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The Costs and Benefits of Compliance with International Environmental Standards

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The Costs and Benefits of Compliance with International Environmental Standards

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SDPI's research program provides support for informed decision-making and thus helps to catalyze the transition to sustainable human development. Specific research themes are linked to the implementation of the National Conservation Strategy (NCS), Pakistan's Agenda 21. Besides the 14 core program areas of the NCS, research has also been initiated in the following critical cross-cutting areas:

- Governance
- Environment
- Human Development
- Economy

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Acronyms

BOD	Biological Oxygen Demand
CETP	Common Effluent Treatment Plant
COD	Chemical Oxygen Demand
CP	Cleaner Production
CPC	Cleaner Production Center
Cr	Chromium
EMS	Environmental Management System
EPA	Environment Protection Agency
EPB	Export Promotion Bureau
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GOP	Government of Pakistan
KTPCP	Kasur Tannery Pollution Control Project
MEA	Multi-lateral Environmental Agreements
NEQS	National Environmental Quality Standards
NGO	Non-governmental Organisation
SEBCON	Socio-Economic Business Consultants
SME	Small and Medium Enterprise
TBT	Technical Barriers to Trade
TDS	Total Dissolved Solids
TSS	Technologically Suspended Solids
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNIDO	United Nations Industrial Development Organization
VOC	Volatile Organic Compounds
WTO	World Trade Organization

Executive summary

Section A – Overview

The trade-environment nexus continues to generate heated debate. From the benign setting of Rio to open confrontation at Seattle and to the "behind closed doors" diplomacy at Doha, at times it appears impossible that the various stakeholders will trade in their differences for consensus. Perhaps environmental regulations define this split best. Its advocates in the north feel that such regulations will promote sustainable development and growth eventually. Inverting this argument, southern countries claim environmental regulations are trade-restricting devices, engineered by coalitions to protect domestic industries and block exports from the south.

Following upon the premise of the Pakistan TKN-1 study (Khan *et al.*, 1999), this paper too avoids the histrionics such debates can give rise to and focuses on the practical implications. It begins with the stance that the reality is somewhere in between and that environmental regulations can cut both ways: they can be trade restricting but they also offer new market niches and can lead to cleaner production practices in the exporting countries. The institutional challenge is to address the concerns and maximize the benefits. Also, in the final analysis, developing countries are left with little choice other than to comply with the increasingly stringent environmental regulations in order to maintain their export shares.

The north, too, has a responsibility to facilitate this process by displaying sensitivity for environmental and social realities in the south. With regard to process standards (effluents, emissions) tolerances vary, given the initial pollution and emission baselines. This is as true intra-north, as across the north-south divide. In fact, the WTO Agreement on Technical Barriers to Trade (TBT) and the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS), to which Pakistan is signatory, offer concrete ways to bridge such differences. Both agreements are designed to minimize trade restrictive impacts and maximize environmental and social benefits associated with the imposition of international environmental and social standards—whether of a voluntary or legal nature. By the same token, the agreements are prone to developing a pro-north bias as the south is unable to respond to their technical and institutional imperatives. This needs to be rectified through technical assistance for capacity building for—among other things—improving access to information on standards, setting good national standards and regulations and ensuring compliance audits (conformity assessment).

Study objectives and methodology

This study attempts to quantify and assess the firm-level impacts of complying with international standards. Three outcomes are envisaged with regard to the economic and social costs and benefits:

- Win-win
- Net-win
- Net-loss

Win-wins refer to a situation where cost savings realized more than offset the costs of mitigation or compliance. This can occur through increased energy efficiency and recycling inputs and wastes. The second win refers to the environmental and social benefits accruing from reduced pollution and health risks. Net wins occur where the mitigation costs outweigh the savings in costs but, combined with the environmental and health benefits, there is still a net gain. In the case of net loss, the costs of mitigation outweigh economic, environmental and health benefits.

The three possible outcomes define a policy spectrum. The first outcome can be seen as a useful entry point for a national and/or international environmental agenda. The second outcome presents a social rationale for compliance. The third outcome justifies incentives/subsidies to industry. As in the TKN-1 study, health and environmental benefits are enumerated (environmental gains are quantified selectively), reflecting the methodological difficulties of quantification.

The assessment is based on a micro-level analysis. Textile firms and leather tanneries were selected purposively, as opposed to randomly, from larger clusters. Questionnaires were distributed and cost and environmental data was collected. The cost data covered the various clean production measures undertaken (machinery upgrades, recycling, waste recovery, other process changes, raw material substitution, end-of-pipe treatment and ancillary activities such as captive energy generation).

A pragmatic approach to standards

From the North's point of view, environmental standards are a necessary means to achieving environmental objectives. There is resistance to lowering these standards for economic gain. In particular, environmental groups in these countries oppose a "race to the bottom" on the grounds that present environmental standards are an outcome of a long and arduous struggle. Compliance, undoubtedly raises complex issues. Whereas product standards imposed by Northern governments cannot be termed protectionist, one cannot say this with any certainty for the standards based on processing and production methods (PPMs). However, as Khan (2002) notes,

> "Southern countries such as Pakistan must distinguish between restrictions imposed by Northern governments and those imposed by Northern businesses. If Northern governments impose import restrictions because Southern countries are not doing enough about child labour or cleaning up production technologies, this constitutes a non-tariff barrier. However, this is not the big danger that faces Southern exporters. Increasingly, businesses in the North are being required by their boards/shareholders to do businesses with firms that meet certain 'voluntary' environmental and quality standards….
> …This is a very important distinction. The only option Southern exporters have is to conform or lose markets."

Given their inevitability, product and process standards could be viewed more proactively as a driver for achieving efficiency gains (improved technology, energy efficiency, recycling inputs) and competitiveness in world markets. Ultimately, the South risks losing export markets if it does not comply. The RISNODEC (2000) regional study referred to such risks, especially with regard to South Asian exports of cotton, textiles, leather, fish and fruits and vegetables.

Success stories

On a positive note, standards offer opportunities for tapping into emerging market niches for "green" products. Also, environmental endorsements, like good quality, can ensure sustained market demand. As consumers and producers all over the world are becoming sensitized to environmental concerns, the global market for environmentally-friendly products is increasing at a rapid rate. There is growing potential for environmentally-friendly products to be rewarded through price premiums and increased market access. Several success stories can be cited where the south has benefited as a result of conforming to environmental standards.

