trategies and methods to promote occupational health in low-income countries

Industrial counselling in tanneries in India

trategieën en methoden voor het stimuleren van de ezondheid van werknemers in lage lonen landen

Industriële advisering in leerlooierijen in India

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This thesis is dedicated to Abhay Shukla, FU Rahman, Vidyut Katagade and to all who are committed to improving the health of workers in low-income countries

एक हमारी सीख सुन, जो तु हुआ सीख ।
करूं करूं तो क्या कहै, किया है तो दीख ।।

Listen to me my dear boy;
If you are my disciple
Do not just talk, "you will do the job"
Do it and show your mettle

Kabir, On Gurudeva

Chapter 1 Promoting workers' health in low-income countries

Concern for occupational health and safety has a long tradition in Western countries. In these countries, well-established disciplines are able to recognize and control inherent risks of industrial processes. The occupational health care system is well-developed and occupational health services play an important role in safeguarding workers' health. There is an abundant body of scientific literature on almost every aspect of occupational health in affluent nations.

In stark contrast, there is very little information available on work-related health hazards in occupations in low-income countries, while the largest part of the worldwide workforce is to be found in these low-income countries. Moreover, anecdotal evidence suggests that working conditions in developing countries may substantially differ from those in affluent nations, usually for the worse. Information on the distribution of health hazards and the prevalence of work-related diseases in low-income countries is extremely scarce or even absent for many areas. In low-income countries, enforcement of labor laws is almost non-existent, occupational health services are not available and resources for identifying and evaluating working conditions and consequent health effects are severely limited.

This thesis is about the health and safety of workers in low-income countries and opportunities to improve their working conditions. The origin of the thesis is the author's personal experience in one specific program directed at improving the occupational health and safety in tanneries in Kanpur, India, and his more general experience in international public health. Working conditions in many low-income countries lead to a loss of health and well-being of workers and their families. It is the author's conviction that readily available interventions may prevent many of the health problems and that in most situations increased attention to working conditions will benefit local productivity and quality production. In order to promote attention for occupational health in low-income countries, a two-tiered approach is suggested. International bodies should develop explicit occupational health policies and systems at the national and international level. Simultaneously, at local level concrete activities are needed aimed at the improvement of working conditions and workers' health.

This thesis intends to bring together needs identified at plant level to improve working conditions and opportunities in international occupational health policies. It aims at bridging the gap between local problems and needs, and global strategies and policies to elevate occupational health in low-income countries. At local level, existing problems and needs have to be identified and evaluated, and opportunities and solutions to improve working conditions and workers' health have to be developed. At global level, strategies and policies have to be implemented, tailored to local needs, that will bring the necessary support to start and maintain local activities. This approach is characterized by the motto "think local, act global".

The thesis consists of two parts. In the first part, an analysis is presented of labor and workers' health in low-income countries, with a review of international occupational health policies. In the second part, a detailed description is presented of a specific occupational

health program in the tanneries of Kanpur, India. As this study was strongly inspired by the author's personal experience in India, we will first set the stage by giving a short description of this personal experience in section 1.1. The objectives of the thesis and the structure of the book will then be presented in section 1.2.

1.1 Awareness and involvement in occupational health: the tanneries of Kanpur, India

When my eyes grew accustomed to the darkness in the tanneries, I saw the workers wearing only pants, standing in deep pits up to their waists in a dark, foul-smelling, brownish fluid, lifting the soaked, heavy skins. The working conditions in the tanneries of Kanpur shocked me.

I visited Kanpur in India for the first time in July 1987 as health advisor to the Indo-Dutch Environmental and Sanitary Engineering Project under Ganga Action Plan, a collaborative effort of the Indian and Netherlands governments to prevent the pollution of the Ganges. My visit to the tanneries was part of an introductory tour to the project site in Kanpur. Tanneries, being among the main contributors to the pollution of the Ganges, were offered assistance by the project to construct waste water treatment plants and chrome recovery units. This support was much appreciated by the tannery owners at that time, as the Pollution Control Board had already closed down some tanneries which did not meet its requirements for waste water treatment. Working conditions were not originally included in the project. Discussions on occupational health issues with my Indian colleagues, Dr. Satish Kumar and Dr. Abhay Shukla initiated the start of activities aimed at improving working conditions in the tanneries. Learning while doing, a participatory approach was developed with tannery owners, tannery workers, staff members of the Regional Labor Institute, the Employees State Insurance Scheme (ESI) and the Inspectorate of Factories.

We realized during our exploratory visits to the tanneries that working conditions and environmental protection are closely interlinked. Lack of clear guidelines for storage and the careless way in which chemicals were disposed of, exposed both the workers and the environment to hazardous substances. We were convinced that improvement of working conditions would also contribute to the prevention of environmental pollution. It was therefore crucial to involve the Regional Labor Institute and the Inspectorate of Factories to exchange views on this interrelation.

During a meeting with the local tannery association, we raised the issue of the apparently miserable working conditions. It was difficult to convince the owners, as they did not share our conclusions about possible harmful effects of the conditions in the tanneries, pointing out the fact that they had been living on the tannery premises with their families for several generations without being harmed by toxic substances. As data on health effects of tannery work were rather scarce, we emphasized the necessity of obtaining objective facts about harmful working conditions. We explained that we had no preconceived ideas about health effects of the tanning process and proposed to conduct a simple health survey

among the workers aimed at major causes of sickness and disability. Local newspapers had repeatedly accused tannery owners of exposing their workers to hazardous working conditions. It seemed that the owners shared a common interest with us in assessing prevailing health risks in the tanneries. The owners had a positive attitude towards the technical assistance offered by the project and finally agreed in 1988 to cooperate in the Occupational Health Program. From 1988 until the end of the program in October 1995, we received full cooperation from the owners and workers of the tanneries in Kanpur. To our surprise, the majority of the workers were indifferent. As they were paid by piecework, they strongly opposed any alteration, including machine protection, which implied a slower work pace. A slower process meant less income. The workers were, however, keen on being trained in first-aid and the program started with training in occupational health and first-aid.

It was realized that the genuine participation of the owners, gained by taking their interests into account, was essential to start the process of change. Our research approach, therefore, combined working conditions and improvement of productivity. Simple methods were used to demonstrate the prevailing tanning process, identifying inefficient working methods and dangerous working conditions. The methods could be used in field situations in the tanneries. Using the results of the surveys in the local tanneries, owners and managers, working in small groups, formulated modifications in order to increase productivity and to improve working conditions. Eight owners installed modifications at their own expense. The most progressive owners realized that good working conditions and healthy workers were essential cornerstones of their enterprise; if they opted for quality production.

In 1992, I was appointed as a health advisor for international development cooperation at the Ministry of Foreign Affairs in The Netherlands and my involvement in the Occupational Health Program decreased. The program team, however, continued to work until October 1995. With the working conditions in the tanneries of Kanpur in my mind's eye, I kept wondering how international occupational health and safety policies of multilateral organizations like the World Bank, the World Health Organization (WHO) and the International Labor Organization (ILO) could contribute more effectively to the improvement of working conditions at plant level. During my missions, I searched for the activities of international agencies to improve occupational health and safety, but they seemed to be rather limited in scope, with a focus on dissemination of information in the broadest sense, varying from training courses and scientific publications to general leaflets and policy documents. It was difficult to identify activities aimed at the concrete improvement of working conditions, let alone to identify activities aimed at the assessment of the impact of such activities on workers' health. At the same time, public opinion and politicians in the industrialized countries increasingly emphasized the need for transparency and the need for impact assessment of international development cooperation efforts [World Bank 1992].

Occupational health is an indispensable part of public health since a substantial proportion of all health problems occur among workers exposed to hazardous agents. Also, improvement of working conditions is closely linked to product quality. Better products can only be achieved with great attention to all aspects of the production process including working conditions. Moreover, a careful use of natural resources contributes to a sustainable production and responsible use of our planet's environment.

1.2 Objectives of this thesis

The objectives of the thesis are:

1. To analyse the policies and activities of international agencies and non-governmental organizations in the field of occupational health and to evaluate their impact on the protection of workers' health in low-income countries;

2. To investigate whether specific rapid appraisal techniques can be applied in low-income countries to assess working conditions and workers' health and to evaluate the impact of workplace improvements on exposure and health;

3. To review the possibilities of incorporating occupational health in international development cooperation.

With regard to the first objective, chapter two presents an overview of important developments in the distribution of the worldwide workforce, the effects of industrial transformation in low-income countries and the increased export of hazardous production and waste to these countries. In chapter three, international occupational health policies are reviewed in relation to how they contribute to the protection of workers' health in low-income countries with a short description of the major international organizations in this field: the International Labor Organization and the World Health Organization. In chapter four, international policies are reviewed in the light of national occupational health policies in India.

The second objective is addressed in the second part of the thesis that describes the occupational health in the tanneries of Kanpur, India. The main goal of chapters five to ten is to evaluate the opportunities to link occupational health issues to bilateral cooperation in the area of environmental and sanitary engineering. Chapter five describes the Indo-Dutch Environmental and Sanitary Engineering Project Kanpur Mirzapur under Ganga Action Plan 1987 – 1995 and the Occupational Health Program. Chapter six provides a description of Kanpur, the tanneries of Kanpur and its tannery workers. Chapters seven to nine provide a detailed description of the occupational health program with an emphasis on relatively simple qualitative methods to assess the exposure of tannery workers to hazardous substances and awkward ergonomic conditions and to asses the health status of tannery workers.

The third objective of this thesis is to demonstrate the virtues of industrial counselling in the tanneries of Kanpur and the strategy to link occupational health to environmental protection and increased productivity, as described in chapter ten. Finally, chapter eleven reviews the main conclusions and presents recommendations related to the three objectives of this thesis.

The reader has to keep in mind that this book is mainly confined to the situation of tannery workers in India. Traditionally, leather work, including tanning, is a male domain and this study is primarily concerned with the health of male workers. However, it has to be emphasized, that the protection of the health of women and child workers is at least as

important. The struggle for equal remuneration and the battle for fair social policies such as maternity leave, provision of day care for children of women workers and the protection of women and children against harassment at the workplace, are basic human rights. Bonded labor, the use of child-soldiers and the use of child labor in dangerous industries, like mines, and factories which produce explosives, should be terminated. Working children in less dangerous positions should receive non-formal education at least, including literacy and numeracy education. They should be informed about their rights, be trained in the skills of how to socialize and how to react to aggressive behaviour, to empower them for self-defence [Das et al. 1992]. However, these topics will not further be discussed in this thesis.

Chapter 2 Labor and workers' health in low-income countries

This chapter reviews the composition of the labor force and provides a description of prevailing labor conditions in low-income countries. First, the labor force distribution is described, including the important role of the non-formal sector. Second, the impact of the integration of low-income economies into the global market, with its ensuing industrial transformation and export of hazardous waste to low-income countries, is brought into relation with workers' health. Finally, the problem of under-reporting of occupational mortality and morbidity and its consequences for (inter)national occupational health and safety policies are described.

In the past 30 years, the world's labor population has increased rapidly. Of the 3,5 billion people between the ages of 15 and 65 year in 1995, 2,5 billion worked for an income in return for their labor, almost twice as many as in 1965 [World Bank 1995]. The labor force in low-income countries[1] already comprises more than 50% of the world's total labor force and it is expected that by the year 2025 this proportion will increase to almost two thirds (table 2.1). Apart from this enormous workforce, in 1995 an additional one billion people spent their time on household activities, on subsistence agriculture, at school or on actually seeking employment. These individuals are not captured in labor statistics, nor are the countless children below the age of 15 and old men and women who are forced to continue to work for their survival. Although problems of child exploitation and working at old age are well recognized, this thesis will focus on the occupational health of workers.

The majority of workers in low-income countries work in the non-formal (farm and off-farm) sector and earn an income which is often hardly sufficient to sustain life at a bare subsistence level. Creation of new jobs, especially for the young urban population in low-income countries poses a real challenge for governments and multilateral agencies. Massive unemployment is a serious concern, and the fear of being unemployed may overshadow the resistance to accept dangerous work, exposing millions to harmful working conditions.

[1] Annual per capita income below $ 670 in 1992 [World Bank 1995].

Table 2.1 The world's labor force by region in 1995 and in 2025

Region	Millions of workers 1995	2025	Growth 1995 – 2025 in %
Sub-Saharan Africa	214	537	151
East Asia and the Pacific	964	1.201	25
South Asia	440	779	77
Europe and Central Asia	239	281	18
Middle East and North Africa	80	204	155
Latin America and the Caribbean	166	270	63
High-income OECD	373	384	3
TOTAL	2.476	3.656	

World Development Report 1995: Workers in an integrating world. World Bank 1995.

2.1 Labor force distribution

The distribution of the labor force over the employment sectors (services, industry and agriculture) differs markedly between high- and low-income countries (table 2.2). The structure of world production has changed considerably over the past ten years. In low-income countries employment in agriculture dropped, while employment in industry climbed. It is expected that this trend will continue [ILO 1995a].

Table 2.2 The world's working-age population by sector and country income group

Sector of employment	High-income countries	Low-income countries
Services	42%	16%
Industry	19%	11%
Agriculture	3%	44%
Not in labor force	30%	27%
Unemployed	6%	2%
Total	100%	100%

Source: World Bank 1995

In high-income countries, 42% of all workers between age the 15 to 65 are employed in services, 19% in industry, 30% are outside the labor force, 6% are unemployed and only 3% are in agriculture. In low-income economies, 16% work in services, 11% in industry, 27% are outside the labor force, 2% unemployed and 44% are employed in agriculture. The figure of 2% unemployed in low-income countries is probably a severe underestimation. However, if we consider the total number of employed people, 40% of those employed in services, 45% of those employed in industry and 80% percent of those employed in agriculture live and work in low-income countries [World Bank 1995].

Low-income countries are now far more differentiated economically than in 1965. Rapid export-oriented industrialization and competition between major economic blocks, with market protection and trade agreements such as the North American Free Trade Agreement (NAFTA) and the European Union, will shape future employment opportunities. In low-income countries, these changes will accelerate the shift from agriculture to light and heavy industry and the expansion of the non-formal sector.

An important difference between high- and low-income countries is the distribution of workers between the formal and non-formal sectors. In high-income countries, more than 80% of the labor force are engaged in the formal sector, the vast majority in permanent positions [ILO 1995a]. In low-income countries, the large majority works outside the formal sector – 85% in Africa and 60% in Latin America [World Bank 1995]. The majority of the labor force in low-income countries does not have a permanent position. In India, for example, some industries like construction, bidi (hand-made cigarettes), handloom, tanneries, quarries, mines and jute depend heavily upon this category of workers. The non-formal sector grows fast and it is estimated that in India about half of all industrial workers belong to the contract, casual and temporary categories [Qadeer and Roy 1989]. The strategy to employ casual workers in the small enterprises is often simply in an effort to survive. Most enterprises in the non-formal sector cannot afford to offer permanent positions. Presently, the economic role and function of small enterprises, most of them belonging to the non-formal sector, is clearly recognized as is their strength and ability to generate employment and income. Moreover, the non-formal sector consolidates and contributes to the diversification of industrialisation [Spath 1995].

2.2 The non-formal sector

Important characteristics of this sector are unregulated and competitive markets, small scales of operation, labor intensive and simple technologies, skills acquired outside the formal school system, absence of legal and administrative regulations, employment of family members, no fixed working hours or days, no institutional loans and production intended for the final consumer [ILO 1972, Hart 1973, Charmes 1990]. Information on occupational safety and health within this sector is rather scanty. There are no formal obligations to report occupational diseases and injuries and thus these remain in the shadow, unilluminated by the light of (official) statistics. In general, occupational risks in the non-formal sector endanger whole families and even neighbourhoods, as toxic, explosive and other

hazardous substances are brought into the dwellings for homework. Workplace and living quarters are often not separated. Workers have long working days, often in insufficiently ventilated places without reliable light sources. Overcrowding in the small dwellings often leads to wrong and hazardous working postures. Women and children are especially at risk, as they are involved on a large scale in housework, which is often highly repetitive work. Work in the homes, in combination with the polluted environment in and around the house, poses serious occupational and environmental risks [McCann 1996, Barten 1992].

2.3 Integration of low-income countries into the international market and its consequences for workers' health

Over the past ten years, rapid economic and political developments have profoundly changed the position of low-income countries in the international market. The former centrally-planned economies in Eastern Europe and the majority of the low-income countries are now integrated in the global market [Anonymus, 1994]. The most important centres of economic activities are concentrated in Western Europe, North America, Japan, other South-East Asian countries and the very rapidly emerging new industrializing countries such as China and South Korea. Dramatic improvements in product quality are needed in low-income countries to comply with international quality assurance as laid down by the International Organisation for Standardization (ISO). Some experts have argued, therefore, that the market share in world production and trade of the least developed countries will markedly decrease [Rantanen 1995]. International trade agreements will have a great impact on many issues, ranging from accessibility of local markets to labor standards and environmental protection. Debates about the feasibility and desirability of including a social clause in trade agreements continue in international forums such as the World Trade Organisation (WTO) and the ILO.

Many low-income countries are currently in the process of stimulating export-oriented production. Foreign investment has increased tremendously in the past five years and brought many challenges to workers in these countries. In this rapidly changing environment there is an increasing need to monitor the problems related to occupational health and safety in a systematic manner. The ILO emphasizes that transfer of industrial processes to low-income countries should be accompanied by a careful strategy to protect workers: 'Today there is a constant flow of machinery, chemicals and processes from developed to developing countries. However, this is now accompanied by a concern not to limit the transfer of knowledge about how the machinery, chemicals or processes function but to extend it to knowledge about the effect machinery, chemicals or processes may have upon the safety and health and the working life of those who operate or work with them' [ILO 1987].

2.3.1 Industrial transformation

Many low-income countries have witnessed a kind of an industrial revolution during the last three decades. It is a well documented fact that multinationals and other enterprises have established a wide array of industries in low-income countries [Rantanen 1995]. This rapid transformation of traditional technology to modern production methods may have various consequences for the well-being and health of the labor force. Occupational risks have been introduced, such as occupational lung disease, industrial chemical poisoning, heavy metal poisoning, industrial accidents, occupational cancer, noise-induced hearing loss and musculoskeletal disorders. Monitoring of specific occupational diseases may indicate trends in exposure which are interesting as 'tracers' to follow the effect of industrialization. The epidemiological consequences of the shift in employment towards manufacturing is illustrated here by the prevalence figures of pneumoconiosis in China. Before 1950, pneumoconiosis was sporadic. With the emergence of industrialization in the early fifties, pneumatic tools were introduced in the mines. In a relatively short time span, pneumoconiosis became one of the most important work-related diseases. In 1955, 419 new cases of pneumoconiosis were reported. In 1986 this figure increased to 27 thousand new cases, 46% of them being mine workers [Zou 1995]. Similar figures on occupational diseases have been described for other countries: Sudan, Egypt and India [El-Karim et al. 1986, El-Batawi 1981, Durvasala 1992]. On the other hand, industrialization has created new jobs and has contributed to the education and training of the workers and also to their well-being by providing them with employment. However, the risks of industrialization are serious, as demonstrated by Quadeer and Roy in their study on occupational risks in India [Quadeer and Roy 1989].

".....Our analysis of the organization of labor around technologies in the new as well as the older industrial units shows:

1. that the technological options chosen have made some tasks in the division of the production process much more hazardous;

2. that these tasks are generally given to unskilled contract and casual workers who have little bargaining power;

3. that there is a strong tendency to devise less safe but quicker methods of production particularly in the small-scale units;

4. that even the organized industries which are mechanized sub-contract work to small-scale units and depend on contract labor for the completion of many necessary tasks."

Occupational health in low-income countries only comes into prominence on international forums and debates gradually. In the past few years, occupational health and working conditions have hardly received serious attention during international conferences, like the United Nations Conference on Environment and Development (UNCED) in Rio in 1992, notwithstanding the fact that workers are more exposed to hazardous substances than the general population. Large industrial disasters like the explosion in the Union Carbide

plant in Bhopal, India, or catastrophes like the fire in the Kader Doll factory in Bangkok, have received full media coverage and diverted public awareness to these large-scale disasters, while the 'silent emergency' of millions of workers daily exposed to hazardous conditions escapes our notice. Debates in NAFTA and the WTO included occupational health and working conditions and the World Bank recently emphasized the importance of a healthy population and protection of human capital [World Bank 1993].

2.3.2 Export of hazardous waste and industries

Non-governmental voluntary organizations and environmental and occupational health activists in both high- and low-income countries are concerned about the 'export' of entire potentially hazardous industrial complexes to low-income countries, like the asbestos industry and the Union Carbide plant in Bhopal in India [PRIA 1992]. Potentially dangerous industries are exported from the more regulated and protected environments in affluent nations to low-income countries. The shift in Europe, North America and Japan from heavy industries to the light technology and service sectors, combined with the increasingly strict regulations with respect to environmental protection, have "pushed" many industries to low-income nations. Low-income countries, being faced with international competition, massive unemployment and the need for hard currency, strive to attract industrial investors. They "pull" polluting industries offering low taxation in a poorly regulated environment, with markedly lower wages and a lack of control or even negotiating power of trade unions. Development of regulations and standards with regard to the control of toxic substances in low-income countries have not kept up with rapid industrialization. The structure for implementing labor legislation is not yet fully developed and the enforcing power is lacking in the majority of low-income countries. The ILO Recommendations on Multinational Enterprises, the London Guidelines on Export of Banned Chemicals, the UNEP's Awareness and Preparedness for Emergency at Local Level (APELL) guidelines and the United Nations Environmental Program's Basel Convention on Prevention of Transboundary Transportation of Hazardous Waste, all emphasize that nothing that is unacceptable in the exporting country should be transferred to the importer, no matter what legislation the recipient country sets about such practices. Sadly, however, many companies apply double standards with regard to environmental issues and occupational health and safety regulations [Frumkin et al. 1995].

There is also a growing concern about the practice of dumping hazardous products and toxic waste in low-income countries [VHAI 1987, PRIA 1992, Novotny 1994]. Greenpeace reports that the cost of dumping in Africa is between two and ten American dollars per ton, as compared to between 160 and 1000 American dollars per ton in high income nations [Goelzer 1993a]. One African nation has even been offered four times its gross national product in exchange for receiving 15 million tons of European toxic waste [Jeyaratnam 1993]. Build-ups of mercury, lead, chromium, copper and cadmium have been reported in recent years in many industrializing countries in South East Asia [Leonard 1984].

The media give due attention to the transport of toxic waste which could pollute the environment. There is also a growing public awareness about the shift of industries which cause environmental pollution. The working conditions within the walls of industries, however, still escape public attention. Media coverage of strategies to prevent occupational diseases lags behind the more spectacular issues like claims for compensation for severe occupational diseases, e.g. cancer from uranium dust and asbestos.

2.4 Workers' health in low-income countries

Protecting and promoting workers' health is of crucial importance to development, both from a human or an economic perspective. Sound working conditions contribute to better quality products. They are essential to prevent occupational accidents and diseases and to contribute to the social development of workers. In a sample of industrialized countries, the ILO estimated economic costs of occupational injuries and associated production losses to be of the order of 1 to 4 per cent of the GNP. The World Health Organization estimates that in low-income countries poor occupational health and reduced working capacity of workers may cause economic loss of between 10 and 20 per cent of the GNP [WHO 1995a]. The large majority of occupational accidents and diseases is preventable.

A recent method to assess the significance to public health of individual diseases has been introduced by the World Bank through the concept of the Disability-Adjusted Life Year (DALY), estimating the loss due to the incidence and mortality of diseases and injuries [World Bank 1993]. The DALY method combines in a single index the impact of premature mortality and non-fatal disease outcomes by combining the number of years of life lost due to premature death and the number of years lived with disability. The use of DALYs to underpin health policies has several applications, most importantly an assessment of national burden of disease, and a procedure to identify national control priorities. According to the World Bank report approximately 2,5% of all DALYs in low-income countries are attributable to occupation and, hence, could be largely prevented by appropriate interventions. Given the direct link between loss of productivity and disease and injury attributable to occupation, reducing major occupational hazards is likely to be cost-effective [World Bank 1993].

In the previous sections, the dramatic changes in industrial production and labor markets in many low-income countries have been sketched. The health of a breadwinner, whether male or female, is critical for the rest of the household. Preventing the disabilities of breadwinners, or curing them, is crucial from both human and economic points of view [Chambers 1989, Dasgupta 1993, Pryer 1993]. Among the physical factors which impoverish, accidents at the workplace and occupational diseases have been neglected, yet many of the workers in low-income countries are exposed to disabling accidents and occupational diseases. Individual case studies of poor households reveal an accident as the event which caused impoverishment. As Chambers has put it: "At a sudden blow, the body, the poor person's greatest and uninsured asset, is devalued or ruined. From being an asset, at one stroke it becomes a liability that has to be fed, clothed, housed and treated. A livelihood is destroyed and a household made permanently poorer" [Chambers 1989].

It is difficult to present general information as to the workers' health in low-income countries. The ILO estimates the number of occupational accidents in the formal sector at 120 million per year with 210.000 occupational fatalities worldwide [ILO 1995a]. Every day more than 500 men or women go to work never to return alive [Takala 1993]. Fatality rates in low-income countries are much higher than in the industrialized world. Industrialized countries report fatality rates between 3 and 6 per 100.000 workers per year, while low-income countries have fatality rates typically ranging from 25 to 30 per 100.000 workers yearly [Takala 1993]. The risk of having a severe occupational accident during working lifetime is also much higher in low-income countries than in high-income countries.

Figures for occupational diseases or accidents vary not only between high- and low-income countries, but also between occupations. The WHO estimated that between 58 and 150 million occupational disesases may be caused by various types of occupational exposures [WHO 1994]. The economic importance of occupational health and safety is also illustrated in the Year Book of Labor Statistics of the ILO, which reports annually on the substantial number of working days lost due to occupational accidents. Rantanen quotes figures from Finland, where there is a 30-fold difference in the occupational accident risk between the low-risk (e.g. managerial and administrative work) and high-risk occupations (e.g. food and beverage manufacturing work, building construction work, industrial work) and a 40-fold difference in the risk of an occupational disease [Rantanen 1995].

Several studies have painted a kaleidoscopic picture of the high occurrence of specific diseases in various industries and agricultural activities. Classical examples are byssinosis, pneumoconiosis, chronic and acute toxic metal and solvent poisoning which are regularly observed in low-income countries, while they have virtually disappeared from nations which went through their industrial revolution at the beginning of the twentieth century or before. Occupational diseases and injuries in the majority of low-income countries go unobserved and thus unregistered, as the coverage by basic health services is still low, especially in Sub-Saharan Africa and in the remote areas of Asia and Latin America. Even if basic health services are available, the health staff has not been trained in occupational health issues and will not be able to recognize work-related diseases.

2.5 Problems in drawing the picture: under-reporting of occupational diseases and injuries

Given this situation in low-income countries, it is very difficult to present a complete and reliable picture of workers' health. Only very scanty information is available. Under-reporting of occupational diseases is illustrated here with an example from India. A comparison of cases reported under the Factories Act and the Workmen's Compensation Act revealed a twofold difference, indicating the lacunae in the implementation of the Factories Act. From 1960 to 1980 only 639 cases of occupational diseases were reported under the Factories Act (1948) in India. It is not very realistic to assume that in a continent as huge as India the number of occupational diseases over twenty years has been so small [Quadeer and Roy 1989]. Why is under-reporting of occupational diseases so common? Five reasons lie at the heart of under-reporting:

First, the lack of political interest in workers' health. Occupational health was dealt with as a side issue during important international conferences like the United Nations Conference on Environment and Development (UNCED) in Rio in 1992 and during the World Summit for Social Development in March 1995 in Copenhagen. Neither is occupational health high on the agenda of governments in the majority of low-income countries. This lack of interest is sadly shared by governments, employers, trade unions and non-govemental organizations[2]. Employers may even intentionally under-report occupational injuries and diseases and reporting may be discouraged by management. Under-reporting leads to underestimation and neglect of occupational injuries and diseases. The situation is severely underestimated and low figures subsequently fail to raise political interest: a vicious circle.

Second, the lack of occupational health and safety programs. According to Ong, less than 25 percent of the world's working population has access to any form of occupational health services. [Ong et al. 1993]. In many low-income countries occupational health services cover only five to ten percent of the total labor force [WHO 1995a]. Over 40 percent of industrial settings in South East Asia consist of small enterprises with fewer than 50 workers [Foo et al. 1985]. These settings have no occupational health services. This lack is caused by insufficient financial means and the shortage of trained personnel.

Third, there is gross under-reporting of occupational accidents and diseases by physicians. In-house physicians may fear termination of employment and panel physicians may fear that they will not receive new contracts if they report occupational diseases or injuries [Geok Lin Khor 1992]. Often there are many administrative and technical constraints in poorly developed national programs for occupational health. There is a widespread ignorance among doctors about their legal obligations to make such reports and they tend to avoid 'bureaucratic paperwork'. Furthermore, there is a lack of incentive for reporting. Moreover, there are considerable difficulties in diagnosing such diseases because of lack of training or knowledge of occupational medicine and considerable difficulties in evaluating the causal role of occupational exposure. Many occupational diseases have an insidious onset and a long latent period. Textbooks and educational programs printed in high-income countries emphasize occupational stress, ergonomics and discuss 'healthy life style' issues to keep the labor force healthy. The 'classical' occupational diseases, like byssinosis, have moved to notes in the margin, are dealt with as side issues or have disappeared completely from recent medical textbooks. Diagnosis is also difficult when the underlying occupational disease has been masked by another ailment. Mendes diagnosed 119 patients as having silicosis among 3440 patients who had been diagnosed as having tuberculosis. These patients came from occupations such as rock drilling, sandblasting, rock grinding, foundry work and work in the ceramics and glass industry. Obviously, nobody asked their profession to track down an occupational disease [Goelzer 1993b].

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[2] Fortunately, there are a few active non-governmental organizations like PRIA, the Society for Participatory Research in Asia in Delhi, India and IOHSAD, the Institute for Occupational Health & Safety Development, Manila, the Philippines.

Fourth, there are hardly any external pressure groups that watch and monitor working conditions and production processes, advocate for improvement and which denounce abuse as Greenpeace does for environmental protection and as Médecins Sans Frontières (MSF or Doctors Without Borders) advocate for human rights in emergencies. There are hardly any international indicators on occupational health, which are followed in yearly publications like the Human Development Index from UNDP. Massive unemployment and lack of social security are among the main reasons that workers are more concerned with maintaining their jobs than with the possible health effects of toxic exposures.

Fifth, there are only a very few rapid appraisal methods available to measure exposure and health effects of hazardous working conditions. Since the first two conferences on rapid rural appraisal techniques in Sussex in 1978 and 1979, numerous articles and books have been published on these 'quick' and, increasingly less 'dirty' methods [Khon Kaen University, 1987]. In the field of health, most of these methods were devoted to collecting health data in rural areas. It is only since the end of the eighties that urban health gradually came into the picture [Harpham et al. 1988]. Within urban health, industrial settings remained largely outside the scope of researchers [Shukla et al. 1991]. The first rapid appraisals were multidisciplinary efforts to collect data, without the large-scale involvement of the community. Recently, participatory techniques have been developed, where community members actively participate in data collection and in the ensuing planning and implementation of activities. As governments are increasingly withdrawing from the management of social sectors, this situation calls for civic initiatives: initiatives from society, where community members can be organized into self-help groups or commercial undertakings as, for example, the health insurance and savings schemes at the beginning of this century in Europe [Heydelberg 1993]. If more simple rapid appraisal methods will be made available, more data can be collected at the local level, without sophisticated instruments or methods.

Objective and reliable data are crucial to identifying dangerous working conditions which should be modified in order to protect workers' health and safety. Real estimates will indicate those occupations in which workers are exposed to huge risks. Collection of reliable data is important to document high-risk occupations and to attract political and scientific attention. Worldwide strategies will only work if there is consensus on the necessary legal and organizational framework which enable the protection of workers' health and safety. The following chapter devotes attention to international organizations and their policies in the field of occupational health and safety, with a special emphasis on low-income countries.

Chapter 3 International occupational health policies

Integration of low-income countries into the international market, industrial transformation and export of hazardous substances to low-income countries provide clear illustrations of the increasing internationalization of industrial production and its ensuing hazards. Labor and working conditions, including the effect of working conditions on the environment, have increasingly become global issues, and protection of workers' health and well-being thus require global attention. This internationalization warrants a survey of international policies on occupational health and an inventory of international organizations in the field of working conditions and workers' health. According to van Liemt, 'globalization' is frequently defined as the declining relevance of national structures and equated with a weakening of the power of national governments and other essential national institutions. Almost by implication, there is a search for new or reinforced supranational structures. It is no coincidence in this respect, that the new World Trade Organization (WTO) will have a mandate that is both much broader (think of services and intellectual property) and in a sense much deeper (think of dispute settlement procedures) than that of the old General Agreement on Trade and Tariffs (GATT). There is no reason why concern about minimum labor standards should not be part of this discussion [van Liemt 1994].

This chapter provides a description of the structure of the two major international organizations in the field of labor and health: the International Labor Organization and the World Health Organization. It reviews their function in the field of workers' health and analyses their performance in this respect.

3.1 Introduction

It was not until the turn of the century that in many affluent countries serious attention was drawn to protecting the health of workers. There was a gradual trend from isolated efforts to protect workers towards institutionalization of such initiatives. The foundation of the ILO in 1919 and of the WHO in 1946 marked international involvement with the health of workers worldwide. The globalization of the world markets have contributed to an increased attention for better working conditions, also from the perspective of social security and basic human rights [van Liemt 1995]. Moreover, the World Bank underlines the importance of health as a pre-requisite for economic and human development [World Bank 1993, 1995]. The awareness that working conditions and environmental protection are closely interlinked, is growing both in affluent nations as well as in low-income countries [Shukla et al. 1991].

The following description of the role of the ILO and the WHO in the field of occupational health and safety is extracted from the 1992 consensus statement. 'The ILO and WHO both have a unique and distinct role in the development of occupational health at the international level. The history of joint efforts of these two UN organizations is a good example of inter-sectoral collaboration, but has not yet always been translated into effective

joint action at the regional and country level. Continued efforts of both organizations for further development of occupational health are needed and the programs of each organization are mutually supportive, complementary but not duplicative. The main focus of ILO activity has been on the provision of international guidelines and legal frameworks for the development of occupational health policies and infrastructures on a tripartite basis (including governments, employers and workers) and the practical support for improvement actions at the workplace, while WHO has concentrated on the provision of scientific backgrounds, methodologies, technical support and in the training of health and related manpower for occupational health'.

