workplace can cause hazardous emissions in-situ. While many individual chemical substances are inadequately assessed in terms of their safety and health effects, mixtures of such substances are generally unique to the workplace involved, and are rarely assessed or tested in the form of a mixture. Most workers are exposed to mixtures, rather than individual chemical substances, therefore the control of mixed exposures is critical for an effective protective programme.

The rate of innovation and research regarding the development and use of chemicals is rapid, but the pace of investigating the safety and health aspects of these chemicals is much slower. Nanotechnology is a key example of this situation. Researchers have been experimenting with producing very small structures, devices and systems, usually between 1 and 100 nanometers. In this small size, the materials exhibit unique properties that affect physical, chemical, and biological behaviour. These unique properties are then used to create new products based on these behaviours. These products are being created in many different industries, including medicine, consumer products, and manufacturing. The unique properties of these materials may also affect how these impact humans exposed to them. The very small size of the materials may increase the potential for exposure in workers involved in producing these innovations. In some cases, while the health effects of the material in its normal presentation might be well-known, and appropriate protections utilized, the use of it in the small size required for these new products may create different hazardous effects for which new approaches to protection are necessary.[1] However, as in other innovations, production is being initiated before the hazards are adequately assessed, thus potentially exposing workers to unknown hazards. For this reason, a significant amount of research into the various occupational health and environmental aspects of nanomaterials is under way in many countries, particularly in the European Union (EU) and OECD countries and the United States of America. Several governments have established national taskforces to evaluate the potential impact of nanomaterials, carry out hazard classification, risk assessment and define the required management criteria; as well as to assess the regulatory implications. Scientific and environmental organizations are also involved in providing important advice on issues related to nanotechnology and the environment.

What is the impact of chemical exposures on workers' health?

Chemicals can cause effects on every system of the human body. If a chemical is in a physical form that allows it to enter the body easily, and is present in quantities sufficient to result in a given dose or amount of exposure, there are many impacts that such exposure can have. The acute effects of chemical exposures, such as poisoning or fatality based on a single exposure[2] have been broadly recognized as compared to those that result from repeated minor exposures over time, because of the immediate associated symptoms.
One difficulty in determining the extent of the health effects in the workplace related to chemical exposures is the lack of recognition of the types of effects that can occur, and the long latency period that may elapse before some of the effects are seen. Making the connections between an exposure 20 years ago, and a case of cancer today, have also been hampered by lack of information about the effects of chemical exposures, as well as insufficient recordkeeping regarding effects resulting from exposure to chemicals.

The significant impact on an individual who has developed a disease as a result of chemical exposures may be incalculable. Certainly, the victims of such diseases often lose the ability to work, and support themselves and their families. The effects of the disease also impact the day-to-day quality of life, and the ability to maintain normal activities. In some cases, the victims die, and their families must deal with the loss of their loved one, as well as a loss of economic well-being and stability. Enterprises also pay the price of such diseases through lost productivity, absenteeism, and workers' compensation programmes.

The toll of occupational disease due to chemical exposures is extensive. Although the burden of disease from chemicals remains unknown, as not all of them can yet be assessed at global level, the World Health Organization (WHO) circulated a note on the global burden of disease attributable to chemicals in September of 2012 at the International Conference on Chemicals Management.[3] It included information which encourages additional research on the economic and social costs of unsound chemicals management, including the cost of inaction and the implications for health. The annex to the note includes a systematic review published by WHO on known and unknowns on burden of disease due to chemicals.[4]

The study reviews available information on the global burden of disease involving chemicals through various media, including air, water, occupational exposures and direct ingestion. The findings of the study show that in 2004, for which data were available, globally, 4.9 million deaths (8.3% of total) and 86 million Disability-Adjusted Life Years (DALYs)[5] (5.7% of total) were attributable to environmental exposure and management of selected chemicals. These figures include both occupational and non-occupational exposures, such as indoor smoke from solid fuel use, outdoor air pollution and second-hand smoke, with 2.0, 1.2 and 0.6 million deaths annually. These are followed by occupational particulates, chemicals involved in acute poisonings, and pesticides involved in self poisonings, with 375,000, 240,000 and 186,000 annual deaths respectively. The study considered only those selected industrial and agricultural chemicals for which data were available.[6] According to these figures, the global burden of disease amounted to 1.7% globally (in DALYs), or 2.0% of all deaths.

While chemicals are not responsible for all occupational diseases, exposure to chemicals is certainly key to the development of many such diseases. Achieving Decent Work includes preventing the occurrence of occupational diseases due to chemical exposures. The ILO estimate that 2.34 million people die each year from work-related accidents and diseases. From these fatalities, the majority or 2.02 million correspond to occupational and work- related diseases; the annual global number of cases of non-fatal work-related diseases is estimated to be 160 million. In addition to causing immeasurable human suffering to victims and their families, such diseases cause major economic losses for enterprises and societies, including reduced productivity and work capacity. Around 4 per cent of the world gross domestic product (GDP), equivalent to about USD $ 2.8 trillion, is lost due to work-related accidents and diseases in direct and indirect costs.

In 2013, the report for the World Day on Safety and Health at Work addressed the prevention of occupational diseases. While the focus was not limited to those caused by chemical exposures, the theme is entirely consistent with this year's topic of safety and health in the use of chemicals. The number of physical, chemical, biological and psychosocial factors affecting workers' health is constantly on the rise. The International Labour Organization (ILO) has been responding to the challenge of preventing occupational diseases with, among other tools, the elaboration of an international reference List of occupational diseases revised periodically by an international tripartite meeting of experts. The List is complemented by the elaboration of criteria for the identification and recognition of occupational diseases which are periodically incorporated in the ILO List. The List of occupational diseases reflects the state of the art in the identification and recognition of occupational diseases and is designed to assist countries in their prevention, recording, notification and, if applicable, compensation of diseases caused by work.[7] Most of the occupational diseases in the list are caused by chemical agents. The prevention of occupational diseases caused by chemical exposures will save lives, improve the quality of life for other workers, and reduce the significant social costs of chemical exposures.[8]


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How are exposure to hazardous chemicals controlled in the workplace?