- When Century Textiles of Bombay, the largest textile company in India, gained Öko-Tex certification for its products, it was able to raise prices by 8–10 per cent and increase market access by 10 per cent. (SIDA: 1998)
- A Hungarian Automobile Battery Manufacturer, Perion, which produces and exports chemical batteries to the EU reduced pollution loads by 50 per cent by introducing environmental management measures.
- Another success story is the Colombian Leather Tannery, Curtigran Ltd. Faced with increasing environmental legislation, decreasing productivity and product quality, the company saw eco-efficiency as a strategy which could ensure its survival. Working in co-operation with the local San Benito Leather Tanners' Association (ASOCUR), the company reduced its operating costs by 11 per cent, and pollution by 50 per cent.
- Another example is that of the agricultural residue-based pulp and paper mill, Raval Paper Mills, India. This company was one of the demonstration units, which participated in the UNIDO-sponsored cleaner production programme DESIRE (Demonstration in Small Industries for Reducing Emissions). Execution of the cleaner production techniques created numerous benefits for the firm. The investment of US$80,000 made in implementing the first 30 measures generated savings of US$88,000 per year.

Section B: Costs and benefits of compliance – the scope for win-wins

The leather sector

Economic costs and benefits

A survey of the tanneries in Kasur and Sialkot revealed that, though the techniques adopted for pollution mitigation in the two areas are different, yet substantial efficiency gains and social benefits have accrued in both places. The Sialkot project thrust is on in-plant modifications to minimize waste generation, and reduce the use of raw materials and energy. The Kasur project concentrates on combined end-of-pipe treatment, with some in-plant treatment at the firm level.

In-plant measures

The Cleaner Production Center (Sialkot) advised the firms to focus on those areas where pollution mitigation was critical and cost savings could be achieved concurrently. Even though financial and environmental outcomes have not been evaluated completely, initial results show that the 16 firms have collectively generated net savings amounting to almost Rs.9 million, about 7.5 per cent of their total capital cost. The programme has led to the identification of fourteen cleaner technology options through a detailed survey of leather tanneries.

Net savings refer to revenue minus the cost of equipment in the first year, whereas yearly savings are the projected savings for the years ahead. It is evident that the measures with a pay-back period of less than one year have high savings. Of the Rs. 17 million in yearly savings generated by all the projects in the sixteen tanneries, almost Rs. 16 million were due to the projects with a pay-back period of less than one year. Since the focus of the CP programme is on introducing housekeeping measures and better in-house treatments, a majority of the investments have a short pay-back period. Thus, by making these one-time investments, firms can potentially cut their costs substantially, without compromising product quality.

A point to note is that the tanners are using environmentally-friendly dyes which, in most cases are four to five times more expensive than the hazardous ones. However, this has not had a significant impact on profitability, as these additional costs are low as a proportion of total operating costs and can also be partly absorbed by price increases negotiated with the clients.

End-of-pipe treatment

Of the 700 tanneries in Pakistan, 237 are located in Kasur. The three tannery clusters discharge about 13,000 m^3 per day of heavily polluted tannery wastewater, which drains into the river Rohi Nullah. The estimated annual effluents consist of 4,000 tons of BOD_5, 11,000 tons of COD, 10,000 tons of suspended solids, 160 tons of chromium and 400 tons of sulphide. Needless to say, the environmental and health consequences were extremely serious until the project intervened. The Kasur Tanneries Pollution Control Project (KTCP) was launched in 1998. The project is a collaborative venture which includes the federal government, provincial departments, international donors and the tanneries. The project components include both in-plant and end-of-pipe measures.

According to a techno-economic study completed under the UNDP/UNIDO Preparatory Assistance Project, the estimates of the annual recurrent costs of the plant are as follows:

Operating and management costs:	Rs. 13.96 million
Depreciation:	Rs. 7.94 million
Total:	Rs. 21.90 million

The following benefits have been identified. While some of these are quantified, data on the others is still to be collected.

- Chrome recovery
- Reduced use of water (indirect benefits such as savings in electricity, dyes)
- Waste recycling for energy
- Land reclamation

The following table compiles the information on capital and recurring costs and benefits.

Consolidated costs and benefits

	Total Costs (million rupees)	Total Benefits (million rupees)
Capital		
Total Capital Costs (water treatment plant, chrome recovery plant, in-plant initiatives)	379.00	
Land Reclamation		462.00
Recurring (annual)		
Water treatment	21.90	
Plant operation	(13.96)	
Depreciation	(7.94)	
Chrome recovery (unit costs)		
Plant operation	1.87	2.53

Capital costs and the reclamation/appreciation of agricultural land have a one-off character. Only recurring costs are relevant from a project sustainability perspective. The transfer of the water treatment facility to tanneries is reviewed in more detail in Section 3, Institutional Analysis. Chrome recovery is clearly profitable and while a pilot project, shows potential for being replicated by the tanners themselves.

Environmental and health benefits

Quantifying environmental and health benefits entails using complicated methodologies, so we have limited ourselves to just enumerating such gains. The only exception is the land reclamation and appreciation which we have quantified in the preceding section.

The presumptive environmental benefits of the CP project (Sialkot)—measured in terms of pollution reduction per year)—are summarized below:

Environmental benefits of the CP Project

Substance	Chromium (kg)	Salt (kg)	Water use (m^3)	Effluent (m^3)	Solid waste (kg)	VOC (kg)	Chemicals[1] (kg)
Reduction/yr.	28,000	138,000	55,500	4,500	9,000	10,000	50,000

1 Chemicals include sulphates, fat liquors, dyes and other tannery substances.
Source: EPB (2001)

These figures illustrate the effectiveness of the CPC measures in reducing effluent and emission levels. The Export Promotion Bureau (2001) reported that the companies had achieved a 10–20 per cent reduction in water consumption, 50 per cent reduction in salt use and an average 25 per cent reduction in the use of chrome. The spray booths and roller coaters had achieved VOC reductions of, respectively 90 per cent and 25 per cent. In addition, the ambient environment within the tanneries had improved considerably as a result of the dust collectors installed to control toxic dust emissions during buffing operations. The key achievement of the project is in demonstrating that relatively simple housekeeping measures, which yield economic benefits, have the potential to reduce pollution by over 25 per cent.

More substantively, the water treatment plant (Kasur) has reduced pollutant loads considerably, as can be seen in the following table.

Pollution reduction

Pollutants	Reduction		
	%	tons/day	tons/annum
Suspended solids	99	40	14,000
COD	60	30	11,000
BOD	75	23	8,300
Cr	98	0.311	110
Sulphide	70	1	350

Source: Malik, S. (2002)

There is little doubt that environmental conditions in Kasur were detrimental to the health and well-being of the inhabitants, the tannery workers and the farmers. The treatment plant has proved to be a primary step in dealing with the problem and is a successful example that can be replicated for other tannery clusters in Pakistan.

