



**STUDY ON THE COMPREHENSIBILITY OF
CHEMICAL SAFETY INFORMATION IN
FIVE SOUTHERN AFRICAN COUNTRIES**

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1. INTRODUCTION

In Southern Africa the manufacture and use of chemicals is rapidly increasing in all economic sectors. Many of the chemicals used in the countries surveyed in this study are imported mainly from South Africa, Europe and United States of America.

The major concern with chemicals in the region is their safe use and the lack of information from manufacturers or importers to users of chemicals, particularly employees, on the potential hazards and safety precautions to be taken. The comprehensibility of the chemical information available to employees and the chemical hazard communication systems used at workplaces was assessed during the study. The countries in the region that were identified and participated in the study include, Lesotho, Malawi, Namibia and Swaziland. A similar study was conducted in Zimbabwe in 1992 and the same study protocol was used during this study.

The objectives of the study include:

- (a) describe for each country the systems and related national regulations, if any, used most commonly in the workplace to convey information and warnings on chemical hazards;
- (b) evaluate comprehensibility of hazard communication tools by testing them on a representative panel of workers;
- (c) analyze the information collected to identify specific issues related in particular to hazard symbols or pictograms and precautionary statements;
- (d) make recommendations on factors which may need to be considered when harmonizing hazard communication tools for integration in a Globally harmonized system of classification and labelling of chemicals, with particular attention to the perceived needs of developing countries.

2. METHODOLOGY OF THE STUDY

2.1 The workplaces surveyed included operations involving dry cleaning, chemicals formulation, hides tanning, hotel and catering services in Namibia; horticulture, seeds chemical treatment, dry cleaning, animal slaughtering and rendering, chemicals marketing and distribution and paint formulation in Malawi; hotel and catering services, textile manufacturing, fibre glass materials manufacturing and agricultural laboratories in Lesotho and sugar cane growing, paint formulation, hotel and catering services, pulp and paper chemicals processing in Swaziland.

2.2 At each workplace visited, a questionnaire and interviews of both representatives of management and employees were carried out to determine their knowledge, attitudes and awareness of chemicals handled, used and stored at the workplace.

2.3 Samples of labels on chemical containers and any printed materials and posters used for disseminating information on chemical safety were collected for detailed review and analysis.

2.4 Where available, chemical safety data sheets, chemical safety policy, inventory of chemicals, chemical safety manual, labels on containers and warning symbols were provided.

2.5 Information and training materials used as part of the chemical hazard communication system at both the national level as well as by industry was collected.

2.6 Individual employees were requested to identify national chemical safety warning symbols where

they existed including international symbols they have seen on chemical containers.

COUNTRY REPORTS

3. MALAWI

3.1 Regulations

- 3.1.1 The Occupational Safety, Health and Welfare Act, 1997, requires that sufficient information is provided and safety precautions are taken on all hazardous substances by manufacturers, importers and suppliers of these chemical substances.
- 3.1.2 A hazardous substance has been defined to mean any matter which by virtue of its chemical, physical or toxicological properties constitutes a risk to safety, health or welfare of persons.
- 3.1.3 Containers of hazardous substances are to be clearly labelled giving relevant characteristics and instructions on the safe handling and use of the chemicals including procedures to be followed in case of spillage.
- 3.1.4 Where there is use of toxic substances or other volatile chemical substances, including thinners and paints special control measures such as local exhaust ventilation are to be instituted.
- 3.1.5 The management and handling of proven carcinogenic substances, particularly in work involving bituminous tar, asphalt, asbestos fibres, pitch, heavy oils and aromatic solvents require strict adherence to measures to avoid inhalation and skin contact.
- 3.1.6 Vessels containing dangerous substances including any scalding, corrosive or poisonous should be covered or securely fenced to at least one metre above ground.
- 3.1.7 The storage of dangerous substances should be done at designated areas which are constructed and maintained with suitable material, adequately ventilated, with adequate storage space and capable of containing not less than 75 percent of spillage.
- 3.1.8 There should be an inventory of all dangerous substances stored and the list prominently displayed.
- 3.1.9 Precautions in the form of enclosure of processes, removal or prevention of accumulation of dust, gas or vapour and exclusion or effective enclosure of possible sources of ignition should be taken to prevent explosion of dangerous chemical substances. All stocks of inflammable substances should be kept in a fire-resisting store or in a safe place outside any occupied building.
- 3.1.10 No fire, flame, open light or other agent likely to ignite volatile and inflammable substances is allowed or used in any part of a workplace where the substances are used or stored.
- 3.1.11 No person is allowed to smoke in any part of a workplace where volatile and inflammable substances are used, and a notice prohibiting smoking should be posted in a conspicuous place in every such part of the workplace.
- 3.1.12 All persons handling hazardous chemical substances should be informed of potential health hazards and trained in measures for prevention and control and protection against health risks

