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Comparison of regulations concerning hazardous substances from an international perspective

Gregor Malich^a, Martin Braun^{b,*}, Panayiotis Loullis^b,
Chris Winder^a

^a *Department of Safety Science, The University of New South Wales, Sydney, Australia*

^b *Institute for Human Factors and Technology Management (IAT), Nobelstraße 12, University of Stuttgart, D-70569 Stuttgart, Germany*

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Abstract

This review focuses on the current legislation concerning the control of hazardous substances in Australia, Germany, the UK, and the USA. A comparison of general policies, fundamental law and standard-setting procedures between the mentioned countries has been carried out. The main objectives of this study are a cross-national presentation of general policies and legislation concerning hazardous substances, an analysis of the legislations' similarities and differences, as

Abbreviations: ArbSchG Arbeitsschutzgesetz; ChemG Chemikaliengesetz; CHIP Chemicals Hazard Information and Packaging for Supply; COSHH Control of Substances Hazardous to Health; DIN Deutsches Institut für Normung; EEC European Economic Community; EINECS European Inventory of Existing Chemical Substances; EU European Union; FAO Food and Agricultural Organization; GATT General Agreement on Tariffs and Trade; GefStoffV Gefahrstoffverordnung; HCS Hazard Communication Standard; HSC Health and Safety Commission; HSE Health and Safety Executive; HSR Hazardous Substances Regulation; HSW Health and Safety at Work; ILO International Labor Organization; IOMC Inter-Organization Programme for the Sound Management of Chemicals; IPCS International Programme on Chemical Safety; NIOSH National Institute for Occupational Safety and Health; NONS Notification of New Substances; NSW New South Wales; OECD Organization for Economic Cooperation and Development; OHSA Occupational Health and Safety Act; OSHA Occupational Safety and Health Administration; TRGS Technische Regeln für Gefahrstoffe; TSCA Toxic Substances Control Act; UNCED United Nations Conference on Environment and Development; UNEP United Nations Environment Programme; UNIDO United Nations Industrial Development Organization; UVV Unfallverhütungsvorschriften; WHO World Health Organization; WTO World Trade Organization

* Corresponding author. Tel.: +49 711 970 2176; fax: +49 711 970 2299; e-mail: martin.braun@iao.fhg.de

well as a recommendation for harmonisation in international legislation. © 1998 Elsevier Science B.V. All rights reserved.

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1. Introduction

The enactment of regulations for the efficient control of chemical substances has been enforced mainly because of two developments in recent years. First, the number of chemicals produced or used by industry, which have the potential to affect human health or the environment, has grown steadily. Second, incidents of harm to workers, to public health or to the environment have increased. The rationale for a standardised policy for the safe handling, supply, and use of hazardous substances has not been only injuries, diseases, fatal incidents and rising costs, but the increasing environmental awareness of the public as well.

With the widespread utilisation of chemicals and hazardous substances, the legal requirements for controlling their supply, handling, and use are getting more extensive. Especially for small organisations, assuring compliance with legislation and standards appears to be difficult due to a lack of safety awareness as well as appropriate human and financial resources.

A cross-national comparison of general policies and legislation concerning occupational health and chemical hazards in Australia, Germany, the UK, and the USA was conducted. In this study, chemical hazards are defined in the conventional way, and cover hazardous materials with physico-chemical, toxic and ecotoxic properties. The countries were chosen as they share the same developed-world values, possess similar political traditions, and enjoy a good reputation for high standards in technological and socio-economical development. It was also our purpose to review representative legislation from the American, Australian, and European continent. While the UK legal concept can be regarded as a model for the development of the Australian legislation, the German regulations were considered in this review due to their complexity.

2. Occupational health and safety legislation

2.1. General policies

The protection of the general public's health and safety is the duty of the state [1]. Occupational health and safety policies are based on the 'user pays' principle, whereas the environmental policies tend to be based on the 'polluter pays' principle. Probably, both principles are more appropriately defined as 'risk creator pays' (if they can be identified). This means that polluting enterprises have to assume responsibility and pay compensation for undesirable externalities associated with their operations. Accordingly, newly developed products have to be tested for their safety before being used.

