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21326

Distr.
LIMITED

ID/WG.541/11(SPEC.)
22 December 1995

United Nations Industrial Development Organization

ORIGINAL: ENGLISH

-
- First Global Consultation on Environmental Management/Cleaner Technologies in the Metallurgical Industry
 - Vienna, Austria, 16-18 October 1995

***MAIN PRESENTATIONS AT THE FIRST GLOBAL
CONSULTATION ON ENVIRONMENTAL
MANAGEMENT/CLEANER TECHNOLOGIES
IN THE METALLURGICAL INDUSTRY****

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The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Secretariat of the United Nations Industrial Development Organization (UNIDO). Mention of firm names and commercial products does not imply the endorsement of UNIDO. This document has not been edited.

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The Steel Industry's Central Role in Sustainable Development

by Ian Christmas, Deputy Secretary General
International Iron and Steel Institute, Brussels

I was very pleased to accept the invitation from UNIDO to address this meeting. The steel industry is by far the largest and most important metallurgical industry in the world today. Steel is the premier engineering and construction material of modern man. Steel is also deeply conscious of its commitment to reconcile its central role in the improvement of the quality and standard of life of mankind with the protection of the environment.

Steel is an enthusiastic supporter of the concept of sustainable development, that is the need to satisfy the needs of the present generation without comprising the ability of future generations to do the same. On the occasion of the Earth Summit in Rio in 1992, members of IISI adopted a statement on the environment which underlines the priority which steel gives to sustainable development. Our Statement set out the principles that we believe lead to environmental excellence in the operations of our industry. I intend to use these principles as the framework for my remarks this morning. But first I shall briefly introduce IISI to those of you who are not familiar with our Organisation.

IISI is the world forum for the steel industry. We are a non-governmental private organisation based in Brussels. Our members are steel companies in 50 countries around the world. These include 55 of the top 60 companies and in total our members account for nearly 75% of the total world steel production in the market-based economies. Our members are both public and private owned companies and our membership is as strong in developing countries as in the industrialised countries, and with electric-arc steel producers as well as with integrated steel producers. We represent producers of flat steel products, long steel products, special steels, engineering steels and stainless steels.

The role of the Institute is to bring the industry together to exchange ideas and knowledge and thereby improve the competitive position of steel. The focus of our activity is in six main areas. These are: Technology, Environment, Statistics and Economic Studies, Raw Materials, Human Resources, and Promotion and Market Development.

A very recent illustration of our work is the decision by 32 steel companies in all five continents to work together in a 20 million US dollar consortium to design and build a ultra-light steel autobody. This project is being undertaken in conjunction with Porsche Engineering in the USA and has already demonstrated that it is possible to reduce the weight of a mid-sized passenger car by 25% without incurring any extra costs to the manufacturer. This is not the case with other materials such as aluminium, which can only achieve similar levels of weight saving at a fundamentally higher cost.

The subject of the consultation over the next three days is Environmental Management in the Metallurgical Industry. IISI's Statement on the Environment is primarily addressed to its own members, and gives guidelines on how environmental considerations should be incorporated into every aspect of the management of a steel enterprise.

I would like to stress that we see no conflict between these principles, which are appropriate for our industry, and the more general principles which are set out in the International Chamber of Commerce Business Charter on Sustainable Development.

The Institute has given its support to the ICC Business Charter which has also been endorsed by many individual companies.

There are ten elements to our Statement on the Environment:

1. Sustainable Development

The first and the most important element is the requirement to incorporate the principles of sustainable development into decision-making at all levels and throughout the life cycle of our products and processes. We believe the principles of sustainable development are fully compatible with the operation and development of the steel industry. We are fortunate that the steel industry makes use of some of the most abundant natural resources in the world, such as coal and iron ore, which are unlikely to run out in the next thousand years. More importantly, now over 40% of total steel production is based on recycled rather than virgin materials, and this has been growing proportionately in recent years. Steel is the most recycled of all materials.

2. Decision-making

It is important to incorporate sound science, risk assessment and cost benefit analysis in establishing the priorities and standards for continuous and fundamental improvements in environmental performance. We believe that investment should first be made where the environmental benefits are highest.

3. Environmental Protection

Environmental protection must include the creation and support of an internal organisation to integrate effective management policies and practices into each business activity as an essential element of sound management. Most steel companies have established a clear environment policy for their business and have designated the senior manager who is personally and directly responsible for the company's environmental performance. In many companies the specialist environmental department is large reflecting the complexity of national and local requirements and the major investment programmes that have been made by industry. However the most important point is that the management at the top of the company must set the priority for environmental protection and lay down clear policies from which other members of staff can operate.

4. Environmental Management Systems

Environmental management systems within a steel company include those to ensure the safe and responsible life cycle management of chemicals and processes, and systems to measure the environmental impact of current or any planned new processes. They include the internal auditing of environmental performance, and systems to ensure rapid response to any emergencies.

5. Environmental Technologies

The steel industry of the 1950's and 1960's was a major source of air pollution and addressing this problem has accounted for nearly over 50% of total expenditure on environmental control by the steel industry over the last two decades. The results have been dramatic. For example, in Germany, emissions dropped from over 9 kilograms per ton of crude steel or 300,000 tons of material in the early 1960's, to 2.4 kilograms per ton or less by the late 1970's, and below 1 kilogram per ton today. We estimate that over the last decade, over 10% of the total capital expenditure by the steel industry has been on environmental control equipment.

For our member companies this represents an investment over the last ten years of close to 20,000 million US\$.

6. Resource Management

The steel industry has sought to ensure that a greater percentage of available scrap is collected and returned to steel plants. Nearly 100% of the ferrous materials for the passenger car are now recycled thanks to steel's unique advantage of being magnetic, which facilitates separation. In most countries steel packaging is the leading material for foods and beverage cans and the target of increasing the percentage recycled should help to minimise the quality dumped in landfill with other household waste.

Today about 90% of the solid by-products waste generated in steel production can be recycled, either by treatment or recharging to the process or through the sale of the material. The most significant volume relates to the production of slags. The steel industry has developed applications for blast furnace slag for road aggregate and cements.

7. Energy Management

The steel industry is a major use of energy. Accordingly the focus on energy efficiency has been very strong and as a result savings of nearly 20% in total specific energy consumption have been achieved since the 1970's.

This is a result of a number of factors. Firstly the replacement of obsolete steelmaking processes and secondly the replacement of ingot casting with continuous casting of steel. The percentage of continuous cast steel in market-based economies rose from under 10% in 1970 to well over 80% last year. Continuous casting saves energy by the removal of a complete process stage in the manufacture of steel, and by significantly reducing the amount of crude steel required for each ton of finished steel supplied to the customer. Thirdly the installation of waste-heat recovery units on major production facilities and fourthly by the optimisation of operating practice and the rationalisation of products.

8. Education, Training and Information

Environmental improvements can be achieved by educating every single employee to the benefits of operating in full awareness of the environmental impact of their action. There are many examples where general education programmes for the total workforce has lead to significant improvements in the environmental performance of steel plants. An informed debate in the community on the steel industry's impact on the environment requires an open dialogue and comprehensive reporting by steel companies. We encourage IISI members to report on their environmental policies and programmes and on key operating performance data.

9. Research Innovation and Technical Co-operation

Observers of the steel industry today will know that the pace of technical change and development in our industry is faster than at probably any time in its history. Not only are there dramatic improvements in the efficiencies as a result of the introduction of new technologies such as thin slab or strip casting, but the rate at which new steels are being developed is passing onto our customers major opportunities for savings in the weight of steel used in many applications. The importance of this research and development effort and product innovation programme to continuous improvement in steel's environmental impact cannot be overstated.

10. Government Requirement

The steel industry recognises that environmental issues will continue to be a high priority. Investments will be maintained in research and development on new recycling and environmental control technologies. New steelmaking processes will be cleaner and more energy efficient.

However today in many areas, the steel industry is close to the limit on what can be achieved from existing technology. Further significant improvements in either its emissions or its consumption of energy will require the development of new processes which are unlikely to become commercially feasible before the next century. A case in point is a generation of significant volumes of CO₂ by the steel industry as the inevitable by-product of the reduction of iron ore to pure metal in the blast furnace. No feasible economic alternative to blast furnaces exists today for the bulk of iron production, and therefore the ability of the industry to reduce CO₂ emissions beyond that achieved over the last 20 years is strictly limited. Accordingly, the proposals to introduce carbon taxes which form part of the agenda of the UN Framework Convention on Climate Change, represent a significant threat to the steel industry's ability to innovate and develop in the future.

A key issue in the next decade is the trade-off and priorities given to further environmental control within our industry. In some areas the steel industry is entering the area of rapid diminishing returns to further expenditure where the level of further improvement achieved cannot be justified in terms of its use of scarce economic resources.

These are the set of principles which we believe should guide environmental management in our industry.

I would now like to say a few words on the present programme on environmental issues being pursued by the steel industry through our Institute.

The priority given to environmental issues is underlined by the creation three years ago of a Committee of the Board of Directors specifically charged with the responsibility of overseeing the steel industry's environmental policy. This Committee, which is chaired by the Chairman of Hoogovens Group, and has representation from the heads of steel companies in all parts of the world, has been very active in promoting and encouraging the steel industry to take a pro-active role in the ongoing environment debate in our societies.

Life Cycle Assessment

At its annual meeting in Rio de Janeiro two weeks ago, the Board of Directors of the Institute gave the go-ahead to the undertaking of a 800,000 dollar project on producing a comprehensive life cycle inventory database for the steel industry. This will be for 15 steel products with applications in automotive, construction and packaging, and include data from steel plants in all five continents. Life cycle assessment is a tool which is increasingly being used to study the environmental impact of the production and use of a product or service. It involves an analysis of the totality of the use of materials and output of emissions over the complete life cycle of a product from the extraction of raw materials, its production, distribution, use and its recycling or disposal. Life cycle assessments can be useful in identifying the priorities for improvements in process or product design. They enable trade-offs in environmental improvements to be identified. One example is where further reduction of emissions to air from a steel plant can only be achieved using significant increased quantities of electrical energy. The production of this energy can generate greater emissions of dust from the power station so that the overall impact of a policy of seeking further reduction in emissions at the steel plant is to increase total emissions of the system.

The reality in the field of environment is that the issues are complex and involve trade-offs for society. There are many cases where choices or priorities have to be made both by steel enterprises and society as a whole, and life cycle assessment can be valuable in this regard. The steel industry is anxious to play a full and informed role in this debate with both its customers and society as a whole, and therefore feels it is necessary for it to place in the public domain a comprehensive set of data outlining the environmental impact associated with the production of steel products up to the moment of their despatch to their customers.

Co-operation with UNEP

IISI works closely with the United Nations Environment Programme. We are currently completing the production of a major publication entitled "Guidelines on Environmental Management in the Steel Industry". This will be published at the beginning of next year jointly by IISI and UNEP. It will be available in English, French and Spanish and will represent an important point of reference for both steel managers and government and regulatory agencies wishing to understand the key environmental management issues in our industry and the best management practices which are used. I am only sorry that this publication is not available for distribution at this meeting, but I commend all the participants here to consult the document when it is published next year.

ENCOSTEEL

To encourage an open exchange of information on best practice in environmental management in the steel industry, IISI has sponsored a number of major international conferences in recent years. In 1993 we published a comprehensive set of papers outlining the state-of-the-art on environmental management which were prepared for a conference in Dusseldorf in 1992. Preparations have already started for the next major conference which will be held in Stockholm in June 1997 entitled "ENCOSTEEL 1997".

The time and venue have been chosen since it will be the 25th Anniversary of the foundation of UNEP in Stockholm in 1972, but it will also be the 250th Anniversary of the Swedish Jernkontoret which is the world's oldest steel industry association.

The Environment Committee of the Institute is anxious to ensure that exchange of information and technology occurs throughout our membership in the world. This year the Committee held a Seminar in Prague jointly with the Czech Metallurgical Society to enable our members and other steelmakers in Central and Eastern Europe to discuss environmental management issues with their colleagues in other parts of the world. Last year the Environment Committee held its meeting in Brazil to enable a greater participation amongst our members in Latin America.

ISO

Most of you are aware of the very active work currently underway within the ISO organisation based in Geneva developing standards in the field of environmental management. IISI is accredited to all the working groups of TC207 and disseminates information on the 14,000 series of standards to its members. However our own direct involvement has focused on developing standards for life cycle assessment and we field teams of experts from the steel industry at each of the regular working sessions of SC5.

The development of clear generic standards in the field of environmental management is beneficial and we commend them to our members. We only remain concerned to ensure that there is no unnecessary duplication of effort between the establishment of quality management and environmental management standards in steel companies, and secondly that the whole field of standards is not used as an artificial barrier to trade between countries. It is our belief that excellence in total quality and in environmental management are both give positive benefits to the overall management of steel companies and that good and professional standards in this area can but help steel companies and their customers.

I would like to end by summarising the steel industry's environmental policy. "Member companies of IISI are committed to providing leadership in achieving a high standard of environmental care while contributing to the needs and prosperity of society through the production of steel". May I close my remarks in wishing all the participants in this consultation over the next three days, an open and productive exchange of views. I hope you will not hesitate to contact me either here or subsequently in Brussels if there is any information or any other way in which the Institute can help you. Thank you for your kind attention.

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THE IRON AND STEEL INDUSTRY IN INDIA

U.K. MITTAL

General Background

Steel is an essential input to development and the hallmark of the economy of several countries worldwide. Though as a product, steel is considered environmentally friendly, because of its almost infinite scope for recycling, its production through multiple steps ranging from extraction of raw materials to dispatch and reuse of finished products has many environmental implications. Steel making is also an energy intensive process.

All industrial production processes depend upon natural resources for input (source) and for disposal of waste (sink). Environmental problems are created either when inputs are demanded beyond the regenerative capacity at the source and/or when wastes overwhelm the recycling and/or absorptive capacity at the sink. The pressure on the source and the sink is determined by the efficiency of the process. The conversion process must be made as efficient as possible so as to provide a much higher output of goods and services from the same resource base and hence reduce waste in the form of pollutants in the gaseous, liquid or solid forms.

Pollution Scenario in the Indian Steel Industry

In the Indian subcontinent, like elsewhere, selection of technologies based on the criterion of "lowest initial capital investment" has resulted in a basketful of technologies which are obsolete and which exert increasing pressure on the natural resource base.

Most of the steel plants in India were installed and commissioned during the late fifties and early sixties. Plants in the private sector, like Tata Iron and Steel Company (TISCO) and Indian Iron and Steel Company (IISCO), were commissioned much earlier. Basic pollution control equipment installed with the available technology prevailing at that time was geared mainly to satisfy operational needs. Adverse changes in the raw material characteristics, obsolescence of the process technology, inadequate growth of infrastructure facilities and lack of timely availability of funds for replacement, led to situations where process emissions and effluents could not match the increasingly stringent Government Standards and statutes. Beside the steel making technology in itself was responsible for contributing to pollution. Some of these technologies are existing even today. Such as :

- Wet quenching of coke
- Bell charging system of Blast Furnaces
- Desiliconising of high silicon hot metal
- High ash coal contributing to large generation of slag
- Open hearth steel making
- Conventional ingot casting and rolling leading to higher scale and scrap generation apart from high consumption of energy

Catalysts for change

Starting with the Stockholm conference on environment (1972), emphasis began to be given gradually to integration of environmental concerns with the development process. In the initial stages of this changeover, environment remained an "add on" component with emphasis on "end of pipe" treatment. Rapid industrialisation coupled with reliance on inefficient obsolete

technologies built up a backlog of environmental problems - land degradation, air pollution, water and noise pollution, specially in the areas with concentration of industrial units.

The linkage between Industrial pollution and human health compelled authorities to initiate pollution prevention, or atleast control programmes.

Environment management in the metallurgical and other core sector industries fell within the purview of several national legislations, prominent among these are

- Prevention & Control of Pollution Act for Water, 1974
- Prevention & Control of Pollution Act for Air, 1981
- Environment (Protection) Act., 1986

Policy Initiatives of the Government of India

The Government of India's announcement of its "Policy statement for abatement of pollution" February 1992 gave a much needed fillip to the promotion of "Preventive" rather than "Curative" strategy for pollution. The policy recognises that mere notification of laws is not enough. Instead, the focus has to be on integration of environmental concerns in the development, planning and pollution prevention at source, by encouraging development and application of best available technical solutions.

Present Status of Pollution Control in Indian Steel Industry, especially SAIL

The Indian Steel industry is today in the midst of a major transformation. Efforts to control pollution and manage the steel works environment are being targeted through multipronged approaches.

At Steel Authority of India Limited, for example, environment management and energy conservation are thrust areas of attention. Three approaches are currently being adopted :-

Modernisation Programmes :

Three of the major steel plants at Durgapur, Rourkela and Bokaro are undergoing technological upgradation. Apart from this, major investments are being made for expansion of rolling facilities at Salem Steel Plant and for continuous casting facilities at Bokaro. The Modernisation programmes would contribute significantly towards improved environmental status at plants because many of the outmoded and excessively pollution generating process are being replaced by energy efficient plants with modern pollution control facilities. (Financial Allocation : Rs. 480 Crores or \$ 150 million for Pollution Control at Durgapur, Rourkela, Bokaro Modernisation)

Pollution Control Action Plan :

To tackle pollution from the existing production facilities, a Pollution Control Action Plan was formulated for SAIL plants in 1992. The Action Plan takes into consideration the technology level at steel plants and suitable control facilities that can be accepted. The IISI Action Plan

schemes with financial allocation of around Rs. 425 crores or \$ 130 million are under various stages of implementation. About 80 percent of this action plan has already been completed.

Addition/Modification/Replacement (AMR) Programmes :

While the Action Plan covers the major areas from environmental angle requiring urgent action, a continual drive to tie up other areas through small and medium sized schemes is maintained under the AMR schemes.

Benefits of Environment Management & Pollution Control Schemes

Concerted efforts to improve the pollution status over the last few years by upgrading the existing pollution control facilities (1125 air pollution control facilities and 202 water pollution control facilities) in SAIL plants and mines and installation of new control facilities in the upcoming production units has shown the following benefits :

- Effluent discharged from all SAIL units conforms to national norms for pollution control.
- Ambient Air quality and Noise level around the steel plants and mines and surrounding townships are generally within norms.
- Particulate emissions from majority of stacks (around 80 %) are within the national standards.

Resource Optimisation at SAIL Plants

In a high raw material consuming industry as steel, where for every tonne of steel produced, approximately equivalent amount of waste is generated, resource conservation has a tremendous impact on both upstream and downstream facilities. SAIL is striving to achieve resource conservation through the following measures :

• Improvement in process technology

Coke making :

- Introduction of PBCC and Stamp Charging in Coke Ovens
- Ceramic Welding to prevent cross-wall leakages
- Phasing out conventional short Coke Ovens by taller and wider batteries

Iron Making :

- Increasing sinter percentage in Blast Furnaces
- Improving Coke quality
- Coal Dust Injection
- Maintaining higher top pressure and higher blast temperature

Steel Making :

- Replacement of Open Hearth Furnaces by Basic Oxygen Furnaces
- Phasing out of Ingot Casting and switching over to Continuous Casting

• Reuse/Recycling of Wastes Generated

- Increased Sinter Production Facilities
Being the scavenger unit of a steel plant, Sintering plants make use of fines generated during mineral extraction processes and the ferruginous wastes generated from various processes of steel production. Percentage of sinter in Blast Furnace feed in SAIL plants varies from 53 to 75 percent
- Increasing the scrap consumption in Steel Melting Shop
- Use of wastes as raw material inputs in other applications
- Cast House Slag granulation facilities for Blast furnace slag. Granulated slag is sold to cement manufacturers.
- Networking with Railways and national research laboratories for increasing the use of BOF slag as rail ballast.
- Exploring the technologies and market for fly-ash bricks, aggregate, etc.

Energy Conservation :

The sustained efforts towards energy conservation have resulted in the reduction of specific energy consumption from 11.42 Gcal per tonne of crude steel in 1986-87 to 8.82 Gcal per tonne of crude steel in 1994-95, a reduction by 23 percent. Some of the main areas have been :

- Use of better coal blend
Modernisation of Blast Furnaces e.g. introduction of bell less top for uniform distribution of burden
- Usage of more sinter in the burden
- Increased use of concast technology
- Replacement of open hearth furnaces by basic oxygen furnaces
- Installation of microprocessor based combustion controlled system

Current Trends In Environment Management In The Indian Metallurgical Industry - Role of Cleaner Technologies

As outlined above, although concerted efforts are on in the Indian steel industry to better manage the steel works environment, there is tremendous scope for improvement in terms of resource optimisation and efficiency improvement. Efficiency improvements in technology can lead to reduced pressure on the resource base, both on the source and the sink side and result in the increased production of goods and services. Cleaner technologies are considered to be the appropriate answer to achieve the following :-

- Waste prevention and minimisation by reduced consumption of raw materials
- Modification and upgradation of the process so that the optimal utilisation of natural resources is achieved
- Adoption of a preventive, rather than a corrective approach to pollution abatement.

The major environmentally cleaner emerging technologies in the global steel technology scenario are :

- Corex
- Hi-Smelt
- DIOS
- Romelt

All these technologies can be categorised under one head viz. smelting reduction technologies. These technologies involve direct reduction & smelting of lump ore/pellets/ore fines into hot metal using non coking as the fuel by-passing the environmentally polluting coke making and sintering processes .

Of the above technologies , Corex has already reached commercial scale application and remaining three are under development on a demonstration scale.

The adoption of cleaner technologies in the developing countries is usually hindered not merely by lack of capacity to manage technological change, but also by the lack of region specific information which can be easily retrieved . The Government of India is currently making operational a ambitious Cleaner Technology Promotion Network Programme through the networking of several specialised agencies. The priority areas identified for this network are steel, cement, fertilisers and pesticides, chemicals and allied industries, thermal power with emphasis on boiler design and clean coal technologies and transportation sector.

It is hoped that the adoption of the cleaner state-of-the-art technologies, essential for efficient industrial operations and environmental management shall be facilitated through this networking to achieve the objective of sustainable development.

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Non Ferrous Metals Industry - Action Plan

Sanjeev Ranjan

Most of the speakers so far have talked of the work done on environmental management in the iron and steel sector. No doubt steel industry being the largest and most important metallurgical industry it has to play a leading role but the problems being faced by other metallurgical industries are similar and immediate challenges in most of the metallurgical industries relate to control of air pollution by SO_x , NO_x and CO_x solid waste disposal, recycling and waste water treatment.

I would like to suggest that we should put in place an institutional mechanism of intersectoral cooperation and consultation involving the international world forums for mining and metals like steel, aluminium, zinc, lead and nickel. Some of these world forms have already done commendable work and bringing their efforts together would greatly strengthen the environmental management practices in the metallurgical industry.

To give an idea of the work done in the field of other metallurgical industries I would like to present the case of copper industry in India.

Hindustan Copper Ltd. which is the major copper producer has from the beginning been taking adequate pollution control measures. Talking of solid pollutants, tailings which is the major effluent from the concentrator plant are stored in tailing dams. Slag coming out of the flash furnace is granulated and sold to cement manufacturers. For control of air pollution, the off gases are laid through, cyclone and electrostatic precipitations for dust removal so that the air emitted conforms to emission standards. SO_x bearing off gas is treated in gas cleaning plant for removal of traces of dust and SO_x and production of H_2SO_4 . For treating liquid effluents from concentrator, smelter, acid plant and refinery there are individual treatment plants after which, for settling, water is stored in lagoons, which is then recycled.

For further improving the environmental condition and in keeping in view of the regulatory requirements of Pollution

Control Board the company has in the last two years made an investment of Rupees 150 Crores for installation of:

- (i) double hood oven convertors
- (ii) additional gas cleaning plant
- (iii) H₂SO₄ plant
- (iv) alkali scrubbing plant

For energy conservation and for obtaining higher sulphur recovery, oxygen enrichment of flash furnace process air has been introduced.

Similar arrangements for pollution control have been adopted by the Zn and Pb industry. But in some cases the industry in order to comply with the regulatory requirements have resorted to short term end-of-pipe solution which may become inadequate over time and there is a need to find safe recycling solutions for which interregional/intersectoral experience sharing/consultation would certainly be mutually beneficial.

Energy conservation, pollution control and environmental management go hand in hand and in keeping with Agenda 21 adopted at the UN Conference on Environment and Development there is a need for the metallurgical industry to adopt strategies for sustainable development. Increasingly stringent regulatory requirements, implications of Based Convention and the proposal to introduce carbon tax in some countries call for larger investment in research and development on new recycling and pollution control technologies for the industry to develop in the future.

In the case of the steel industry a system of regional/global conferences and regular publications has been initiated and a similar arrangement covering all sectors of the metallurgical industry is required to be put in place for open exchange of information.

For funding such environment management activities, resources may be generated with contributions from waste exporting countries keeping in view the basic principle that the Polluter Pays for the wastes generated.

I am sure that there is no doubt in the minds of any one of us that in mining, extraction, processing and handling of metals greatest care should be exercised to safeguard the human, animal and planet life from harmful effects. There is no development alternative to sustainable development and I am sure that by the end of the conference we should be able to chalk out a clear plan of activities for achieving it.

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Experiences and Needs in the Latin American Steel Industry

Author : Ing. Luis Alberto Trama
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· Technical Secretary of the CADIMA (Advisory Council of the ILAFA Board of Directors on Environment)
· Regional Coordinator for UNIDO Projects in Latin American steel industry.

General outline

- 1) Introduction and objectives.
- 2) Previous joint activities between UNIDO and the Argentine Iron and Steel Institute.
- 3) Creation of CADIMA - Summary of its activities.
- 4) Experiences in mutual Regional Technical Assistance.
- 5) Publishing of up-dated technical information. The Environment and Development Series.
- 6) Organization of Regional Meetings and Technical Assistance of Extra - Regional Experts.
- 7) Creation of Regional Reference Centers. The BATNEEC criteria in developing countries.
- 8) Commitment to Environmental International Standardization.
- 9) Future Perspectives and Proposals.
- 10) Concluding remarks.

1) *Introduction and objectives :*

The environmental impact of the iron and steel industry on the air water and land is well known all over the world but this issue is of a particular importance in the Latin American Region.

The iron and steel industry is one of the most capital intensive industrial sectors in our continent and its participation in the world steel production is increasing and will continue this trend in the near future.

The following figures are very clear in this sense:

<i>Item</i>	1992	1993	1994
World raw steel production (million ton)	723,6	730,5	723,7
Latin American raw steel production (million ton)	42,2	43,6	46,0
% Participation of Latin America	5,83	5,97	6,36
World apparent steel consumption (million ton)	612,8	617,1	626,3
Latin American apparent steel consumption	25,6	26,9	31,1
% Participation of Latin America	4,18	4,36	4,96
<i>Production in Latin America (1000 t)</i>			
Iron Ore	183122	159174	182900
Pellets	37394	43990	52216
Primary iron	37115	38025	40924
Steel	42215	43598	45983
Continuous Casting	27440	29098	30809

The social, health and economical structural problems of our emerging countries build up the framework in which we must analyze the topics of this First Global Consultation.

Although many efforts have been made about pollution prevention and in many places the steel industry behaves as a leader among other industrial sectors being much more proactive, many problems still are demanding urgent solutions.

As it will be explained in this paper, UNIDO has played a very important role in the introduction of new concepts about cleaner technologies and

environmental management in the steel industry of our Region by different interesting and useful ways.

The objectives of this presentation are basically two:

1.1) To show how we have worked in the IAS and ILAFA through UNIDO cooperation and also through mutual regional technical assistances, by the diffusion of up-dated technical informations, organization of regional meetings and the assistance of extra-regional experts.

We will also comment some particular points of view about the necessity of the creation of reference centers in the Region and the introduction of the "best available technologies not involving excessive cost" criteria.

1.2) To describe the major issues and challenges that the Latin American steel industry is facing at the present time.

For example a greater commitment to the process of the environmental international standardization is needed because it may become in trade barriers for our developing countries.

The eventual future restrictions to the import of co-products for recycling is another important issue for the metallurgical sector.

Of course the incorporation of new technologies for pollution prevention in order to reach more stricter standards and the new requirements of the international market are of first priority. It's very important to point out that this process must be developed jointly with a very deep plan of training in order to be able to select the more adequate technologies (both from the technical and economic aspects) considering the special characteristics of each place and case.

2) Previous joint activities between UNIDO and the Argentine Iron and Steel Institute (IAS) :

The IAS received precious assistance from UNIDO by means of the DPI/ARG/81/010 - a wholehearted support for the development of the iron and steel industry in Argentina - , which was officially approved on October 21st, 1982 for a total amount of \$ 1,411,300 (Overhead, not included), and which had as a part \$ 500,000 by way of a contribution from the IAS for the shared payment for costs.

These were the recommendations outlined in the project:

- a) Close and careful consideration of native inputs and raw materials;
- b) Rational administration of the energy resources used for the iron and steel industry;
- c) Optimization of technical processes;
- d) Development of new kinds of steel.

From April to May 1988 the project was submitted to a meticulous examination and, according to this analysis, the objectives of the project came to fulfilment. It has been estimated that, thanks to this project, net savings on the order of u\$s 15.000.000 a year were collected, apart from causing the production to rise approximately u\$s 38.000.000 a year - not to mention the contribution to the increment in exports to the value of u\$s 40.000.000 a year.

Another worth-mentioning experience of mutual assistance between the IAS and UNIDO was that of the TF/GLO/89/901 project, which aimed at providing "A Methodological Approach to Assist Developing Countries in Assessing Existing and New Cleaner Technologies for the Steel Industry", also called this Project "Model Steel Works".

The principal advantages obtained by this UNIDO Project were:

- a) A greater awareness and an effect which will bring about more dynamism in the field of environmental management in the iron and steel industry as a whole, as well as in those plants of ACINDAR - one of the private member companies belonging to the IAS - in particular.
- b) The training of Argentine professionals and the supply of operating manuals on a number of those key subjects regarded as being the most relevant ones, which will come of use when training technical staff, in the different Argentine plants.

- c) The supply of display monitors to test air quality, whose use will be insured by the IAS to be put into practise in all different steel works.
- d) The good diagnosis made by the Japanese committee when in their "Fact Finding Mission", was found to be of great help, since it recommended solutions at different levels: housekeeping, simple and economical proposals and major investments.
- e) In fact, ACINDAR has implemented some of the "Remedial Measures", which were suggested in the "Fact Finding Mission", such as that of installing a degasifying unit, or of introducing changes in the steel plant operating system, and that of improving the management of liquid effluents, as well.
- f) Furthermore, ACINDAR begun to develop into the possibilities of recycling a number of its by-products and solid waste, with an eye to taking advantage of the experiences about recycling of electric arc furnace dust as recommended by the Austrian experts who attended the Training Sessions, and as the Argentine representatives were able to appreciate when in Austria (Workshop held in Vienna / Visits to plants)
- g) The co-operation and support manifested by not only the people from UNIDO, but also the experts involved in the event, during all the time the project was carried out, has been recognized and thanked for in Argentina as it has contributed to the improvement of the original environmental situation.

3) Creation of CADIMA - Summary of its activities :

There was a growing anxiety all over the world - and Latin America was not the exception to the rule - owing to the mere fact that the damage caused to the environment, and its consequences for mankind and nature in general, were not anywhere near improvement.

A number of different international organizations, the United Nations, and National and State governments, not to mention those in Municipalities, had not only cried out for help, but also were working on the legislation and on the measures to be taken for the protection of environment.

By virtue of what was stated above, and since it was a must to join forces in view of a further contribution to the research, and the achievement of measures - which would be of service when coming to the control and reduction in the pollution affecting the environment -, and as co-operation with the authorities - in the environmental study - became a need, the Board of Directors of the Latin American Iron and Steel Institute (ILAFSA), had decided to approve of the creation of an Advisor Committee, whose objectives would be:

- Having, at a Regional level, a system of information on:
 - a) Legislation for the environmental protection, not only within the different countries in the region, but also in those highly- developed countries - with a special emphasis on those subjects related to the iron and steel industry.
 - b) Experiences in environmental problems in the iron and steel industry; their effect and the courses of action to be taken in order to protect the environment.
 - c) Events (Such as: Conferences, congresses, seminars, courses of study, etc.) which should be held at a national level, as well as at an international level; particularly on the subject of environmental problems which affect the iron and steel industry.
 - d) Systems and methods for monitoring, controlling and assessing special cases in which pollution is caused by effluents produced in the iron and steel industry.
 - e) Projection of a different image for the iron and steel industry - one in which it should be the producer of fully-recyclable material.

- Based on the above-mentioned objectives, its activities would be:
 - a) Acquainting the iron and steel industries in the region with the information just shown, aiming at attaining the objective that, by means of the Advisor Committee and the National Working Groups, their exchange remain stable - with the assistance and under the coordination of ILAFA.
 - b) Making seminars and courses of study, on the subject, take place, with the support of the experts in the region as well as of those provided by the United Nations.
 - c) Doing specific research on the environmental effect led by the different processes involved in the iron and steel production in the region, and taking all the necessary steps for its monitoring and reduction / reversion.
 - d) Making use of the COPANT-ILAFA Program for Regional Iron and Steel Normalization, in order to co-operate with the making of the Panamerican regulations for the control and assessment of the environmental quality (Based on the confirmation of the ISO international standards).
 - e) Obtaining political, technical, financial and fiscal conditions which may favor the inclusion of measures in the iron and steel industry, for environmental protection.
 - f) Promoting an active and permanent exchange of experiences between raw material producers and iron and steel producers, on the subject of environmental problems, and, as far as possible, getting the members of the Working Groups in the different countries to take part in the observance of the courses of action to be taken and of its consequences.
 - g) Have a share in the activities to be carried out by those specialized organizations like UNIDO, IISI, etc.

4) **Experiences in mutual Regional Technical Assistance :**

Goals attained and Conclusions

- a) We have fostered the exchange of concrete experiences in plants, among professionals from operation areas. As a result, those countries in the Region, which were more developed, conveyed the learning gained to those countries which needed it most.
- b) We have been granted the possibility of being informed of relevant concepts which were suggested by extra-regional experts. These professionals had been previously selected, according to their experience, to how practical they were when recommending solutions and to their prior knowledge of the situation Latin America was undergoing.
- c) The presence of regional experts in different fields (liquid, solid and gaseous effluents, noise, energy, environmental policy, assessment of the environmental effect, etc.) enabled the creation of a network and the advantage of being able to request the services of the professionals in the region.
- d) Within the framework of such a kind of projects, the professionals were able to give concrete technical assistance in the region. ILAFA and the National Institutes (IAS, IBS, IVES, CANACERO, FEDEMETAL, etc.) functioned as those in charge of collecting needs while the Regional Co-ordinator organized technical missions which relied on detailed information of actual requirements, so as to make rational use of the resources. UNIDO served as a catalyst for the mentioned activities, covering travelling allowances and fees
- e) The prior needs, which became of particularly interest in countries such as Perú, Venezuela, and in some plants in Brazil and in Argentina, came under these topics:
 - e.1) The need of being equipped with units for environmental monitoring, in order to determine and rate the level of actual pollution which the sector and final effluents produce. (in liquid, solid and gaseous states)
 - e.2) The taking into consideration that the technical staff in the plant, who - in most cases - is familiar with the problems and who is motivated by the reversion of the environmental effect, should have to be given as right the opportunity of attending technical seminars and of visiting iron and steel factories and companies within the region, by way of a fast and inexpensive means of self-training.

- e.3) The need for a comprehensive approach to the environmental effect, that is to say, avoiding limiting the effect to simply the iron or steel plant affected, bearing in mind a broader view which include neighboring industrial plants apart from the community.
- e.4) The faults in the optimization of the combustion and heating processes bring on pollution problems, and, consequently, an impoverishing of the product quality, higher specific uses of energy and a reduction in the productivity, resulting in a set-back for competitiveness.
- e.5) The case of some areas which are very polluted like for example the Talcahuano harbour in Chile, the Chimbote bay in Perú or the Riachuelo in Buenos Aires Province of Argentina must be considered separately. However, it had not represented a problem in which the only one to blame had been the iron and steel industry, since some other neighboring companies were responsible as well. Technical information had been provided so that the iron and steel industry in the area, should have taken on an active-minded role in respect to the industrial sector and the community.

5) *Publishing of up-dated technical information - The Environment and the Development Series:*

Today, the rational use of energy, natural resources and the reduction in the environmental effect are basically some of the subjects which come first in the list of priorities, in the global economy.

Since 1985, the Argentine Iron and Steel Institute, by means of the Committee of Environmental Affairs, which is composed of experts from every single member company, has been performing a fruitful activity at a national as to international levels.

To that effect, we thought it to be of great help to send out information to the member companies on the regular basis to up-date them on subjects such as:

- Sustainable Development
- Strategic planning and environment
- Position of international companies on the subject
- Implications of the new standards
- Recent events in the international iron and steel industry.

The material released has been submitted to conscientious study, compilation and translation from magazines, international publications, etc. We thank the information sent by the Committee of Environmental Affairs which belongs to IISI (ENCO-IISI) to which the IAS represents the Technical Secretary of the mentioned Institution in our country.

For the last few years this activity has found itself better off on account of the fact that the IBS-IAS joint committee started its functions and that CADIMA was created -not to mention the regional meetings which took place within the framework of the UNIDO-ILAFSA regional programme.

We sincerely hope the content and the information enclosed in this volume will come of use when coming to the realization of the environmental effect or simply to be up-dated as to the international recent events.

The environment and development series of the period 1995 includes the following issues :

- The impact the Basilea Convention had on the scrap trade. The international chamber of commerce and the climatic change Convention.
- Life Cycle Analysis.
- Emmisions in the processes of melting scrap en EAF

- A programme to minimize and re-use efficiently the wastes from steel plants.
- Statement on the policies put forward by IISI about Life Cycle Analysis.
- Brazil and the future ISO 14000 Series.
- Aspects in the steel recycling processes.
- A rational use of energy and a reduction in the CO₂ emissions in the German iron and steel industry. An example of autorregulation.