Because of the complexity of assessing mixtures, governments and organizations have tended to focus on individual chemical substances when developing strategies to prevent exposures harmful to workers health in the use of chemicals at work. Occupational exposure limit values (OEL) are standards developed as guidelines to assist in the control of health hazards and used by industrial hygienists in making decisions regarding safe levels of exposure to various chemical and physical agents found in the workplace when establishing control measures. Deriving and implementing OEL for individual chemicals has been the primary approach. The OEL is either a recommended or required numerical limit for workplace exposure. These limits commonly establish a time-weighted average exposure level that is expected to prevent most health effects from occurring in workers exposed full-time to a chemical. There may also be limits for short-term exposures or ceiling levels that should not be exceeded in any circumstance. Many different terms have been used by countries or organizations


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to describe their OELs. One of the most widely referenced is the Threshold Limit Value (TLV). The TLVs are recommended levels with no legal requirement, and are prepared by the American Conference of Governmental Industrial Hygienists (ACGIH). While they are not mandatory limits, some countries have adopted them and made them legal in their systems. Thus the TLVs have a broad reach with regard to exposure limits in workplaces around the world. Other terms that have been used by countries or organizations include Permissible Exposure Limit, Recommended Exposure Limit, and Maximum Allowable Concentrations (MACs). A database that includes many of the OELs recommended or required around the world has been made available in Germany.[9]

These OELs have also been focused in many cases on a single health effect, rather than approaching a chemical holistically and determining all of its potential hazards. Therefore, there may be an OEL for benzene and its potential to cause leukemia in workers—but there is no recognition in the same standard that benzene is highly flammable, and needs to be handled to minimize the risks of that effect. For example, a country may have adopted a standard for lead, which included an occupational exposure limit (OEL) for lead exposures, as well as protective measures to ensure the safe handling and use of lead in the workplace. Such individual standards have often adequately addressed the problems with a single chemical; nevertheless the reality of the situation is that there are so many chemicals to which workers may be exposed that this substance-by-substance approach will never be able to adequately protect them. In addition, where governments or organizations have created lists of recommended occupational exposure limits for several hundred chemicals, it has become clear that the resources to keep these lists up to date are significant. Thus many of these lists contain outdated OELs, that don't reflect the latest data on the chemical, that are no longer made, or are used so infrequently that few workers are exposed to them. There is no current priority system for selecting the chemicals to be addressed in most situations, and highly hazardous chemicals, and/or widely used chemicals in today's workplaces, may not be addressed at all.[10] While there may always be a need for some OELs to address exposure to particular hazardous chemicals, it is clear that alternative approaches that can cover most chemicals in a workplace are needed.

What are the effects of the physical hazards of chemicals in the workplace?

In addition to the potential for serious injuries and diseases to workers handling the chemicals in the workplace, there is significant potential for property damage to the facility, and in the worst case situation, impact on surrounding parts of the community and the general environment.

The physical hazards of chemicals in the workplace can result in injuries to workers if not properly controlled. The physical characteristics of chemicals are often related to health issues as well. Aspects such as volatility rate, for example, can determine the potential for exposure in a workplace. The proper control of such hazards requires knowledge of the potential effects of chemicals in the workplace, as well as how such effects might be made worse if chemicals are not handled or stored as required. The GHS also has a list of classification criteria for the physical hazards of chemicals.

Physical hazards are generally regarded as inherent properties of the chemical involved, but in many cases, a precipitating factor is required to trigger an effect. Therefore, a highly flammable liquid that is handled and stored away from sources of ignition such as flames is not likely to result in any harm. If physical hazards are not managed properly, this may result in a catastrophic event that will subsequently lead to extensive exposure to health hazards too. For example, a fire in a chemical plant can lead to a toxic mixture of chemicals developing, and being emitted into the environment. Or the corrosive aspects of a chemical that is improperly stored can lead to a leak or release of the chemical, which may in turn pose serious health effects for workers, the community and the general environment. Control of such adverse effects requires extensive knowledge of workplace conditions, the chemicals involved, and the possible synergistic effects of the chemicals being handled or stored in the same areas. Monitoring of the situation, as well as regular maintenance, are key to successful control.

Would a framework for action at the national level help achieve the sound management of chemicals?

OSH has always been a central aspect of ILO's mandate and Decent Work. ILO framework Conventions, namely the Occupational Safety and Health Convention, 1981 (No. 155), the Occupational Health Services Convention, 1985 (No.161) and the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187), as well as their related Recommendations provide for a national and enterprise level policy, the national system under which these are implemented and the relevant occupational health services responsible for the implementation of preventive and protective measures at national and workplace level. The Chemicals Convention, 1990 (No. 170), the Prevention of Major Industrial Accidents Convention, 1993 (No. 174) and the Safety and Health in Agriculture, 2001 Convention (No.184), have contributed to the development of a coherent approach to the sound management of chemicals respecting concerns both for workers, communities and the environment. Those instruments, together with the Labour Inspection Convention, 1947 (No.81) and its Protocol, 1995 (No.81), the Labour Inspection (Agriculture) Convention, 1969 (No.129) and their recommendations, all provide for a national framework for the sound management of chemicals for governments, employers' and workers' and their organizations.