Since 1950, the ILO and WHO have a common definition of occupational health. This definition was adopted by the Joint ILO/WHO Committee on Occupational Health at its first in session in 1950 and revised at its twelfth session in 1995 [Coppée 1996].

"Occupational health should aim at:

1. the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations;

2. the prevention amongst workers of departures from health caused by their working conditions;

3. the protection of workers in their employment from risks resulting from factors adverse to health;

4. the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and, to summarize:

5. the adaption of work to man and of each man to his job."

The main focus in occupational health is on the three different objectives:

1. the maintenance and promotion of workers' health and working capacity;

2. the improvement of working environment and work to become conducive to safety and health; and

3. development of work organizations and working cultures in a direction which supports health and safety at work and in doing so also promotes a positive social climate and smooth operation and may enhance productivity of the undertakings. The concept of working culture is intended in this context to mean a reflection of the essential value systems adopted by the undertaking concerned. Such a culture is reflected in practice in the managerial systems, personnel policy, principles for participation, training policies and quality management of the undertaking.

Occupational safety was defined as the absence of unacceptable levels of known harm allowing for planned and unplanned events and their likely consequences at workplaces. Since the working environment is considered an integral part of the human environment,

the United Nations Environment Program (UNEP) is also dealing with the matter, particularly within the framework of the International Program on Chemical Safety (IPCS). The following sections provide a description of the main organizations at the international level in the field of occupational health and safety.

3.2 The International Labor Organization (ILO)

The ILO, founded in 1919, is one of the eldest specialized organizations of the United Nations (UN). The number of member states of this specialized UN agency for labor issues stood at 175 in 1996 [Coppée 1996]. Workers, organized in trade unions, have played an important role in the foundation of the ILO. During the first world war, trade unions insisted on their participation in the peace negotiations. Their most prominent claim was the inclusion of a clause on national and international rights of workers in the peace treaty. They also urged that guaranteed minimal conditions of employment should be defined and that a permanent organization should be established with the mandate to draft and implement international labor standards and regulations. The pressure of the organized workers before and after the cease-fire, combined with the fear of governments for social turbulence inspired by the revolution of 1917 in Russia, led the Paris talks to the establishment of an international committee for labor legislation with a tripartite structure consisting of representatives from governments, employers and workers. This committee drafted a charter for a permanent organization, according to the wish of the workers. In June 1919 the charter was incorporated as Chapter XIII in the Treaty of Versailles, marking the foundation of the International Labor Organization. In 1946 the ILO became the first specialized agency associated with the United Nations.

3.2.1 Goals of the ILO

The ILO, from its conception until today, aims "at the attainment of optimal social and economic well-being of all and at the stabilization of peace". In the words of the ILO Constitution, "universal and lasting peace can be established only if it is based upon social justice". In 1944, the objectives of the ILO were reformulated at the Conference of Philadelphia, adding to its charter the principle of ILO's responsibility to fight against poverty and social insecurity, proclaiming the right of all human beings "to pursue both their material well-being and their spiritual development in conditions of freedom and dignity, of economic security and equal opportunity". The foundation of the ILO has been surrounded by the idealistic view that peace is more than merely the absence of war. Interestingly, the World Health Organization realized in a similar way that health is more than the absence of disease, deducible from its Constitution, which defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. However, it would be a mistake to ascribe the foundation of the ILO to optimism and idealism alone. It was realized that the ILO could contribute to the regulation of international competition, a parallel interest of both the labor movement and governments [Reinalda 1991].

3.2.2 ILO's structure

The ILO comprises a yearly general assembly, the International Labor Conference, an executive council, the Governing Body and a permanent secretariat, the International Labor Office. The Organization also works through subsidiary bodies such as regional conferences, industrial committees and panels of experts. The International Labor Conference elects the Governing Body and adopts the ILO's budget, sets international labor standards (Conventions and Recommendations or the International Labor Code) and provides a world forum for the discussion of social and labor questions. Each national delegation has a tripartite representation composed of two government delegates, one employers' and one workers' delegate, accompanied as necessary by technical advisors. Employers' and workers' delegates have a free voice and can disagree with their governments and with each other. Half of the members of the Governing Body are elected from governments and a quarter each from employer and worker representatives. A two third majority of votes is required for Conventions and Recommendations. All member states are obliged to submit the Conventions and Recommendations which have been approved by the Conference to their competent/proper authorities. Ratification of Conventions involves a dual obligation for a member State: it is both a formal commitment to apply the provisions of the Convention and an indication of willingness to accept a measure of international supervision. The tripartite structure, with participation of employers, workers and government institutions, has been regarded as important as it enables the translation of the experience from the industrial setting into legislation to enhance optimal conditions for the implementation of the Conventions. An advisory position of the 'social partners' (employers and workers) would not sufficiently safeguard the implementation of these instruments. This structure of the ILO is unique: it is the only organization of the United Nations with a tripartite structure. It enables employers, workers and government representatives to exert direct influence on the ILO's activities, which greatly enhances the feeling of 'ownership' of decisions, a crucial element in international cooperation [World Bank 1992].

3.2.3 ILO's activities

The International Labor Organization, with regional offices in Africa, Asia, Europe, Latin America and the Middle East and a number of country and area offices, offers technical advice related to labor regulations, social security systems, labor inspection and support programs to policy development in the field of employment, working conditions and environmental issues. These programs are under the supervision of the Governing Body. The ILO recently adopted for its field structure an active partnership policy (APP). This brings the organization closer to its tripartite constituents in member states by strengthening the field structures, most notably through the establishment of 14 multidisciplinary teams (MDTs).

The ILO has a supervision system with regard to compliance of the implementation of its Conventions and Recommendations. Governments have to report regularly on the implementation of ratified Conventions. The ILO tripartite structure provides an excellent way of

obtaining information about the implementation of Conventions from both governments and from employers and workers. In their regular reports, governments have to indicate if representative organizations of the social partners have been consulted and have given their annotations to the official government reports. Governments are obliged to send their reports to the International Labor Organization and also for comment to their national social partners. The social partners are allowed to send their comment via their governments, but they may also send it directly to the International Labor Office. In addition to reports, compliance with Conventions can also be stimulated via complaint procedures, raised by governments or the social partners. In the case of long-standing and severe problems, the International Labor Organization may send a 'direct contact mission' to try to come to a solution. With respect to labor legislation, including legislation with regard to occupational health and safety, three fundamental questions should be answered to be able to assess the contribution of the ILO and its supervisory system to the protection of workers [van Liemt 1996]:

1. why do countries have the labor legislation that they have and why do they ratify ILO Conventions?

2. to what extent does labor legislation have an impact on local practice and where it doesn't, why not?

3. what is the impact of the ILO supervisory mechanism on cases of ratified and non-ratified Conventions?

The contribution of the ILO to the improvement of working conditions and to the protection of the labor force at plant level in the tanneries of Kanpur was rather limited. Conclusions, based on one industry in one town may, however, be biased. Therefore a general overview of labor legislation in India is provided in chapter 4. In the majority of low-income countries, enforcement of ratified Conventions proved to be rather difficult. The realization of these difficulties may have contributed to a new strategy of the ILO, which promotes the ratification and observance of the so-called Fundamental Conventions, as described in the next section.

3.2.4 ILO's basic human rights Conventions

Before any improvement in occupational safety and health and working conditions can be implemented, it is necessary to have a legal foundation and a righteous occupational health policy. Among the Conventions and Recommendations of the ILO, six Conventions are grouped together as basic human rights Conventions, see table 3.1 [ILO 1995b]. These basic human rights Conventions are prerequisites for actions in the field of occupational health and safety. They aim to safeguard basic human rights. The promotion of these rights is carried out within the more general framework of the promotion of the entire body of ILO standards. Human rights questions receive a great deal of attention in the work of the International Labor Standards Department, which include seminars and technical assistance

provided to ILO constituents. The ILO has been asked by the United Nations Center for Human Rights to cooperate in pursuing the objectives of the International Decade of Human Rights Education, which started in 1995. The Committee on Legal Issues and International Labor Standards of the ILO had been invited in March 1995 to recommend to the Governing Body that the Office be instructed to undertake a campaign to promote the ILO's fundamental rights Conventions. Respect for human rights is a basic tenet of the relationship between international labor standards and technical cooperation. As such, it is an important part of the work of the ILO multidisciplinary teams to promote the ratification and observance of such standards. The Conventions listed in the resolution are presented in table 3.1 [ILO 1995b].

Table 3.1 The basic human rights Conventions

Description of the Convention	Year	Convention Number	Number of ratifying countries*
Forced Labor	1930	29	135
Freedom of Association and Protection of the Right to Organize	1948	87	113
Right to Organize and Collective Bargaining	1949	98	125
Equal Remuneration	1951	100	123
Abolition of Forced Labor	1957	105	114
Discrimination (Employment and Occupation)	1958	111	119

* As at 10 January, 1995

With the exception of the convention on child labor and occupational health and safety, the Conventions in table 3.1 are those with the highest number of ratifications. It is remarkable that Conventions dealing with occupational safety and health, such as Convention no. 155 (1985) on Occupational Safety and Health, are not included in the list of basic human rights Conventions. This may be interpreted in two ways: either basic human rights, as provided in the listed conventions, are considered fundamental to the realization of improved occupational safety and health, or occupational safety and health are not regarded as basic human rights.

Another approach, discussed within the ILO in relation to the protection of workers' health and safety, is the promotion of a social clause in international trade. According to van Liemt, "a social clause aims at improving labor conditions in exporting countries by allowing sanctions to be taken against exporters who fail to observe minimum standards. A typical social clause in an international trade arrangement makes it possible to restrict or halt the importation or preferential importation of products originating in countries, industries or firms where labor conditions are inferior to certain minimum standards. Produ-

cers that do not comply with the minimum requirements must choose between a change in working conditions or run the risk of being confronted with increased trade barriers in their export markets" [van Liemt 1989]. Most proposals for a social clause refer to or are actually based on a selection of international Conventions adopted in the International Labor Organization. Table 3.1 provides the areas which are usually suggested for inclusion in a social clause.

3.2.5 ILO's role with respect to the protection of workers' health

The most important activity of the ILO is its normative role in standard setting, put into application by international agreements in the form of ILO Conventions and Recommendations which serve as a basis for national legislation and policies. The ILO Conventions and ecommendations on occupational safety and health define the rights of the workers and allocate duties and responsibilities to the competent authority, the employers and the workers in the field of occupational safety and health. The ILO Conventions and Recommendations adopted by the International Labor Conference, taken as a whole, constitute the International Labor Code which defines minimum standards in the labor field. In the field of occupational health and safety, the ILO devoted about 70 international Conventions and Recommendations dealing with occupational safety and health [Tansley 1994, Coppée 1996]. In 1984, the International Labor Conference adopted a Resolution concerning the improvement of working conditions and environment which recalled that the improvement of the working conditions and environment was an essential element in the promotion of social justice. It stressed that improved working conditions and environment are a positive contribution to national development and represent a measure of success of any economic and social policy. It spelled out the three fundamental principles that:

1. work should take place in a safe and healthy environment;
2. conditions of work should be consistent with workers' health, well-being and human dignity; and
3. work should offer real possibilities for personal achievement, self-fulfilment and service to society.

ILO's program of activities in the field of occupational safety and health aim at:

1. reducing the number and seriousness of occupational accidents and diseases;
2. adapting the working environment, equipment and work process to the physical and mental capacity of the worker;
3. enhancing the physical, mental and social well-being of workers in all occupations; and
4. encouraging national policies and programs of member States and supplying appropriate assistance.

The ILO Headquarters and field structures support the commitment and the activities of member States in occupational health and safety within the framework of the International Program for the Improvement of Working Conditions and Environment (PIACT). This program includes a large variety of advisory services and technical cooperation activities all over the world, including the active partnership policy (APP) with the multidisciplinary teams (MDTs). The ILO has always striven to achieve a balance between 'upstream activities', e.g. policy making and 'downstream activities' e.g. implementation of activities at the field level.

The ILO policy on occupational health and safety is contained in two international Conventions and their accompanying Recommendations [Coppée 1996]. The backbone of these Conventions and Recommendations consists of primary prevention for the control of risks at the source, the adaptation of work to people and a top priority for information and training. The ILO Occupational Safety and Health Convention (No. 155) and Recommendation (No. 164), 1981, provide for the adoption of a national occupational safety and health policy and describe the actions needed at the national and at the enterprise levels to promote occupational safety and health and to improve the working environment. Convention No. 155 and Recommendation No. 164 include the formulation, implementation and periodic review of coherent national policies on occupational health and safety. The ILO Occupational Health Services Convention (No. 161) and Recommendation (No. 171), 1985, provide for the establishment of occupational health services which will contribute to the implementation of the occupational safety and health policy and will perform their functions at the enterprise level. Convention No. 161 and Recommendation No. 171, 1985, include the formulation, implementation and periodic review of coherent national policies on occupational health services and the development of these services for all workers, including those in the public sector and the members of production co-operatives, in all branches of economic activity and all undertakings. They also include guidelines for the surveillance of the working environment and the surveillance of workers' health. In addition, they provide guidelines on designing and implementing programs of information, education and training on health and hygiene in relation to work including first aid, treatment of occupational diseases and injuries and health programs. Finally, they provide guidelines on the organization of occupational health services.

Apart from this normative role, the ILO has three supportive roles: training and guidance, dissemination of practical information including exchange of experiences, and technical cooperation activities for low-income countries. Recently, there has been an emphasis on operational programs and on educational work in the broadest sense, but due to budgetary constraints, the ILO has cut down too much on downstream activities [Nielsen 1996]. It remains a challenge to achieve a balance between policy making and technical cooperation. In the field of occupational health and safety, the workshops on Work Improvements in Small Enterprises (WISE) and workshops Start Your Business / Improve Your Business are important methods to improve working conditions in low-income countries. Technical cooperation started in the early 1960s and gained in importance from 1976, when the International Program for the Improvement of Working Conditions and Environment (PIACT) was established. The ILO increasingly support governments in low-income countries to enable them to execute their core function of policy making in the field of labor

codes through technical cooperation by multidisciplenary teams [Kogi, personal communication 1996]. The ILO has an International Occupational Safety and Health Information Centre (CIS) to meet the increasing need for information on work-related accidents and diseases and the means to prevent them. The ILO Encyclopaedia of Occupational Health and Safety is a comprehensive and authoritative reference work, the fourth edition being scheduled for 1997.

The main function of the ILO is its normative role with respect to labor laws. This internationally acknowledged role has certainly contributed to national legislation of Labor Codes. However, according to its Constitution, the ultimate goal of the ILO is the attainment of optimal social and economic well-being. In the field of workers' health it is the attainment of a healthy workforce. The ultimate impact of the ILO's activities on workers' health in low-income countries, however, has been relatively limited. There are several reasons for this. First, notwithstanding its tripartite structure, the ILO remains mainly an international organization negotiating and cooperating mainly with governments and less with trade unions and employers' organizations. Even in this bilateral relation, the ILO could not persuade some countries to ratify its major Conventions and Recommendations and even now many countries lag behind in ratification. Even when the Conventions and Recommendations have been ratified, national labor laws have not always been tailored accordingly. Enforcement of labor codes at national and local level is another problem for the ILO. This illustrates the importance of advisory and technical cooperation activities by the ILO. Notwithstanding its clear supervisory structure, which enables the social partners to report directly to the ILO, the organization has no mandate for direct interventions or for sanctions in case of non-compliance with labor codes. Another reason for the rather limited contribution of the ILO to the effective protection of workers in low-income countries, is ILO's main focus on the industrial sector, while, 'the most blatant cases of exploitation and deprivation are not generally found in manufacturing industries which produce for export. The worst offences are usually found in plantations and mines, construction industry and small service firms working entirely for the domestic market.' [van Liemt 1994]. The non-formal sector still largely escapes ILO's attention. According to van Liemt, 'poor working conditions are the result of a low level of development, of the refusal to grant workers certain basic rights, of inadequate legislation and of the inadequate enforcement of existing laws' [van Liemt 1994].

Notwithstanding the relatively small annual budget share devoted to occupational health and safety (in 1992 – 93, the ILO spent 1.9% of its regular budget on occupational health and safety activities and 2.9 % from extrabudgetary sources), the ILO considers this field as one of its key areas in overall ILO activities. Occupational health and safety issues are discussed during ILO conferences, industrial committees and are often the subject of the multidisciplinary teams, while the ILO also indirectly deals with occupational health and safety through its attention to basic rights and industrial relations.

3.2.6. Conclusion and recommendations

In conclusion, the ILO has an important normative role through its Conventions and Recommendations. It has stimulated governments to ratify these Conventions and Recommendations, and through the Basic Conventions the ILO will pursue the protection of human rights. The ILO has invested much in the development of training materials and workshops. Through its multidisciplinary teams it will hopefully contribute to the implementation of its Conventions and Recommendations at the local level. ILO and FINNIDA have, through their bilateral African Safety and Health Project and the Asian-Pacific Program on Occupational Safety and Health, contributed to the strengthening of occupational health and safety policies and the strengthening of inspectorates in selected African and Asian countries [Lamberg and Mattila 1995a, 1995b]. However, the organization still lacks a strategy to contribute effectively to the implementation of the improvement of working conditions at the local level, especially in the non-formal sector. Ratification of important Conventions and Recommendations still lags behind in many countries, and enforcement of labor laws in most low-income countries leaves much to be desired. The number of projects and activities of the ILO in low-income countries, aimed at the improvement of working conditions at plant level, is rather limited. It is critically important for the ILO, particularly learning from recent successful activities such as WISE projects and MDTs, to extend advisory and technical cooperation activities so as to promote and develop effective enterprise-level activities with the active participation of employers and workers [Kogi, 1996].

It is recommended that the ILO use its opportunities as a tripartite organization by involving trade unions and employers more actively. ILO's core mandate, protecting workers via a tripartite set-up, is often not realized. The balance to implement activities in the tripartite setting is uneven, often resulting in the neglect of one of the stakeholders. Bilateral donors and other organizations should insist in the involvement and active participation of all three parties: employers, workers and governmental institutions. The ILO could also, like the United Nations Childrens' Fund (UNICEF) does, support countries via their multidisciplinary teams with the development and implementation of national plans for the improvement of working conditions. The ILO should also devote more efforts to reach in-depth the large non-formal sector in low-income countries.

3.3 The World Health Organization

As in the history of the ILO, the first attempts to create an international organization for health were made at the beginning of the twentieth century. In 1902, the International Sanitary Bureau, later re-named Pan American Sanitary Bureau, was set up in Washington. This bureau is the forerunner of today's Pan American Health Organization (PAHO), which also serves as the WHO's Regional Office for the Americas. In 1907, the L'Office International d'Hygiène Publique (OIHP) was established in Paris and in 1919 the League of Nations was created and the Health Organization of the League of Nations was set up in Geneva, in parallel with the OIHP. In 1945, the United Nations Conference on International

Organization in San Francisco unanimously approved the proposal to establish a new, autonomous, international health organization [WHO 1990]. The International Health Conference in New York approved the Constitution of the World Health Organization in 1946 and the WHO Constitution came into force on 7 April 1948, combining the OIHP and the Health Organization of the League of Nations. The WHO is an intergovernmental organization within the United Nations system. The number of WHO member states stood at 183 in 1994.

3.3.1 Goals of the WHO

The ultimate objective of the WHO is the attainment by all peoples of the highest possible level of health. The Constitution of the WHO describes health as "....a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition." In order to attain this objective, the WHO has a number of functions that include the following:

1. to act as the directing and coordinating authority on international health work;

2. to promote, in cooperation with other specialized agencies where necessary, the prevention of accidental injuries;

3. to promote, in cooperation with other specialized agencies where necessary, the improvement of nutrition, housing, sanitation, recreation, working condtions and other aspects of environmental hygiene;

4. to promote cooperation among scientific and professional groups which contribute to the advancement of health;

5. to encourage technical cooperation for health with member states.

The functions of the WHO include the proposition of regulations and preparation of recommendations with respect to international health matters. The WHO provides scientific background and guidance to governments, who, in turn, have the responsibility to establish, regulate and enforce their own standards, taking into account not only the scientific basis but also the socio-economic context in which they have to be applied [Goelzer 1996].

3.3.2 WHO's structure

The WHO performs its functions through three principal bodies: the World Health Assembly, the Executive Board, and the Secretariat. The World Health Assembly approves the biennial program budget and decides on major policy matters. The Executive Board gives effect to the decisions and policies of the Health Assembly, provides advice to the Assembly, and facilitates its work. The headquarters of the WHO are located in Geneva. The WHO is decentralized and has six regional offices with regional committees. It has resident WHO representatives in many countries. They support the governments in the planning and management of national health programs. Over 40% of the entire WHO staff works in countries throughout the world.

3.3.3 WHO's activities

Until 1978, the activities of the WHO were mainly restricted to the preparation of recommendations and guidelines intended to provide scientific background and guidance to governments. The WHO introduced in 1978, in close collaboration with UNICEF, the concept of Primary Health Care (PHC)[3] in Alma Ata. This concept made prevention the focus of attention. PHC was conceived to replace the inadequate urban hospital-based curative health care system by a system based on equity and community participation with a large coverage in rural regions [WHO 1978]. PHC was focused on the hitherto under-served rural regions and the development of an equitable urban health care system was neglected. Crucial to the strategy of PHC is assuring social control of the health infrastructure and technology through a high degree of community involvement.

The core activity of the WHO, after the 1978 conference in Alma Ata on Primary Health Care, is support to national health systems via technical assistance in specific areas such as tropical disease control, essential drugs, tuberculosis, AIDS, immunization, acute respiratory infections and mental health. It also has programs concerning environmental health, health of the elderly and workers' health.

[3] Primary health care is based on practical, scientifically sound and socially acceptable methods and technology, made universally accessible to individuals and families in the community, through their full participation, and at a cost that the community and country can afford to maintain, at every stage of their development, in a spirit of self-reliance and self-determination.

3.3.4 WHO's role with respect to the protection of workers' health

Since its foundation, the WHO did recognize occupational health as belonging to its mandate, but it was only towards the end of the 1970s that occupational health was recognized as an important field for action. This development was positively influenced by the introduction of the Primary Health Care concept. PHC focused mainly on rural regions, and occupational health in urban regions, including the industrial setting, remained in the shadow. At present, there is a strong policy basis for occupational health within the WHO, also for low-income countries, as can be exemplified by the following extract from a resolution by the World Health Assembly:

"...to support developing countries in ensuring safe working conditions and effective protective measures for workers' health in agriculture, in mining and in industrial enterprises which already exist or which will be set up in the process of industrialization, by using the experience available in this field by both industrialized and developing countries".

Until 1985, occupational health remained the domain of occupational medicine and, in this respect, lagged behind the new concept of Primary Health Care. In 1985, a working group of the WHO was convened to study the role of occupational health and workers' health programs in the context of Primary Health Care [WHO 1986]. The primary focus of most occupational health professionals remained, however, the diagnosis and treatment of diseases and disorders among workers, whether or not work related. Prevention of occupational diseases by the improvement of working conditions was still a largely neglected area. An important recent activity of the WHO in the field of occupational health and safety is the Global Strategy on Occupational Health for All. In response to a need for a strategic approach in the promotion of occupational health at the country level, both in developing and industrialized countries, a Global Strategy on Occupational Health for All was developed through the Global Network of the WHO Collaborating Centres for occupational Health [WHO 1995c]. The Resolution on the "WHO Global Strategy for Occupational Health for All" was adopted by the 49th World Health Assembly in May 1996. This strategy aims at identifying main needs and establishing priorities for action at the country and global levels, creating awareness and political commitment to encourage countries to develop appropriate occupational health services to eventually give full coverage of the working populations, promoting intersectoral coordination and international collaboration. Simultaneously the Declaration on Occupational Health for All was prepared, calling governments to give occupational health a higher priority. The WHO has created a network of 57 institutions in 35 countries around the world. This network has been active in supporting WHO occupational health program, including from the point of view of elaborating policies and strategies, as well as in promoting international collaboration and promoting and supporting research, training and other occupational health activities at the country level [Goelzer 1996]. Unfortunately, the number of collaborating centres in low-income countries, especially in Africa, is still rather limited. Non-governmental organizations contribute to WHO activities, but for the best part pursue their own activities. The Global Strategy was prepared along the lines of four policy orientations of the WHO Ninth General Program of Work, covering the period 1996 – 2001, namely:

1. integrating health and human development in public policies;
2. ensuring equitable access to health services;
3. promoting and protecting health;
4. preventing and controlling specific health problems.

and accepting that:

5. occupational health and safety is an integral component of the health concept, which is part of socio-economic development;
6. occupational health and safety at work is a fundamental human right and should be a worldwide social goal;
7. political commitment of a nation as a whole, and not only of the Ministry of Health and/or the Ministry of Labor, is essential for the attainment of Occupational Health for All;
8. participation of all parties in the planning and implementation of health and safety at work, through an intersectoral and multidisciplinary coordinating body, is a key factor.

During the Joint ILO/WHO Committee on Occupational Health at its 12th Session in April 1995, it was decided to develop a joint program aiming at the global reduction and eventual elimination of silicosis.

There are other positive signs for occupational health within the WHO. The WHO has taken an active stance in promoting recognition and control of hazardous working conditions by supporting the international development of the occupational hygiene discipline. It has convened international workshops in Luxembourg in 1986, Geneva 1989, and Geneva 1991 that have provided useful groundwork in defining the scope and objectives of the discipline, the minimum requirements for training and education of its practitioners, the required quality of professional practice and the scope and functions of a professional occupational hygienist in the field of occupational health. The organization has recently established an interdisciplinary working group, Prevention and Control Exchange (PACE). PACE is a program designed to stimulate the sharing of solutions and control measures to reduce occupational hazards [Swuste et al. 1995, WHO 1995b]. Solutions and measures to control occupational hazards or strategies to replace hazardous machines and equipment have received only marginal attention in professional and scientific literature. Examples of successful interventions, solutions and control mechanisms, which have proven to be effective and efficient in the course of their applications, are not only worthwhile for copying and use on a larger scale, but they also stimulate the adoption and innovation of similar options. At first, PACE will focus its attention on chemical hazards and practical experience with management of occupational safety and health. In the long run, other occupational hazards will be dealt with. It is essential that the relatively large data sets, like the

case histories collected by the National Institute for Occupational Safety and Health in the United States and other information collected in the United Kingdom, Australia, Denmark and the Netherlands, will be made available to low-income countries. Information on occupational health like the CD Rom series of the ILO, WHO and others are now within reach of computer networks, which will hopefully enable and stimulate the improvement of working conditions in low-income countries. The WHO has issued a Global Strategy for Health and Environment with an action plan [WHO 1995a]. Surprisingly, the document does not make a linkage between occupational and environmental health in the workplace.

However, the WHO, similar to the ILO, has no mandate for sanctions in case of non-compliance with its standards, nor has the WHO, with the exception of the collaborating centres, a strong and well-equipped field structure like UNICEF, to provide intensive follow-up of the use and enforcement of its guidelines and standards. Moreover, the WHO has rather an epidemiologic and research-oriented approach to workers' health. While it may be true that prevention of occupational injuries and diseases is an important topic for the WHO, in reality the contribution of the WHO to the prevention of serious injuries and occupational diseases at plant level in low-income countries, remains marginal.

In conclusion, the contribution of the WHO to the improvement of working conditions at plant level in low-income countries seems to be rather limited. The department of Occupational Health and Hygiene has only two staff members, whereas WHO headquarters has about 1.500 staff members in total. The proportion of the program on occupational health in WHO's annual regular budget for 1992-1993 was only 0.6%, the percentage from extrabudgetary funds being only 0.2%. The approved effective working budget for 1992 – 1993 was US$ 734.936. At present, the department has no projects or programs in the field. On paper, WHO's Workers' Health Program has the objective of monitoring the changes in health problems of workers with the introduction of new materials and technologies and supports countries in dealing with these new work-related problems [WHO 1990]. Similar to the ILO, the WHO mainly collaborates with governments and has not yet developed a network of collaborating NGO's at field level. The WHO representative in low-income countries is often located in the Ministry of Health without frequent contact with the Ministry of Labor or with organizations dealing with workers' health.

The vast majority of occupational health resources in the world are spent on monitoring activities and epidemiological studies. For example, a survey on research in the field of occupational health among 299 research institutions and factory inspectorates in 117 countries resulted in a description of 500 ongoing research projects in 71 countries [Levy et al. 1992]. The review disclosed that more than three-fourths of the studies were concentrated on chemical hazards, while one-fourth focused on physical hazards. Descriptive epidemiological and industrial hygiene/exposure assessments occurred most frequently. Action research or operational research on occupational health was not mentioned once. A relatively small number of studies concerned important topics such as ergonomic hazards in the workplace and psychosocial stress. Levy concluded that "Research in occupational health and environmental epidemiology presents important challenges to developing countries. These challenges include training research personnel, providing needed equipment and supplies, and financially (and otherwise) supporting the research. The relatively limited

support by international donor agencies, and the seriousness of occupational and environmental health problems in developing countries should stimulate these agencies to increase support for occupational health and environmental epidemiology research in these countries." [Levy et al. 1992].

The target of the WHO VIII General Program of Work to have 70% of countries develop occupational health services has not been achieved as per December 1995. Rantanen provides two reasons for this under-achievement: the extremely limited resources of the WHO and the emergence of new acute problems such as rapid structural changes in working life and changes in the political priorities, for example to alleviate the problems related to severe unemployment in the member countries [Rantanen 1995].

3.3.5 Conclusion and recommendations

In conclusion, the WHO remains predominantly an organization which prepares recommendations and guidelines intended to provide scientific background and guidance to governments. It has published articles and books on toxic substances, on occupational health and safety, it has prepared guidelines and recommendations on subjects related to occupational health. However, with regard to supportive actions to attain the goals set, to support the implementation at plant level, the WHO lags behind other UN organizations like UNICEF and ILO. WHO, in contrast to UNICEF for example, has, except for the collaborating centres, no structure to support the implementation of activities at field level. The organization has, in contrast to the ILO, no multidisciplinary teams in the field with regard to workers' health. During the last decades, the WHO emphasized the rural regions in low-income countries through the Primary Health Care concept and has only recently included urban health in its policies and activities [Harpham 1988]. Workers' health did not receive much attention during the Primary Health Care decade. WHO's research in the field of occupational health and safety is mainly of a descriptive character. There is a lack of action-oriented and operational research stimulated by the WHO.

It is recommended that the WHO should devote more attention to the development of operational and applied research on the prevention of occupational risks. This could be done by evaluating the impact of control methods and substitution of harmful production processes [Swuste 1996]. Even in developed countries, it has been recognized that there is the so-called 'knowledge-application gap'. An important reason for the failure in controlling health and safety risks is largely an inability to apply existing knowledge rather than an absence of appropriate knowledge [Swuste and Buringh 1994]. The WHO should publish and distribute rapid appraisal participatory methods to enable collection of data at plant level and it should collaborate more intensively with the ILO and the World Bank in the field of occupational health and safety.

3.4 Other international organizations in the field of occupational health and safety

3.4.1 The World Bank

The World Bank, in its World Development Report 1993 'Investing in Health' and in its World Development Report 1995 'Workers in an Integrating World', devoted some attention to occupational health, safety and working conditions. Important in the 1993 Report is the emphasis on health as a prerequisite for economic development [World Bank 1993, World Bank 1995]. The World Development Report 1993 'Investing in Health' was an important document with regard the role good health contributes to economic and social development. The report challenged even the leading role the World Health Organization is supposed to play in the field of international health [The Lancet 1993]. The report provided through the calculation of the DALY[5] a new method to identify the healthy years lost caused by disease and disability. The World Development Report 1995, 'Workers in an Integrating World' identified the change by the increasingly internationalization of the world market. It failed, however, to devote attention to occupational health and safety in view of these recent changes.

3.4.2 The International Organization for Standardization (ISO)

The ISO Program for Developing Countries has several projects to assist low-income countries in obtaining ISO certification. One such project concerns eco-labelling to assist low-income countries to achieve sustainable development through awareness and training in environmental management. About two-thirds of the members of the International Organization for Standardization (ISO) are from low-income countries. To cater for the needs of those members, the ISO Committee on Developing Country Matters or ISO DEVCOP was established in 1960 as a Policy Committee reporting to the ISO Council. After the restructuring of ISO in 1993, DEVCOP now reports directly to the General Assembly of ISO which meets once a year. A special program of ISO offers a number of services designed specifically to serve the needs of low-income country members in the field of standardization and related matters. This program, known as the ISO Program for Developing Countries (ISO DEVPRO) includes the following elements [ISO 1992]:

1. publication of development manuals in the areas of standardization and related matters;
2. training in standardization and related matters;
3. sponsorship of participation in ISO standards committee meetings;
4. assistance and guidance in the establishment of International Standards needed by low-income countries;
5. assistance in documentation, information and promotion of standardization.

[5] See for definition DALY page 21

Apart from the activities of the ISO in Geneva, more and more business enterprises are joining in the competition to achieve ISO 9000 and ISO 14001 Quality System Registration. This registration is sometimes required to qualify for government contracts. In the private sector, customers feel better buying from a registered company. In general, ISO 9000 Quality System Registrations increase the 'market value' of a company, and facilitates competition on the international market. When the European Union announced their intention to require ISO 9000 registration, the popularity of the standards increased substantially. The ISO 9000 Quality Assurance standards require that the quality policy be understood, implemented and maintained at all levels of the organization. It is an excellent opportunity for employers and workers representatives to include occupational health and safety in the requirements to obtain ISO 9000 and ISO 14001 registration [Edmunds 1992].

3.4.3 The International Commission on Occupational Health (ICOH) and the International Occupational Hygiene Association (IOHA)

Two other important international organizations are involved in occupational health, safety and working conditions: the International Commission on Occupational Health (ICOH) and the International Occupational Hygiene Association (IOHA). The ICOH is an non-governmental international organization for occupational health with a strong focus on the medical aspects of occupational health mainly in the highly industrialized countries. In recent years there has been growing attention to low-income countries and the ICOH provides training in these countries. In its journal, the ICOH also devotes attention to occupational health and safety issues in low-income countries.