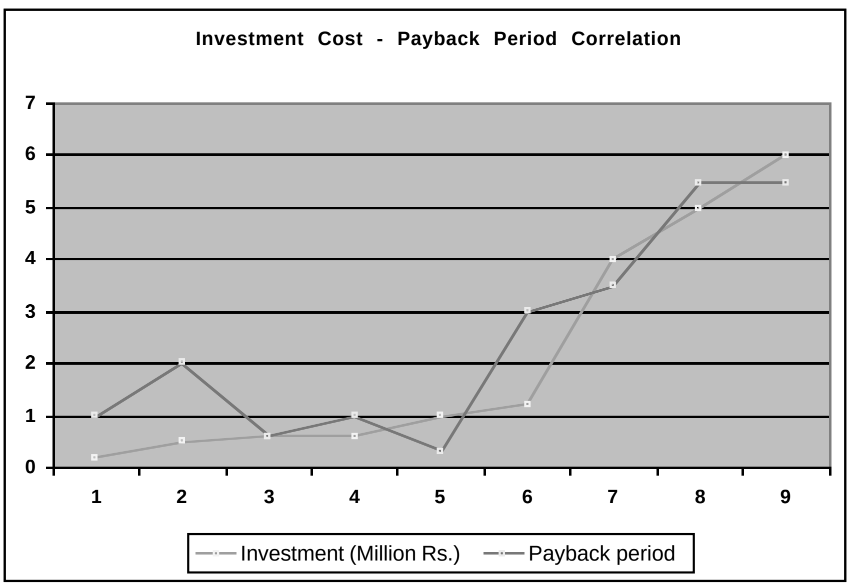
The textiles sector

Economic costs and benefits

Pakistan's textile industry is concentrated in the Faisalabad, Lahore, Gujranwala and Karachi regions. Textile processing utilizes a variety of chemicals, which include detergents, dyes, acids, sodas, salts and enzymes. Currently, the textile mills are discharging the wastewater into the municipal drains and rivers without any treatment, which has serious impacts on natural water bodies and land in the surrounding areas. Other environmental impacts, less hazardous in nature, are solid wastes, air emissions, noise pollution within the firms and health risks to workers from over exposure to chemicals.

In-plant treatment: Environment Technology Program for Industries

The Environment Technology Programme for Industries (ETPI) carried out a survey of textile firms, identified a number of CP and end-of-pipe treatment options and presented rough cost estimates and payback periods for them. The CP (in-plant) options have the potential to reduce effluent loads, which in turn reduce the end-of-pipe treatment costs.



There is a direct correlation between cost of investment and payback period, as can be seen in the above figure. However, firm financial constraints suggest the need for prioritizing mitigation investments. An obvious criterion for prioritizing such investments is their cost but an additional efficiency parameter can be imposed on this, namely, the payback period in relation to investment cost (preferred options are those where the payback period converges to, or is less than the investment cost).

End of pipe treatment: ETPI

The ETPI firm level survey identified the following end-of-pipe treatment options. Their potential for mitigation and relative capital and recurring costs are presented in the table below.

End-of-pipe treatment for textile wastewater

Recommended Measures	Environmental benefits	Capital cost estimates	Recurring cost estimates (annual)	Remarks
Integrated Macrosorb treatment	Removal of some 60% of COD and some 95% of overall dyestuff effluents	Rs. 11,000–Rs.14,000/m^3	Rs. 11,000–Rs.14,000/m^3	A large volume of effluent can be treated through this method, although it is relatively more expensive than the others.
Macrosorb treatment of concentrated dye bath/ wash water	Removal of some 6% of COD, 10% of Nkj and 80% of dyestuffs	Rs. 4,000/m^3	Rs. 5,600/m^3	This method is economical as only a small stream, highly polluted with dyes, can be treated.
Separate removal of size from desizing wastewater and COD from scouring wastewater by ultra filtration	Removal of 50% COD and 5% BOD	Rs. 8,000/m^3	Rs. 4,800/m^3	Effluent may require further biological treatment to reduce BOD level.
Combined removal of size from desizing and scouring wastewater by ultra filtration	Removal of 65% COD and 20% BOD	Rs. 7,000/m^3	Rs. 4,900/m^3	Effluent may require further biological treatment to reduce BOD level.
On-site color removal of heavily colored effluents with the help of ozone	Removal of some 7% of COD, 5% of BOD and 80% of dyestuffs	Rs. 16,000/m^3	Rs. 4,800/m^3	

End-of-pipe initiatives are the most effective because of the large volume of water treated and important from the viewpoint of the national environmental quality standards (NEQS). However, high costs preclude firm-level investments. Their intentions are limited to planning designs and stated intentions to construct water treatment plants. Also, textile plants are dispersed, unlike the tannery clusters which attract project funding for remediation.

Environmental and health benefits

Environment Technology Programme for Industries (ETPI)

The presumptive environmental benefits enumerated under the ETPI project are presented in the table below:

Adoption of cleaner production options in textile mills

Recommended measures	Environmental benefits
Caustic recovery from mercerising	50% savings in caustic consumption
Direct reuse of waste caustic from mercerising in scouring	Savings in caustic consumption
Counter current washing and replacement of nozzles at printer table blankets	50–70% reduction in water use in washing
Pigging of dye paste from printing equipment (lance, tubes)	Reduction of dye paste emissions to water
Installation of a tray at the printers to avoid spilling	Reduction of dye paste emissions to water
Installation of Shorter tubes between paste drums and printer	Reduction of dye paste emissions to water
Addition of displacement bio-dies in dye/finish equipment	Reduction of water and chemicals consumption
Introduction of pad batch dyeing system	Saving of chemicals and water Prevention of chemicals emission
Application of reactive dyes with higher fixation degrees	Prevention of dyestuff emission
Reduction of dye paste losses by in-line dye paste dosing	Reduction of dye paste losses and emissions to water
On-line conductivity measurement in washing process	Reduction of wash water Better utilization of equipment
Installation of automatic water shut down valves	5–10% savings in water consumption and discharge
Reuse of Boiler off-gas	Savings in energy consumption
Reuse of off-gas in the drying sections of the rotary printers	Savings in energy consumption
Reuse of energy from blow down with flash tanks	Energy conservation
Countercurrent regeneration of ion exchangers	Energy conservation Reduction in the use of regeneration salt
Treatment of boiler feed water by R O	Energy conservation Reduction in blowdown
Heat recovery from wastewater by heat exchange	Savings in energy
Excess water removal after washing with the help of vacuum suction boxes	Reduction of water and chemical use and chemicals discharge water, chemicals
Anti-corrosion measures	Reduction of water and chemical consumption Prevention of related safety problems

Note: 1. In all cases, energy conservation will reduce CO_2-emissions as well.

Section C: Institutional analysis

Pressure for mitigation, status and problems in compliance

Tanneries and textile mills face various kinds of pressure to adopt environmental mitigation strategies. Importer specifications constitute pressure from outside the country, which is directed at exporting industries. National laws and regulations embrace production for domestic as well as international markets. While their focus is not on the export sector *per se*, synergies in the form of concessions, technical assistance and institutional capacity building can be achieved by interfacing national laws and regulations with international requirements. Community pressure tends to be exerted when environmental degradation and pollution and the health problems they pose become intolerable.