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A relevant, coherent and effective method is to use a management systems approach based on the general ILO principles of these OSH standards, the ILO Guidelines on occupational safety and health management systems, (ILO–OSH 2001) and social dialogue in promoting the sound management of chemicals throughout their life cycle. It should aim at the continuous harmonization, integration and improvement of preventive

and protective measures, management systems and tools and capacity building, encompassing both the workplace and the environment. This includes effective labour inspection services provided with the means, qualifications and training to fulfil their duties. The joint effort from employers and workers and their organizations are essential for successfully achieving the goals of the national and global management of chemicals.

National framework for action for the sound management of chemicals

A good national OSH system is critical for the effective implementation of national policies and programmes on OSH, and in particular for the sound management of chemicals; such a system should include:

- Laws and regulations, and where appropriate, collective agreements incorporating the for the sound management of chemicals;
- Law compliance mechanisms, including effective OSH inspection systems;
- Risk assessment and management measures;
- Cooperation between management and workers and their representatives in the implementation of OSH measures relevant to the use of chemicals at work;
- Provision of occupational health services;
- Adequate mechanism for the recording and notification of occupational accidents and diseases;
- Awareness raising, OSH information sharing and training on safety measures in the use of chemicals at work;
- Collaboration between ministries of labour, health and environment.

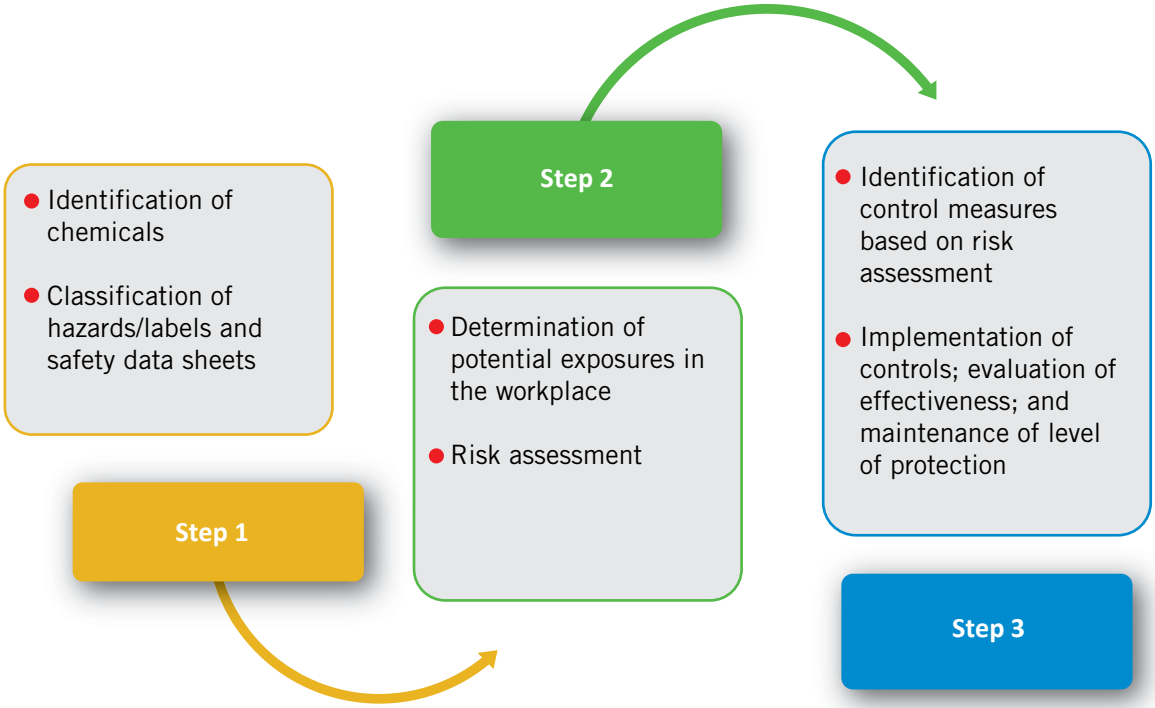
How can we achieve the sound management of chemicals in the workplace?

The overall strategy to achieve the sound management of chemicals in the workplace and in protecting the general environment can be simply described as follows:

The first step is to identify what chemicals are present; classify them as to their health, physical, and environmental hazards; and prepare labels and safety data sheets to convey the hazards and associated protective measures. Without such information on chemicals in the workplace, or released to the environment, it is not possible to go farther in terms of an evaluation of impact, and determination of appropriate preventive measures and controls. Information provides the underlying structure needed to achieve the sound management of chemicals.

The second step is to evaluate how the identified and classified chemicals are used in the workplace, and what exposures can result from this use. This may be accomplished through exposure monitoring, or through application of tools that allow for estimation of exposures based on factors regarding the quantity used, the potential for release given the conditions in the workplace or facility, and physical characteristics of the chemical. Once the hazards have been identified, classified, communicated, and their risk has

been assessed, the third and last step is to use this information to design an appropriate preventive and protective programme for the workplace. This would include various types of preventive and control measures, including installation and use of engineering controls; substitution by less hazardous chemicals; and use of respiratory protection, and other personal protective equipment when necessary. Other provisions of a thorough program that support and enhance these controls are exposure monitoring; information and training for exposed workers; recordkeeping; medical surveillance; emergency planning; and disposal procedures.



What should a workplace level program for safety and health in the use of chemicals include?

ILO Convention on Safety in the Use of Chemicals at Work, 1990 (No.170), provides a blueprint for the sound management of chemicals in the workplace. The Convention provisions are further elaborated in the accompanying Recommendation (No. 177) as well as in the Code of Practice for Safety in the Use of Chemicals at Work, and a number of training manuals.[11] The Convention and other tools are just as relevant today as they were when initially adopted. The major elements of the Convention include all of the requirements that an employer would need to implement sound management of chemicals in terms of worker protection and environmental impact. They also provide considerable details in what a workplace program should include. It should be noted that this approach is also consistent with the ILO Guidelines on occupational safety and health management systems, ILO–OSH 2001.[12] The table below shows the main components of a workplace level programme.