6) Organization of Regional Meetings and Technical Assistance of Extra-Regional Experts :

The organization of Regional Meetings with the Technical Assistance of Extra Regional Experts on behalf of UNIDO has been one of the outstanding aspects of the cooperation. Next month will take place the Fifth Regional Meeting in Vitoria, Brasil but in this opportunity without the support of UNIDO. The issues of the Five Regional Meetings were:

- 1° - 1991 - Chile *Liquid Effluents*
- 2^a - 1992 - Venezuela *Solid Wastes*
- 3° - 1993 - Argentina *Gaseous Effluents and Energy*
- 4° - 1994 - México *Environmental Management and Standardization*
- 5° - 1995 - Brasil *Environmental Quality and Management in different steelmaking processes.*

As an example we will summarize the most important Conclusions and Recommendations drawn from the 3rd and 4th UNIDO-ILAFAs Regional Meetings:

6.1 Conclusions and Recommendations drawn from the 3rd UNIDO-ILAFAs Regional Meeting on the subject of Gaseous Effluents in the Iron and Steel Industry in Latin America

- a) Nearly all those countries in the Latin American steel production have been brought into this 3rd Meeting within the framework of the ONUDI-ILAFAs Program. This event manifests the importance and the attention the Latin American iron and steel industry is giving to the environmental affairs

To the inclusion of México and Perú in the 2nd Meeting, we are to add, now, that of Colombia -not to mention those of Brazil, Venezuela and Argentina. As a consequence, the technological co-operation network has been expanded as well as the exchange of experiences in the region, made possible. The presence of extra-regional specialists, who, on this occasion, were from the USA and Korea, once more, was regarded to have been fundamental.

- b) Once again, it was more than evident our needing for an environmental management at the level of corporations or any other productive-economic groups, so as to have a global perception of the environmental issue within each and every member company. This gives way to a better approach, not only to the causes which bring upon environmental problems, but also, to the solutions to be implemented by making a more rational use of human and economic resources. We have been offered for consideration some

experiences in different countries which demonstrate having made headway in this particular subject.

Such courses of action have given us vent to act in a practical way and to protect our industry from environmental questioning from different parts of the society or any other organization. This fact affirmed that the iron and steel companies were not to blame for the problems but some other companies in the region were. (Whether they be industries or not).

- c) The legislative and normative aspects still represent -not monthly for the iron and steel industry - grounds for being worried or for being criticized in different countries; mainly owing to the absence of suitable and reasonable possibilities to fulfil or the lack of technical basis. Therefore, our suggestion is that of working on the subject at a regional level, bearing in mind the different economic processes of integration (MERCOSUR, NAFTA, Pacto Andino, G3)
The first recommendation was to develop regional initiatives with respect to the environmental standarization and the comparison of regulations at Latin American level.
As a second recommendation, we find that of stressing the LatinAmerican presence in the international regulation organization so that our initiatives should have a major influence when setting global standards.
- d) Regarding to the application of the ISO 9000 normative system, particularly in the environment and policy areas, we are to confess that the need for strengthening co-operation and assistance repeats itself once more. Therefore, Latin American companies urge to take a more active role in the creation and statement of norms, since the above-mentioned subject is intrinsecally linked with the market problems.
- e) We have made a point of the importance of the environmental policy being intimately related to the energy policy of the company.
In the consideration of the complete optimization of the combustion and heating processes, we are to include not only a reduction in the specific consumption of energy, but also an improvement in the quality of the product and of the productivity which should be compatible with the reduction of its effect on the environment.
This goal is achieved, on several occasions, by means of a sound operating system as well as of the design of the combustion system, which should be capable of meeting the process needs.
- f) Special attention will have to be drawn from now onwards in connection with the control and the monitoring of those commonly called new or microcontaminant, such as and as a general pattern,

the notion that the environmental monitoring, operated through networks, needs further specializing on the regular basis.

g) Those companies, whose units operate well, should exchange experiences in designs, operating systems, and elements with which the fumes extraction units are fitted, with the companies, which are taking the first steps on the road to implementing the mentioned systems.

h) UNIDO was required to support the co-operation on specific technological subjects so as to be aware not to incur in the same negative experiences. There are some shining examples of bilateral co-operation, such as the ones listed below:

- The research on the environmental effect, having as a purpose the closure of a mineral mine in Venezuela.
- The assistance for a more improved design of a fumes extraction system, in the electric steel plants in Perú.
- The technical assistance in order to fit oxygen convertors with a fumes extraction system, in Colombia.
- The assistance in the optimization of combustion and heating in reheating furnaces, in Perú and Colombia.
- The technical assistance for the purpose of making a diagnosis of the environmental situation in a highly industrialized area, in Colombia.
- The environmental control and operating system in coke ovens, in Chile. The request for an exchange of experiences among Mexico, Brazil and Argentina.
- The assistance on environmental management system at level of directors in the companies.
- The extra-regional assistance in the management of electric arc furnace dust, requested by Brazil and Mexico.

i) At the meeting, experiences of success have come to light. They may be the object of which much advantage can be taken, particularly on the following subjects and by the companies named below:

- . Control over the coke oven emissions in the iron and steel industry in Tubarao (Brasil).
- . Control over the acid emissions produced by ACINDAR (Argentina).
- . Relationship between the company and the community in the Huachipato iron and steel company.

- . System for managing dust in those electric steel plants which belong to SIDOR, ACINDAR and SIDERCA (Venezuela, Argentina).
 - . Monitoring of air quality in SIDOR, ACINDAR, and the Huachipato iron and steel company (Venezuela, Argentina and Chile)
 - . Resolution on the dusts analysis made by the National Commission of Nuclear Energy, with advanced methods (Argentina).
 - . Optimization of combustion and heating processes, in the IAS.
 - . Control over the liquid effluent of coke plants in Brazil.
- j) It was highly recommended to get the conclusions drawn from these meetings to be known by the different National Associations, Councils and Organizations, which are devoted to working on the environmental situation.
- k) It was requested that workshops and courses of study should be carried out, particularly on concrete topics, such as: operation and service of equipment for environmental protection, plants for coke cooking, optimization of combustion and heating, to name some.
- l) A different methodology was recommended for future meetings - one similar to the IISI-ENCO kind, which consists in sending out the reports some reasonable time before the meeting, by way of providing you with a prior panorama of the environmental situation in each country.
- ll) It was stated for consideration drawing up a list of specialists in every single field and from every country to keep the other countries informed of them.
This should be done by means of the National Committees of Environmental Affairs.
- m) Once more, we expressed our thankfulness to UNIDO, and we begged for the continuity of the Regional Program, since -regardless of counting on little investment- it is leading to outstanding results as for the exchange of concrete experiences, aiming at the solution to environmental problems on the way to achieving a sustainable development in the Latin American iron and steel industry.

6.2) Conclusions and Recommendations drawn from the 4th UNIDO-ILAFA-CANACERO Regional Meeting on Environmental Management and Standardization

- a) The processes of reorganization and privatization of the productive steel sector have improved the environmental management and its has produced a great advance in the total quality.
- b) Some experiences are taking place about quantitative evaluation of the environmental performance (ESAP-GEMi).
- c) A growing active minded role is being manifested, in particular, as to the community and government offices. At the same time some agreements have been signed in certain polluted zones between the government authorities and the higher directors of the different enterprise groups.
- d) It's more than evident the need for a much more active participation of the underdeveloped countries in the international standardization activity ISO-TC 207. In a short time the ISO standards will play a similar role to that today is played by ISO 9000.
- e) It is an advantage the existance in several countries like Brazil, México and Chile of organisms like National Councils of Environment.
In other countries there is a lack of these type of organisms.
- f) We must be also aware about the existance of similar public and/or private entitles which are working on very similar issues actualiy in an isoiated way, bearing no communication among them and besides with superposition of their goals and activities. A more rational use of these resources must be planned. This was a case pointed out by the Perú members of CADIMA.
- g) Some outstanding experiences explained in this 4th Meeting were:
 - g.1) High recycling taxes of by-products in integrated iron and steel plants in Brasil.
 - g.2) Efforts made in México, in zones were the water is a very scarce and expensive resource, in order to recuperate sewage water from the municipal treatment plants and its later use in the steel plants.

- g.3) Incorporation of environmental aspects in the extension of the useful life of the boilers in the thermal power house of the integrated iron and steel plants of Argentina.
- g.4) The human resource was again evident a fundamental aspect to achieve the success of the environmental management. The participation of professionals of different branches in the environmental management level of the companies is increasing. For example people of security and health, lawyers, process engineering, accountants, etc. are now present in the organization. It appeared as very important need the training of young professionals in the concepts of sustainable development.

7) **BATNEEC criteria in developing countries and the creation of reference centers in the region :**

This criteria is not only shared by the IAS but also, by means of the direction of industrial research, of which the area of energy and environmental affairs of our Institute is a part, it represents the main objective of its activity.

The above mentioned criteria has to be framed within the economic situation of our country. Time and money prevent us from doing further research or from buying highly costly technology. The solution, to our lowly view, is to implement what has already been put into practice in a number of developed countries, in other words, the BATNEEC (Best available technologies not involving excessive costs) criteria.

What is requested for a satisfactory application of the stated criteria or way of working? Among some other things, the following:

- Detailed knowledge of the process
- Up-dating of knowledge on new technology
- Opportunities for pilot experimentation
- Capacity for analysing problems by means of numerical models
- Intimate contact and joint activities: plant - research institute - universities.
- International co-operation
- Comparison of similar solutions in other plants within the country or overseas.
- Capability of the solution to adapt to special cases, what cannot be solved on the regular basis with the purchase of technology.
- The setting-up of well - established, applied research groups on the part of the companies Board of Directors.

It is our intention to provide you with some examples of activities which our Institute carries out, particularly in the field of energy and environmental affairs and with the strict observance of the criteria. These are those:

- Optimization of the combustion in the thermal power houses in integrated iron and steel plants.
- Remodelling of burners in reheating furnaces.
- Redesign of the combustion system for annealing batch furnaces.

Like it was declared at the beginning, the responsibilities undertaken in the three areas mentioned are just a start for a new management policy, which will make a point of the environmental quality. In some other sectors, interesting experiences have taken place, also. Moreover, there were cases in which a different criteria was introduced -the criteria of the development

of new technology free from very high investments- and which brought about solutions to the existing problems.

The experience shown enables us to stand out some features we consider worthy of being noticed, since they are in accordance with the International Iron and Steel Institute Environmental Management Principles. They are:

- Management policy, strongly determined to incorporate the environment on subjects connected with the optimization of processes and the expansion of the utility of the equipment.
- Link between the company and the sector institute and national specialists on the subject.
- International technological co-operation (by means of the National URE Programme, the EU provided experts from the IFRF, Ijmuiden -from Holland- and the University of Zaragoza -from Spain-, as well as equipment)
- The achievement of satisfactory economical results in addition to a better environmental performances.
- Team work between the plant and the IAS.

8) Commitment to Environmental International Standardization :

In the description of an assistance programme similar to the one suggested, we should not fail to make room for the support given by UNIDO, in order to carry out the normalization made by COPANT (Panamerican Standardization Commission), in the fields already mentioned. In this opportunity the general field of activity should be represented by the environmental quality, which would be completed with those sectors which are intrinsically related to the ones of quality, such as: information; notification; certification; accreditation; policy and insurance of the environmental quality, among some others the authorities and members of COPANT, may include.

Obviously that support will provide both parties with a benefit, since it will enable the active promotion of an eventual improvement of the regional as well as the Latin American markets, on the basis of a sustainable development. As a result, it will cause the European Countries to trust the imports of our products, which will be manufactured according to the world - wide regulations for environmental protection, as those of ISO and IEC are bound to be.

It would be recommendable that the main objective of an assistance programme or co-operation project (UNIDO-COPANT) should be aimed at supporting the efforts, the members of COPANT are making, to establish the necessary conditions for a sound management of the environment in a way that agrees with experiences and European technology. Particularly, the concepts shown below should be included, apart from those preset by the authorities and COPANT members.

- Support at institutional level in order to create (if there were not any already existing) and strength for Regional Environmental Systems for normalization, certification and accreditation; so as to make them appropriate for the current conditions of the global market.
- Training of environmental expert, who should be able to take active part in the different fields already pointed.
- Quick and light exchange of up-dated information between UNIDO and COPANT, specially in those environmental fields connected with environmental certification, so that it may get to COPANT members in less no time.
- Encouragement and support for the improvement of the environmental quality of those products coming from Latin American countries which

are COPANT members, in particular when their production entails the use of non renewable resources and significant environmental effects.

- Promotion of a rise in the number of commercial exchanges between the developed countries and those Latin American countries of COPANT, trying to make a stress on those products which can only be manufactured because their environmental quality has been improved, in addition to the improvement which took place in the factories where these were produced.
- Mutual acknowledgment in respect to their agreement on the management policy and the environmentally friendly products (certification and register).
- Provision of model equipment to prepar documents as well as to receive and send the corresponding information (computers, printers, programs, faxes, modem, etc)
- Make easier the participation of delegates from emerging countries members of COPANT to ISO-TC 207 meetings with voice and vote.

The description depicted have only dealt with the far-reaching suggestion out line, aimed that causing our countries to be granted the opportunity to clearly stated the expectation of their communities, to be taken into consideration at the highest level, when begging for the environmental protection.

9) Future Perspectives and Proposals :

a) To bear the urgent need for the Latin American iron and steel industry to encouraged the national normalization organization to take active part as "P" country in the different ISO-TC 207 subcommittees, and specially in those in which the normalization of the system for environmental management, labelling and auditorships will be faster in application. The international trade as well as the possibility of exporting our iron and steel products will be altogether affected enormously.

It is recommended at the same time, to bear in mind the commitment that being a member country means, to act like one.

b) To promote methods for quantitative assesment of the environmental performance so as to make comparisons an easier task. A methodology is suggested -one similar to the ESAP type used by the GEMI in the USA.

c) To solve the problems brought around, due to the lack of not only treatment plants but also final disposal sites, for hazardous wastes which cannot be recycled at all. In view of that, a greater effort is suggested to be made in order to get people aware of the requirements needed and of the suitable places for their location.

d) To promote subjects such as the descrimination of environmental costs between the total operation costs and the concept of life cycles of different products.

e) To strain every nerve in order to obtain loans to improve the environment by means of low interest rates and long periods. This is not a practical use in the economical policies of the governments within the Region. It is recommendable to explore the possibilities in the international mark.

f) To cause Latin American Iron and Steel Industry, by means of its regional organization, to acquire a more active role in respect of the problems which are cropping up on the subject of restrictions on the scrap import coming from developed countries.

g) To keep up the proposal for the creation, in every country, of organizations such as national councils of environment for a better industry-government relationship.

h) To attempt, while pondering over the current Latin American situation, to make a rational use of the human and technological resources available in the region, with an eye to solving more critical problems. By virtue of

what was said above. UNIDO and ILAFA are requested to keep on giving the necessary support so that we may, together with the commitment undertaken by companies and institutes in the sector, continue developing activities such as these ones.

- Projects of regional interest on concrete environmental subjects.
 - Technical co-operation and assistance between companies and specialists in the region on concrete subjects.
 - Assistance of extra-regional experts.
 - Regular meetings with the purpose of reinforcing and raising the level of experience exchanged so far.
- i) To go over the by-products produced throughout the different technological courses, bearing the possibility of current or future recycling. This task, already in course in some countries, should be implemented in the rest of the countries, by means of the committees of environmental affairs in the different sectors.
- j) To make a point of the community service and of an active-minded attitude, by means of different organizations (official, legal, those for students, or in the field of education, companies, etc.) so as to get activities for environmental protection, which the Latin American Iron and Steel Industry carries out, to be known by the general public.

The more information and knowledge people are given, the less demands will be placed.

- k) To elaborate a regional project, which will observe the current requirements made by UNIDO, which will consider the development of specific subjects, of common interest, and the reinforcement of regional exchanges on the basis of the mentioned needs.
- It is demanded as fundamental that the Latin American counterpart for this kind of project, should be a national or regional institution within the sector.

10) Concluding Remarks :

The hard economic and social situation through which Latin America is wading, nowadays, to make things worse, faces the environmental problem, which needs to be approached urgently, since it influences on a number of aspects.

The situation of the industrial sector is our concern. In this respect it is of great importance that competitiveness among developing countries and their foreign trade can find themselves seriously affected by those environmental measures taken by developed countries, which can transform themselves into concrete blockages for the customs in the region.

The only way to be able to overcome the situation consist in raising the level of technological knowledge and putting into use, methods for cleaner production with the consequent monitoring and control.

According to the situation in our countries, the assistance of such organizations as UNIDO and the project currently in course, happen to be fundamental.

In this regard, it is my wish to conclude the present report, reminding those who represent the authorities in UNIDO of the recommendation from the bussiness council for sustainable development about technological co-operation.

Technological co-operation

- The technological co-operation is a concept much more comprehensive than the simple exchange of technology. It is, besides, a vital component in the sustainable development; in particular, for all those developing countries and for all those new democracies, by way of reinforcement in its own technological capacities.
- The definition for technological co-operation reads like this :

"... a process, by which two or more parties identified individual all common interest in order to share information, knowledge, know-how, and management capacities, taking into consideration the use of technology which should be compatible with the environmental protection, more energetically efficient, less intensive in the use of resources less contaminants and meant to recycling, with the purpose of contributing to the objective of sustainable development."
- Another source of technological co-operation, apart from the government activity, is that of getting the industry to be uninterruptedly involved in the

universities activities and those of institutes for research and development, to make the increase of competitiveness as well as the availability cleaner technology easier in developing countries.

Education for sustainable development

- The educational gap between rich and poor countries, needs to be narrowed to allow significant changes on the road to the achievement of sustainable development.
- To reduce this gap is not only the responsibility of developing countries, which need to spare more resources to the improvement of education. Develop countries should co-operate to make this educational gap narrower. Powerful countries spend in education about twenty times more per capita than developing countries -a tremendously big difference.

Finally we think that it's important to mention some parts of the International Iron and Steel Institute (IISI) Preamble and specialy Principles Numbers 1; 8; 9 and 10 of their Statement on the Environment:

**IISI STATEMENT ON THE ENVIRONMENT
Preamble**

The member companies of the International Iron and Steel Institute have long recognised their responsibility to conduct production operations in a manner that protects the environment and contributes towards the objectives of sustainable development -a concept that involves meeting the needs of the present without compromising the ability of future generations to meet their own needs

The first IISI Statement on the Environment was published in 1972. Since that time, much has been accomplished. It is estimated that in the last decade, over 10% of the total expenditure by the steel industry has been on environmental control -a sum of close to u\$s 20,000 million on protection of the environment. Steel as a material has also made a major contribution to sustainable development in the construction of environmental protection systems, infrastructure and energy conservation systems. Steel products are "environmentally friendly" and are not only compatible with, but critical to, the success of sustainable development. On average, about 40% of all steel produced is sourced from steel scrap. Steel uses less energy per ton to produce than many competitive materials. Environmental protection initiatives and improvements will continue to be a major element of iron and steel operations for the foreseeable future.

Sustainable development is a complex subject that involves not only environmental protection but also issues such as economic prosperity, population growth and poverty. Relative priorities and relationships must be established if progress is to continue.

STATEMENT OF POLICY

The member companies of the International Iron and Steel Institute are committed to providing leadership in achieving a high standard of environmental care while contributing to the needs and prosperity of society through the production of steel.

PRINCIPLES

1

Sustainable Development

Apply the principles of sustainable development to the steel industry

This involves working together to take a long-term global view of environment, economy and social integration. These principles should be incorporated into business decision making at all levels and throughout the life cycle of the process and products. Sustainable development should be seen as an opportunity as well as a challenge. IISI recognises that different countries and steel firms are evolving towards these goals in different ways.

8

Education, Training and Information

Develop and promote mutual understanding through education, training and information for stakeholders, including directors, management, supervisors, employers, contractors, shareholders, suppliers, customers, government and the community.

These measures should be appropriate to the needs and responsibilities of the stakeholders. This should be open, positive, proactive and incorporate a long-term global view.

9

Research, Innovation and Technical Cooperation

Support research, innovation and technical cooperation that will result in continuous improvement, technical breakthroughs and cleaner technologies.

This development should be seen as an opportunity to transfer technology to other firms and countries to further environmental and economic improvements on a global basis.

10
Government Requirements

Cooperate with government in a responsible manner and contribute to the development of cost-effective legislation and regulations that are based upon sound science, technical possibilities and the true environmental and economic priorities of the global community.

Environment regulations require a balancing of social, economic and environmental goals. The health and environmental risks addressed by proposed regulations must be carefully quantified and then properly evaluated by comparison with other natural and man-made risks. The resolution of economic and social conditions among nations including the use of economic instruments should be consistent with equity and harmonisation of their environmental requirements. International cooperation and consensus is important and necessary for successful implementation.

The International Iron and Steel Institute supports, in concept, the International Chamber of Commerce Business Charter for Sustainable Development and the ICC Environmental Guidelines for World Industry. Many individual steel companies have endorsed the Charter.

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Regional Activities for Environmental Conservation in the South East Asian Iron & Steel Institute

CHANG RAE-WOONG

Environmental Committee of SEAISI

Content

**Part I : Results of the Project Sponsored by UNIDO from
1992 to 1994**

**" Assistance to Develop a Regional Program in
Environmental Management/ Cleaner Production
in the Iron & Steel Industry in South East Asian
Region"**

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Part II : Future Plan and Recommendations

PART I

Assistance to Develop a Regional Program in Environmental Management and Cleaner Production in the Iron and Steel Industry in South East Asian Region

Project Title

Assistance to develop a regional program in Environmental Management and Cleaner Production in the Iron and Steel Industry in South East Asian Region

(started in August 1992, ended in July 1994)

Overall Objective

To reduce the impact of the development of the iron and steel industry on the environment by means of establishing efficient and integral mechanisms of educational cooperation in the region

Immediate Objective

- To assist the members of the South East Asian iron and steel industry for introduction, promotion and application of cleaner technologies and environmental management.
- Incorporation of working groups in selected areas of environmental concern and by designing a regional program on environmental management.
- Responsibility of the working group :
 - Formulation of a comprehensive awareness and educational program for the regional industry focused on :
 - Solid waste management
 - Liquid waste management
 - Air pollution control
 - Legal framework for environmental management

Chief Objectives of The Working Group

- Identify each South East Asian countries' needs in the field of environmental management
- Identify potential local points for technology transfer in the region
- Prepare comprehensive and educational cooperation programs (Training, Seminars, Experience Exchange etc.)
- Develop cost-benefit analysis which support the application of environmental management methodologies
- Prepare methodologies and a regional program including joint training activities, demonstration pilot plants, joint research activities

Participants

Australia : Australian National Committee of SEAISI

Indonesia : Indonesia National Committee of SEAISI

Japan : Japan National Committee of SEAISI

**Korea : Korea Iron and Steel Association
Korea National Committee of SEAISI**

**Malaysia : Malaysian Iron and Steel Federation
Malaysia National Committee of SEAISI**

Philippines : Philippine Iron and Steel Institute

Singapore : Singapore National Committee of SEAISI

**Taiwan : Taiwan Iron and Steel Association
Taiwan National Committee of SEAISI**

Thailand : Thailand Steel Club

Vietnam : Southern Steel Union of Vietnam

Activities

- 4 Times general meeting of the working group
- 2 Workshops
 - on EAF Dust Treatment, Petaling Jaya, Malaysia on 6-7th Sept. 1993
 - on Sludge Treatment in Mini- Mills, Bangkok, Thailand on 18-19th July 1994
- 1 Conference
 - on Environmental Control and Energy Saving Practices within the Iron & Steel Industry, Sendai, Japan on 11-15 April 1993
- Exchange of several technical Information materials and data

Project Achievements

EXPECTED

1. Selection of members of the working group

2. The first general meeting of the working group

RESULT

1. One member from each country was nominated before the 1st meeting

The working group was recommended as a Standing Committee of SEAISI by the BOD Meeting after its own suggestion, called now "SEAISI Environmental Committee"

2. It was held on 28-29 August 1992 at SEAISI Head Office.

EXPECTED

3. Report of the capabilities and experts available in SEA region, the list of institutes and plants as demonstration units

4. The second general meeting of the Working Group

RESULT

3. Experts contributed to the workshops and conference were considered as the main capabilities in the region. Several institutes and plants were visited. Demonstration units were not available

4. It was held on 18-19 January 1993 at RIST, Research Institute of Ind. Sci. & Technology, Pohang, Korea.

EXPECTED

5. Educational seminars with selected consultants for training

6. Regional Conference meeting on environmental issues

RESULT

5. Workshop on EAF Dust Treatment (6-7. Sept.1993, Petaling Jaya, Malaysia)
- 8 experts presented papers
- 28 specialists took part

Workshop on Sludge Treatment in Mini-Mills (18-19. July 1994, Bangkok, Thailand)
- 7 experts presented papers
- 21 specialists took part

6. SEAISI Conference on Environmental Control and Energy Saving
- 46 papers were presented
- 212 participants

EXPECTED

7. Coordination meeting in Vienna with representatives of SEAISI and ILAFA

Objectives :

- to present the final report of the regional program
- to discuss possible mechanisms for long term program

RESULT

7. The meeting entitled 'The Interregional Meeting on Cooperation in the Field of Environmental Management of Iron & Steel Sector in Latin America, Asia and Africa Regions' is being held 10 to 12 October 1995 in Brazil.

Conclusions

1. Readiness of all iron and steel industries, institutions, and individuals in the SEA region to reduce the impact of the industrial development on the environment was expressed strongly.

→ Establishment of an efficient and integral mechanism of educational cooperation is necessary.

2. A Working Group was formed with 10 experts nominated by the affiliated National Iron and Steel Association or National Committee of SEAISI.

WG formulated a comprehensive awareness and educational program.

WG was developed later in a Standing Committee of SEAISI.

3. Four meetings had been held during the running of the project.

The main agenda of the meetings were :

- Discussion and selection of the specific areas which were mostly interested in the region ;
- Set-up of national and regional education programs ;
- Arranging the educational seminars and workshops and evaluation of those results ;
- Preparation and distribution of technical information materials and data in form of manuals, guidelines, benchmarks, and standards ;
- Discussion and decision for future activities and programs

4. The Working Group prepared, conducted and took part in the following educational activities :

- Workshop on EAF Dust ;
- Workshop on Sludge Treatment in Mini-Mills ;
- Conference on Environmental Control and Energy Saving Practices ;
- Solid Waste Management Tour.

5. The Working Group prepared and distributed the following technical information materials and data :

- Legal Framework of Environmental Standards of all Countries
- Benchmarks of EAF Air Pollution Control
- Benchmarks of Solids Waste Treatment of EAF Plants
- Manual on EAF Dust Collection
- Manual on Environmental Measurement and Evaluation
- Technical Review of Pollution Control Facilities in Steel Industries
- Other various Information Materials

PART II

Future Plan and Recommendations

Future Plan of the Environmental Committee

- Promoting the exchange of various technical information for pollution control technologies, environmental management systems, and progress in environmental policy, legal matters.
- Preparing and conducting further various comprehensive awareness and educational program including workshops, seminars, conference, and plant visits in-and outside the region
- For realising the above activities, the committee will have a regular general Meeting annually, a technical exchange session, and some plant visits.

Recommendations

- Sponsorship of UNIDO has remarkably promoted the environmental activities of SEAISI.
- It is desirable that UNIDO's further assistance for
 - the Annual Meeting
 - the Awareness and Educational Programs Development
 - the Exchange of Information on the EAF Dust Control and Environmental Management.
- It is necessary to expand the interregional cooperation
 - Taking part in the Meeting of the Global Consultation
 - Coordination Meetings between SEAISI, ILAFA, AISU, and AISA.

DR SANUSI A. MOHAMMED
SECRETARY GENERAL
AFRICAN IRON AND STEEL ASSOCIATION

The global consultation on environment management in the metallurgical industry is a product of several meetings initiated and sponsored by the United Nations Industrial Development Organisation (UNIDO) in its quest to fulfil its rightful objective to the international community. This started with regional meetings involving the Latin American, Asian, African, and Arab regions spanning between 1992 and 1995. The meetings came up with conclusions and recommendations, at the end of which, regional committees were set up. The culmination of the regional meetings was the inter-regional meeting which was held in Belo Horizonte, Brazil, between 10th and 12th October, 1995, and an inter-regional committee was set up to see to the practical implementation of the decisions arrived at.

All these achievements (so far) are as a result of UNIDO'S commitment to ensure safer environment for all.

The African position paper has been presented to UNIDO as a prelude to this global meeting. I will only highlight some of the conclusions and recommendations coming out of the meeting.

- * A framework consisting of a set of agreements and arrangements among governments, sector companies, the scientific community, linked institutions (consulting firms, suppliers, manufacturers, buyers etc), on policies, priorities, and planning, implementation, and finance mechanisms has to be established.

- * Attain acceptable common regional standards in monitoring, policy and regulation for efficient allocation of industrial, financial and technical support resources and for effective policy implementation.

- * Economic instruments to be implemented to provide incentive for industry to willingly comply with policies and incentives for continuous evolution of pollution prevention and control technologies.

- * program of exchange of experience through news letters and networks, academic curriculum, training centres, professional associations, development of local/regional auditing and equipment supply service companies to be developed.

It must be recognised that the environment is global, what happens in one part of the globe is most likely to happen to the other parts. A global approach to environmental management is the only meaningful approach that will ensure safe environment for all, otherwise no one will be safe.

It is nevertheless recognised that industrialisation is a necessary ingredient for development, and Africa has acknowledged this fact. However, only few African countries take interest in the environmental implications of industrialisation. The developed world has expended enormous amount of resources in combating the menace of environmental degradation due to industrial activities. The African nations are struggling to meet the basic needs of the people and the necessary resources are not readily available let alone to cater for the urge to industrialise with its heavy capital outlay plus the penalty of environmental degradation. This makes Africa at disadvantage in catching up with the rest of the world.

For developing nations, industrialisation is a mandatory vehicle for creating the economic growth and social development necessary to provide basic needs and augment the quality of life for the population as a whole. Industrial activities, by their very nature, are based on cycles which diverge from the natural ecological cycles; hence their propensity to impact the natural environment in an adverse manner. Programs for protecting and improving the human environment for the present and future generations must therefore be a necessary component of all industrialisation plans.

The past experience of developed countries has amply demonstrated that prevention is less costly than remedy. Ignoring environmental issues has caused several tragedies, with irremediable damage to human health, on the atmosphere and meteorology; on water supply and usage; on fauna and flora. Fortunately, today, pollution control technology is well developed and only needs to be learned, selected and acquired by those who need it. There is therefore hope that developing countries may be spared the folly of leaping first and looking after, which is the root cause of the ecological disasters in developed countries.

Most countries of Africa are either new comers to the iron and steel industries or are planning to acquire iron and steel plants. It is an established fact that the key to effective environmental management is "awareness" and "consciousness".

Causes of environmental degradation in the various units of industrial activity have been well articulated and the resultant effects and scientific and technological, including metallurgical solutions both preventive and curative have been developed by the industrialised nations.

The African Iron and Steel Association (though at its infancy) has taken steps to address these issues squarely, and has come up with plans of action and cooperation. It is however incapacitated by inadequate logistical support some of which have been made known, through the Director General of UNIDO, to the international community, and we look forward to your urgent response for Africa to give its share of contribution in this global crusade!

Africa is not begging, but asking for reasonable and equitable participation otherwise it will continue to weigh down the rate of development of other regions.

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ENVIRONMENTAL PROTECTION
IN THE ARAB IRON & STEEL INDUSTRY

BY: ENG. ADEL HUSSEIN
CAIRO REGIONAL DIRECTOR
ARAB IRON & STEEL UNION

The Iron & Steel Industry is considered to be one of the sources of environmental pollution.

This pollution is characterized by the media through which it enters the environment (air, water, soil).

Air pollution:-

Air pollutants are gaseous or particulate in form .

Water Pollution:-

Industrial discharges are a major source of water pollution.

Hazard Wastes & Toxic Substances:-

Hazardous waste is solid, liquid or gaseous waste that poses a substantial hazard to human health or the environment when improperly managed.

The Arab iron & Steel industry has also its share as a source of environmental pollution, but still to some limited extent. Environmental management has become a challenge for every one. The coming decades will witness, and even larger, problem in this field unless we are able to cooperate and exchange experience in pollution prevention.

The Arab Iron & Steel Union(AISU) Assists steel industry in the Arab countries to apply modern technologies having a better environmental compatibility and to participate in all efforts concerning environmental protection.

Eight Arab countries (Algeria , Egypt, Bahrain , Morocco , Qatar, Saudi Arabia, Syria and Tunisia) attended the expert group meeting on co-operation in environmental management of the iron & steel industry for the Arab region which was held in Cairo, Egypt from 22 to 25 May 1995. The meeting was hosted by the metallurgical industries corporation in cooperation with AISU. One of the main outputs of this meeting, was the setting -up of the Arab Regional committee on environmental management of iron & steel industry to promote inter Arab regional cooperation in iron & steel industry through joint development and production programmes in environment.

Also this meeting is part of a series of regional programs in environmental management of iron & steel developed by UNIDO.

AISU also has supplied the Arab steel companies by technical advices assisting them to measure the pollution levels in each steel plant.

The pollution level is proportional to the following items:-

- The production size.
- The plant technology accomplished with.
- The developing which it had undergone.
- The plant category whether semi integrated plant or integrated one.

These can indicate the pollution level & its impact on environment.

The production of the Arab steel companies in 1994 is only 1.3% (8.6 million ton) of the international steel industry.

The Arab steel companies are related to three categories, Mini Mills, Integrated plants, of blast furnace / converter route & direct reduction / EAF route.

The pollution problems are mainly in blast furnace/converter route integrated plants & some of semi integrated plants of past technology.

The following table presents the Arab steel plants, their start up year, production of 1994 and percentage share in total Arab production.

Semi Integrated Plants :-

Country	No. of Plants	Start up Year	Steel Products 10 ³ ton 1994	Percentage Share
Egypt	2	1947	1076	12.54%
	1	1952		
	20			
Saudi Arabia	1	1962	269	3.14%
Syria	1	1971	49	0.57%
Morocco	1	1984	405	4.72%
Mouritania	1	1984	30	0.35%
Sub-total	28		1829	21.32%

Integrated Plants

Blast Furnace/ Converter, route

Egypt	1	1962	819	9.55%
Tunisia	1	1965	207	2.41%
Algeria	1	1969	750	8.74%
Sub-Total	3		1776	20.70%

Integrated Plants

D.R/EAF, route

Qatar	1	1978	604	7.04%
Saudi Arabia	1	1983	2411	28.09%
Egypt	1	1986	1101	12.83%
Libya	1	1989	860	10.02%
Sub-Total	4		4976	57.98%
Total	35		8581	100

The Egyptian iron & steel Co. as an example for integrated plants blast furnace / Converter route, has the following average ratio of dust in atmospheric air

sintering plant area	16 mg/m ³
Blast furnace area	14 mg/m ³
Lime and dolomite shop	14 mg/m ³
The max allowable ratio is	4.74 mg/m ³

Analysis of Sintering plant

dust from gas cleaning

Fe	SiO	CaO	C
26-45%	7-12%	5-9%	4-6%

These results were performed by the company laboratories and are not within acceptable levels of environmental standards and permits. Some measures must be taken. Generally we have to adopt a specified policy which must be enforced by authorized manager. in order to fulfil the function of any equipment engaged in environmental protection. Many dust collection bag filters, for example, may be not working efficiently , or not working at all due to lack of maintenace,the stoppage of the fan or its motor, the missalignment between their shafts, or the worn out of the bags material, may frequently happen without drawing the attention of any one. Handling of fine dust or wastes may be the main reason of pollution. There are many different systems for dust collection which depend on the manual discharge in special trucks in regular intervals, this is not done in the proper time, the dust collecting system will be clogged up with dust.

The support given to improve and maintain such equipment is not a waste of money, but if compared with the improvement in general health of workers & the less waste in raw material due to recycling, it means money gained is much more.

A detail study and deep investigation, of the dedusting units and gas cleaning units in different departments, is urgently needed specially for the following departments:-

- 1- Sintering plants and stock yard.
- 2- Blast furnaces.
- 3- Steel Plant

In Egyptian Iron & Steel Co. there are some identical equipments for dedusting but most of them became obsolete since it was erected 37 years ago for the old plant and 20 years for the extension of the iron & steel Co. of Egypt.

And in the other two plants of Tunisia and Algeria, They have the same problems since the raw material used are iron ore coke, limestone, dolomite and ferro alloys, moreover the L.D.converter of Tunisia is without gas cleaning.

Some examples of pollution prevention:-

- 1- Implementation a new unit for pelletizing fine lime dust which is a by product of the lime kilns.

The handling processes of fine lime through transportation to sintering plants were stopped and preventing its emission to environment. Through pelletizing it is used in oxygen converters and improving the efficiency of lime burning(Helwan Plant).

2- Improvements in industrial water cooling systems .

The setting up of new units, such as the new oxygen station in Helwan plant, has a good water cooling system, the water treatment has improved water quality, no scale or sludge are precipitated inside cooling tubes, better heat transfer, lower water consumption, more energy saved.

This system of compact design has revealed the draw backs of the existing systems. A project for better quality and increased quantity of industrial water in the steel plant was studied and is ready for execution, this project will stop drainage industrial water to the river Nile, and meet the requirements of expansions.

3- Prevent land pollution from Helwan plant

Another studied project for increasing sulphuric acid regeneration for cold rolling mill from $5\text{m}^3/\text{hr}$ to $18\text{ m}^3/\text{hr}$ is ready and will stop land pollution by the liquor pumped outside the plant.

Those projects in item 2&3 are waiting source of financing.

The result of air pollution in Helwan Area due to concentrated plants.

In Helwan urban air quality suffers from uncontrolled emissions from the large concentrations of polluting industries around urban areas, especially steel, cement, fertilizer and chemicals, which contribute to levels of dust and SO_2 that are 2 to 10 times maximum safe levels. 600000 tons of cement dust escape to the atmosphere. 29 percent of Helwan's school children suffer from lung diseases compared to nine percent in rural areas of Egypt.

Let us all cooperate to modernise the past technology steel plants and set up clean technologies for a better world.

The Direct Reduction .E.A.F Plants

These plants in the Arab countries belong to a design taking into account the problems of environmental pollution. Each plant has one centre for safety and environmental management. In general the environmental pollution in these plants is continuously monitored and regular reports are frequently issued for analysis the findings and checking adherence to the set standards. Governments and national organizations promulgate standards and guidelines to maintain acceptable levels of substances or materials.