Importer specifications

Pakistan's major trading partners, the U.S., EU and Japan, have stringent environmental regulations which Pakistani exporters were generally unfamiliar with in the past. In recent years, these are being overtaken by voluntary standards, reflecting consumer purchasing preferences. Exporting firms are becoming aware of importer specified "codes of conduct" pertaining to environmental and social-standards. Our interactions with large textile and leather exporters pointed to responses in the shape of relatively low-cost, in-plant mitigation measures, particularly those which reduce production costs as well. There was much less evidence of more expensive end-of-pipe treatment. Often compliance is facilitated by donor interventions. In the case of the Sialkot tanneries, the donor initiative was pitched as much at cleaning the export sector, as it was with promoting the national environmental agenda.

Many grey areas exist that need policy attention. While the ISO 14000 certification requires documented proof of compliance with national environmental quality standards (NEQS), some firms have secured such certification even though they do not appear to be in full compliance. Also, a number of firms are being granted ISO 14000 and/or bilateral certification ahead of full compliance, by demonstrating partial compliance or intent to comply. This provides an opportunity for dilatory tactics at best and spurious compliance at worst. There is, however, strict compliance with product standards banning the use of carcinogenic dyes and other substances harmful to human health.

National laws, regulations and their implementation

The first draft of the Pakistan Environmental Protection Ordinance (PEPO, 1983) was prepared in 1976 and promulgated in 1983. This created a legal basis for environmental policies, national standards and environmental impact assessments. A concerted effort to implement the NEQS for industrial effluents and emissions was made at the first meeting of the Pakistan Environmental Protection Council (PEPC) in 1993. The NEQS set limits to air emissions, effluents and noise pollution.

An innovative response to the weak enforcement capabilities of the EPAs was the move to rationalize existing environmental standards (which were too stringent) and implement them through a self-monitoring and compliance program, which includes a combination of self-assessed pollution charges and random external audits.

The EPAs have called in large producers, indicated they are in violation and threatened them with closure. By and large, exporters obtain stay orders or ignore such warnings. Compounding this problem is the fact that the warnings are frequently issued without on-site checks. While voluntary compliance is seen as a way of addressing the weak technical and enforcement capabilities of the EPAs, the process has not reached operational maturity. There still appears to be a clear lack of understanding of the NEQS process among exporting firms. Conversely, the EPAs seem unaware of international environmental standards. Neither entity seems aware of the potential interface between the two. In principle, international standards can inform and refine the NEQS process, while the NEQS standards can be viewed as a useful benchmark for phasing in international standards.

Community pressure

Another source of pressure for environmental action is civil society groups, which exert pressure on the government to impose standards to protect the environment and public health from dirty processes. The Kasur tanneries are an important example where communities residing adjacent to the tanneries and various public welfare organizations lobbied successfully to get the KTCP initiative launched.

However, concern exists regarding the collective effort required to operate the combined water treatment plant once the donors phase out. Despite the obvious cost advantages associated with collective action (economies of scale) it may not actually be observed. For instance, Olsen (1971) was sceptical of collective action because of the free-rider problem. This is very much in evidence in the case of the Kasur tanneries with widespread delinquency in mandatory contributions by the tanneries.

The way ahead: tapping into the WTO

As tariff restrictions are being phased out under various trade accords, non-tariff barriers to trade represented by quality, environmental and social standards are phasing in. Further, legally-binding technical regulations are being overtaken by a bewildering array of voluntary standards. As these fall outside the government remit—not being governed by international trade rules—they have the potential to become instruments of protection. By the same token, because they reflect a combination of consumer sovereignty and social pressure, exporting countries like Pakistan can ill-afford to ignore them. We have attempted to show that in the best case scenario, exporting firms can comply with such standards and reap economic benefits from doing so. However, this is premised upon a support infrastructure that, presently, does not exist. Specifically, Pakistan does not have the institutional and technical capacity to help its industries respond to the plethora of voluntary standard requirements, or tap into the export prospects that they offer.

In this context, the WTO Agreements on Technical Barriers to Trade (TBT) and on the Application of Sanitary and Phytosanitary Measures (SPS) agreements—to which Pakistan is signatory—present both an opportunity and a constraint. The two agreements seek to increase market access for the exports of its member countries. As constituted, the agreements require that those *importing* governments that formulate standards do so according to rules related to transparency, fairness and sound science. However, developing countries like Pakistan come up short in two respects: first, they generally lack the technical and institutional capacity to test for and certify compliance with such standards and have to rely on costly foreign testing bodies. Second, they lack the resources to participate meaningfully in the development of standards, whether in the context of developing standards in international standards-setting bodies, or in responding to proposed national-level standards in the countries to which they export.

The WTO offers technical assistance to developing countries to develop these capabilities. Such assistance should be preceded by a capacity and needs assessment under the following broad categories:

- Risk assessment and sound science, namely, how technically empowered is the country in question to justify its environmental standards and technical regulations.
- Access to information. Is there an effective domestic network in place which ensures that relevant national government agencies, industry groups are aware of impending standards and have the opportunity to comment on them?

- Does the country have a competent standards body that has relevant legal and economic expertise, that complies with the standards code and that can enter into agreements with competent authorities on technical equivalence issues?
- Does the country have a robust conformity mechanism in place, which includes testing and metrology equipment, experimental techniques and procedural rigour?

Section A – Overview

1. Introduction

The trade-environment nexus continues to generate heated debate. From the benign setting of Rio to open confrontation at Seattle and to the "behind closed doors" diplomacy at Doha, at times it appears impossible that the various stakeholders will trade in their differences for consensus. The proponents of open trade argue that trade and environmental objectives are compatible: that the most pressing environmental problems will be addressed only when economies are developed sufficiently—trade being one among the many instruments for such development (for instance, through clean technology transfers).[1] The opposing view is that trade liberalization will degrade the environment and rules out the possibility of harmony between trade and environment objectives. This debate also coincides with a north-south split, one complicated further by the endorsement of southern concerns by progressive northern NGOs. Perhaps environmental regulations define this split best. Its advocates in the north feel that such regulations will promote sustainable development and growth eventually. Inverting this argument, southern countries claim environmental regulations are trade-restricting devices, engineered by coalitions to protect domestic industries and block exports from the south.