In each of the above mentioned countries the hierarchic legal system is made up of the following types of laws [2].

Common Law, which defines the basic rights, duties, and responsibilities of each person (of legal age) or corporation to act with care towards others. It is the basis of an extensive part of commercial law.

Statute Law, which is approved by the relevant legislative system and enforced by the relevant government or state regulatory authorities. Acts and regulations are the most usual form of legislation at the level of statute law.

Nonstatutory Law, which does not necessarily have binding character and is developed in consultation with different parties. Among others, workplace exposure standards and biological exposure indices may be defined in the form of standards, codes of practice or guidelines. Nonstatutory law are persuasive but do not have the force of statutory law (although they can have application in common law). If not followed, convincing arguments to justify alternative measures are expected.

2.2. National legislation, fundamental law and standard-setting procedures

Provisions for the protection and improvement of occupational health and safety have been defined in national laws and regulations. An overview on fundamental law and standard-setting procedures concerning the current occupational health and safety legislation in the mentioned countries is given.

2.2.1. Australia

The *NSW Occupational Health and Safety Act 1983* (OHSA) is an enabling statute law, which covers health and safety in all workplaces in New South Wales (NSW) [3]. This legislation has been used as a model for occupational health and safety legislation in all jurisdictions in Australia. As part of the legal framework of OHSA, the *Hazardous Substances Regulation* (HSR) is also statutory legislation. Nonstatutory legislation includes *Australian Standards*, *National Codes of Practice*, *Guidance Notes* and *Guidelines*. This level is not binding unless it is specifically incorporated into statute law. However, if not incorporated, these publications have status in common law, unless there is an alternative course of action, which achieves the same or a better standard of health and safety in the workplace.

As a governmental agency, Worksafe Australia (National Occupational Health and Safety Commission) has been responsible for the development of a national regulation concerning hazardous substances. In 1991 a national model was proposed, based on the UK Control of Substances Hazardous to Health Regulations and the International Labour Organization Convention No. 170 [4]. State and Territory Governments issued their own drafts based on this model in 1991/1992. After a public comment phase, the model Hazardous Substances Regulation finally was released in 1994 for all States and Territories in Australia to enact consistent legislation.

2.2.2. Germany

In support of the European Union (EU) legislative harmonisation, the *Arbeitschutzgesetz* (ArbSchG) was released in 1996 and provides the conceptual framework for occupational health and safety in Germany [5]. The German statute law concerning chemical substances, however, is the *Chemikaliengesetz* (ChemG) [6]. It serves as a base

for a variety of regulations, the most important of which is the *Gefahrstoffverordnung* (GefStoffV) [7]. This regulation was enacted in 1986 for the control of hazardous substances and modified in 1993. Relevant nonstatutory law standards are not related exclusively to the *Gefahrstoffverordnung* but to other regulations as well, which are categorised in *Technische Regeln für Gefahrstoffe* (TRGS, Technical Rules for Hazardous Substances), *DIN-Normen* (German Standards), *Unfallverhütungsvorschriften* (UVV, Rules for the Prevention of Accidents), and *Merkblätter* (Instruction Sheets).

In Germany, the law-setting procedures are carried out by the Federal Parliament. The responsibility of the Federal States is the implementation of legislation and control of compliance with the law. Despite the fact that environmental awareness of the public is high, public participation in law-setting procedures is restricted.

2.2.3. UK

The *Health and Safety at Work etc. (HSW) Act* 1974 introduces wide ranging legal duties, which include duties for the control of chemical hazards [8]. More detailed obligations are contained in the *Control of Substances Hazardous to Health (COSHH) Regulations 1996*, amending the 1988 and 1994 regulations [9]. Besides the COSHH Regulations, the *Chemicals (Hazard Information and Packaging for Supply) (CHIP) Regulations 1994* [10], and the *Notification of New Substances (NONS) Regulations 1993* are also relevant statutory requirements. These regulations implement European Directives which, together with the COSHH Regulations, form the main legal framework for controlling the supply, handling, and use of hazardous substances. There are also approved codes of practice which have a legal base in the HSW Act and a nonstatutory base in *British Standards, Codes of Practice and Guidance*.