of exposure to chemical substances at the workplace.

3.1.13 All information, instruction and training should be given in a language understood by workers, and written, oral, visual and participative methods to be used to ensure that workers assimilate the information, instruction or training.

3.1.14 Protective clothing and appliances in the form of gloves, footwear, screens, goggles and head covering are to be provided to workers and maintained by employees at no cost to workers.

3.2 Findings of the Study

3.2.1 Results from Visits, Interviews and Questionnaires

3.2.1.1 Table 1: Types of companies selected for the study

Occupational Sector	No. of Employees
Seeds Chemical Treatment	85
Horticulture	450
Dry Cleaning	15
Animal Slaughtering and Rendering	12
Paint Formulation	6
Chemicals Marketing and Distribution	15
TOTAL	585

3.2.1.2 Questionnaire Responses

3.2.1.3 Most chemical containers had written labels with warning phrases and warning symbols.

3.2.1.4 Chemical safety data sheets were available for some chemicals, but most employees had not seen them.

3.2.1.5 Employees felt employers should inform them of the health effects of chemicals they handle and use in the workplaces.

3.2.1.6 Some of the labels on chemical containers had safety information written in different languages including English, Dutch, Afrikaans or German.

3.2.1.7 Most workers could identify at least two warning symbols on chemical containers, and in some cases the symbols for "oxidizing" was likened to a flower while that for "harmful" was identified to mean No Entry or Red Cross signs.

3.2.1.8 Most of the employees are illiterate.

3.2.1.9 Employees were not provided with adequate personal protective equipment such as respirators or whenever the equipment was provided it was not used and the enforcement for its use was minimum. In some cases employees were given milk as protection against health effects of inhaling chemicals.

- 3.2.1.10 There was generally inadequate training of employees in safe handling of chemicals.
- 3.2.1.11 Most employees were not aware of national laws and regulations on chemical safety.
- 3.2.1.12 Employees could identify most of the chemicals used in the workplaces using chemical trade names.

3.3 **Physical Visits Interviews and Observations**

- 3.3.1 Most of the chemicals handled at the workplaces are harmful and may cause skin and eyes irritation.
- 3.3.2 The employees were not trained in chemical safety including procedures and measures to prevent exposure during mixing and application of chemicals.
- 3.3.3 Housekeeping practices were unsatisfactory from chemical spillages on the floors.
- 3.3.4 Generally the ventilation in the chemical storeroom was inadequate.
- 3.3.5 Several chemical containers which were used by employees did not have labels with safety information and warning symbols of the chemicals.
- 3.3.6 Some chemical containers had labels which were colour coded and with written safety information in both English and Chichewa (national vernacular language).
- 3.3.7 Companies involved in export business received chemical safety information including materials safety data sheets from their international or regional trading companies.
- 3.3.8 Most employees would like to have medical examinations and first aid treatment readily available at the workplaces.