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**ENVIRONMENTAL FACTORS AND MANAGEMENT IN THE IRON AND
STEEL INDUSTRY IN CENTRAL AND EASTERN EUROPEAN REGION**

J.V. KROUZEK

1. PROBLEMS TO BE ADDRESSED

As it is well known, the iron and steel industry is one of those industrial sectors which may be and often are the source of heavy pollution of air, water and land. Due to the restructuring in iron and steel production in recent years in the CEE countries there is a major drop in output of steel and thus in pollution. However, the magnitude of prevailing pollution, proven by the press and television, calls for urgent remedial measures. Gross emissions per head of population reach much higher levels in CEE countries than in any other part of the world. A profound solution of the accumulated problems in the countries concerned is hampered by:

- lack of funds for modernization;
- non-availability of know-how in the field of pollution abatement;
- lack of accurate data on environmental pollution;
- non-availability of adequate training facilities;
- problems with planned introduction of environmental legislation.

For example, the long lasting extensive character of development of the iron and steel in the former Soviet Union led to the situation, that a significant part of the metallurgical operations has been conducted on outdated technologies and equipment, with wasteful consumption of raw materials and energy and with no proper significance given to problems of environmental pollution. As a result, the pollution of the environment of the iron and steel operations continues in CIS on an impermissible scale. If compared to the integrated iron and steel plants, operating in developed Western-European countries, where the emission of dust per ton of steel amounts to 1-2 kgs, the same figure at the plants of CIS reaches 4,5-11 kgs, that is 3-6 time more. As a result, about 35% of the employees of these plants are affected by dusts and gases emitted in addition with concentration of harmful substances often higher than the permissible limits. The areas with the highest air pollution at the working places within the iron and steel plants are the coke-making, sintering, blast furnace and steel shops of the plants.

In consequence, according to the information released by the federal hydrological and ecology-monitoring authorities of the Russian Federation, 11 of the 44 towns, plagued by excessive pollution of air in result of the regular violation of the established limits, are those, where iron and steel metallurgical plants are located. This industry is responsible for about 20% of the total emission of harmful substances in the Russian Federation. The situation is the same concerning the rivers, water basins and systems in the surroundings of these plants, where again the concentration of harmful components is over and above the limits, permitted. The soil on and around the territories of the iron and steel plants is polluted by heavy metals and oil derivatives. As a logical consequence, there is an increased level of health hazards and frequency of different kinds of diseases among the employees of these plants and among the inhabitants of the population centres, situated at the iron and steel plants of the Russian Federation and other CIS countries.

A typical example of this situation is the city of Magnitogorsk and, the Magnitogorsk Integrated Steelworks (MMK). MMK is the largest integrated steelworks in the Russian Federation with nominal annual capacity fo 16 mil. tonnes of steel per year which was reduced to output of 9 mil. tpy recently. The population of the Magnitogorsk city is about half of a million on the territory of 38,000 hectares. Average age of the citizen is 34.6 years. The problems of pollution remain most painful for the citizens. The environment in the city reached dangerous levels causing increased rates of cancer, children death and birth handicaps, poisoning, traumas. etc. The index of atmospheric pollution in the city is 25 times higher than the permissible standard. In terms of Russian highest concentration indicator (HAC) the population concentrations were as follows: in dust, 11 HAC; in sulphur dioxide, 8 HAC; Oxycarbons, 3.5 HAC; dioxynitrogen, 13 HAC; hydrogen sulphide 5.5 HAC; in carbon hydrogen 29.5 HAC; in phenol, 21 HAC; in benzinepyrine, 164 HAC; in lead, 12,7 HAC; in iron, 49.1 HAC; in manganese, 6 HAC; in amonia, 7.4 HAC. The polluted territory around Magnitogorsk covers region of about 11.000 Km², including also farm-land's districts producing food products for the city.

A difficult situation, although not of that magnitude as in CIS countries, applies to Central European steel producers and the critical hot spot regions of their concentrations for example in Czech Republic, Poland, Romania, and Slovakia. The air and water pollution and solid wastes of Slovak iron and steel and ferroalloy industries are given in the following tables:

<u>Air Emissions</u> <u>in tpy</u>	1990 <u>real</u>	1995 <u>forecast</u>	2000 <u>forecast</u>	Ratio 1995 <u>1990</u>	Ratio 2000 <u>1990</u>
Solid	31,726	10,308	6,257	0.32	0.20
SO ₂	35,816	27,608	16,607	0.77	0.46
NO _x	14,334	15,371	7,321	1.07	0.51
CO ₂	106,195	60,710	55,710	0.57	0.52
OTHER	7,728	3,000	3,000	0.39	0.39
<u>TOTAL</u>	<u>195,589</u>	<u>107,067</u>	<u>88,915</u>	<u>0.55</u>	<u>0.45</u>

Total Volume of Waste Water	52,524	39,096	32,357	0.74	0.62
Soluble waste t/y contamination	20,074	16,828	15,717	0.84	0.78
Non soluble waste t/y contamination	1,275	989	566	0.78	0.44
Biological oxygen consumption (BSK5) t/p contamination	720	200	166	0.28	0.22
<u>Total</u>	<u>122,095</u>	<u>18,034</u>	<u>16,453</u>	<u>0.82</u>	<u>0.74</u>

Solid Waste materials Production in Kt/y	3,355	2,592	2,502	0.77	0.75
Utilized Waste Materials in Kt/y	2,107	2,268	2,868	1.08	1.36
Unutilized dump waste in Kt/y	1,248	323	234	0.26	0.19

The main plants in the Slovak Republic are the East Slovakian Steelworks at Kosice, with an annual crude steel capacity of 4 million tons and the Podbrezova Zeleziarne (annual raw steel capacity 600,000 tons). Crude steel production in Slovakia was reduced to 3.7 million tons in 1993, from previous 4.5 million tpy.

First steps to introduce environmental measures were started, e.g. a system to suppress fumes from liquid metal in blast furnace cast houses was introduced, other measures aim at reducing coke consumption by e.g. injection of coal into the blast furnace. Training programmes to recycle sludge are also under way. The plant faces decisive problems related to environmental protection, covering: coke gas desulphurization, including phenol-ammonia waters cleaning; flue gas dedusting in steel plant; metal dust and sludge utilization with zinc and lead content; collection, storage and removal of liquid and solid hazardous waste; continuous monitoring of air and water pollution.

The Podbrezova Zeleziarne has a capacity of 600,000 tons of raw steel (production in 1993 was 200 000 tons) final products, comprising seamless and welded pipes. The modernization programme of the plant is almost completed with shutdown of 3 OH furnaces and 2 old EAFs, improvement of the rolling mills, extension of high-value pipes, and establishment of an integrated mini-mill of 60 tons EAF capacity. Orava Ferroalloy Plant in Istebné reached production of 130,000 tons, annual capacity of 170,000 tons), broad range of ferroalloys. The metallurgical sector is of considerable importance for Slovakian economy, contributing approximately at 30% to the balance of foreign trade of Slovak Republic. Therefore environment management is a top priority for further development of this industrial sector.

2. REMEDIAL EFFORTS

The CEE governments prepared, based on the recommendations of various restructuring studies action plans related to pollution control e.g. the government of Romania' action plan includes the following measures:

- Setting up of an emission monitoring system;
- Setting up of an environmental data bank;
- Improving R and D in the field of pollution control equipment;
- Modernization of production facilities using LW/NW technologies;
- Elaboration of complex studies for introduction of best technically and environmentally acceptable technology;
- Dust catching and removal facilities;
- Waste gas cleaning at sintering plants;
- Dust control facilities at coke ovens;
- Improvement of chemical process technologies related to coke making;
- Modernization of existing electric arc furnaces and related pollution; control facilities, as well as pickling shops and rolling mill waste water treatment facilities;
- Process technology for recovery and recycling of waste from dumps (slags, ashes).

These plans are supported by national activities of research institutes and technical universities such as ICEM Institute/ECOSIDER in Bucharest, etc. Different CEE countries achieved varied results in these remedial efforts. The process will develop gradually since heavy investment is involved. In general, the environmental problems in the iron and steel industry are very similar in the CEE countries; they vary with the size of the overall operation, the volume of resource requirements, and the emissions and wastes generated by the different production stages, i.e. coke production; sintering; iron production or direct reduction of iron ore; crude steel production; hot shaping, and finishing (pickling, forging, rolling).

The failure to modernize resulted in a situation which is most evident in the accumulated and ongoing pollution levels in the industrial centres of the region. Nowadays that environmental protection is no longer looked at in isolation but as being mandatory to decrease the harmful effects on the population and as a mean to improve plant effectiveness and competitiveness, e.g. through introduction of energy saving technologies, the issue is of ever growing priority and demands urgent solution.

The main reasons leading to the environmental problems reaching disaster status were the orientation in these countries, to utilize lower grade raw materials, chronic lack of investment financing, inadequate maintenance and, as a consequence, the neglect of environmental standards and requirements. At the same time, because of political reasons the critical voices of the society raised against the increasing problems of environment, affecting both the health of factory personnel and the population in the surrounding region, were suppressed for a long period of time.

UNIDO drew attention of various donor countries to this problem during the ESID Conference in Copenhagen in 1991 when a subregional project to the tune of US\$ 6.6 mil. was presented. In spite of considerable efforts, the Western Governments declined to finance this large scale project and partial solutions were implemented only e.g. Austrian Okofonds financed environmental audits in the neighbouring countries. The environmental issues were discussed on a more coordinated, investment oriented basis during the UNIDO Conference in Budapest in March 1993 during which over 140 investment promotion profiles were identified. The recommendations of UNIDO meetings in May 1993 in Moscow and May 1994 in Dnepropetrovsk respectively, included also pollution abatement measures as top priority. During the June 1994 "International Workshop on Environment Management in Metallurgical Processes" the first version of a regional project for the six CEE countries was discussed; a similar regional project for CIS countries is to follow.

The 1995 metallurgical meetings in Czech and Slovak republics respectively reiterated interest in the regional project. Such a regional project would build up a platform to introduce and coordinate efficient application of environment management techniques and cleaner technologies in the iron and steel industries of the CEE countries participating in the network of regional technical cooperation. The envisaged outputs and activities of such a project could be summarized as follows:

3. REGIONAL PROJECT OUTPUTS AND ACTIVITIES

Output 1

Establishment of a network of companies and institutions to be responsible for implementation of the programme. Thus, the identified national focal points will closely co-operate in gathering the necessary data, promoting the exchange of information, agree on priorities, training programmes, etc. The network thus established could eventually lead to an Iron and Steel Association.

Activities for Output 1

Starting date/duration

Hiring of an international consultant on environmental issues in the iron and steel industry (for split missions).

A

Procurement of a study and demonstration on the trends in the world steel with special regard to Environment Management.

A + 1 month

Identification of national institutions/companies in the participating countries and selection of one focal point institution/company in each country, prepared to coordinate activities, transfer technology, undertake training, etc. A + 2 months

Organization of a meeting for introduction and endorsement of the project work plan and by the identified network focal point institutions/companies. Under the auspices of UNIDO and the international consultant (first split mission), national inputs, work methodology and work programme will be adopted. Selected participants in the meeting will be interviewed so as to qualify as national experts, to undertake project activities. They will cover the six participating countries: Bulgaria, Czech Republic, Hungary, Poland, Romania, and Slovak Republic. Observers from government/industry and international organizations (such as ECE Steel Committee), IISI Brussels will also be invited. One of the national focal point institutions will be selected leading network focal point, responsible for overall regional co-ordination of project activities. A + 3 months

Output 2

Inventory of technical capabilities and expertise available in the participating CEE countries in the field of environment management, with particular emphasis on heavy polluted regions, such as Pernik or Kremikovtzi (Bulgaria), Ostrava (Czech Republic), Kosice (Slovak Republic), Borsod (Hungary), Silesia (Poland), Galati (Romania).

Activities for Output 2

The national experts identified and selected under Activity 1 will be contracted. A + 5 months

They will visit national companies/institutions, explain the aims of the regional programme, collect relevant information on available technical capabilities, expertise and equipment for environment management (including environmental monitoring and auditing), identify additional focal points prepared to transfer technology and undertake training. A + 6 months

They will prepare country reports (inventories) where the profile of the participating companies, their technical capabilities and expertise will be explained. A list of plants which could act as demonstration units will be included. A + 8 months

The results will be discussed in a working group meeting in the presence of UNIDO. The inventory will be available to all participating countries/companies.

A + 9 months

Output 3

Inventory of technical requirements that cannot be met with available capabilities, expertise and equipment. Due to lack of financing, priorities for investment will have to be carefully selected and advised upon, e.g. handling of sludge, LD converter fumes, etc.

Activities for Output 3

This activity will require the second split mission of the international consultant on environmental issues in the iron and steel industry. The consultant will study the report prepared under Activity 2 and will subsequently visit selected plants to discuss cooperation between companies in the region and the technical requirements that need to be procured from abroad.

A + 11 months

In his report the consultant will suggest on the order of priorities for procurement of expertise, equipment and training of staff. He will thus complement the inventory prepared under Activity 2.

A + 13 months

Output 4

Staff from the participating network institutions/companies with strengthened capabilities on the application of environmental management techniques.

Activities for Output 4

Based on reports by the experts and consultants a few study tours/training programmes will be organized within the European region and abroad, with emphasis on environmental monitoring/auditing. Thereby first direct contacts for co-operation between institutions/companies will be established.

A + 15 months

A study tour by the regional project coordinator to regional organizations with recently established environmental management programmes will be organized, possibly to the Latin American Iron and Steel Institute (ILAFSA), Santiago, Chile, who set up an Advisory Committee on Environmental Issues (CADIMA), and to the South East Asia Iron and Steel Institute (SEASISI), Malaysia, which is in the process of establishing regional mechanisms for cooperation among Asian steelmaking plants in the field of environment as well as IISI, Brussels. Co-operation arrangements with these institutes may be agreed upon.

A + 15 months

Output 5

Guidelines for the establishment of a permanent regional consultancy group, responsible for the formulation of a comprehensive awareness and educational programme for the regional iron and steel industry which will focus on:

- Solid waste management;
- Dust minimization/recovery;
- Slag/sludge minimization/recovery;
- Liquid waste management;
- Waste water management/prevention;
- Air pollution control;
- Thermal pollution minimization;
- Environmental management in metallurgy/legal framework;
- Environmental monitoring;
- Environmental auditing;
- Pollution prevention programmes;
- Cleaner technologies;
- Standards/regulations;
- Cost-benefit analysis for environment programmes

Activities for Output 5

The international consultant, in co-operation with the national experts and representatives from the focal point institutions will prepare a report on methodologies for designing, developing and promoting friendly environmental activities in Central and Eastern European iron and steel industries. The report will include technical draft guidelines as well as strategies required to strengthen the regional focal points and to implement the regional programme on environmental management in the above fields. A + 17 months

The report and relevant papers will be presented to the final meeting of the national focal point representatives. The meeting is expected to adopt the regional programme and will define the future roles of the network focal points in its implementation. A + 20 months

4. INPUTS FOR THE REGIONAL PROJECT

Participating Focal Point Institutions and companies are expected:

- to ensure participation of relevant national iron and steel companies/associations in the project;
- to provide staff required for collection of iron and steel related environmental data and to assist the regional project co-ordinator;

- to arrange plant visits by the international and national experts and access to required data;
- to host, as appropriate, the meeting of the working group and ensure participation of qualified members at the discussions;
- to provide all necessary logistics and secretarial support required.

UNIDO inputs in US\$ include the following project components:

11-51	International consultant (split missions) 3 months, including participation in meetings and travel to network countries	30,000
16-00	UNIDO staff member missions (to co-ordinate the preparatory meeting and the ensuing 2 working group meetings)	9,000
17-00	Project Co-ordinator and national consultants, 18 m/m including DSA and travel to participate in preparatory and two working group meetings	86,400
32-00	Study tours/training activities Training within the network countries (6 participants 2 weeks each)	10,000
	Study tour abroad to a regional iron and steel association (ILAFA, Chile, or SEAISI, Malaysia).	8,000
42-00	Procurement of World Steel Dynamics reports/ subscription update	3,000
51-00	Miscellaneous (Reporting)	2,000
	<u>TOTAL</u>	<u>148,400</u>

The project will be evaluated according to UNIDO procedures. After completion of this project, it is expected that a number of joint projects at national and regional levels as well as regional training activities will be prepared for consideration of international/regional financing institutions.

5. ECE ACTIVITIES

Similar pattern of activities was practically followed by the Working Party on Steel of the Economic Commission for Europe (ECE).

Although the Working Party on Steel has dealt with environmental issues for a long time in its publications on iron and steel scrap and the recuperation of by-products of the iron and the steel industry, the first concrete approach was made in 1991 when the Working Party organized a Seminar on Producer's and User's Metallurgical Requirements in the Welding of Steel Products in Kiev, Ukraine. During the Seminar, it was recommended that particular attention be given to environmental questions in the iron and steel industries.

This recommendation was confirmed during the 47th Session of the ECE which was held in April 1992 in Geneva. After that, the Working Party organized a Seminar on Metallurgy and Ecology in 1993 in Nancy, France.

At this Seminar, the participants recommended that the Working Party take up the issues of environmental management, recycling of iron and steel products and by-products, environmental safety standards and the harmonization of regulations in countries belonging to the ECE. This recommendation was confirmed during the 3rd Session of the Working Party on Steel which was held in October 1993 in Geneva.

To carry out the recommendations of the participants of the Nancy Seminar, the Working Party organized the first Meeting of a Group of Experts on the Steel Industry and the Environment in Geneva in March, 1994 and decided to create a programme entitled "Metallurgy and Ecology" in its programme of work.

Upon the recommendations of the Experts on the Steel Industry and the Environment, the Fourth Session of the Working Party on Steel (1994) decided that the Working Party should serve as an information circulation centre and should seek to develop greater transparency in the sustainable development of the steel industry by becoming involved in the training and retraining of steel workers, standardization of measurements, recycling and re-use of metallurgical scrap and waste from the steel industry and the encouragement of the utilization of technologies best suited to the situation in each country. The Working Party was also recommended to pay particular attention to the development of those issues in the countries in transition.

In line with these recommendations the Working Party adopted several activities in its programme of work on the steel industry and the environment. In the field of scrap, the sixth updating of the biannual publication "Iron and Steel Scrap: its Significance and Influence on Further Developments in the Iron and Steel Industries" was completed and will be published in October 1995. Following the Seminar on the Steel Industry and Recycling, organized in April 1994 in Dusseldorf, Germany, a follow-up Seminar on Processing, Utilization and Disposal of Waste Materials in the Steel Industry will be organized in June 1996 in Balatonszeplak, Hungary. A Directory of organizations which conduct work on the steel industry and the environment is being prepared for publication in March 1996. Finally, the Working Party is addressing issues related to the harmonization of environmental regulations in the economies in transition. To this end, it considers projects that could further facilitate the exchange of information between steel producers and government representatives leading towards greater harmonization.

The Second Meeting of Group of Experts on the Steel Industry and the Environment which will be held in Geneva in March 1996 will discuss the future activities of the Working Party on Steel on the environmental issues.

**Clean Technologies and
Environmental Issues in the
Iron and Steel Industry**

Chang, Rae-Woong

Environmental Committee

SEAISI

Change of Circumstances in International Trade Market

● GATT → WTO

● UR → GR

⇒ Competition power of product depends on environmental control technologies in the manufacturing process

Trend of Environmental Technology

End-of-Pipe technology

→ Clean Technology
(Pollution Prevention Technology)

- Waste recycling
- Pollution source reduction
- Product change

Environmental Issues in the Iron & Steel Industry

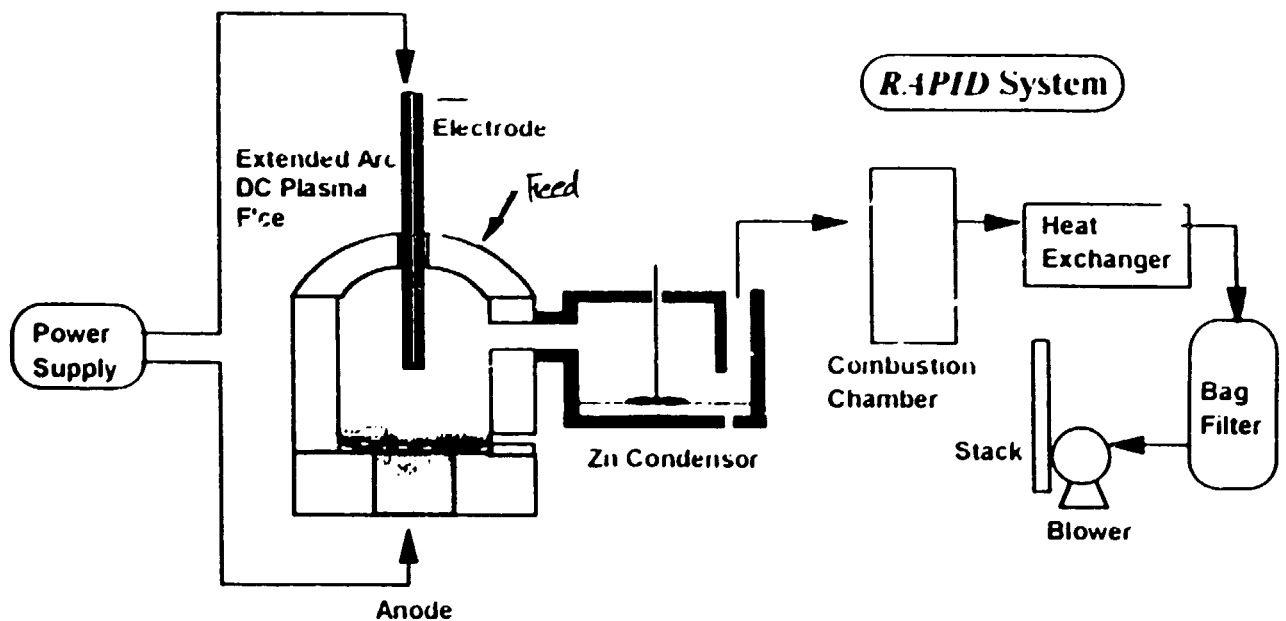
- **The 5th SEAISI Environmental Committee Meeting**
 - Dioxin in incinerator and EAF
 - Waste minimization
 - EAF dust treatment
 - Scrap utilization in minimills
 - Basel convention outcomes and effect
 - Alternative Fe source
 - Energy saving for CO₂ reduction
 - ISO 14000 impact on South East Asian Region
 - : Establishment of environmental management system and development of clean technology
 - LCA research: Exchange of technical information
 - Environmental, training in parallel with research

● **The 33rd IISI Environmental Committee meeting**

- Dioxin: measuring method and regulation standard
- Radioactive substance in scrap: proposal on detector installation
- Regulation standard of dust under 2.5um size: Causing pulmonary disease
- CO₂ tax : Cancelled or reserved in most countries
- ISO 14000 : Information exchange of LCA research, standardization of environmental management system(EMS)
- Basel convention: the effect of scrap trade
- Training and communication (Environment, Safty and Health)

EAF Dust Treatment by DC Arc Plasma Technology

- **Objective :** EAF Dust treatment from stainless steel plant and minimills
- **Characteristics of the system(pilot scale)**
 - 1MW and 2000 T / Y capacity
 - Continuous dust injection without pretreatment
 - Zn separation at the top of the system



- **Advantages**

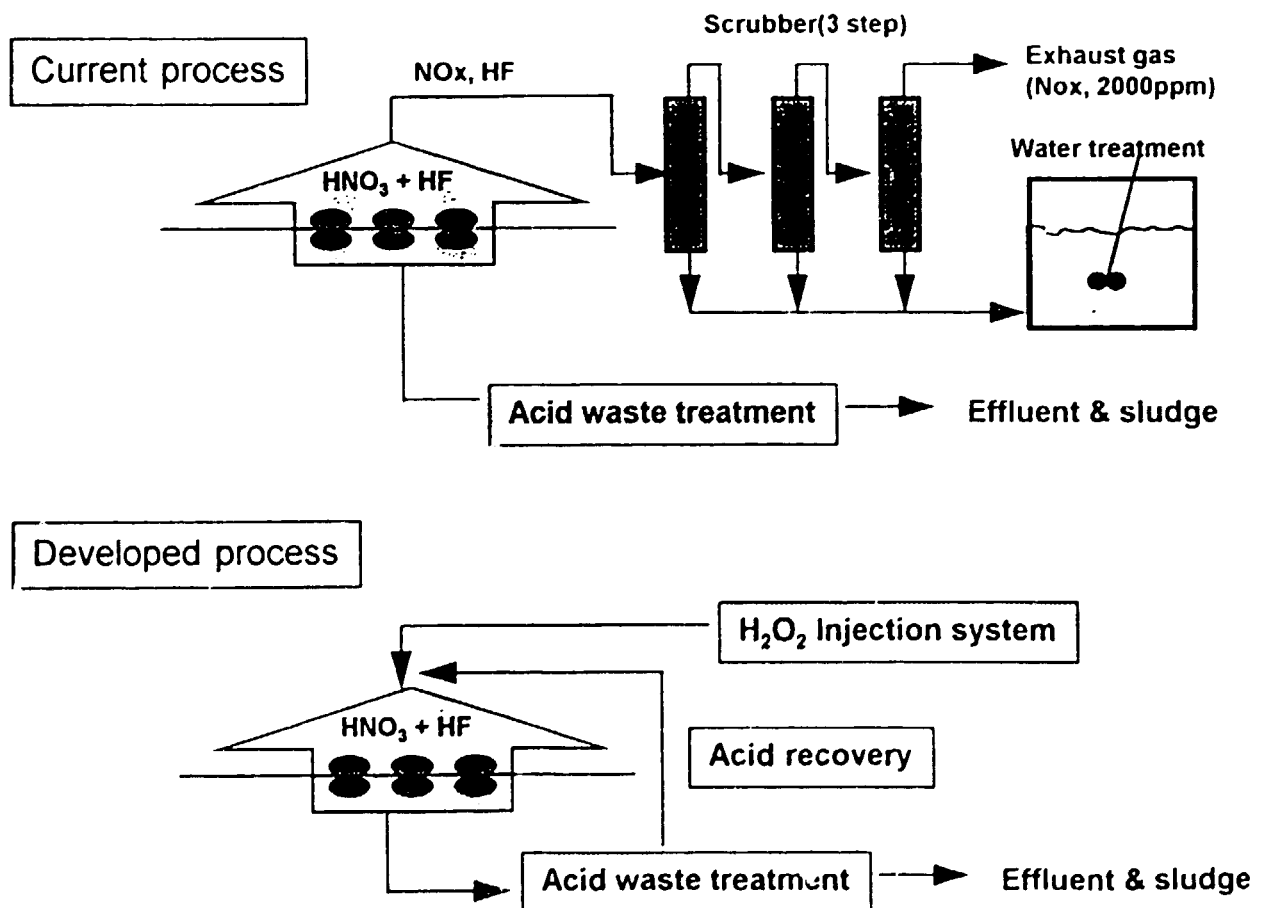
- Total recycling of EAF dust
- Not expensive compare to the other commercialized process(\$100-120/T)

Wastewater Recycling

- **Activated carbon process**
 - Remove organics that cause odor, taste and PAHs in the wastewater, especially, coke plant wastewater
 - Reusable in most direct cooling system
 - Not expensive, 7.0 cent / T
- **Reverse osmosis process**
 - Remove all pollutants as well as ionic compounds
 - Produce ultra pure water from wastewater
 - Very expensive, 65 cent / T
- **Electrodialysis process**
 - Remove ionic compounds such as chloride, sulfate and metals
 - Applicable in the wastewater from plating process
 - Expensive, 30 cent / T

Source Reduction of NO_x in a Stainless Steel plant

- NO_x is inevitably produced in a stainless steel pickling process by using nitric acid and hydrofluoric acid
- Addition of a little amount of hydrogen peroxide into pickling acid can drastically reduce the NO_x
- Product quality is similar to current pickling process



AGREEMENTS WITH INDUSTRY; THE DUTCH COVENANTS
BY JAN A. SUURLAND

Introduction

One of the most striking features of Dutch Environmental Policy is the so-called Target Group Approach. This approach implies the translation of longer term environmental quality levels into quantified emission reduction and resource conservation targets for different sectors of the economy. Based on the policy objectives of the National Environmental Policy Plan targets have been set for key sectors like industry, energy conversion, agriculture, building and construction, traffic and transport, waste management services and consumerism.

A fundamental principle underlying this approach is that the responsibility for achieving these targets lies primarily with the target group. Therefore the government is encouraging stakeholders in a particular set of environmental issues to enter into voluntary agreements. These agreements can be viewed as the 'modus operandi' of the target group approach. Up till now about 60 voluntary agreements have been made covering a very broad span of environmental issues and economic activities. As far as industry is concerned voluntary agreements can be divided in two broad categories. One type of industry agreements is dealing with product related issues. Examples are package waste prevention and recycling; recycling of plastic materials, solvent reduction in paints, ink and cleaning products; reduction of fosfates in detergents; reduction of PAH (Polycyclical aromatic Hydrocarbons) emissions from wood products, etc. The second type of industry agreements is dealing with production process control measures. It is on this type of agreements or covenants that we will focus in this paper, because they are part of a comprehensive programme to achieve sustainable production systems throughout industry. Across the board this means that emission reductions should be achieved up till 50-70% percent in 2000 and 70-90 percent in 2010 compared to 1985 levels. Total annual environmental control costs in industry will rise from approximately 2 billion guilders in 1990 to 5 billion in 2000.

Table 1: Summary of NEPP TARGETS For Industry

	<u>2000</u>	<u>2010</u>
<u>Climate change</u>		
- ozone depletion (montreal, EC)		
- CO ₂ (base-year 1989)	-3-5%	
<u>Acidification (1985)</u>		
SO ₂	-80%	-90%
NO _x	-60%	-90%
VOC	-60%	
<u>Diffusion (1985)</u>		
Heavy metals	-50-90%	-80-99%
toxic chemicals	-50-90%	-50-99%

Eutrophication (1985)

Nitrate	-70%	-75%
Phosphate	-75%	-95%

Waste Disposal

Prevention	10%	} 60.10 ⁶ tons
Re-use/recycling	68%	
Incineration	15%	
Landfill	7%	

2. Why Industry Emission Control Covenants?

As in most countries industrial pollution control in the Netherlands is being executed by means of a decentralised licensing system, involving local, regional and water management authorities. For small and less risky activities emission control is being regulated by general decrees. Although there are legal requirements and guidelines to be respected there is considerable room for discretionary decision making by the licensing authorities, not only regarding emission control standards to be imposed upon industries but also with regard to enforcement policies to be followed.

Another typical feature of the traditional licensing approach is that it relies very much on the managerial capacity and capabilities of licensing authorities to ensure that all industrial facilities are operating under an appropriate - up to date - permit. This implies that the licensing authorities should be able to monitor and review all existing facilities within their jurisdiction rather frequently. Our experience is that keeping the environmental performance of industries up to date by means of license-review procedures is a very costly and time - consuming business if it has to be done by unilateral action on the part of licensing authorities. The actual result is that throughout industry there is a wide divergence in actual environmental performance standards due to deficiencies in the existing licensing system. Furthermore there is no guarantee that national targets will be achieved.

This divergence in standards and enforcement is not only problematic from an environmental perspective but also for industry at large because it is disturbing competitive relations within sectors of industry both in the domestic and international market place. Until recently these problems were felt by the business community as a nuisance that was irritating but not making life miserable. However in view of the ambitious goals set by the NEPP and the substantial increase in environmental costs to be made it became clear to all parties involved (business community, central government and licensing authorities) that a concerted action should be taken to ensure a more uniform and efficient implementation process throughout industry. This is exactly what the covenants are trying to accomplish.

Before going into more details it is important to note that these covenants are being used as a complement to existing law and license regulations rather than being an alternative to direct regulation. They serve as a management tool by providing rather detailed agreements on the implementation process to be followed but are bounded by the general legal framework that is determining the core responsibilities of central government, licensing authorities and industries as well the community rights related to licensing and enforcement procedures. In this respect these covenants differ from a number of product related covenants (e.g. packaging waste, plastic recycling, take back schemes of used products) which do replace or pre-empt direct regulations.

Before actually starting negotiations with separate sectors of industry the Ministry of Environment has sought general agreement on the rules of the game to be played. For this purpose a Central Committee on Environment and Industry was established immediately after the NEPP. This committee consists of major players in the field. (key decision makers in industry, trade-unions, licensing authorities and central government ministries).

Under the supervision of this committee a number of documents have been produced that serve as a guidance for the target group management approach and the covenant processes involving industry. A major task in preparing the covenant process was the compilation of an industry-wide inventory of base line emissions to be used as a reference document for the development of emission reduction and resource conservation targets to be met by the different sectors of industry. On the basis of this inventory 14 sectors have been selected as priority target groups involving some 12000 companies, together responsible for over 90 percent of industrial pollution. (Not included is the energy conversion sector-refineries and power generation - for which a somewhat different target group approach is being followed). The general approach has been discussed extensively in Parliament. This resulted in a broad endorsement of the covenant approach, although Parliament reserved its right to check each covenant separately.

Table 2: Schedule of Covenants to be Concluded with Industry

<u>Industry Sector</u>	<u>Date of Covenant</u>
Printing and packaging printers*	1992
Base Metals*	1993
Chemicals*	1993
Dairy*	1994
Metal products and electronics	1994
Textiles	1994
Abattoirs/meat industry	1994
Paper and paper products	1994
Leather	1995
Rubber and plastic products	1995
Brick and tiles	1995
Concrete and Cement products	1995
Other mineral products	1995

* Covenants concluded

4. The Covenant Process

For each particular sector the process is being initiated by an invitation of the Ministry of Environment to all relevant parties (industry and licensing authorities) to participate in a joint starting meeting. This meeting is being used to explain the purpose of the covenant process, procedures to be followed, to identify issues that will need special attention and to check whether and to what extent industry representatives are empowered to start actual negotiations. Depending on the mandate of industry representatives preparations can start immediately or will require further consultative meetings- with key decision makers.

Due to the lack of experience and unfamiliarity with this type of negotiations the first covenants took a rather long time (more than 12 months) also because along the way it turned out that the legal status of the covenants needed more clarification to become acceptable to industry lawyers. We have also learned that it is essential to have an adequate feedback mechanism built into the negotiation process, particularly with CEO's of leading companies in the sector. Without their direct involvement there is no guarantee that results achieved with the negotiators will have a fair chance to be endorsed by the sector at large.

The covenant takes actual shape by drawing up a declaration of intent in which industry-sector associations, central government ministers and the licensing authorities pledge that they will pursue a policy aiming at the realisation of the Integral Environmental Target Plan for the sector concerned. The IETP comprises all NEPP policy objectives including energy conservation, pertaining to the sector for 1995, 2000 and 2010 and is as such part of the covenant. Therefore the contract runs also up to 2010 though under the condition that there will be a periodic assessment of the process.

It should be noted that the IETP is in principle not negotiable. The targets to be met are set one sided by the central government on the basis of the relative share of the sector in total pollution loads, taking into account the NEPP policy objectives. However to the extent that there is doubt about the validity of the data being used this may lead to a correction of the IETP. This being the case the agreement will provide for a more detailed assessment of baseline and actual emission profiles of the sector.

The IETP's are being established without a detailed assessment of the economic impacts on the particular sector. On the basis of a macro- and meso economic impact analysis in combination with a rough technology assessment the NEPP concluded that no major economic disruptions were to be expected. However this does not exclude the occurrence of particular technical-economic bottlenecks at the sectoral level for instance because of changing market conditions. For this reason the declaration of intent does not commit individual companies directly - in a legal sense - to the attainment of the IETP. Instead they are committed to apply - as a general rule - Best Available Technology (BAT), in accordance with the guidelines set out in a number of documents.

Most of the work to be done during the preparation phase centres around the implementation procedures to be followed. The way this implementation process is being handled may differ from sector to sector as well as between companies within a sector. To keep it simple we will discuss two rather extreme types. In reality more hybrid sector structures are the rule and accommodated for in the covenant process (e.g. textiles and metal-electro).

Heterogeneous sectors

In those sectors where there is a great variety of industrial processes and individual plants have a substantial impact on total pollution loads of the sector, like for instance the base-metal and chemical industry, the covenant does require that each individual company will submit every four years a Company Environmental Plan (CEP) to the licensing authority. To ensure that this will take place the government demands that the agreement has to be signed not only by the industry associations involved but also by the majority of the companies in the sector (covering at least 80% of total emissions).

This plan - the first to be issued within six to eight months after the agreement - has to indicate the measures that the company will take to reduce pollution loads during the first four years. The plan should also indicate the emission reduction targets the company intends to achieve in the next four years. This to enable the licensing authority to appraise the short run performance in conjunction with the longer term commitments the company is willing to take upon itself. The CEP has to be submitted for approval to the licensing authorities. When approved this implies that the company may be assured that investment decisions taken in accordance with the plan will meet no objections by the licensing authorities. Neither will the licensing authority take action to enforce environmental control measures beyond the scope of the plan (unless forced to do so as a result of appeal procedures). To assist the licensing authority in its appraisal the (first) company plan should be accompanied by an inventory of emissions and energy consumption for the base year stated in the IETP and a summary of emission reductions already achieved since the base year (1985). Furthermore the company plan should give an estimate of likely problems the company may have in applying BAT due to e.g. financial, technical or market circumstances.

The covenants also stipulates that companies are free to set their own priorities and to choose the most cost-effective solution as long as they can demonstrate to the satisfaction of the licensing authority that their efforts are in line with the requirements of the agreements, i.e., does not jeopardise the attainment of emission reduction targets set at the sectoral level.

Companies that are required to draw up an environmental company plan are also obliged to issue an annual report on their performance over the last year and the results to be expected in the next year. Both company plans and annual reports are public documents, with exemption for commercially sensitive information. The company plans and annual reports will be used also to monitor progress at the sector level. In each sector the aggregate results will be produced and analyzed by a Consultative Committee. This sector Committee is supervising the implementation of the agreement and has to draw up recommendations to the Minister of Environment to remedy problems that may arise eventually. The Consultative Committee consists of representatives of all parties involved in the agreement.