Following upon the premise of the Pakistan TKN-1 study (Khan *et al*., 1999), this paper too avoids the histrionics such debates can give rise to and focuses on the practical implications. It begins with the stance that the reality is somewhere in between, that open trade can have both environmentally harmful and beneficial impacts. By the same token, environmental regulations can cut both ways: they can be trade restricting but they also offer new market niches and can lead to cleaner production practices in the exporting countries. The institutional challenge is to address the concerns and maximize the benefits. Also, in the final analysis, developing countries are left with little choice other than to comply with the increasingly stringent environmental regulations in order to maintain their export shares. The Pakistan TKN-1 study is succinct on this:

> In fact, the reality is that the various product-related environment standards should be seen as a consumer protection movement in the West. If LDCs confront process-related standards, they can complain legitimately about an infringement on their sovereignty as long as governments impose these. However, they can't argue about consumer sovereignty in the West. Further, our view is that cleaning up production processes generates far more social benefits than costs in producer countries and wins markets as well.

The north, too, has a responsibility to facilitate this process by displaying sensitivity for environmental and social realities in the south. With regard to process standards (effluents, emissions) tolerances vary, given the initial pollution and emission baselines. This is as true intra-north, as across the north-south divide. In fact, the WTO Agreements on Technical Barriers to Trade (TBT) and on the Application of Sanitary and Phytosanitary Measures (SPS), to which Pakistan is signatory, offer concrete ways to bridge such differences. Both agreements are designed to minimize trade restrictive impacts and maximize environmental and social benefits associated with the imposition of international environmental and social standards—whether of a voluntary or legal nature. By the same token, the agreements are prone to developing a pro-north bias as the south is unable to respond to their technical and institutional imperatives. This needs to to be rectified through technical assistance for capacity building for—among other

[1] For a good treatment of the various effects, see Munasinghe (Munasinghe: 1996).

things—improving access to information on standards, setting good national standards and regulations and ensuring compliance audits (conformity assessment).

2. Study objectives and methodology

This study attempts to quantify and assess the firm-level impacts of complying with international standards. Three outcomes are envisaged with regard to the economic and social costs and benefits:

- Win-win
- Net-win
- Net-loss

Win-wins refer to a situation where cost savings realized more than offset the costs of mitigation or compliance. This can occur through increased energy efficiency and recycling inputs and wastes. The second win refers to the environmental and social benefits accruing from reduced pollution and health risks. Net wins occur where the mitigation costs outweigh the savings in costs but, combined with the environmental and health benefits, there is still a net gain. In the case of net loss, the costs of mitigation outweigh economic, environmental and health benefits.

The three possible outcomes define a policy spectrum. The first outcome can be seen as a useful entry point for a national and/or international environmental agenda. The second outcome presents a social rationale for compliance. The third outcome justifies incentives/subsidies to industry. As in the TKN-1 study, health and environmental benefits are enumerated (environmental gains are quantified selectively), reflecting the methodological difficulties of quantification.

The assessment is based on a micro-level analysis. Textile firms and tanneries were selected purposively, as opposed to randomly, from larger clusters. Questionnaires were distributed and cost and environmental data was collected. The cost data covered the various clean production measures undertaken (machinery upgrades, recycling, waste recovery, other process changes, raw material substitution, end-of-pipe treatment and ancillary activities such as captive energy generation).

At this stage, it becomes necessary to explain how this study differs from its predecessor. Briefly, the aim is to carry the analysis forward by adding value to it in the following ways:

TKN-1	TKN-2
The TKN-1 study was done at the macro-level. It estimated baseline pollution levels for the leather and textile export industries sectors by projecting exports and multiplying them with a pollution factor (effluents per million square meter fabric, leather). It then estimated the costs of mitigation based on presumptive pollution reduction treatments (activated sludge technology for textiles and primary treatment and chrome recovery for leather).	The TKN-2 study carries out a micro-level analysis of individual firms in the textile and leather sectors. The costs reflect the actual in-plant and end-of-pipe treatment. In addition, it also measures efficiency gains and quantifies environmental benefits selectively.
In terms of the institutional analysis, the TKN-1 study is prescriptive. It recommends that firms undertake mitigation based on the low assessed costs, for the state to provide information to industry on standards and for an industry-state interface in the implementation of the reconstituted national environmental quality standards (NEQS).	TKN-2 follows up by assessing the status of compliance. What drives such compliance: NEQS, trade-related standards or social pressures; a combination of these? Have any synergies emerged between them? Is there any evidence of spurious compliance (e.g., under ISO 14000)? What causes it? Based on this assessment, some institutional recommendations are offered.

The study is structured as follows. Section 1 presents the north-south perspectives on environmental standards in the context of more open trade. It provides the rationale for industry selection and details of the relevant standards. Section 2 presents the results of the social cost-benefit analysis. Section 3 focuses on institutional issues. It links the key findings of the social cost-benefit analysis with policy and institutional recommendations.

3. The North-South debate

3.1 Northern initiatives

International environmental standards instituted by the north have two sources. Some of these standards reflect public interests, as manifested in specific national environmental laws and they draw their strength from legal status. Other standards are voluntary in nature, such as eco-labelling schemes and environmental management systems, and have come into force as a result of either consumer choice expressed through buying patterns or socio-cultural pressure, expressed through media campaigns, protests and boycotts. For instance, in Sweden, consumer choice has removed nearly all non-eco-labelled detergents and washing powders from the local markets. With over 200,000 members, the Swedish Society for Nature Conservation, the largest environmental organization in Sweden, operates Society's "Shop-and-Act-Green" project, to promote awareness of what "normal citizens" can do for the environment on a day-to-day basis.

3.2 Southern reactions

Developing countries view the environmental standards imposed upon their exports as trading obstacles—variants of trade policy measures, such as tariffs, quotas, farming subsidies, etc., which protect domestic industries and restrict market access for southern products. The south, lacking the technical and financial capacity, finds compliance with northern environmental standards an expensive proposition. The perception is, once compliance costs are factored in, southern exports will become less competitive, leading to a loss of markets. In general, developing countries fear that the imposition of northern environmental concerns on the international trade agenda will open floodgates for the so-called "green protectionism," which will be particularly detrimental to developing country products and services (Najam, 2002).

The south also fears "industrial migration" from the north, induced by its lax environmental regulations and practices. That, under the guise of trade liberalization, the north will dump its dirty technology and other domestically-prohibited goods (DPGs) on their soil. A number of studies assessing the impact of environmental regulations on industrial relocation have led to different conclusions. Leonard (1988), Dean (1991), Tobey (1990) and Repetto (1993) contend that savings from the absence of pollution controls are not substantial enough to alter the locational preferences of multinational firms. Other factors such as the level of training of labour, infrastructure and stability play a significant role in relocation of a firm.

However, Bharucha (1994) argues that many dirty industries have already migrated, especially to South Asia. These industries cause long-term environmental damage in the region by polluting soil, water and other natural resources. Mollerus (1994) examined this issue with reference to the SAARC countries. His findings show that products from dirty industries in the region are gaining market share, whereas world trade in such products is declining.