4. **LESOTHO**

4.1 **Regulations**

- 4.1.1 The National Labour Code Order, 1992 provides for requirements on the control of and communication of information on hazardous chemical substances at the workplaces. Vessels which contain toxic, corrosive or flammable substances are to be clearly displaced and marked with the name and nature of the substances and the precautions to be observed during storage, handling or use. Employees who are likely to come into contact with these chemicals are to be informed of the hazards and precautions.
- 4.1.2 The Spray Painting Regulations 1996 require employers to take necessary precautions for storage and handling of flammable paints and materials including keeping containers in well ventilated areas and provision of personal protective equipment to employees. Material safety data information should be obtained by the employer and to be made available to employees involved in the handling of the chemical substances. The employees are to be adequately trained in safety procedures.
- 4.1.3 The recently drafted Occupational Safety and Health Act 1997, which is about to be

promulgated into law provides that every employer, manufacturer or supplier of chemical substances shall be adequately marked or marked with a label.

- 4.1.4 The mark or label shall have complete, accurate, properly presented and legible information including: trade name; chemical name; name, address and telephone number of supplier; danger symbols, regarding health hazard, fire and explosion hazard in international colours; composition; nature of special risks associated with the handling, use transport, storage and disposal and the precautionary measures to be taken for the evidence of the risks and recommended first aid measures, and measures for dealing with spillage or any foreseeable danger. The chemical information on the label shall be written in English or English and Sesotho (national vernacular language spoken by the majority of employees).
- 4.1.5 The label shall be of such size in relation to the package as to be sufficiently conspicuous. Every employer shall display prominently warning signs, posters and or notices to warn employees of hazards of the chemicals to which they are exposed and the safety precautions to take and prevent exposure.
- 4.1.6 A chemical list of toxic substances has been presented in the form of a schedule in the Labour Code Order, 1992.
- 4.1.7 There is close coordination between the Occupational Safety and Health Unit in the Ministry of Labour with other government agencies responsible for regulating hazardous chemical substances, for example the Ministry of Agriculture, Pesticides Units. The Government has not yet ratified ILO Convention 170 on Safety in the Use of Chemicals at Work but the legal process of reviewing the convention is underway.

4.2 Findings of the Study

4.2.1 Results from Visits, Interviews and Questionnaires

4.2.1.1 Table 2: Types of companies selected for the study

Occupational Sector	<u>No. of Employees</u>
Hotel Catering Services	30
Textile Jeans Manufacturing	300
Fibre Glass Materials Manufacturing	20
Agriculture Laboratories	25
TOTAL	375

4.2.1.2 Questionnaire Responses

4.2.1.3 Most employees were not aware of the health effects of the chemicals in the workplace.

4.2.1.4 Employers receive and keep material safety data sheets on chemicals and employees do not have access to the chemical information.

- 4.2.1.5 Some chemical containers had labels with warning symbols and chemical information written in English and Afrikaans.
- 4.2.1.6 Employees would like training in health effects of chemicals they handle in the workplaces.
- 4.2.1.7 Most original containers had labels with written chemical information but the containers which are used by employees were not labelled.
- 4.2.1.8 The employees could identify the most commonly used chemicals using trade names.
- 4.2.1.9 Most of the employees are illiterate and could not identify the international warning symbols on the labels of chemical containers.
- 4.2.1.10 Most employees do not get medical examinations despite the exposure to some very toxic chemical substances.
- 4.2.1.11 Employees are not provided with appropriate personal protective equipment including respirators goggles and gloves.

4.3 **Physical Visits and Observations**

- 4.3.1 There were chemical spills on the floor and in some cases most containers were left open and without lids or covers.
- 4.3.2 The chemical storage facilities were crowded with chemical containers haphazardly stored and the ventilation was very poor and inadequate.
- 4.3.3 The employees complained of skin and eyes irritation.
- 4.3.4 Housekeeping practices were unsatisfactory from very congested and bad working conditions and the equipment covered with dust and chemical spills.
- 4.3.5 There were no emergency showers for employees to wash whenever skin contact occurs.
- 4.3.6 The general attitude of employers was that production received priority rather than the training of employees in chemical safety.
- 4.3.7 First aid treatment facilities were generally inadequate.
- 4.3.8 Most of the employees could not identify any of the international warning symbols on chemicals.
- 4.3.9 During mixing of chemicals most employees did not use personal protective equipment.
- 4.3.10 Employees were not aware of the national laws and regulations relating to chemical safety.
- 4.3.11 There were no warning signs, posters and notices on chemical safety displayed in the workplaces.