Workplace Program for Safety and Health in the use of Chemicals	
Elements of the Programme	**Components Included**
General obligations, responsibilities and duties	Role of the competent authority; responsibilities and duties of employers, workers, and suppliers Rights of workers Confidential information
Classification Systems	Criteria for classification of hazards Methods for classification
Labelling and Marking	Nature and type of labelling or marking on containers of hazardous chemicals
Chemical Safety Data Sheets	Provision of information Content of safety data sheet
Operational Control Measures	Assessment of control needs Elimination of hazards Control measures for: health hazards; flammable, dangerously reactive or explosive chemicals; transport of chemicals; disposal and treatment of chemicals
Design and Installation	Enclosed systems where feasible Separate areas for hazardous processes to limit exposures Practices and equipment that minimize releases Local exhaust ventilation General ventilation
Work Systems and Practices	Administrative controls Cleaning and maintenance of control equipment Provision of safe storage for hazardous chemicals
Personal Protection	Personal protective equipment Respiratory protective equipment Protective clothing Welfare facilities and personal hygiene Practices to maintain equipment and clothing as necessary
Information and Training	Workers exposed to hazardous chemicals should be provided information about these chemicals (labels and safety data sheets), and be trained how to handle them safely, what to do in an emergency, and how to obtain additional information

Workplace Program for Safety and Health in the use of Chemicals	
Elements of the Programme	**Components Included**
Maintenance of Engineering Controls	Practices and procedures to keep engineering controls in good working order
Exposure Monitoring	Measuring methods Monitoring strategy Recordkeeping Interpretation and application of data
Medical and Health Surveillance	Medical exams as necessary Recordkeeping Use of results to help evaluate program
Emergency Procedures and First Aid	Planning should be done to anticipate possible emergencies, and have procedures to deal with them First aid should be available on-site
Investigation and Reporting of Accidents, Occupational Diseases and Other Incidents	All incidents should be investigated to determine why they occurred, what failed in the workplace or in the emergency plan Authorities should be notified as required by national laws

Social dialogue for the sound management of chemicals

The sound management of chemicals requires effective and efficient governance through transparency, public participation, and accountability involving all stakeholders. Making better use of social dialogue to improve the legislation and its implementation, including effective labour inspection, provided with the means needed and conducted by inspectors who are trained, suitably qualified and free of any undue outside influence. The active participation of employers' and workers' organizations is essential for the development of national policies and programmes for the sound management of chemicals and good governance. Employers have a duty to take preventive and protective measures through assessment and control of the risks at work including to those related to chemical exposures. Workers and their organizations have a right to be involved at all levels in formulating, supervising and implementing prevention policies and workplace programmes. Managers, supervisors, OSH professionals, workers, and safety and health representatives all have important roles to play through effective social dialogue and participation on the implementation of OSH measures enhancing the effectiveness of risk-management systems. The sound management of hazardous substances in the workplace is an essential element in reducing their impact on workers' health, industry and the environment. Employers' and workers' organization are represented in a number of international mechanisms for global social dialogues, framework agreements and voluntary initiatives promoting good industrial relations in the chemical industry and the sound management of chemicals.

What is the impact of chemicals on the environment?

Chemicals in the environment have been proven to have significant impact, from climate change to the destruction of wildlife species and contamination of drinking water. Clearly, a more judicious use of chemicals, and controlled release and disposal of them, is critical to ensuring our future environmental safety and health. It must also be done with clear regard for the safety and health of workers.

For many years, the chemical waste of facilities was indiscriminately disposed of in the ground, air, and water sources in the area. This situation has changed to a large extent in those countries where appropriate controls and practices to clean up and prevent their recurrence have been established. However, there are other countries that are still dealing with significant pollution. In some cases, environmental effects are seen as a necessary adjunct to increased development and economic growth. The long-term costs to society need to be adequately addressed when decisions are made regarding what is acceptable in terms of impact on the environment. For developed countries, much of the emphasis has been on correcting mistakes of the past, and establishing and implementing policies to prevent them in the future. Developing countries and economies in transition have the opportunity to learn from mistakes made in developed countries, and the experiences of having to correct them, by applying prevention through design principles to new facilities. One important aspect of this situation is the realization that pollution crosses borders. While one country may have programs to prevent improper emissions and disposal of waste, a neighbouring country may not—and pollution travels in the air, as well as in waterways. Thus to truly have an effective national programmes for the environment, there must be an international coordinated strategy to promote a similar approach for all countries. The GHS also has a list of environmentally agreed criteria for hazard classification.

Environmental protection and occupational safety and health are often dealt by separately in government institutions, without recognizing the impact that each may have on the other. As a result, situations developed where emissions to the environment were controlled by regulations that had no consideration of worker exposures, and the controls implemented actually produced greater exposures inside the facility than those present previously. Clean-up of hazardous waste sites also created significant worker exposure problems, particularly difficult because the chemicals present may be unknown, and the mix of the chemicals could create new hazards.