The base metal sector is the first that has completed the first round of environmental company plans. The aggregated results are presented in table 3 and compared with the emission reduction targets set for the sector. Due to a collapse of world market prices of steel and aluminium the industry is faced with a strong erosion of financial resources since 1990. This has resulted in a slow down of environmental investments which explains why not all 1995 targets are being met. This has been accepted by the public authorities. However the Consultative Committee recommended to maintain the 2000 targets and these will have to be safeguarded by the next round of environmental company plans. The committee has decided to develop a more detailed guidance document to resolve existing technical problems in environmental control, particularly with regard to NO_x and some toxic emissions.

**Table 3: Comparison of Emission Reduction Targets and Aggregated Results
Environmental Plans Base Metal Industry**

	1995 Target	CEP's	2000 Target	CEP's
Acidification				
● Sulphuroxide	35%	28%	75%	56%
● Nitrogenoxides	25%	14%	55%	16%
Diffusion to air				
● Fluorides	-	-	80%	23%
● Fine Particulates	-	-	75%	60%
● Zinc	50%	46%	50%	49%
● Lead	70%	-37%	70%	90%
● Chromium	50%	29%	50%	60%
● Arsenic	50%	63%	50%	63%
● PAH's	-	-	80%	70%
● Hydrogen Sulphide	-	-	50%	49%
Diffusion to water				
● Phenols	-	-	50%	99%
● Zinc	65%	86%	65%	90%
● Lead	65%	73%	65%	78%
● Nickel	50%	38%	50%	60%
● Mercury	25%	-21%	50%	-15%
● Hydrogen sulphide	-	-	50%	81%
Eutrophication				
● Nitrogen	40%	61%	70%	61%

Homogeneous Sectors

In sectors dominated by industries of a relatively homogeneous nature with hardly any 'outstanding polluters' like for instance the printing industry, a more standardized approach to environmental management can be followed. For these sectors the covenant does not need to have the direct commitment of individual firms to become effective. Therefore the covenant process involves - on the side of industry - only the branch organisations. The core element of the agreement in these sectors is the development of a detailed implementation plan. The purpose of this implementation plan is twofold. First it provides for a package of technical options to solve environmental problems in a cost-effective manner, suited to the different processing modules prevailing in the sector, together with a standard format report to be used by the companies as a company environmental plan. Secondly the implementation plan provides for a time-schedule with regard to specific emission control measures to be taken by companies. Contrary to the case of heterogeneous industry there is no obligation for these firms to issue an annual report. Actual progress will be monitored by the Sector Consultative Committee on the basis of surveys to be carried out in collaboration between the contracting partners.

In Company Environmental Management

Part of the Target Group approach for industry is to enhance the quality of environmental management (environmental care systems) within companies. In agreement with the national employers association a programme was set up in 1990 to stimulate the introduction of in company environmental management and auditing systems. The target set for 1995 was that some 10.000 companies should have a comprehensive environmental management system in place. Most of these companies belong to the same sectors that were selected as priority target groups. Part of the industry sector covenants is therefore the obligation that companies will establish an adequate environmental management and auditing system.

If we break down the development of an environmental management system in 3 phases the situation by the end of 1992 can be summarised as follows.

Some 32 percent of the companies had started preparations, 37 percent was in the process of designing the system and 21 percent was actually implementing an environmental care system or had finished the job. More than 70 percent of companies with more than 500 employees are in the advanced group. For the 100-500 employee bracket this number is 40 percent. The chemical sector is front-runner with 60 percent in the advanced group.

Slow starters are mainly to be found among the smaller companies and in sectors which so far have not been included in the covenant process. This indicates that the pressure to set-up environmental management systems, is more strongly felt when companies are being confronted more directly with the need to improve environmental performance.

A recent survey under Dutch enterprise revealed that there is a great demand for a common standard against which the quality of the environmental management system can be judged. Together with industry we have started to develop such a standard and certification scheme within the framework of implementing the European Environmental Management and Audit Scheme Regulation. One of the major advances, of standardisation and certification is that it may streamline existing monitoring and enforcement procedures, thereby reducing the administrative costs for both industry and licensing authorities. This of course depends very much on the safeguards that can be built into the certification scheme. In our view this not only requires safeguards that the company will comply with existing emission and resource conservation standards but also that a certified system should guarantee that the company will take steps to improve its environmental performance continuously. A practical solution would be to link the certificate to the requirement that the company should issue an environmental plan like the one that is being demanded in the Dutch covenants.

Energy conservation

Under the first responsibility of the Minister of Economic Affairs (Department of Energy) an energy conservation programme is being implemented aiming at an increase of energy efficiency of 20 percent in industry during this decade. This target has been derived from the CO₂ target for 2000 in the NEPP, demanding a cut in CO₂-emissions of 3-5 percent overall.

Within industry some 25 sectors have been selected to be incorporated into the energy conservation programme. Targets to be met may differ from sector to sector and are established in direct negotiations between DOE and the branch organisations involved. On the basis of these sectoral targets individual companies are being approached in order to come to individual agreements.

These company by company contracts are based upon an assessment of feasible energy saving options available for the industry and result in a time-schedule for implementing these measures. The programme provides for a financial incentive that is (partly) bridging the gap there may be between commercially acceptable financial returns on capital investment and the longer pay back period of energy conservation-measures.

To the extent that there is an overlap between the sectoral energy agreements and the priority target groups of environmental policy the energy agreement will be incorporated in the environmental industry covenants. This also implies that the energy measures agreed on the level of individual companies will have to be part of the company environmental plan that has to be submitted to the licensing authority. However, although the environmental licensing authorities are competent to impose energy efficiency standards and measures, there is a general agreement between parties that as a rule licensing authorities will not deviate from the agreements achieved in individual energy contracts, unless a trade off between environmental and energy saving issues is unavoidable. This may be the case for example when a company is delaying critical pollution control measures in favour of energy conservation.

5. Concluding Remarks

We will conclude this paper with a summary of the main advantages of the covenants to both industry and the government.

a. Integration of sectoral industry and environmental policy

The most appropriate level to address possible conflicts between environmental and economic interests is the sectoral level. The covenant provides for a framework for the reconciliation of environmental and economic issues by establishing Sectoral Consultative Committees involving all relevant parties in combination with a sector by sector monitoring and evaluation scheme. Also the covenant commits the public authorities to ensure a co-ordinated implementation of environmental control measures. Central government is committed to avoid as much as possible a distortion of competitive relations and has therefore the obligation to monitor the development of environmental policies in other advanced industrial nations. More in particular the central government will strive for the implementation of a similar industry target group approach within the framework of the European Union.

b. Integration of environmental and strategic company planning

By establishing an IETP for each sector the central government makes clear what is expected from industry and the licensing authorities. The IETP covers the whole environmental agenda up to 2010 with regard to industrial emission control. By working with the same agenda it will be more easy for individual companies and licensing authorities to agree on-priorities. The system of company environmental plans also ensures that the agenda will be updated periodically. Important is also that the covenant allows companies more flexibility in making trade offs between different environmental issues. This will facilitate the implementation of cost-effective process integrated pollution prevention measures. We may therefore conclude that the covenant will help companies to integrate environmental concerns into their overall investment planning and marketing strategies.

c. Streamlining licensing and enforcement procedures

A major objective of the covenant process is to bring about a shift in industry's attitude toward environmental management. Rather than being reactive to environmental measures imposed upon them the covenant commits companies to a pro-active role. Part of the covenant is the development of an appropriate communication structure to make sure that all companies and licensing authorities know what is expected from them. On top of that helpdesks are being established to assist companies and licensing authorities with the implementation of the covenant. This will contribute to a more coherent approach by the licensing authorities. To ensure compliance throughout industry the covenant instructs licensing authorities to take special measures to counter possible free rider behaviour.

The overall result will be that the administrative costs involved in licensing and enforcement procedure will be substantial less than under traditional command and control approaches to the benefit of both industry and the public authorities. Indeed we will get:

More Environment for less Money

WHY INDUSTRY CONVENANTS ?

- * Streamlining of licensing and enforcement procedures
- * To improve environmental performance by industry
- * To provide for a level playing field

THE CONVENANTS PROCESS (PARTIES)

CENTRAL GOVERNMENT

Ministry of Environment

Ministry of Water Management

Ministry of Economic Affairs

LICENSING AUTHORITIES

Provincial councils

Union of municipalities

Union of water management authorities

INDUSTRY

Branch organisations

THE CONVENANT PROCESS (PRODUCTS)

A. INTEGRAL ENVIRONMENTAL TARGET PLAN

- sectoral emission reduction targets
- best available technology (alara)

B. DECLARATION OF INTENT

- implementation procedures ietp
- commitments industry
- commitments public authorities

C. SECTORAL CONSULTATIVE COMMITTEES

- monitoring and evaluation
- recommendations to central government

CONVENANT PROCESS (HETEROGENOUS SECTORS)

- * individual companies sign covenant
- * environmental company plans
(every four years)
- * annual company progress reports
- * annual reports total sector performance

examples: base metal / chemicals

COMMITMENTS FOR COMPANIES (1)

- * Update the Company Environmental Plan every four years
- * Annual report concerning the implementation of the Company Environmental Plan

COMMITMENTS FOR COMPANIES (2)

- * The Best Available Control Technology is the starting point for the Company Environmental Plan
- * When the IETP is not fully implemented, more extensive measures must be indicated in next CEP

RESULTS ADDITION COMPANY ENVIRONMENTAL PLANS PRIMARY METALS INDUSTRY

	1995 Target	CEP's	2000 Target	CEP's
<u>Diffusion to water</u>				
. Phenols	-	-	50%	99%
. Zinc	65%	86%	65%	90%
. Lead	65%	73%	65%	78%
. Nickel	50%	38%	50%	60%
. Mercury	25%	-21%	50%	-15%
. Hydrogen sulphide	-	-	50%	81%
<u>Eutrophication</u>				
. Nitrogen	40%	61%	70%	61%

ADVANTAGES TARGET GROUP APPROACH

- * Initiative lies with companies**
- * More process–integrated solutions for environmental problems**
- * Integrated approach of environmental problems**
- * More efficient licensing**

RESULTS ADDITION COMPANY ENVIRONMENTAL PLANS PRIMARY METALS INDUSTRY

	1995 Target	CEP's	2000 Target	CEP's
<u>Acidification</u>				
. Sulpharoxide	35%	28%	75%	56%
. Nitrogenoxides	25%	14%	55%	16%
<u>Diffusion to air</u>				
. Fluorides	—	—	80%	23%
. Fine Particulates	—	—	75%	60%
. Zinc	50%	46%	50%	49%
. Lead	70%	-37%	70%	90%
. Chromium	50%	29%	50%	60%
. Arsenic	50%	63%	50%	63%
. PAH's	—	—	80%	70%
. Hydrogen Sulphide	—	—	50%	49%

SECTOR CONSULTATION

- * To monitor progress in the development and implementation of the IETP
- * Possibilities for further phasing parts of the IETP for at the most 4 years
- * Can Propose to adjust IETP
- * For adjustment IETP approval of all parties necessary

COMMITMENTS FOR THE AUTHORITY (1)

- * To judge and check the Company Environmental Plan
- * Company Environmental Plan is basis for issuing licences
- * To judge and check the yearly report

COMMITMENTS FOR THE AUTHORITY (2)

- * Unilaterally action towards companies that do not implement the declaration of intent
- * Efforts to achieve international harmonization of environmental policy

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**SELF-REGULATORY ENVIRONMENTAL MEASURES
IN THE METALLURGICAL INDUSTRIES**

Raads Welvaadt

The first Dutch Covenant

On March 10th 1992 the first covenant was signed between the target group "Primary Metals Industry" (PMI) and the Dutch authorities that deal with environmental issues.

This target group PMI consists of 35 steel and aluminium producing and processing companies.

In full the name of this covenant is:

"Declaration of intent on the implementation of environmental policy for the primary metals industry"

Important part of this covenant is the "Integral Environmental Target Plan" (IETP). In the IETP the goals of the Dutch National Environmental Policy Plan are translated into reduction targets for the years 1995, 2000 and 2010 in relation to the emissions in 1985. Headlines of the covenant are:

Every 4 years each company of the PMI will make a "Company Environmental Plan" (CEP), that covers a period of 4 years and also provides a projection of activities to be taken for a subsequent period of 4 years.

In the CEP the company describes activities and efforts to reduce the environmental pollution against the background of the IETP.

The companies of the PMI strive to reach consonance with the authorities about the content of their CEP.

The authorities judge the CEP on accuracy of data.

The authorities ensure that each company makes a satisfactory effort to reduce environmental pollution against the background of the IETP

If the authorities approve of the CEP, they take it into account by their regulatory activities: the plan will be formalised in the framework of the relevant permits.

What is the companies interest to agree with this covenant

In the CEP it is possible to take an integrated approach to environmental problems. As a result of the organization of the environmental control in the Netherlands, permits are given by different authorities for emissions to air and to water. In the CEP a company can choose the best solution for the environment as a whole.

In the CEP a list of actions with high priority results in "certain investments". Once a CEP is approved by the authorities, other possible actions are not taken in the period of that CEP.

The process of making a CEP at Hoogovens Staal

activities

The activities started in March 1992. In december 1992 the first concept of the CEP was ready. It consisted of

-description of the works

-inventory of environmental effects divided in
climate and energy (CO₂)
acidification (SO₂, NO_x)
diffusion of substances (heavy metals

*air
*water
*soil
*radiation

eutrofication
recycling
disturbance:

*noise
*smell
*external safety
*dust

drought
waste
environmental care systems

-inventory of techniques to reduce emissions

From december 1992 until july 1993 the CEP was studied by the authorities. Their reactions resulted in a definite CEP that was ready in july 1993.

experiences

During the process it became clear that it was a learning process for both the company and the authorities.

The total operation was very extensive in time and man power.

Reductions of emissions

In oktober 1993 the results of all CEP's from the PMI were known and added up. The conclusion was in general that 80 % of the targets for 1995 will be met. For instance:

substances	emissions in 1985	reductions in 1995		reductions in 2000	
		target	CEP's	target	CEP's
acidification					
sulphur-oxide	16000 ton	35%	28%	75%	56%
nitrogen-oxides	8800 ton	25%	14%	55%	16%
diffusion to air					
fluorides	338 ton	-	-	80%	23%
fine particulates	7250 ton	-	-	75%	60%
zinc	104 ton	50%	46%	50%	49%
lead	51 ton	70%	+ 37%	70%	90%
chromium	1 ton	50%	29%	50%	60%
arsenic	0,54 ton	50%	63%	50%	63%
PAH's	23 ton	-	-	80%	70%
hydrogen sulphide	490 ton	-	-	50%	49%
diffusion to water					
phenols	161 ton	-	-	50%	99%
zinc	62 ton	65%	86%	65%	90%
lead	5,8 ton	65%	73%	65%	78%
nickel	4,6 ton	50%	38%	50%	60%
mercury	0,040 ton	25%	+21%	50%	+15%
hydrogen sulphide	32 ton	-	-	50%	81%

- ♦ the emission is higher in relation to the emission in 1985. In some cases this does not mean that emissions are really higher.

Continuation

In 1996 the PMI will make new CEP's.

It is clear that high priority has to be given to substances for which the targets in 2000 are not yet reached.

ISO TC 207 and its Relation to European EMAS-Regulation

Christine Jasch, IOW Vienna

Historical development

In connection with the stricter product and environmental liability laws, companies in the United States and the United Kingdom started in the 80ies to undertake periodic reviews of environmentally relevant parts of their production processes and to monitor compliance with legal requirements. The tools used for this purpose are a mixture between internal controlling and auditing procedures on the one hand and the procedure for the audit of the annual accounts under the relevant accounting laws on the other, adapted in such a way as to put a new emphasis on assessing a company's environmental performance.

Eco-audits belong to a new category of economic instruments for environmental protection which rely on the self-regulating forces of the market and the economy as well as the responsible behaviour of business firms and consumers. The aim of these market-based instruments is to design an appropriate framework within which business firms assume economic and ecological responsibility for their activities. This is to be done in such a way as to make environmental management and ecologically responsible business practices pay, not only for the economy as a whole but also for the individual firm.

The roots of the eco-audit, as performed in the United States, go back to the late 1970s, when it was developed in response to tightened environmental regulations as well as a number of accidents in large chemical companies. However, the only purpose of the audit was to ascertain whether compliance of the firm's activities with the relevant laws and regulations could be ensured. Since then eco-auditing, performed either by the companies themselves or by external consultants, has become increasingly widespread - by 1979 already two thirds of the 110 largest American companies had introduced an eco-auditing programme as an internal management instrument. Following this, more and more companies wanted to have these programmes audited externally. In general, an eco-audit is introduced when a company decides to install a management system which is designed to discover (by regular and systematic monitoring and inspection), analyse and report (both internally and externally by means of an environmental information system) potential environmental problems.

During the last two decades the reasons for which audits are carried out have changed. While in the beginning audits were merely a means to ensure compliance with the numerous environmental regulations, a much wider and, from the management's point of view, more sensible approach was adopted later on, the purpose being a comprehensive analysis of all possible ways of mitigating environmental impacts and reducing emissions in an economically efficient way. Furthermore it forms the basis for an efficient environmental management and environmental controlling system.

The environmental information system is modelled on the financial audit (see Figure 1), which is composed of three parts:

1. The balance sheet, a stock concept, which shows the fixed and current assets as well as liabilities and owners' equity of a company at a given date.
2. The profit and loss account, a flow concept, which records the flow of funds over the financial year, categorized into sales revenues minus personnel and material expenditures
3. Reports, which explain the items in the first two statements and provide an overall picture of the general situation and prospects of the firm.

In the case of large firms, the annual accounts as well as the internal control system are examined annually by a certified accountant, following which they are published in the Commercial Register.

The traditional (financial) audit is completed by the auditor's report to the addressees of the annual accounts. These are primarily the owners of the firm, but also stakeholders such as creditors, customers, employees, etc. It includes a report on the accounting procedures and results as well as the annual accounts drawn up in compliance with accounting principles such as true and fair view, unambiguous presentation, substantive accuracy and impartiality. Thus the auditor confirms compliance with legal accounting and auditing rules as well as conformity with the principles of proper accounting.

Similar categories have developed in the field of environmental accounting, which can be classified into:

1. Assessment of accident and risk potential at a site
2. Input-output analysis of material flows
3. Environmental report.

In case a company participates in the EMAS Regulation the environmental report is validated by an independent environmental verifier, who also reviews organisational structures and the implementation of environmental programmes.

The draft EMAS Regulation (Environmental Management and Audit Scheme) submitted by the EC Commission in 1990 provided for mandatory standardised environmental reports to be rendered annually by certain companies. The procedure was closely modelled on the financial audit and was therefore also intended to serve as a check on the enforcement of environmental legislation. On the other hand, the International Chamber of Commerce has always supported an auditing procedure which is modelled on internal audits and designed for internal use only.

Due to objections from industry the EU scheme was modified into a voluntary system, with companies subjecting themselves to this annual review being allowed to use the statement of participation for promotional purposes.

The final EU Regulation is much more comprehensive than the ICC model since

- it provides for validation of the environmental statement by external environmental verifiers
- as well as the publication of the results, and
- the audit comprises both factual data on the environmental impacts of a company and the review of the management structure.

What are the objectives of the scheme?

The aim of the EU Regulation is the

- voluntary
- continuous
- pro-active

improvement of a company's environmental performance. This new instrument clearly embodies the idea of a preventive environmental policy. Without doubt it is – apart from so-called industry agreements – one of the first instruments which, in line with the cooperation principle, attempts to overcome the trade-off between economy and ecology and to reconcile the diverging interests of various countries, social groups, associations, businesses, consumers, etc. To realise the goal of sustainable development all parties involved should have an interest in devising a practical instrument that can easily be brought to life.

Requirements of the EMAS Regulation – a brief description

Under Article 3 the company has to fulfill certain requirements to register a site. To be entitled to use the statement of participation for a particular site the company is required to implement all rules, conditions and procedures specified in the EU Regulation.

In this context, the Regulation does not prescribe certain emission limits as minimum standards, but opts for a dynamic instrument to proceed on the road towards sustainable development.

In their environmental policy, participating companies must commit themselves to compliance with all relevant regulatory requirements regarding the environment as well as reasonable continuous improvements of their environmental performance. These commitments must aim at reducing environmental impacts to levels which can be achieved by economically viable application of best available technology.

Another obligation is the application of so-called good management practices, as listed in Annex I, D. They describe preventive organisational measures to reduce environmental impacts at source.

Furthermore, companies have to define, in the light of the results of the environmental review and subsequent audits, (largely quantitative) targets for all departments, the fulfilment of which is to be reviewed in the next period. Through this ongoing cycle the aim of continuous improvements is to be achieved. Initial differences in national standards and legal frameworks will thus tend to be reduced in the medium term (See Figure 2).

Data collection and assessment on the basis of input-output analysis

To comply with the requirements of the EU Regulation concerning data collection and assessment of the environmental impacts of a site different tools than used within financial or quality audits have to be used. One of these instruments for the recording and assessment of environmental impacts of business activities will be the company eco-balance statement (input-output mass balance) (see Figure 3)

Via weakness analysis and the establishment of targets continual environmental controlling can be installed as a comparison of desired and actual performance with regard to the environmental facts and conditions pertinent to a company. This is done on the basis of analysing current performance by means of mass balances and the ecological assessment of these data (eco-balance and environmental information system). Measures to be taken will then be deducted from the environmental controlling system.

The IÖW approach

The ecobalance approach of the IÖW (see Figure 4) comprises four elements:

- input-output analysis on the company level
- Process flow charts
- Product Life Cycle Assessment
- Site Assessment

Input-output analysis of the company

This mass balance of material flows is the starting point of the analysis. On the one hand the inputs used by the company are shown, categorised into materials and energy. On the output products as well as material and energy emissions are recorded. This gives an overview over the quantities of materials and energy used in the company. It is therefore an analysis which does not only consider the marketable product, but also the by-products, resource use, wastes and emissions which arise from its production.

Process Flow Charts

A subdivision of the company balance statement into individual procedural steps leads to process balances. The process balance statement is designed to give insights into company-specific processes. This requires a detailed examination of individual steps in production - again in the form of an input-output analysis. Circular processes are characterised by particularly low materials and energy flows outside the system boundaries.

Product-Life-Cycle Analysis

If we change our point of reference from the company to the individual product, we have to broaden our view and consider the entire product life-cycle by adding upstream and downstream life-cycle stages. This type of analysis serves to evaluate the environmental impacts of raw materials, various production stages, consumption and disposal of a product. It is performed by considering the entire life-cycle of product and largely corresponds to the product life cycle assessment.

Site Assessment

This type of analysis corresponds largely to the procedures involved in carrying out an environmental impact analysis and the analysis of accident risk. The structural interference of the site with its environment as well as any risks resulting from this are recorded. For example, the use of land and environmental resources, interference with the landscape as well as the ecological dimension of fixed assets and inventories and accident and liability risks arising from this are considered.

With the help of these elements materials and energy use, transformation processes, products manufactured, material and non-material emissions as well as structural encroachments are identified and reported. Energy consumption, recycling opportunities, waste disposal problems, materials toxicity and accident risk can thus be assessed. The data thus recorded are then summarised and weighted in accordance with the company's valuation priorities

In general, the EMAS Regulation is site-based. In view of the requirement (in Annex I C) to examine the environmental impacts of product design it is also necessary, however, to conduct at least a rough analysis of the product range. In some companies and industries it is clear that significant adverse environmental impacts do not arise from production at the site, but from the goods produced and the associated logistics. Therefore this area also needs to be optimised.

EMAS-Participation

In accordance with the requirements of the EMAS Regulation the procedure involved in obtaining the statement of participation can be summarised as follows (see Figure 5 and Figure 6, Peglau, 1992 (modified)).

Relationship with standards

Those responsible for a site must carry out an initial environmental review with a view to ascertaining existing environmental impacts and to develop, in the light of the results of this review, a site-specific environmental management system. The basic features of an environmental management system and related requirements are set out in the annexes to the EMAS Regulation.

Basically, the EMAS Regulation can be implemented all by itself. However (in combination with Art.19) Art. 12 of the Regulation creates the possibility of having parts of the environmental management and audit system certified to a standard. Standards may thus serve to meet parts of the requirements of the EMAS Regulation, provided they have been recognised by the European Commission. The EU Commission reserves the right to recognise the standards for environmental management system, environmental audit and the certification procedure itself. Until a CEN standard has been adopted it is possible to apply a number of standards that vary with regard to their field of application (national or international) and their content (environmental management standards, auditing) in parallel.

Basically, however, the EMAS Regulation can be applied all by itself, i.e. its implementation does not require any implementation of national or international standards.

Even if a company has been certified to a standard for environmental management systems and eco-audits by a recognised procedure, the environmental statement must be validated by an accredited environmental verifier. As yet, the draft standards do not cover the environmental statement. Its attestation will, in any case, be independent of the standards and require an additional verification procedure.

The first draft standard, the BS 7750, was developed by the British Standard Institution (BSI) and implemented in a pilot project. Following this, the British environmental management standard was modified and a completely revised version, which seems to conform to the requirements of the EMAS Regulation with regard to environmental management systems, was published in February 1994. Other draft standards have been developed in France, Spain and Ireland and a position paper has been drafted in Germany.

To ensure compatibility, standard institutions on the international (International Standards Organisation - ISO), European (Comité européen de normalisation - CEN) and national level have set up special standards committees, within which individual working parties are to discuss methodological questions.

The European Union has given a mandate to CEN to develop a uniform European standard for environmental management and auditing. In doing so, CEN has to take account of the efforts made by ISO in this field. On the international level, the Technical Committee 207 Environmental Management has practically finished work on a standard on environmental management systems. In the future this specification ISO 14001 will be used as a basis for environmental management systems all over the world.

ISO TC 207 Environmental Management

Therefore the work done within the International Standards Organisation (ISO) is of much greater relevance. Within the ISO several subcommittees and working parties have been formed within the Technical Committee TC 207 to develop a new standard series ISO 14xxx for the regulation of environmental management. ISO/TC 207 Environmental Management consists of the following working groups belonging to SC 1,2, and 4:

SC1 Environmental Management Systems

WG1 EMS specification
WG 2 EMS guidelines

Number 14001
Number 14000

SC2 Environmental Auditing

WG General principles
WG2 Audit procedures
WG 3 Qualification of Auditors
WG 4 Other types of environmental investigation

Number 14010
Number 14011
Number 14012

SC 3 Environmental labelling

Number 14021

SC4 Environmental performance evaluation

WG Indicators for management system performance
WG Indicators for operational system performance

SC 5 Life cycle assessment

Number 14040

SC 6 Definitions

The 14001 specification of SC 1 WG 1 and the guideline 14000 + 14010-12 could be directly binding under the EMAS Regulation.

ISO 9000 versus ISO 14000

The draft standard on environmental management systems ISO 14001 is partly based on the ISO 9000 series of quality standards, the first management standard ever. Since quality standards were developed earlier it is obvious that the certification bodies for quality management systems have a great interest in certifying environmental management systems as well. At the same time, companies certified under ISO 9000 have a well-founded interest in expanding the existing management system by including environmental aspects rather than establishing a completely new additional system. Unfortunately, as it often happens when two views of the world meet ("Environment meets quality"), co-operation was not immediately established. The early phase in the development of environmental management standards was influenced by a conflict (which in the meantime has been settled) between the representatives of ISO 9000 (who claimed that environmental management could and should be done on the basis of the ISO 9000) and the environmental consultants (holding that a separate environmental management standard was needed). The establishment of the new Technical Committee (TC207) was the essential milestone in settling this conflict.

"It should be understood, however, that there are significant differences between QMS and EMS. While QMS deals with customer requirements where a required level of performance is addressed, an EMS has to take into account the needs of the environment as well as the needs of a range of stakeholders, in setting its policy, objectives and targets", cited from ISO 14001.

Of course the new ISO 14001 specification on environmental management systems adopts, in the appropriate form, all elements which are essential for both standard series. Summing up, it can be stated that the principles and most of the elements of the ISO 9000 series are used in environmental management systems, but that the relative weighting of the individual elements do not meet the practical requirements of environmental protection. (See outline of ISO 14001 in Figure 7)

Significant differences are perceived in the basic objectives. For example, classical quality management has to be careful to meet customer expectations. In the field of environmental protection, however, the emphasis is put on the guiding principle of continuous improvement. Non-compliance with requirements in the field of environmental management can thus lead to prosecution under criminal law. Therefore it is to be feared that environmental management systems and environmental audits become less attractive for several firms if environmental standards are modelled too closely on the ISO 9000 series or if those who take part in the certification of quality management systems are too closely involved in the certification of environmental management systems.

Especially companies which do not need quality management systems due to their market profile or which put the emphasis on tightly monitoring the technical safety of their plants may be put off by the additional effort for building up a quality management system. The same applies to companies with a decentralised decision-making structure or companies which perform product quality control without having established a quality management system according to the ISO 9000 series. These companies should be able to make use of the existing management and controlling systems in establishing an environmental management system without being forced to comply with the requirements of ISO 9000.

If environmental management standards are modelled too closely on ISO 9000 this would have the absurd consequence that companies which have excellent eco-controlling systems in place may not get certification if the documentation of the system is not as well developed as its implementation. Basically, however, the gap between the standards institutions for quality and environmental management will narrow in the medium or long term. Today, however, it can be stated that the smaller a company is the more difficulties it will have in dealing with the terms used in the ISO 9000 standard series. The type of system standard used in the ISO 9000 series does not have any tradition in the German-speaking area. The description of what has to be regulated alone without any hint as to how to do it will create uncertainties for the user – not only in the field of environmental protection.

Therefore it will be up to the individual companies to choose whether they want to model their environmental management system on quality management or not.

The different design of systems developed under these two approaches will, due to the differences in the underlying ideologies, spawn certain conflicts. Certification bodies for ISO 9000 may mostly consider the formal aspects of the environmental management system and place less emphasis on the identification and assessment of environmental impacts. Environmental verifiers who validate a company's environmental management system without reference to ISO 9000 may set their priorities exactly the other way round, putting most stress on the improvement of the environmental performance of the company in question.

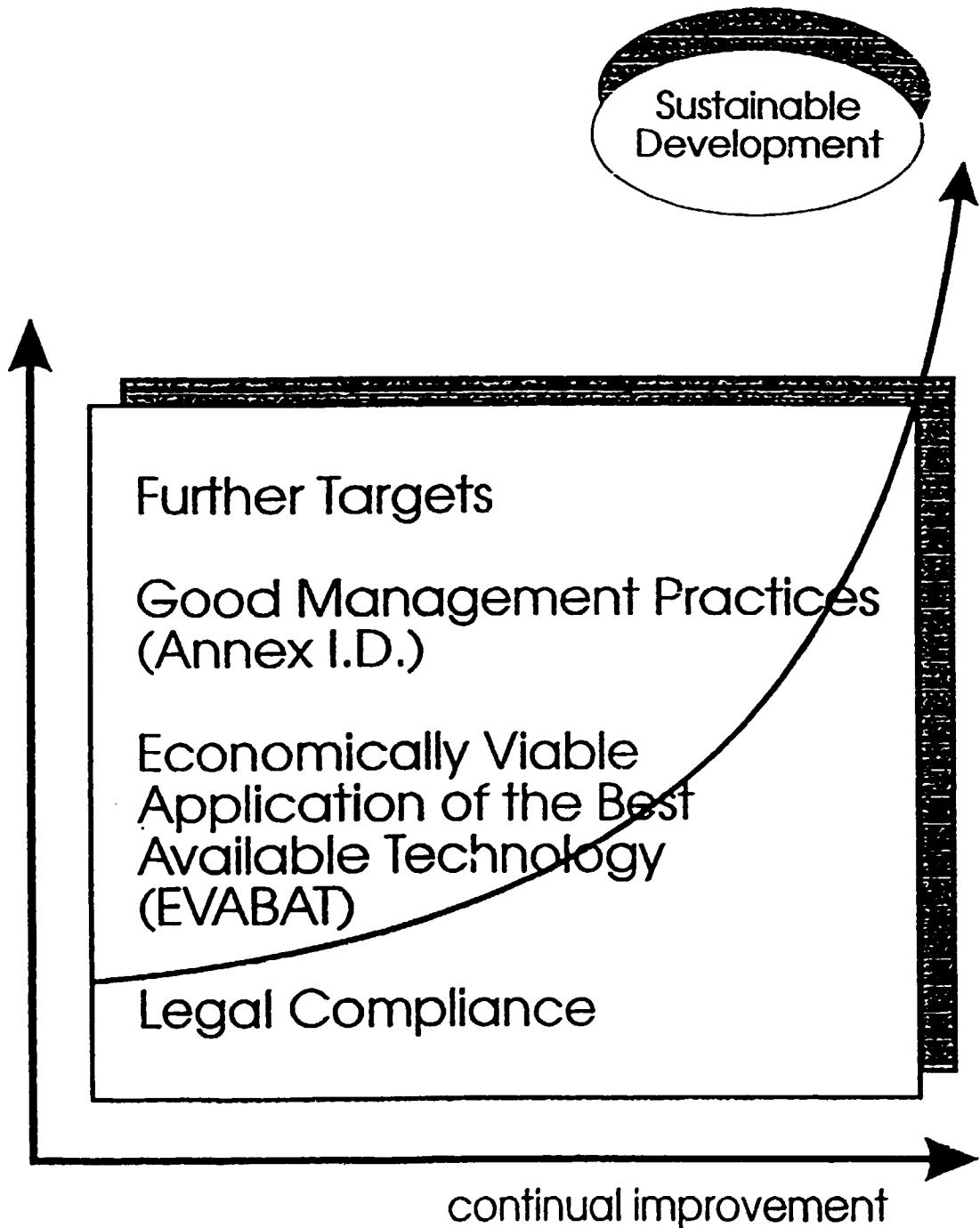
FINANCIAL ACCOUNTING	ENVIRONMENTAL ACCOUNTING
Balance sheet stock concept assets and liabilities	Site assessment potential risks and accidents impact assessment of sites
Profit-and loss account flow concept sales revenues minus material and human ressource expeditures	Input-output analysis on the corporate, process and product level
Notes to the financial statements/directors report	Environmental report



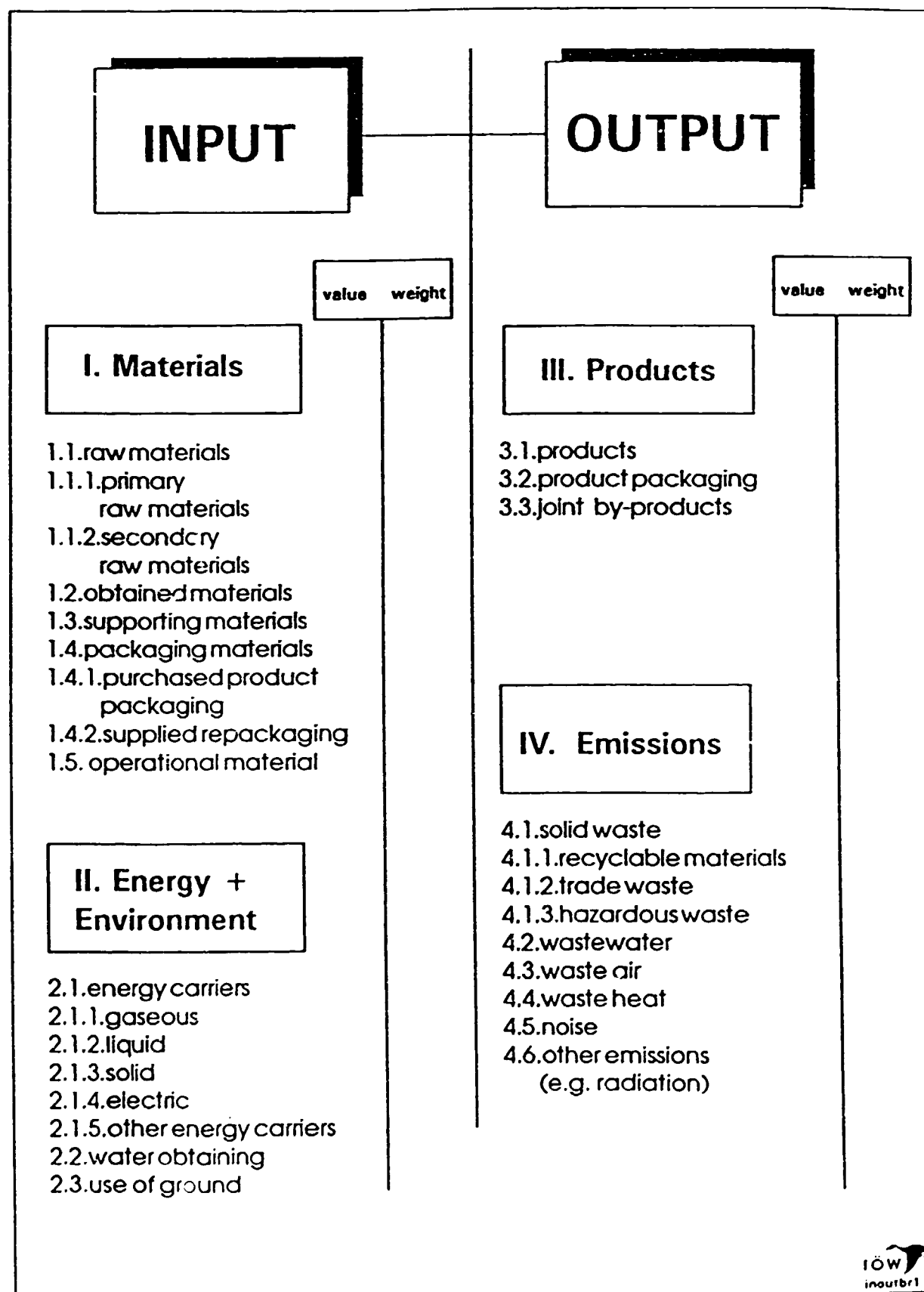
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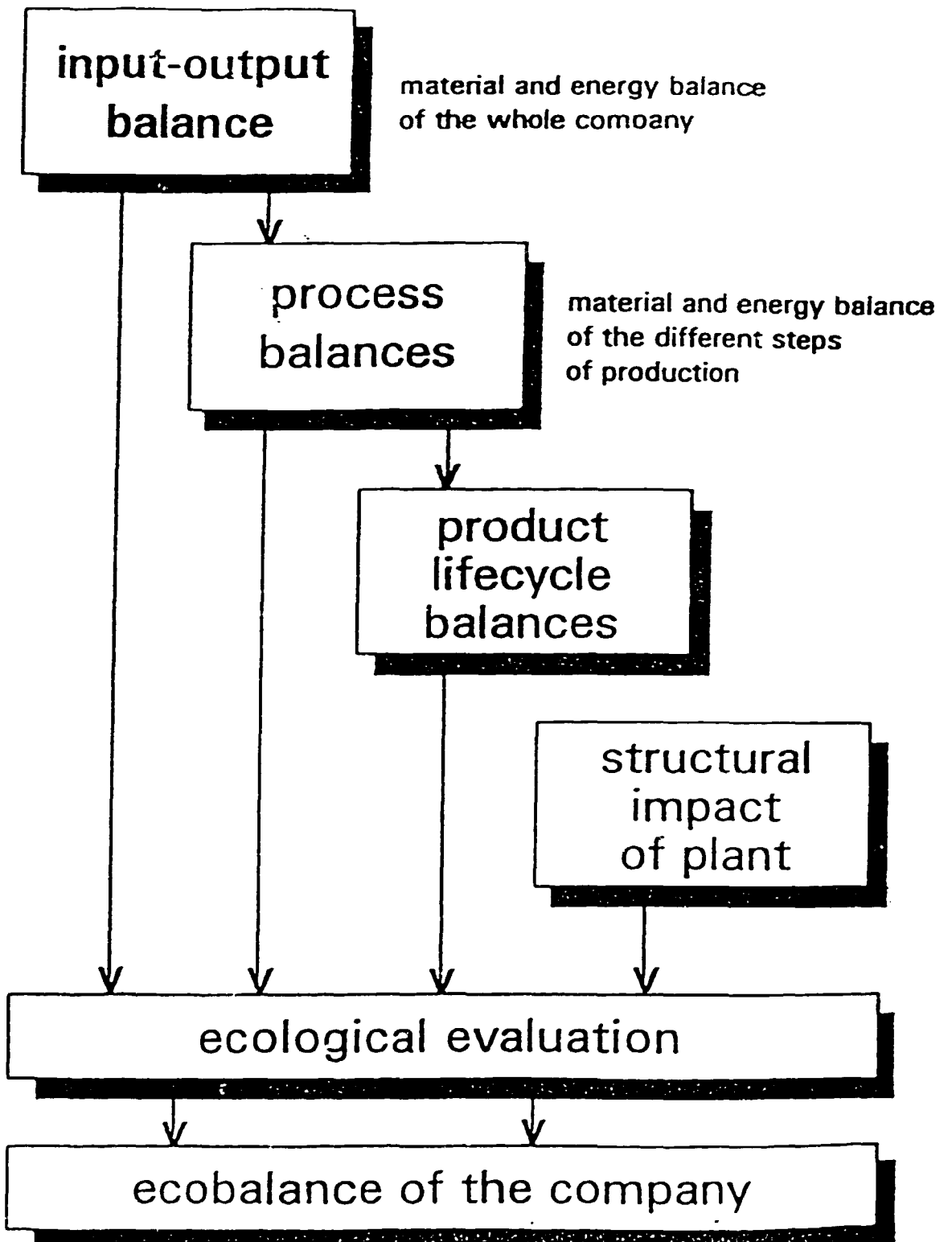
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REQUIREMENTS OF THE EMAS - REGULATION