There may be merit in southern apprehensions. Najam (2002) points out that developed countries exhibited a tendency in the past to co-opt environmental concerns for what seemed like protectionist purposes. Prominent is the "tuna dolphin" case and the use of clean air standards to the disadvantage of Brazilian and Venezuelan refineries. Apart from environmental measures, the frequent use of anti-dumping laws and other trade distorting measures, such as subsidies, constitute reasonable grounds for such apprehensions. Between 1992 and 1996, the EU launched more anti-dumping investigation in the "textile and allied" sector than any other country (32 out of 151 cases). At the end of 1996, the EU had 143 anti-dumping measures in place, the U.S. 198, Canada 93 and Australia 47. Recourse to anti-dumping will continue to be a problem, even though Uruguay Round changes have moderated this practice. Subsidies, an alternative form of protection, also present major obstacles to exports from developing countries. Although the Uruguay Round set limits to agriculture subsidies, total annual support for agriculture in OECD countries averaged $350 billion in 1996-98. This was more than twice the total agriculture exports from developing countries ($170 billion) during that period. Direct export subsidies account for around one sixth of the total EU agricultural subsidies. (UNCTAD: 1999)

Lumping environment-related trade regulations with direct and indirect export restrictions may or may not have merit. However, the south's sensitivity could also have a more intrinsic rationale. The differences in pollution and emission baselines clearly suggest that environmental standards should accommodate such differences in assimilative capacity of the physical environment to sustain industrial activities.[2] Also, the south is limited in its ability to comply with/enforce environmental regulations. Thus, rather than type-casting the south as an irresponsible bad guy, a more constructive approach would be to work towards improving its institutional and scientific capabilities. There is considerable scope for doing this under the WTO, TBT and SPS agreements.

3.3 A regional perspective

The Research and Information System for the Non-Aligned and other Developing Countries (RISNODEC), India, have concluded a regional study, titled, "Impact of Enhancing Environmental Standards on the International Trade of South Asian Countries." The countries included in the study were Bangladesh, India, Pakistan, Sri Lanka and Nepal. The purpose of the study was to examine the effects of environmental standards on the trade of these countries. Each country identified the domestic measures and institutional arrangements already in place and those required to reduce the hazards associated with individual products and processes.

However, the findings with regard to impacts were inconclusive for the chosen industry sectors. Bangladesh did not really address the impacts of international environmental standards upon their exports. The Sri Lankan study assessed compliance costs as being low but this was largely due to the fact that compliance was desultory. It went on to state that environmentally sensitive (ES) products had not experienced any loss of international competitiveness. It advocated that early adjustment would give a "first mover" advantage to Sri Lanka. The Pakistan study again did not evaluate impacts in any great depth, focussing primarily on institutional issues. However, an earlier study (Khan *et al.*, 2000) determined compliance (in-plant and end-of-pipe treatment) costs as being low. The export forecasts (for cotton and leather) suggested that factors such as the MFA, raw materials availability, production capacity quality and exchange rates were likely to be the significant export determinants rather than conformance with

[2] Invoking the adage that, "what is sauce for the goose should be sauce for the gander," the south alludes to unsuccessful attempts at harmonizing standards, intra-north, for instance, among the EU countries.

environmental or social standards. The study for India assessed costs of compliance in both SMEs (leather) and large manufacturing industries as being high and a bar to implementing such measures. In the SME-dominated leather sector, in particular, the costs of compliance were estimated to increase three-fold.

Recapping, the compliance costs seem to be indeterminate across South Asia. However, exports do not appear to be affected by the imposition of standards. In fact, a separate study on South Asian countries (Chaturvedi *et al*., 2001) indicated that proliferating environmental standards notwithstanding, exports from South Asia rose significantly. This suggests that export industries have little incentive to comply at present, on both cost and market criteria. However, it may just be a matter of time before exports begin to be affected as the RISNODEC study has pointed out. It will pay to be ready for this eventuality rather than playing catch-up later.

4. A pragmatic approach to standards

From the North's point of view, environmental standards are a necessary means to achieving environmental objectives. There is resistance to lowering these standards for economic gain. In particular, environmental groups in these countries oppose a "race to the bottom" on the grounds that present environmental standards are an outcome of a long and arduous struggle. Compliance undoubtedly raises complex issues. Whereas, product standards imposed by Northern governments cannot be termed protectionist, one cannot say this with any certainty for the standards based on processing and production methods. However, as Khan (2002) notes,

> "Southern countries such as Pakistan must distinguish between restrictions imposed by Northern governments and those imposed by Northern businesses. If Northern governments impose import restrictions because Southern countries are not doing enough about child labour or cleaning up production technologies, this constitutes a non-tariff barrier. However, this is not the big danger that faces Southern exporters. Increasingly, businesses in the North are being required by their boards/shareholders to do businesses with firms that meet certain 'voluntary' environmental and quality standards….
> …This is a very important distinction. The only option Southern exporters have is to conform or lose markets."

Given their inevitability, product and process standards could be viewed more proactively as a driver for achieving efficiency gains (improved technology, energy efficiency, recycling inputs) and competitiveness in world markets. Ultimately, the South risks losing export markets if it does not comply. The RISNODEC (2000) regional study referred to such risks, especially with regard to South Asian exports of cotton, textiles, leather, fish and fruits and vegetables.

The case for adopting a proactive stand on environmental compliance is effectively summarized by Najam (2002) as follows:

Why the South should worry about trade and environment	**What is best for the South**
Environment might be used to "trump" WTO rules. Environment standards can be used as trade barriers and as a guise for protectionist policies. Environmental concerns can distract from the South's more pressing and legitimate development priorities.	LDCs should remain vigilant about their concerns. This does not mean shunning the trade and environment agenda, which can only be shaped to their own interests if they are proactive. Irrespective of WTO rules, Southern export producers will have to respond to environmental concerns because of consumer demands. What is good for the South's environment has to be good for the South.

4.1 Success stories

On a positive note, standards offer opportunities for tapping into emerging market niches for "green" products. Also, environmental endorsements, like good quality, can ensure sustained market demand. As consumers and producers all over the world are becoming sensitized to environmental concerns, the global market for environmentally-friendly products is increasing at a rapid rate. There is growing potential for such products to be rewarded through price premiums and increased market access. Several success stories can be cited where the south has benefited as a result of conforming to environmental standards.

When Century Textiles of Bombay, the largest textile company in India, gained Öko-Tex certification for its products, it was able to raise prices by 8–10 per cent and increase market access by 10 per cent. (SIDA: 1998)

A Hungarian Automobile Battery Manufacturer, Perion, which produces and exports chemical batteries to the EU reduced pollution loads by 50 per cent by introducing environmental management measures.[3] The most important financial result for Perion is reduced environmental fines by 98 per cent. The wastewater pollution penalty dropped from US$70,000 to US$1,380. Fresh water consumption was reduced. Fees for use of the public sewage system decreased. Recycling of lead-containing car batteries also brought Perion an additional income of HUF 30 million per annum.