The creation of the International Occupational Hygiene Association (IOHA) in 1986 was a benchmark in the development of occupational hygiene on a worldwide basis. The creation of the new profession of occupational hygienists was a logical step in the evolution of the approach to workers' health from occupational medicine via occupational health to occupational hygiene. Occupational hygiene emphasizes the need for a multidisciplinary approach encompassing risk assessment, environmental and occupational health impact assessment, promotion of appropriate control technology, substitution of dangerous equipment or process and training of employers and workers in these subjects. The comprehensive approach to occupational hygiene, covering "anticipation, recognition, evaluation and control", should be promoted all over the world [Goelzer 1996].

3.4.4 The Organization for Economic Co-operation and Development

The Organization for Economic Co-operation and Development (OECD) has recently devoted some attention to cleaner technology and, in this respect, to working conditions. It is, however, regrettable that the OECD devotes attention to the environment at large, but neglects the internal environment in industries and other workplaces, while the source for pollution is largely identical. The concept of occupational health should be used in its broadest, developmental sense, and should not be restricted to the health side alone.

Environmental protection and care for the environment inside the workplaces are both essential, as workers are more exposed to hazardous substances than the population at large.

3.5 Initiatives from civic society: the role of non-governmental organizations

Non-governmental organizations often play a stimulating role in occupational health and safety. International agreements and conventions may exert a stimulating effect at the local level. To illustrate the role of initiatives originating from civic society, the Maquiladora Health and Safety Support Network is used here as an example. The Border Industrialization Program (BIP), launched in 1965 by the Mexican Government along the border of Mexico and the United States, aimed to attract industries and create employment in one of the poorest regions of Mexico. Mexico liberalized its trade restrictions in 1970s, when it entered the GATT. All this led to a rapid increase in the number of the so called 'maquiladoras' – assembly plants. In 1995, there were approximately 2.139 maquiladores with around 488.00 workers. Workers in these labor-intensive plants are exposed to physical hazards such as repetitive motions, awkward work postures, noise, solvents, acids, metals and other chemicals [Frumkin et al. 1995]. The Maquiladora Health and Safety Support Network, a volunteer network of over 200 occupational health and safety professionals, was launched in October 1993 at the annual meeting of the American Public Health Association. They provide information, technical assistance and on-site instruction regarding workplace hazards and protective measures in these plants along the US-Mexican border. The workers work with community organizations on the Mexican side and with support groups on the US side to increase their knowledge and understanding of the hazards in their workplaces and how these hazards can be eliminated or reduced. The American Industrial Hygiene Association, the American Association of Safety Engineers and the National Safety Council are developing a training curriculum for courses on the border. Support Network members respond to requests from organizations on the border or directly from the maquiladora workers themselves. This organizational set-up may be classified as an example of an initiative to build a 'civic society'. In 'civic society' initiatives, a feeling of shared, responsible citizenship is established. In the maquiladora case, this initiative encompasses the shared feeling of responsibility for workers' health.

Civic organizations have also tried to include measures to protect workers' health and safety via international regulations into trade and commerce. The next section provides a short overview of these international efforts towards the inclusion of a social clause into international trade.

3.6 Minimum labor standards and international trade: the case of a multilateral social clause

The first initiatives to link international trade and workers' rights go back to the nineteenth century [van Liemt 1989]. There have been only a few written international agreements related to trade and the improvement of labor standards. According to the OECD Trade Directorate, these agreements include those in the Treaty of Versailles (1919), the Havana Charter (1947), the European Coal and Steel Community Treaty (1951), the Treaty establishing the European Economic Community (1956), and several international commodity agreements (Sugar, 1953; Tin, 1981; Cocoa, 1986). However, none of these agreements has ever been enforced.

As described in section 3.2.4, a social clause aims at improving labor conditions in exporting countries by allowing sanctions to be taken against exporters who fail to observe minimum standards. A social clause could offer opportunities to promote sound working conditions and to protect workers' health and safety. Such regulation could prevent the so-called double standards of some multinational enterprises. This is important as some multinational corporations have their own guidelines and strategies for occupational health. It is increasingly accepted that the guidelines in the home countries of the multinational corporations should also be applicable and necessary in all subsidiaries of the 'mother' companies. However, often double standards prevail. Another reason to link safe working conditions to trade arrangements is the fact that there is a global tendency for governments to reduce their involvement in social and welfare activities [Osborne and Gaebler 1992]. More 'safety valves' are required to protect workers' health

Recently, there is a trend from isolated efforts to use pressure on governments towards institutionalization of such pressure. Interest groups in importing countries used pressure on their governments to use market access as a lever for improving working conditions in exporting countries. At present, consumer groups and non-governmental organizations in rich countries attempt to boycott products which have been manufactured by children or workers who work under appalling working conditions.

The discussion on basic human rights at the workplace should be much broader than its possible link to trade alone. And conversely, it is questionable if trade sanctions are applicable for the enforcement of human rights in general. Two examples of international organizations are provided here to illustrate threats and opportunities for linking trade and social issues: the World Trade Organization (WTO) as an example to show how difficult it is to solve the problem from "the top" and the North American Free Trade Association (NAFTA) to show how it dealt with the pressure from the ecological and occupational health representatives and groups.

3.6.1 The World Trade Organization

It is questionable whether the World Trade Organization (WTO), the successor of the GATT, is the most suitable institution to deal with minimum labor standards within the framework of international trade agreements. Eglin mentions four attributes of the WTO which make its involvement in the debate of trade and social sanctions a fairly complex matter [Eglin 1994][6]:

1. The WTO is a commercial contract based on rules and disciplines governing commercial behavior. It is not based on value judgments about other aspects of a Contracting Party's domestic or foreign policies;

2. Under the WTO, market access is a right, not a privilege. It can be modified if a Member is found to be in breach of the obligations it has accepted under the WTO, but if no obligations exist in a particular area (e.g. labor standards) there are no grounds for proposing a withdrawal of rights;

3. Aside from one or two isolated agreements, there is no provision in the WTO that aims to harmonize domestic policies among Contracting Parties;

4. The WTO does not contain any obligation on its Members to impose trade restrictions.

The concept of labor standards is often very vague, and therefore open to different interpretation, which turns sanctions into a rather vulnerable instrument. A second problem with the social clause is its enforcement. Trade sanctions may actually be quite ineffective as they are targeted at a whole trade structure and not to the specific sector, where the problems occur. A third problem in the application of a social clause in a multilateral perspective is the fact that a sanction is viewed as an unfriendly, sometimes even aggressive act. When nation-states do not comply with norms laid down in an international treaty, it is relatively rare that such a conflict is resolved through a punitive action, such as a trade sanction. In the large majority of cases, the general tendency is to invoke the disapproval of the world community at large, rather than apply concrete sanctions [van Liemt 1989]. Nation-states still prefer other mechanisms, such as incentives, peer pressure and, only as a last resort, (trade) sanctions.

Sometimes the application of positive signals towards states which comply with labor standards is advocated. Countries may receive the status of 'Preferred Trade Partner' or may be exempted from import and export regulations. In a review of the social clause and working conditions van Liemt [1989] provides a number of pros and cons of the social clause (table 3.2).

[6] Disclaimer: the remarks made by R. Eglin were made in a personal capacity which should not be attributed to the GATT Contracting Parties nor in any formal sense to the GATT Secretariat.

Table 3.2 Arguments in favor of and against a social clause in international trade

Arguments of high-income countries in favor of a social clause:	Arguments of low-income countries against a social clause
It stimulates fair competition between exporters by ensuring that those who respect minimum labor standards are not penalized for their efforts to promote social development	Form of protectionism in high-income countries against low-income countries because of their export success
It enables working people to benefit from increased trade	Obstruction of development of low-income countries by depriving them of one of their key comparative advantages: the ability to use low-cost labor productively
It prevents a destructive downward spiral in the conditions of work and life of working people all over the world	Interference in domestic affairs of low-income nations
It prevents rich nations from collaborating in the exploitation of workers in low-income countries if they failed to press for the adoption of universal minimum labor standards	Reciprocity in social obligations in return for trade concessions
Without a social clause, the pressure for increased protectionism would be much harder to resist	

3.6.2 The North American Free Trade Agreement: a recent example of labor standards and trade

In 1993, an important trade agreement was signed among Canada, Mexico and the United States: the North American Free Trade Agreement (NAFTA). The NAFTA aims to eliminate most trade restrictions among the three countries. Occupational health specialists and environmental activists have expressed their fears about possible adverse effects. Trade unions in Canada and the United States fear the cheap labor in Mexico which will lead to unemployment and compromise occupational health and safety in the North. Environmental activists promoted a side agreement or opposed NAFTA altogether. In fact, environmental protection is relatively emphasized in terms of general statements, while occupational health and working conditions are mentioned only once. Additionally, there are some side agreements to the main text of NAFTA, one on labor and one on the environment [Frumkin et al. 1995]. It can safely be stated that the spirit in NAFTA provisions for environmental protection is much stronger than those pertaining to occupational health and safety. According to Frumkin et al. only three labor issues – occupational health, child labor and minimum wages – are part of the labor mandate. Some treaties for environmental protection are protected from legal challenge under NAFTA, but this protection is absent for labor codes, including Conventions and Recommendations of the ILO [Frumkin et al. 1995]. Trade negotiations, as with NAFTA, may offer a forum to discuss occupational health and safety issues.

3.6.3 Conclusion and recommendations

A working environment where health and safety are protected is a basic human right for workers. Occupational health and safety should internationally be regarded as basic human rights and should be included in international and national labor policy guidelines. The ministerial conference of the World Trade Organization of December 1996 contained the following statement on core labor standards: "We renew our commitment to the observance of internationally recognized core labor standards. The International Labor Organization (ILO) is the competent body to set and deal with these standards, and we affirm our support for its work in promoting them. We believe that economic growth and development fostered by increased trade and further trade liberalization contribute to the promotion of these standards. We reject the use of labor standards for protectionist purposes, and agree that the comparative advantage of countries, particularly low-wage developing countries, must in no way be put into question. In this regard, we note that the WTO and ILO Secretariats will continue their existing collaboration" [WTO 1996].

Support and guidance to national governments to enable them to enforce and monitor occupational health policies are important tasks for international organizations such as the ILO and the WHO. The ILO and WHO should collaborate more with grassroot organizations in the field of occupational health and safety and should include in their activities all stakeholders: employers, governmental and non-governmental organizations in the field of labor and health, insurance companies, trade unions and workers. Legislation, enforcement and control should be approached from a realistic point of view. It is not very useful to set quantitative targets of exposure limits if there is no infra-structure to carry out the required quantitative evaluations. These kind of limits may even have a negative effect, as employers may get away with not controlling hazardous exposure because enforcing officers are materially unable to provide quantitative proofs of unacceptable high exposure levels [Goelzer 1996]. Occupational health and safety should not be approached solely from the viewpoint of health: they are closely related to environmental protection, industrial development, social and human development in its broadest sense. Inclusion of occupational health via concepts such as industrial counselling and quality production are essential cornerstones to protect workers. Occupational health and safety are related to trade, but trade sanctions as an isolated instrument may not be the preferred way to provide protection in the long term. Discussion and inclusion of occupational health and safety within the framework of international trade arrangements, such as in the NAFTA, however, offer an important forum to discuss occupational health issues and to focus attention on workers' health.

Inclusion of the ratification of basic human rights Conventions by countries and of occupational mortality data in the Human Development Index published by the United Nations Human Development Program should seriously be considered. The ISO should stimulate the inclusion of working conditions into its ISO 9000 standards. These international policies should be adopted and adapted at the national level in low-income countries.

Chapter 4 provides an example of how a low-income country, in this case India, deals with occupational health and safety at the national level. The chapter describes the structure for occupational health and safety in India as an example of the legislative and enforcing institutions in low-income countries.

Chapter 4 Occupational health policies in India

The development of occupational health regulations and their enforcement in India is similar to the pattern of development in this field in many low-income nations and has been described as follows [de Graaf 1988]:

1. Occupational health activities commencing in large industries, e.g. factories, mines and plantations, through general practitioner services for workers and their families, with the organizsation of those services through outpatient departments at hospitals near the workplaces. Health services at the plantations of the British tea companies in Assam in 1839 and the services offered by the Bengal Coal company and at the cotton and jute mills in Bombay and Calcutta are examples of these developments;

2. Governments introducing legislation along with increasing industrialization, covering large concerns and adopted from corresponding legislation in industrialized countries, with the development of a means of enforcement through factory inspectorates. Social security legislation is often introduced at this point to deal with workers' compensation and child labor. The Workmen's Compensation Act 1923, the Factories Act 1948 and the Employees' State Insurance Act 1948 in India are examples of these legislations;

3. A gradual shift towards prevention, once larger enterprises have gained experience in occupational health with the development of a national infrastructure for occupational health provision.

4.1 Labor legislation in India

At least on paper, safety and health occupy an important position in the policy framework of India's Constitution. To give effect to the directive principles of the Constitution, the Government of India has enacted several laws on safety and health, which are to be enforced by the Central and State Governments. The directive principles impose equal pay for equal work, provision of just and humane conditions of work, and a wage which allows a decent living to all workers [de Graaf 1988]. Safety and health have also been incorporated in the National Five-Year Plans. The evolution of the approach towards workers' health and working conditions is reflected in the topics in the subsequent Plans. Before the 6th Five-Year Plan (1980-85), the main emphasis was on the protection of workers against accidents. In the 6th Plan, protection against occupational diseases was added, prompted by the development of the chemical and various process industries. Environmental conservation and protection was also mentioned in the 6th Plan. The 7th Five-Year Plan (1985-90) further emphasized the importance of industrial safety, probably also inspired by the accident at the Union Carbide Plant in Bhopal in 1982. However, promotional services were restricted to surveys, research, training in hazard identification and inspection, without any emphasis on how to attain improvements at the workplace. Actions in these Plans were mainly of a legislative and academic nature. The majority of labor acts and regulations concern the organized sector and do not cover the non-formal sector [Kashyap 1988].

The major legislations on occupational safety and health are categorized in legislation on working conditions covering safety, health and welfare, and legislation on hazardous substances and activities covering safety aspects only. The difference between the two is that the approach in the former is pursued from the point of view of the safety and health of workers, whereas the approach in the latter is based on the dangers arising from the hazardous substances or activities [Vaidyanathan, 1992]. The legislation on working conditions are provided in table 4.1. To enable a unified approach, a proposal for enactment of a General Enabling Act is being considered [Vaidyanathan 1992].

Table 4.1 Regulations related to occupational health and safety in India

Year	Law, Decree or Regulation	Objectives	Enforcement
1884	Explosives Act	Legislation pertaining to hazardous substances	A multiplicity of legislative approaches, with different administrative and enforcement arrangements
1934	Petroleum Act		
1968	Insecticides Act		
1971	Insecticides Rules		
1989	Manufacture, Storage and Import of Hazardous Chemicals Rules under the Environment (Protection) Act 1986		
1910	Indian Electricity Act	Legislation concerning hazardous activities	
1932	Indian Boilers Act		
1971	Radiological Protection Rules		
1983	Dangerous Machines (Regulation) Act		
1948	Factories Act	Legislation on working conditions	Labor Departments of Central and State Governments
1951	Plantations Labor Act		
1952	Mines Act		
1986	Dock Workers (Safety, Health and Welfare) Act		

The Ministry of Labor, Government of India and Labor Departments of the State and Union Territories are responsible for the safety and health of workers. The Industrial Safety and Health Branch of the Ministry discharges the overall functions relating to policy decisions and laying down guidelines for countrywide adoption, as labor is a concurrent subject in the Constitution. As most of the laws on safety and health are Central Government legislation, the Ministry performs the important function of piloting the bills through Parliament after interministerial consultations and consultations with the State Governments and organizations of employers and workers. Liaison with the International Labor Organization and other countries is carried out by the Ministry. Co-ordination at national level is undertaken by the Ministry by periodically convening the State Labor Ministers Conference and State Labor Secretaries Conference, in which policy matters and issues on uniformity in labor laws are discussed.

In summary, the Indian legislation on workers' health and working conditions provides workers, in principle, with a reasonable protection with regard to machinery, pressure vessels, dangerous fumes and gases and provides guidelines for health and safety on the plant including ventilation, illumination, safe buildings and protection in case of fire. It safeguards, at least on paper, that workers have access to safe drinking water and washing facilities. It also regulates working hours, annual leave and wages. The legislation also deals with on-site emergency plans and requires a detailed disaster plan. The employer is specifically required to appoint qualified supervisors and arrange for measures for health monitoring. The legislation provides for workers' participation in safety management through the constitution of Safety and Health Committees/Councils. For detailed information on the Indian acts and for a brief outline of labor movement and labor struggle in India, the reader is referred to 'Labor movement and legislations in India, A manual for activists', published by the Society for Participatory Research In Asia, Delhi [PRIA 1992]. Despite this legislation, implementation lags behind, partly because of the complexity of the regulation. Moreover, what exists on paper, appears to apply only to industrial workers, who constitute just a fraction of India's large workforce.

4.2 Labor legislation enforcement in India[7]

Matters relating to the safety and health of workers are the overall responsibility of the Industrial Safety and Health Branch of the Ministry of Labor. The Directorate-General Factory Advice Service and Labor institutes, in the technical office attached to the Ministry of Labor located in Bombay, attends to matters relating to the safety and health of workers employed in factories, i.e. manufacturing industries and ports and docks. Besides, the Directorate General, on behalf of the Ministry, carries out the important function of providing training for Factory Inspectors and co-ordinating training outside the country. Facilities at these institutes are expected to provide education and training and to conduct research on the health and safety of industrial workers. According to a survey in and around Bombay, over 90 percent of the industries, however, have never utilized the institutes' facilities [Uplekar 1992].

At the State level, the departments of Labor through the Inspectorate of Factories and Industrial Health Inspection Service carry out surveys within the industrial plants, and enforce and monitor the legal standards. The safety and health provisions under the Factories Act, 1948, are enforced by the Factories Inspectorates in 31 States and Union Territories. The Act gives workers a weekly day off, fourteen days' annual leave, bans child labor and restricts the employment of young persons between the ages of 14 and 18. The State Factories Inspectorates also enforce requirements under some of the allied Acts, such as the Payment of Wages Act, the Maternity Benefit Act and the Minimum Wages Act. The Directorate-General Factory Advice Service and Labor Institutes, being the technical organization of the Ministry, liaises with the State Factories Inspectorate and advises them on the administration of the Factories Act 1948, the infrastructural facilities required for the purpose and issuance of Rules under the Act.

[7] The factual information in this section is mainly based on the ILO publication: Profile on Occupational Safety and Health in India, Asian and Pacific Regional Centre for Labor Administration (ARPLA), Bangkok, ILO, 1993.

In India, the number of workers at a given workplace is very important with regard to enforcement of specific legislation. In small-scale industries or companies with less than 10 workers, workers have almost no rights. The Minimum Wages Act for some selected industries and the Workmen's Compensation Act are the only legal protection for those workers. In industries with more than 10 workers when power is used or more than 20 workers when there is no use of power, the firm has to register under the Factories Act and has to pay its contribution according to the Payment of Bonus Act. When there are more than 20 workers, the company has to contribute to the Provident Funds and has to enter the Employees State Insurance Scheme (ESI). In the case of 50 or more workers, the Industrial Workers Act and the Industrial Disputes Act can be enforced and when there are over 100 and 250 workers the rules of the Factories Act are further enlarged by dictating all kind of provisions for the workers [de Graaf 1988]. Employment of many short-term workers (who are outside the registers) and division of the firm into small companies are well-known methods of avoiding enforcement of labor legislation. Duration of work is another 'entry point' for escaping legislation. The Workers' Provident Fund concerns workers who work more than 60 days within a period of three months, while enforcement of the Factories and Disputes Acts depend on a closed work period of 240 days or more. Needless to say, many employers have found 'creative' solutions to escape these requirements. A laborer can remain a temporary or casual worker at the same place for years with short breaks [de Graaf 1988].

In addition to the Central Labor Institute in Bombay, there are three Regional Labor Institutes in Calcutta, Madras and Kanpur. These Labor Institutes, staffed with the necessary technical and other supporting staff, are equipped with a permanent Industrial Safety, Health and Welfare Center, where safety appliances, safety devices etc. are on display as well as a Mobile Safety Exhibition Van on similar lines to the Safety Center. The Labor Institutes also have a trainees' hostel. Training in safety and health for personnel from industries is carried out by the four Labor Institutes. These institutes may be regarded as supportive institutions with normative functions. Other institutes with activities related to occupational health, safety and improvement of working conditions are the Indian Toxicology Research Centre (ITRC) in Lucknow, the National Institute of Occupational Health (NIOH) in Ahmedabad, the All India Hygiene and Public Health Institute in Calcutta, The Indian Council of Medical Research in New Delhi, the National Environmental Engineering Institute in Nagpur, the National Productivity Center in New Delhi and some departments at various Indian Universities and Management Institutes.

According to PRIA and to Quadeer and Roy, State Factories Inspectorates are unable or unwilling to enforce legislation as they are overloaded and sometimes collude with the employer [PRIA 1993, Quadeer and Roy 1989]. It is important to repeat here, that only those firms employing more than 20 persons (without power) or 10 persons (with power) are required to report on occupational injuries and diseases. Nihila gives the following reasons why those, who are covered by various Acts, do not benefit from labor legislation [Nihila 1994]:

1. A worker cannot directly take a factory owner to court even if the latter violates all provisions of the Factories Act. The Factory Inspectorate is the only authority which can seek legal action against employers;

2. Not all factories are inspected by the Factory Inspector because this target is beyond his/her capacity (both in terms of time and money);

3. The Acts only provide/lay clear remedies that are available to workers subsequent to disease or infirmity, but do not lay down any principle regarding prevention of unsafe working conditions;

4. The benefit at the time of injury under the Employees' State Insurance Scheme ESI is not available if the injured worker has not contributed to the common fund for at least 13 months;

5. As far as the Employees' State Insurance Scheme is concerned, it has become a scheme for the general health of the worker. The ESI hospitals do not have trained doctors to diagnose occupational diseases;

6. Under the Workmen's Compensation Act, a worker is entitled to compensation only if he/she is bedridden for a minimum of 3 days. If the injury does not hamper the production of a commodity, then it is not considered an injury.

In general, there is a severe shortage of inspectors. Streefkerk found in his research in Gujarat that partiality of public servants could hamper open communication between the Inspector of Factories and workers, as the social background of these public servants is closer to the employers' background than that of the workers [Streefkerk 1978].

4.3 Conclusion

Qadeer and Roy, basing their conclusions on field work in Madhya Pradesh in India, describe some major problems in relation to occupational health and safety in India. Five are cited here:

1. Under-reporting of accidents and occupational diseases. Only a small number of these cases come to notice. They provide for their conclusion an underpinning by matching the reporting of occupational diseases under the Factories Act (1948) with the reporting under the Workman's Compensation Act (1923). The latter reported a higher number of diseases;

2. Organization and distribution of work over the formal and non-formal sectors with much less protection of workers' health in the latter. Even within the organized industry, the tendency is to organize work in a way that a few skilled workers handle the major technical operations while the rest of the jobs are done by contract workers or are out-contracted to other smaller industrial units, often in the non-formal sector under extremely undesirable conditions;

3. Structure and implementation of the legislation is ineffective as sanctions are so light that they are hardly effective as a deterrent;

4. Welfare services are inadequate and available only to a very small percentage of workers. Most workers depend on their own resources and have to utilize the general urban health services, which are often inadequate;

5. Neglect of occupational safety and health by trade unions. Occupational health and safety and the incorporation of safety provisions and health care have not been a major concern of trade unions over the years.

Qadeer and Roy conclude that "Despite the low priority given to health issues by trade unions, it is obvious from the data presented earlier that while the employers neglect important health problems, workers have been the main agents of redressal of whatever health and safety problems have been resolved. The law and the government machinery have played only a marginal role in this" [Qadeer and Roy, 1989]. Given the limited contributions of governmental agencies and trade unions to safeguarding workers' health, it has been advocated that the current status quo can only be changed by the capacity of the workers themselves to organize and fight for those choices which are the most conducive to their overall health.

The conclusions of two other surveys are provided here to illustrate the similarity of problems in the field of occupational health between India and two other low-income countries, Vietnam and Lebanon. A recent survey in Vietnam identified four bottlenecks [Matsuda 1996]:

1. Shortage of materials and manpower;

2. Inadequate occupational safety and health information system;

3. Inappropriate occupational safety and health administrative system and;

4. Poor awareness of workers and employers about the occupational safety and health problems.

An overview of occupational health in Lebanon [Nuwayhid 1995] came to similar conclusions. The author identified five constraints for occupational health and safety:

1. Minor contribution of the industry to the overall economy;

2. Obscurity of occupational health on the national agenda;

3. Perception of the industry as non-hazardous;

4. Lack of standards and enforcement;

5. Scarcity of data.

In conclusion, governments, private employers and trade unions fall short in protecting workers' health. There is a role for civic initiatives, including the workers themselves, in this field.

The second part of this thesis describes in detail the Occupational Health Program of the Indo-Dutch Environmental and Sanitary Engineering Project Kanpur Mirzapur under Ganga Action Plan in the tanneries of Kanpur, India. In this Program, employers, workers and government agencies worked together to protect workers' health in tanneries.

Chapter 5 The Indo-Dutch Environmental and Sanitary Engineering Project Kanpur Mirzapur under Ganga Action Plan 1987 – 1995[8]

The Occupational Health Program of the Indo-Dutch Environmental and Sanitary Engineering Project Kanpur Mirzapur under Ganga Action Plan 1987 – 1995 aimed to improve the working conditions in the tanneries of Jajmau, an industrial suburb of Kanpur in the State of Uttar Pradesh in India. The Indo-Dutch project is one of the components of a bilateral program on environmental protection between India and The Netherlands. The following two sections outline the general structure of this bilateral program. Section three presents an detailed overview of the Occupational Health Program.

5.1 The Ganga Action Plan

The Government of India, concerned about the effects of rapid growth and industrial development on the environment, launched several plans and programs for environmental protection. Among these, the Ganga Action Plan is one of the largest and most prestigious undertakings. In 1980, the Central Pollution Control Board of India was asked to prepare a study of the source and extent of pollution in the Ganges and to formulate a program for its prevention. This study, prepared by the Board in 1984, is the country's first comprehensive assessment of the pollution of the Ganges. The summarized text about the Ganga Action Plan in this section is based on the Draft Final Report of the Environmental and Sanitary Engineering Project in Kanpur and Mirzapur Under Ganga Action Plan, March 1994. The main conclusions of this report are:

1. three-quarters of the pollution of the Ganges originates from untreated municipal sewage;

2. 88 percent of municipal sewage stems from 25 Class-I (population over 100.000) cities;

3. only a small number of towns had sewage treatment facilities but, unfortunately, the majority of these facilities were not in regular operation;

4. industries accounted for 25 percent of the total pollution, but this was far more serious in areas such as Calcutta and Kanpur.

Along its 2.525 kilometre long journey from the Himalayas to the Bay of Bengal, the water of the Ganges river passes 29 Class I cities, 23 Class II (population between 50.000

[8] Further in the text abbrevated as 'Indo-Dutch project'.

and 100.000) cities and about 48 towns having less than 50.000 inhabitants. In those towns, where there is no sewerage system or the coverage of the system is only partial, domestic and industrial waste water flows through open drains directly into the river. Unfortunately, even in some towns with sewerage systems, non-functional pumping stations may ultimately led to the same polluting effect on the river due to poor operation and maintenance or break down of electrical power. In the large majority of these towns, however, there are no sewerage systems. This inventory of pollution formed the basis for the Ganga Action Plan prepared by the Indian Department of Environment in December 1984. Launched in 1985, it is a massive plan to tackle the pollution of the river Ganges. In its first phase, 261 schemes in 25 Class I cities were implemented.

From a cultural and psychological point of view, purification of the Ganges was a wise choice, as this river occupies an important position in Hindu religion. Hindus attribute purifying powers to the water of the Ganges and its water plays a central role in religious ceremonies and bathing rituals. This intensive use of river water from the Ganges for drinking and bathing purposes gives serious concern, as the polluted water can easily harm human health. With increasing public awareness in India about environmental degradation by industries and human settlements, waste management holds the political spotlight and became a hotly debated issue within political and scientific forums in India. Polluted water from the Ganges used for irrigation pollutes the soil and contaminates agricultural products in the vast North Indian plains with adverse effects on agricultural productivity and human health.

5.2 The Indo-Dutch Project

5.2.1 Project organization

Support for environmental protection activities of low-income countries is one of the main objectives in bilateral international collaboration of the Directorate General for International Cooperation (DGIS) of the Ministry of Foreign Affairs in The Netherlands. The policy paper of the Directorate, 'A World of Difference', puts heavy emphasis on environmental protection [Ministry of Foreign Affairs 1991]. Within the framework of a bilateral program for collaboration between India and The Netherlands a contract on the prevention of environmental pollution was signed. It was decided to target environmental projects in Kanpur and Mirzapur, two cities along the Ganges that had already been selected for participation in the Ganga Action Plan. The resulting Indo-Dutch Environmental and Sanitary Engineering Project Kanpur Mirzapur under Ganga Action Plan started in June 1987. The Ganga Project Directorate (GPD), the Ministry of Environment and Forests and the Directorate General for International Cooperation in The Netherlands are the nodal official counterpart agencies for the project on behalf of the Governments of India and The Netherlands.

The consultancy services are being provided within the framework of technical assistance by a consortium of Dutch and Indian consultancy companies: Haskoning Royal Dutch Consultants and Euroconsult from The Netherlands and Iramconsult and AIC from India. In addition to the main objective of reducing the pollution load on the river Ganges, the project aimed at improving the environmental conditions of the communities in the project areas in Kanpur and Mirzapur. Both project areas have about 130.000 inhabitants.

5.2.2 The Integrated Approach

The Indo-Dutch project adopted the so-called 'Integrated Approach'. This approach aimed to involve the community in the planning, implementation and maintenance of technical interventions, such as drinking water and sewerage systems. Another important aspect of the integrated approach is institutional strengthening of governmental institutions. Involvement of formal and informal community leaders and the community at large will enhance the feeling of 'ownership' by the community and stimulate the community to accept co-responsibility for these systems with the respective municipal institutions which were made responsible for maintenance and repair. The project aimed to resolve the problems of domestic and industrial waste in an integrated manner. This implied that not only new and clean technologies were introduced, but also due attention was paid to the environmental and living conditions of the communities.

In the past, engineering projects had been designed and implemented without substantial involvement of local communities. Sewerage lines, piped water systems and storm water drainage were built based on technical blue prints. Operation and maintenance had been regarded as the sole responsibility of government institutions, without providing the training and skills to community members necessary to maintain some simple facilities. Governmental institutions, responsible for operation and maintenance of large schemes, were often not involved in the activities. Important aspects within the integrated approach of the Indo-Dutch project were strengthening of the municipal institutions responsible for drinking water and sewerage, including their capacity to recover the cost for services delivered from the population served, and the involvement of community members through imparting the skills necessary to operate and maintain the facilities. "It has now...", as the Indo-Dutch Project states "...become increasingly evident that the mere provision of safe drinking water and sanitation facilities is not going to produce a perceptible dent in the problem of diarrhoea and water borne diseases unless human and behavioral aspects concerning water and sanitation facilities are also taken into account. These might include an improvement in water storage practices, personal and domestic hygiene and perceptions about water-related diseases i.e. diarrhoea" [Indo-Dutch project 1994]. The Indo-Dutch project emphasized the participation of the community from the very first day onwards. Involvement of the community was the main task of the Socio-Economic Unit of the project.

5.2.3 The Socio-Economic Unit (SEU)

The Indo-Dutch project took a large and integrated view of the Ganga Action Plan's objective of 'Cleaning of the river Ganges'. It included the whole gamut of related services and issues, viz. water supply, sewerage, solid waste management, environmental sanitation, institutional development and socio-economic aspects. For this purpose, a Socio-Economic Unit SEU was created which took up the support for the engineering work.

The main task of the Socio-Economic Unit was to mutually adjust the technical "distribution systems" and the socio-economic "receiving structure", in order to attain efficiency and effectiveness. It is, after all, the community, who use the technical facilities and have to be made responsible for certain tasks related to operation and maintenance. The project has attempted to initiate a program with a strong focus on communities and their involvement in the planning, implementation, operation and maintenance of technical facilities. The involvement of the community was assured by 'change-agents' whose main tasks were the creation of a sustainable set-up for community participation in the effective utilization of the installed facilities. They have formed the potential nuclei for community-level organizations, which, in turn, are able to deal with the community and the available governmental infrastructure directly on the one hand and to mobilize community manpower resources on the other.

In Kanpur, the industrial city where the Indo-Dutch project concentrated its activities, conditions in the slum – like water scarcity, poor sanitary services and high incidence of morbidity among the poor sections certainly did contribute to the creation of a common concern on these issues. The Socio-Economic Unit followed two approaches in involving communities: the Direct and the Indirect Approach.

In the Direct Approach, several surveys and in-depth studies were conducted and contacts were established with informal leaders at community level during the inventory phase of the project. These contacts resulted in the establishment of informal groups of men and women in selected slum areas. In the selection of handpump sites, for example, direct communication lines were established between the field staff of the Socio-Economic Unit and the community via their representatives, mainly community volunteers. The community volunteers were selected from all over the project area.

The Indirect Approach uses training programs. The community is reached by means of trained intermediaries. Training of professional intermediaries, like traditional birth attendants, school teachers and private practitioners has a twofold aim. First, to improve their professional skills. Second, to prepare them for improving the knowledge, attitude and practices/skills (KAP) of the community at large. The following professionals have been trained by the Indo-Dutch project: *anganwadi* workers (pre-school child caretakers), private medical practitioners, first-aid volunteers, traditional birth attendants, primary school teachers, handpump caretakers, standpost caretakers, adult education teachers, community volunteers and handpump mechanics. In the tanneries of Kanpur, employers and workers have been trained during the Occupational Health Program in occupational health principles and first-aid. The next section provides a detailed overview of this program.

5.3 The Occupational Health Program

The original Plan of Operations of the Indo-Dutch Project did not contain any activities with regard to the health of workers or working conditions. However, health experts of the Indo-Dutch Project were struck by prevailing working conditions in the tanneries during their site visits. It was then decided to modify the Plan of Operations and a program for improvement of working conditions and the health of tannery workers, known as the Occupational Health Program, was added to the Indo-Dutch Project. The name of this program, however, covered only a part of its activities as its main focus was on the implementation of industrial modifications to improve working conditions.