Parameters of the input/output-analysis on the total corporate level



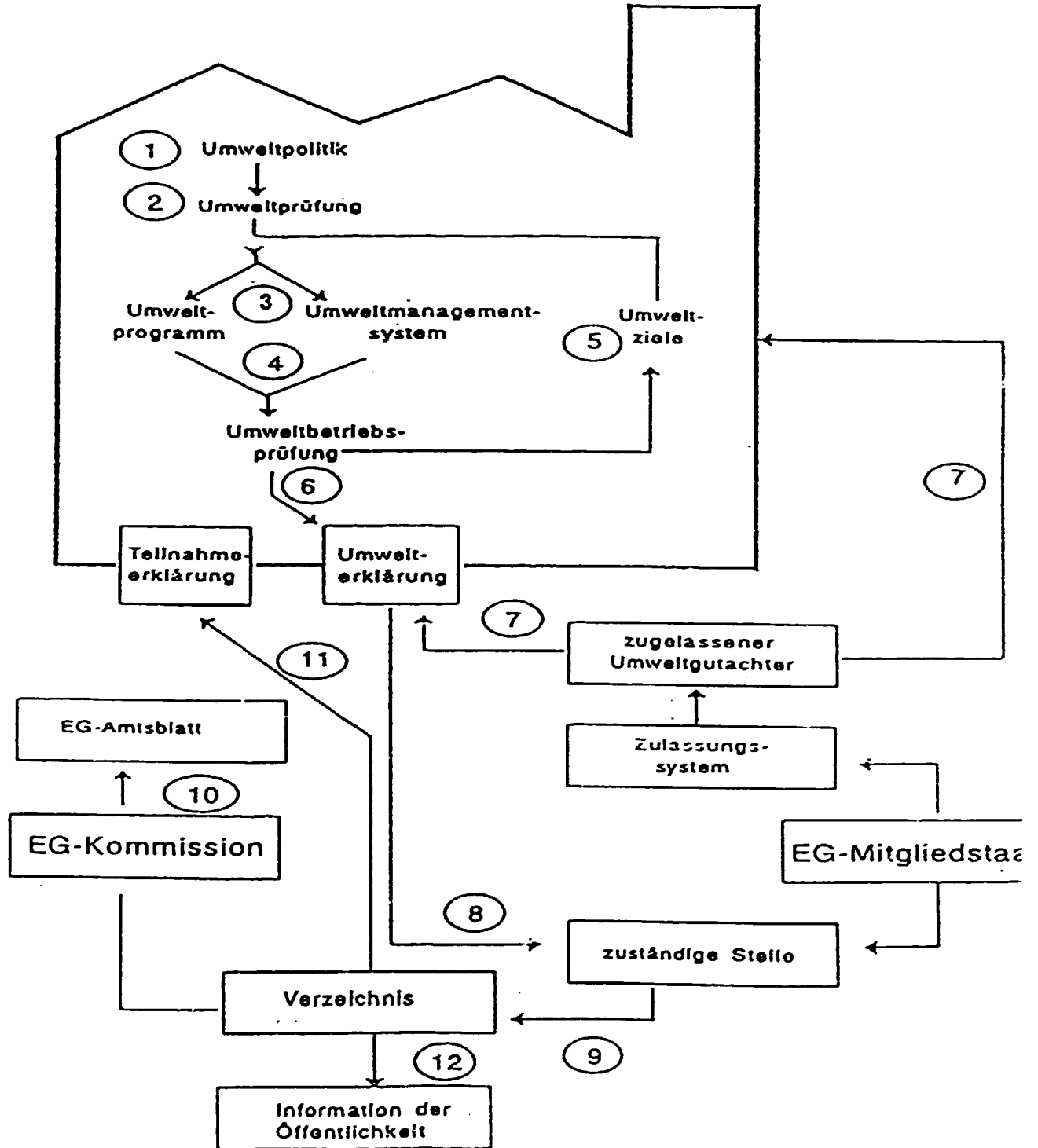


PARTICIPATION IN THE EMAS SCHEME

- O ADOPT A COMPANY ENVIRONMENTAL POLICY**
 - o Providing for compliance with all relevant regulatory requirements regarding the environment
 - o Including commitments aimed at the reasonable continuous improvement of environmental performance
 - o Corresponding to economically viable application of best available technology
- O CONDUCT ENVIRONMENTAL REVIEW**
- O INTRODUCE**
 - o Environmental programme
 - o Environmental Management System
- O CARRY OUT SITE AUDITS BY INTERNAL OR EXTERNAL AUDITORS**
- O SET OBJECTIVES AIMED AT THE CONTINUOUS IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE**
- O PREPARE AN ENVIRONMENTAL STATEMENT**
- O VALIDATION BY ACCREDITED ENVIRONMENTAL VERIFIERS**
of environmental policy, programme, management system, review or audit procedure and environmental statement
- O SUBMISSION TO THE COMPETENT BODY; REGISTRATION**
- O COMPANIES MAY USE THE STATEMENT OF PARTICIPATION**

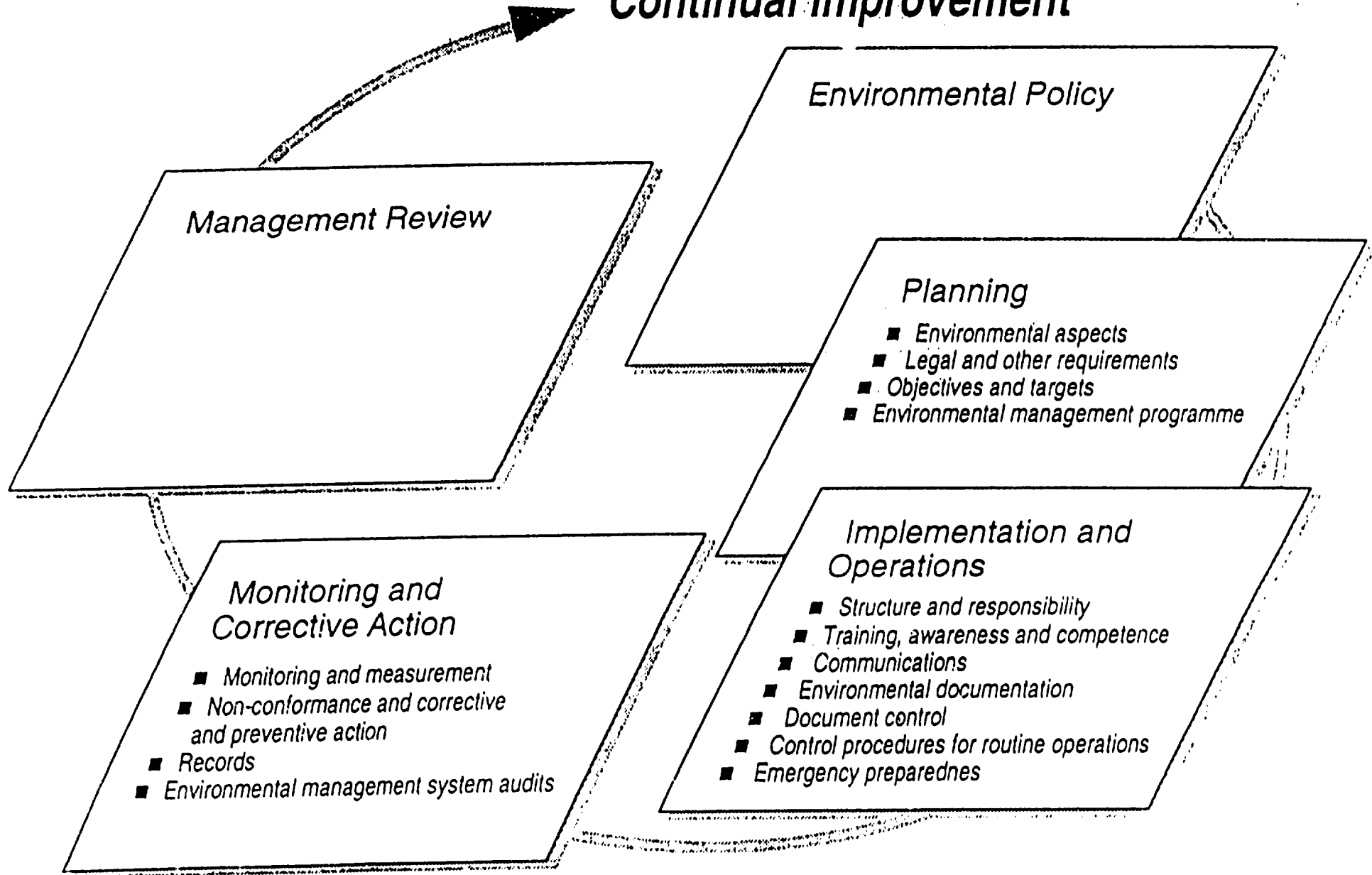


Das Teilnahmeverfahren in einzelnen Schritten⁴⁾



4) vgl. Peglau R. Umwelt-Audits: Sachstand und Perspektiven

Continual Improvement



**TRADE IMPLICATIONS OF INTERNATIONAL
STANDARDS FOR ENVIRONMENTAL MANAGEMENT SYSTEMS
(ISO 14000 Series)**

*Response to questionnaire
Draft 13 October 1995*

*Prepared by
Industrial Sectors and Environment Division and
Human Resource, Enterprise and Private Sector Development Division*

1. Prospects for ISO 14000¹

1.1 Development of environmental issues

1.1.1 Environmental policies and legislation

With few exceptions the countries had established environmental policies, but everywhere there were respondents who were not aware of all the environmental requirements. Indeed, only two thirds of the respondents were fully aware of the content of their country's environmental degradation. One standards body in Africa and one industry association in Latin America answered that the content of environmental laws was completely unknown to them and one third of the respondents admitted they were only partly aware of environmental legislation.

Even fewer respondents were well informed about voluntary agreements. Only 37 per cent claimed to be fully aware of voluntary agreements, with 54 per cent conceding that they were partly aware. The remainder, one respondent from Africa and three from Latin America, replied that they were not aware of the content of any voluntary agreements.

1.1.2 Environmental awareness

In most of the responding countries the Governments had launched campaigns to promote general environmental awareness without focusing on particular sectors. China, however, concentrated its policy on large national companies.

In most countries businesses faced pressure to avoid environmental damage. Environmental organizations and Governments were the main forces promoting environment-friendly production. There were, however, domestic customers and importers that exerted hardly any pressure. Consumer organizations were also very weak in this respect. Overseas customers were fairly important in Asia and less so in the other regions.

About 90 per cent of the respondents recognized growing pressure to avoid environmental damage in their country. The remainder expected pressure to remain constant; none foresaw it declining. About 80 per cent believed that compliance with ISO 14000 would reduce pressure on companies, and about 10 per cent felt the opposite.

¹ Note that by the time the survey was carried out only draft documents of the TC 207 were available.

1.2 Awareness of ISO 14000 Series

For all types of companies and institutions, awareness was highest in Asia and Latin America; in eastern Europe it was unevenly distributed. African respondents showed the lowest awareness levels. The Ghana Chamber of Commerce regretted having been badly informed about the development of the standards, making it unable to inform its members. Similarly, a respondent in Nigeria complained that the ISO 14000 draft should have been sent to all countries regardless of ISO membership.

Even though overall awareness differed greatly from one region to another, the relative awareness of the various types of companies and institutions did not vary greatly.

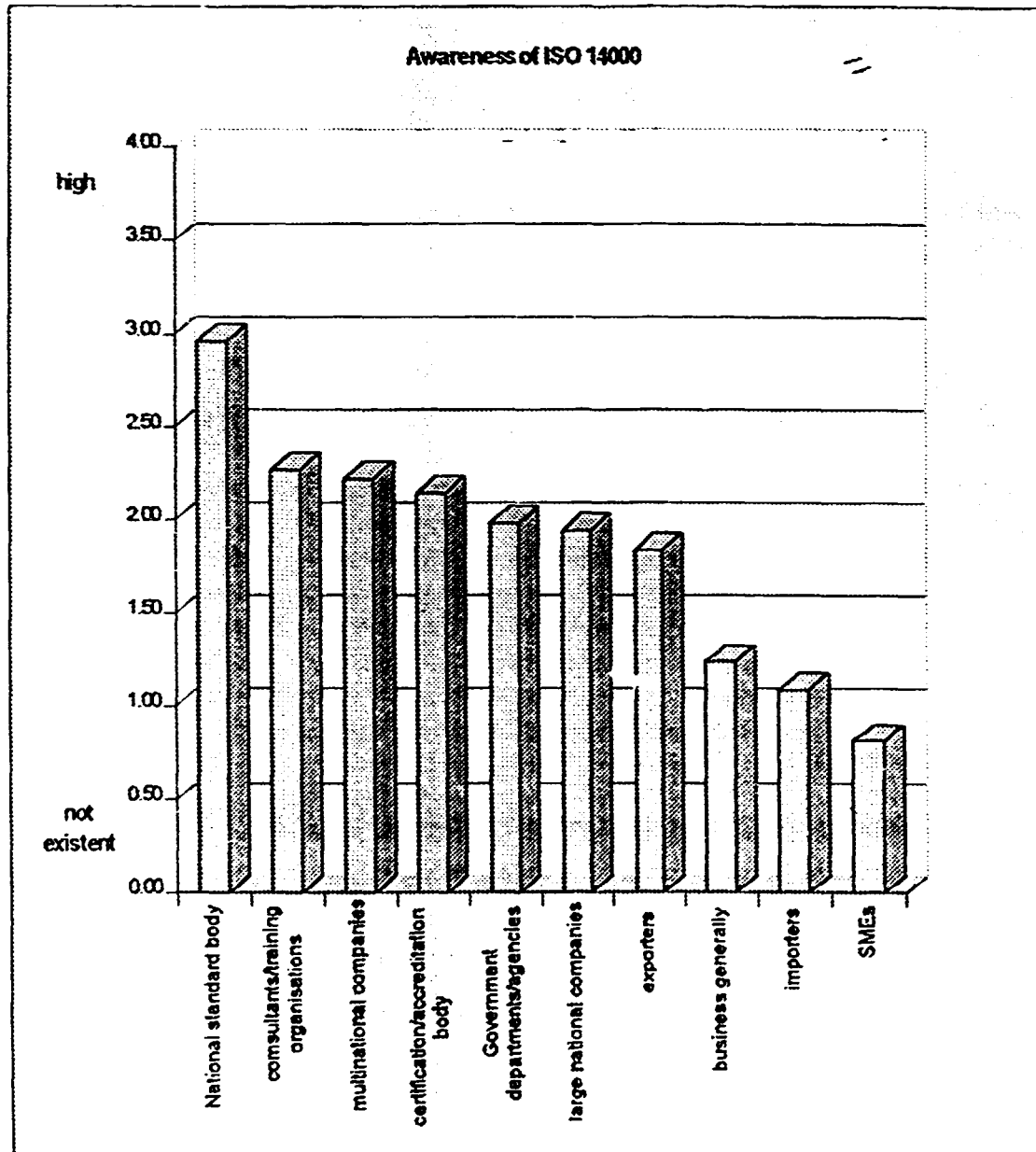


Figure 1 Awareness of ISO 14000 by type of company and institution

The groups that were most aware of the ISO 14000 draft were naturally national standards bodies. On average, consultants and training organizations were in second place, multinational companies in third. Least aware were in all regions were SMEs and importers.

This result reflects the close relationship between either the need or willingness to implement the standard and the level of awareness. Those sectors and institutions that were not likely to be very affected by the standard were more or less unaware of its existence, partly owing to a lack of interest and partly to a lack of information.

1.2.1 Familiarity with the ISO 14000 draft

Much as with awareness, fewer respondents in Africa had seen a draft of the ISO 14000 series, whereas about 70 per cent in Asia and 80 per cent in Latin America and the Caribbean had seen it. None of the respondents from the Russian Federation and Romania had had the opportunity to read the standard, whereas both respondents from Turkey were familiar with it.

Most institutional respondents had received a copy by virtue of their country's membership in ISO; industry had been informed by national standards bodies. Other bodies had had the opportunity to learn about the ISO 14000 series through articles and publications.

1.2.2 Understanding of the ISO 14000 series

Generally speaking, there appeared to be great difficulties in understanding the prospective ISO 14000 series. In Asia, however, Governments, consultants and accreditation and certification bodies seemed to have a fairly good understanding of the prospective standard. In Latin America and Africa even those bodies that had been most involved with the standards said that they did not understand the draft very well. Understanding was particularly poor in Africa, but only slightly better in Latin America, where only accreditation- and certification bodies comprehended the standards at least partly. In all, consumers were expected to be the groups with least understanding of the ISO 14000 series, but there were also very few SMEs who comprehended the standard. It should be noted, however, that consumers, just like SMEs, had not had the opportunity to learn about and to understand the standard.

1.3 Participation in the development of ISO 14000

The proportion of countries participating in the development of the standard was 85 per cent in Latin America and the Caribbean and 60 per cent in Asia. In eastern Europe and Africa only one third of the responding countries had participated in its development.

1.4 Promotion of awareness about ISO 14000

Even though almost all Governments had supported the development of an environmental conscience, very few had publicized ISO 14000. In Africa and Latin America, only one respondent in each region had noticed any special government effort to promote awareness of ISO 14000. Yet awareness of the standard was relatively high in Latin America, and most respondents were familiar with its contents. In Africa, the lack

of government commitment was reflected in the low level of awareness and the lack of knowledge and understanding of the standards. The Government of Turkey had promoted awareness for ISO 14000, but the Governments of Romania and the Russian Federation had not. Only the Asian Governments were relatively active in this respect. Five of the nine surveyed countries had launched an awareness campaign for the new standards.

1.5 Implementation of ISO 14001 (environmental management systems)

1.5.1 Reasons for implementing ISO 14001

The reasons for implementing ISO 14001 are shown in order of importance in figure 2. The main reason for a company's readiness to implement ISO 14001 was to demonstrate conformity to legislation. Especially in Asian countries, this reason was important, whereas in Africa it was less so. The second most important reason was to reduce the costs of implementing environmental mandatory standards. In Latin America this reason was the decisive one. In Africa the most important reason was to meet overseas environmental legislation, an argument that was also very often forwarded in the other regions. Respondents generally were not sure if meeting self-imposed targets, improving staff morale or reinforcing management control could be reasons to implement ISO 14001. Asian respondents for the most part even denied that implementation would improve staff morale. Meeting the demand of domestic customers was the least important argument in favour of applying for ISO 14000 certification.

Similarly, for SMEs the most important reason by far was to demonstrate conformity to legislation. Achieving efficiency in implementing mandatory and voluntary environmental standards also appear to have been essential for SMEs. Least important were improvement of staff morale, meeting of self-imposed targets and strengthening of the market share.

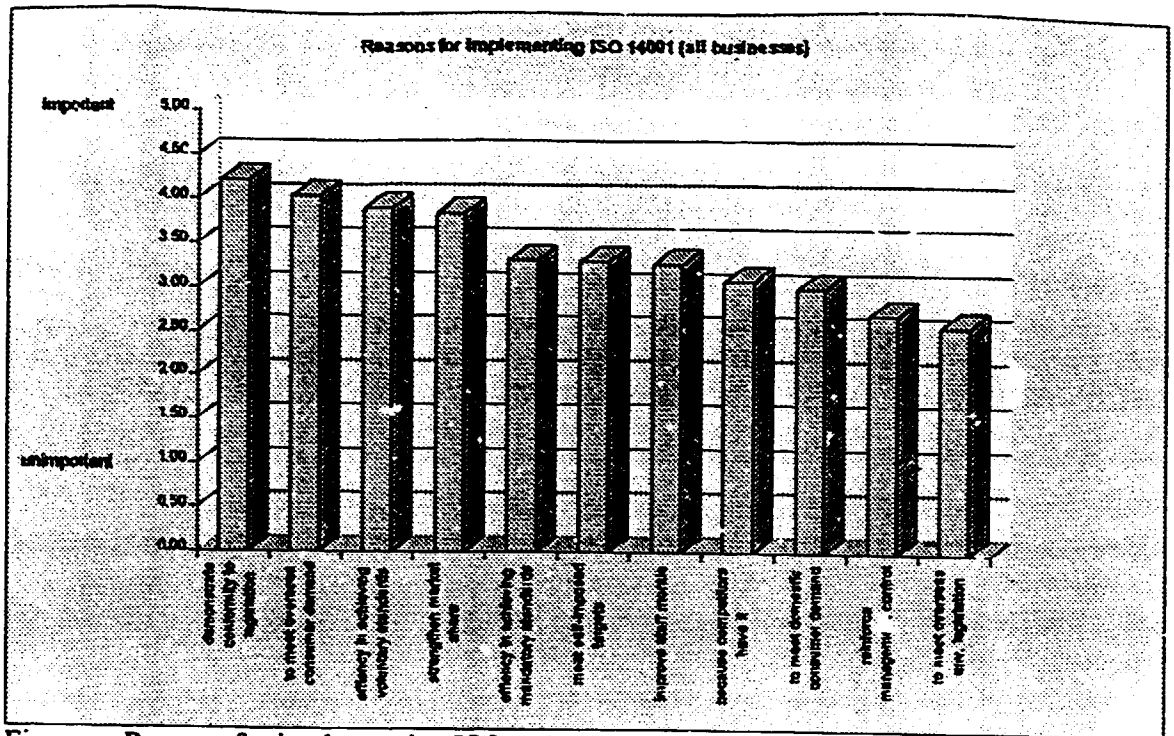


Figure 2 Reasons for implementing ISO 14001

4.5.2 Reasons for not implementing ISO 14001

Of the factors that were expected to deter companies from implementing ISO 14001, the lack of awareness of benefits was the most common. In Africa the lack of technical equipment was another important argument, just as it was in Asia; it was of far less relevance in Latin America or eastern Europe. The lack of consultants was more important in Africa than in any of the other regions. In Latin America, Asia and eastern Europe it was a lack of management commitment that kept companies from applying ISO 14001. But the high costs of setting up an environmental management system also kept companies from participating in the scheme, especially in Latin America and eastern Europe. Few respondents cited impracticability of the standards as an argument against their implementation.

For SMEs, the most important reason for not applying ISO 14001 was the cost of setting up an environmental management system. The lack of consultancy and of awareness of the potential benefits were other weighty counter-arguments. Just as for business in general, the ISO 14000 series was not considered impracticable for SMEs either.

1.6 Expected costs and benefits

1.6.1 Financial burden of existing mandatory standards

Perceptions on whether or not compliance with existing mandatory standards was a significant burden on business varied, depending on whether the respondent was a representative of industry or of administration; it varied also between the regions. Whereas about 10 per cent of the respondents did not see existing mandatory standards as

a significant burden on business, about 50 per cent saw trouble in some cases and 40 per cent viewed legislation as an onerous charge.

1.6.2 Financial burden of voluntary agreements

Half of the respondents could not comment on the effects of voluntary agreements because such agreements did not exist in their country or the respondents were not aware of them. Among representatives of administrative bodies, only four believed voluntary agreements were a burden on companies, whereas most of the industry representatives thought they were. Companies in Latin America and eastern Europe seemed to have least problems with voluntary agreements, whereas African and Asian ones found compliance rather difficult.

1.6.3 Comparison of compliance costs

Systematic data on the costs of compliance with mandatory standards, voluntary agreements and, prospectively, ISO 14001 are not available as fewer than half of the respondents answered the cost question. Most of those who answered thought the costs of mandatory compliance were about 2 per cent of production costs. About 30 per cent of the respondents, primarily from Africa, thought that the costs of mandatory compliance would be over 5 per cent of production costs. Similarly, slightly more than half of the respondents thought that the costs of voluntary agreements would be less than 2 per cent of production costs, but about 10 per cent thought it would be greater than 5 per cent.

	Estimated costs (% of production costs)				
	No cost	< 1	1 -2	2 -5	> 5
Mandatory standards	0	30%	30%	10%	30%
Voluntary agreements	0	56%	6%	25%	13%
ISO 14001	17%	28%	11%	11%	33%

Table 1 Distribution of responses on compliance costs

The respondents were less certain about the costs of complying with ISO 14001, given the distribution of their answers. About half of the respondents thought that the costs of meeting ISO 14001 would be less than 2 per cent of production costs, approximately 15 per cent (all administrative bodies) thought there would be no costs at all and approximately one third from both from administrative bodies and industry expected the costs to be greater than 5 per cent of production costs.

1.6.4 Incorporating compliance costs into product prices

About 60 per cent of the respondents believed that compliance costs could, at least for the most part, be incorporated into product prices. Only 4 per cent of them thought that would be impossible.

1.6.5 Cost sharing

When asked about their suggestions for a distribution of the costs related to implementing ISO 14001, industry and administration bodies had a similar opinion: Governments should bear the costs of awareness campaigns, whereas companies should take over consultancy costs, implementation costs and certification costs (figure 3). Promotional costs should be shared equally between Governments and companies. Few respondents suggested that customers be directly made to cover the costs.

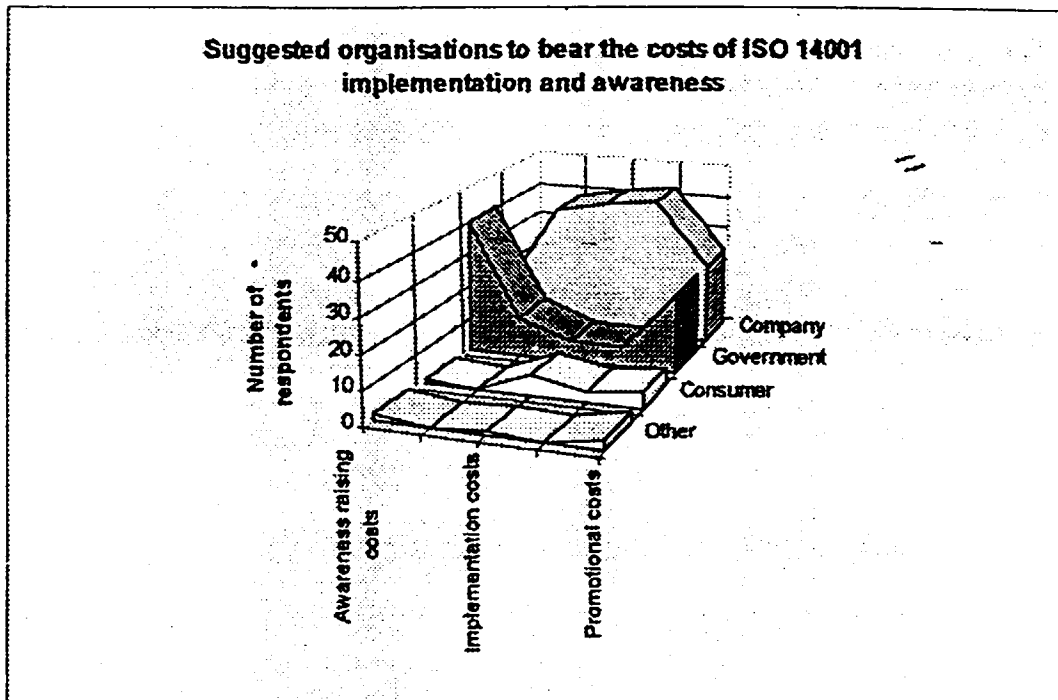


Figure 3 Cost sharing for ISO 14001

1.6.6 Industry migration due to compliance costs

Even though burdens may differ among countries, both industry representatives and administration bodies thought that costs of compliance with ISO 14001 would not cause companies to migrate. Only some Asian and Latin American respondents thought that it would cause companies to relocate to other regions.

1.6.7 Potential benefits of implementing ISO 14001

Administration bodies perceived more than industry representatives the benefits of applying ISO 14001. The majority of administration bodies estimated the potential to save inputs at 10 - 30 per cent, whereas industry, on average, estimated less than 10 per cent. Only three African administration bodies were of the opinion that implementing ISO 14001 would not lead to any input saving at all. By contrast, the Indian standards body estimated the potential of input saving at more than 50 per cent. Figure 4 illustrates the input saving potential as estimated by all respondents.

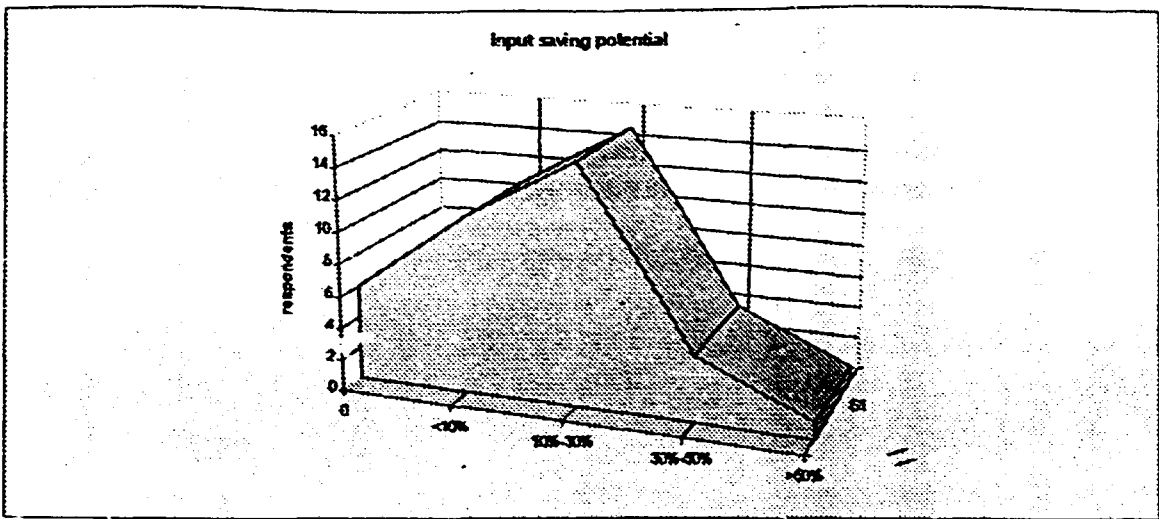


Figure 4 Input saving potential

Similarly, administration bodies held a more optimistic view of the possibilities of improving the market position by implementing ISO 14001. Unanimously they expected a strengthening of the market position for companies, although to varying extents. The majority of the industry representatives also thought that their market position would be improved by adopting ISO 14001, but several expected very little positive effect or even none on their market position.

1.7 Infrastructure for ISO 14001

1.7.1 Accreditation bodies

In all regions, respondents in about 50 per cent of the countries thought that a national accreditation body for ISO 14001 would be established. The respondents in one quarter of the countries did not know whether such a body would be set up or not. They envisioned the types of infrastructure shown in annex 4. The remainder said their countries would not have a national accreditation body. About 65 per cent of the respondents held the view that accreditation bodies should be public and 10 per cent (the respondents from Argentina and Ghana) thought they should be private. One quarter of the respondents did not have an opinion. All of the bodies would accredit domestic certification bodies. More than half of them would also accredit overseas and international certification bodies.

Respondents were convinced that most of their countries would seek mutual recognition agreements with other countries, but they considered it premature to suggest partner countries. Still, respondents from Argentina, Ghana, Indonesia and Pakistan thought that agreement would be sought with European and United States accreditation bodies. The respondent from Malawi suggested a convention on mutual recognition among all ISO member countries; a respondent from Bolivia suggested doing so with as many countries as possible. Nigeria would profit from an agreement with the Economic Community of West African States (ECOWAS).

1.7.1.1 *Single accreditation body for ISO 9000 and ISO 14001*

Three quarters of the respondents supported the view that there should be a single accreditation body for both ISO 9000 and ISO 14001 registration (figure 5). In Latin America all respondents except one shared this opinion. Only in Africa did most of the respondents speak in favour of establishing separate accreditation bodies.

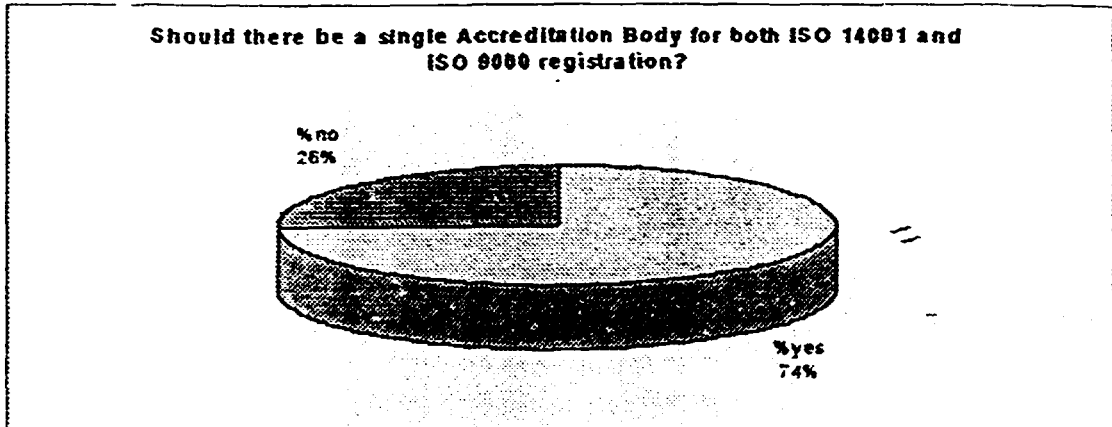


Figure 5 Single accreditation body for ISO 9000 and ISO 14001

Most respondents took the view that a single body would be useful because the standards were analogous. In that way, existing infrastructure could be used, taking advantage of experience, skills and synergies and thus saving costs. The system would be less complex and confusion could be avoided. Respondents from Barbados and the Philippines suggested that environmental management systems (EMS) should be completely integrated into total quality management (TQM) and thus be administered by the same institution. Other respondents, by contrast, feared that administering both standards would overload a single body and prevent it from being able to provide its services in a satisfying manner. The respondent from Indonesia argued that ISO 9000 and ISO 14000 belonged to different spheres of government, which would make it difficult to unify administration bodies. Still, others opposed the creation of a single body for both standards because there were substantive differences between quality and environmental issues.

1.7.1.2 *International acceptance*

Most respondents expected their national accreditation bodies to have difficulties in meeting the requirements for international acceptance. Only respondents from Pakistan, the Philippines, Sri Lanka and Taiwan Province did not foresee any problems at all. On average, Asia's prospective accreditation bodies seemed likely to be best equipped to meet international requirements. African respondents unanimously thought that their bodies would face great trouble in securing international recognition.

1.7.2 *National certification schemes*

There was a lot of uncertainty about whether countries would set up a national certification scheme for ISO 14001. More than half of the responding countries would

Still, the respondents of two thirds of the countries thought such a scheme should be created. Overall only 13 per cent of the countries had decided to put in place a certification scheme; in one third of them the matter was unclear.

One half of the respondents took the view that certification bodies should be public and one third supported private bodies. In Africa, Asia and eastern Europe, a majority spoke in favour of public certification bodies. Only Latin American respondents unanimously preferred private bodies. Almost 90 per cent of the respondents proposed that domestic certification bodies should register domestic companies, public or private. About 60 per cent held the view that they should also certify domestic companies based overseas, and approximately 45 per cent advocated the certification of overseas companies.