In the UK, the standard-setting procedures for controlling chemicals is based on a tripartite institutional structure. This means that workers, industry, local government and independent experts are involved in decision-making processes and advisory bodies. These parties are represented in the Health and Safety Commission (HSC). The operational arm of the HSC is the Health and Safety Executive (HSE) which includes policy-making and the various health and safety inspectorates.

In both Germany and the UK, EU legislation prevails over national laws and has to be adequately implemented. The *Classification, Packaging and Labelling of Dangerous Substances Directive 67/548/EEC* of 1967 and subsequent amendments (as 7th Amendment 92/32/EEC) outlines the harmonisation of laws, regulations and administrative provisions relating to dangerous substances within the European Union. The EU is currently developing a codified version of legislation that amends Directive 67/548/EEC.

2.2.4. USA

An early conceptual framework for controlling hazardous substances transmitted through food in the USA was the Federal *Food and Drugs Act* of 1906. In the 1970s, there was a development of regulatory law, resulting from the exponential rise in chemical production. The US Congress enacted in 1970 the *Occupational Safety and Health Act* [11] and in 1976 the *Toxic Substances Control Act (TSCA)* [12].

The peculiarity of the US law hierarchy is the absence of a regulation for the safe handling of chemicals at the same legislative level as it exists in the other countries. An appropriate legislation exists at the level of nonstatutory law and is called the *Federal Hazard Communication Standard (HCS) 1910.1200* [13]. Another standard concerning the control of hazardous substances is the *Occupational Safety and Health Administration Laboratory Standard 1910.1450*, which applies especially for chemical laboratories [14]. As with most nonstatutory legislation, employers do not have to comply with these performance-oriented standards, if they have efficient alternative solutions for achieving the required level of safety.

Standard-setting procedures for the control of hazardous substances in the USA are initialised by Occupational Safety and Health Administration (OSHA) or commence in response to petitions from other parties, including the Secretary of Health and Human Services, the National Institute for Occupational Safety and Health (NIOSH), State Governments and others. The USA provides the most generous opportunities for the public to participate in regulatory proceedings.

2.3. Structure of the legal concepts

A general overview of the law hierarchy concerning hazardous substances in the four countries is given in Table 1.

At first glance, the law structure seems to be similar due to the fact that the law development took place almost simultaneously. Also, the nearly same technological,

Table 1
Hierarchy of the legal concepts

USA	Germany	UK	Australia
<i>Statute law</i>			
Occupational Safety and Health Act 1970 (amended 1990)	Arbeitsschutzgesetz (ArbSchG) 1996	Health and Safety at Work etc. Act (HSW Act) 1974	NSW Occupational Health and Safety Act (OHS Act) 1983
Toxic Substances Control Act (TSCA) 1976	Chemikaliengesetz (ChemG) 1980 (amended 1994)		
	Gefahrstoffverordnung (GefStoffV) 1993 (amended 1997)	Control of Substances Hazardous to Health (COSHH) Regulations 1994 (amended 1996/97)	Hazardous Substances Regulation (HSR) 1996
		CHIP Regulations 1994 (amended 1997)	
<i>Nonstatute law</i>			
OSHA Standards (e.g. Hazard Communication Standard) Guidelines	TRGS	British standards	Australian Standards
	DIN-Normen	Codes of Practice	National Codes of Practice
	GUV/UVV Merkblätter	Guidance Notes	Guidance Notes Guidelines

economical, and social development in these countries contributes to the similarity of the law structures. Moreover, in the past years, as members of the European Union, Germany and the UK were challenged to harmonise their policies.