The long-term objective of the Occupational Health Program was to improve the working and health conditions of tannery workers in Jajmau, Kanpur. The main short-term objectives were:

1. to identify hazardous working conditions via workplace surveys;

2. to assess the health conditions of the workers;

3. to formulate and implement industrial modifications with the aim of diminishing the risk of occupational health and safety hazards for tannery workers.

The program, in line with the Integrated Approach described in section 5.2.2, puts a heavy emphasis on the 'ownership' of the program by the four main target groups: tannery workers, tannery owners and managers, relevant government officials and the community in the project area, consisting mainly of family members of the tannery workers [Indo-Dutch Project 1988].

The program of the Socio-Economic Unit aimed to reach the whole community in Jajmau, the industrial slum of Kanpur where the tanneries are located. It was, therefore, considered essential that the messages delivered to the tannery workers, owners and managers should build on and reinforce the messages delivered by the Socio-Economic Unit.

The Occupational Health Program can be divided into six periods, depicted in table 5.1.

Table 5.1 Time frame of the Occupational Health Program

Period	Name	Activity	Chapter in this thesis
1988	Preparatory phase	Study of Indian Labor Laws Visit to Institutes/organizations in the field of Occupational Health and Safety in India Walk-through surveys	5
Early 1989	Base-line survey	Hazard and health survey in 20 tanneries	7
September 1989	Hazard analysis	Preliminary analysis to identify hazards and to formulate viable interventions	7
March 1990	Workshop	Workshop 'A higher productivity and a better place to work' in collaboration with the ILO	7
1991 – 1994	Implementation	Implementation of industrial modifications	5
May 1994	Impact survey	Qualitative assessment of the effect of industrial modifications on exposure to chemicals, dust, awkward ergonomic conditions and the health status of workers	8 & 9

First, in 1987, the program was introduced to the Hindustan Chamber of Commerce of Kanpur, the Tanners Federation of India and the tannery owners. All participants agreed on its objectives and strategy. The introduction to the owners was followed by an introduction to the workers during first aid and safety training sessions. The training was executed in close collaboration with staff members of the Employees State Insurance Services (ESI), Kanpur Medical College, the Regional Labor Institute and the Directorate of Factories. At regular times, the program staff, sometimes accompanied by technical consultants in tannery processing and occupational health, visited tanneries in Jajmau and assessed the working conditions during several 'walk-through' surveys.

In 1988, Indian labor laws were studied and the National Institute of Occupational Health in Ahmedabad and the Industrial Toxicology Research Centre in Lucknow were visited and invited to participate in relevant activities. Several walk-through surveys in tanneries were organized. Second, a base-line survey was executed in 20 tanneries in early 1989. Third, a preliminary hazard analysis was performed in September 1989 to formulate viable interventions to reduce existing occupational hazards. Fourth, in March 1990, the workshop 'A higher productivity and a better place to work' was organized in collaboration with the International Labor Organization. Fifth, industrial modifications were installed by tannery owners from 1991 to 1994. Finally, in May 1994, the impact survey was executed to assess the effects of industrial modifications on the exposure to chemicals, dust, awkward ergonomic conditions and on workers' health.

The program team prepared a structured approach for an extensive base-line survey on occupational injuries and diseases, which was executed in 1988/89. Chapter 7 provides a detailed description of the base-line survey. This was followed by a preliminary hazard analysis, conducted by a multidisciplinary team in three representative tanneries in October 1989. The team consisted of members of the program, the Director and Assistant Director Industrial Hygiene of the Kanpur Regional Labor Institute, the Deputy Medical Director of the Directorate of Factories Uttar Pradesh, and the tannery process expert of the Indo-Dutch Project. The complete 'hazard' team discussed the results of the analysis with the scientist in charge of the Central Leather Research Institute Kanpur and with the head of the Preventive and Social Medicine Department of Kanpur Medical College to formulate viable interventions for the improvement of working conditions. The results of the hazard analysis were then disseminated to tannery owners and senior tannery managers from 36 tanneries during the workshop 'A higher productivity and a better place to work', organized with the assistance of an ILO expert. The Director of the Institute of Occupational Health from Ahmedadabad and the Director of the Regional Labor Institute in Kanpur participated in the workshop. Several hundred slides, taken from local tanneries, were shown while concentrating on the theme: 'How to increase productivity while taking care for working conditions'. A model 'walk-through' survey was organized in a few tanneries with a preformatted observation check list to demonstrate possible improvement sites to tannery owners. For many tannery owners, this visit was the first occasion to enter the tannery of another owner. The workshop was concluded by discussing possible industrial modifications. During the following years, tannery owners, assisted by the program team, installed industrial modifications at their own expense. These consisted of local exhaust ventilation, machine guards, trolleys and a system for mechanized transportation of hides.

From 1991 to 1993, the Occupational Health Program, with the generous support of the Kanpur Medical College, operated an Occupational Health Clinic with a special emphasis on orthopaedic and dermatologic disorders. The clinic was open once a week and held 121 clinical sessions. During its operation from July 1991 to December 1993, 1.139 workers have visited the clinic.

The Occupational Health Program offered a unique opportunity to assess the impact of industrial modifications on the exposure to chemicals, to dust, to awkward ergonomic conditions and the health status of the workers. The program applied relatively simple qualitative methods (which have been used and tested in industrialized societies at the shop-floor level) in the tanneries with the participation of employers, workers and staff members of relevant governmental institutions. The survey of May 1994 is an example of an impact assessment survey of a bilateral project in the framework of international development cooperation. In international development cooperation, this kind of impact study is rather an exception, notwithstanding the increasing demand for quality assurance and evidence for the beneficial impact of international development efforts. Chapters 8 and 9 provide a detailed description of these studies. To enhance understanding of the circumstances in the tanneries of Kanpur, the next section will first provide a description of Kanpur city, with a special emphasis on tanneries and tannery workers.

Chapter 6 Tanneries and tannery workers in Kanpur

6.1 Kanpur

Kanpur, situated on the south bank of the Ganges in central Uttar Pradesh, is an industrial metropolis in northern India. With a population of 2,2 million inhabitants[9] it is the largest city in the state of Uttar Pradesh and, according to population, the ninth largest city in India. Kanpur, being a relatively young industrial town, 'not figuring in the sacred geography of its region' [Molund 1988], has no ancient monuments and no monumental buildings like Varanasi (Benares), Allahabad and Lucknow. It is a poor city, an estimated 40 – 48% of its population having an average income below the urban poverty line [de Wit 1995]. Over 20% of Kanpur's population, mostly poor migrant workers, are believed to live in 350 to 450 urban slums, with little or no access to basic amenities. This excludes 282 urban villages, which should not generally be seen as slums. Prospects for the economic growth of Kanpur are not very favorable. Being a poor city, Kanpur has been unable to meet the requirements of its people. Most public amenities and institutions are in bad shape, mainly due to a lack of sound operation and maintenance strategies. Kanpur municipality has insufficient funds, partly because of a narrow tax base [de Wit 1995].

6.2 A short history of Kanpur

In 1770, a small detachment of the Honourable East India Company troops, campaigning with the Nawab of Oude against their common enemy, the Mahrattas, arrived in Kanpur [Yalland 1987]. With the Cession of 1801 the Nawab of Oude transferred the possession of Kanpur to the British in lieu of heavy debts. The city remained under British rule till independence and grew very fast. The army, providing a stable market for clothes, shoes and saddles enabled the economic and industrial growth of the textile and leather industry, financed by British capital. Kanpur owed its prosperity in former times partly to its location on the Ganges. With the construction of the Grand Trunk Road, begun in 1833 and reaching Kanpur in the late 1830s, and with railway connections between Kanpur and Allahabad completed in 1859 and with Calcutta in 1864, the town became a well-placed commercial centre. For a short period after the revolt against British rule in 1857, the growth of Kanpur stagnated. In 1860, the civil war in America broke out, blocking cotton exports. This created a sudden demand for Indian cotton. The decision to process the cotton and to manufacture cotton cloth in Kanpur, rather than to send it to the port for export, influenced to a great extent the growth of Kanpur as a manufacturing center [Yalland 1987]. Twenty years later Kanpur re-emerged as a busy and prosperous city. By 1911, apparently the first year for which comprehensive statistics are available, the number of registered factories was 47 and the total industrial workforce 17.000, while the total population came to 178.557 [Molund 1988, Bellwinkel 1981].

[9] This figure is based on the population census data of 1991 for Kanpur city from the Uttar Pradesh District Census handbook 1991. The projected 1995 figure is based on an annual growth rate between 1981 and 1991 of 2,16 percent.

During World War II, Kanpur's industry experienced an unprecedented boom. Being a major supplier to the army, existing factories were expanded and new ones were set up, many of which were heavily engaged in the war effort. After World War II, Kanpur's industrial activities were reduced with the notable exception of the leather industry. At present, Kanpur is facing difficult times as its textile mills are old fashioned and not able to compete with other industrial settlements in India.

6.3 The inhabitants of Kanpur

Kanpur attracted and still attracts a large number of people from the rural areas. The majority of Kanpur's population is drawn from villages in the district, but also from regions in Eastern Uttar Pradesh. As in many low-income countries, communities in urban areas of India form a heterogenous population. Through the years, Kanpur engulfed many rural villages. Based on national Census data from 1961 and 1991, Kanpur's total population was 971.062 and 2.029.889, respectively. In a mere 30 years, the population of Kanpur had more than doubled. Kanpur, as many other Indian cities, has more male than female inhabitants. The number of females per thousand males (sex ratio) was 762 in 1971 [Ram 1988] and 822 in 1991.

The two major religious groups in Kanpur, Hindus and Muslims, live largely segregated from each other. Muslims are concentrated in areas like Chamanganj, Begamganj, Naisanak and Moolganj. The various Hindu castes also live largely separated. A majority of the scheduled ("untouchable") Hindu castes population resides in *Ahatas*[10] and in other congested and unhygienic areas spread over the city. Table 6.1 depicts the occupational structure of the labor force in Kanpur in 1961 and 1991. The shift in the labor force from manufacturing to trade and commerce is evident.

[10] *Ahatas* are old multi-storied buildings, often built from mud, erected either in rows or in quadrangles with minimum civic amenities like common tap water and latrine, open drains and a low level of hygiene. They are generally known by the name of the owner and accommodate people drawn mostly from the low-income groups. *Ahatas* often have only two doors and are relatively easily fenced off. Through the years, the *ahatas* in Kanpur degraded into slums. They can be compared with the *'Chawls'* in Bombay and the *'Katras'* in Delhi [Bellwinkel 1981].

Table 6.1 Occupational structure of the labor force in Kanpur

Occupation	1961 Number of workers (x 000)	%	1991 Number of workers (x 000)	%
Agriculture, livestock and cultivators	3,7	1	20,3	4
Manufacturing	141,8	46	149,6	28
Construction	-	-	10,5	2
Trade and commerce	39,9	13	143,7	27
Transport, storage and communication	18,4	6	39,8	8
Other services	85,6	28	160,2	31
"Marginal" workers	11,7	4	0,04	-
Residual	5,1	2	-	-
Total	306,2	100	524,2	100

Source: Census 1991, State of Uttar Pradesh.

6.4 The tanneries and tannery workers of Kanpur

Tanning of leather has been known in India from time immemorial. Even the Mahabharata, the famous mythological book of ancient India, mentions leather articles such as quivers, drums and bags [Chakraborty 1987]. Flayers, leather workers (tanners) and artisans (craftsmen) maintain the hygiene and sanitation of villages, turning skins and hides into valuable products and contributing to the national economy. Leather workers, or *chamars*, however, have been looked upon as 'unclean' and as the most degraded class of society.

Kanpur and its adjoining places already had a concentration of traditional tanneries, footwear and leathergoodmakers even before the British settled in 1770. These tanneries were even regarded at one time as the 'chief industry of Cawnpore' [Upper India Chamber of Commerce, 1938]. From the time of the settlement of the East India Company troops in 1770, the army needed saddlery and bags for the transport of goods on horseback, and shoes for the soldiers. The presence of a Government arsenal and ordnance depot at an early date created a large demand for leather goods required for the army. As the supply was obtained solely from the bazaars, there soon sprang up a large native industry for boots, harnesses and equipment, which were exported to all parts of India. All the saddlery and the like required for the Company's forces was obtained from Kanpur contractors, though the leather made in the crude native process was, in many respects, defective [Upper India Chamber of Commerce, 1938].

Until 1919, these tanneries adopted the vegetable tanning process using locally available tanning materials. In 1919, chrome tanning was introduced for the production of upper leather. Production of chrome-tanned leather was actually limited to a small number of larger tanneries. Around 1940, chrome had largely taken the place of vegetable tannage in the larger tanneries of Kanpur, but even today the majority of the tanneries still use vegetable tanning along with chrome tanning. During the second world war, defence requirements increased enormously and a number of new tanneries were established to meet these demands. According to Mehra, Kanpur was in the middle of the twentieth century, the largest producer of leather in Asia and also the largest producer of "Leather Army Footwear" in the world [Mehra 1995]. In 1988 there were 151 tanneries located in Jajmau, of which 124 were operational. In 1995, the official number of tanneries in Jajmau came to 178, but not all tanneries were registered. Table 6.2 provides an overview of the tanneries in Kanpur in 1988.

Table 6.2 The tanneries in Kanpur in 1988

Tannery according to hide-processing capacity	
Small or cottage level tanneries: less than 3 tons per day	100
Medium scale: 3 – 5 tons per day	24
Large scale: more than 5 tons per day	27
Total	151
Tanneries classified on the basis of type of tanning operation:	
Exclusively chrome tanning	62
Exclusively vegetable processing	50
Both chrome and vegetable tanning process	38
Total	150*

* Note: The type of tanning process from one tannery has not been recorded. Central Leather Research Institute CLRI Kanpur, quoted in Indo-Dutch Project 1988.

Traditionally, leather work is largely a male domain. The transportation of dead animals, flaying, cleaning, collection of bones and the extraction of oil from fats are all done by men. Flesh and carcasses are dried by women, but tanning is almost exclusively a male profession. Traditionally, tanning was a kind of cottage industry, where the hides were tanned in pits around the cottages. The artisans were skilled in tanning and produced all kinds of leatherwear in their villages. Due to the establishment of large-scale tanneries in the cities, the scarcity of hides and the introduction of chrome for tanning purposes, the cottage industry slowly disappeared. For chrome tanning, less skills are required than for the traditional vegetable tanning and the cottage industry slowly disappeared from the villages.

At present, Kanpur is the largest heavy leather producing centre in India, with a processing capacity of 250 tons per day, amounting to 15 percent of the processing capacity of the entire country. Kanpur tanneries are estimated to employ more than 7.000 workers. The development of the tanning industry in Jajmau has been made possible mainly because of its favorable situation on the banks of the Ganges, and in the suburbs of the city, thus avoiding nuisance and odor for the residential areas. The vicinity of the Ganges river is essential, as tanneries use immense amounts of water. Tanneries in Jajmau had easy access to the cantonment area, the army being a reliable market outlet, while Jajmau had a large amount of vacant land for the development of new tannery settlements.

Tanneries in Kanpur can be divided in those belonging to the formal and those belonging to the non-formal sector. The large tanneries, often employing more than 100 workers, have to comply with labor laws as they employ more than 10 persons and use power. These tanneries belong to the formal sector. The small tanneries, however, frequently employing less than 10 persons, fall outside formal regulations and can thus be considered to be non-formal. The social security, employment structure and income show large differences between the small (non-formal sector) and large (formal sector) tanneries. Only a small minority, 8% of the workers in small/medium sized tanneries had a permanent position, in contrast with 40% of the workers in the large tanneries, who were permanently employed. In small/medium-sized tanneries, only 18% of the workers were in possession of an Employees State Insurance ESI card, against 59% in large tanneries. There is a general trend that working conditions in small tanneries are worse, as there are less financial means to maintain machinery. Small/medium-sized tanneries use tanning pits, with a higher risk of accidents and more physical contact with chemicals, while large tanneries have rotating drums, which reduce these risks considerably.

Officially, tanneries in Kanpur are under the supervision of the Inspectorate of Factories but due to chronic understaffing, there are almost no regular visits to the numerous tanneries in Jajmau. There is no functional reporting system of accidents and occupational diseases. The Employees State Insurance Scheme (ESI) has a large hospital in operation in Jajmau, but during the period of the Indo-Dutch project from 1987 to 1995, the largest part of the hospital was closed. Moreover, as tannery workers are paid by piece, the long waiting time at the outpatient department of the ESI hospital prevented the majority of the workers from visiting ESI services. The base-line survey revealed that the majority of the workers were dissatisfied with the impersonal and unfriendly services at the ESI departments.

The role of trade unions with regard to occupational health and safety in the tanneries in Kanpur is only marginal. Trade unions do not implement activities in the occupational health and safety sector in the tanneries. During the implementation period of the Indo-Dutch project in Kanpur from 1987 to 1995, the project staff has not once been approached by trade union members for collaboration or to exchange information.

The majority of the tannery workers belong to the Hindu scheduled castes or are unskilled Muslim industrial workers. The scheduled castes share approximately 15% of the total population of Kanpur city. In 1972, the overall literacy rate for the city was reported

to be 46,6%, out of which 33% was educated up to primary standard and the rest had received higher education. The percentage literacy rate among the scheduled castes was only 28% in 1972. In the Census of 1991, the percentage literates among the scheduled castes had increased to 61%. According to the 1991 Census, 10% of Kanpur's population belonged to the scheduled castes.

The hide trade was traditionally in the hands of Muslims while the craftsmen were Hindu *chamars*. The booming export trade in hides and the application of more hygienic technology enticed a large number of non-Muslims and also a more alert section among the *chamars* to enter as traders and entrepreneurs. Many *chamars* in Kanpur prospered and gained respectability. [Chakraborty 1987]. However, a large number of *chamars* do not follow their traditional occupation any longer.

6.5 Conclusion

In Kanpur, tanneries offer employment to thousands of workers, both in the formal and non-formal industrial sectors of the city. There is a large difference in working conditions and social security for workers in the formal sector compared with those in the non-formal sector, the latter being less protected and more exposed to hazardous conditions. Due to severe understaffing of the Inspectorate of Factories and lack of reliable information about working conditions in the tanneries, not much has been known about the risks and dangers to which tannery workers are exposed. The apparently bad working conditions in some tanneries stimulated members of the Indo-Dutch Environmental and Sanitary Engineering Project Kanpur Mirzapur under Ganga Action Plan to include working conditions of tannery workers into the Indo-Dutch project. The ensuing Occupational Health Program started in 1987. Chapter 7 provides a description of the base-line survey with an analysis of the results. Chapter 8 and 9 give a description of the impact survey, which measured the impact of industrial modifications on the exposure of chemicals, dust and awkward ergonomic conditions and the health of the workers. Chapter 10 elaborates the Industrial Counselling concept and chapter 11 provides the main conclusions and recommendations of this thesis.

Chapter 7 Occupational health and the environment in an urban slum in India[11]

Abhay Shukla, Satish Kumar and F.G. Öry

ABSTRACT –The Indo-Dutch Environmental & Sanitary Engineering Project under the Ganga Action Plan in Kanpur and Mirzapur is being executed within the Indo-Dutch bilateral development cooperation framework. The project aims to integrate physical, social and health related improvements. It is expected that the development approach and methodology can be replicated in other urban settlements in India. The project is being supplemented by a training and institutional strengthening program to facilitate the transfer of new technologies and improvement of operation and maintenance of the new facilities. The project is also aimed at the improvement of the living conditions of the population, by installing drinking water and drainage systems. A socio-economic unit in the project supports the technical interventions by encouraging the community to participate in project activities. The Occupational Health Program in Jajmau, an industrial slum of Kanpur, aims to improve the working conditions of tannery workers. Four hundred and ninety-seven tannery workers and 80 workers not engaged in leather work, from 20 tanneries, were interviewed and underwent physical examination. The mean age of tannery workers was 32 years, about half of them recently migrated to Kanpur. The majority of the workers are illiterate, have temporary jobs and 85% have a monthly income between 300 and 600 Rs. Occupational morbidity was 28.2%. Regular meetings with tannery owners, the training of tannery workers in first aid, and support for the installation of safety and health councils in tanneries are the main program activities. A walk through survey to detect occupational and safety hazards and the workshop 'Higher productivity and a better place to work' in colla-boration with the International Labor Office (ILO) led to industrial modification in the tanneries. Occupational health should form an integral part of industrial counselling as it is an important link between health and environmental protection by controlling pollution.

"Medicine, like jurisprudence, should make a contribution to the well-being of workers and see to it that, so far as possible, they should exercise their callings without harm." Bernardino Ramazzini (1633-1714)

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[11] *Reprinted from Social Science and Medicine (1991), vol. 33: 597 – 603.*

INTRODUCTION

The classical concept of occupational health emphasized cause-effect relationships between toxic agents and occupational morbidity within the working environment. Disasters in Bhopal and Chernobyl, with devastating effects on the environment and health, led to environmental impact assessment and safety procedures for large industrial plants. The promotion of health and safety within the working place has not yet been integrated with the protection of the environment surrounding these industries. The health of the labor force, already endangered by occupational hazards, is further endangered by the cumulative effect of lack of sanitation, lack of safe drinking water and other unhealthy conditions in the urban industrial slums of third world countries. This article describes an integrated approach to tackle these problems in an urban slum in Kanpur, India. The government of India and The Netherlands signed a Letter of Agreement for cooperation to protect the environment. At The Netherlands Embassy a sector specialist environment is directly responsible for the execution and monitoring of projects in this field. One of these projects, the Indo-Dutch Environmental and Sanitary Engineering Project Under Ganga Action Plan started its activities in 1987 in two cities along the Ganges: Kanpur and Mirzapur, in the State of Uttar Pradesh. The project aims at prevention of the pollution of the Ganges and the improvement of the living conditions of the population in the project area by interventions related to sewerage and storm water drainage, water supply and sanitation, anaerobic treatment of industrial and domestic waste water, reuse of effluents, collection and disposal of solid waste, public health education and community development. Special emphasis is being given to training, institutional development aspects for improving operation and maintenance of the facilities provided and transfer of knowledge. The project has a socio-economic unit (SEU) for strengthening the effectiveness of the technological aspects by enhancing the active participation of the community. The SEU trains groups of hand-pump caretakers, women masons and other community-based functionaries. In the health field they train Anganwadi (pre-school) workers, birth attendants, private practitioners and school teachers. An important part of the activities of the SEU is the Occupational Health Program, the subject of this paper. In India, according to the 'State of India's Environment 1984-85 'the government is enjoined to direct its policy towards securing the health and strength of workers and each state is required to make provisions to ensure just and humane conditions of work'. Unfortunately, no single law deals with occupational health in its entirety. Three acts touch different aspects: the Factories Act, 1948, the Workers State Insurance Act (ESI), 1948 and the Workmen's Compensation Act (WCA), 1923. A review of these three reveals that a large number of workers who are exposed to hazards at their place of work are excluded from their purview. However, these three acts form in theory a certain base for workers' protection. The main problem in India lies not in the formulation of the relatively well designed laws but in their enforcement; as stated in the above quoted State of India's environment report:

> The enforcement laws relating to occupational health are woefully inadequate. Under the Chief Inspector of Factories, who is advised by the Directorate General of Factory Advice Service, certifying surgeons and inspectors are appointed, including medical inspectors. There is a lack of inspectors in the country and the lacunae in the Factories Act endanger their controlling power. The enforcement of the ESI and WCA is also far from satisfactory.

Besides the inspection and enforcement apparatus, a number of research institutes have been set up: the Central Mining and Research Station in Dhanbad, under the council for Scientific and Industrial Research (CSIR), the Industrial Toxicology Research Centre (ITRC) also under the CSIR, the Central Labor Institute in Bombay, the All India Institute of Hygiene and Public Health in Calcutta and the Indian Institute of Technology Kanpur. The leading institute in the field of occupational health and safety is the National Institute of Occupational Health (NIOH) in Ahmedabad. Yet despite recognition of occupational health problems at a national level most management of industrial firms and trade unions have not yet presented comprehensive strategies towards occupational health and safety issues.

Tanneries and tannery workers in Kanpur

Kanpur, the ninth largest city in India with an estimated population of 2.2 million (extrapolation from 1981 census), is the largest city in the State of Uttar Pradesh. It has been an industrial centre since the beginning of this century, with large textile mills, ordinance factories and tanneries. The tanneries prepared leather for shoes and boots for the British and Indian armies and since then Kanpur has been one of the main manufacturers of leather. It has not been a major exporter of finished leather products like Madras and Calcutta, but prepares the leather for other industries in India and abroad. The tanneries in Kanpur are concentrated in Jajmau, a large slum area near the Ganges on the east side of the city, where the activities of the Indo-Dutch Project are situated. Accounts of the health hazards of tanners [Ramazzini 1940] exist in the classic 'De Morbis Artificum Diatriba' (1713), the product of the pioneering investigations of Bernardino Ramazzini, considered the Father of Occupational Medicine. Despite Thackrah's (1795-1833) impressions that tanners "are remarkably robust; the countenance florid; and disease almost unknown" [Meiklejohn 1957], subsequent studies have revealed a wide variety of hazards in the leather tanning industry. Attention has been focused on the existence of potential carcinogens in the industry including nitrosamines, chromate pigments, benzidine-based direct dyestuffs, formaldehyde, aromatic organic solvents and leather dust [Decoufle 1979, Lollar 1980]. While Marrett el al. discovered an increased risk of bladder cancer with exposure to leather while working, Stern et al. studied the mortality of chrome leather tannery workers and did not detect higher cancer mortality at any site [Marrett et al. 1986, Stern et al. 1987]. Similar findings were reported by Pippard et al. who did not find significant numbers of deaths for common sites of cancer for either chrome or vegetable tanners [Pippard et al. 1985]. Important carcinogenic exposures include *N*-Nitroso compounds [Roumbehler et al. 1979] which includes *N*-nitrosodimethylamine, a known human carcinogen in the beamhouse; benzidine analogue-based dyes used in the dyeing of leather and leather dust generated in the buffing operation containing trivalent and hexavalent chromium [WHO 1981]. Other important hazards reported include chrome ulceration due to trivalent chromium in tanning liquor, occupational asthma due to bark dust or leather dust, chronic bronchitis due to dusts of vegetable tanning materials, lime, leather and chemical mists [Gupta 1989, Hills and Fajen 1988]. Skin diseases found among Indian tannery workers [Gupta et al. 1978] include fungal infections, vitamin deficiency diseases, scabies, allergy and eczema, pigmentary disorders and psoriasis. Accidents commonly reported in tanneries include falls and drowning in pits and vats, injuries on revolving drums, in running rollers and knives and gassing by hydrogen sulphide while cleaning out tanning pits [Gupta 1989].

SUBJECTS AND METHODS

Study sample

A two stage sampling procedure for selection of the study population was adopted. Of the 124 functioning tanneries in Jajmau, a representative sample of 21 tanneries was obtained by stratified random sampling. The tanneries were stratified on the basis of tanning process (chrome, vegetable or mixed) and hide processing capacity (large, medium or small) (Table 7.1). Of the 21 tanneries selected, one closed down during the study leaving 20 tanneries in the sample. Within each of the 20 study tanneries, a one-third sample of workers was selected by stratifying the workers on the basis of work-department: Raw hide, Beamhouse, Tanyard (vegetable), Tanyard (chrome), Finishing and Other. Thus a total of 497 workers were selected and studied. In addition, 108 persons employed in the tanneries but not engaged in leather work (e.g. office attendants, gardeners, gatekeepers, carpenters etc.) were studied. Of these, 80 were finally matched with the sample of workers for age and income and taken for comparison.

Table 7.1 Types of tanneries included in the study sample

Size	Type of tanning process	Number in sample
Large	Mixed (chrome + vegetable)	3
	Chrome	3
	Vegetable	3
Medium	Chrome	3
	Vegetable	3
Small	Chrome	3
	Vegetable	3
Total		**21**

Study tools

Two questionnaires were administered by the interviewer:

1. A social questionnaire eliciting employment details, working conditions and practices, facilities available at work, hazards experienced at the workplace and personal habits;

2. A medical questionnaire eliciting the existence of current and recent (within last 15 days) symptoms relevant to identifying occupational and non-occupational morbidity and health care utilisation pattern.

Study procedure

1. Administration of questionnaires: the social questionnaire described above was administered by trained social workers and the medical questionnaire by qualified physicians;

2. Physical examination: a complete general and systemic physical examination of each subject was performed by the surveying physician including height and weight measurement;

3. Peak expiratory flow rate: a Standard Wrights Peak Flow Meter was used for this purpose. After two trial blows, readings were taken on three test blows;

4. Investigations: selected workers with specific health problems requiring further investigation were referred to the Workers State Insurance Corporation Hospital responsible for medical care and reports were obtained.

Informal discussions with tannery workers and tannery owners added to the information collected by the methods described above. The data was put into PCs by the social workers who performed the interviews, using dBase III plus, and was analyzed with SPSS.

RESULTS

A. Personal and social profile of the study population

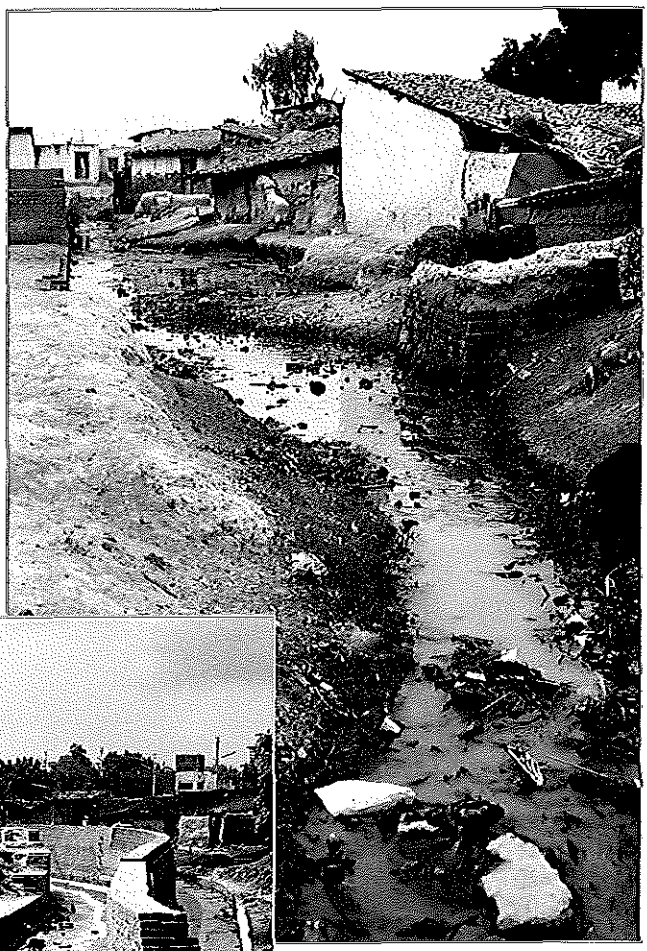
Personal particulars

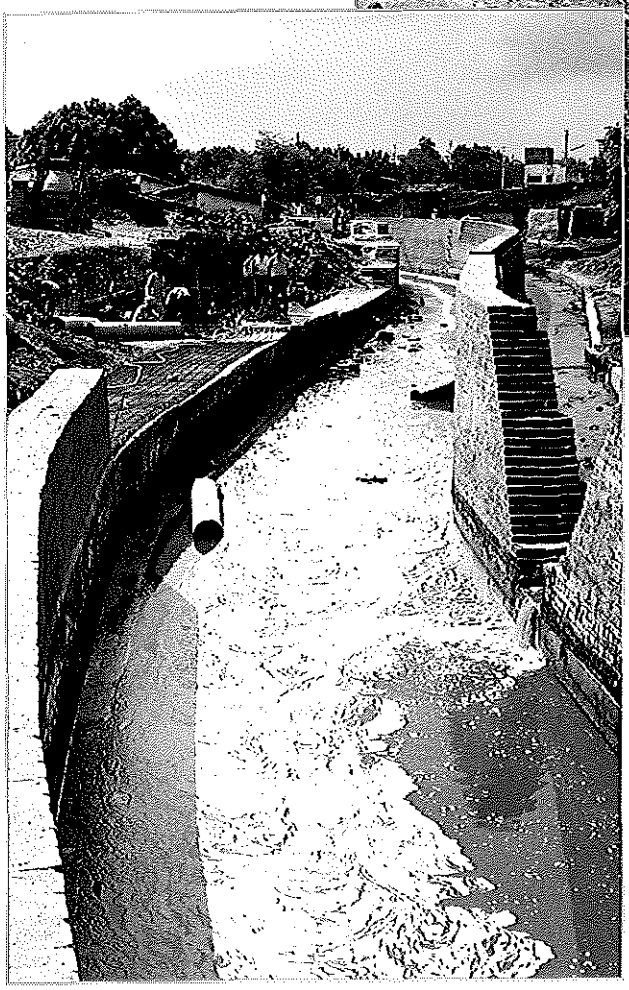
Tannery workers constituted a predominantly young population with a mean age of 32 years. This correlates with the fact that the majority of workers were recent migrants with 45.6% having been in Kanpur city for less than 10 years. The religious distribution of the workforce can be seen to be markedly distinct from national and state population compositions which are about four-fifths Hindu and only around one-eighth Muslim. Illiteracy or only primary education is the norm in the tanneries which is related to the work requiring few or informally acquired skills. Rock-bottom wages with a mean of Rs. 546 per month ensure that few educated persons are attracted to this industry. It may be noted that tannery workers are an all-male population, although only about two-thirds (67.4%) of those married stay with their families. The remaining, mostly migrants from eastern and central Uttar Pradesh, visit their villages once or twice a year only.