5. **NAMIBIA**

5.1 **Regulations**

- 5.1.1 Labour Act, 1992 and Regulations No. 156 of 1997 provide for the protection of the health and safety of employees at work including during exposure from materials handling, use and storage of hazardous chemical substances.
- 5.1.2 The regulations require that transporters and suppliers of hazardous substances should ensure that the marking, labelling and storage of hazardous substances for safe transport is in accordance with existing legislation, or recommendations on the transport of hazardous substances or dangerous goods made by the United Nations.
- 5.1.3 A hazardous substance has been defined to mean any toxic, harmful, corrosive or irritant substance.
- 5.1.4 The suppliers of hazardous substances, whether manufacturers, importers or distributors are also required to ensure that the classification of all hazardous substances is done in accordance with International Programme on Chemical Safety (WHO/IPCS), the International Labour Organization or the International Occupational Safety and Health Information Centre. The classification should be based on the substances characteristics, including toxic, chemical, physical, corrosive and irritant properties, and their allergic and sensitising effects, carcinogenic effects, teratogenic and mutagenic effects as well as their effects on the reproductive system.
- 5.1.5 The containers of all hazardous substances are to be clearly marked to indicate their contents and labelled in a uniform manner with a legible and durable label. The label should be written in a language easily understood by employees and other persons and in a size that is clearly visible.
- 5.1.6 The information required on the label includes: trade name; identity of substance; identification of the batch; hazard symbol; nature of the special risks associated with the use of the substance; safety precautions; first aid treatment; name, address and telephone number of supplier and availability of chemical safety data sheets.
- 5.1.7 The regulations require that specific essential information on safety data sheets include: chemical product and company identification (including trade or common name of the chemical and details of the supplier or manufacturer); information on the composition of ingredients (in a way that clearly identifies them for the purpose of conducting a hazard evaluation); hazards identification; applicable first-aid and antidotes; fire-fighting measures; protective measures in case of accidental release; handling and storage; exposure control relating to employee protection (including possible methods of monitoring workplace exposure); physical and chemical properties; stability and reactivity; toxicological information (including the potential routes of entry into the body and the possibility of synergism with other chemicals or hazards encountered at work); ecological information; manner of disposal; transport information; regulatory information; other information (including the date of preparation of the chemical safety data sheet).
- 5.1.8 Containers intended for storage of hazardous substances should be constructed from such materials and of such shape and strength, that they do not create a risk of contamination. The appearance of the containers be such that they cannot be mistaken for containers contaminating harmless substances.

- 5.1.9 Inflammable and explosive substances should also be labelled, stored and handled in a manner taking into account the risks associated with them.
- 5.1.10 Respiratory protection equipment should be provided to employees exposed to dust, gases, fumes or vapours from hazardous substances and the employees should be instructed and trained in the proper use of respirators.
- 5.1.11 The employer should propose and regularly review emergency plans and procedures which may be activated or implemented in the event of a major accident or catastrophic involving hazardous informed and regularly trained in relation to the plans and procedures.