In the comparison of cross-national legislation, one important difference concerns the status of the American Federal Hazard Communication Standard. Both HCS and the OSHA Laboratory Standard are performance standards. However, they are not complementary to each other. The OSHA Laboratory Standard does not apply to all laboratories and supersedes the requirements of all other OSHA health standards where applicable [15].

3. Analysis of regulations concerning hazardous substances

Even though the regulations and standards concerning the control of hazardous substances in Australia, Germany, the UK and the USA possess similar significance and set similar objectives, they display some differences which complicate an analysis. First, they do not have the same role as legal instruments for their respective countries. Since the American HCS does not apply for all clauses covered by the other regulations, additional related American standards must be considered for this analysis. Second, the regulations differ in their structure and extent.

A presentation of regulations concerning hazardous substances of each country is given in Table 2, where the *New South Wales Hazardous Substances Regulation 1996* [16] serves as a reference source because of its clear structure. This regulation is based on, and consequently very similar to the Australian Federal HSR of 1994. In Table 2, the most important clauses of the HSR are briefly described, accompanied by comments on comparable clauses in similar legislation of the other three countries. In cases where the corresponding German, British or American regulations do not apply to one of the clauses of the HSR, relevant other legislation is cited. However, in view of the complex national legislations regarding hazardous substances, the cross-references cannot be viewed as complete. If a comment on an appropriate clause from other regulations is made, the name is given in brackets.

Although extensive, the tabular comparison makes no claim to be exhaustive. A detailed full text comparison would go beyond the scope of this paper. Due to the absence of some comparable clauses in the Australian HSR relevant information on the German, British, American regulations not considered in the Table 2 are presented in the following paragraphs.

Summarising the provisions and peculiarities of the cross-national regulations, the following points arise.

3.1. Hazardous substances regulation

The Australian Hazardous Substances Regulation is based on the UK COSHH regulations, although they have been extensively modified to suit Australian conditions. Important inclusions in the regulation are:

- Requirements for the provision of information on chemical hazards;
- Criteria for the determination of hazardous substances;

- Procedures for risk assessment and control, education and training;
- Requirements for health surveillance;
- Information on record keeping.

The HSR only covers hazardous substances that can affect human health. Other aspects, like the effects of hazardous substances on the environment, remain out of consideration owing to jurisdictional demarcations at the Australian Federal level.

3.2. *Gefahrstoffverordnung*

The German *Gefahrstoffverordnung* is the most complex regulation in view of extent and structure. Specific information resulting from the many cross-references to other paragraphs is related to: (1) the requirements for the protection of human health and the environment from risks due to hazardous substances by use of general procedures for their classification, labelling, packaging and handling; (2) the requirements concerning the protection of special groups of the workforce (outworker, pregnant women and youth employees); (3) the obligation of employers for the substitution or graded use of selected hazardous substances; (4) the obligation of employers for risk management considering the hierarchy of control measures; (5) the supplementary regulations for the safe handling of carcinogenic and mutagenic substances; and (6) the specific hazardous substances (extensive appendix).

3.3. *Control of substances hazardous to health regulations*

The UK Control of Substances Hazardous to Health Regulations places a responsibility on employers to do all that is reasonably practicable to ensure the safety of their employees and to protect them from harmful substances. In addition, the COSHH Regulations include some requirements related to the suppliers' duties. The COSHH regulations also include general requirements from the primary legislation (the UK Health and Safety at Work Act 1974) for employers, owners of premises and others (such as contractors). Further, there are separate CHIP and NONS Regulations related to suppliers' and employers' duties which implement European Directives. Important requirements for employers resulting from COSHH Regulations are:

- Assessments of health risks arising from hazardous substances at work and introduction of appropriate precaution measures;
- Controls for properly maintained equipment and observation of procedures;
- Monitoring of workers exposure and undertaking of health surveillance;
- Information, instruction and training of employees regarding the risks and the precautions to be taken;
- Review of safety measures and record keeping.