Another success story is the Colombian Leather Tannery, Curtigran Ltd.[4] Faced with increasing environmental legislation, decreasing productivity and product quality, the company saw eco-efficiency as a strategy which could ensure its survival. Working in co-operation with the local San Benito Leather Tanners' Association (ASOCUR), the company reduced its operating costs by 11 per cent, and pollution by 50 per cent. kClean and efficient technologies were developed in-house with the help of external consultants and tannery experts. The company has both reduced harmful environmental impacts and improved its efficiency, productivity and product quality.

Another example is that of the agricultural residue-based pulp and paper mill, Raval Paper Mills, India.[5] This company was one of the demonstration units, which participated in the UNIDO-sponsored cleaner production programme DESIRE (Demonstration in Small Industries for Reducing Emissions). Execution of the cleaner production techniques created numerous benefits for the firm. The investment of US$80,000 made in implementing the first 30 measures generated savings of US$88,000 per year. Water consumption decreased by 28 per cent, thus enabling the unit to operate at full capacity even during the water-scarce summer period. Solid waste generation reduced by 18 per cent, water pollution load by 46 per cent and air pollution load by 8.5 per cent. Effluent treatment costs were also reduced substantially.[6]

5 The environmental rationale and taxonomy of international standards

The two categories of international standards—product and process standards—are characterized by a diversity of approaches to remediation, the mandates which govern them and the stakeholders involved.

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[3] Source: http://www.inem.org/htdocs/case_studies/perion.html
[4] Source: http://www.inem.org/htdocs/case_studies/curtigran.html
[5] Source:http://www.inem.orh/htdocs/case_studies/raval.html
[6] For every firm that assumes environmental objectives there are thousands that do not at this time. However, these examples demonstrate the win-win potential.

5.1 Product and process effects

Various health and environmental hazards are associated with product use and its disposal, sometimes termed as "product ecology." Generally, product standards relate to the characteristics of the product itself, rather than to how it is made. Scientific research has revealed the presence of chemical substances in various products that are injurious to human health. In environmentally-sensitized countries like Sweden, Denmark and Holland, concern is growing about the harmful effects of textile fabrics. It has evoked reactions on the use of azo dyes and formaldehydes. In Sweden, the campaign for clean cloth is aimed at educating buyers and consumers about the harmful effects embodied in the fabric used. The Danish EPA has published lists of colorants (dyestuffs), which are frequent skin sensitizers and should be regarded as carcinogens. Germany and other western countries including the U.S. have banned the use of azo dyes altogether and prohibits any product containing azo dye from entering the market.[7]

Process effects refer to the negative effects of production and processing methods on the local environment and on the health of factory workers and surrounding communities. Process effects can also have a global dimension, as when production causes emissions of ozone-depleting compounds. Process effects are identified in the two sectors selected for the Pakistan study.

Table 1: Environmental hazards associated with the textile sector

Process	Source	Major Impacts
Fiber cultivation	Pesticides use	Occupational health problems, reduction in natural fertility for the soil, harm to soil structure, soil aeration and soil erosion, reduced genetic biodiversity
Spinning	Spinning operation	Fibres cause respiratory disease
Washing	Detergents, soaps, alkalis, wetting agents, foamers, defoamers and lubricants with high BOD, COD, TDS	Carcinogenic, depletion of ozone layer, potentially bioaccumulative, obnoxious odor, water turbidity, reduce light penetration, threaten aquatic life, low biodegradability
Sizing/desizing	Sizing material	Low biodegradability,
Bleaching	Bleaching material	Low biodegradability, emission of air pollutants such as formaldehydes etc
Mercerizing		High pH value
Dyeing	Dyestuff and chemicals	Carcinogenic, high allergy risk, high BOD and COD, obnoxious odor, threatens fish spawning grounds, water system corrosion
Finishing	Finishing materials	Extremely persistent effluent pollutants, very low biodegradability, high toxicity, occupational health hazards

Source: Khan et al. (2001)

[7] Any product with azo dyes that may split off into any one of the 20 carcinogenic amines is prohibited in these countries. The splitting of azo dye can occur on the skin, in the intestine and in the body. On the skin and in the intestine, this is brought about by bacteria. In the body, for instance in the liver, azo compounds can be broken down by certain enzyme systems. Non-fixed, water soluble azo dyes can also come in contact with skin via perspiration fluid. Some of these azo dyes form amines, which are carcinogenic. Benzidine in particular, is an identified carcinogen.

Table 2: Environmental hazards associated with the leather sector

Waste	Source	Major Impacts
Liquid	Organic and inorganic solid, hydrogensulphide, ammonia, volatile organic compound, electrolytes	Occupational health problems, corrosion of the water-carrying system, contamination of coastal area, reduction in natural fertility for the soil, harm to soil structure, threat to aquatic life, low crop yield, contamination of food, reduce genetic biodiversity
Solid waste	Organic material, meat remains, the tanned skin remains, chromium remains during trimming	Contamination of soil and underground water, contamination of food, occupational health hazard such as perforation and bronchiogenic carcinoma, contamination of poultry feed, reduce genetic biodiversity
Air emissions	Hydrogen sulphide and sulphur-containing compound, ammonia and nitrogen containing compounds, organic solvents	Lower than NEQS

Source: Khan et al. (2001)

Tanneries are the most striking case of industrial pollution in Pakistan. Surveys revealed that tannery wastes have severely polluted the areas of Korangi, Charsadda, Sialkot and Kasur and the improper use and handling of chemicals has subjected workers and residents to hazardous exposure, leading to respiratory disorders, dermatological diseases and serious stomach infections. The contribution of tanneries to the contamination of Karachi coastal waters is about 10–15 per cent of the total. Hydrogen sulphide formed due to the presence of sulphide and chromium in the effluent proved so toxic that workers in Karachi died while clearing monsoon ditches filled with tannery sludge (Khan *et al.*, 2001).

5.2 International standards applicable to Pakistan

Product hazards have led to the promulgation of environmental laws and regulations. These laws regulate not only the composition and characteristics of products but also mandate safe disposal after use. Standards based on processing and production methods, or PPMs, aim to make production processes more environmentally-friendly and reduce health risks. As mentioned earlier, the south sees PPM-based standards as protectionist measures. Both product and process standards can have legal fiat or be voluntary in nature. A taxonomy of such standards is presented below:

Table 3: Anatomy of international standards

Demander of measure	Scope of measure	
	Product-based	PPM-based
Northern governments	Technical regulation	Technical regulation (controversial)
Commercial buyer	Product standard	Process standard (e.g., ISO 14001)
Importing firm	Sector voluntary code of conduct, eco-label, etc.	Sector voluntary code of conduct, eco-label, etc.