5.2 Findings of the Study

5.2.1 Results from Visits, Interviews and Questionnaires

5.2.1.1 Table 3: Types of companies selected for the study

Occupational Sector	No of Employees
Hides Tanning	60
Hotel Catering Service	50
Dry Cleaning	12
Chemical Manufacturing	9
TOTAL	131

5.2.1.2 Questionnaire Responses

- 5.2.1.3 Most chemicals including raw materials used for local chemical formulations are imported mainly from South Africa and Germany.
- 5.2.1.4 The majority of chemical containers had labels written in English and warning symbols were displayed.
- 5.2.1.5 Employees were only familiar with trade names of the chemicals.
- 5.2.1.6 Knowledge of the intrinsic hazards with the chemicals was minimum to non-existent among employees.
- 5.2.1.7 Almost all employees interviewed were not aware of material safety data sheets of the chemicals. In cases where the safety data sheets were available, only employers representatives were aware of them.
- 5.2.1.8 Employees felt they should have access to material safety data sheets on all chemicals.
- 5.2.1.9 Of the employees interviewed, an average of 90% employees could correctly identify two of the hazard symbols, particularly the "toxic and flammable" symbols. The symbol for harmful was

invariably identified as "No Entry, Red Cross or Railway Crossing" signs.

- 5.2.1.10 The majority of employees are illiterate and cannot read or write especially in English.
- 5.2.1.11 Employees were not aware of the existence of any legislation relating to chemical safety.
- 5.2.1.12 Appropriate personal protective clothing and equipment was not always provided to employees but where it was made available, the employees did not use it.
- 5.2.1.13 Whenever the chemicals are transferred from the original containers, the new containers used by employees are not labelled with the necessary safety chemical information.

5.3 **Physical Visits Interviews and Observations**

- 5.3.1 During the visits, discussions were held with management and physical observations of the workplace facilities, operations and processes were made to assess the handling procedures, storage facilities, engineering control measures, housekeeping practices and training programmes. Most questions asked during the visit interviews were the same as those in the questionnaire.
- 5.3.2 Most chemicals are decanted in crowded facilities not properly constructed for chemical storage and are haphazardly stored in very poorly ventilated areas. For example, at the hotel and catering chemicals were stored in a food beverage office and manager's toilet.
- 5.3.3 Several of the containers of cleaning chemicals had labels which indicated that they may cause severe chemical burns, eye and skin irritation and were harmful if inhaled or swallowed.
- 5.3.4 The employees are not trained in the health effects of the chemicals and safety precautions to follow in order to avoid contact with skin or inhalation.
- 5.3.5 Housekeeping practices were very poor resulting in chemical spillages as common occurrences on the floors.

6. **SWAZILAND**

6.1 **Regulations**

- 6.1.1 The regulations to control the manufacture and use of chemicals at workplaces are being formulated. Existing legislation for the control and inspection of factories premises is used to regulate the use of hazardous chemicals at workplaces.
- 6.1.2 Consultations are taking place with employers and employees on steps for the ratification of the ILO Convention 170 on Safety on the Use of Chemicals at Work.
- 6.1.3 In August 1997, the government hosted and participated in a regional tripartite technical committee to develop a code of practice on the safe use of chemicals.

6.2 **Findings of the Study**

6.2.1 Results from Visits, Interviews and Questionnaires

6.2.1.1 **Table 4: Types of companies selected for the study**

Occupational Sector	No. of Employees
Paint Formulation	14
Agriculture - Sugar Cane Agronomy	40
Hotel Catering Service	25
Pulp and Paper Process	80
TOTAL	159

6.2.1.2 **Questionnaire Responses**

6.2.1.3 Most chemical containers have warning symbols and written labels with warning phrases.

6.2.1.4 The employees have no access to chemical safety data sheets information since the safety data sheets are usually kept by the employer.

6.2.1.5 Most employees felt the information on health effects of chemicals should be made readily available to them.

6.2.1.6 The employees were not aware of existing or proposed national laws and regulations on chemical safety.

6.2.1.7 The majority of employees interviewed could identify warning symbols relating to "toxic and flammable" and in a number of cases the symbols for "harmful" was identified to mean "No Entry or Red Cross" signs. All employees could not identify the symbols for oxidising substances.

6.2.1.8 Most employees could give trade names to at least 3 or 5 chemicals used at the workplace.

6.2.1.9 The employees felt that they should receive medical checks regularly.

6.2.1.10 All employees expressed the need to be provided with personal protective clothing and equipment including overalls, goggles, gum boots, gloves and respirators.