Due to the prevalent EU legislation, all dangerous substances as defined in Directive 92/32/EEC must be classified by the manufacturer or importer in both Germany and the UK. Once classified, substances are required to be packaged and labelled accordingly. Founded on a harmonised notification procedure, new substances not included in *the European Inventory of Existing Chemical Substances* (EINECS) must be notified to the competent authority before being placed on the market. Notification provides

Table 2
Cross-national comparison of regulations concerning hazardous substances

	Australia	USA	Germany	UK
Regulation	Hazardous Substances Regulation	Hazard Communication Standard	Gefahrstoffverordnung	Control of Substances Hazardous to Health Regulations
<i>Part I: Preliminary</i>				
Citation	Regulation may be cited as the Occupational Health and Safety (Hazardous Substances) Regulation 1996 (clause 1)	—	—	These Regulations may be cited as the Control of Substances Hazardous to Health Regulations 1988
Commencement	Regulation commenced on 12 July 1996 (clause 2)	Introduced into the manufacturing sector in 1983 and extended to include virtually all industry in 1988. Amendment 1994	Regulations came first into force on 1st October 1986 and was modified in 1994. Amendment 1997	Regulations 1988 came first into force on 1st October 1989. Reenacted Regulations 1994, amendment 1996/97
Object	To minimise risks to health due to exposure to hazardous substances in workplaces (clause 3)	To ensure that the hazards of all chemicals produced or imported are evaluated, and that hazards information is transmitted to employers and employees	To protect persons from work-related risks and the environment from damages related to hazardous substances (Section 1)	Regs. 6 to 12 shall have effect with view to protecting persons against risks arising from exposure to substances hazardous to health
Application	To all hazardous substances, to all workplaces and to all persons who may become exposed to hazardous substances in those workplaces. To all self-employed persons as to the employers (clause 4)	To any chemical which is known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency	To all hazardous substances and preparations under Section 3a of Chemikaliengesetz. To substances and preparations as in Appendix III. To products as presented in Section 8 (Section 2)	To all substances hazardous for workers as defined in reg. 2(1)

Part 2: Supplier's duties

Classification	Before first supplying a substance for use at work, the manufacturer or the importer of the substance must determine whether the substance is hazardous (clause 7)	Similar reference in Section 2	Similar reference in Section 4	CHIP: Classification has to be done for all chemicals according to the Approved Supply List
Preparation of MSDS	Before first supplying a hazardous substance for use at work, the manufacturer or the importer of the substance must prepare a material safety data sheet (MSDS) for the substance (clause 8 and 9)	Similar reference in Section 3	Similar reference in Section 14	CHIP: Suppliers must provide safety data sheets for dangerous chemicals to the recipient if the chemicals are to be used at work. No provision of safety data sheets when dangerous chemicals are sold for public use through shops
Labels	A supplier of a hazardous substance for use at work must ensure that any container of the substance is appropriately labelled (clause 10)	Similar reference in Section 3	Similar reference (including hazardous substances and preparations) in Sections 5 to 13	CHIP: If a dangerous chemical is supplied in a package, the package must be labelled

Part 3: Employer's duties

Material Safety Data Sheet	For each hazardous substance supplied to an employer's workplace, the employer must obtain an MSDS and must ensure that the MSDS is readily accessible and not altered (clause 15)	Employers shall have a material safety data sheet for each hazardous chemical which they use (Section 3)	Employers shall prepare an instruction sheet for each workplace where hazardous substances are handled. They must be easy to understand and be written in the language, the employees speak (Section 20)	Appropriate reference in General COSHH Approved Codes of Practice
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Table 2 (continued)