Table 7.2 Personal particulars of tannery workers

	Number	Percentage
Age (in years)		
< 20	21	4.2
20 - 29	216	43.4
30 - 39	141	28.4
40 - 49	73	14.6
≥ 50	46	9.3
Religion		
Muslim	269	54.1
Hindu	228	45.9
Education		
Illiterate	297	59.8
Primary	111	22.3
Middle/high school	75	15.1
Higher education	14	2.8
Income (in Rs. per month)		
< 300	7	1.4
300 - 600	426	85.7
600 - 900	53	10.7
> 900	11	2.2

Open drain in Jajmau residential area carrying tannery effluent





Improved drainage system in Jajmau residential area

Employment particulars

There was wide variation in total working experience in tanneries and the mean working experience of 11.6 years did not adequately reflect that over one-third of the workers were fresh, having worked for less than 5 years. The extremely high turnover of employment is brought out by the fact that nearly one-fourth of the workers had been working in the tanneries where they were surveyed for less than a year. This is directly linked to the predominantly daily wage character of employment with frequent lay-offs and retrenchment.

Workplace particulars and practices

While our proportional sample revealed the largest number of workers in finishing and beam house sections, rotation in workstation was comparatively uncommon, with each worker ordinarily confined to a single work-process. The majority of workers never used protective devices, the common reasons being non-availability (28.2% workers) and that they were considered unnecessary (25.6% workers). The use of protective devices was distributed highly unevenly between departments with 94% of beam house workers always using devices compared to only 8.1% workers in the tanyard. None of the tanneries had separate lunch rooms so that about half (50.5%) of the workers were taking lunch at the workplace itself and most of the remaining (47.3%) were taking lunch in open spaces within the tannery. Soap for hand washing or bathing was not available in the vast majority (94.4%) of tanneries. Most workers (89.9%) washed their hands with only water before meals and the great majority (90.1 %) took a bath after work.

Table 7.3 Employment particulars of tannery workers

	Number	Percentage
Total working experience in tanneries (in years)		
< 5	172	34.6
5 - 9.9	120	24.1
10 - 19.9	120	24.1
≥ 20	85	17.1
Duration of work in present tannery (in years)		
< 1	117	23.5
1 - 4.9	135	27.2
5 - 9.9	101	20.3
10 - 19.9	93	18.7
≥ 20	51	10.3
Type of employment		
Daily wage	215	43.3
Permanent	201	40.4
Temporary and other	81	16.3

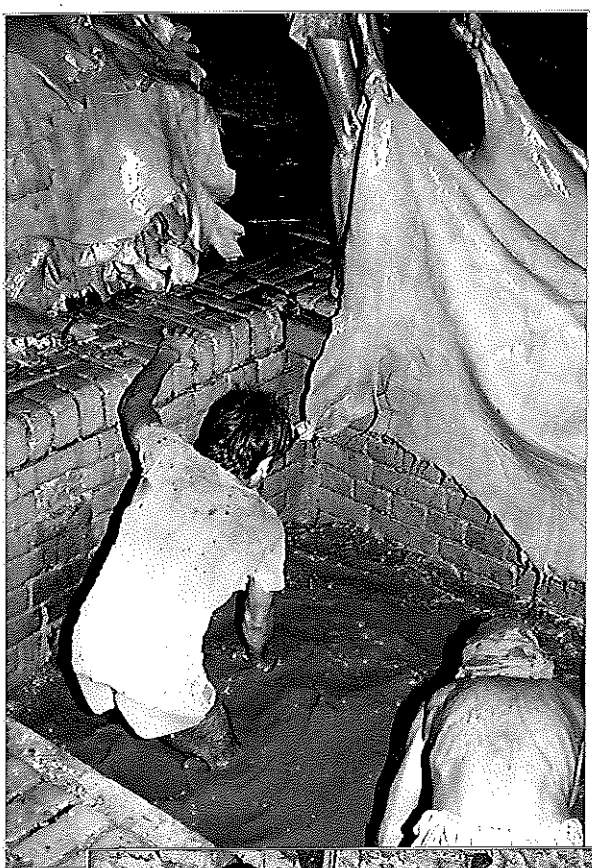
Table 7.4 Workplace particulars and conditions for tannery workers

	Number	Percentage
Work department		
Raw hide	12	2.4
Beam House	116	23.3
Tanyard (Veg.)	74	14.9
Tanyard (Chrome)	67	13.4
Finishing	141	28.4
Others	87	17.5
Rotation of workstation in present tannery		
Yes	74	14.9
No	423	85.1
Usage of protective devices		
Always	188	37.8
Occasionally	24	4.9
Never	285	57.3

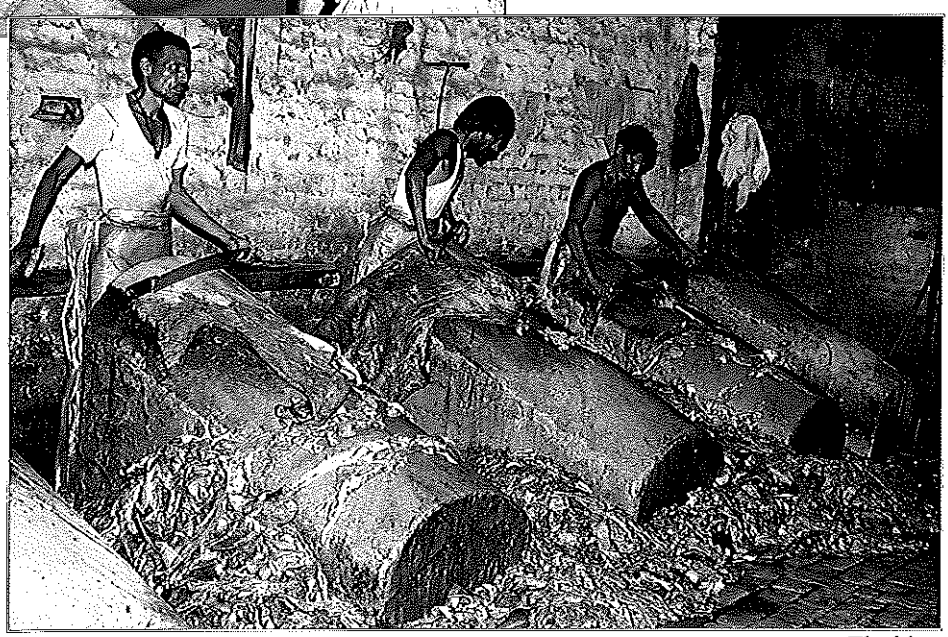
B. Medical profile of the study population

Occupational morbidity in tanneries (Table 7.5)

This was found among a significantly high proportion (28.17%) of workers and could be divided into morbidity of four major systems – skin, respiratory tract, musculoskeletal system and eyes. Diseases of the skin were mostly caused by toxic, irritant or sensitising chemical substances including chrome ulcers caused by trivalent chromium, acid burns due to sulphuric acid and contact dermatitis caused by exposure to lime solution, solvents or dyes. Diseases of the *respiratory tract* were mostly caused by irritant dust particles and vapours especially during the finishing stage of tanning. Clinically most significant were occupational asthma in the grinding, buffing and chrome tanning sections and occupational respiratory irritation in grinding and buffing sections. An atypical syndrome of exertional dyspnea, haemoptysis and chest pain was observed among workers exclusively in the spray painting section. This is probably related to exposure to lacquer thinner consisting of a complex mixture of organic solvents. Diseases of the *musculoskeletal system* were primarily due to poor ergonomic conditions, persistently working in abnormal postures and lifting of heavy weights. The principal form of musculoskeletal morbidity accounting for virtually half of all occupational morbidity was lumbar backache found among workers working consistently in stooping or abnormal postures in lime yard, vegetable tanning and certain finishing sections. This lumbar backache generally improved when away from work and was not present before commencing work in tanneries. Diseases of the *eyes* were related to irritating substances, causing conjunctival irritation and its sequelae. Occupational conjunctival irritation in grinding, chrome tanning and buffing sections may have been responsible for pterygium (17.7%) and pingeculum (10.6%) which were noted as possible sequelae of chronic conjunctival irritation.



Vegetable tanning
with pit system



Fleshing

Table 7.5 Occupational morbidity among tannery workers

Type of morbidity	Number	Percentage
Lumbar backache	77	15.5
Chrome ulcers	10	2.0
Occupational respiratory irritation	19	3.8
Occupational asthma	11	2.2
Occupational conjunctival irritation	15	3.0
Contact dermatitis	13	2.6
Injuries, burns	20	4.0
Solvent-induced exertional dyspnea	1	0.2
Occupational heat exhaustion	2	0.4

Non-occupational morbidity

Among tannery workers and other tannery staff this was considerable with 70.4% workers and 73.7% other tannery staff being affected (Table 6). Other tannery staff having been selected as persons employed in the tanneries but not engaged in leather work, the number of them was comparatively small (n = 80) to make statistical comparison. The overall incidence of non-occupational morbidity among workers and other tannery staff was similar, as noted above. However, the possible occupational association of certain illnesses such as chronic obstructive aspecific lung disease (COAD) and arthritis among tannery workers appears to be a fruitful area for further investigation.

Occupational responses

These were defined as conditions involving physiological alterations without symptoms caused by occupational exposure. This included mainly callosities on the hands (72.6% leather workers, 44.4% other staff) and callosities on the shoulder or other sites (23.9% leather workers, 1.8% other staff) which were adaptations to friction encountered during the work.

Lung function (Peak Expiratory Flow Rate)

A single lung function test was performed on all subjects in the form of measurement of Peak Expiratory Flow Rate (PEFR) by means of a Standard Wrights Peak Flow Meter. The predicted value of PEFR for each worker was calculated on the basis of his height and age using Rastogi's equation derived from a population of North Indian workers [Rastogi et al. 1983].

Expected PEFR = (1.944 x height—2.019 x age + 148.882) L/min

PEFR was calculated as: actual as a percentage of the expected PEFR i.e. A/E x 100

The mean PEFR index for workers was found to be 113.50 and for other staff 119.94. Thus Rastogi et al.'s equation was not found to be a very good fit for our data, the mean A/E index being about 15% higher for our data.

Using the above equation only 4.3% leather workers had a PEFR which could be regarded as abnormally low (<80% of the expected) indicative of abnormally reduced ventilatory function. The majority of leather workers had a PEFR index in the range 100-119.9 and 120 – 139.9 (Table 7.6).

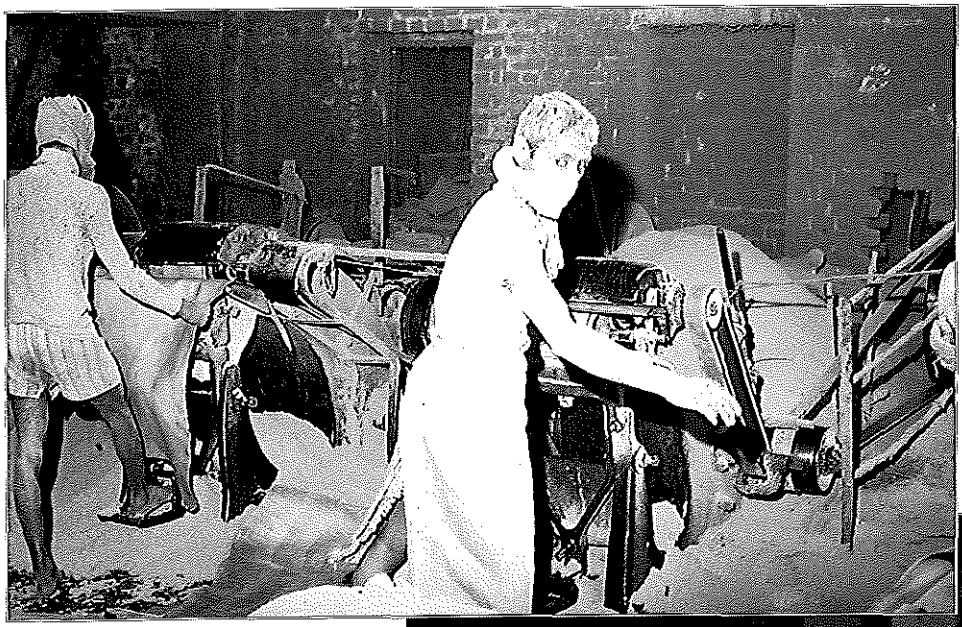
Table 7.6 Selected non-occupational morbidity in tanneries

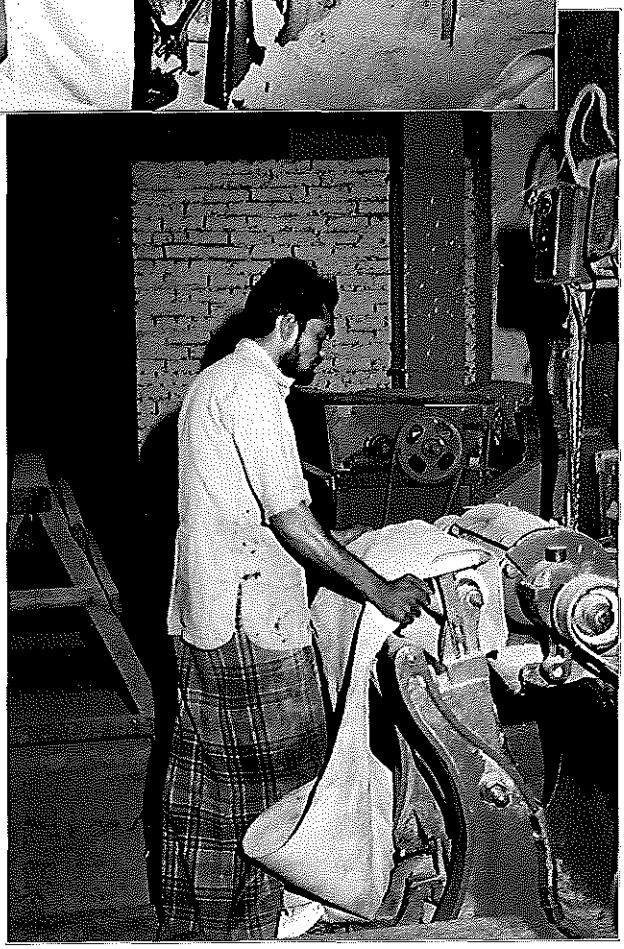
Form of morbidity	Workers		Other staff	
	Number	Percentage	Number	Percentage
Skin				
Pyogenic infections	17	3.4	1	1.2
Fungal infections	13	2.6	3	3.7
Leprosy	4	0.8	0	0
Respiratory system				
COAD	14	2.8	0	0
Pneumonitis	13	2.6	0	0
U.R.I.	49	9.8	12	15.0
Chest pain	10	2.0	0	0
Musculoskeletal system				
Arthritis (U. limbs)	12	2.4	0	0
Arthritis (I. limbs)	18	3.6	1	1.2
Sprain/soft tissue injuries	11	2.2	1	1.2
Eyes				
Cataract	17	3.4	4	5.0
Conjunctivitis	4	0.8	0	0
Other systems				
Pain abdomen/acid dyspepsia	27	5.4	7	8.7
Cardiac conditions	6	1.2	0	0
Vit. A deficiency	7	1.4	0	0

Table 7.7 Distribution of per index (actual as a percentage of expected by Rastogis equation) among tannery workers

A/E x 100	Number of workers	Percentage (n = 486)
< 60	11	2.3
60 - 79.9	10	2.0
80 - 99.9	65	13.4
100 - 119.9	215	44.2
120 - 139.9	159	32.7
≥140	26	5.3

Buffing without exhausting system





Exhausting system for buffing machine

DISCUSSION

With respect to the tannery workers of Jajmau, certain important social factors and attributes which shape attitudes to hazards at work deserve a mention. Firstly, the workforce is predominantly young and first generation migrants leading to a certain degree of social mobility and 'uprootedness' inconceivable in their native villages. Lack of stable jobs, with frequent lay-offs by employers interspersed with slack periods of under- or unemployment accentuates this state of insecurity. Employment is the main anchoring point in this otherwise shifting context. Work, especially skilled kinds of work means social placement, identity, status and most importantly, significant income. Being engaged in productive work largely tends to override considerations related to 'quality' of work; hazards are an unsavoury part of a no-option survival package.

A parallel social determinant of considerable significance is the caste/religious background. It is significant to note that in the entire sample of workers directly engaged in leather work there was only one example of an individual of upper caste (*'savarna'*) background. As noted earlier, the working population is roughly equally divided between Muslims and scheduled caste (mainly *'chamar'* or Raidas-traditionally untouchable) Hindus. Although muslims are nominally beyond the ambit of the caste system, even here the great majority of workers belonged to *'Ansari'* or similar clans, descended from untouchables converted to Islam centuries ago yet still at the bottom rung of the social hierarchy within muslims. Traditionally relegated to performing the 'unclean' tasks in the village economy, such as flaying of dead animals, curing of the hides obtained and disposal of carcasses, these workers of each religion have tended to accept unhygienic and at time unsafe kinds of work with less resistance than might be expected. The self-image of such workers, particularly their perception of their own bodies and definition of 'acceptable' levels of bodily exposure to unhealthy situations is significantly conditioned by this historical internalisation of caste oppression. This is despite the positive fact that traditional caste roles and social positions are increasingly under challenge due to a variety of factors. Certain additional factors also condition the attitude of workers to workplace hazards. One is the prevalence of piece-rate work in departments involving repetitive dangerous operations such as the hydraulic embossing press operation. Since the wage is directly dependent on the number of hides processed and even obtaining a minimal income depends on appreciable work performance, 'straining' the machine to maximise production, even at the cost of safety, is common. On the hydraulic press this takes the form of operating the machine at unduly high pressures (which shortens processing time) and removal of safety guards which interfere with 'straining'. Another factor is the system of contracting out certain hazardous types of work to groups of contract workers who are paid a fixed amount for performing a specific operation – such as cleaning pits/sludge tanks/industrial sewage lines within the tannery. Once the work is contracted the tannery owner shrugs off the responsibility for work safety – with not infrequently catastrophic consequences. Study of the results of the data relating to morbidity tends to blur the conventional distinction between 'occupational' and 'non-occupational' disease. Although the data has been presented in the categories of 'occupational morbidity' and 'non-occupational morbidity', in fact the conditions encountered lie on a continuum ranging from conditions with one-to-one

occupation – disease correlations like occupational asthma, to conditions with progressively less clearly defined association with occupational factors. Many kinds of morbidity tend to be more embraceable in the WHO concept of 'work related disease' rather than 'occupational disease'.

Occupational diseases ... stand at one end of the spectrum of work-relatedness where the relationship to specific causative factors at work has been fully established and the factors concerned can be identified, measured and eventually controlled. At the other end diseases may have a weak, inconsistent, unclear relationship to working conditions; in the middle of the spectrum there is a possible causal relationship but the strength and magnitude of it may vary [WHO 1985].

This includes conditions like lumbar backache which are less esoteric yet magnitude-wise responsible for much more workers' misery compared to classic 'occupational diseases' such as chrome ulcers which often tend to be regarded as insignificant irritants. One is led to speculate about the extent to which a mechanistic theory of disease etiology, positing a clearly identifiable 'agent' or 'toxin' for each disease condition, is responsible for an often narrow emphasis on occupational toxins within the rich and complex gamut of interaction between work and health. Interestingly and significantly, the workers themselves rarely distinguish between occupational and non-occupational illness though they are acutely aware that much of their physical ill-being stems from bad working conditions.

Another significant dynamic which could be touched upon, given the unique nature of the project, was the relationship between work environment and general environment – schematically, 'ergotoxicology vs ecotoxicology'. The association between the two seems to be characterised by a simultaneous concurrence and complementarity. On the one hand, substitution of hazardous substances and modernisation of production processes could be seen to clearly reduce both work hazards and environmental damage. This emerged while discussing a proposal to substitute ground-bark tanning by extract tanning. Elimination of the grinding operation would clearly eliminate the hazard of bark-dust responsible for occupational asthma; on the other hand, with the elimination of bark from the tanning process, a major solid waste problem would be eradicated.

However, a converse situation is obtained wherever attempts are made to efficiently displace toxins from the workplace to reduce workplace hazards. A clear example of this was the original installation of effective exhaust systems in several tanneries in the spray painting sections – leading to lower solvent levels in the work environment by throwing concentrated solvent vapours into the ambient environment While the project, as a component of its industrial counselling program, has now designed and assisted installation of model combined exhaust and vapour filtering systems, the fact remains that this complementarity must be continuously kept sight of. An interesting reversal of this complementarity may be seen in the newly-installed primary treatment plants for first-stage effluent treatment within the tanneries. The sedimentation tanks of these plants contain organic sludge which has to be periodically cleaned by workers – and cases of hydrogen sulphide intoxication have occurred in this process. So even ensuring a healthier environment led to an unhealthy work situation.

This clearly emphasizes that work environment and living environment have to be viewed integrally. In a developing country like India, where both of these are comparatively recent concerns and infrastructural development is often insufficient or uneven, a comprehensive industrial counselling approach appears to be the most suitable to support integral change. The Indo-Dutch Project has made a start in this direction by implementing interventions as diverse as an effluent treatment plant, chromium recovery units, workplace exhaust-cum-filtration systems, automatic machine guards, first aid boxes, safety posters, initiation of health and safety councils and safety training to workers in the leather tanning industry of Jajmau. A major area of exploration lies in the conceptualisation and implementation of industrial counselling approaches for different industries, to provide packages of technical support to industries on mutually interconnected aspects: improvement of work environment, pollution control, productivity and work organisation. An important component of this process of industrial upgrading is the active and self-sustained involvement of workers on the shopfloor. This is possible through the agency of health and safety councils consisting of workers and employers at the plant level, and empowered with initiation and monitoring of industrial modification to improve the working environment. The challenge is to transform the wealth of existing knowledge into a real process for change and improvement – of the environment both within and beyond the workplace [Öry et al. 1990]. There is scope for work in the very appealing field of health and the environment. The horizon should not be restricted to environmental health; health should indeed be seen as a sustainable state [King 1990], which could be achieved only if we broaden our views and cooperate with people outside the narrow health sector.

CONCLUSION

Protecting workers and the environment within tanneries in an urban slum results in displacing the dangers to the other side of the walls and thus polluting the immediate vicinity of the tanneries, the slums where the tannery workers live with their families. Activities for controlling the pollution caused by tanneries such as installation of waste water treatment plants inside tanneries result in accidents within the tanneries. The environment within the workplace and environment beyond the workplace form a dialectical unity and neither can be adequately dealt with without appropriate attention to its converse. Occupational health, as an integrated part of industrial counselling, should stimulate responsible authorities to implement pollution control measures in a holistic way to protect the environment both within and outside the industry.

Acknowledgements – Realization of the Occupational Health Program would not have been possible without the enthusiasm of the whole Indo-Dutch project team. In this respect we thank specially Mr Johan Schaapman and Mr Hans Maas from Haskoning/Indo-Dutch Project for their support, our colleagues from the Socio-Economic Unit Indo-Dutch Project for their cooperation, the tannery owners and tannery workers from Jajmau for their support and cooperation, the Regional Labor Institute, the Directorate of Factories Kanpur, Kanpur Medical College and Mr H. Pelckmans TNO-Holland, for their collaboration in the research. A special word of thanks goes to Mr Ed Frank, coordinator Socio-Economic Unit Indo-Dutch Project and Mr Hirak Gosh, joint secretary, Ministry of Labor, India, for their stimulating support and stimulating advice.

Chapter 8 Assessment of exposure to chemical agents and ergonomic stressors in tanneries in Kanpur, India[12]

F.G. Öry, F.U. Rahman, V. Katagade, A. Shukla and A. Burdorf

ABSTRACT

In developing countries qualitative assessment of exposure at the workplace may be an essential tool in evaluating hazardous working conditions. This survey reports on qualitative assessment of exposure to chemicals, dust and ergonomic stressors among 298 workers in 15 tanneries in Kanpur, India. In general, chemical exposure and dermal exposure was highest among beamhouse workers, less for workers involved in dry finishing activities, and lowest for those performing the wet finishing of hides. Dermal exposure was rated as high to very high during beamhouse activities, reflecting direct contact with wet hides and manual handling of hides in soak tanks. Relevant dust exposure was only observed during dry finishing activities. Most workers experienced severe postural load due to working in trunk flexion and rotation for more than 50% of their daily worktime. In addition, manual materials handling with loads over 20 kg frequently occurred. The size of the tannery, in general a reflection of state of technology, showed no systematic influence on exposure profiles. The survey suggested that mechanization of material transfer and application of trolleys reduced the worktime with trunk flexion and rotation and implied less manual lifting. The presence of local exhaust ventilation in large tanneries seemed to reduce the chemical exposure. This survey has demonstrated the importance of rapid appraisal techniques for evaluating hazardous conditions at the workplace. In developing countries this approach may facilitate occupational hygiene research and practice.

[12] *American Industrial Hygiene Association Journal, in press*

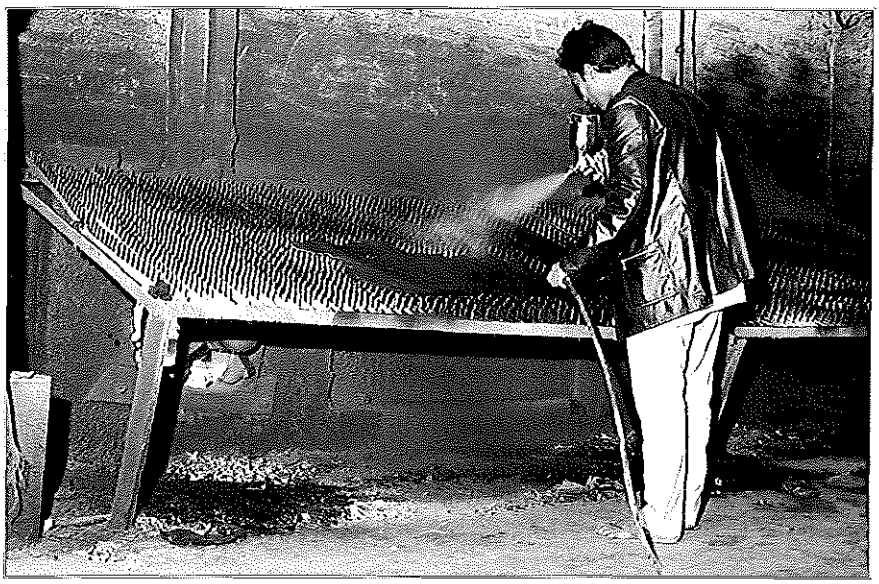
INTRODUCTION

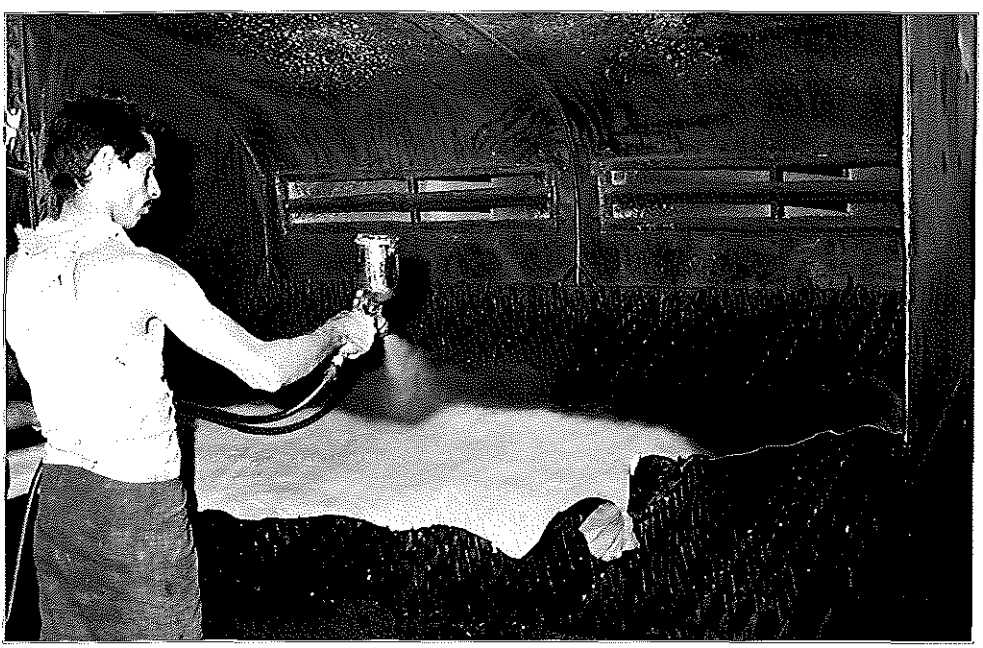
Although the best part of the worldwide workforce is to be found in low-income countries, there is very little information available concerning occupational health hazards in various occupations in these countries. Anecdotal evidence suggests that working conditions may substantially differ from those in developed countries, usually for the worse [Chavalitsakulchia and Shahnavaz 1993, Mathur et al. 1993]. However, information on distribution of health hazards and prevalence of work-related diseases is sparse or non-existent. Resources for identifying and evaluating hazardous working conditions are severely limited in most low-income countries.

Objective measurements of exposure to harmful agents often are too costly and may require technical experience and skills that are not available. Hence, the use of surrogate measures of exposure may offer an opportunity to arrive at estimates of exposure with sufficient reliability to capture the basic characteristics of the exposure profiles. Several authors have reported that qualitative exposure assessments may yield information that correlates reasonably well with actual measurements of exposure at the workplace and that is useful to identify groups of workers with high and low exposures [Fonn et al. 1993, Kromhout et al. 1987, Post et al. 1991]. Assignment of workers to a limited number of exposure categories has proven a suitable approach, despite the inevitable misclassification of some workers due to overlapping exposure distributions [Kromhout et al. 1987]. These qualitative methods can offer important features for occupational health surveys in countries without advanced occupational hygiene facilities.

This paper reports the results of an epidemiologic study among tannery workers in Kanpur, India, using simple qualitative methods to assess exposure to hazardous agents and ergonomic conditions. The study was part of the occupational health program of the Indo-Dutch Environmental and Sanitary Engineering Project under Ganga Action Plan. In 1986, the Indian government launched the Ganga Action Plan, aimed at preventing pollution to enter the Ganges and at improving the living conditions of the population on the river banks. The occupational health program specifically addressed the working conditions in tanneries in Jajmau, an industrial slum in Kanpur which contributed heavily to the pollution in the Ganga river. In 1988, this program started with a walk-through survey in 20 tanneries to identify possible hazards at the workplace. At the same time, information was collected on some health complaints that may be caused by hazardous working conditions [Shukla et al. 1991]. In 1990, this survey was followed by the workshop 'A higher productivity and a better place to work'. In collaboration with the International Labour Organization tannery owners and senior managers of 38 tanneries discussed the working conditions in their tanneries and agreed on the need for appropriate control of airborne dust and chemical agents, for ergonomic improvements and safety measures. During this workshop, a plan for implementation of industrial control techniques was launched and, subsequently, modifications were made in seven tanneries. In large tanneries control measures were implemented at larger scale than in smaller tanneries since owners were more 'open-minded' and convinced of the benefits of the proposed modifications. The control measures consisted of local exhaust ventilation at several work stations, some mechanization of material transfer,

Spray painting, without protection





Spray painting, with exhaustion

installation of guards on several machines with rotating parts and introduction of trolleys [Shukla and Katagade, 1994].

In May 1994, it was possible to study the working conditions in the tanneries in more detail and to evaluate whether better working conditions are associated with less health complaints. An epidemiologic survey was conducted to gather information on the occurrence of health complaints with an assumed high prevalence among tannery workers, that is respiratory disorders, skin complaints and low-back pain [Öry et al. 1997]. The current paper describes the qualitative exposure assessments that were performed as part of this epidemiologic study. The primary goal of the assessment strategy was to describe exposure to chemical agents, dust, and ergonomic stressors among tannery workers in India. A secondary aim of the study was to evaluate whether a simple assessment of exposure could demonstrate differences in working conditions between traditional tanneries and tanneries with basic occupational hygiene control techniques in place.

SUBJECTS AND METHODS

Tanneries in Kanpur

In 1993, the Kanpur region had about 150 tanneries engaging approximately 7.000 workers. The size of the tannery is determined by its hide processing capacity; small tanneries tan 60 hides/day or less, medium-sized tanneries handle approximately 60 to 120 hides/day, and large factories produce over 120 hides/day. The number of workers in small and medium tanneries usually varies between 10 and 100, while large tanneries may employ several hundred workers. In general, large factories have adopted a better production technology and are largely mechanized. Small and medium-sized tanneries often work in the traditional manner, predominantly based on manual operations.

The tanning process

The tanning process is similar in all tanneries. After storage of raw hides and selection and marking of the hides, the typical process route for leather tanning and finishing consists of four steps: Beamhouse operations and tanning, Wet finishing, Dry finishing, and Packing [Gupta 1990].

In the beamhouse the hide processing starts by either stretching the hides on bamboo frames or by pegs, or spreading the hides on the ground in mild sun. During beamhouse operations and tanning activities laborers are exposed to various chemical agents in the air. The contribution of skin exposure is significant due to frequent contact with water and chemicals during preparatory operations such as soaking, liming, fleshing, deliming, bating and pickling. Chemicals used are lime, sodium chloride, sodium sulfide, sodium acid flouride, caustic soda, dimethylamine and sulphuric acid. Tanning involves application of chrome (III) compounds or various barks in case of vegetable tanning. In small traditional

tanneries the operations are usually performed in cramped, sheltered places while in large tanneries the operations are more layed out. Machinery equipement is seldom used in this stage of the process.

The wet finishing process includes splitting, shaving, waxing and oiling. Workers have no direct contact with water nor with chemicals. They may, however, experience dermal exposure to chemicals while processing wet hides. Application of oil products may introduce specific hazards. Operations are predominantly performed standing at machines.

Laborers in the dry finishing stage perform operations such as drying, shaving, buffing, pressing, staking, padding and spraying. Workers are exposed to dust particles originating from leather and/or paint, while operating machinery and sprayers. Bark grinding is included in the category of dry finishing as the occupational risk (inhalation of bark dust) is similar to the risk encountered in dry finishing operations.

Finally, there is a group of miscellaneous workers such as packers, sweepers, carriers, and mixers of chemicals. They often have a mixture of exposures as they move from one section to the other during their daily work and their tasks may change from day to day. Carriers carry wet hides, sometimes up to 100 kg. Mixing of chemicals is usually done with bare hands, introducing a large amount of skin exposure and inhalatory exposure to the various chemicals used throughout the tanneries. Due to small numbers, these workers were assigned to one group.