6.2.1.11 Most employees are either illiterate or have had basic primary education and those in management have a higher education status.

6.3 **Physical Visits Interviews and Observations**

6.3.1 Management and employees are both aware of the potential health effects from exposure to chemicals.

6.3.2 Most employers except those for large multi-national companies did not have information on the material safety data sheets for the chemicals used at the workplace.

6.3.3 Most of the original chemical containers had labels with warning symbols and written warning

phrases in both English and Afrikaans.

- 6.3.4 There are no training programmes for employees handling the chemicals except in cases when suppliers provide chemical information in the form of safety data sheets to designated management personnel.
- 6.3.5 Chemical spills were common and storage facilities were not purposely built for chemical storage.
- 6.3.6 Generally the ventilation system was very poor in most workplace areas where chemicals are stored or used.
- 6.3.7 Some employees complained of respiratory problems and chemical burns, skin and eyes irritation.
- 6.3.8 Some employees complained of not being regularly provided with personal protective clothing and equipment, although in a number of cases, the equipment that had been provided was not being used or not used properly.
- 6.3.9 The containers used by employees if they are not original containers, are not labelled with chemical information and warning symbols except the chemical trade name.
- 6.3.10 Most employees were only able to identify correctly two international warning symbols on chemicals.

7. **ZIMBABWE**

7.1 **Regulations**

- 7.1.1 The Hazardous Substances Act classifies hazardous substances into three categories depending on the toxicity and include:
 - (a) a Group I hazardous substance
 - (b) a Group II hazardous substance
 - (c) a Group III hazardous substance
- 7.1.2 A hazardous substance is defined as any substances or mixture of substances which may endanger the health of human beings or domestic or wild animals, birds or fishes by reason of its toxic, corrosive, irritant, sensitizing, inflammable or radio-active nature.
- 7.1.3 No person shall import, manufacture, sell, possess, store, convey or use hazardous substances without a written permit issued by a licensing authority and registers of licences of suppliers and facilities for hazardous substances shall be maintained.
- 7.1.4 Containers of hazardous substances are to be labelled using a hazardous ranking colour coding system of triangular warning symbols:
 - (a) Caution green harmful if swallowed
 - (b) Danger + skull amber poison
and crossbones

- (c) Danger + skull and crossbones red dangerous poison
- (d) Danger + skull and crossbones purple very dangerous poison

7.1.5 The regulations have not changed since the survey on the comprehensibility of the warning symbols was conducted by Loewenson et al in 1992.

7.2 Findings of the Study

7.2.1 Loewenson et al reported in 1992 that of the 100 employees interviewed, the majority of employees could not put the Zimbabwe warning symbols in the correct order. However, the employees had a high recognition level of "toxic" (90%) and "flammable" (69%) international symbols and the "harmful" symbols had the lowest recognition (15%).

8. DATA ANALYSIS

8.1 Most of the companies surveyed have developed regulations to control the manufacture, use and import of chemicals and to ensure that systems and tools for chemical hazard communication are developed and implemented at workplaces. Table 5 shows that 3 of 4 countries surveyed already have regulatory provisions requiring labels on chemical containers, safety data sheets including warning symbols and training of employees in handling chemicals.

8.2 All countries are participating in regional programmes for developing a code of practice on the safe use of chemicals and training in chemical safety information including safe handling procedures of chemicals.

8.3 **Table 5: Similarities and Divergences of Regulations**

	Malawi	Namibia	Lesotho	Swaziland	Zimbabwe
Labels	Yes	Yes	Yes	? (No)	?
Text	Yes	Yes	Yes	? (No)	?
Symbols	? (Yes)	? (Yes)	Yes	?	Yes
Colours	Yes	? (Yes)	? (Yes)	?	? (Yes)
Format	Yes	Yes	Yes	No	?
Safety Data Sheets	Yes	Yes	Yes	No	?
Headings	Yes	? (Yes)	Yes	? (No)	?
Symbols	? (Yes)	? (Yes)	Yes	? (No)	?
Training	Yes	Yes	Yes	Yes	?