Many jobs being created in the global economy today are so-called Green Jobs, or jobs in industries that are designed to reduce adverse environmental impacts through the development and implementation of alternative technology and practices.[13] While Green Jobs are welcome in terms of providing new opportunities for workers to be employed, it is critical that these jobs are established and monitored to ensure that they are not creating new, and possibly unknown, hazards. While supporting the concept that new approaches to chemical use and other aspects of industry are needed to minimize the impact on the environment, it is just as important to ensure that the workers performing

Bhopal, India Chemical Accident

- Over 40 tons of methyl isocyanate gas were released
- Over 3000 people died shortly after the incident
- Estimates vary, but up to 25,000 people total died as a result of exposure
- Over 500,000 people were injured
- Continuing effects include such impacts as birth defects and environmental contamination.

these important jobs are adequately protected. One example of this was recently examined by the ILO in a report regarding electronic waste recycling.[14] The widespread use of computers has led to an extensive amount of waste as these devices become obsolete quickly. While use of an electronic device for its intended purpose does not result in significant chemical exposures to users, breaking down the components for purposes of recycling can expose the workers involved to hazardous chemicals. In some cases, the items being recycled may be shipped to other countries to perform this more dangerous task of taking the devices apart to recycle the parts. Thus the hazards are also being exported. This has happened in shipbreaking operations, when the ships have outlived their utility, they are shipped to other countries where recycling operations take place, and workers in those countries are exposed. Thus while achieving the laudable environmental goal of recycling usable materials; new jobs that involve hazardous exposures are being created to perform the work. These jobs are often in not being enforced.[15]

In 2014, the world marks the 30th anniversary of the worst industrial accident that has ever occurred. In December 1984, over 40 tons of methyl isocyanate gas were released as a result of an unintended chemical reaction in a plant in Bhopal, India. The effects of this tragedy are still being experienced in Bhopal in terms of lingering health effects and significant environmental contamination. The incident has proven to be the precipitating focus to change safety and health practices in the chemical industry and develop mayor hazard control measures. As one of the seminal events that led to the examination of processes for the sound management of chemicals, this accident illustrated the many aspects of sound management that were ignored or underutilized in the operation of the facility, from improper maintenance that led to the leak itself, to allowing a densely crowded community to be built around the plant that housed such a deadly chemical. The loss of life was extensive, and the importance of preventing such occurrences became foremost in the minds of safety and health practitioners. This led to some fundamental changes in approaches towards chemical safety and the management of major hazard installations.

The ILO Convention on the Prevention of Major Industrial Accidents, 1993 (No.174) and its accompanying Recommendation (No. 181) focus on examining the potential risk of catastrophic disaster, and planning appropriate preventive measures and emergency response on the basis of an OSH management system.[16] The requirements of this Convention complement the ILO Chemicals Convention (No. 170) by elaborating further on the sound management of chemicals. The ILO has also developed a Code of practice on the prevention of major industrial accidents[17] and a manual on major hazards control to complement the standards.[18]

How does safety in the use of chemicals at work relate to environmental protection?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The sound management of chemicals with regard to environmental protection involves the same steps as illustrated in the graphic above. As mentioned before, first, the chemicals must be identified, classified, and have information distributed on hazards and protective measures; second, there must be an evaluation of potential exposures or quantities, and subsequently a risk assessment to determine what needs to be controlled; and lastly, appropriate control measures must be implemented, evaluated, and monitored.

The sound management of chemicals is a life cycle approach to chemical management, meaning that each step of the life cycle is subject to such an evaluation to determine the level and type of control. While the use of the chemicals in work processes is one step, proper disposal and the management of emissions and releases are relevant as well. A thorough examination of the potential risks of a chemical in the workplace will include all of the steps in the life cycle, including those related to environmental protection. The protection of workers involved in the disposal, or maintenance of controls related to environmental protection, must also be included in this assessment. An effective chemical management programme will address all of these issues. A thorough approach also addresses the need for preventing catastrophic releases, or containing them should they occur accidentally. As was learned in Bhopal, a workplace leak, inadequate maintenance of equipment, as well as other factors related to placement of the chemicals in the community, all impacted what became a significant environmental disaster in addition to the impact on the workplace. ILO Convention on Major Hazard Control, 1993 (No. 174) and its accompanying tools detail how this type of planning can be addressed in facilities.

What other international and national developments relate to the implementation of the sound management of chemicals?

A major part of international work in the field of chemical safety takes place through collaboration within the context of established mechanisms for inter-agency co-operation. The Bhopal incident and other precipitating factors have formed the basis for continuing and coordinated strategy for the sound management of chemicals. In 1992, the United Nations Conference on Environment and Development (UNCED) adopted a number of mandates related to chemical control. The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) was one of those mandates. Subsequent to UNCED, a coordinating group of international organizations responsible for implementation activities related to the UNCED work was formed to ensure the work proceeded in a cooperative and coordinated fashion. This group is known as the Inter-organization

Programme for the Sound Management of Chemicals (IOMC). Their stated function now is to "promote coordination of the policies and activities pursued by the Participating Organizations, jointly or separately, to achieve the sound management of chemicals in relation to human health and the environment. The participating organizations are: Food and Agriculture Organization (FAO); International Labour Organization (ILO); United Nations' Development Program (UNDP); United Nations Environment Program (UNEP); United Nations' Industrial Development Organization (UNIDO); United Nations' Institute for Training and Research (UNITAR); World Health Organization (WHO); World Bank; and Organization for Economic Cooperation and Development (OECD). Each of the Participating Organizations has programs and policies related to sound management of chemicals. Through the IOMC, these programs and policies remain complimentary, enhancing the overall approach through coordination of efforts, and providing capacity building to assist countries in addressing chemical issues. From these efforts, the Strategic Approach to International Chemicals Management (SAICM) has evolved.[19]

The Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

The GHS:

- Harmonized criteria for classification of health, physical, and environmental hazards
- Harmonized Pictograms, Signal Words, and Hazard Statements for Labels
- 16-Section Safety Data Sheet
- Updating and Maintenance of the GHS by United Nations Subcommittee
- Responsibility of Manufacturers and Suppliers to Generate and Distribute the Required Information