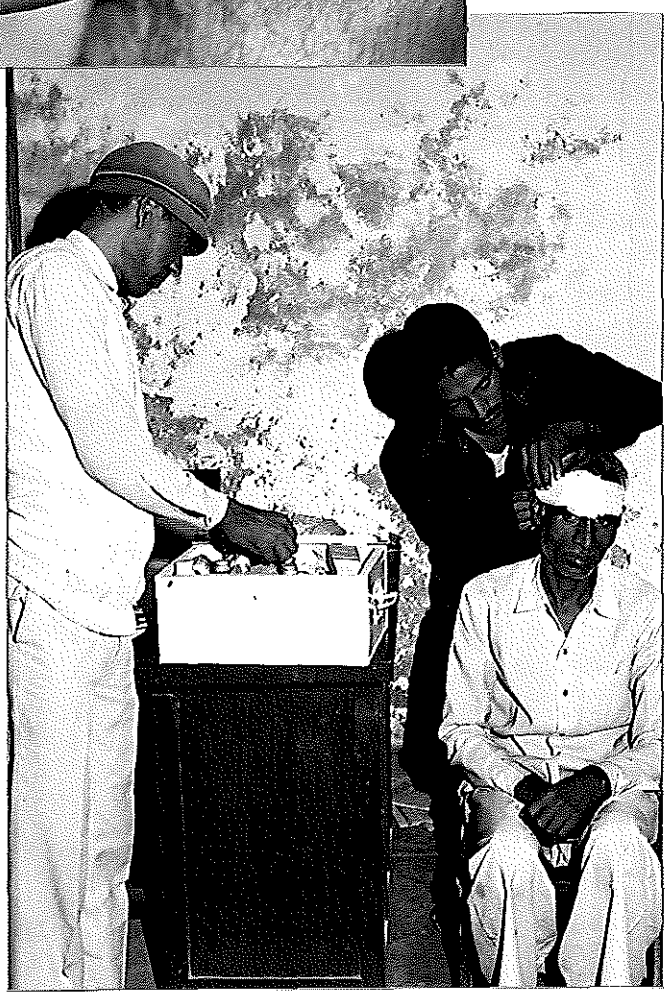
Industrial modifications

During the Indo-Dutch project seven tanneries (three large and four small/medium) made several modifications in the production process in order to improve working conditions. In large tanneries the modifications consisted of installation of local exhaust ventilation in the dry finishing section, guards on press machines and machines with rotating parts in the wet and dry finishing sections, some mechanization of material transfer in the beamhouse and the wet finishing section, as well as introduction of trolleys in these sections. In the small/medium tanneries changes were more modest; simple local exhaust ventilation systems in the dry finishing section, guards on machines in the wet finishing area, and limited mechanization and introduction of trolleys in the beamhouse and wet finish.

Study population

The 15 participating tanneries were visited to conduct on-site surveys. There were no refusals from tannery owners to participate in the survey. Three large and four small tanneries which had made modifications to their production process and three large and five small tanneries without modifications were included in this study. The Indo-Dutch Environmental and Sanitary Engineering Project under Ganga Action Plan has supported tannery owners to build chrome recovery units and primary waste treatment plants in the course of the

Chrome ulcers



Tannery workers receive First Aid training

years. The high participation from a traditionally secluded industry in India can thus be explained by this ongoing support from the Indo-Dutch project.

The study population comprised 418 tannery workers that were present at production departments in these 15 tanneries during the survey. All invited laborers participated in the survey, resulting in a response rate of 100% (n=418). Workers were asked to participate (but not in front of the owner). Informed consent was given orally, see also the high proportion of illiterate workers. Although workers could refuse to participate, this was not observed. We cannot discuss reasons for this response rate except for the observation that the researchers were warmly welcomed by participants, partly because the good relation between the project team and the laborers. Another important reason is the strong hierarchical relation of the laborers to the tannery owners: if a tannery owner agrees, it is very hard for a worker to refuse participation.

Of all workers information on age, height, weight, occupational history and health complaints was collected by means of a standardized interview. Qualitative exposure assessments were performed on 298 (71%) laborers at their respective work stations. These work stations were assigned to three exposure groups that resembled the major stages in the tannery process. Assessments were also performed for workers with miscellaneous activities if the observed activity was a substantial part of their regular work. For a variety of reasons no individual exposure assessment could be obtained from 120 (29%) laborers; due to restricted electricity supply various workers could not operate their machines, several workers did not perform their regular tasks at the day of the survey and other workers had jobs with too many miscellaneous activities that hampered an overall assessment of individual exposure. Table I shows the distribution of subjects in each of the four exposure groups over modified and non-modified tanneries, stratified by size of tannery.

Qualitative exposure assessment

The exposure assessments were performed at individual level and comprised a qualitative ranking of exposure to dust, to chemicals in the air, to dermal contact with chemicals and to ergonomic stressors. The procedure to estimate exposure to chemicals in the air, using a five-point scale recording no, low, moderate, high, and very high exposure, has been described in the literature [Kromhout et al. 1987, Hawkins et al. 1991]. The qualitative assessment of skin exposure to chemicals agents was based on a three-point scale method published by Hawkins and colleagues, distinguishing between no, moderate, and high exposure [Hawkins et al. 1991]. Dustiness was assessed on a five-point scale ranging from no, low, moderate, high, to very high exposure [Fonn et al. 1993]. Ergonomic stressors were also estimated with five levels, based on the percentage of worktime in awkward postures and strenuous activities. As cutoff points were used 10%, 25%, 50%, and 75% of worktime [Dallner et al. 1991]. See the Annex I for a detailed description of the qualitative exposure estimates and the rating schemes applied.

All exposure assessments were conducted by two teams of each three assessors with ample experience in working conditions in Indian tanneries. They received a three-day

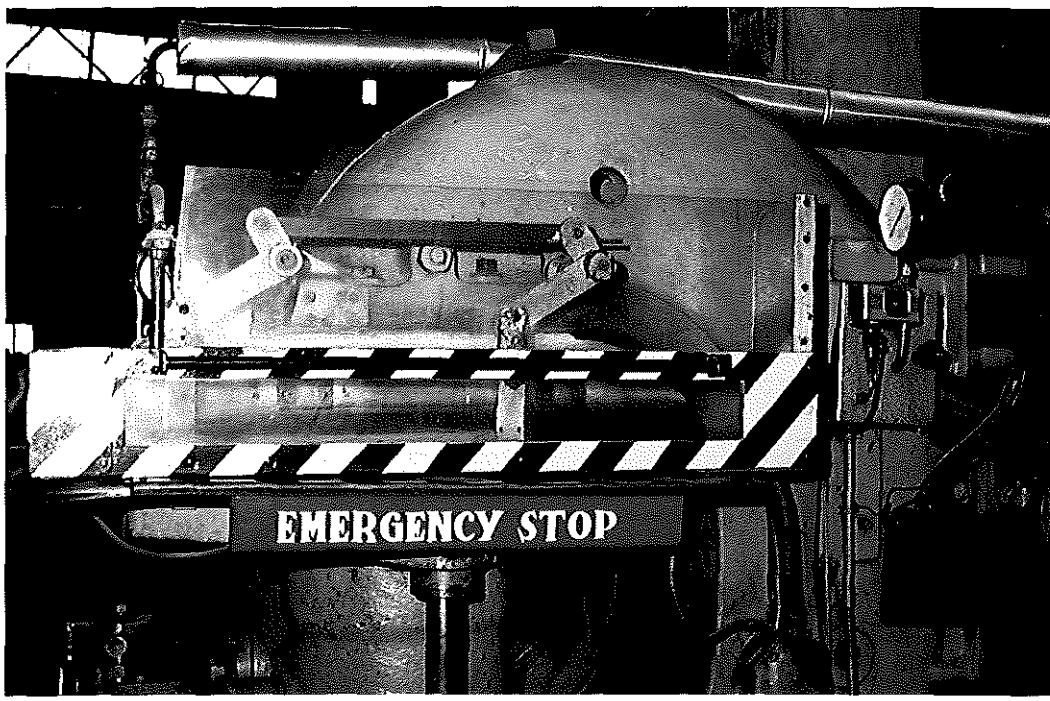
training course in the assessment procedure and use of the rating schemes. Subsequently, all assessors visited a few non-participating tanneries to test the assessment procedure under field conditions. Difficulties encountered were discussed to optimize the assessor's ability to arrive at reproducible estimates and to minimize differences among the assessors. Both groups were supervised by a person with ample experience of several years in occupational health in the project area. As tannery workers work at piece rate and the operations at the respective work stations are identical for every piece of leather, an observation period of approximately 10 minutes at each work station was regarded sufficient to observe several complete work cycles. Assessment ratings were obtained from all assessors individually by showing their estimates with the fingers simultaneously to the team leader. This procedure was developed to avoid substantial interobservational influence. The assessors' ratings were averaged and rounded off to whole numbers in order to obtain an exposure estimate for any particular worker that resembled the original categorical scale.

Care has been taken to execute the study outside the rainy or hot season. Climatic conditions in low income countries have often a stronger impact on traditional industries, like tanneries, than in industrialized countries. A survey during the rainy season would not have included drying of the hides. The study was also conducted before the summer with its very hot periods. These climatic conditions considerably affect routine tannery productions. For certain periods exposure in the rainy season or in the summer may be higher.

Statistical Analysis

All statistical analyses were performed with the software package SPSS-PC version 5.0. The results of the qualitative exposure estimates were collected as the average score of three assessors for each worker, rounded off the whole numbers. In order to reduce the large number of estimates, the original exposure scores were collapsed into three categories; no exposure (score 0), low exposure (score 1) and moderate/high exposure (scores 2 to 4). For all relevant exposure variables the number of estimates with no, low, and moderate/high exposure were calculated. In the tables the exposure distribution is presented by percentage of estimates within each category. Differences in exposure distributions between departments and between modified and non-modified tanneries were tested with the χ^2 test for trend. In these 2x3 tables a cell with a zero was regarded to have a value of 1. In case of two cells with value zero, the data were further collapsed into a 2x2-table and tested for significance by the χ^2 test. Since the number of observations per cell may be small, a significance level of 0.10 was regarded as appropriate.

The correspondence between the assessors was evaluated by % of agreement over all assessors. The strength of agreement was also evaluated by Cohen's kappa, taking into account that interrater agreement depends on both the number of agreements between categories and the number of disagreements between categories. As a rule of thumb, kappa values less than 0.4 represent poor agreement, 0.4 – 0.6 moderate agreement, 0.6 – 0.8 substantial/good agreement and 0.8 – 1.0 (almost) perfect agreement [Landis 1977]. The interobserver agreement was evaluated for all pairs of raters, resulting in three comparisons within each group of three assessors.



Protection device on plating and embossing machine

RESULTS

Table 8.2 presents the results of the qualitative estimates for exposure to chemicals in the air, chemicals on the skin and airborne dust among 298 workers in 15 Indian tanneries. The stratification by tannery size did not demonstrate clear differences in exposure profiles between large and small/medium tanneries. The overall pattern showed that exposure to chemical agents was higher among workers in the beamhouse and dry finishing departments (29% to 100% of estimates at low to moderate/high exposure) compared with workers in the wet finishing department (0% to 29% of estimates at low to moderate/high exposure). In general, at group level the ratings for exposure to chemicals by inhalation were reasonably comparable with those for dermal contact. Exposure to dust was only rated among workers involved in dry finishing activities. The group of workers involved in miscellaneous activities was very small and the assessments of their exposure are based on too small numbers to arrive at sound conclusions on their exposure profiles. The estimates for those workers in large tanneries are only presented for descriptive purpose.

The workers in the beamhouse received a considerable range in ratings, with the best part of the population judged as being exposed to low or moderate/high levels of chemical agents, either by inhalation or by dermal contact. Dust exposure was rated as not relevant. The presence of control techniques was associated with lower exposure estimates for chemicals in the air among the beamhouse workers in large tanneries, approximately 27% of the workers shifted from low to zero exposure. For workers involved in wet finishing activities the industrial modifications in large tanneries shifted the distribution of chemical exposure towards lower exposure ratings for chemical agents in the air (most notably a shift of 12% workers from high to moderate or low exposure) and higher ratings for dermal exposure (13% increase in high exposure). Exposure to dust was not observed among these workers. The workers in dry finishing activities were rated as either not exposed or moderately/highly exposed to chemical agents. In large tanneries with industrial modifications lower ratings were obtained for both types of chemical exposure, with a significant reduction for dermal exposure.

Table 8.3 describes the results of the qualitative estimates for postural load, characterized by prolonged standing, trunk flexion of more than 20° and trunk rotation of more than 20°. The large majority of tannery workers had to stand more than 50% of their daily worktime. Trunk flexion and rotation were also estimated to be present during a substantial part of the shift. In general, the workers in the large tanneries with production processes partly mechanized received the lowest ratings for awkward postures of the trunk compared with workers in small tanneries. The estimates for duration of trunk flexion and trunk rotation were significantly lower among beamhouse workers in modified tanneries than those in traditional tanneries. This effect was present in small/medium tanneries as well as large tanneries. A similar picture emerged for workers in the wet finishing departments, but only the shifts in ratings for trunk rotation were statistically significant. No effect of modifications on postural load was observed among workers in the dry finishing sections.

Table 8.4 shows the manual material handling estimates: pulling more than 20 kg, lifting 10 to 20 kg and lifting more than 20 kg. Manual material handling was especially concentrated in the beamhouse sections. Most laborers handled loads of at least 10 kg less than 25% of their daily worktime although some workers (n=41) were rated as being involved in lifting of loads over 20 kg more than 50% of the shift. Tannery size did not influence the exposure ratings with the exception of beamhouse workers in large tanneries who were more often involved in pulling and lifting loads over 20 kg than their colleagues in small/medium sized tanneries, respectively 43 out of 121 and 2 out of 28. The presence of control techniques significantly reduced the duration of lifting activities among workers at the beamhouse and wet finishing departments in large tanneries. Surprisingly, the ratings of the wet finishing workers in small tanneries showed lower scores in traditional tanneries compared with modified tanneries.

In table 8.5 the agreement in exposure estimates among the three raters of the first group are presented. The various ergonomic stressors showed very similar results and, hence, the agreement was calculated over all scores on all stressors. The overall agreement among the raters was high, varying from 89% to 100%, and resulting in high Kappa values of 0.82 to 1.0. The agreement on dust exposure among raters was perfect, predominantly caused by the high percentage of zero scores. Similar findings were observed for the measures of agreement among the three assessors of the second group of raters.

DISCUSSION

This study addressed working conditions in tanneries in Kanpur, India by means of extensive qualitative exposure assessments. The choice for qualitative assessments rather than exposure measurements was prompted by the limited resources available at local level to conduct a series of comprehensive occupational hygiene surveys in 15 tanneries. This situation is very common in most developing countries and, hence, a thorough effort was made to develop a protocol based on qualitative assessments.

Strategies for qualitative estimates of exposure have been developed and tested in affluent, industrialized societies [Fonn et al. 1993, Kromhout et al. 1987, Post et al. 1991]. Serious drawbacks in qualitative exposure assessments are the limited discriminatory power, misclassification of individual exposures between categories, and substantial overlap of exposure distributions underlying the qualitative scores. However, several authors have reported a fair relation between objective measurements and subjective exposure assessments by workers using various tools such as questionnaires, diaries and interviews. Kromhout and colleagues found that assessment of the actual exposure levels as very difficult but that ranking of jobs into an ordinal exposure scale was reasonably feasible [Kromhout et al. 1987, Post et al. 1991]. Hence, qualitative information may lead assessors in an efficient way to shops with the highest exposure. For assessment of ergonomic conditions a fair agreement was reported between subjective and objective assessments on duration of trunk flexion of more than 20° and on handling of weights more than 5 kg [Wiktorin 1993].

In the current study no attempt was made to validate the exposure ratings with actual measurements and, thus, the translation of these ratings to actual levels of exposure to chemicals, dust and ergonomic stressors remains unknown. One has to bear in mind that the exposure estimates in the current study were related to the local working conditions in the Kanpur tanneries. A zero (no exposure) by a local assessor means that according to the local situation he did not observe any exposure. It is however not unlikely that in this situation an assessor, accustomed to work in sophisticated industrial environments in affluent industrialized societies, might present a higher exposure score. For example, a score of 1 for dermal exposure of beamhouse workers may encompass that naked arms and legs are infrequently dipped into open baths since high dermal exposure may locally refer to the situation where the worker stands in a large soak tank while manually handling hides floating around in a chemical mixture of disinfectants and surfactants. Moreover, protective boots, aprons and gloves are seldom available. A rating of 0 for dermal exposure may have included infrequent skin contact with wet hides.

The interrater agreement in our study is very high with Cohen's kappa between 0.83 and 1.0. Although a few reports suggest that agreement between persons with similar experiences may be high [Kromhout et al. 1987, Macaluso 1993] this extraordinary result may be due to the specific approach in this survey. First, the qualitative exposure assessments in this study were performed at the workplace while observing the worker. The production process characteristics may have strongly influenced the ratings since the whole assessment procedure was new for the persons involved and their opinion was guided by visible aspects rather than expertise. Second, the tanning process consists of handling each piece of leather separately and the workers are paid by the number of skins they process. Processing one piece of leather takes only a few minutes at each working stations, with the exception when the hides are soaked in the pits or rotated in the drums. An observation period of approximately 10 minutes comprises several work cycles and, thus, enables the assessor to take into account all relevant activities. In a dynamic process with various tasks over time during long work cycles the determinants of exposure are more difficult to assess. Hence, assessment of exposure during repetitive work is likely to show a better agreement. A third reason for the high agreement is the meticulous attention and training of the assessors and the fieldtesting of the qualitative exposure assessment method. To minimize other sources of error in the study, the investigators used only rating schemes which have been published in the scientific literature. Special attention has been given to the training of the assessors and to the phrasing of the assessment ratings and questions in the local language (Hindi). Fieldtesting of the rating schemes and close guidance and support during the assessment were also important parts of the study. Fourth, the methodology applied in the study by showing the ratings to each other at the same time may have biased the ratings towards a 'harmonious' outcome. During the training of the assessors, it was observed that the raters avoided overt disagreement and tended to follow the most experienced member of the rating team. In the course of the survey, the assessors 'learned' how the most experienced member judged the different exposures at the various working stations and, consequently, their estimates may have regressed to the estimates of the most experienced member. This will have reduced the magnitude of interobserver disagreement. Also, this assessment bias partly offset the advantage of applying an expert panel rather than individual raters. In principle, the use of an expert team seems a suitable approach to increase the quality of qualitative exposure assessments but great care has to be taken in assuring independent estimates.

While acknowledging these difficulties, the qualitative assessments were regarded as useful for the purpose of the study; to identify differences between small/medium and large tanneries and between tanneries with industrial modifications aimed at improving working conditions and those without. With respect to differences in exposure profiles of small/medium and large tanneries, only duration of awkward trunk postures was significantly lower among workers in large tanneries. At first sight, this lack of a clear contrast in exposure may sound surprising. After all, the majority of small/medium size tanneries work in the traditional manner. Pits instead of drums are used for deliming and tanning, mechanical ventilation is uncommon, machines are old-fashioned and often not protected. Manual labor is the rule and measures to protect the workers are exceptional. However, small/medium tanneries produce considerably less hides per day than large tanneries. Moreover, the production process in small/medium tanneries is frequently interrupted due to shortfalls in the electricity supply and mechanical problems with machinery. Thus, the lower production rates and shorter production periods in traditional tanneries may counterbalance the contribution of manual, traditional work processes and methods to exposure to chemical agents, dust and ergonomic stressors.

The qualitative assessment were also performed to estimate the impact of industrial modifications made in several tanneries as the result of a sustained occupational health program in tanneries in Kanpur. Table 8.6 presents the control measures that were implemented and their likely effect on the exposure assessments, as described in tables 8.2, 8.3 and 8.4. The comparisons between modified and non-modified departments demonstrated that in 12 out of 54 (22%) comparisons the exposure ratings significantly decreased. Similar effects were observed for several other exposure factors but due to small numbers these effects failed to reach a significant level. The likely impact of industrial modifications was also illustrated by the fact that the observed reductions in exposure almost always occurred at departments where specific control measures were in place which, in theory, could explain this reduction. In two situations the modifications seemed to slightly increase exposure; skin exposure at wet finish departments in large tanneries and lifting 10-20 kg in wet finish departments in small tanneries. These findings indicate that careful interpretation of the qualitative assessments and their analysis is warranted.

Mechanization of materials transfer and introduction of trolleys in the beamhouse and the wet finishing sections in the tanneries were aimed at reducing ergonomic stressors by decreasing the amount of awkward back postures and the frequency of manual handling of loads. Workers in modified tanneries adopted, in general, less awkward trunk postures than laborers in the non-modified tanneries. In large tanneries also an effect on manual handling was observed, which may be caused by introduction of mechanized material transfer and trolleys at a much larger scale. This mechanization likely influenced the chemical exposure among beamhouse workers in large tanneries; they had to spend less time in close vicinity of open soak tanks because lifting of hides in and out of these tanks involved less manual handling. With regard to local exhaust ventilation (LEV) at the dry finishing departments, only an effect on chemical exposure could be seen in large tanneries. The assessments of airborne dust did not show large differences between departments. This may be due to the lack of contrast in dust exposure. The impact of LEV on dust levels is difficult to interpret since no specific tests were performed as to the effectiveness of the LEV systems.

This study has demonstrated that qualitative exposure assessment, especially in developing countries, is an important tool for rapid appraisal of hazardous conditions at the workplace. Such assessments can provide substantial clues about how, when and where to conduct detailed workplace investigations and also which occupational groups are at highest risk. The qualitative assessments were conducted on 298 workers and subsequently used to characterize exposure profiles at group level. The results indicated clear differences in exposure between tannery departments and illustrated that, to some extent, these differences may be attributed to the impact of industrial modifications on exposure. Although crude ratings necessarily lack the information to provide the magnitude of positive effects, this simple approach may stimulate this type of research in developing countries. At the same time, the approach described may also be used to communicate results to tannery workers and owners to advance future industrial modifications.

CONCLUSIONS

The qualitative exposure assessments among 298 workers in 15 Indian tanneries demonstrated considerable levels of chemical exposure, airborne dust, and dermal exposure. Also, the physical load among workers was high due to awkward trunk postures and frequent manual materials handling. The size of the tannery showed no systematic influence on the observed exposure profiles. The survey suggests that in particular tanneries mechanization of material transfer reduced the physical load of the workers. The presence of local exhaust ventilation in large tanneries was associated with lower levels of chemical exposure.

Table 8.1 Number of workers participating in the survey (N) and number of exposure assessments performed on these workers (n) for non-modified and modified tanneries, stratified by size of tannery

Tannery department	Non-modified tanneries				Modified tanneries					
	5 small/medium sized tanneries		3 large tanneries		4 small/medium sized tanneries		3 large tanneries		TOTAL	
	N	n	N	n	N	n	N	n	N	n
Beamhouse	33	14	89	65	18	14	87	56	227	149
Wet finishing	10	8	36	35	21	13	27	23	94	79
Dry finishing	7	5	29	24	11	9	25	22	72	60
Miscellaneous group	1	0	8	7	3	1	13	2	25	10
TOTAL	**51**	**27**	**162**	**131**	**53**	**37**	**152**	**103**	**418**	**298**

Table 8.2 Percent distribution of qualitative estimates of exposure to chemicals in the air, chemicals on the skin and airborne dust among 298 workers in 15 Indian tanneries in Kanpur

	Chemicals in air			Skin exposure			Dust exposure		
	no	low	mod/ high	no	low	mod/ high	no	low	mod/ high
Small/medium sized tanneries									
Beamhouse									
Non-modified n=14	7	50	43	21	21	58	100	0	0
Modified n=14	14	29	57	21	36	43	100	0	0
Wet finish									
Non-modified n=8	100	0	0	100	0	0	100	0	0
Modified n=13	100	0	0	100	0	0	100	0	0
Dry finish									
Non-modified n=5	60	20	20	60	0	40	40	60	0
Modified n=9	33	66	0	0	100	0	80	20	0
Miscellaneous				No information available					
Large tanneries									
Beamhouse									
Non-modified n=65	0	65	35	5	52	43	100	0	0
Modified n=56	27	43	30**	4	39	57	100	0	0
Wet finish									
Non-modified n=35	71	17	12	100	0	0**	100	0	0
Modified n=23	87	13	0*	78	9	13	100	0	17
Dry finish									
Non-modified n=24	58	0	42	25	17	58	83	60	17
Modified n=22	71	9	20	73	9	20**	63	14	23
Miscellaneous									
Non-modified n=7	43	57	0	71	0	29	100	0	0
Modified n=2	100	0	0	0	0	100	100	0	0

* $p < 0.10$, comparing modified versus non-modified tanneries

** $p < 0.05$, comparing modified versus non-modified tanneries

Table 8.3 Percent distribution of qualitative estimates of prolonged standing, trunk flexion and trunk rotation as determinants of postural load among 298 workers in 15 Indian tanneries in Kanpur

	Standing			Trunk flexion			Trunk rotation		
	no	low	mod/ high	no	low	mod/ high	no	low	mod/ high
Small/medium sized tanneries									
Beamhouse									
Non-modified n=14	0	0	100	0	64	36	0	21	79
Modified n =14	0	0	100	43	57	0**	43	7	50*
Wet finish									
Non-modified n=8	13	3	87	13	62	25	0	13	87
Modified n=13	0	0	100	15	85	0	24	32	24**
Dry finish									
Non-modified n=5	0	0	100	20	80	0	0	20	80
Modified n=9	0	0	100	0	67	33	33	0	66
Miscellaneous				No information available					
Large tanneries									
Beamhouse									
Non-modified n=65	11	0	89	11	71	18	11	5	84
Modified n=56	0	11	89	52	29	19**	23	61	16**
Wet finish									
Non-modified n=35	0	0	100	60	23	17	0	26	74
Modified n=23	0	13	87	52	22	26	35	65	0**
Dry finish									
Non-modified n=24	0	0	100	75	25	0	50	42	8
Modified n=22	9	0	91	59	41	0	46	27	27
Miscellaneous									
Non-modified n=7	0	29	71	29	71	0	0	0	100
Modified n=2	100	0	0	0	0	100	0	100	0

* $p < 0.10$, comparing modified versus non-modified tanneries

** $p < 0.05$, comparing modified versus non-modified tanneries

Table 8.4 Percent distribution of qualitative estimates of characteristics of manual material handling among 298 workers in 15 Indian tanneries in Kanpur

	Pulling over 20 kg			Lifting 10 to 20 kg			Lifting over 20 kg		
	no	low	mod/ high	no	low	mod/ high	no	low	mod/ high
Small/medium sized tanneries									
Beamhouse									
Non-modified n=14	86	0	14	57	7	36	100	0	0
Modified n =14	100	0	0	50	21	29	71	29	0
Wet finish									
Non-modified n=8	100	0	0	100	0	0	100	0	0
Modified n=13	100	0	0	38	38	24**	85	15	0
Dry finish									
Non-modified n=5	100	0	0	100	0	0	100	0	0
Modified n=9	100	0	0	67	0	33	100	0	0
Miscellaneous	No information available								
Large tanneries									
Beamhouse									
Non-modified n=65	63	25	12	54	20	26	46	11	43
Modified n=56	70	4	26	84	2	14**	66	29	5**
Wet finish									
Non-modified n=35	100	0	0	71	29	0	86	14	0
Modified n=23	100	0	0	61	30	9	100	0	0**
Dry finish									
Non-modified n=24	100	0	0	100	0	0	83	0	17
Modified n=22	100	0	0	91	0	9	91	0	9
Miscellaneous									
Non-modified n=7	100	0	0	100	0	0	71	0	29
Modified n=2	0	0	100	100	0	0	0	0	100

* $p < 0.10$, comparing modified versus non-modified tanneries

**$p < 0.05$, comparing modified versus non-modified tanneries

Table 8.5 Agreement among pairs of raters of exposure to chemicals, dust and ergonomic stressors in Indian tanneries in Kanpur

Exposure	Cohen's kappa between pairs of raters		
	1 & 2	1 & 3	2 & 3
Chemicals	0.87	0.94	0.82
Dust	1	1	1
Ergonomic stressors	0.86	0.89	0.86

Table 8.6 Industrial modifications in Indian tanneries and their estimated effect on exposure

Department	Control measure	Observed effect in exposure
Small medium tanneries		
Beamhouse	Mechanization of material transfer and introduction of trolleys	Reduction in trunk flexion and rotation
Wet finishing	Mechanization of material transfer and introduction of trolleys	Reduction in trunk rotation
Dry finishing	Local exhaust ventilation	–
Large tanneries		
Beamhouse	Mechanization of material transfer and introduction of trolleys	Reduction in trunk flexion and rotation, less manually lifting Reduction in chemical exposure
Wet finishing	Mechanization of material transfer and introduction of trolleys	Reduction in trunk rotation
Dry finishing	Local exhaust ventilation	Reduction in chemical exposure, especially dermal exposure

Annex

Qualitative ratings of exposure assessment of chemicals in the air.

CATEGORY	DESCRIPTION
0, no exposure	No contact with agent
	Agent is used on workplace but is very unlikely to result in exposure to workers involved
1, low exposure	Infrequent contact with agent at low concentrations
	Agent is used in a closed/controlled system; there are no specific activities that enhance exposure; exposure takes place because of presence at the shop floor
2, moderate exposure	Frequent contact with agent at low concentrations
	Agent is used throughout the closed/controlled process and exposure mainly occurs by passive contact; infrequent contact is needed with the agent
3, high exposure	Frequent contact with agent at high concentrations
	Due to the nature of the production process and associated manual activities regular contact is needed; agent causes exposure during the frequent manual activities and particular sources such as presses, drums
4, very high exposure	Frequent contact with agent at very high concentrations
	Agent is used in manual activities that introduces frequent peak exposures such as cleaning, opening a press, spraying paint

Qualitative ratings of exposure assessment of dermal exposure to chemicals

CATEGORY	DESCRIPTION
0, no skin contact	No contact with agent
1, moderate exposure	Infrequent skin contact with agent
	Contact occurs during specific activities that are not part of the daily work routine
2, high exposure	Frequent skin contact with agent
	Regular contact is unavoidable due to particular activities in daily work practice

Qualitative ratings of exposure assessment of airborne dust

CATEGORY	DESCRIPTION
0, no exposure	Clear visibility
1, low exposure	Visibility more than 10 meter
2, moderate exposure	Visibility between 5 to 10 meter
3, high exposure	Visibility between 1 to 5 meter
4, very high exposure	Visibility less than 1 meter

Qualitative ratings of exposure assessment of ergonomic stressors

CATEGORY	DESCRIPTION
0, no exposure	Does not occur (< 10% of worktime)
1, low exposure	Less than 25% of daily worktime
2, moderate exposure	25 – 49% of daily worktime
3, high exposure	50 – 74% of daily worktime
4, very high exposure	75% or more of daily worktime

Chapter 9 Respiratory disorders, skin complaints and low-back problems among tannery workers in Kanpur, India[13]

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ABSTRACT

In a cross-sectional survey health complaints among 418 laborers in 15 Indian tanneries were studied. Low-back pain (61%), asthma (38%), dermatitis (23%), and chronic bronchitis (14%) were the most frequently reported complaints in the 12 months prior to the survey. In general, beamhouse workers reported the highest prevelances but only chronic low-back pain was significantly elevated compared with workers in the finishing departments. When using individual exposure estimates, clear associations were presented among manual lifting over 20 kg and low-back pain (OR=3.5) and skin exposure and dermatitis (OR=2.6). Frequent lifting of loads was also associated with self-reported asthma. About 44% of the laborers reported at least one period of sickness absence and 17% were involved in a serious occupational accident that required a visit to the local physician. Logistic regression analysis showed that sickness absence occurred more often in small tanneries (OR=2.7) and also was significantly associated with low-back pain (OR=3.3) and occupational accidents (OR=2.2). This epidemiologic survey on health complaints in tannery workers is among the few in occupational populations in low-income countries. For many reasons these populations are easily overlooked. The results of this descriptive study indicate that there is a clear need for epidemiologic surveys in these countries in order to obtain information on working conditions and associated health problems.

[13] *American Industrial Hygiene Association Journal, in press*

INTRODUCTION

Tannery workers have been the subject in various epidemiologic studies, predominantly focusing on mortality from cancer [Acheson and Pippard 1984, DeCoufle 1979, Marrett et al. 1986, Pippard et al. 1985, Stern et al. 1987]. Epidemiologic research on occupational morbidity among tannery workers has been published seldom, especially when workers in low-income countries are involved. In one publication an occupational asthma case was described [Olaguibel 1990] and two reports are available on the occurrence of skin disorders among tannery workers in Algeria [Araibia et al. 1992] and India [Gupta 1967]. There is a clear need to pay more attention to workers' health in developing countries since these countries accommodate the best part of the worldwide workforce and exposure conditions in their industries may significantly differ from those in affluent countries.

As part of an occupational health program in a large Indo-Dutch Environmental and Sanitary Engineering project a health survey among Indian tannery workers was performed in Kanpur in 1988. This survey comprised nearly 500 workers in 20 tanneries and pointed at prevailing health problems such as musculoskeletal complaints, respiratory disorders and skin diseases [Shukla et al. 1991]. In 1990, this survey was followed by a workshop, assisted by an expert from the International Labour Organization, where tannery owners agreed on the need for appropriate control of airborne dust and chemical agents, for ergonomic improvements and safety measures. In the years after this workshop, seven tanneries modified to some extent the work process and equipment by installation of local exhaust ventilation, mechanization of material transfer, introduction of guards on machines with rotating parts and purchase of trolleys [Shukla and Katagade 1994]. In May 1994, it was possible to study the occurrence of health complaints in greater detail and investigate whether the improvements in working conditions in these seven tanneries has resulted in an improved health of the workers [Öry et al. 1997]. The aim of the study was twofold. First, to describe the occurrence of common health complaints among tannery workers in India. Second, to analyse the associations between exposure assessments and reported health complaints as to the impact of industrial modifications.

SUBJECTS AND METHODS

Study population

The tanning process in Indian tanneries and associated exposures to hazardous agents in the beamhouse operations, wet finishing and dry finishing have been described in detail elsewhere [Öry et al. 1997, Gupta, 1983]. In this survey 15 tanneries were invited to participate, comprising 7 modified tanneries (of which 4 were small/medium sized) and 8 non-modified tanneries (of which 5 were small/medium sized). In large tanneries with industrial modifications local exhaust ventilation was installed in the dry finishing section, guards were introduced on press machines and machines with rotating parts in the wet and dry finishing sections, and material transfer was partly mechanized in the beamhouse and wet finishing section by lifting aids and trolleys. Modifications in the small/medium sized tanneries were modest and consisted of simple local exhaust ventilation systems in the dry finishing section, guards on machines with rotating parts in the wet finishing area, and a limited introduction of trolleys in the beamhouse.