1.7.2.1 *International acceptance*

National certification bodies, like domestic accreditation bodies were expected to face difficulties in meeting the requirements for international acceptance. African certification bodies were seen likely to have the greatest trouble in securing international recognition. Still, respondents from the Philippines and Taiwan Province did not expect their certification bodies to have any problems at all.

1.7.2.2 *Single certification body for ISO 9000 and ISO 14001*

As with accreditation bodies, about 70 per cent of the respondents suggested using the same certification bodies for ISO 9000 and ISO 14000 certification. Only in Africa did half of the respondents advocate separate bodies for these standards.

1.7.3 *Resources and constraints*

In general, respondents expected to have some difficulties in accessing the resources needed to meet ISO 14001 (figure 6). Especially in Africa, respondents faced trouble, whereas in Asia and Latin America a respectable number expected to have easy access to the necessary resources. A lack of local consultants was one of the major constraints on companies that would be willing to implement ISO 14001. In Africa the lack of consultancy was particularly striking. Only three respondents, from Argentina, India and Pakistan, were content with the availability of consultants. As a consequence, companies would have to rely at least partly on overseas expertise. African respondents in particular expected a high degree of dependence on foreign consultants.

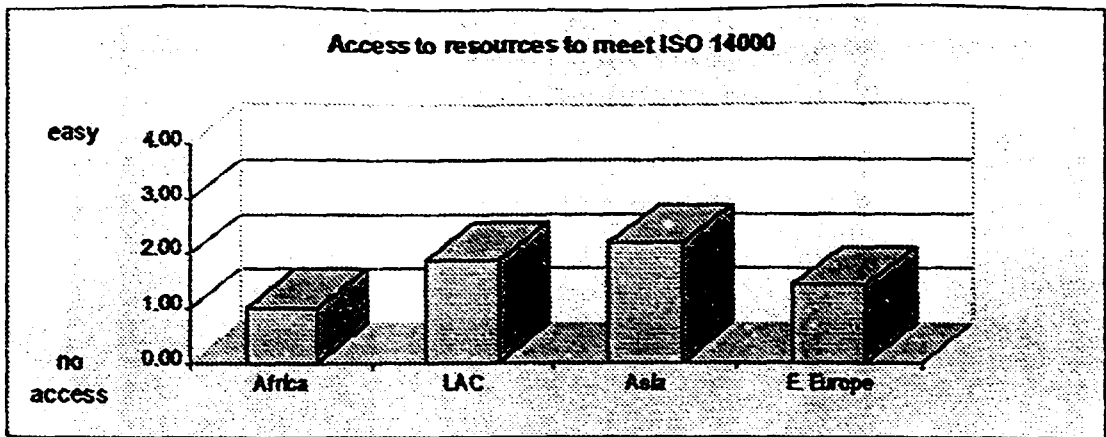


Figure 6 Access to resources

1.8 ISO 14001 and trade

Existing overseas environmental requirements did not have the same effect on all responding countries or organizations. In each of the regions the number of those who felt exports had been hindered by overseas environmental legislation was almost equal to the number of those who felt it had not been. Only in African countries did a clear majority of organizations and companies consider overseas environmental standards an obstacle to trade. In particular, the European Union regulations (EMAS) as well as various product standards were considered to have a negative effect on trade.

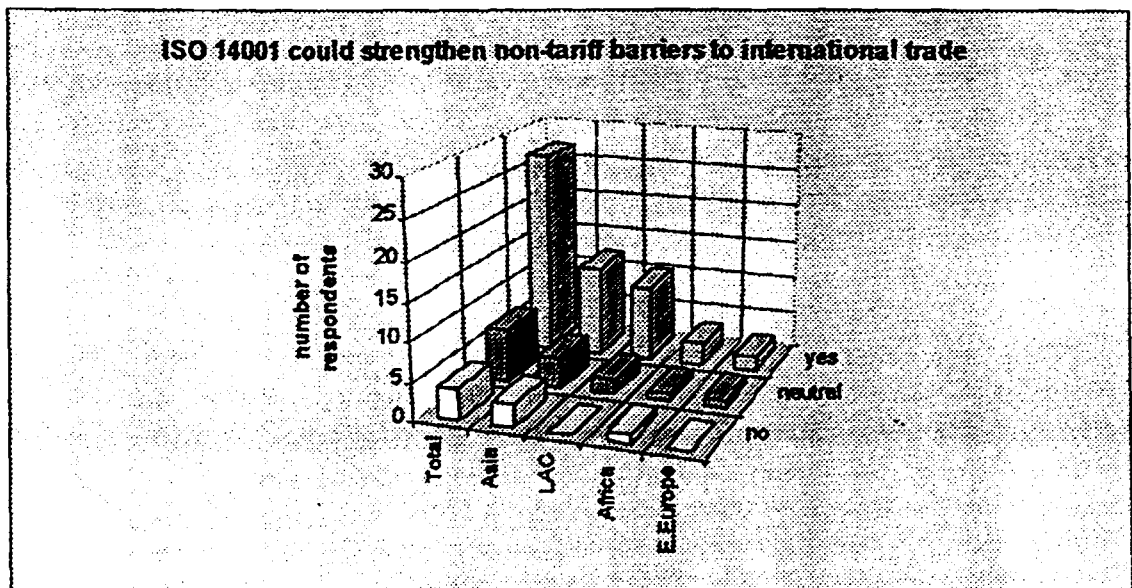


Figure 7 ISO 14001, barrier to trade?

By contrast, the majority of the respondents expected ISO 14001 to strengthen non-tariff barriers to trade (figure 7). In Asia, this fear was particularly widespread, even though most respondents also feared a loss of market if ISO 14001 was not introduced. Sri Lanka and Tunisia expected their products to be rejected by customers. Nigeria and Brazil foresaw a multitude of approaches, standards and regulations. Brazil had had a

particularly bad experience with the subjectivity of the European Union regulations and other national standards. A respondent from Pakistan feared it would be difficult to convince customers of the environmental efforts taken during production.

1.8.1 Measures to mitigate the negative effects of ISO 14001 on international trade

The respondents identified a number of measures that could reduce the negative effects of ISO 14001 on international trade:

- The respondents from Thailand and the United Arab Emirates emphasized that ISO 14001 had to be maintained on a voluntary basis. Making it obligatory would definitely raise a barrier to trade. Most other countries called for unification of the certification scheme, because the lack of recognition and differences between schemes were the main obstacle to obtaining equal opportunities for all participants.
- One respondent from India suggested that international organizations like UNIDO, the World Bank or the World Trade Organization could grant financial help to developing countries. A Colombian respondent advocated worldwide promotion of awareness, provision of training and technical support for industry and up-grading of national environmental standards to accord with international requirements. An Indonesian respondent supported the latter idea. He said improvement and stricter implementation of national environmental legislation would help to overcome the disparities between developed and developing countries.
- Chilean and Indian respondents spoke in favour of a phased introduction of the standard, to give sufficient time to adapt it gradually.
- The respondent from Barbados thought that incorporating EMS into TQM and QSAR structures would be the appropriate way to avoid barriers to trade.
- Quite a few respondents shared the opinion that the more common the standard became, the more barriers to trade would shrink. On the other hand, there were respondents who did not see any possibility of reducing barriers to trade within the framework of ISO 14001.

1.9 Eco-labelling

Most respondents found that the diversity of national eco-labels hindered their export opportunities. Only one Pakistani company and one Pakistani industry association did not have any problems with overseas eco-labels. Eighty per cent of the respondents were therefore convinced that internationally recognized labels would improve export opportunities. Only two respondents from India were not so sure about the positive effects of international recognition. Altogether, 90 per cent of the respondents believed that an international environmental labelling guideline like ISO 14020 could indeed lead to harmonization.

1.10 Conclusion

The biggest problem related to the introduction of ISO 14000 was the lack of recognition for local accreditation and certification bodies and local certificates. Such a lack would

make the standard useless, and it would merely be a protectionist instrument for developed countries. Therefore the need to harmonize certification procedures was the top concern expressed by the respondents. International recognition institutions were suggested, but QSAR was not expected to work very effectively. Furthermore the process of awarding the certificate needed to be more transparent.

ISO TC 207 Environmental Management

ISO/TC 207 Environmental Management consists of the following working groups belonging to SC 1,2 and 4:

SC1 Environmental Management Systems

WG1 EMS specificationNumber 14001
WG2 EMS guidelinesNumber 14000

SC2 Environmental Auditing

WG1 General PrinciplesNumber 14010
WG2 Audit proceduresNumber 14011
WG3 Qualification of AuditorsNumber 14012
WG4 Other types of environmental investigation

SC3 Environmental labellingNumber 14021

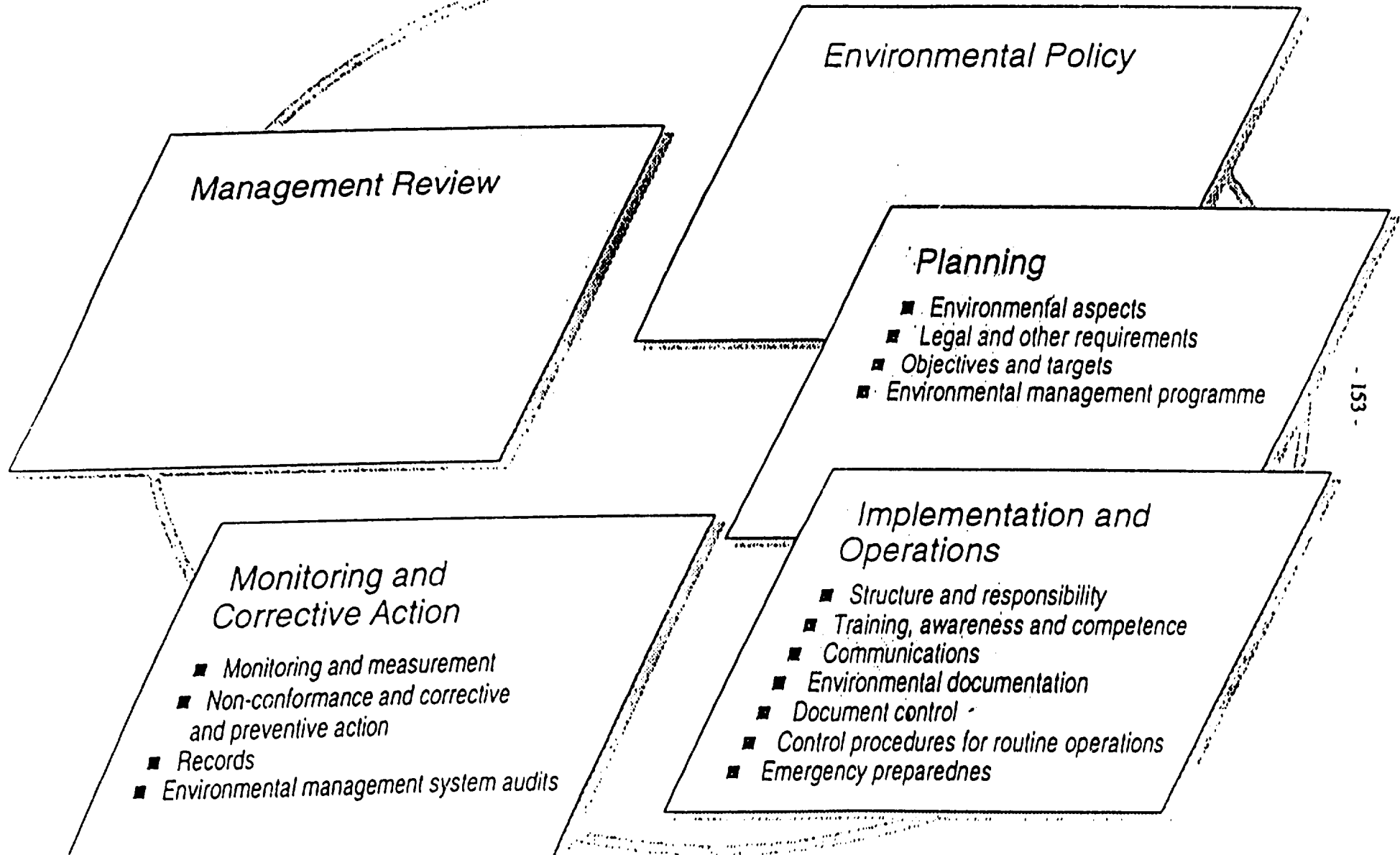
SC4 Environmental performance evaluation

WG Indicators for management system performance
WG Indicators for operational system performance

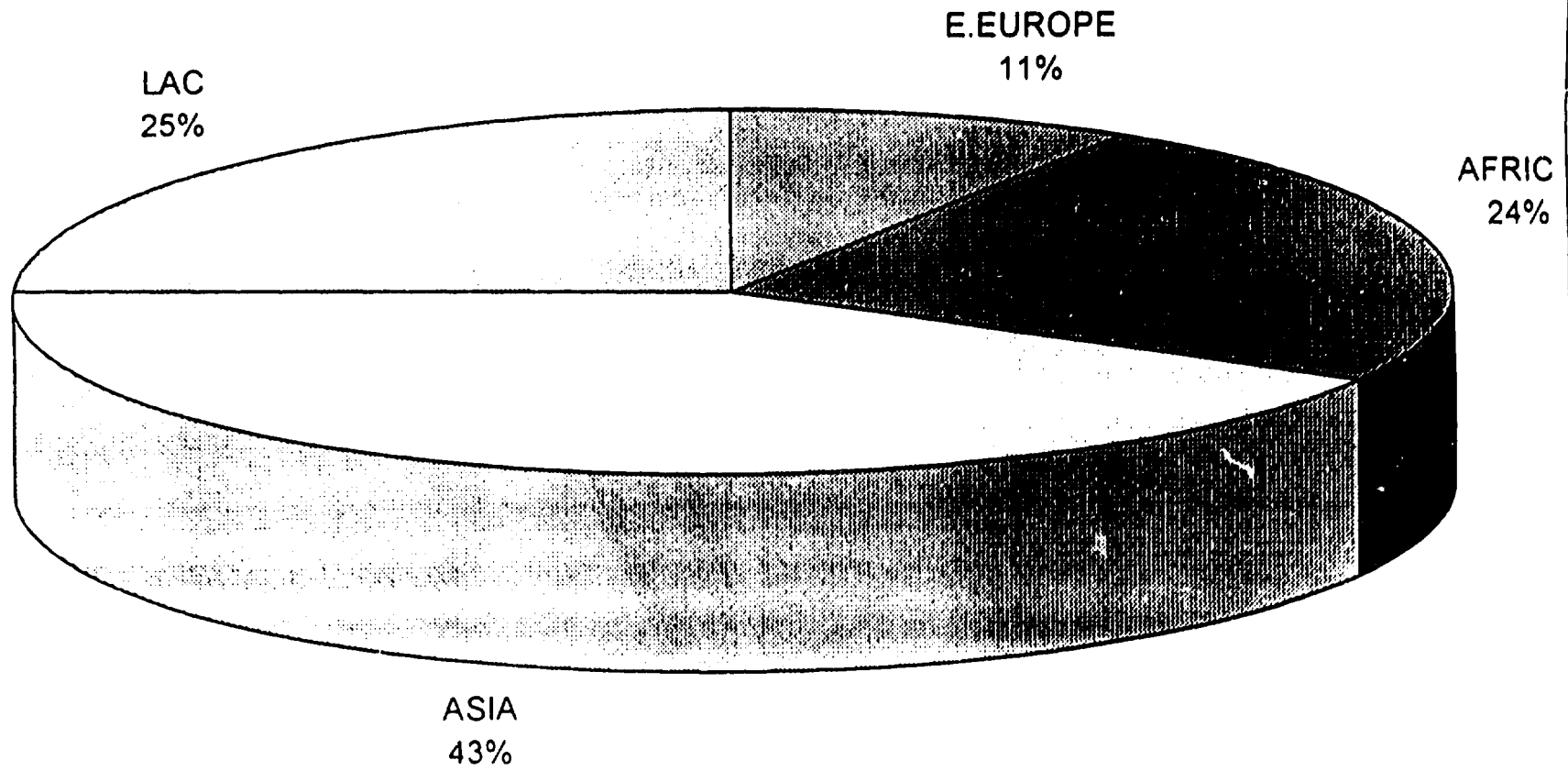
SC5 Life cycle assessmentNumber 14040

SC6 Definitions

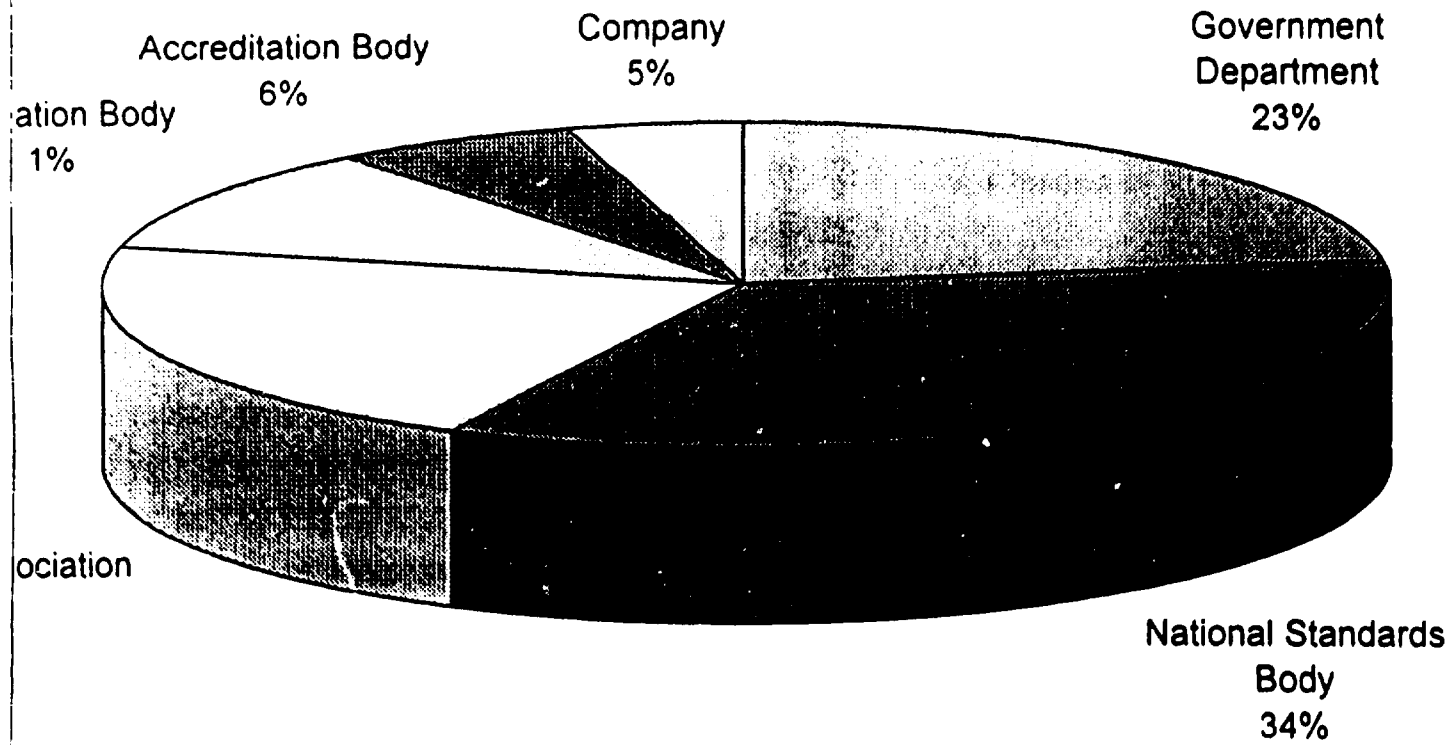
Continual Improvement



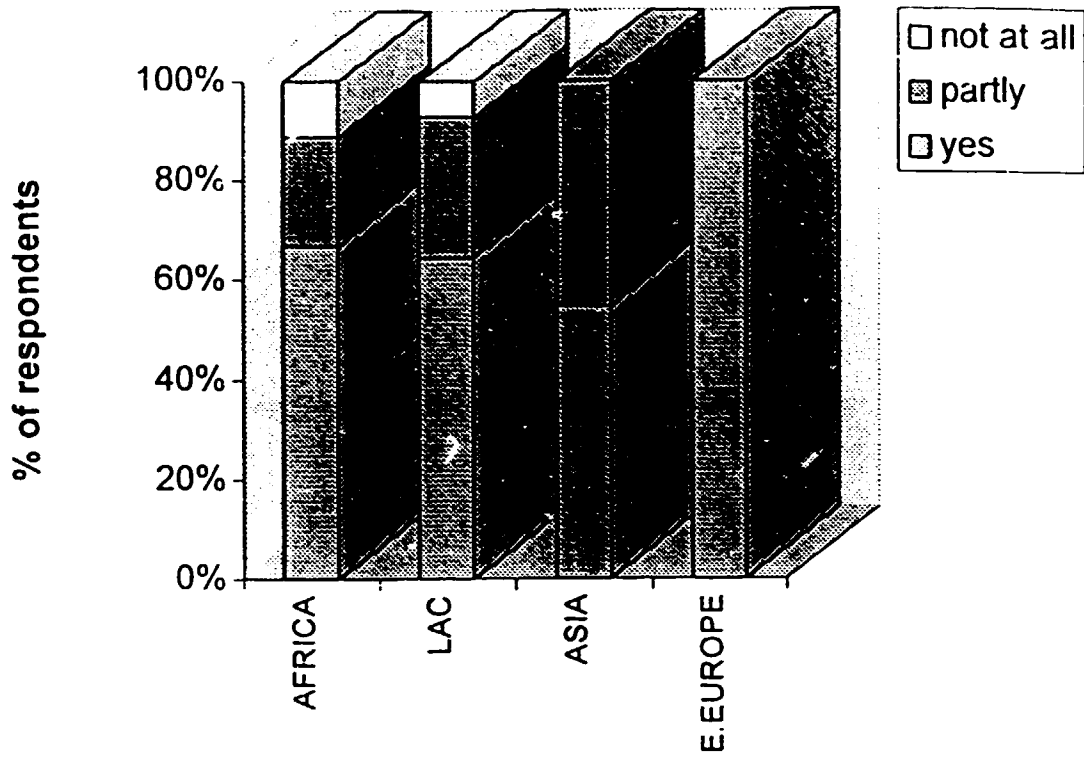
Geographic distribution of respondents



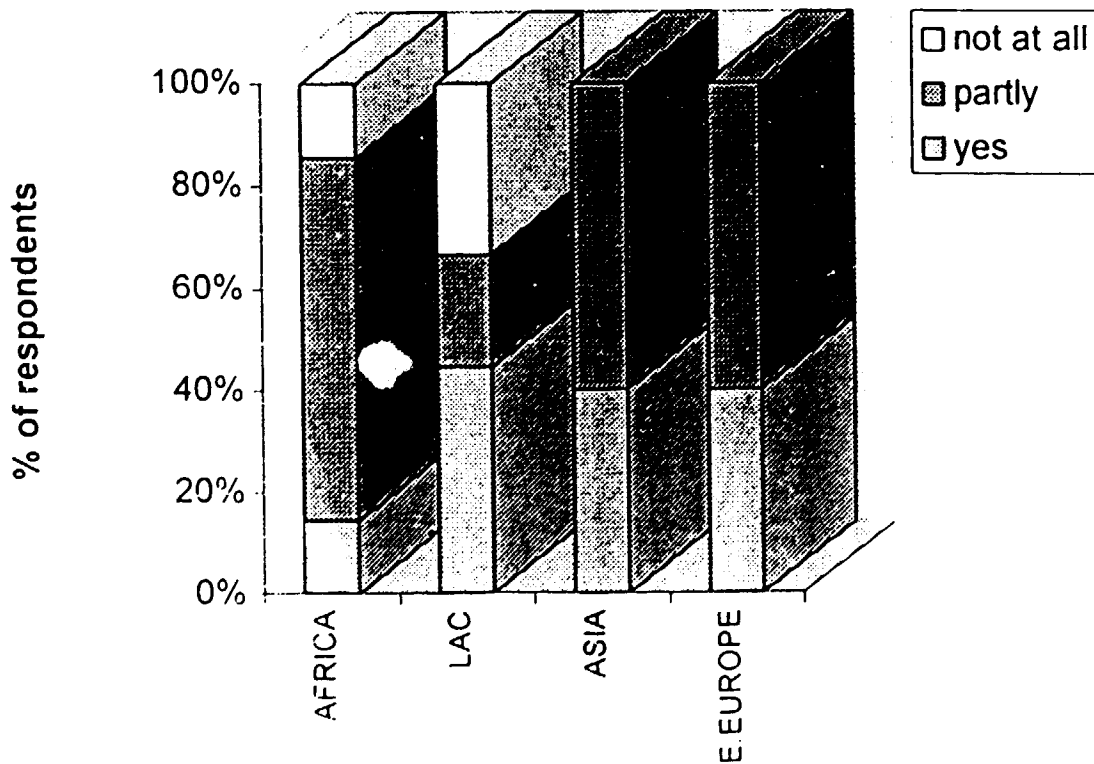
Organizational structure of respondents



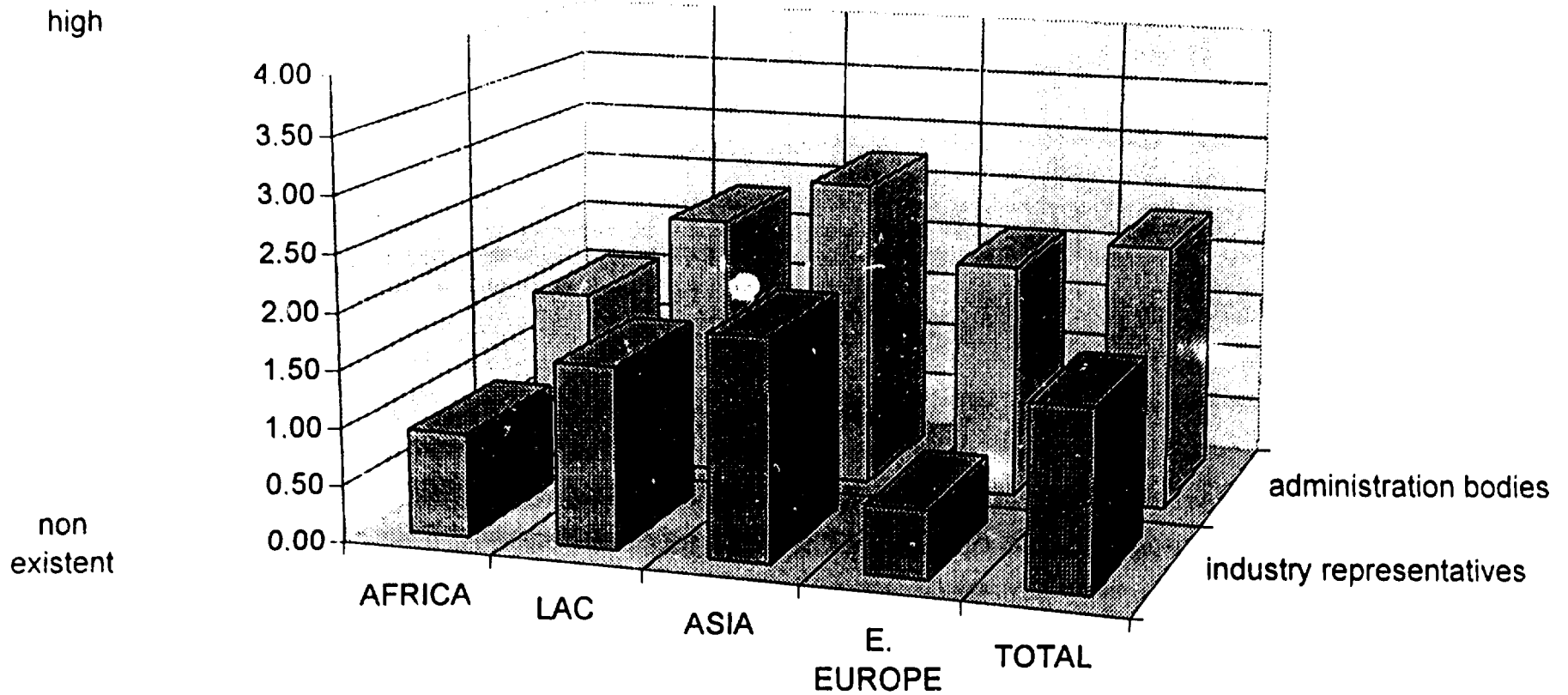
Awareness of mandatory national environmental requirements



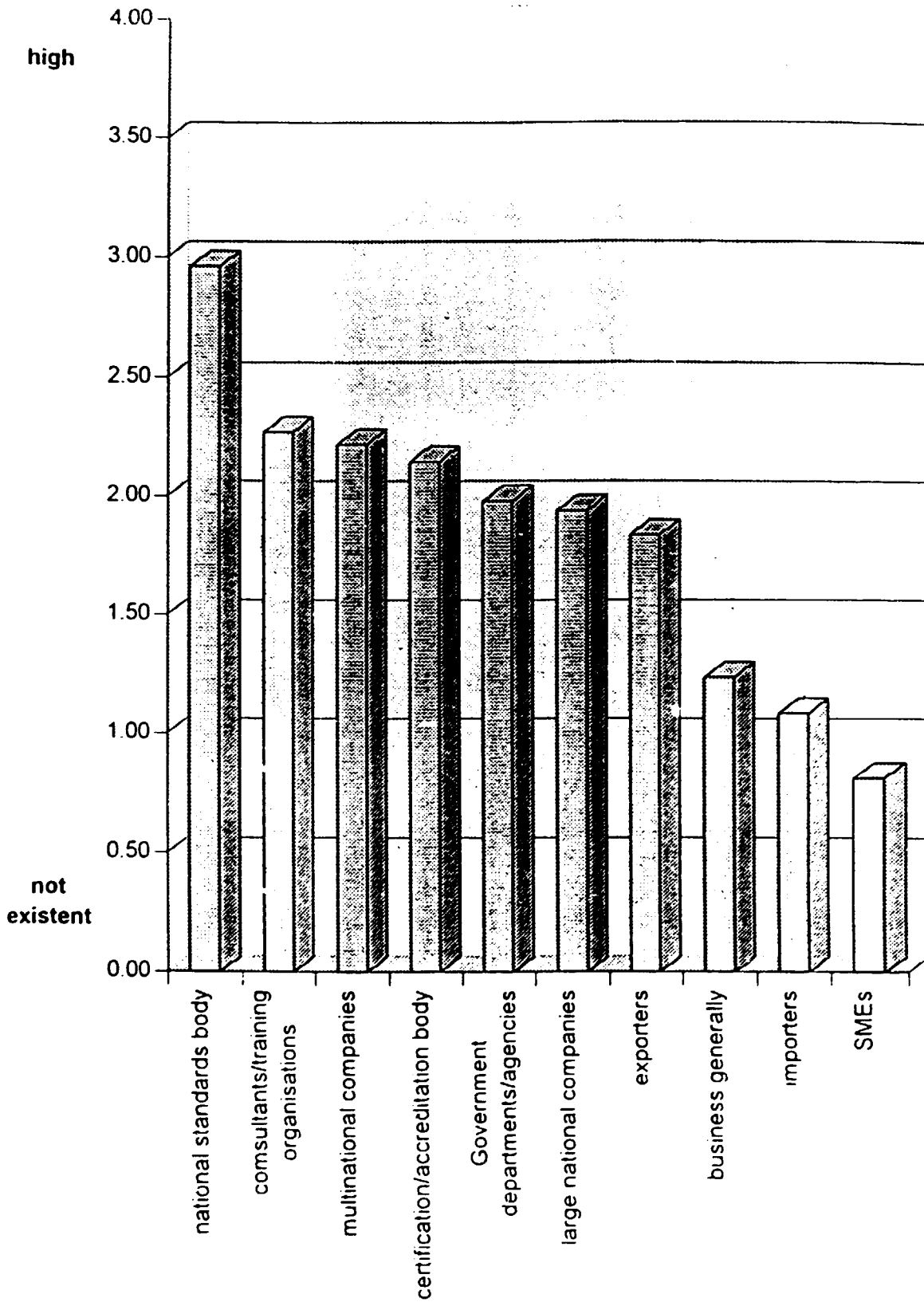
Awareness of voluntary national environmental agreements



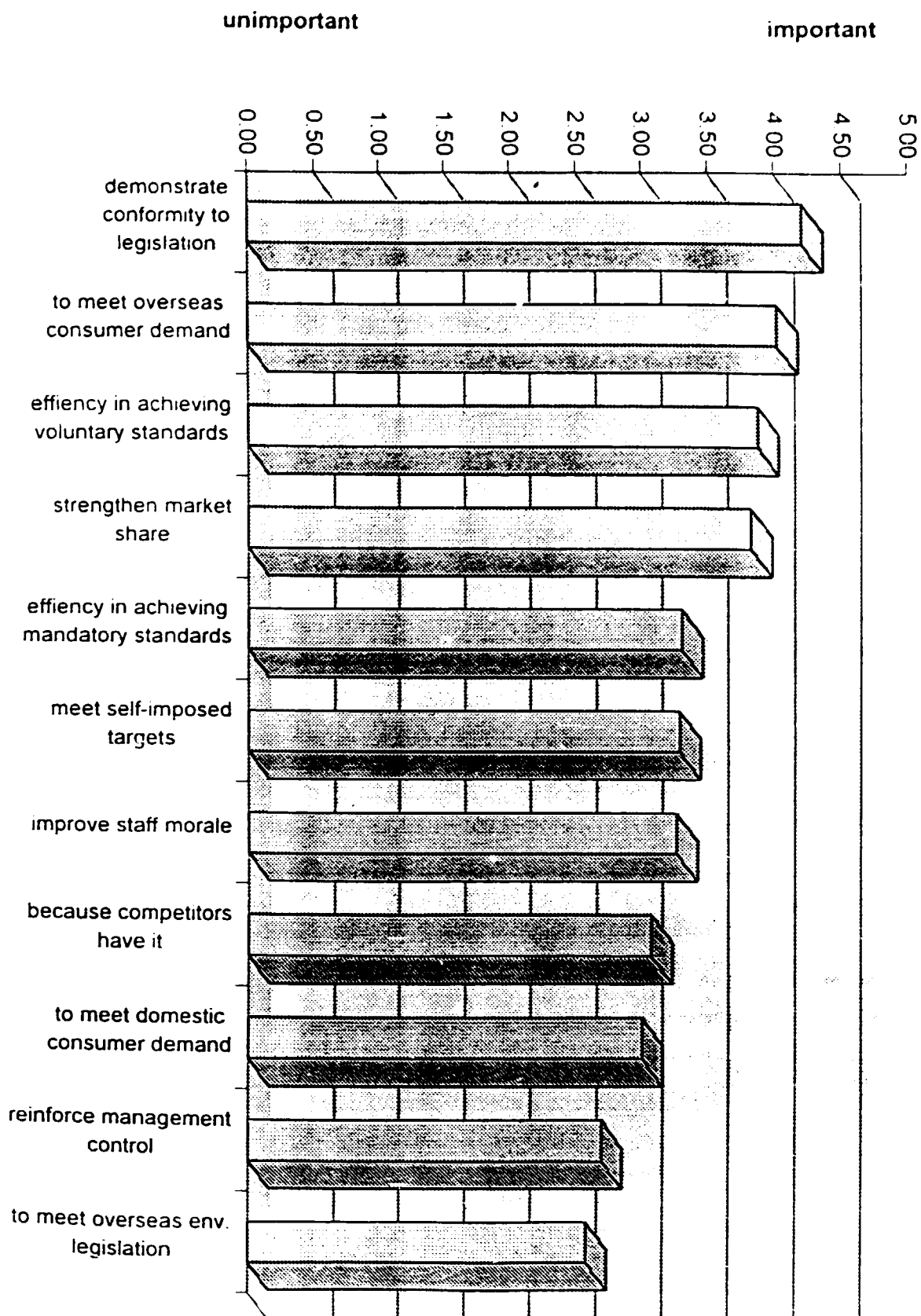
Average awareness of ISO 14000



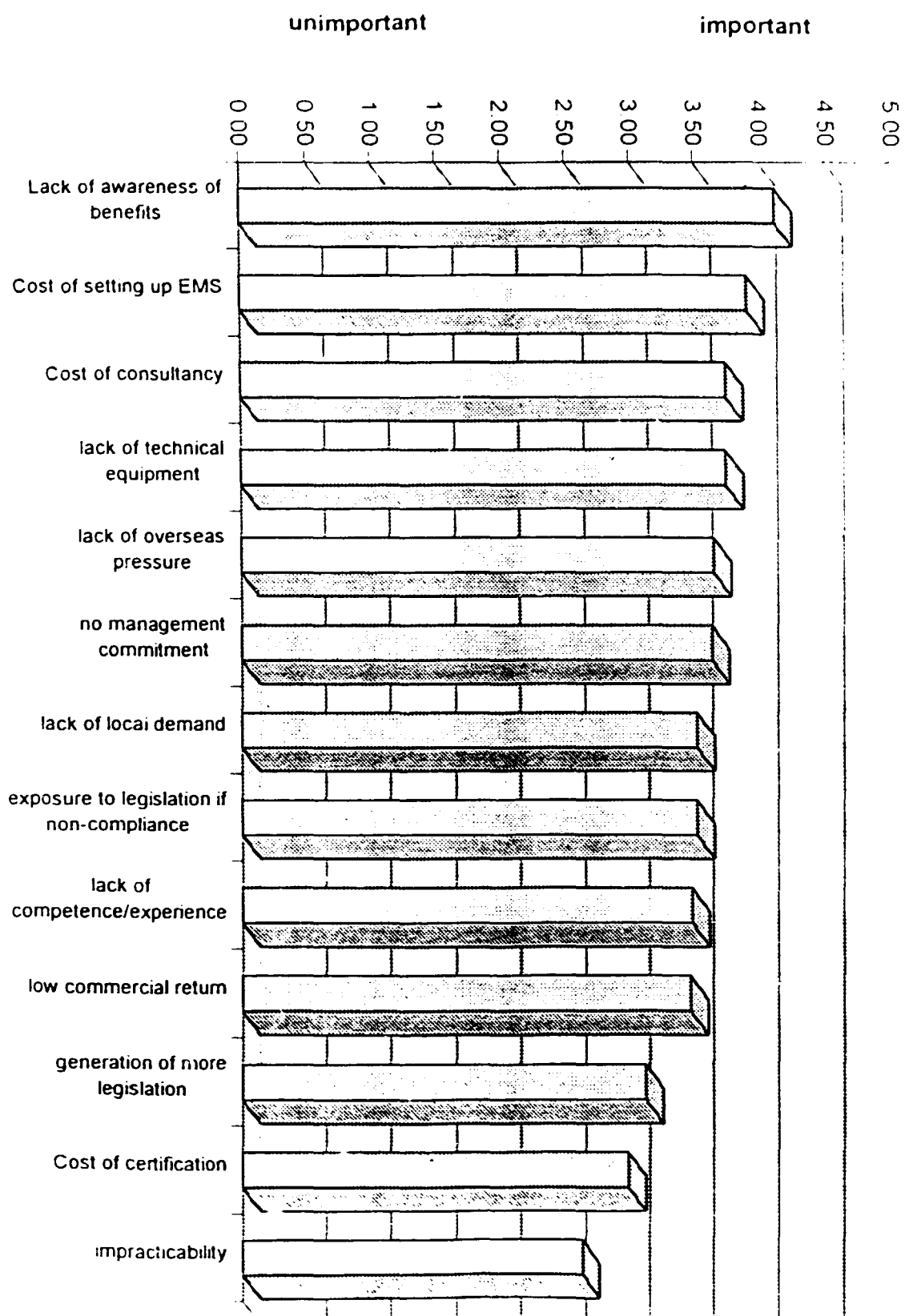
Awareness of ISO 14000



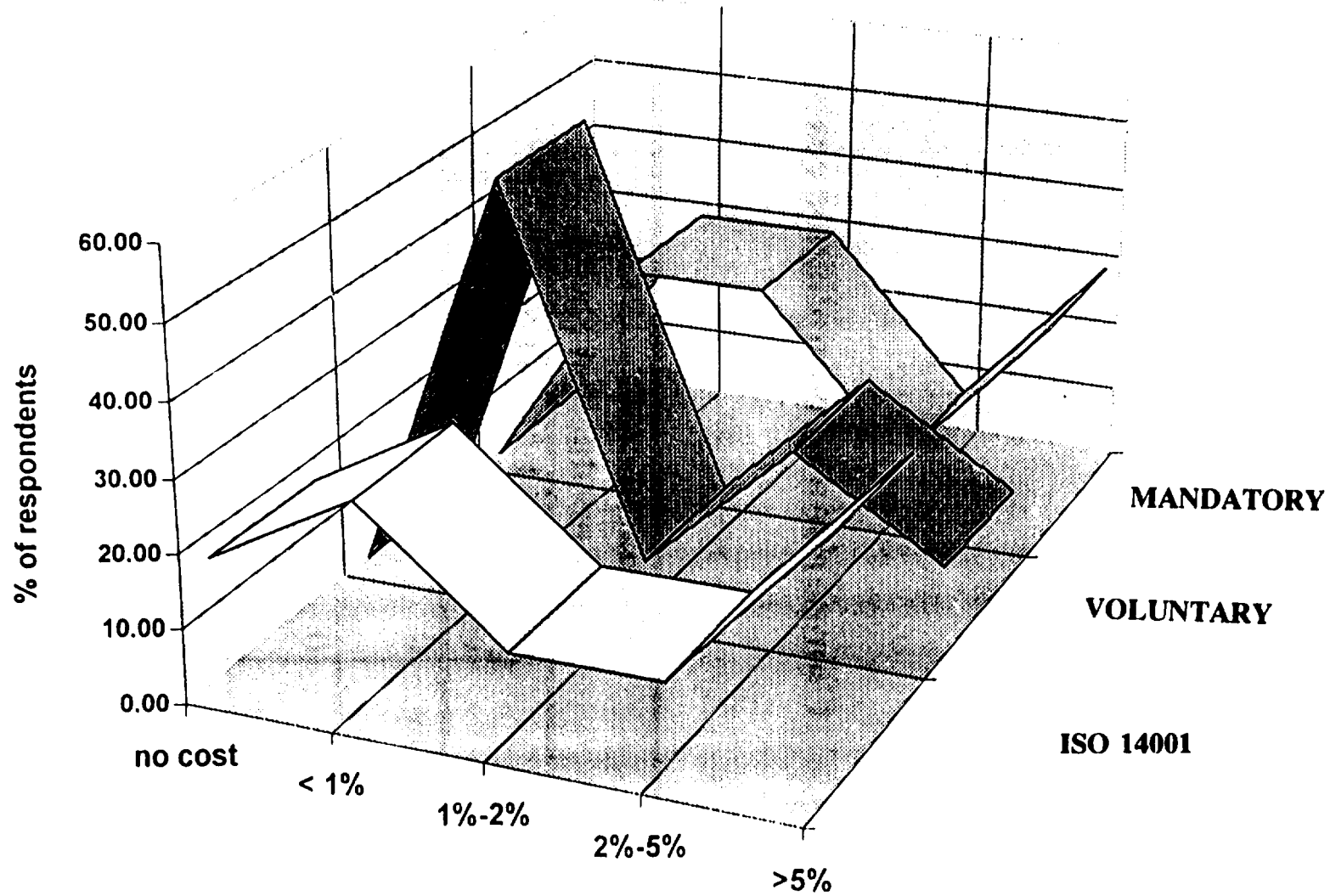
Reasons for Implementing ISO 14001 (all businesses)