	Australia	USA	Germany	UK
Labels	An employer must ensure that a container that holds a hazardous substance used at work, including one supplied to or produced within the employer's workplace, is appropriately labelled and that the label is not removed, defaced or altered (clause 16)	The employer shall ensure that each container of hazardous chemicals in the workplace is labelled, tagged or marked with information in English and in the language which his employees speak (Section 3)	Detailed description in Sections 23 and 24	Appropriate reference in General COSHH Approved Codes of Practice
Registers	An employer must ensure that a register is kept and maintained for all hazardous substances used at his workplace (clause 17)	Similar reference in Part E: Provisions for 'multiemployer workplaces'	Similar reference in Section 16	Appropriate reference in General COSHH Approved Codes of Practice
Consultation	An employer must consult with employees who are likely to be exposed to risks arising from hazardous substances used at work and with employee representatives (clause 19)	Reference in [1910.119 Process Safety Management of Highly Hazardous Substances] Part C: Employee participation	Employer must consult and instruct employees regularly and keep records of the instructions (Sections 20 and 21)	Reference to instruction (reg. 12). Consultation required by HSW Act and Health and Safety (Consultation with Employees) Regulations
Risk assessment	An employer must identify all hazardous substances that are used or produced at his workplace and must ensure that a suitable and sufficient assessment is made of the health risks created by work that involves exposure to any of those hazardous substances. He must keep record of the assessment, review it regularly and must ensure that it is readily accessible to any employee (clause 20)	Similar reference in Part D: Hazard determination	Similar reference and emphasis that the employer must try to substitute hazardous substances with less hazardous ones to the most possible extent (Section 16)	Similar reference in reg. 6 considering the quality of assessment, provision of information and review of assessment

Control	The employer must ensure that exposure to a hazardous substance is prevented, or if that is not practicable, adequately controlled so as to minimise the risks to health caused by the substance (clause 21)	Similar reference in [1910.1450: Occupational exposure to hazardous chemicals in laboratories], Part E	Similar reference in Sections 17 and 19	Extensive reference in regs. 7 to 9
Airborne concentrations	An employer must ensure that no employee or other person working at the employer's workplace is exposed to an airborne concentration of a hazardous substance in his or her breathing zone at a level greater than that established by the appropriate exposure standard (clause 22)	Similar reference in [1910.1450: Occupational exposure to hazardous chemicals in laboratories], Part C	Reference with permissible levels in Section 18	Extensive reference in regs. 7 and 9
Monitoring	The employer must undertake appropriate monitoring if an assessment indicates that atmospheric monitoring is necessary. He must keep record of the results and make sure that this record is readily accessible to the relevant employees (clause 23)	Similar reference in [1910.1450: Occupational exposure to hazardous chemicals in laboratories], Part D	Records of monitoring must be kept for at least 30 yr (Section 18)	Records must be kept for at least 40 yr when it is representative for personal exposure of identifiable employees; otherwise they must be kept for at least 5 yr (reg. 10)
Induction and ongoing training	An employer must provide induction and ongoing training to any employee who is likely to be exposed to any hazardous substance at the employer's workplace and must keep a record of the training (clause 24)	Similar reference in Part H: Employee information and training. Training guidelines also in [1926.65; Hazardous waste operations and emergency response], Appendix E: Training curriculum guidelines	Similar reference. Employees have to sign for their instructions. Record keeping for at least 2 yr (Section 20)	Similar reference without information about record keeping (reg. 12)

Table 2 (continued)

	Australia	USA	Germany	UK
Health surveillance	An employer must provide health surveillance for each employee who could be exposed to a hazardous substance. The health surveillance must be undertaken at the expense of the employer under the supervision of a medical practitioner (clause 25)	Similar reference in [1910.1450: Occupational exposure to hazardous chemicals in laboratories], Part G	Similar reference in Sections 28 to 30	Extensive reference in reg. 11 including notification of results of health surveillance and storage and use of medical records
Notification of results of health surveillance	The employee must be notified of the results of the surveillance. The employer must ensure that any results of health surveillance obtained by the employer are kept confidential (clause 26)	Reference in [1910.1450: Occupational exposure to hazardous chemicals in laboratories], Part G	Similar reference in Section 31	Similar reference in reg. 11
Storage/Use of medical records	A medical practitioner must ensure that medical records obtained as a result of health surveillance for an employee are retained as confidential records (clause 27)	Reference in [1910.1450: Occupational exposure to hazardous chemicals in laboratories], Part G	Similar reference in Section 31	Similar reference in reg. 11
Record keeping	An employer must retain as a record in a suitable form: a) all assessment reports indicating a need for monitoring or health surveillance for at least 30 yr; b) no need for monitoring or health surveillance for at least 5 yr; c) all records of induction and ongoing training for at least 5 yr (clause 29)	No record keeping is required for employee training	Detailed description of record keeping in Section 34	Appropriate reference in COSHH