The study population consisted of 418 tannery workers that were present at production departments during the survey. All invited laborers participated in the survey, resulting in a response rate of 100% (n=418). This exceptionally high response rate can be explained by the good relation between the project team, the tannery owners, and the laborers. The distribution over tanneries was 51 workers in non-modified small/medium tanneries, 53 workers in modified small/medium tanneries, 162 workers in non-modified large tanneries, and 152 workers in modified large tanneries.

Of all 418 workers information on socio-economic variables, occupational history and health complaints was collected by means of a standardized interview. Qualitative exposure assessments were performed on 298 (71%) laborers at their respective work stations. Results of the qualitative exposure assessments have been reported elsewhere [Öry et al. 1997]. For eight workers some answers to health questions were missing or filled out wrongly, and, therefore, these workers were excluded from the analysis linking exposure estimates to health complaints. The survey was executed outside the rainy and hot summer seasons since these climate conditions considerably affect routine tannery production.

Health survey

The laborers were interviewed by social workers from the Urban Development Cell of the Kanpur municipality. All social workers had ample experience in the slum area, where the tanneries are located. The questionnaire contained questions eliciting age, religion, education, employment history, number of occupational accidents, use of protective devices, as well as various health complaints in the 12 months prior to the interview. The health survey part comprised four questions on low back trouble, based on a standardized Nordic questionnaire [Kuorinka et al. 1987], seven questions on skin complaints [Smit et al. 1993] and

ten questions on respiratory disorders [Minette 1989]. The questions on health complaints were derived from existing, validated questionnaires. The questions on skin complaints were used to identify subjects with possible hand dermatitis. Affirmative answers to the questions on respiratory complaints were used to distinguish between the presence of asthma or chronic bronchitis. Work-related respiratory complaints were defined as respiratory complaints reported to occur during work and to improve during evenings or weekends without exposure. Details on these questions are provided in Annex A. Questions on occupational accidents and on sickness absence [Burdorf et al. 1996] during one year prior to the interview were also included.

All questions were translated into Hindi. Interviewers received a three-day course in interviewing techniques. Special attention was paid to pose questions to illiterate laborers without influencing their answers and without being threatening to the workers [Sudman and Bradburn, 1983]. This aspect was crucial in order to get valid answers from illiterate laborers on precoded questions. All interviewers visited a few non-participating tanneries to test the questionnaire under field conditions. The interviewers were supervised by two occupational health specialists with ample experience in tanneries in Kanpur.

Apart from the interview, some simple health measures were obtained. Weight and height of the laborers were taken by using a commercial scale and tape, while the laborers stood against the wall on a flat and hard surface. The Mini Wright Peak flowmeter was used to measure maximum respiratory flow as an estimate of lung capacity. Peak flow readings were taken at early morning hours before work started and again at the end of the same day. After careful instruction and demonstration how to use the peak flow meter, three to four test blows were taken to examine the ability of workers to use the instrument properly. Subsequently, results of three blows were registered and the highest value is being used in the analysis. A Peak Expiratory Flow Rate index was calculated as ratio of the measured PEFR over the predicted PEFR. The predicted PEFR values were obtained from a reference population of North Indian workers, according to the formula PEFR = (1.944*height) – (2.019*age) + 148.882 [Rastogi et al. 1983].

Exposure assessment

As a first step, all production workers were assigned to an exposure group that best fitted their daily activity. The four exposure groups were: beamhouse/tanning area, wet finishing, dry-finishing and a miscellaneous group comprising carriers, mixers of chemicals, sweepers and packers [Öry et al. 1997]. Second, the exposure assessments on 290 out of 418 workers were used to investigate associations between exposure to chemical agents, dust and ergonomic stressors and various health complaints. This analysis is restricted to all subjects that had information on both exposure and health complaints. The original qualitative exposure estimates were regrouped into three levels of exposure since the highest categories contained very small numbers; no exposure (score 0), low exposure (score 1), and moderate/high exposure (scores 2 – 4).

Statistical Analysis

All statistical analyses were performed with the software package SPSS-PC version 5.0. Differences between frequencies were tested by the χ^2-test and those between means of continuous variables by the unpaired student's *t*-test. The effect of exposure on health symptoms was estimated by unconditional logistic regression analyses with adjustment for confounding variables [Schlesselman 1982]. Age and years of work experience were treated as continuous variables. Individual exposure estimates consisted of a three-point scale. Exposure was also evaluated by means of introducing dummy variables in the logistic models, representing exposure group status, size of tannery and presence of industrial modifications. The covariates in the logistic analysis were initially examined one by one and subsequently retained in the final model if the likelihood ratio of the model changed significantly. The regression coefficients were used to calculate as the measure of risk the odds ratio and 95% confidence interval. Confidence intervals that do not include the value 1 represent statistically significant differences.

RESULTS

Table 9.1 presents the individual characteristics and work experience of tannery workers, stratified by tannery size. The population under study was relatively young with a mean age of 33 years. Approximately half of the population was illiterate. Workers in large tanneries have been employed significantly longer in the current tannery and, thus, have a longer total work history in tanneries. Large tanneries are also characterized by a larger proportion of Hindu workers, workers with a permanent position and workers under employees insurance services. Within the group of large tanneries, those that had the financial resources to institute workplace modifications were characterized by the largest proportion of workers with a permanent job as well as workers with, on average, the longest employment.

Table 9.2 shows the 12-month prevalence of low-back trouble, respiratory complaints and hand dermatitis. Overall, 61% of the subjects reported episodes of low-back trouble in the past 12 months. Among those subjects 31% (78 out of 255) had experienced at least 10 separate episodes of low-back trouble. Chronic-non specific respiratory complaints were also highly prevalent (40%) with significantly more subjects complaining about asthma-like symptoms than symptoms of chronic bronchitis. However, the overlap of both diagnoses was very large with only 7 out of 60 workers reporting chronic bronchitis without asthma-like complaints. Among subjects with respiratory complaints 84% (139 out of 166) indicated that their complaints were likely to be work-related, that is these complaints worsened during the workday and/or improved during a day off. The peak flow measurements were related to the presence of respiratory symptoms. On average, subjects with respiratory complaints had a lower peak flow rate than expected (about 2% decrease). These subjects also showed a decrease in peak flow rate over the workday of 4.5 l/min whereas those without complaints improved their peak flow rate by 1.9 l/min. Symptoms of hand dermatitis were reported by 23% of all workers with small differences in observed prevalences among the four departments.

In general, beamhouse workers reported the highest prevalences but only the 12 months prevalence of chronic low-back pain was significantly elevated compared with workers at the finishing department. No systematic differences were observed for the size of the tanneries and the presence of engineering modifications at the workplace.

Table 9.3 gives the occurrence of accidents at work in the past 12 months and the self-reported sickness absence in the same period. About 17% (70) of the subjects was involved in a serious occupational accident that required a visit to the local physician. The percentage of workers with at least one period of sick leave in the past 12 months was 44% and the average number of days lost due to sick leave was 18 (calculated over subjects with sick leave). The four departments showed quite similar patterns of occupational accidents and sick leave. Logistic regression analysis demonstrated that the occurrence of sick leave was significantly associated with low-back trouble (OR = 3.27), occupational accidents (OR = 2.21) and small tanneries (OR = 2.70). Moreover, these variables accounted for 35% of the variation in days lost due to sick leave. Other variables such as age, work experience, body mass index, and presence of guards on machines failed to demonstrate any influence on occupational accidents and sick leave.

The final logistic regression models for low-back trouble and hand dermatitis are presented in table 9.4. These models were arrived at after fitting several models to the primary variable age and important covariates such as individual characteristics, work history, department, modifications, tannery size and all qualitative exposure estimates. This analysis includes only the 290 workers with individual estimates of their exposure. Low-back trouble was clearly related to worker's age with the older age groups showing elevated odds ratios. Lifting of loads more than 25% of daily worktime and a serious occupational accident had a significant contribution to the occurrence of low-back trouble. None of the other covariates contributed significantly to the logistic model or resulted in any marked change of the coefficients of included variables. For hand dermatitis a significant odds ratio of 2.32 was observed for workers in the age of 25 to 35 years whereas the highest agegroup showed an elevated odds ratio that was not statistically significant. Laborers with a moderate skin exposure of chemicals had a significant odds ratio of 2.56. Those with a high skin exposure, surprisingly, demonstrated no increased risk for hand dermatitis. Work history, department and size of tannery, and modifications were not associated with back trouble and hand dermatitis.

Table 9.5 shows the results of the logistic models for respiratory complaints. Older age groups had increased prevalences for both respiratory complaints as well for work-related respiratory complaints. The respiratory complaints were not associated with exposure to chemicals in the air, dust, tannery size, or technical modifications. The overall pattern showed that workers involved in manual material handling, especially lifting of loads, reported more often respiratory complaints.

DISCUSSION

This cross-sectional study describes the relationships between several occupational exposures and health complaints among tannery workers in Kanpur, India. The population studied is typical for the workforce in Indian tanneries; young male workers, often illiterate, usually working in a temporary position without any social security. In contrast to the general population in Kanpur with about 75% Hindus and 20% Muslim [Molund 1988], approximately half of the tannery workers were Muslim. Work with dead animals is regarded highly 'unclean' to Hindu religion and only the Chamars, one of the lowest castes in the Hindu cast hierarchy, are engaged in tannery work [Shukla et al. 1991]. In 1988, 60% of the tannery workers were illiterate, the current figure of 52% shows some improvement in educational level over the past six years.

The health survey demonstrated that the highest prevalence of health complaints was for low-back trouble (61%), followed by asthma (38%), and hand dermatitis (23%). Chronic bronchitis was mentioned least frequently (14%). Since occupational populations in developing countries have hardly been studied, there are only few publications to compare with. A report on occupational dermatitis among tannery workers in Algeria presented a prevalence of 21% [Araibia et al. 1992]. An earlier inventory among tannery workers in Kanpur, India, provided significantly lower prevalence figures for all health complaints [Shukla et al. 1991]. This contradictory observation can largely be explained by the low response in the first survey, the strong emphasis on clinical findings during the medical examinations, and the fact that the European investigator had too little time to remove some suspicion by the Indian tannery owners and laborers. The current survey was executed after seven years of close cooperation between the project-team, tannery owners, and tannery workers with a feeling of mutual trust.

The reported prevelances of complaints on low-back trouble, hand dermatitis, and respiratory symptoms in the past 12 months among these Indian tannery workers suggest that serious occupational health problems are present in Indian tanneries. This suggestion is supported by the substantial number of workers involved in serious accidents at work and by the sickness absence prevalence. It is of interest to note that comparable prevalence figures have been reported in Dutch studies using the same questionnaires among occupational populations with hazardous working conditions for the complaints of interest [Smit et al. 1993, Burdorf et al. 1991, Post et al. 1994].

In an attempt to collect additional information on respiratory capacity, peak flow measurements were performed with a Mini Wright Flow meter. Since the investigation was confined to a single day, only information on the change in peak flow across the shift was available. Although it could be demonstrated that subjects with respiratory symptoms had a slight decrease in peak flow over the workday (about 1%), the measurements proved to be of limited value since most cases with asthmatic symptoms were not identified. Spirometry with FVC and FEV1 values would have been much more informative but collection of reliable data in this field study was simply not feasible. The reader has to keep in mind that the infrastructure and resources for research in occupational health were extremely limited, a condition often faced in low-income countries.

In order to investigate associations between working conditions and health complaints, the four departments in tanneries were compared (see table 9.2). No clear differences in occurrence of health complaints were observed. A further breakdown by both tannery size and workplace improvements showed no differences. Since tannery workers at different departments have a different exposure profile [Öry et al. 1997], this lack of associations may indicate that the tannery department is not a good proxy for exposure. Therefore, it was decided to conduct a detailed analysis on the subset of 290 workers with individual exposure estimates and complete health data. This subgroup of 290 workers had similar prevalences of health complaints as the total group of 418 workers. The logistic regression models illustrated relationships between several exposure estimates and the occurrence of low-back trouble and hand dermatitis. Also, respiratory complaints were positively associated with heavy physical labor. The latter result may suggest that physical labor increases the respiratory volume rate and, thus, considerably increases the dose at the target organ.

These results showed that qualitative assessments at the individual level may enlighten significant differences in health complaints due to harmful conditions that were not detected by simple comparisons of groups defined by work station. This compares favorably with earlier statements that classifying jobs into categories of exposure without knowledge of exposure data is difficult and may cause that differences in individual exposures go undetected [Rappaport et al. 1993]. The fact that well-known associations were found, suggests that the exposure estimates at individual level better represent true exposures than the work stations as exposure proxies.

One has to bear in mind that in cross-sectional surveys it is not possible to determine the temporal relationship between working conditions and the development of health complaints. A cross-sectional design is also sensitive to selection processes in the workforce that are influenced by health state. Given the large proportion of workers without a permanent position in the tanneries, labor turnover may be influenced by a healthy worker selection. Hence, the presented associations between physical load and low-back trouble and between dermal exposure and dermatitis may have been underestimated. On the other hand, in cross-sectional studies the prevalence odds ratio overestimates the true risk when the prevalence of disease is rather high, as is the case for low-back trouble and respiratory complaints. In general, the associations presented in this survey illustrate the necessity to pay attention to the potential role of working conditions in workers' health in Indian tanneries.

In the statistical analysis no beneficial effect on workers' health could be demonstrated of the engineering modifications in seven tanneries, although the qualitative exposure assessment demonstrated some positive effects of the control measures [Öry et al. 1997]. All modifications have been installed in 1992, so the 'lag-time' between the installation of modifications and the survey (18 months) may be too short to bring significant differences in health complaints to light.

In general, workers in small/medium sized tanneries were in a less favorable situation than laborers in large tanneries. They had more often temporary jobs, usually lacked employee insurance service and, on average, their Body Mass Index, an indicator for chronic energy deficiency in adults [Shetty and James, 1994, Öry et al. 1996] was also significantly lower. Nevertheless, workers in small tanneries reported similar patterns of health complaints compared with those in large tanneries. The only striking difference was

the elevated rate of sickness absence in the past 12 months. This result could not be explained by a higher number of accidents, more spells of low-back pain, or socio-economic variables.

Most epidemiologic studies among tannery workers have been limited to affluent, industrialized societies. Tanneries have largely been shifted from industrialized countries to low-income nations due to local environmental legislation and availability of cheap labor. Nowadays, leather products from low-income countries compete heavily with locally manufactured products. There is almost no information available on the consequences of this transformation on workers' health in developing countries. An important reason for this apparent lack of knowledge is that epidemiologic investigations among occupational populations in developing countries cause many problems. In the majority of low-income countries it is difficult to keep track of health effects of longterm exposure as permanent jobs are exceptional. Tannery owners prefer to employ laborers at piece rate without providing long-term job security. This situation may affect cross-sectional studies that, by their nature, are sensitive to the healthy worker effect. This study is no exception, moreover since only workers present in the tanneries could be studied. Differential differences in healthy worker selection may be present between large and small tanneries.

This study is also hampered by the fact that in many low-income countries an infrastructure to identify and evaluate hazardous working conditions is hardly present. Objective measurements of exposure to harmful agents often are too costly and may require technical skills and resources that are not available. Hence, the use of surrogate measures of exposure may be required to investigate hazardous working conditions and its impact on worker's health. Although qualitative exposure assessments and health interviews may be classified among the 'quick and dirty' methods, they provide essential data on exposure and health complaints in occupational populations that are otherwise overlooked [Fonn et al. 1993]. An additional advantage is that such rapid appraisal techniques are more likely to be used by local stake-holders, such as employers, employees and local organizations [Öry et al. 1996]. The current study demonstrated that descriptive epidemiologic methods can contribute to the evaluation of working conditions and consequent health problems in occupational populations in developing countries.

CONCLUSIONS

This cross-sectional survey showed that low back trouble, skin complaints, and respiratory complaints were prevalent among Indian tannery workers. The analysis of possible associations with exposure estimates suggests that physical load and dermal exposure play a role in the development of low back trouble and hand dermatitis among workers in Indian tanneries. Sickness absence in the past year was significantly associated with the occurence of low back trouble and occupational accidents.

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Table 9.1 General characteristics of laborers in 15 Indian tanneries in Kanpur, India

Variable	Small/medium sized tanneries (n = 104)	Large tanneries (n = 314)	All workers (n = 418)
Age (years)	31.2 ± 9.3^	33.2 ± 10.1	32.7 ± 9.9
Height (cm)	161.8 ± 6.9	160.7 ± 6.0	160.1 ± 6.2
Weight (kg)*	47.7 ± 6.4	50.2 ± 6.8	49.6 ± 6.8
Body Mass Index (kg/m^2)*	18.2 ± 1.9	19.4 ± 2.3	19.2 ± 2.3
Work experience in current tannery (yr)*	4.3 ± 4.2	8.9 ± 8.1	7.8 ± 7.6
Work experience in any tannery (yr)*	8.2 ± 6.4	11.7 ± 8.8	10.8 ± 8.4
Literacy rate (%)	42	49	48
Hindu workers (%)*	40	55	51
Muslim workers (%)*	60	45	49
Permanent position (%)*	8	38	31
Employee Insurance (%)*	17	57	47

^ Mean and standard deviation

* $p < 0.05$: Comparing small/medium versus large tanneries

Table 9.2 Number and percentage of workers with health complaints in the past twelve months among Indian tannery workers, stratified by department

Complaint in the past twelve months	Beamhouse (n = 226)	Wet finishing (n = 95)	Dry finishing (n = 72)	Miscellaneous (n = 25)	All workers (n = 418)
Low-back trouble	147 (65%)	59 (62%)	39 (54%)	10 (40%)	255 (61%)
Chronic low-back trouble*	51 (22%)	16 (17%)	7 (10%)	4 (16%)	78 (19%)
Hand dermatitis	57 (25%)	17 (18%)	17 (24%)	5 (20%)	96 (23%)
All respiratory complaints	91 (40%)	37 (39%)	25 (35%)	13 (52%)	166 (40%)
Asthma	88 (39%)	35 (37%)	23 (32%)	13 (52%)	160 (38%)
Chronic bronchitis	37 (16%)	12 (13%)	8 (11%)	3 (12%)	60 (14%)
Work-related respiratory complaints	78 (34%)	29 (31%)	24 (34%)	8 (32%)	139 (33%)
Work-related asthma	76 (34%)	29 (31%)	23 (32%)	8 (32%)	136 (33%)
Work-related chronic bronchitis	35 (15%)	10 (11%)	7 (10%)	2 (8%)	54 (13%)

* $p < 0.05$: beamhouse workers compared with workers of both finishing departments

Table 9.3 Distribution of occupational accidents and sick leave among Indian tannery workers, stratified by department

Variable	Beamhouse (n = 227)	Wet finishing (n = 94)	Dry finishing (n = 72)	Miscellaneous (n = 25)	Total (n = 418)
Serious occupational accident in previous year	42 (19%)	13 (14%)	9 (13%)	6 (24%)	70 (17%)
Frequency of occupational accidents in previous year	1.3 ± 0.5[A]	1.2 ± 0.4	1.9 ± 1.3	1.8 ± 1.6	1.4 ± 0.8
Sick leave in previous year	92 (40%)	49 (52%)	32 (44%)	13 (52%)	186 (44%)
Number of sickness days in previous year (days)	17.6 ± 17.9	20.0 ± 14.8	19.6 ± 16.8	10.2 ± 9.2	18.0 ± 16.6

[A] Mean and standard deviation

Table 9.4 Odds ratio estimates of risk factors for low-back pain and hand dermatitis among tannery workers (n=290) in 15 Indian tanneries

Independent variable	Low back pain		Chronic low back pain		Hand dermatitis	
	Odds ratio	Confidence interval	Odds ratio	Confidence interval	Odds ratio	Confidence interval
Age						
< 25	1		1		1	
25 - 35	6.05	2.89 - 12.64	4.21	1.53 - 11.63	2.32	1.09 - 4.92
> 35	2.26	1.20 - 4.25	3.93	1.53 - 10.08	1.79	0.87 - 3.67
Lifting 10-20 kg						
No exposure	1		1		na	
Low exposure	1.26	0.74 - 2.13	2.66	0.94 - 7.52		
Moderate/high exposure	8.19	2.65 - 67.00	2.37	0.93 - 6.02		
Lifting more than 20 kg						
No exposure	1		1		na	
Low exposure	1.44	0.62 - 3.38	3.07	1.22 - 7.71		
Moderate/high exposure	3.54	1.42 - 8.78	6.25	2.47 - 15.84		
Accidents in past year						
No accidents	1		1		na	
One or more accidents	3.18	1.36 - 7.42	2.06	0.92 - 4.69		
Skin chemicals	na		na			
No exposure					1	
Low exposure					2.56	1.29 - 5.07
Moderate/high exposure					1.20	0.59 - 2.45

Table 9.5 Odds ratio estimates of risk factors for complaints about asthma and chronic bronchitis among tannery workers (n=290) in 15 Indian tanneries

Independent variable	Asthma		Chronic bronchitis		Work-related asthma		Work-related chronic bronchitis	
	Odds ratio	Confidence interval	Odds ratio	Confidence interval	Odds ratio	Confidence interval	Odds ratio	Confidence interval
Age								
<25	1		1		1		1	
25-35	1.84	0.96 - 3.55	2.70	1.10 - 6.59	1.82	0.92 - 3.59	2.35	0.95 - 5.80
> 35	1.87	1.02 - 3.43	1.50	0.62 - 3.63	1.92	1.02 - 3.61	1.17	0.47 - 2.92
Lifting 10-20kg								
no exposure	1		1		1		1	
low exp	1.72	0.81 - 3.66	1.70	0.60 - 4.79	1.48	0.68 - 3.25	1.45	0.48 - 4.39
moderate/ high exposure	2.36	1.15 - 4.85	2.11	0.86 - 5.21	2.07	1.00 - 4.30	2.27	0.91 - 5.68
Lifting >20 kg								
no exposure	1		1		1		1	
low exposure	1.62	0.72 - 3.60	2.83	1.10 - 7.26	1.73	0.77 - 3.89	1.85	0.66 - 5.16
moderate/high exposure	2.56	1.14 - 5.71	1.57	0.51 - 4.88	1.69	0.74 - 3.87	1.19	0.35 - 4.02

Annex A.

Identification of skin complaints was based on the following questions:

1. Have you had one of the following symptoms on your hands or fingers in the past 12 months?

   a red and swollen hands or fingers?

   b red hands/fingers and fissures?

   c vesicles on the hands or between the fingers?

   d scaling hands or fingers with fissures?

   e itching hands or fingers with fissures?

   The answer could be either yes or no.

2. Did one or more of these symptoms last for more than 3 weeks? (yes/no/do not know)

3. Did one or more of these symptoms occur more than once?

Diagnosis of a person with ***hand dermatitis***: a person who answered positively on two or more of the questions 1a to 1e (symptoms) and who answered positively to either question 2 (symptoms for more than three consecutive weeks) or question 3 (recurrence of symptoms).

Questions on respiratory symptoms have been based on the following questions:

1. Did you cough most days or nights for at least 3 months in the previous year? (yes/no)

2. Did you cough up phlegm most days or nights for at least 3 months in the previous year? (yes/no)

3. Do you get breathless when you walk with other people of your own age on the flat at a normal pace? (yes/no)?

4. Have you at any time in the past 12 months had an attack of shortness of breath that came on during the day (yes/no)?

5. Have you at any time in the past 12 months woken up with a feeling of tightness in your chest first thing in the morning (yes/no)?

6. Have you had wheezing or whistling in your chest at any time in the past 12 months (yes/no)?

7. Have you had attacks of wheezing or whistling in your chest for at least 1 week in the past 12 months (yes/no)?

8. Has a doctor ever told you that you have asthma (yes/no)?

9. Do your respiratory complaints normally improve when you are a day off work? (yes/no)?

10. Do your respiratory complaints normally worsen over the work day (yes/no)?

Diagnosis of ***chronic bronchitis***: positive reply on questions 1 or 2.

Diagnosis of ***asthma***: positive reply on questions 4,5, or 7.

Diagnosis of ***work-related respiratory complaints***: positive reply on questions 9 or 10.

Low back trouble was identified by the following questions:

1. Have you ever had low-back trouble (ache, pain or discomfort)? (yes/no)?

2. Have you had low-back trouble in the past 12 months (yes/no)?

3. How often have you had low-back trouble in the past 12 months?

   zero,

   once,

   2- 5 times,

   6 - 10 times,

   more than 10 times but not every day,

   (almost) every day

4. What is the total length of time that you have had low-back trouble during the past 12 months?

   0 days

   1 – 7 days

   8 – 30 days but not every day

   every day

Chapter 10 Industrial counselling: linking occupational and environmental health in tanneries of Kanpur, India[14]

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ABSTRACT

This paper describes an occupational health program in tanneries in Kanpur, India. The program was instituted as part of a bilateral cooperative effort of India and The Netherlands focusing on providing engineering solutions to prevent industrial waste and community sewerage from polluting the Ganges river. The occupational health program was linked to the environmental activities by adopting the concept of industrial counselling. This method aims to increase production and product quality of enterprises and at the same time improve working conditions in these enterprises. The tanneries in Kanpur were targeted for industrial counselling by the Indo-Dutch Environmental and Sanitary Engineering Project Kanpur-Mirzapur under Ganga Action Plan. Recovery of chrome from wastewater, automation of hydraulic press machines, use of an airpollution-prevention system in the spray-painting section, and automation of transport are examples of measures used to increase productivity and improve leather quality. Working conditions were improved by adding local exhaust ventilation, mechanizing material transfer, instituting safer procedures for storage and use of toxic materials, and introducing breathing apparatus for operations done in confined spaces to prevent hydrogen sulfide intoxication. The linkage of occupational health problems to environmental issues proved to be effective in drawing attention to working conditions. Also, the application of simple survey techniques to identify and evaluate environmental and occupational hazards substantially increased awareness of these hazards and comprehension of the need to adopt changes among employers, workers, and occupational health professionals. The article discusses the core elements of this successful program.

Key words: industrial counselling, tanneries, wastewater, water pollution, environmental protection.

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Protection of the green environment attains wide coverage by the international community at large, whether it be at a political, economic, or scientific level [Worldwatch Institute 1994]. Mass media play an important role in creating public support for active programs to safeguard communities from environmental hazards. With the integration of low-income countries into the global economy, the environment becomes an important issue in these countries as well [Nuwayhid 1995]. Apart from the intrinsic arguments for environmental protection, specific attention is needed for the developments that put low-income countries at greater risk than before. First, the rapid industrialization in low-income countries may focus attention on the advantages of economic growth and neglect the environmental impact. Second, affluent countries may export their hazardous industries to low-income countries that have no political and economic means to prevent these businesses from doing so. Third, less environmental protection may be used as an argument in the fierce competition to attract foreign investments. Fourth, large-scale unemployment may force low-income countries to accept hazardous environmental conditions in their struggles for survival.

In the past decade, however, there has been growing recognition in these low-income countries that it is of utmost importance that the community and policymakers be informed about the need for concerted action to protect the environment both inside and outside the factory walls [Shukla et al. 1991]. Although the workers at risk for occupational exposures may be considerably smaller than the population suffering from environmental problems, their risk of adverse health effects is usually significantly greater due to more intense exposure.

This paper presents the results of an action program conducted in tanneries in Kanpur, India. The original program was aimed at instituting engineering controls to prevent pollution from entering the Ganges river [Shukla et al. 1991]. The concept of industrial counselling was adopted to link occupational health to environmental issues [Royal Netherlands Embassy 1990]. This article presents the core elements of this program and discusses the strengths and weaknesses of combining environmental issues with efforts to improve working conditions.

Industrial counselling in Indian tanneries

In the early 1980s, the Indian government, concerned about the effects of rapid growth and industrial development on the environment, launched several plans for environmental protection. Among these, the largest and most prestigious undertaking was the Ganga Action Plan, aimed at the prevention of further pollution of the Ganges river. The Central Pollution Control Board of India was asked to prepare a study of the sources and extents of pollutants in the Ganges and to formulate a program for its prevention. This study, prepared by the Board in 1984, was the country's first comprehensive assessment of the pollution of the Ganges [Indo-Dutch Project 1994]. This inventory of sources of pollution formed the basis for the Ganga Action Plan. One of the main conclusions of the study was that industries accounted for 25% of the total pollution of the Ganges. Pollution was far more acute in heavily industrialized areas such as Calcutta and Kanpur.

The Control Board identified the tanneries of Kanpur as one of the main sources of industrial pollution. The Board informed the owners that environmental laws were to be strictly enforced and required the construction of tannery wastewater-treatment plants to prevent the direct discharge of tannery waste into the Ganges. In 1987, the Board closed some tanneries because they did not comply with the requirements.

Environmental protection is one of the cornerstones of the international development cooperation policy of the Dutch government [Ministry of Foreign Affairs 1990]. The governments of India and The Netherlands signed a Memorandum of Understanding and agreed on a bilateral program for environmental protection. Within this bilateral agreement, the Indo-Dutch Environmental and Sanitary Engineering Project Under Ganga Action Plan initiated its activities in Kanpur and Mirzapur in 1988. The project's goal was to halt the pollution of the Ganges. Its main components were construction of wastewater treatment facilities such as the Upflow Anaerobic Sludge Blanket (UASB) treatment plant, construction of chrome-recovery units, wastewater treatment in tanneries, and construction of sanitation and drinking water facilities. Involvement of the community through training and through organizing and supporting income-generating activities was an important strategy of the Indo-Dutch project [Indo-Dutch Project 1994].

Because they were major polluters of the Ganges, the tanneries in Kanpur were the targets of many of the activities of the Indo-Dutch project. During initial visits to the tanneries, the project staff was struck by the inadequacies of prevailing working conditions. Shortly before the start of the project, four workers had died in local tanneries from hydrogen sulfide intoxication, and the tannery owners agreed to cooperate with project staff in identifying the most dangerous sites in their operations. It was decided, with the full consent and active cooperation of the owners, to investigate working conditions in the tanneries and, with the results of the investigation at hand, to formulate and implement interventions aimed at the reduction of risks for occupational health hazards for workers. The Occupational Health Program started in 1987 and lasted until December 1995 [Shukla et al 1991]. The Indo-Dutch Project applied the concept of industrial counselling to the tanneries of Kanpur. The program on industrial counselling consisted of four activities:

1. Environmentally sound technologies, such as chrome-recovery units that prevented pollution and reduced the use of an expensive material, were introduced. Recovery of chrome proved to be very profitable, such that the amount invested in the unit could be recovered within a year and afterwards the recovery meant pure profit. Moreover, the chromium previously lost in the effluent had amounted to an annual waste of 30 million Indian rupees.

2. Environmentally sound technologies contributed to more efficient production methods by saving energy and raw materials and promoting safe procedures for the storage and use of hazardous materials, modifying production processes and uses of raw materials, and recycling waste. These changes will, in the long-term, contribute to greater productivity.

3. Clean technologies reduced emissions into the air, water, and soil and protected the environment. They also reduced the exposures of tannery workers to harmful substances either touching the skin or inhaled in the air and thus contributed to better working conditions.

4. Better process control and good housekeeping further reduced the chances of accidents and other occupational health risks were also reduced. This concept proved to be effective for improving working conditions and involving employers, workers, and officials in the field of occupational health.

Linking the environment with working conditions in tanneries

The owners were interested in increasing worker productivity and improving leather quality. Most owners regarded the improvement of working conditions as of only incidental value. The industrial modifications that increased productivity and contributed to better working conditions and to the prevention of environmental pollution consisted of installing general and local ventilation systems, improving storage and dispensing of toxic materials, and constructing chrome-recovery units. General and local ventilation systems, especially in the buffing and painting sections, prevented leather dust from marring freshly painted leather and thus contributed to improving the quality of the product. The ventilation systems clearly also contributed to better working conditions. Moreover, the dust and paint collected could be disposed of safely, without polluting the environment. Improved storage and careful control of dyes and other toxic materials reduced spills and thus reduced exposures and accidents. Introduction of chrome-recovery units clearly helped to prevent environmental pollution, as the chrome was now recycled. Tannery owners were able to recover the costs of the units in less than two years. The units also reduced the exposure of tannery workers to chrome. Clean technologies, such as the chrome-recovery units, better control of toxic substances, and the introduction of ventilation systems all increased productivity, improved working conditions and contributed to the prevention of environmental pollution [Royal Netherlandfs Embassy 1990].

Industrial counselling is an integrated approach that creates incentives at different levels of industrial production. The introduction of clean technology with due attention to occupational health aspects makes pollution control and improved working conditions compatible with industrial development. Important aspects of industrial counselling are measures resulting in increased productivity that are economically feasible and that help to protect the environment while at the same time improving working conditions. The crucial element of the industrial counselling concept is the linkage of increased productivity, environmental protection, and improved working conditions while applying technical interventions [Shukla et al. 1991, Royal Netherlands Embassy 1990]. The occupational health program in the tanneries of Kanpur included all of the above-mentioned aspects. In the next section the critical elements of the program are discussed in more detail from the perspective of community involvement. A program of this type can be sustained only with the active participation of the principal stakeholders in the process. The description of the program focuses on the various strategies applied to improve the working conditions in the tanneries of Kanpur.

Core elements of a successful program for community involvement

Five crucial strategies

Various stakeholders in the program were identified: employers, workers, the community in the vicinity of the tanneries, officials from the Directorate of Factories, the Workers State Insurance Scheme, the Regional Labor Institute and faculty from Kanpur Medical College. Active participation of the stakeholders was essential to mutually adjust the industrial modifications and the socio-economic "receiving structure" so as to promote efficiency and effectiveness. Involvement of the stakeholders in the planning, implementation, operation, and maintenance of technical facilities was essential to ensure a feeling of ownership and responsibility for industrial counselling in the long-term. Five crucial activities were used to involve the stakeholders. First, real-life examples and local data were used to increase awareness about occupational health and safety. Second, tannery owners and managers were involved from the very first moment by emphasizing increased productivity, better product quality, and environmental protection to ensure their consent and active participation. Third, the combination of environmental and occupational health aspects from the sustainable development perspective was emphasized throughout the project. Fourth, workers, the Directorate of Factories, the Workers State Insurance Scheme, the Regional Labor Institute, and Kanpur Medical College were invited to participate in training sessions, in the surveys, and in the establishment of safety and health councils to ensure active participation of these organizations, which play an important role in the field of occupational health and safety. Finally, workers, employers and participating organizations were involved in collecting information about working conditions and workers' health [Blanc 1995].