Reasons for NOT Implementing ISO 14001 (all businesses)



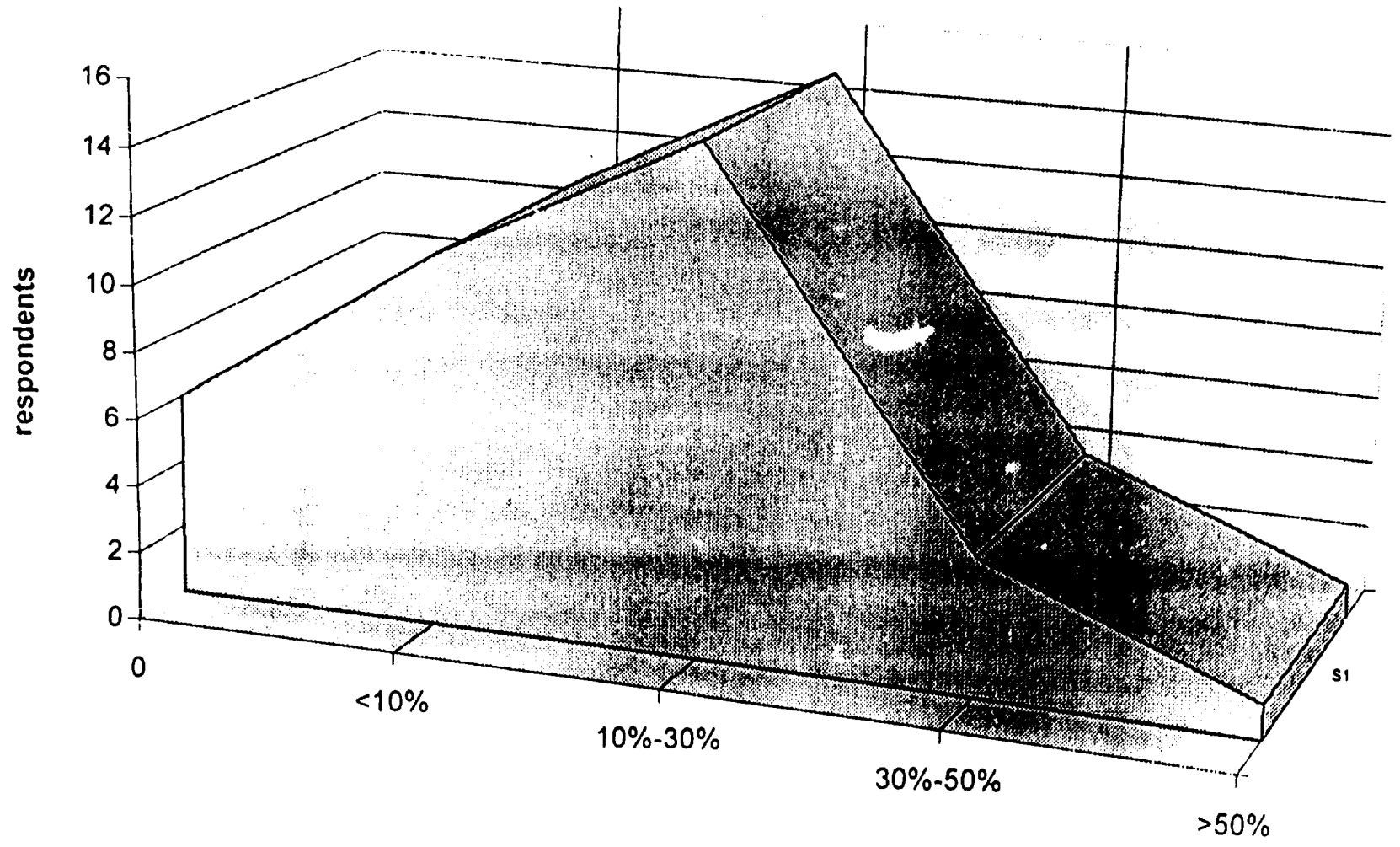
Comparison of estimated compliance costs as % of production costs



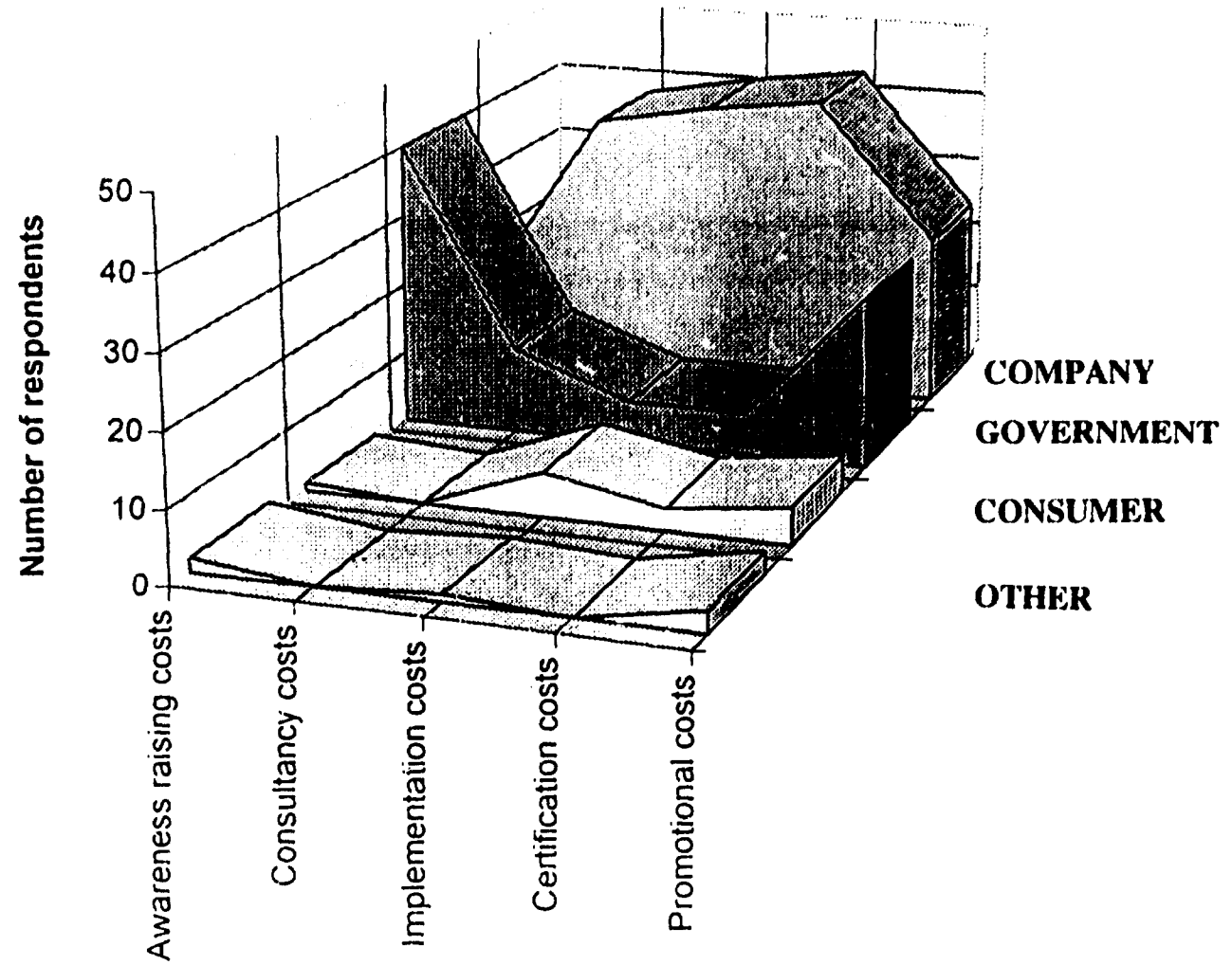
Comparison of compliance costs

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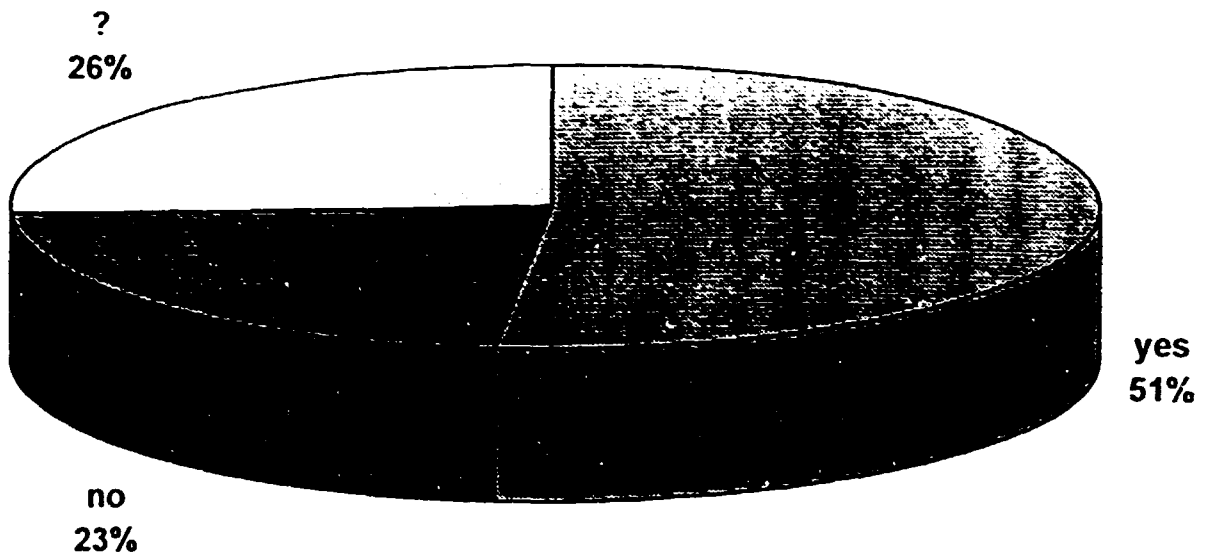
Input saving potential



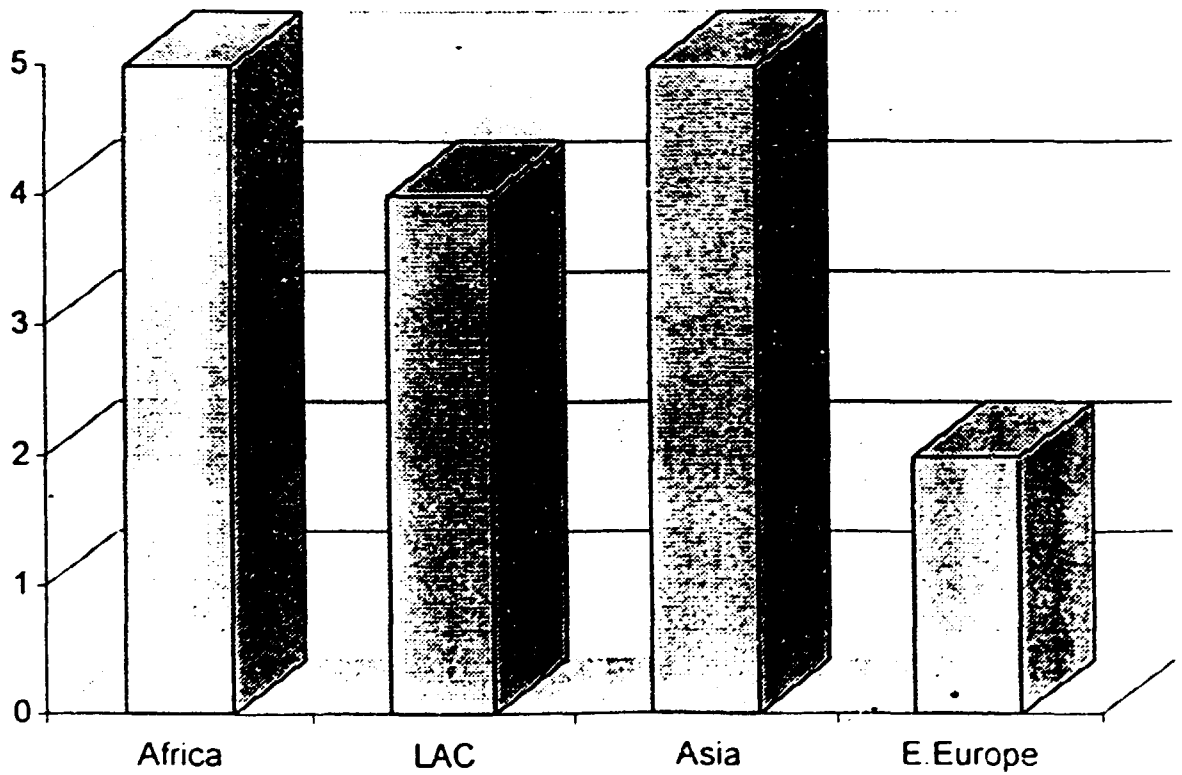
Suggested organisations to bear the costs of ISO 14001 implementation and awareness



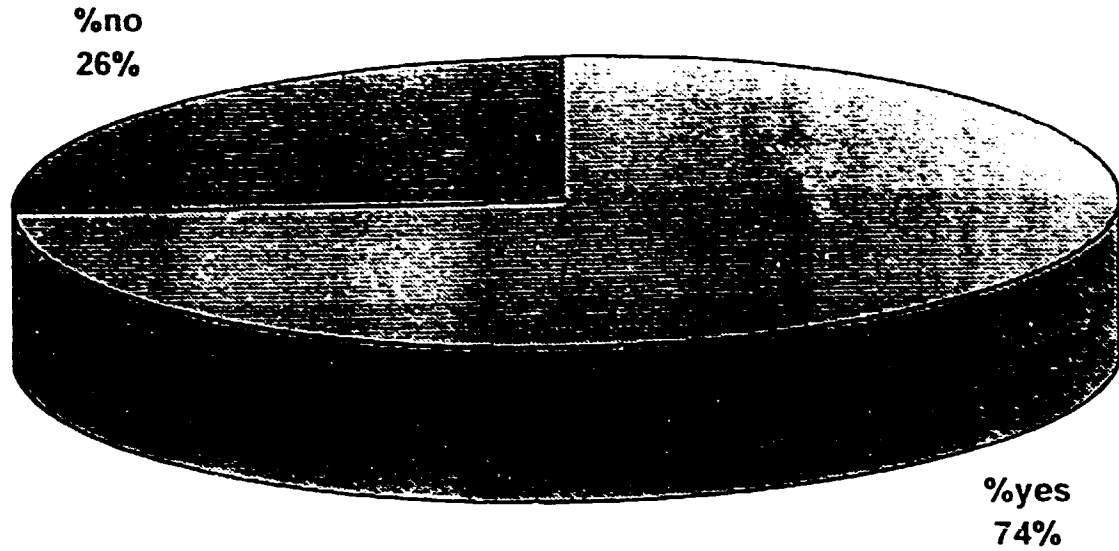
165
Countries that will have a national accreditation body for ISO 14000



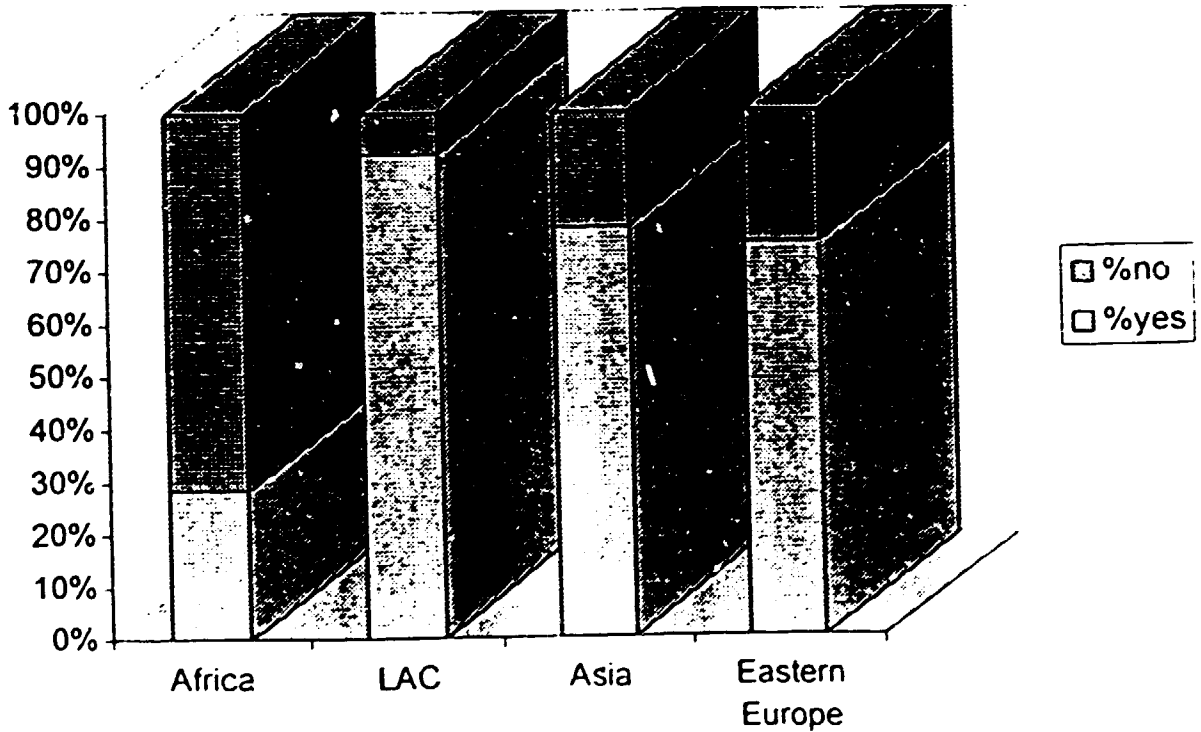
Number of countries that will have a national accreditation body for ISO 14000



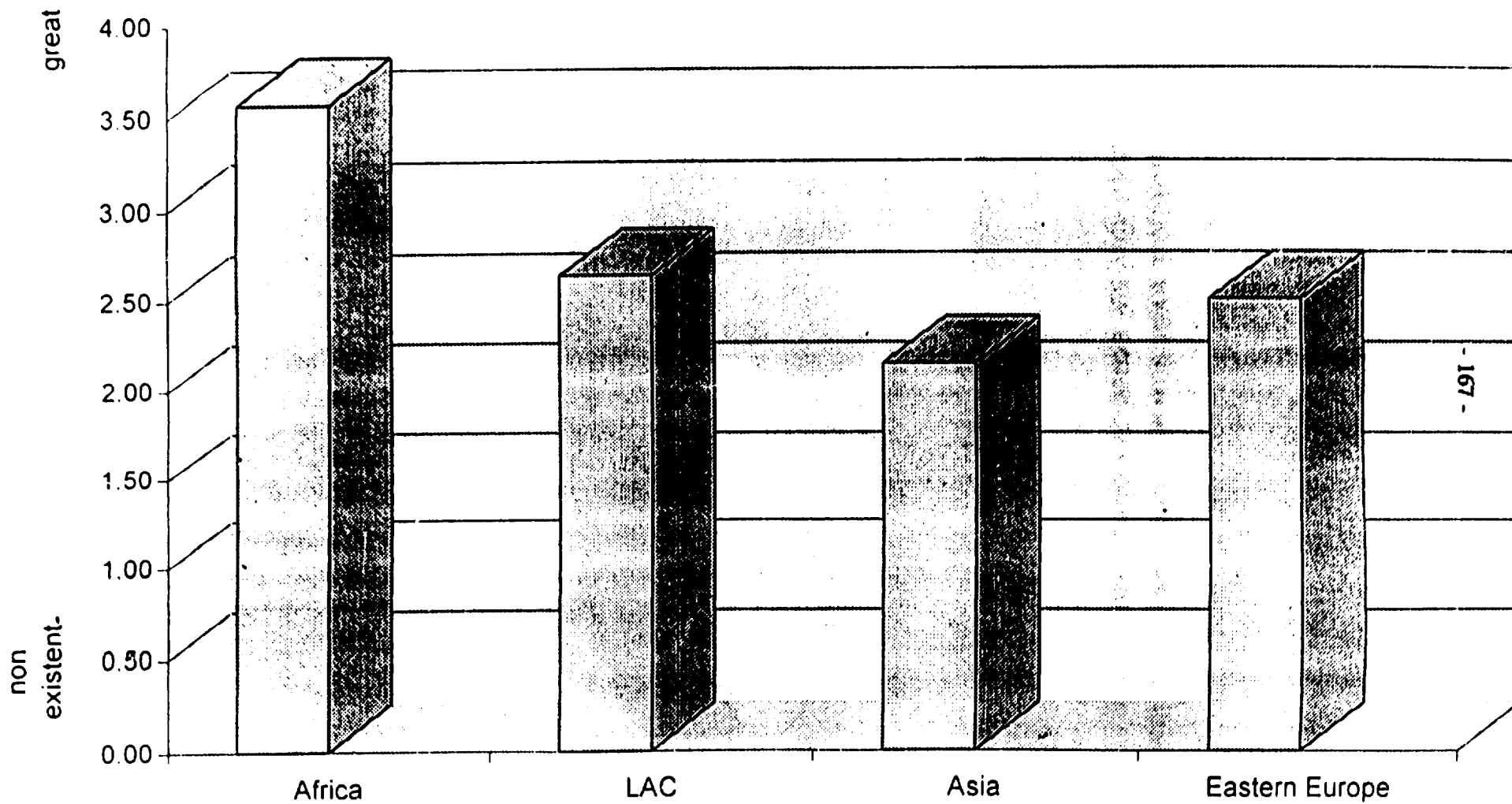
Should there be a single accreditation body for both ISO 14001 and ISO 9000 registration?



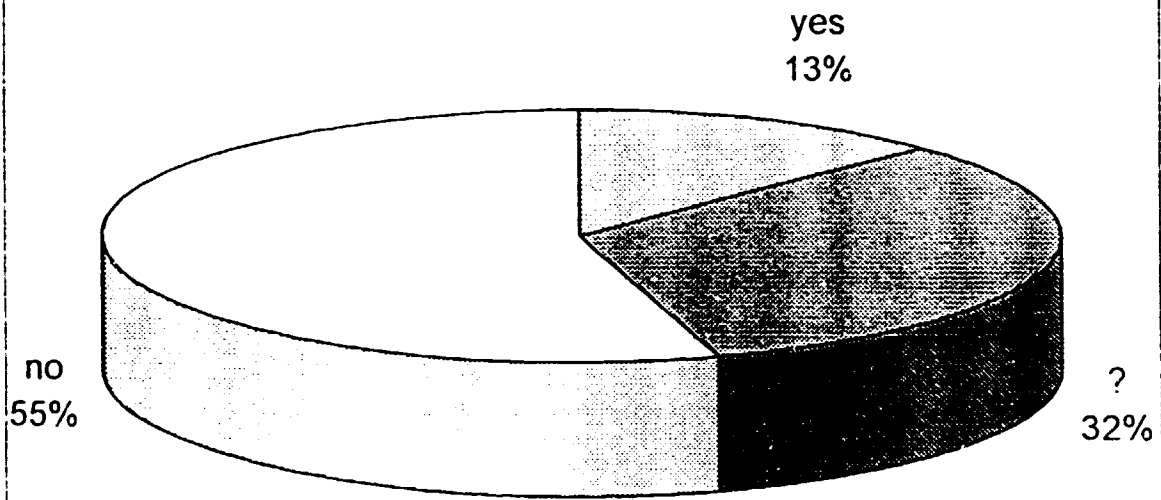
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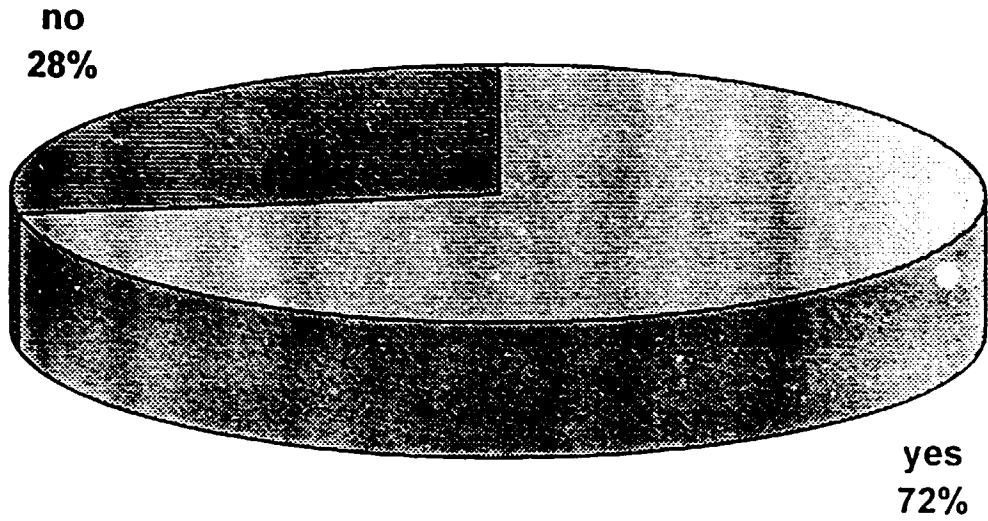
Expected difficulty of national accreditation body to obtain international acceptance



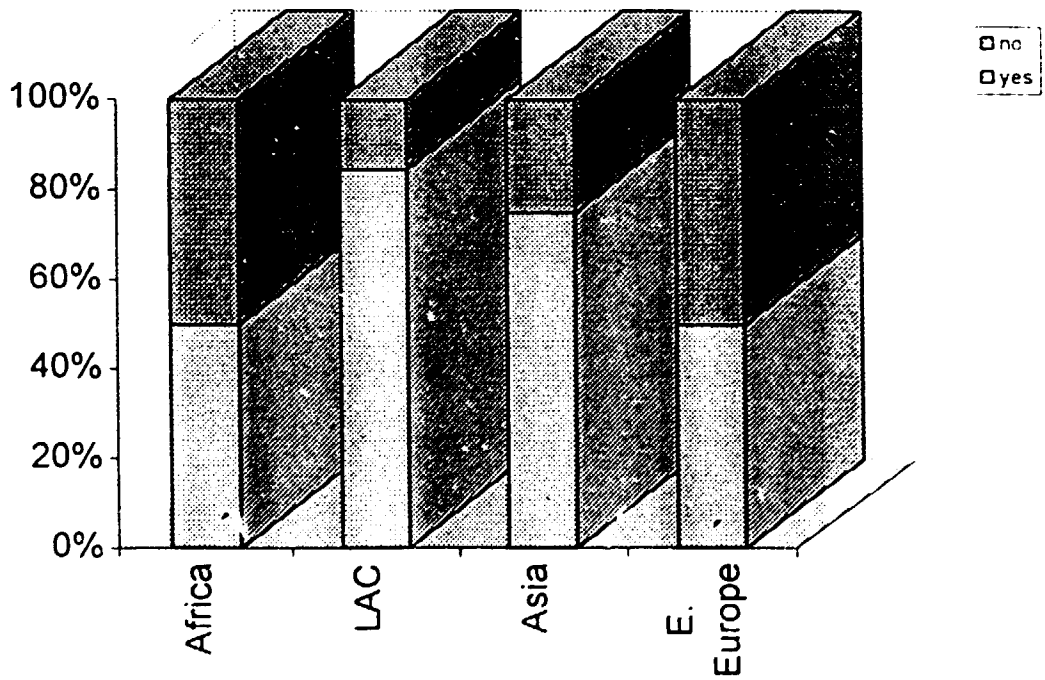
**Countries that will have a national
certification scheme for ISO 14001**



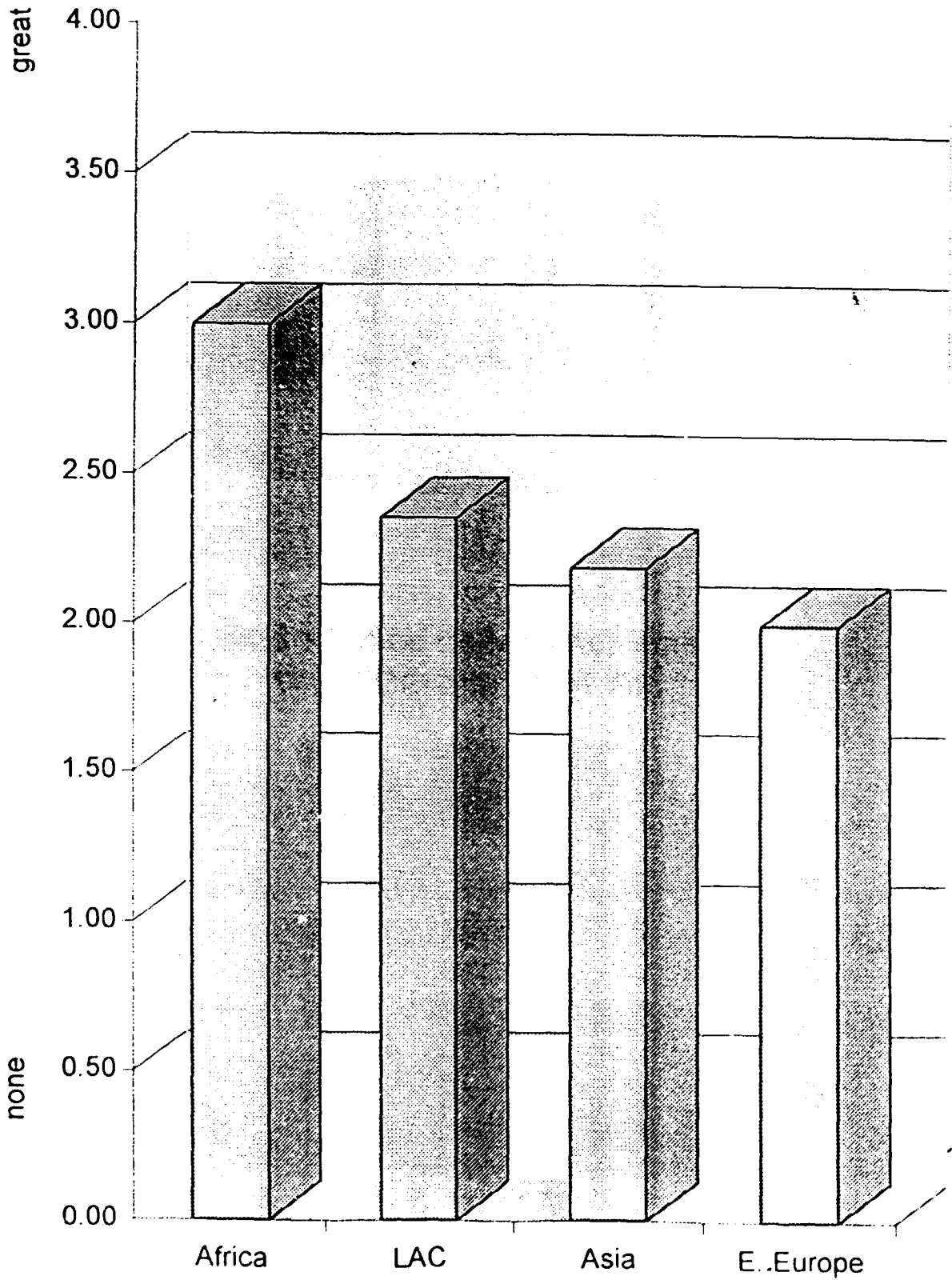
Same certification body for ISO 14001 and ISO 9000?