Labels: if labels are required by regulations or recommended. Text: if any specific written information is required or recommended on the label. Symbol: if any specific symbols are required or recommended on label.

Colours: if the label is required or recommended to have specific colours; if symbols are required or recommended to have specific colours are indicated within the parentheses. Format: if the label is required or recommended to have a specific size, shape or design. Safety Data Sheets: if data sheets are required by regulations or recommended. Headings: if standardized headings are required or recommended on the data sheet. Symbols: if specified symbols are required or recommended on the data sheet. Training: if training is required or recommended. ?: no indication in the documents received.

- 7.2 Most chemicals used and handled in the four regional countries surveyed are imported mainly from South Africa and Europe.
- 7.3 Concerning the employees recognition level of international warning symbols on chemical containers, the results of interviews in Table 6 were representative of the trends, knowledge, attitude and awareness of chemical safety issues in Lesotho, Malawi, Namibia and Swaziland.
- 8.4 Table 6 shows that the levels of recognition of the warning symbols ranged from 81% to 67% for both "toxic and flammable" and "oxidizing" having zero and the lowest recognition.
- 8.5 A similar survey conducted by Loewenson et al in 1992 in Zimbabwe concluded that the "toxic and flammable" symbols had the highest levels of recognition which is consistent with the results of this study.

8.6 **Table 6: Typical Employees Responses to Chemical Warning Symbols**

Chemical Warning Symbol	Correct	Incorrect
Toxic	81 %	19 %
Corrosive	14 %	86 %
Harmful	14 %	86 %
Flammable	67 %	33 %
Oxidising	-	100 %
Explosive	19 %	81 %

9. CONCLUSIONS

- 9.1 The countries surveyed have introduced or in the process of preparing new legislation on occupational safety and health including issues of chemical safety information communication. In addition, legal measures were being taken to consider the ratification of the ILO Convention 170 on Safety in the Use of Chemicals at Work. A review of the information and analysis of the data collected during this study revealed the following issues:
- 9.2 At the national level, there is a general recognition of the potential health risks of exposure to chemicals in the workplaces, as evidenced by the promulgation of national laws and regulations to control chemical hazards and promote safety in the use of chemicals through chemical hazard communication systems at workplaces.

- 9.3 Chemical safety information in the form of materials safety data sheets is seldom supplied with chemicals and whenever the safety data sheets are available, they are kept by employers and the employees have no access to them.
- 9.4 Most employees who use and handle chemicals are illiterate and ignorant of the chemical safety information including warning symbols, precautionary safety measures and national laws and regulations to protect employees against health risks from chemicals.
- 9.5 Training and education of employees in chemical safety is minimum to non-existent in most workplaces where chemicals are used and handled, in particular, the identification and recognition of the chemical hazard warning symbols, health effects and the use of appropriate personal protective equipment.
- 9.6 The chemical safety information in the safety data sheets is not fully understood by the employees and warning phrases on the labels were written in different languages not understood by the majority of employees handling the chemicals.

10. **RECOMMENDATIONS**

- 10.1 A national database of all chemicals in use and relevant hazard information should be developed and established in consultation with manufacturers, importers and suppliers of chemicals and they should be closure coordination and maintaining of updated records among government agencies responsible for licensing and monitoring the manufacture and importation of chemicals.
- 10.2 The chemical information from safety data sheets should also be written in the language and manner understood by the majority of employees and be accessible to those using and handling chemicals. National chemical warning symbols on the label should be developed with particular attention to harmonizing them with international chemical warning symbols. All chemical containers should be labelled and marked to provide essential information on the chemicals.
- 10.3 Training and education of employees in the identification of chemical hazards and health effects, recognition of chemicals warning symbols and precautionary safety measures, and creating awareness of national laws and regulations on chemical safety should be intensified at national and workplace levels.
-