The most relevant international source of information on chemical safety is the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). The GHS has been designed to cover all chemicals, including pure substances and mixtures and to provide for the chemical hazard communication requirements of the workplace, the transport of dangerous goods, of consumers and the environment. As such it is a truly harmonized and universal technical system that has a far-reaching impact on all national and international chemical safety regulations. The GHS have a list of classification criteria according to health, physical and environmental hazards.[20] Work on the GHS started as a follow-up to the adoption of the Chemicals Convention, 1990 (No.170). The work was coordinated and managed under the auspices of the IOMC and the technical focal points were the ILO, OECD and the United Nations Economic and Social Council's Sub Committee of Experts on the Transport of Dangerous Goods (UN SCETDG). Recognizing that unprecedented capacity building efforts would be required to enable countries, especially developing countries and countries with economies in transition to deal with the use of chemicals at work by implementing the GHS, UNITAR and the ILO established the UNITAR/ILO GHS Global Capacity Building Programme. The UNITAR/ILO Global GHS capacity building programme provides guidance documents, educational, awareness raising, resource and training materials regarding the GHS. Relevant topics include the development of national GHS implementation strategies, legislation, situation/gap analyses, chemical hazards, labelling, safety data sheets (SDSs), as well as related support measures, such as comprehensibility testing. UNITAR and ILO are the designated focal point for capacity building in the UN ECOSOC Subcommittee of Experts on the GHS (SCEGHS).[21]

The Strategic Approach to International Chemicals Management (SAICM)

The Strategic Approach to International Chemicals Management (SAICM) is a policy framework for international action to advance the sound management of chemicals, adopted by the International Conference on Chemicals Management (ICCM) on 6 February 2006. SAICM has as its overall objective the achievement of the sound management of chemicals throughout their life cycle so that, by 2020, chemicals are produced and used in ways that minimize significant adverse impacts on human health and the environment. This "2020 goal" was adopted by the World Summit on Sustainable Development in 2002 as part of the Johannesburg Plan of Implementation. SAICM is encouraging governments to have a National Chemicals Management System that includes the following elements:

(a) Adequate legislation,

(b) Information gathering and dissemination,

(c) Capacity for risk assessment and interpretation,

(d) Establishment of risk management policy,

(e) Capacity for implementation and enforcement,

(f) Capacity for rehabilitation of contaminated sites and poisoned persons,

(g) Effective education Programmes, and

(h) Capacity to respond to emergencies.

SAICM aims to encourage governments and other stakeholders to address chemical safety more effectively in all relevant sectors, such as agriculture, environment, health, industry, and labour. The ILO, as part of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC)[22], was an active member in the development of the SAICM and actively participates in the SAICM Global Plan of Action. The Strategic Approach will support the achievement of the goal agreed at the 2002 Johannesburg World Summit on Sustainable Development which ensures that, by the year 2020, chemicals will be produced and used in ways that minimize significant adverse impacts on the environment and human health. To this end, SAICM promotes capacity building for developing countries and countries with economies in transition and better co-ordination of international efforts to improve the sound management of chemicals.[23]

The ILO, with other Participating Organizations in the IOMC, have been developing and coordinating policies and strategies with countries to move towards achievement of the SAICM goal to accomplish the sound management of chemicals in 2020. They have also provided additional guidance and information on achieving chemical safety and health at work. These tools can supplement the legal instruments, and address many of the questions governments, employers, and workers may have about aspects of this strategy. The ILO already has significant tools available for governments, employers and workers to develop and implement such a programme for the sound management of chemicals in the workplace, as well as to protect from the impact from chemicals to the environment and to contribute to the challenge of achieving sound management of chemicals in 2020.

Ratification of the ILO conventions relevant to chemical safety and health and the prevention of major accidents, as well as the implementation of the GHS, will further contribute to international progress towards meeting the SAICM goal for 2020. Ratification of these conventions by as many countries as possible would be a major step forward in the goal to achieve the sound management of chemicals. Implementation of its provisions would provide a framework for countries to develop programs to minimize worker exposures and environmental impacts from chemicals. This would establish a consistent global approach, and therefore, a more coordinated strategy to achieving an international strategy on chemical control. In doing so, the ILO and UNITAR cooperate closely with governments, employers and workers and their organizations with a view to improving the sound management of chemicals at national level, particularly within small and medium-sized enterprises (SMEs) by providing capacity building targeted at constituents with a view to promoting awareness and knowledge on sound management of chemicals, as well as providing information and training and technical assistance for the implementation of the GHS.

As the first step for the sound management of chemicals, the preparation and distribution of comprehensive information on chemicals is critical. This is reflected among the major elements of the Chemicals Convention, 1990 (No.170). When it was adopted, the Committee also adopted a resolution supporting the development of a globally harmonized system addressing hazard classification, labels, and safety data sheets. While the Convention is written such that governments could move forward by adopting their own systems, the Committee members thought successful implementation of the Convention would be enhanced by having a global approach to complement it that could simply be adopted by countries. This would ensure that hazards would be classified the same, regardless of the country of origin, and that the labels and safety data sheets would be consistent as well. Clearly, this would result in an harmonized and more coordinated, preventive and protective approach to the provision of hazard information, as well as provide an international infrastructure to maintain the system, which saves resources for many countries. It would create the additional benefits associated with eliminating barriers to trade caused by differing information requirements in various countries, and the need to duplicate materials. This is how the GHS was born.


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Development of such a system proved to be a daunting task, which took many years to complete. The ILO was a key player in this process, convening a Meeting of Experts to examine the tasks involved in achieving harmonization, and later serving as the Secretariat for the group coordinating the development of the system, as well as the group preparing the hazard communication elements.