essential information for users and enables the dangerous properties of the substances to be assessed. Within the European Union the Notification of New Substances Programme is intended to increase the effectiveness of monitoring compliance and to facilitate regular cooperation in the future.

3.4. Hazard communication standard

The American Federal Hazard Communication Standard outlines requirements for manufacturers, importers and employers in the areas of assessment of hazards, information dissemination and training programs. These include: (1) the obligation of manufacturers and importers to determine the hazards of each product and to disseminate information and protective measures through safety data sheets, labels and training; (2) the obligation of employers to identify and list chemicals in the workplace, to develop and implement a written hazard communication program and to communicate hazard information to employees; (3) the obligation of employers to undertake measures for 'multiemployer workplaces'; (4) trade secrets and exceptions in order to establish fair trade conditions.

The HCS was the first of its type and focuses on information dissemination and training functions. It does not include complete provisions regarding the control of hazardous substances and lacks information concerning workplace assessment, monitoring and health surveillance.

4. Internationally harmonised regulation on hazardous substances

Companies operating in various countries or jurisdictions sometimes find that permissible activities in one country may not be allowed in another. Depending on economic opportunities and requirements, in special cases this may present commercial advantage or disadvantage. Therefore, to facilitate trade and to provide protection for public health the disparity among national law should be minimised. Additionally, globally operating industries and businesses require effective chemical safety systems based on internationally consistent legislation. As an example, the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal* [17] is the first global attempt at addressing hazardous waste and demonstrates international compatibility of legislation which predominantly aims at protecting human health and the environment. Similarly, the assessment of risks associated with chemical exposure has been recognised as being of global importance to meet social and economic goals. For instance, the establishment of the World Trade Organization (WTO) underscores particular interest in the assessment of risks from a trade perspective and displays the importance of coordinated efforts in this area. As a result, not only human health and the environment may be preserved, but trade conditions may be standardised which will increase performance at reduced costs. Also, the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992, recommended within Agenda 21, Chapter 19, that attempts be made to develop a framework for the risk assessment of toxic chemicals and to improve risk assessment methodology for the

Table 3

Contents of an internationally harmonised regulation on hazardous substances

Obligations of a regulatory agency with legislative responsibility for hazardous substances:

- to enact and enforce relevant legislation;
- to introduce classification criteria for substances hazardous to human health;
- to introduce classification criteria for substances hazardous to the environment;
- to maintain a mandated list of hazardous substances;
- to introduce clear outlines of minimal compliance requirements for hazardous substances through standards, codes of practice, guidelines and information;
- to introduce clear outlines of minimal compliance requirements for special categories of hazardous chemicals, such as explosives, flammables, poisons, ozone depleters or carcinogens;
- to appropriately resource a chemical safety inspectorate and necessary prosecutions.

Obligations of suppliers of hazardous substances, including:

- classification of chemical products hazardous to human health;
- classification of chemical products hazardous to the environment;
- requirements for packages for chemical products;
- preparation of hazard communication standards for chemical products, including:
 - labels,
 - worker communication,
 - consumer communication (product summaries);
- requirements for timely dissemination of product hazard communication to regulatory agencies, emergency services, users and consumers;

Obligations of employers with hazardous substances on site, including requirements for:

- risk management of hazardous substances in the workplace, including:
 - consultation with workers,
 - development of organisational policy, programs and safe working procedures,
 - inventory control,
 - workplace assessment,
 - hazard communication,
 - training,
 - control of exposure using the hierarchy of control measures,
 - workplace environmental monitoring,
 - health surveillance of workers;
- environmental protection, including:
 - cleaner production,
 - recycling and reuse,
 - waste minimisation,
 - waste treatment,
 - waste disposal;
- emergency procedures;
- consultation with the community;
- special groups, such as:
 - retailers,
 - contractors,
 - young workers,
 - pregnant workers,
 - out workers;
 - record keeping.