1. Use of real-life examples and local data to increase awareness about occupational health and safety

The theme of this program element was "With data in hand, the fight is far from won, but at least the policymaker is armed for the battle" [Blanc 1995]. The initial activities consisted of walk-through surveys and a base-line survey, aimed at the assessment of working conditions that endangered the health and safety of workers. The surveys were executed by social workers of Kanpur Municipality and physicians of Kanpur Medical College with the participation of physicians of the Workers State Insurance Scheme (ESI). The interdisciplinary collaboration between social workers, physicians, and staff members of the Directorate of Factories, whose task is to officially supervise the working conditions in Kanpur, resulted in interesting discussions, similar to the discussions during other Rapid Appraisal surveys [Chambers 1983]. As the social workers of the municipality had already worked a long time in the slums where the workers lived, they also contributed to discussions of working conditions within the community informally, during the evenings. They played an important role as go-betweens between the community, the project staff and the employers, and informed project staff and employers about the workers' perspectives. The surveys were executed by physicians in close cooperation with the social workers, the latter establishing a feeling of security and confidence among the workers.

The surveys revealed various occupational diseases, including chrome ulcers of the hands and feet [Shukla et al. 1991], which are caused by exposure to hexavelant chrome. The occurrence of this disease was used as a clear example to pinpoint occupational hazards. The surveys also revealed a high percentage of occupational accidents. The survey results were discussed with the workers and tannery owners. The results convinced the owners of the need to identify the most hazardous places in the tanneries and to examine the feasibility of possible steps to reduce the hazards. Data collected were primarily used to argue for improvement of working conditions at the plant level. In addition, this information was used in the first-aid and occupational health training courses for the workers.

2. Motivating tannery owners: industrial modifications that increase productivity and improve working conditions

Educating workers and owners without concrete action is not likely to be effective [Kogi at al. 1989]. The project staff soon realized that ownership of the modifications by the employers and workers was crucial to the success of the program. Tannery owners are interested in high-quality products and profits. Fortunately, in India some owners also tend to take good care of their workers. These owners are essentially "patrons" of the working populations, and workers' health and well-being are not entirely outside their scope of interest. Increasing productivity while safeguarding workers' health was thus chosen as a slogan. The project staff approached the International Labor Organization (ILO) to organize a workshop entitled 'A Higher Productivity and a Better Place to Work' [ILO 1989]. This workshop had been held successfully in other Asian countries. The workshop in Kanpur was the first to be confined to one industrial sector. During the workshop, slides taken in local tanneries and the results of the surveys were shown to demonstrate with real-life and local examples the existence of dangerous working conditions and ineffective production methods. The slides functioned as a trigger to provide the tannery owners and managers food for thought about the ways they were currently processing hides and skins and about methods to improve this process from the viewpoints of both productivity and occupational health. The workshop was followed by a study tour of local tanneries under the supervision of an ILO expert. For many tannery owners, this was the first time they had visited another tannery. Owners and managers, working in small groups, were then invited to design interventions and modifications that would enhance productivity and improve working conditions. This resulted in many proposals for industrial modifications. In seven tanneries, several of these modifications were paid for by the tannery owners and installed with technical support from the Occupational Health Program.

3. Emphasis on the combination of environmental and occupational health aspects from the sustainable-development perspective

The Pollution Control Board had identified the tanneries of Kanpur as one of the main polluters of the Ganges river. The Board had informed the owners that environmental laws were to be strictly enforced and ordered the construction of tannery wastewater treatment plants to prevent the direct discharge of tannery waste into the Ganges. In 1987, the Board closed some tanneries that did not comply with the requirements. Among the first activities of the Indo-Dutch project were the interception and conveyance of tannery wastewater, treatment of tannery wastewater, and the introduction of chrome recovery and reuse. The relatively simplicity of the process of adding magnesium oxide, the low investment costs, and the successful demonstration plant showed the tannery owners that clean technologies could also enhance productivity. Environmental protection, higher productivity and improved working conditions were all included in the promotion of the industrial modifications.

One of the most popular interventions was the general and local ventilation system, especially in the grinding, buffing and painting sections of the tanneries. Exhaust systems remove dust that damages freshly painted skins and at the same time prevents the inhalation of dust by workers. Originally, the collected dust, dyes and paint had just been dumped outside the plant. Paint and dyes, dripping from the walls, caused serious environmental pollution. It was soon realized that the environment inside and outside the walls all belonged to one ecological system and that prevention of pollution inside should not lead to pollution outside the walls of the tanneries. Dust, paint and dye were collected and disposed of as recommended.

4. Training and organizing tannery workers with participation of support and service groups

Indian labor laws allow the formation of safety and health councils [PRIA 1993]. Basically, these councils are groups of workers who are specially trained in first-aid and disaster management. During the first three years of the project, collaboration of tannery owners and workers for safety and health councils was quite encouraging. The first-aid training, provision of first- aid boxes, and the frequent visits of the project staff to the tanneries all contributed to the enthusiasm for safety and health councils. In the long run, however, these councils fell apart and the initial enthusiasm ebbed away. Long-term commitment of workers, apart from direct interventions through first-aid, proved to be difficult.

A second initiative to structure a support service for occupational health problems was the launch of an occupational health clinic. As the Workers State Insurance Scheme (ESI) services operated only during the daytime and as the ESI hospital and clinical ESI services were not functioning properly, the project decided to operate an occupational health clinic during the evening hours. Orthopedists and dermatologists of Kanpur Medical College held office hours twice a week to investigate complaints and symptoms of the musculoskeletal system and the skin. During 121 clinic sessions from mid-1991 to the end of 1993, 1139 workers visited the clinic. Unfortunately, Kanpur Medical College was not able to sustain this effort, and after 30 months of operation, the clinic had to close down, notwithstanding its popularity.

5. Rapid appraisal techniques to collect information about occupational health issues at the plant level

In order to increase participation of workers and owners at the plant level, the choice was made to use rapid appraisal techniques to collect information about working conditions and health complaints. The term "barefoot epidemiology", introduced by Blanc [Blanc 1995], emphasizes the fact that collection of data can be a crucial element for change in a participatory setting. Collection of data does not require specialist physicians or sophisticated industrial hygiene monitoring. Field workers with structured data-collection instruments and minimal training can accurately observe and estimate the exposures of workers to hazardous working conditions and the prevalences and incidences of major work-related health complaints and symptoms. Brief walk-through surveys of workplaces can disclose the numbers and types of hazards. Simple qualitative methods can disclose exposures to noise, dust, awkward ergonomic conditions, solvents, heavy metals, or pesticides [Blanc 1995].

During two surveys in May 1994 using simple qualitative assessment methods, the exposures to chemicals in air, chemicals in contact with the skin, dust, and adverse ergonomic conditions were evaluated [Öry et al. 1997a, Öry et al. 1997b]. These methods proved to be easy to apply and provided results that were useful to describe prevailing working conditions and the occurrence of health complaints.

Evaluation of the Occupational Health Program

The Occupational Health Program was evaluated twice: first during a mid-term evaluation in December 1991, and again during an impact survey in May 1994. The evaluation mission in 1991, consisting of three Indian and four Dutch mission members, structured its recommendations along the following points: progress, impact, sustainability and replicability [Dave at al. 1992]. Over all, the report was favourable, as summarized below: The mission concluded that the approach followed to involve the community in health-related activities had met with a positive response. In Kanpur, there were indications that living conditions were improving, e.g. public awareness and participation in public health and occupational health activities were evident. The active and self-sustained involvement of workers had been made possible through the agency of the health and safety councils that included both workers and employers. With additional support from the Directorate of Factories, the workers had been empowered by the initiation and monitoring of health and safety conditions within the working environment. The occupational health aspects deserved special attention. In the case of the tannery workers of Jajmau, the input of first-aid training, industrial modifications, and safety precautions had had a favourable impact on the health and safety conditions of the workers. More important, the subsequent formation of health and safety councils, comprising both workers and management, had potential in terms of social control over the working practices of tannery owners [Dave at al. 1992].

In May 1994, it was decided to evaluate the impact of the industrial modifications. Using simple qualitative assessment techniques, exposure assessment was performed at the individual level and comprised a qualitative ranking of exposures to dust, chemicals in the air, chemicals on the skin, and ergonomic stressors among 298 workers. In summary, no systematic difference between the exposure profiles of small/medium sized tanneries and large tanneries was observed. The qualitative assessments of exposure demonstrated to some extent that the industrial modifications had been beneficial in reducing hazardous working conditions [Öry et al. 1997a]. The second part of the impact survey consisted of a health survey among 418 workers to elicit information about respiratory disorders, skin complaints, and low-back pain, including questions about occupational accidents and sick leave. In summary, small/medium sized tanneries were found to have higher figures for accidents and sick leave. Job-related exposures to polluted water and chemicals and to awkward trunk postures were associated with higher prevalences of dermatitis and low-back pain, respectively [Öry et al. 1997b].

DISCUSSION AND CONCLUSION

Industrial counselling proved to be an effective strategy to involve employers, workers, and organizations active in the field of occupational health and safety. The participatory approach resulted in sustained industrial modifications and an increased awareness for occupational health issues. Occupational health could successfully be linked to environmental protection, quality improvement, and increased productivity through, for example, chrome-recovery units, exhaust systems, and automation of hydraulic press and transport systems. As a result of the successful industrial counselling approach taken by the Occupational Health Program in the tanneries of Kanpur, occupational health has now also been included in other industrial counselling projects within the bilateral cooperative effort of India and The Netherlands, e.g., in the textile, fertilizer and paper industries. The successful application of simple qualitative and other rapid appraisal methods at plant level will enable employers, workers, and individuals of non-governmental organizations to collect data to be used during negotiations with employers on the necessity to improve working conditions.

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Laudable Verdict

The Supreme Court's landmark judgment which holds that the right to health and medical aid of workers is a fundamental right under Article 21 of the Constitution guaranteeing the right to life should, if implemented properly, benfit millions throughout the country. The ruling was given in connection with a public interest litigation seeking remedial measures for the protection of workers engaged in mines and asbestos industries and adequate mechanism for the diagnosis and control of the killer disease asbestosis. The court's direction to compensate any worker in the asbestos industry suffering from occupational health hazards and to conduct tests to ascertain the presence of asbestos fibres in the workplace should serve to shake factory owners out of their complacency and make it that much more difficult to flout safety regulations. Besides, the court has insisted on all factories whether covered by the Employees State Insurance Act and Workmen's Compensation Act or not to provide compulsory health insurance to each worker. However, this ruling alone does not ensure that the workers are assured a better deal now. The existing Employees State Insurance Act of 1948 already provides for medical care in cash and kind, benefits in the eventuality of sickness, maternity, injury and pension for dependants on the death of a worker. Yet workers have not always been accorded justice and those in the unorganised sector have routinely been victims of inadequate safety measures in the workplace.

Though the law provides for workers to be treated in ESI hospitals, many of the ailments that they could contract at work are beyond the scope of the ESI hospitals. They are in no way equipped to deal with the harmful effects of industrial mutagens on human health — workers in the copper, chromium and other metal industries have been exposed to cancer-causing mutagenic changes in direct proportion to the period of exposure to the hazardous substance. Factory owners have invariably found dubious methods to circumvent the law wherever possible like employing workers for short periods before replacing them to avoid implementing the Workmen's Compensation Act. A worker is normally fired at the first sign of an occupation-related illness. The present judgment seeks to prevent this by directing that all asbestos industries at least maintain the health record of every worker up to a minimum period of 40 years from the beginning of the employment or 15 years after retirement or cessation of employment whichever is later. The factory owners will be unable, therefore to evade responsibility for any worker who may contract an ailment even after he is no longer in their employment. Stricter implementation of the law is essential at a time when there has been a phenomenal growth in chemical and allied industries without a simultaneous growth in safety conciousness.For this, along with providing more teeth to the law as the present ruling has done, workers themselves should be educated in the various asspects of industrial safety.

Chapter 11 Conclusions and recommendations

This chapter concludes this thesis with the final conclusions and recommendations, closely related to the original objectives of the thesis, as mentioned on page 12:

1. To analyze the policies and activities of international agencies and non-governmental organizations in the field of occupational health and to evaluate their impact on the protection of workers' health in low-income countries;

2. To investigate whether specific rapid appraisal techniques can be applied in low-income countries to assess working conditions and workers' health and to evaluate the impact of workplace improvements on exposure and health;

3. To review the possibilities of incorporating occupational health in international development cooperation.

Objectives one and three are dealth with in sections 11.1 and 11.2, while objective two will be discussed in sections 11.3 and 11.4.

11.1 International occupational health policy and workers' health in low-income countries: conclusions

Occupational health and safety is a neglected theme in low-income countries, not withstanding the fact that more than 1.2 billion workers in these countries are exposed to hazardous working conditions. Due to underreporting of occupational accidents and diseases, lack of trained occupational health personnel and the large share of workers working in the non-formal sector, which is largely out of sight and control of governmental institutions of occupational health and safety, there is a serious lack in our knowledge and understanding of the risks and the consequences of hazardous working conditions on the health of workers in low-income countries. It is largely left to the workers to protect themselves and look for opportunities and activities to prevent occupational diseases. Most employers in low-income countries have even neglected the most fundamental and basic official guidelines for safety and health regulations and contingency plans for disaster management at their premises.

Two basic hypotheses can be formulated with regard to the lack of effective actions to improve occupational health and safety. First, the main emphasis in occupational health has been on passive, defensive activities, such as the provision of personal protective equipment and dissemination of information. Production technology and process are still considered sacrosanct, not be interfered with. Second, the protection of workers' health is still organized in a top-down manner, with an attitude of charity and protection towards the workers, not based on fundamental human rights, nor regarded as an integral part of the enterprise as an essential part of quality production. Workers, fearing unemployment and not aware of their rights, are not involved in the improvement of their own workplaces.

There are very few serious efforts to increase their ownership and co-responsibility. Occupational health is still regarded as a health issue, not as a development issue, which should include environmental protection, quality production and human entrepreneurship.

International organizations, such as the ILO and the WHO, largely restrict their activities to general policy development and recommendations with regard to occupational health and safety. Attention for the enforcement of labor codes is weak or lacking in the large majority of low-income countries, but it is also largely a neglected area within the ILO and the WHO. The ILO and WHO have only a few local projects at plant level in low-income countries.

Occupational health care has still largely a medical, curative orientation with much less attention to primary prevention and solutions outside the medical area. This 'defensive' approach which restricts occupational health care largely to diagnosis and treatment of work-related diseases passes over the opportunities in primary prevention to make a strong impact on workers' health.

11.2 International occupational health policy and workers' health in low-income countries: recommendations

International organizations can play an essential role in developing and supporting occupational health programs at national level. Also, these organizations could be involved in local activities to promote occupational health concepts in local industries. At international level, the following actions are recommended:

First, ILO should act according to its tripartite composition in order to ensure the full co-operation of trade unions and employers' organizations to improve working conditions in low-income countries. International organizations should tailor their activities to local developments. For example, in a recent verdict of the Supreme Court in Delhi in India asbestos workers were compensated for their disease [Anonymus 1995 see page 128]. This verdict argues for better enforcement of labor laws concerning workers' health in India. ILO and WHO could offer assistance to set up an effective enforcement body.

Second, it is important to raise at international level political and public interest for the health of workers in low-income countries. Occupational health issues should de discussed within international trade agreements and international labor regulations. A promising step at international level could be the inclusion of two new indicators in the Human Development Index of the United Nations Development Program (UNDP): the number of countries which have signed ILO's basic human rights conventions and the number of registered fatal occupational accidents per country.

Third, it is recommended that the ILO and WHO promote the ratification and enforcement of ILO's basic human rights Conventions and of Conventions that encompass the right on a safe workplace.

Fourth, it is recommended that the WHO and ILO stimulate operational and applied research in the field of occupational health, with measurement of the impact of control methods or substitution of harmful production processes. These activities should be implemented at local level, with active participation of workers, employers, non-governmental organizations, trade unions and all other relevant stake holders. The WHO and ILO should strengthen their active local partnership policies and start projects at plant level.

Fifth, it is recommended that the ISO includes working conditions in their 9000 standards for quality control. A safe and healthy working environment should be reflected in the assessment of product quality. And, vica versa, it is increasingly recognized that safe working conditions contribute to increased product quality by reducing material loss, reduction of contamination of products during the various cycles of production.

Sixth, ILO and WHO should incorporate occupational health as an important cornerstone in the future development of primary health care. A large proportion of the general population is involved in industrial and other manufacturing processes. Laborers may experience much higher exposure levels than the general population at large. A healthy labor force is essential for any economic development. It should be realized, that the involvement of all stakeholders in activities with regard to workers' health is essential, to obtain sustainable results during the negotiations to protect workers [Fisher and Ury 1987].

Seventh, international organizations should be actively involved in training and eduaction of occupational health specialists in low-income countries. Short, specialized courses should be developed and offered at location to labor inspectorates and trade unions alike. In addition, these organizations should stimulate co-operation between research and training institutes in Western countries and their counterparts in low-income countries in order to facilitate a continuing transfer of knowledge and expertise.

Finally, it is recommended that working conditions be included in reviewing industrial processes, similar to the concept of industrial counselling as described in chapter 10 of this thesis. Life Cycle Analysis, Responsible Care and Product Stewardship are interesting new concepts which take workers' health into consideration. Responsible Care is a voluntary program of the chemical industry and its objective is to take care of all the environmental, safety and health aspects of chemical production, distribution, use and disposal. Product Stewardship is the same concept applied to any product throughout its life time. Life Cycle Analysis is a technique to quantify the impact on the environment, safety and health of workers of a given product, process or activity from the extraction of raw materials to their final disposal.

11.3 Rapid appraisal techniques, simple qualitative methods in the field of occupational health and safety: conclusions

Rapid appraisal methods, as applied in the tanneries of Kanpur, were useful to map exposure to hazardous substances in the air, dermal exposure, and awkward ergonomic conditions. The application of rapid appraisal techniques in the Occupational Health Program, executed in a participatory fashion, has resulted in industrial modifications which have contributed to improved working conditions. The relatively simple qualitative appraisal methods, such as those described in this thesis, are useful tools to build workplace profiles in a particular industrial setting on exposure to hazardous substances. These profiles can than be used by workers, trade union members and members of non-governmental organizations in the negotiations with employers for better working conditions.The qualitative techniques are important alternatives in the large majority of low-income countries, where there are no sophisticated quantitative methods to measure exposure levels.

11.4 Rapid appraisal techniques, simple qualitative methods in the field of occupational health and safety: recommendations

First, it is recommended to train workers, trade union members and members of non-governmental organizations in the application and analysis of the results of the simple qualitative methods as described in this thesis to estimate exposure levels. After the training, the trainees should be able to [Goelzer 1996]:

1. recognize obvious hazards and dangerous work practices;
2. identify and localize conspicious hazard sources;
3. recommend simple control measures;
4. recognize conditions which offer immediate danger, or are somehow suspicious and seem to require further study, and report on them to the next level of competence, for example, in a governmental department.

Second, it is recommended that the results of these rapid appraisal techniques are shared with all stakeholders and that the data collected serve in discussions and negotiations to improve working conditions [Öry et al. 1996].

Work is an important source of satisfaction, prosperity and progress. It is also an important source of illness and suffering. Well directed policies towards improving occupational health in low-income countries and the development and implementations of relatively simple methods of prevention and evaluation will form a major contribution to the health and wellbeing of many millions.

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Acronyms

AIC	AIC Engineering Consultants, Bombay, India
APELL	UNEP's Awareness and Preparedness for Emergency at Local Level
APP	Active Partnership Policy (ILO)
ARPLA	Asian and Pacific Regional Centre for Labor Administration
CIS	International Occupational Safety and Health Information Centre
CLRI	Central Leather Research Institute (India)
DALY	Disability Adjusted Life Years
DANIDA	Danish International Development Assistance
DEVCOP	Committee on Developing Country Matters (ISO)
DEVPRO	Program for Developing Countries (ISO)
DGIS	Directorate General International Cooperation (The Netherlands)
ESI	Employees' State Insurance Scheme
FINNIDA	Finnish International Development Cooperation Agency
GATT	General Agreement on Trade and Tariffs
GPD	Ganga Project Directorate (India)
ICOH	International Commission on Occupational Health
IDRC	The International Development Research Centre (Canada)
ILO	International Labor Organization
Indo-Dutch Project	Indo-Dutch Environmental and Sanitary Engineering Project Kanpur Mirzapur under Ganga Action Plan
IPCS	International Program on Chemical Safety
IOHA	International Occupational Hygiene Association
IOHSAD	Institute for Occupational Health & Safety Development (Philippines)
ISO	International Organization for Standardization
ITRC	Indian Toxicology Research Centre (India)
MDT	Multidisciplinary Teams (ILO)
NAFTA	North American Free Trade Agreement
NIOH	National Institute of Occupational Health (India)
OECD	Organization for Economic Co-operation and Development
OIHP	L'Office International d'Hygiène Publique

PACE	Prevention and Control Exchange
PAHO	Pan American Health Organization
PHC	Primary Health Care
PIACT	International Program for the Improvement of Working Conditions and Environment
PRIA	Participatory Research in Asia
SEU	Socio-Economic Unit
UNCED	United Nations Conference on Environment and Development
UNDP	United Nat ions Development Program
UNEP	United Nations Environmental Program
UNICEF	United Nations Children's Fund
VHAI	Voluntary Health Association of India
WHO	World Health Organization
WISE	Work Improvement in Small Enterprises
WTO	World Trade Organization

Summary

The labor force in low-income countries comprises more than 50% of the world's total labor force, but our knowledge about occupational health and safety in these countries is rather limited. A large proportion of the labor force in low-income countries is engaged in the non-formal sector, which is often not covered by labor laws and occupational health services. Even in the formal sector, labor laws are often not enforced. Development of labour standards and policies in low-income countries lag behind the industrial transformation in these countries with its rapid changes in technology and production methods. Export of hazardous waste and industries further endanger the health of workers in low-income countries. As shown in chapter three, international organizations in the field of labor standards and occupational health, like the International Labor Organization and the World Health Organization, are mainly active at the normative level, while their influence on the shop floor is limited.

This thesis is about the health and safety of workers in low-income countries and opportunities to improve their working conditions. It describes the Occupational Health Program of the Indo-Dutch Environmental and Sanitary Engineering Project Kanpur Mirzapur under Ganga Action Plan in Kanpur, India. The main objective of this program was the improvement of the health and safety of workers in tanneries of Kanpur. During a period of eight years, from 1988 to 1995, tannery owners, tannery workers and staff members of the Inspectorate of Factories, the Regional Labor Institute, the Employees State Insurance Scheme and Kanpur Medical College worked together in a program to simultaneously increase productivity and improve working conditions.

In the baseline survey, executed in 1989 among 497 workers in 20 tanneries, 28% of tannery workers showed signs of occupational morbidity, low-back pain being the most frequently mentioned symptom, followed by injuries, respiratory symptoms, and skin conditions, including chrome ulcers. Results of the baseline survey were presented to the tannery owners in 1990 during a workshop "A higher productivity and a better place to work" in close collaboration with the ILO. As a result of the workshop, seven tannery owners implemented industrial modification in their tanneries, such as local exhaust ventilation, mechanization of material transfer, installation of guards on machines, and introduction of trolleys.

The impact of these industrial modifications on the exposure to chemical agents and ergonomic stressors was assessed in 1994 among 298 workers in 15 tanneries using simple qualitative assessment methods. The occurrence of respiratory symptoms, skin complaints, and low back trouble was also assessed among 418 workers in the same 15 tanneries. Chemical and dermal exposure were highest among beamhouse workers, while relevant dust exposure was only observed during dry finishing activities. Most workers were exposed to severe physical load due to work in trunk flexion and rotation for more than 50% of their daily worktime. Manual material handling with loads more than 20 kg occurred frequently. The size of the tannery showed no systematic influence on exposure profiles. The survey suggested that mechanization of material transfer and application of trolleys reduced work-

time with trunk flexion and rotation and implied less manual lifting. The presence of local exhaust ventilation in large tanneries seemed to reduce the chemical exposure. In the cross-sectional survey on health symptoms, 61% of the workers complained of low-back pain, 38% had symptoms of asthma, 23% symptoms of dermatitis, and 14% complained of chronic bronchitis. In general, beamhouse workers reported the highest prevalences but only chronic low-back pain was significantly elevated compared with workers in the finishing department. When using individual exposure estimates, clear associations were presented for manual lifting over 20 kg and low-back pain, and dermal exposure and dermatitis. Frequent lifting of loads was also associated with self reported asthma. About 44% of the workers reported at least one period of sickness absence and 17% were involved in a serious accident, requiring a visit to a local physician. Logistic regression analysis showed that sickness absence occurred more often in small tanneries and also was significantly associated with low-back pain and occupational accidents. The surveys have demonstrated the importance and feasibility to apply rapid appraisal methods for evaluating the impact of hazardous working conditions at plant level.

Adopting the concept of industrial counselling, implying increased productivity, quality improvement, environmental protection, and improved working conditions, proved to be an effective strategy to improve working conditions in tanneries of Kanpur. The linkage of occupational health problems to environmental protection proved to be effective in drawing attention to working conditions.

It is recommended to approach working conditions in low-income countries from two angles: at the international level and at the plant-level, under the motto: "think local, act global". Rapid appraisal techniques, such as used in these studies, are valuable assets to demonstrate hazardous working conditions and to draw attention to places where improvements and protection of laborers are imperative. Activities at international level should strongly support the development at local level.

Samenvatting

Meer dan de helft van de werkende bevolking woont en werkt in lage lonen landen, maar onze kennis over beroepsziekten en veiligheid op de werkplaats in deze landen is nogal beperkt. Een groot gedeelte van de werkende bevolking in lage lonen landen heeft een betrekking in de informele sector, die niet wordt bereikt door arbeidswetgeving en diensten voor bedrijfsgezondheidszorg. Zelfs in de formele sector wordt in lage lonen landen de arbeidswetgeving nauwelijks afgedwongen. Beleidsontwikkeling op het gebied van arbeidsomstandigheden in lage-lonen landen loopt achter bij de snelle veranderingen in deze landen door industriële transformatie, waarbij eenvoudige productiemethoden worden vervangen door moderne productie processen. Export van gevaarlijke stoffen en industrieën naar lage-lonen landen vormen een andere gevaar voor de gezondheid en veiligheid van de beroepsbevolking. Internationale organisaties, zoals de Internationale Arbeidsorganisatie (ILO) en de Wereldgezondheids-organisatie (WHO) hebben vooral een normatieve en adviserende functie en hun invloed op de werkvloer wat betreft de bescherming van de gezondheid en veiligheid van de beroepsbevolking in lage lonen landen is beperkt.

Dit proefschrift gaat over de gezondheid en veiligheid van arbeid(st)ers in lage lonen landen en over mogelijkheden om de arbeidsomstandigheden in deze landen te verbeteren. Het beschrijft het "Occupational Health Program" van de Indo-Dutch Environmental and Sanitary Engineering Project Kanpur-Mirzapur under Ganga Action Plan in Kanpur, India. De voornaamste doelstelling van dit programma was het verbeteren van de arbeidsomstandigheden in de leerlooierijen van Kanpur. Gedurende een periode van acht jaar, van 1988 tot en met 1995, hebben werkgevers, arbeiders en stafleden van de Fabrieksinspectie, het Regionale Arbeidsinstituut, van de Werknemers Verzekeringsfonds en van de Medische Faculteit van Kanpur samengewerkt in een programma met als doel de productiviteit in de leerlooierijen te verhogen en tegelijkertijd de arbeidsomstandigheden te verbeteren.

Het eerste oriënterende onderzoek (base line survey) werd uitgevoerd in 1989 in 20 looierijen, waarbij 497 arbeiders werden onderzocht. 28% van hen vertoonde verschijnselen van beroepsziekten, waarbij lage rugpijn het meest werd genoemd, gevolgd door bedrijfsongevallen, klachten van de ademhalingsorganen en tenslotte huidafwijkingen, waaronder chroom-zweren. De uitkomsten van het oriënterend onderzoek werden in 1990 aan de werkgevers gepresenteerd gedurende een workshop "Een hogere productie en een betere werkplek", dat in nauwe samenwerking met de Internationale Arbeidsorganisatie werd georganiseerd. De workshop had tot gevolg dat in zeven leerlooierijen de eigenaren op eigen kosten verbeteringen aanbrachten, zoals afzuiginstallaties, rails om het leer te transporteren, machines werden beschermd en trolleys werden geïntroduceerd.

In 1994 werd het resultaat van deze verbeteringen op de blootstelling aan chemische stoffen en ergonomische belasting gemeten bij 298 arbeiders in 15 leerlooierijen, waarbij eenvoudige kwalitatieve methoden werden gebruikt. Klachten van de luchtwegen, van de huid en lage rug pijn werden ook onderzocht bij 418 arbeiders in dezelfde 15 leerlooierijen. Blootstelling aan chemische stoffen in de lucht en op de huid waren het hoogste in de hallen met de looiputten, terwijl blootstelling aan stof alleen merkbaar was in het gedeelte

waar het leer werd gepolijst. De meeste arbeiders waren blootgesteld aan hoge fysieke belasting van de rug door een gebogen houding van het lichaam langer dan 50% van de dagelijkse arbeidstijd. Het met de hand tillen en verplaatsen van materiaal dat meer dan 20 kilogram woog werd vaak waargenomen. De grootte van de looierij, waarbij de kleine looierijen met hun eenvoudig arbeidsproces tot de informele sector kunnen worden gerekend, had geen systematische invloed op de blootstellingsprofielen. Het onderzoek leverde aanwijzingen op dat het moderniseren van het materiaal transport en het gebruik van karretjes de totale arbeidstijd die met gebogen of gedraaide rug werd doorgebracht had verminderd, waarbij ook de tijd dat het materiaal met de handen werd opgetild werd gereduceerd. De aanwezigheid van plaatselijke afzuigsystemen in de grote leerlooierijen leek de blootstelling aan chemische stoffen te verminderen. In de dwarsdoorsnede studie over lichamelijke klachten, had 61% van de arbeiders klachten over lage rugpijn, 38% had asthmatische verschijnselen, terwijl 14% van hen over chronische bronchitis klaagde. In het algemeen hadden arbeiders in de hallen waar de looiputten stonden de meeste klachten, maar alleen chronisch lage rugpijn verschilde statistisch significant met de arbeiders van de afwerk afdelingen. Met individuele schattingen van blootstelling, werden duidelijke verbanden gevonden tussen het tillen van materiaal van meer dan 20 kilogram en lage rugpijn en tussen blootselling van de huid aan chemische stoffen en dermatitis. Het vaak heffen van gewichten was ook geassocieerd met astmatische klachten. Ongeveer 44% van de arbeiders meldde tenminste één periode van ziekteverzuim en 17% was betrokken bij een ernstig ongeval, dat een bezoek aan een lokale arts vereiste. Logistische regressie analyse toonde aan, dat ziekteverzuim vaker voorkwam in de kleine leerlooierijen en ook statistisch significant was geassocieerd met lage rugpijn en bedrijfsongevallen. Dit onderzoek heeeft het belang en de toepasbaarheid van eenvoudige snelle methoden om blootstelling aan gevaarlijke stoffen en lichamelijke symptomen op de werkvloer via eenvoudige kwalitatieve methodieken te schatten, aangetoond.

Het concept van industriële advisering (industrial counselling), dat tegelijkertijd gericht is op het verhogen van de productie, het verbeteren van de product kwaliteit, het beschermen van het milieu en het verbeteren van de arbeidsomstandigheden, bleek een doeltreffend strategie te zijn om de arbeidsomstandigheden in de leerlooierijen van Kanpur te verbeteren. De relatie tussen arbeidsomstandigheden en bedrijfsgezondheid en het beschermen van het milieu bleek doeltreffend om aandacht te vestigen op de arbeidsomstandigheden.

Het wordt aanbevolen om arbeidsomstandigheden in lage lonen landen van twee kanten te benaderen: op het internationale vlak en op de werkvloer, onder het motto: "think local, act global". Snelle evaluatie methoden, zoals beschreven in dit proefschrift, kunnen waardevolle bijdrage leveren om gevaarlijke arbeidsomstandigheden aan te tonen en de aandacht te vestigen op plaatsen op de werkvloer, waar verbeteringen en bescherming van arbeiders noodzakelijk zijn. Internationaal beleid zal deze ontwikkeling krachtig dienen te ondersteunen.

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About the author

Ferenc (Ferko) Gyula Öry was born on October 5th, 1944 in Budapest, Hungary. He left Hungary in 1956 for The Netherlands. During his study at the medical faculty of the University of Amsterdam he met his wife Maaike Hoorweg and both graduated in 1975. In 1975 professor Valkenburg offered hospitality at the Department for Epidemiology at Erasmus University, Rotterdam. From 1976 to 1980 he pursued his specialization in pediatrics at the Sophia Children's hospital at the Erasmus University, under the stimulating guidance of professor HKA Visser. From 1980 to 1983 he was team leader of the Community Health Development Project at the Hasanuddin University in Ujung Pandang, Sulawesi, Indonesia. His stay among the fishers of the small village of Pattotongan, Jeneponto in Sulawesi, contributed much to his later choice for public health in international development cooperation. From 1983 to 1986 he worked as head of the department for general pediatrics at the Wilhelmina Childrens' Hospital of Utrecht University. In 1986 he joined the Primary Health Care group at the Royal Tropical Institute in Amsterdam, working as a public health consultant and teacher at international courses. In 1992 he started to work at the technical advisory section of the Ministry of Foreign Affairs, The Hague, until 1995. He joined Médicins Sans Frontières several times in the field. Currently he is Regional Advisor for Health, Population and Nutrition for Southern Africa at the Royal Netherlands Embassy in Harare, Zimbabwe. He is married to Maaike Hoorweg. They have four children: Gyula, Merijn, Janti en Sándor.