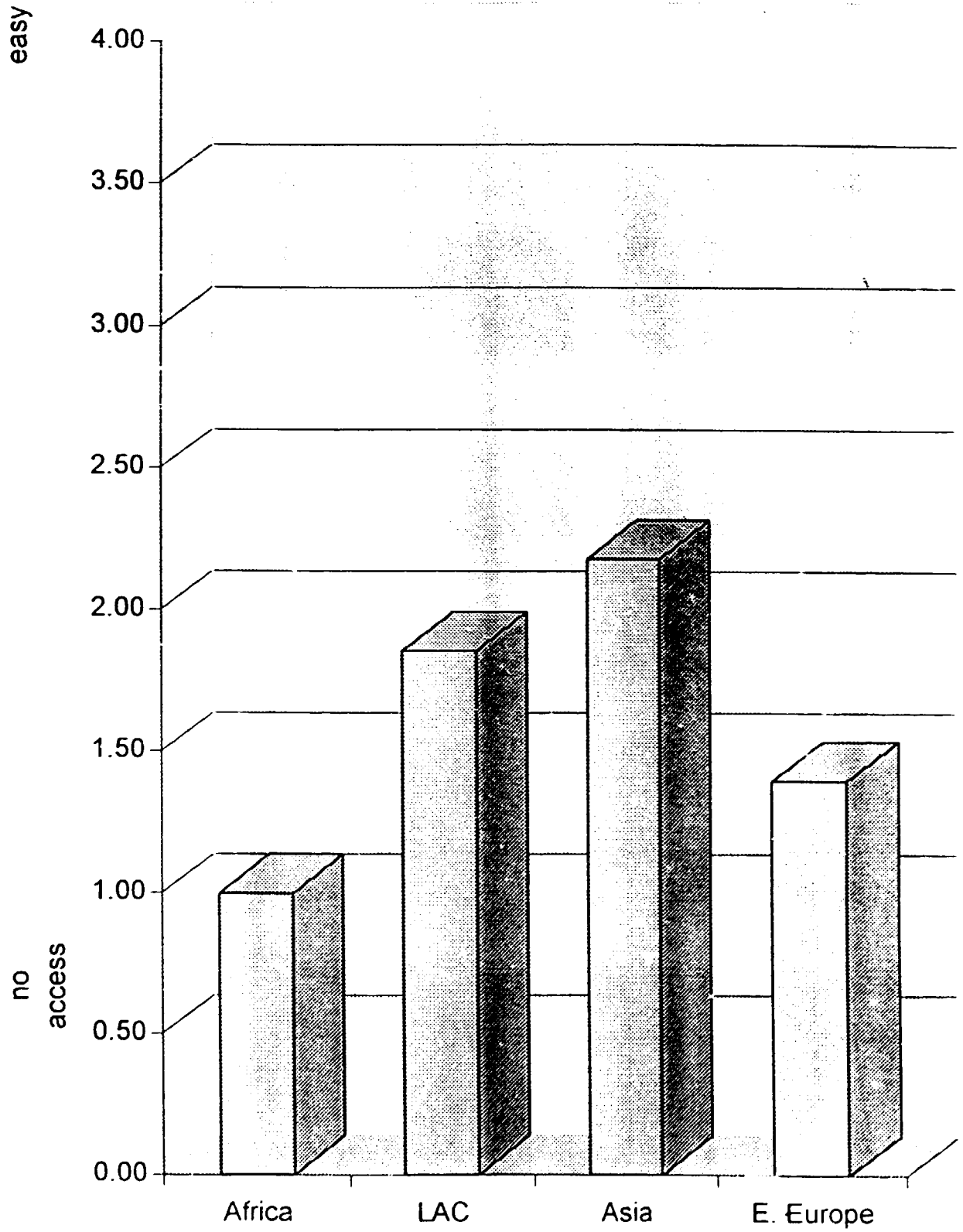
Same certification body for both ISO 14001 and ISO 9000?



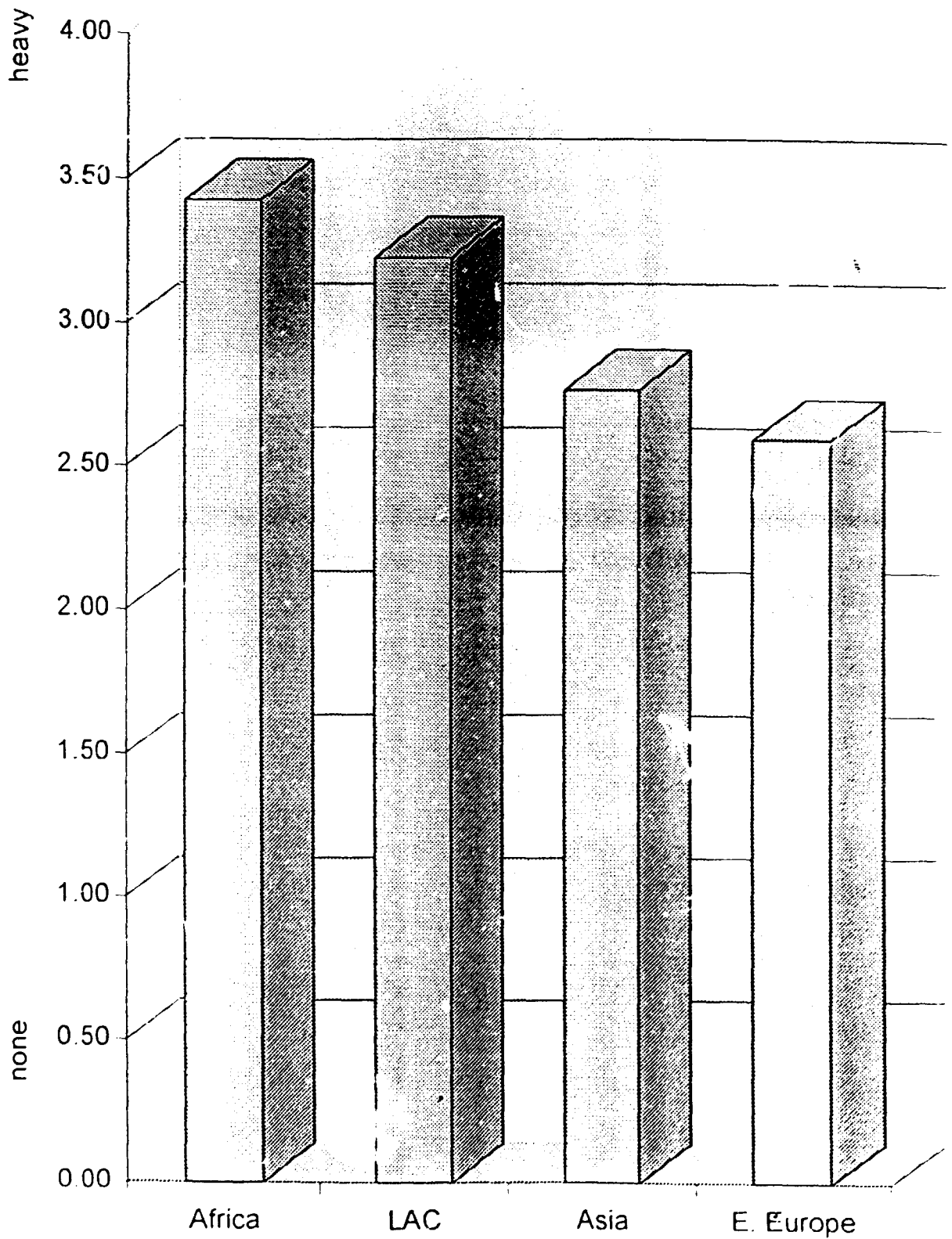
Expected difficulty of Nat. Certification Body to obtain international acceptance



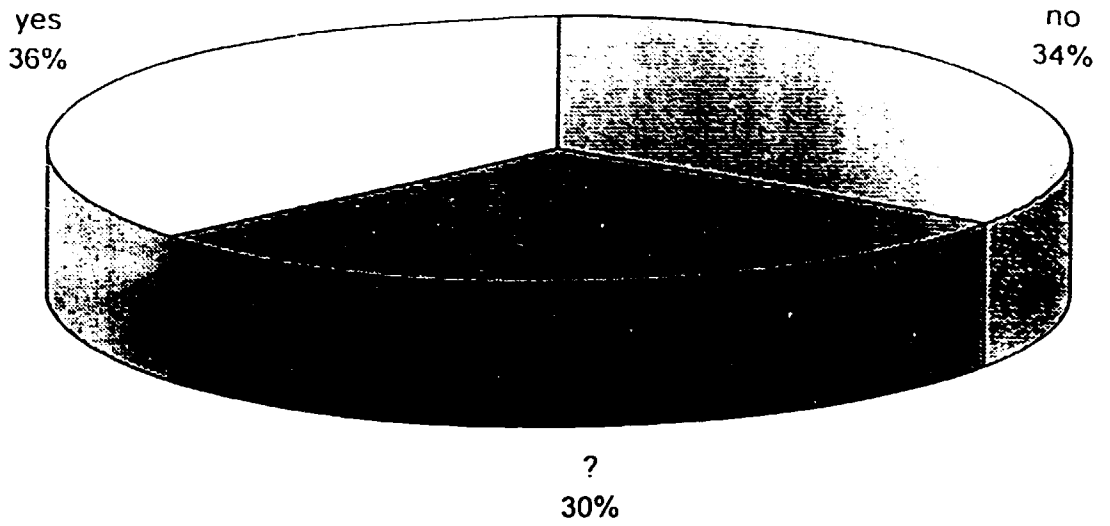
Access to resources to meet ISO 14000



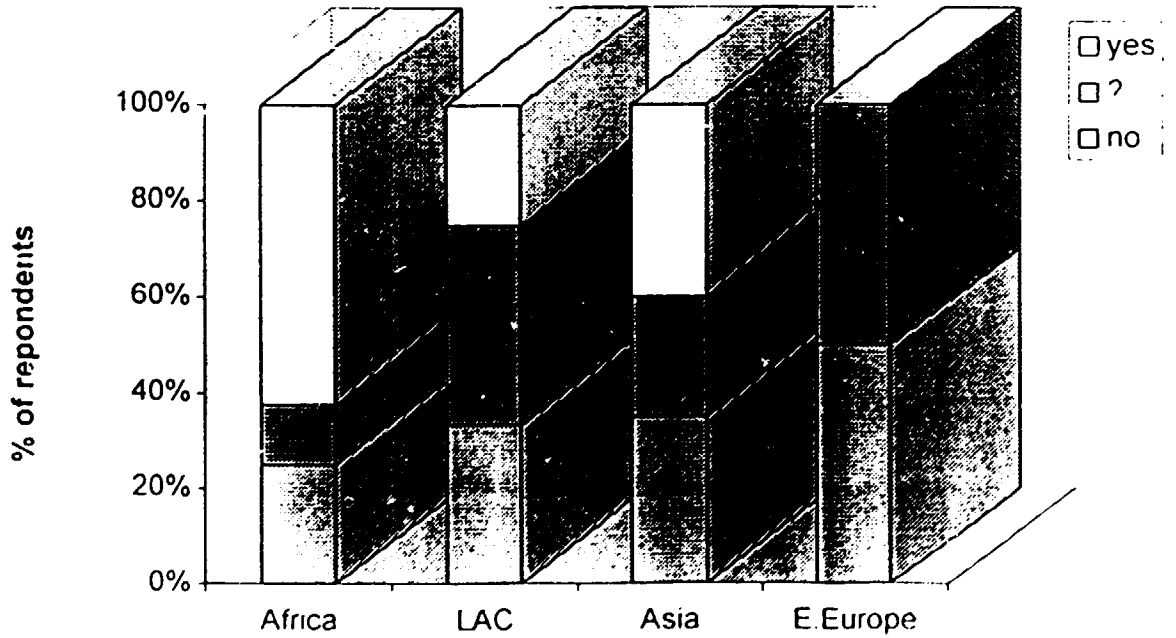
Constraints due to lack of consultants



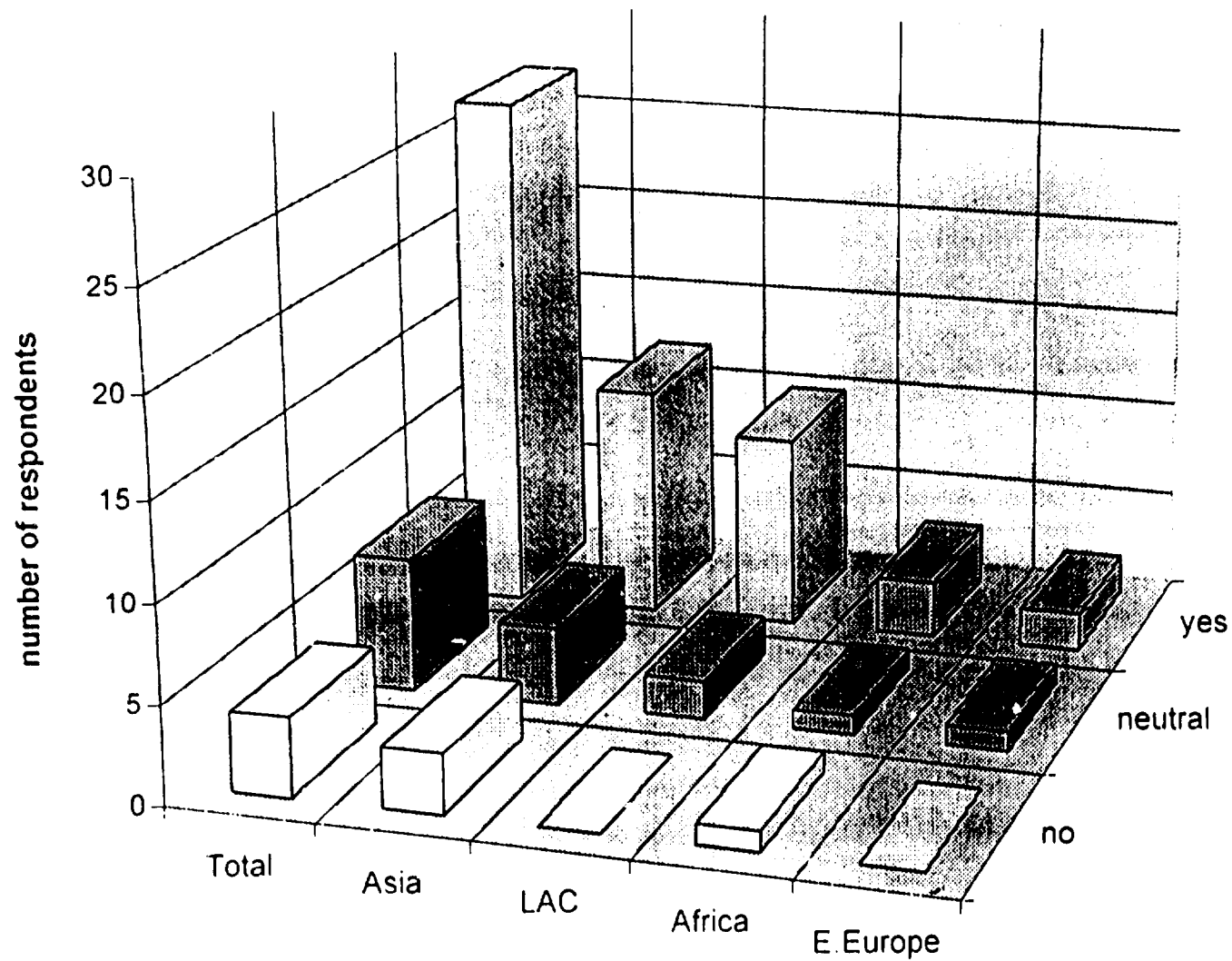
Overseas environmental requirements=barriers to exports



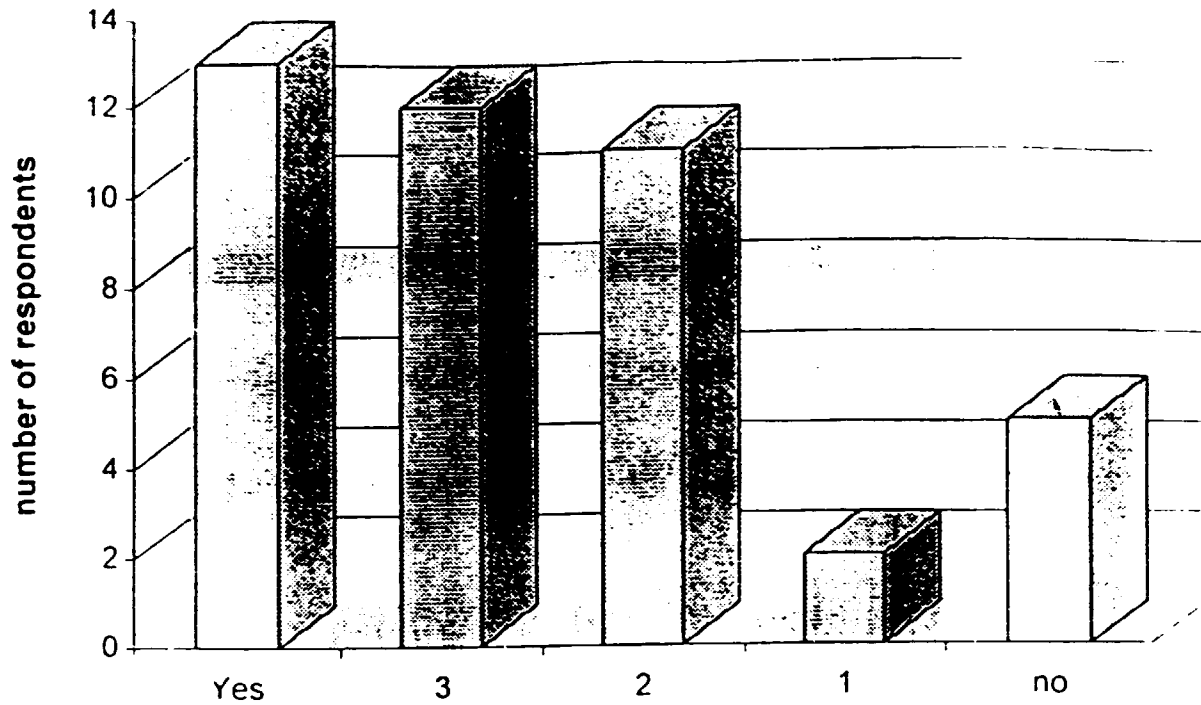
Overseas environmental requirements = barrier to exports?



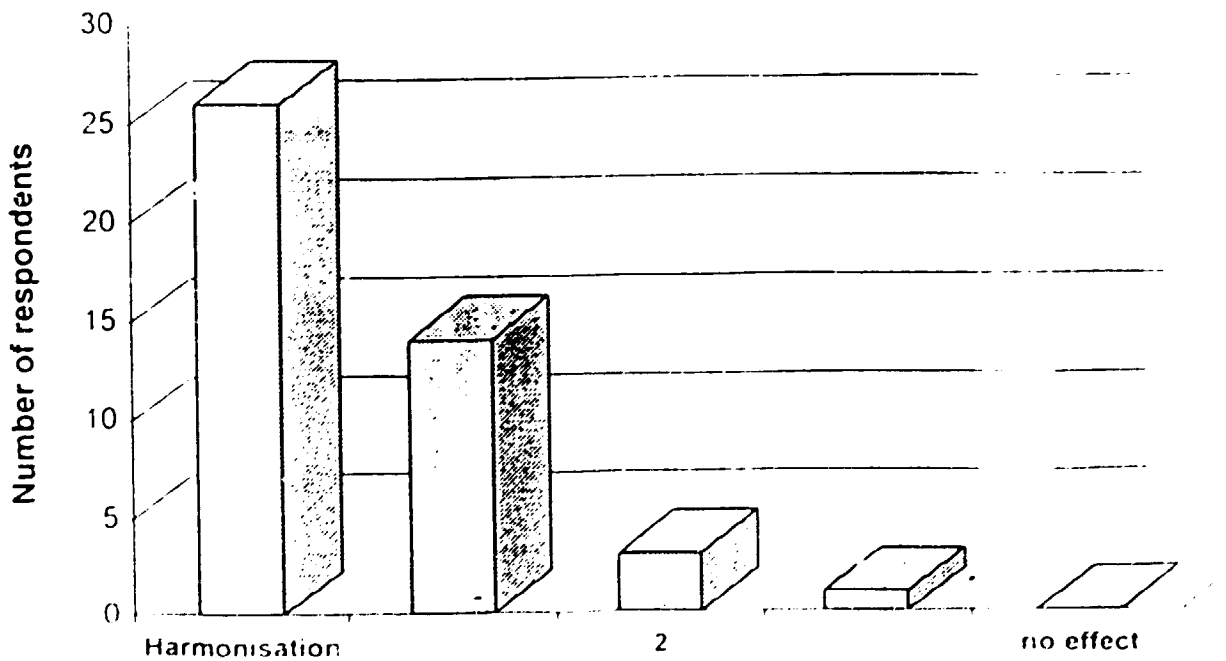
ISO 14001 could strengthen non-tariff barriers to international trade



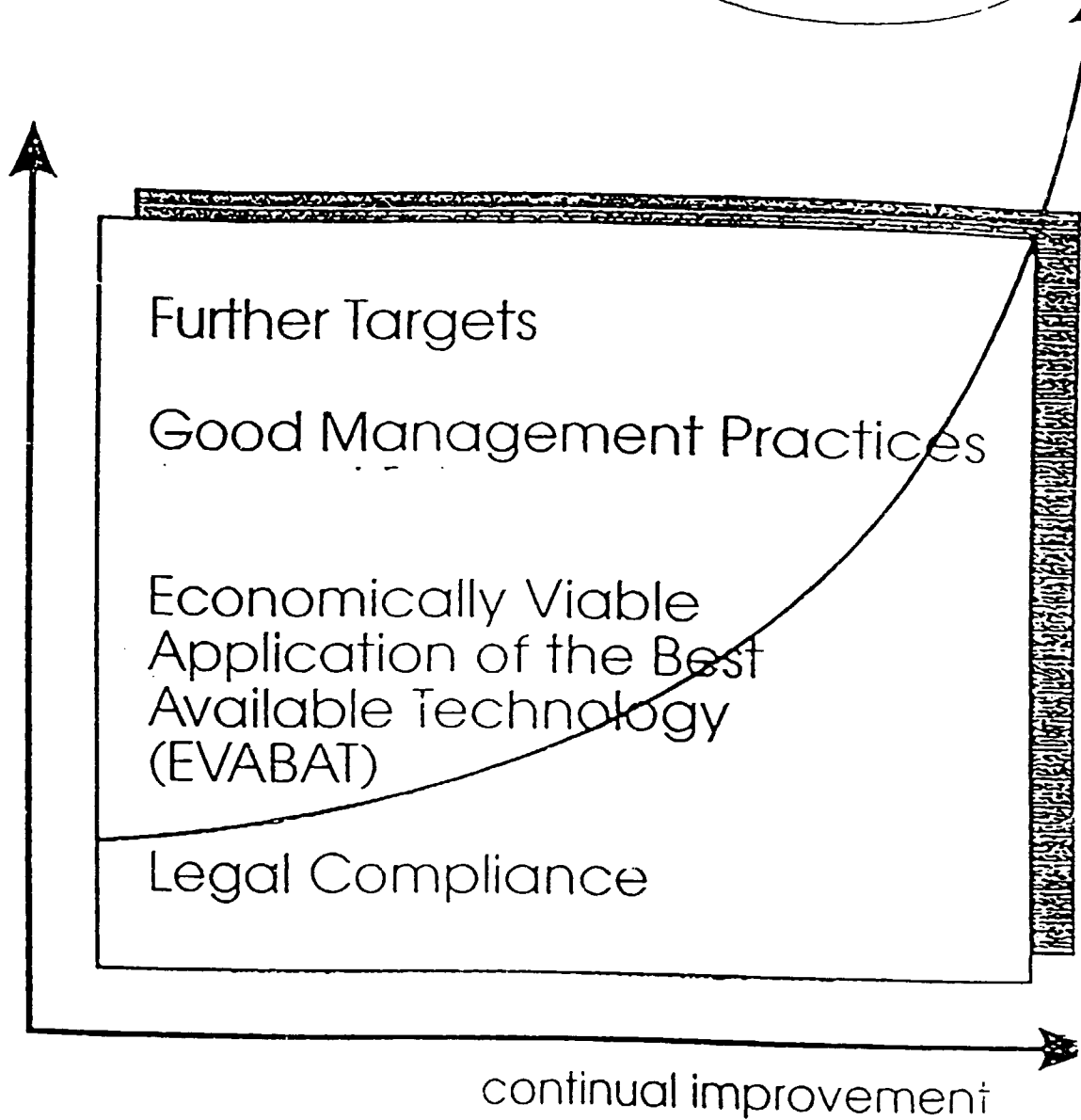
National labels hinder export opportunities



Effect of an international environmental labelling guideline like ISO 14020



Sustainable
Development



CLEANER INDUSTRIAL PRODUCTION

Prepared by the

Industrial Sectors and Environment Division

Cleaner Production

Cleaner Production is the continuous application of an integrated preventive environmental strategy to process and products to reduce risks to humans and the environment.

For production processes, CP includes conserving raw materials and energy, eliminating toxic processing materials and reducing the quantity and toxicity of all emissions and wastes before they leave a production process.

For products, the approach focuses on the reduction of environmental impacts along the entire life cycle of a product, from raw material extraction to the ultimate disposal of the product, by appropriate product design.

UNIDO CP Programme

1. Formulating Policies and Strategies for CP
2. Building Institutional Capacities for CP
3. Identifying CP opportunities for Industry at the Sectorial and Enterprise level (sectorial approach)

UNIDO ESID Conference

- Protection of eco-capacity
- Efficient use of human, material and energy resources
- Equity in sharing the environmental burdens as well as outputs of industrialization

World Industry Conference on Environmental Management 1991

Business charter for
sustainable development

U N C E D 1992

Rio Declaration on Environment and Development, Agenda 21
Chapter 30 of Agenda 21 calls for promotion of cleaner production

Cleaner Production

Establishment of NCPCs

Barriers to Cleaner Industrial Production

- Legislative and regulatory regime
- Confusion between CP and End-of-Pipe
- Lack of awareness of benefits
- Unsuitability of some techniques and technologies
- Lack of info about technology options
- Lack of technical personnel
- Perception of local inability to offer appropriate advice
- Cost of technology
- Cultural factors
- Funding difficulties among SMEs

NCPC Programme is a Response to Barriers

Programme Objectives

To facilitate the transfer of technical information and technology from developed and developing countries to industrial enterprises and environmental management agencies in developing countries in order for them to incorporate cleaner industrial production in their industrial pollution reduction programmes

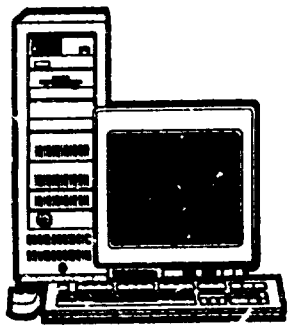
NCPC Functions

- Promote cleaner industrial production concept through dissemination of information
- Organize demonstration projects in industrial establishments
- Coordinate training programmes in cleaner industrial production practices
- Identify the needs and provide advisory services to industry and companies
- Stimulate applied research on CP technologies and obstacles to their utilization
- Provide advice to key policy-makers of the advantages of incorporating the CP approach in environmental policies

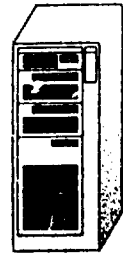
What are appropriate goals for CP programmes?

- **Demonstration**
- **Dissemination**
- **Integration**

UNIDO (VIC)



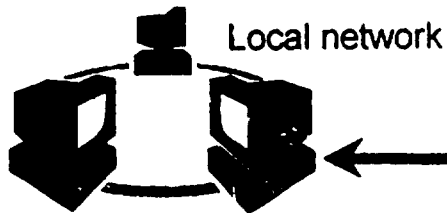
UNIDO server



REED system

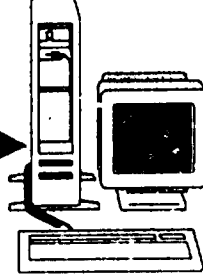
INTERNET LINE

NCPC



Local network

End-User PC's



NCPC server

Information Sources

Unido server: UNIDO/ISED/ENV
NCPC server
REED system

SUB/SECTORIAL REVIEWS FOR THE NCPCs

INDUSTRIAL POLLUTION AND CLEANER TECHNOLOGIES
CHAPTER ON

IRON FOUNDRY INDUSTRY

This chapter belongs to the subsectorial reviews produced by the Environmental and Energy Branch of the Industrial Sector Environmental Division of UNIDO. It is a revision of the available technical books, papers and previous UNIDO reports. It is intended primarily for the use in the NCPCs. The interpretations and conclusions expressed in this paper are entirely those of the authors(s) and should not be attributed in any manner to UNIDO. UNIDO does not guarantee the accuracy of the data included in this publication and accepts no responsibility whatsoever for any consequence of their use.

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NATIONS UNIES
COMMISSION ÉCONOMIQUE
POUR L'EUROPE

ОБЪЕДИНЕННЫЕ НАЦИИ
ЭКОНОМИЧЕСКАЯ КОМИССИЯ
ДЛЯ ЕВРОПЫ

UNITED NATIONS
ECONOMIC COMMISSION
FOR EUROPE

**UN/ECE Working Party on Steel's Activities
on Environmental Issues
(9.10.95)**

The Working Party on Steel of the Economic Commission for Europe places great importance on issues concerning the steel industry and the environment.

Although the Working Party on Steel has dealt with environmental issues for a long time in its publications on iron and steel scrap and the recuperation of by-products of the iron and the steel industry, the first concrete approach was made in 1991 when the Working Party organized a Seminar on Producer's and User's Metallurgical Requirements in the Welding of Steel Products in Kiev, Ukraine. During the Seminar, it was recommended that particular attention be given to environmental questions in the iron and steel industries.

This recommendation was confirmed during the 47th session of the ECE which was held in April 1992 in Geneva. After that, the Working Party organized a *Seminar on Metallurgy and Ecology* in 1993 in Nancy, France.

At this seminar, the participants recommended that the Working Party take up the issues of environmental management, recycling of iron and steel products and by-products, environmental safety standards and the harmonization of regulations in countries belonging to the ECE. This recommendation was confirmed during the 3rd session of the Working Party on Steel which was held in October 1993 in Geneva.

To carry out the recommendations of the participants of the Nancy Seminar, the Working Party organized the *first Meeting of a Group of Experts on the Steel Industry and the Environment* in Geneva in March 1994 and decided to create a programme entitled "Metallurgy and Ecology" in its programme of work.

Upon the recommendation of the Experts on the Steel Industry and the Environment, the fourth session of the Working Party on Steel (1994) decided that the Working Party should serve as an information circulation centre and should seek to develop greater transparency in the sustainable development of the steel industry by becoming involved in the training and retraining of steel workers, standardization of measurements, recycling and re-use of metallurgical scrap and waste from the steel industry and the encouragement of the utilization of technologies best suited to the situation in each country. The Working Party was also recommended to pay particular attention to the development of those issues in the countries in transition

In line with these recommendations the Working Party adopted several activities in its programme of work on the steel industry and the environment. In the field of scrap, the sixth updating of the biannual publication *"Iron and Steel Scrap: its Significance and Influence on Further Developments in the Iron and Steel Industries"* was completed and will be published in October 1995. Following the *Seminar on the Steel Industry and Recycling*, organized in April 1995 in Düsseldorf, Germany, a follow-up *Seminar on Processing, Utilization and Disposal of Waste Materials in the Steel Industry* will be organized in June 1996 in Balatonszékplak, Hungary. A *Directory of organizations which conduct work on the steel industry and the environment* is being prepared for publication in March 1996. Finally, the Working Party is addressing issues related to the harmonization of environmental regulations in the economies in transition. To this end, it considers projects that could further the exchange of information between steel producers and government representatives leading towards greater harmonization.

The *second Meeting of Group of Experts on the Steel Industry and the Environment* which will be held in Geneva in March 1996 will discuss the future activities of the Working Party on Steel on the environmental issues.

1. **Introduction**

Mr. Chairman, ladies and gentlemen.

I am glad to have this opportunity to tell you something about the environmental activities of the Working Party on Steel of the United Nations Economic Commission.

2. **Introducing ECE**

Let me introduce very briefly my organization. The Economic Commission for Europe was founded in 1947 as a regional commission of the United Nations and it is still today the only permanent intergovernmental forum for economic cooperation covering all the countries of Europe and North America.

ECE responds rapidly to the needs of its member countries. Several factors help ECE to meet this challenge. The first is a wealth of experience in the study and analysis of national economies and in the promotion of cooperation among all countries of the region. ECE has also accumulated expertise in developing regional strategies, concepts and policy recommendations and in drawing up international conventions, particularly in the fields of environmental protection and transport.

ECE has four Working Parties in its Industry and Technology Division, which study the chemical industry, standardization, engineering industries as well as steel. The Division also acts as secretariat to the Senior Advisers to ECE Governments on Science and Technology.

3. **Environmental Activities of the Working Party on Steel**

Among other activities the Working Party on Steel of the Economic Commission places great importance on environmental issues in the steel industry. For a long time, the

Working Party on Steel has issued publications on iron and steel scrap and others such as the recuperation of by-products of the iron and steel industry. However, the first concrete approach to address the complex issues involved was made in 1991 when the Working Party organized a Seminar on Producer's and User's Metallurgical Requirements in the Welding of Steel Products in Kiev, Ukraine. During the Seminar it was recommended that attention be given to environmental questions in the iron and steel industries.

Thus, the Working Party organized a Seminar on Metallurgy and Ecology in 1993 in Nancy, France. At this seminar, participants recommended that the Working Party set up an expert group to discuss issues related to environmental management. Accordingly, the Working Party created a Group of Experts on the Steel Industry and the Environment and this Group met for the first time in March 1994 in Geneva.

During its discussions, the Group of Experts recommended that the Working Party promote greater transparency in the sustainable development of the steel industry, including training and retraining of steel workers, standardization of environmental measurements, recycling and the re-use of metallurgical scrap and waste from the steel industry, and encourage the utilization of technologies best suited to the particular situation in each country. It was also recommended that particular attention be paid to the development of these issues in the countries in transition.

To carry out these recommendations the fourth session of the Working Party which was held in October 1994 in Geneva decided to create a programme entitled "Metallurgy and Ecology" in its programme of work.

In line with the recommendations of the Group of Experts, the Working Party adopted several activities in its programme of work on the steel industry and the environment. In the field of scrap, the sixth updating of the biennial publication "Iron and Steel Scrap: its Significance and Influence on Further Developments in the Iron and Steel Industries" was completed and will be published in November 1995.

A Seminar on the Steel Industry and Recycling was organized in April 1995 in Dusseldorf, Germany. The Seminar was attended by 193 participants from 17 countries and

3 international organizations and 52 papers were presented. The participants agreed that environmental control was a costly exercise which had an impact on international competition, and that maintaining the balance between ecology and economy was a vital task. They recommended that the consideration of those factors could take place under UN/ECE auspices, for instance by bringing together a selected number of highly qualified experts working on specific topics of concern to the steel industry. Another recommendation was to ensure a follow-up to the Düsseldorf Seminar. Accordingly, a Seminar on Processing, Utilization and Disposal of Waste Materials in the Steel Industry will be organized in June 1996 in Balatonszék, Hungary.

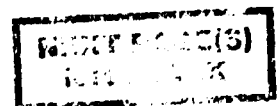
In addition, a directory of organizations which conduct work on the steel industry and the environment is being prepared for publication in March 1996. Finally, the Working Party is addressing issues related to the harmonization of environmental regulations in the economies in transition. To this end, it is considering projects that could further the exchange of information between steel producers and government representatives leading towards greater harmonization.

Before the Hungarian Seminar, the Group of Experts on the Steel Industry and the Environment will have its second Meeting in Geneva in March next year. We are expecting very positive participation in that Meeting and would like to have suggestions and proposals regarding the future environmental activities of the Working Party. For instance, we would like to expand our work on the harmonization of environmental regulations and help steelmakers adopt effective environmental management methods. We are open to any suggestions from you in that regard. Your suggestions will be carefully reviewed and discussed during the Meeting of Experts.

5. Ending

Once again, I appreciate very much this opportunity to take part in your meeting and to introduce the environmental activities of the UN/ECE.

Thank you, ladies and gentlemen.



*FIELD EXPERIENCES IN ENVIRONMENTAL
MANAGEMENT, AUDITS AND TRAINING PROGRAMS*

Georg Schoerner

There is worldwide a growing acceptance that Governmental authorities and industry need to take mutual supportive action in order to ensure effective environmental management in relation to steel making. As an instrument of environmental management the environmental audit in connection with training programmes play a very important role.

The main objectives of this mentioned instrument are the protection of health, safety and welfare of both the industrial workforce and the general population, the avoidance of unnecessary degradation of the natural environment, the reduction of nuisance and loss of amenity and the wise use of natural resources.

Environmental protection policies need to be seen as a whole and in relation to use of resources.

A forward looking approach of the environmentally sound development will help to ensure

* first the wise and rational use of different sources, raw material and energy;

* secondly, it will ensure that water resources are seen in the context not only of the isolated needs of the industry but also of the current and future overall requirements of the local community and region;

* thirdly it helps to plan the effective use of economic resources, minimizing both unnecessary, excessive expenditure and the need for expensive and capital intensive retrofitting pollution control in the future.

* Finally it helps the companies to plan its manpower needs in terms of maintenance and running of abatement equipment as well as training of personnel in good operating practices and measures which have a view to protecting the internal and external environment.

The aims are also to include benefits and procedures of "cleaner production" and environmental assessment techniques, like philosophy of introducing environmentally sound technologies, concepts and procedures of pollution prevention, waste minimization, cleaner technologies, sustainable developments and world trends on environmental issues, quality assurance and follow-up actions.

These programmes are worked out in close connection with related UNIDO programmes. As mentioned in an UNIDO-basic-document 1991, this approach will be a "new" one: "horizontally in the learning process and vertically in the practical experience process, because the major pollution problems found by the steel industry apply to many points within one steel plant. These are not confined to any of the processing stages".

The environmental audit process could be divided into different steps:

- * Understanding the processes in the plant
- * defining process inputs / process outputs / material and energy balance studies
- * identifying reduction alternatives to reduce the environmental burden
- * integrated financial, economical and implemental studies
- * implementing action plan

Including in this scheme are three working procedures:

- * pre-audit activities (including: set audit objectives, define audit scope, select and introduce the audit team, review of previous audits or reviews, understand activities and management systems, ensure the top management commitment)
- * on-site-activities (including: discussions with site personnel on different levels, fact-finding missions, assess in-plant and external environmental standards, evaluate audit findings and conclusions, inspect all the operation conditions, etc.)
- * post-audit activities (including: preparation of audit report, communication with management on different levels; development of a corrective action plan; establishing mechanisms to ensure follow-up procedures etc.)

During the lecture basic informations were given on practical work. In the course of an project in which our team has analyzed a large integrated metallurgical plant in the Czech Republic, it was necessary to execute the following steps of the program:

- * Fact-finding-procedure and pre-audit-activities
- * Air-pollution emission monitoring and including the ambient air pollution.
- * Training programs for key personnel
- * The environmental audit process
- * Environmental and technological recommendations
- * Final report

Audit procedures are undertaken according to the EMAS (Environmental Management and Audit Scheme) regulations, the local regulations and other standards like ISO 14.000 or BS 7750.

For the different industrial plants the results of environmental audit procedures are very valuable information sources not only for their daily work but also for intensive planning purposes.