The new system was based on major existing systems in Europe, the United States, and Canada, as well as the already harmonized international system for transport information. It has been available for adoption for over 10 years, and many countries either have implemented it, or are in the process of doing so. Some of the key countries involved in chemical production are implementing, including the Member States of the European Union, the United States, and Japan. The GHS is an international recommendation, but the provisions become mandatory through national implementation. Adoption of the GHS will allow countries to satisfy the Convention requirements for classification and other measures for the sound management of chemicals by relying on the internationally harmonized approach, rather than having to develop and maintain a system of their own. And the information provided under the GHS will allow the development of effective programmes for the sound management of chemicals.[24]

A key aspect of a successful national GHS programme is to ensure that chemical manufacturers, importers and suppliers have responsibility to generate the required information, and make it available to their customers through the supply chain. Successful existing systems incorporated this approach. While individual employers have responsibility for implementing a program, they cannot be expected to be familiar with all of the chemicals they purchase, and prepare appropriate documentation. That responsibility must lie with the producer or distributor of the chemical to workplaces where it is used.

International Chemical Safety Cards (ICSC)

The ICSC project is a joint undertaking between WHO and the ILO with the cooperation of the European Commission.[25] This project was initiated by the WHO and the ILO during the 1980s with the objective of disseminating appropriate hazard information on chemicals for workplace use. To date approximately 1700 Cards are available and new chemicals are being added regularly; the cards are also translated into 16 different languages. The preparation of ICSCs is done by an international group of experts from a number of specialized scientific institutions in different countries and peer-reviewed in the development process. The process of peer review ensures the authoritative nature of the information provided in the Cards. Chemicals are selected for new Cards based on a range of criteria for concern (high production volume, incidence of health problems, high risk properties). Chemicals to be included in the project can be proposed by countries' authorities or stakeholders, such as trade unions. Existing Cards are updated periodically when significant new information becomes available. The information provided in the ICSCs is in line with the ILO Chemicals Convention, 1990 (No. 170) and Recommendation

(No. 177) with the European Union Council Directive 98/24/EC, and with the criteria of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).[26]

The purpose of the International Chemical Safety Cards is to serve as internationally agreed reference providing up-to-date information to complement any available chemical safety information at national level or enterprise level for the sound management of chemicals and are not intended to substitute any legal obligation in place by countries using them. The ICSCs project is intended to provide essential safety and health information on chemicals in a clear and concise way. The Cards provide a concise summary of potential adverse effects of a chemical, as well as protective measures. The primary aim of the Cards is to promote the safe use of chemicals in the workplace and may be used as a reference source for employers, those responsible for occupational safety and health at enterprise level or by workers exposed to the chemicals involved. The Cards are also regularly used as a readily available source of concise information in the event of a chemical incident. ICSCs might be the principal source of information available for both management and workers in less developed countries or in small and medium sized enterprises.

Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH)

The European Union has made major modifications to its approach to regulating chemicals. Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) is a new EU regulation that addresses chemicals throughout the life cycle of the product.[27] It is a cradle-to-grave approach that replaces a number of previous regulations with a single system, and establishes an integrated approach to risk management in the member States. Its Implementation of REACH is being coordinated by the European Chemicals Agency (ECHA).[28] The EU also adopted the GHS in a complementary regulation to REACH, and is following the GHS requirements for classification and labelling. REACH has a number of stated objectives:

- To provide a high level of protection of human health and the environment from the use of chemicals.
- To make the suppliers of chemicals responsible for understanding and managing the risks associated with their use.
- To allow the free movement of substances on the EU market.
- To enhance innovation in and the competitiveness of the EU chemicals industry.
- To promote the use of alternative methods for the assessment of the hazardous properties of chemicals.


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Under requirements of the European Chemicals Agency (ECHA), manufacturers have been requested to notify the Agency of chemicals that will be classified and labelled. Over 5.7 million notifications have been received for over 110,000 chemical

substances used, classified and labelled in workplaces in Europe. In addition to the extensive information being made available on chemicals through REACH, there are a number of tools and information sources on workplace chemical safety and health available online from the European Agency for Safety and Health at Work.[29]

A national example is the Chemical Abstracts Service (CAS),a division of the American Chemical Society. It maintains a registry of numbers assigned to unique, individual substances for purposes of reliable identification. As new chemical substances are synthesized around the world, each is assigned a CAS number for identification purposes. These numbers are unique to the chemical substance, and help to ensure that they are properly identified wherever they are present. There are now more than 75 million chemical substances in the registry. Clearly, all of these chemicals are not currently being produced, but have been produced and the large number is a reflection of the potential for exposure. What is most interesting, and indicative of the difficulty associated with designing preventive and protective measures for chemicals in workplaces and for the environment, is the rate at which chemicals are produced and are being added to the registry. However, while it took 15 years to register the first 10 million substances, it took only one year between the registration of 70th and 75th million chemical substances. Innovation is occurring in many countries around the world, for example, China and other Asian countries are responsible for many of the new substances recently added to the registry.[30]

The Committee of Senior Labour Inspectors (SLIC)

The Committee of Senior Labour Inspectors (SLIC) from the European Commission was established in 1995 to deal with aspects related to the monitoring and enforcement of the Community Law on Occupational Safety and Health by the EU member States. The committee meets twice a year to discuss and provide advice on the practical application of the OSH directives, promote awareness raising campaigns directly relevant to specific risks in European workplaces and encourage the harmonization of inspectorates' action in relation to enforcement and awareness raising. SLIC developed and maintains an on-line Knowledge Sharing System (KSS) that functions as a hazard alert system sharing information, methods and good practices among European inspectorates in case of need.