Obligations of employees.

environmentally sound management of chemicals. Consequently, in 1993, the International Programme on Chemical Safety (IPCS) (implemented in 1980 as a joint activity of the World Health Organization (WHO), the International Labor Organization (ILO) and the United Nations Environment Programme (UNEP)) was given the responsibility to actively discuss and coordinate the harmonisation of chemical risk assessment through its collaboration with other international partners [18]. Meantime, this coordination has expanded to the Organization for Economic Cooperation and Development (OECD), Food and Agricultural Organization (FAO), and United Nations Industrial Development Organization (UNIDO), within the framework of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), as well as with regional/intergovernmental (e.g. European Commission) and national (e.g. US Environmental Protection Agency) organizations [19]. Recommendations for the harmonisation of risk assessment methodologies for human health and the environment have also been made at meetings concerned with specific classes of chemicals, for instance the Special Sessions on Pesticides of the OECD [20] and the Conference on Food Standards, Chemicals in Food and Food Trade, coordinated by FAO, WHO, and GATT (General Agreement on Tariffs and Trade) [21]. Despite these efforts, an internationally harmonised regulation on hazardous substances has yet to be developed.

Table 3 outlines most aspects to be considered in an internationally harmonised regulation on workplace hazardous substances. It was derived from the Australian HSR and further describes minimum requirements concerning environmental protection and the pressing obligation for substitution of hazardous substances in view of modern types of work. In order to promote interaction and communication for the effective and permanent protection of human health and the environment, the aspects listed in Table 3 address all relevant parties, including regulatory authorities, manufacturers, suppliers, employers and employees.

5. Conclusions

The comparison of hazardous substances legislation in Australia, Germany, the UK and the USA reveals different priorities in regulations' content and structure, although Germany and the UK are forced to harmonise their legislation according to the European Union Directives. The main features of the national legislations are: (1) the consideration of environmental protection and the obligation for elimination or substitution of hazardous substances in the German *Gefahrstoffverordnung*; (2) the consideration of suppliers' obligations, not only in UK Control of Substances Hazardous to Health Regulations but detailed requirements for suppliers and employers are written down in separate Chemicals (Hazard Information and Packaging for Supply) and Notification of New Substances Regulations; (3) the extensive consideration of obligations for manufacturers, suppliers, employers, and employees within one single framework of the Australian Hazardous Substances Regulation centred around a phased risk assessment approach; (4) the lack of employers' obligations regarding workplace assessment, emergency response, monitoring, health surveillance and disposal in the American Hazard Communication Standard, which have only been addressed recently.

The Hazardous Substances Regulation came into force 8 to 10 yr later than the other regulations and could benefit from the experience gained from prior application of these regulations. It is in line with the International Labor Organisation Convention 170 and Recommendation 177, which set minimum standards of basic labour rights for the workers' protection from harmful effects of chemicals. Because of its comprehensive approach of identify, assess, and control, the Australian Hazardous Substances Regulation could serve as a basis for harmonising international legislation regarding hazardous substances.

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Gregor Malich, Dipl.-Ing., PhD Research Student at Department of Safety Science, University of New South Wales, Sydney, Australia. Work in toxicology and safety science. Martin Braun, Dipl.-Ing., Researcher at Institute for Human Factors and Technology Management, University of Stuttgart, Germany. Work in occupational health, ergonomics, and industrial engineering. Panayiotis C. Loullis, Dipl.-Ing., Fellow Researcher at Institute for Human Factors and Technology Management, University of Stuttgart, Germany. Research work at Department of Safety Science, University of New South Wales, Sydney, Australia. Chris Winder, PhD, Associate Professor at Department of Safety Science, University of New South Wales, Sydney, Australia.