The SLIC has also Working Groups, one of which on occupational safety and health of chemicals (CHEMEX) which provides guidance to national labour inspectorates on the enforcement of REACH in relation to occupational safety and health matters related to chemical exposures In workplaces; provides advice and raises awareness on OSH directives directly relevant to the use of chemicals in workplaces and support inspectorates in ensuring compliance by employers, and in some cases manufacturers and suppliers. In 2010 the SLIC run an European campaign on risk assessment in the use of dangerous substances.[31] SLIC also collaborates actively at the European level with the European Agency for Occupational Safety and Health (EU-OSHA) and REACH, the EU regulatory system on chemical.

Knowledge sharing at International and national levels

Universal access to information and knowledge is essential for the sound management of chemicals and the development of preventive and protective tools. An ILO Meeting of Experts held in December 2007 to "Examine Instruments, knowledge, advocacy, technical cooperation and international collaboration as tools with a view to developing a Policy Framework for Hazardous Substances"[32], adopted the following recommendations as priority actions at international level:

- continuing the active collaboration of IOMC members for policy coordination on chemical management;
- strengthening ILO tripartite participation in SAICM activities and use the SAICM mechanisms to build technical cooperation synergies for the promotion of ILO instruments, guidelines and programmes related both to OSH and hazardous substances; and
- strengthening the technical collaboration with the United Nations Institute for Training and Research (UNITAR) in developing chemical safety training tools for the GHS and guidance for the implementation of national chemical safety programmes;
- promoting the adoption by member States and the implementation and use by
- industry of the GHS;
- increasing its input in the development, updating, translation, dissemination and
- overall promotion of the International Chemical Safety Cards (ICSCs),
- as well as promoting the use of internationally recognized hazardous chemicals assessments such as the IPCS Environmental Health Criteria (EHC) and the Concise International Chemical Assessment Documents (CICAD);
- assessing the hazardous properties of chemicals and strengthening screening and
- evaluation systems for new chemicals entering the market;
- supporting efforts to harmonize chemical hazard identification, assessment and
- management methods at an international level;
- promoting universal access to reliable information on hazardous substances such as
- classification and labelling and material safety data sheets in as many languages as possible;
- supporting the development and implementation of international standards and technical guidelines on the prevention of exposure to, and the sound management of, hazardous substances, including occupational exposure limits (OELs) and threshold limit values (TLVs);
- updating national lists of occupational diseases;
- implementing transparent, comprehensive, efficient and effective risk-management strategies based on appropriate scientific understanding of health effects, hazard/risk elimination, including detailed safety information on chemicals, to prevent unsafe or unnecessary exposures to chemicals at the workplace;

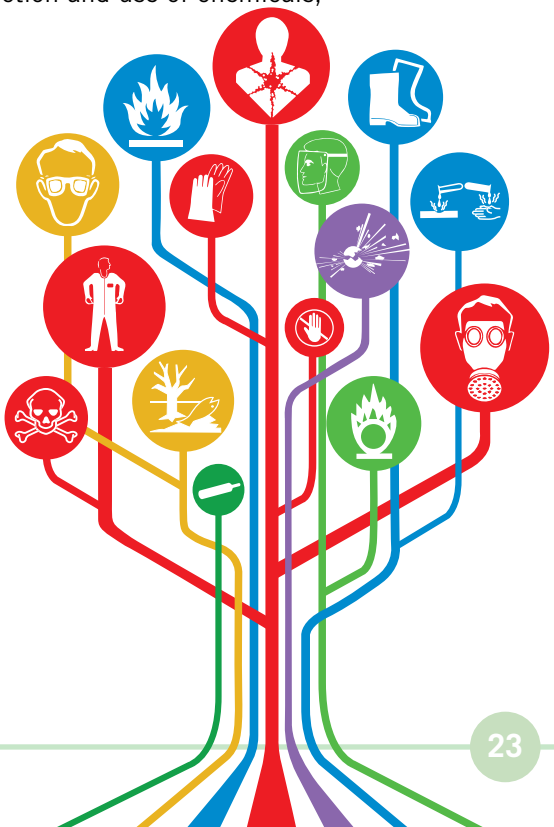
- applying appropriately the precautionary approach, as set out in Principle 15 of the Rio Declaration on Environment and Development, while aiming to achieve that chemicals are used and produced in ways that lead to the minimization of adverse effects on the health of workers;
- ensuring that specific needs of all workers, particularly vulnerable and precarious workers, are taken into account; and
- promoting the development of global networks to facilitate the sharing of good practices, methodologies, interventions, approaches and results of research to improve the sound management of hazardous substances, and making full use of the wide network of the ILO CIS national centres.

Final remarks

Chemicals are key to modern life, and will continue to be produced and used in workplaces. With concerted efforts governments, employers, and workers and their organizations can achieve the sound management of chemicals for an appropriate balance between the benefits of chemical use, and the preventive and control measures of potential adverse impacts on workers, workplaces, communities and the environment.

Implementing the GHS in a country will address the first step of the sound management of chemicals. The provisions of the GHS support manufacturers and importers being responsible for hazard identification and classification of the health, physical, and environmental hazards of all substances and mixtures they produce or import. It also specifies the development of labels and safety data sheets for hazardous substances and mixtures using the harmonized criteria in the GHS, thus helping to ensure that exposed workers have access to information, as well as downstream employers. These requirements for manufacturers and suppliers to be responsible for hazard classification, and transmittal of hazard information and protective measures, will form the basis of a program for the sound management of chemicals in the country. The task at hand for governments, employers, and workers is to:

- Maintain the benefits achieved through the production and use of chemicals;
- Minimize worker exposures and emissions of chemicals into the environment; and,
- Develop and implement national preventive and control strategies and systems that comprehensively and simultaneously address the health, safety, and environmental aspects related to the use of chemicals to help ensure a coordinated and sustainable management, and Decent Work for all.



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