Source: IISD communication

5.2.1 Environmental laws

Various environmental laws are in force in western countries, regulating the nature and composition of products. They deal usually with the physical and chemical characteristics of the product. The product is, directly or indirectly, considered responsible for any adverse environmental or health effects. In addition to legislation on specific substances, several European countries including Germany and the Netherlands have general laws on products hazardous to health and to the environment. By means of this type of legislation, entry into the market of products that have been treated with dangerous substances, is prohibited. In the Netherlands, this is regulated under the Goods Act, Article 18c. In Germany, similar legislation exists under the Chemical Act, Article 17 (CREM, 1996).

5.2.2 Environmental management systems

International buyers often demand the institution of such systems, where client companies are required to be certified by internationally-accredited certifying organizations. Such systems embrace the entire production process and entail a commitment to comply with national environmental laws and regulations, commitments to monitoring and ongoing information management, and commitments to continual improvement. International buyers consider certification by internationally-accredited certifying agencies as a guarantee that the suppliers have met their environmental obligations and have documentation to that effect.

The ISO 14001 standard, the most widely applied in Pakistan, is a generic management system.[8] Generic means that the same standards can be applied to any organization regardless of its size and function. ISO 14001 is referred to as a system because it is concerned with "environmental management" aimed at ensuring that the organization has taken steps to minimize the harmful effects of its activities on the environment and has carefully documented these steps.

ISO 14001 takes a broad-spectrum approach to environmental management. Directly, it mandates pollution prevention measures to address the intermediate and long-run impacts of its products and services on the environment. It also focuses on improved management methods, reliability in risk and emergency situations, cost efficiency by adopting cost-minimization techniques, resources and energy conservation, and environmental awareness among employees and the community.

5.2.3 Eco-labelling

Eco-labelling has become an increasingly important tool for discerning consumers in industrial countries to influence production processes. The transmission works both ways: eco-labelling schemes provide information to consumers and encourage producers to shift to more environment-friendly production processes. Environmental labels contain information about the environmental impacts and qualities of the products, enabling organizations and individuals to make informed choices. Eco-labelling also constitutes a market-based incentive, both in terms of the choices it provides to consumers and the niche opportunities it offers to producers.

In addition, the potential for "new" markets is also being established. Synthetic materials can be replaced by natural ones, for instance, jute and *sisal* are offered as substitutes for artificial fibers,

[8] For the various published standards in the ISO 14000 series, see Annex II-A

and color grown cotton can replace chemical intensive artificially dyed cotton. Prominent eco-labels include FSC (Forest Stewardship Council) for forest products, Rugmark for carpets and Öko-Tex for dyes.

5.2.4 Codes of conduct

Codes of conduct represent another effort by companies to develop environmentally-friendly profiles and are being applied increasingly to exporting firms in developing countries. These demands are not as rigorous as for eco-labelling as they do not explicitly state the environmental initiatives that need to be taken, but they are mandatory in nature and monitored closely by the buyers that are often lead firms in a global value or commodity chain.[9] Some company codes of conduct are tabulated illustratively.

Table 4: Environmental codes of conduct

Company	Standards for Suppliers
Wal-Mart	Environment: In accordance with the principle of the three "Rs"—reduce, reuse and recycle
Sears and Roebuck	Strict adherence to local laws governing working conditions and production methods
Levi Strauss	Sharing commitment to the environment and conducting business in a way that is consistent with Levi Strauss & Co.'s Environmental Philosophy and Guiding Principles
IKEA	Due compliance to environmental conditions such as eliminating the use of azo dyes, formaldehyde, and PCP (pentachloropehenol)
C & A	C & A will assist its suppliers in their efforts to meet their obligation to preserve the environment
Hennes & Mauritz	Suppliers must comply with all environmental laws and regulations in the country of operation

Large firms, conscious of their image, often set up their own codes of conduct for the exporters and manufacturers in the developing countries to ensure that environmental and quality standards are being complied with. These firms do not rely on ISO certifications and send their own auditors to evaluate a company's performance. An example in this regard is IKEA, which is currently buying textile products from a number of textile companies in Pakistan. It does not permit the use of chemicals such as azo dyes or cadmium in textile products. IKEA also applies the strictest possible (German) regulations on pentachlorophenol, used as a mould agent (Khan *et al*., 2001). IKEA also provides a niche for "organically grown" cotton, meaning that no artificial fertilizers or chemical biocides have been used in its cultivation. Another example is of Walt Disney Ltd., U.S., which is also a major buyer of Pakistan's textile products. Their codes of conduct include a complete list of regulations for labour and environmental protection.

6. Pakistan's export profile and opportunities

Textiles and leather are the mainstay of Pakistan's exports and, according to studies, the most polluting industries (Khan *et al*., 1999). The production and export profile of these sectors is presented below:

[9] Refer to Gerrefi (1994) for pioneering work and Kaplinski and Morris (2002) for a more recent exhaustive handbook for value chain research.

6.1 Textiles

The textile industry is the single most important manufacturing sector, accounting for 40 per cent of manufacturing employment, 62 per cent of manufacturing exports, and 30 per cent of manufacturing value added. Pakistan's textile industry produces cotton yarn, cotton cloth, made-up textiles and apparel. In order to reduce pressure on the demand for raw cotton, the polyester fibre and yarn industries have also grown significantly in recent years.

In general, large firms concentrate on spinning and weaving, leaving garment-making to highly-fragmented small to medium-scale producers. The number of textile units totalled about 503 in 1997–98. Knitwear has been Pakistan's largest single segment of garment exports, but finished goods have generally lagged behind yarn and cloth production. The GOP has proposed a series of measures to upgrade the garment sector, including modernization of facilities, market research and sales promotion.

The total exports of textile manufactures (excluding synthetic textiles) amounted to US$4.23 billion in 2000. The major importing countries of Pakistan's textile products are the U.S., European Union, Hong Kong and Japan.

6.2 Leather

Leather is a major, rapidly-expanding and highly-polluting export sector of Pakistan. The leather and leather products industry is labour intensive, employing about 280,000 workers in over 700 tanneries spread across the country. The sector contributes approximately five per cent to manufacturing GDP and seven to eight per cent to the total exports of the country.

Pakistan has a natural advantage in terms of its large livestock population, the major input in the leather sector. The country presently produces 7.4 million hides and 36.2 million skins with an average annual growth of 2.92 per cent and 1.47 per cent respectively. The major leather manufactures include footwear, leather garments, gloves, handbags, wallets, belts, key chains and cases and covers for different articles.

6.3 Export trends and opportunities

Tables 5 and 6 present the increase in the production and export of cloth over the years and Pakistan's share of textiles in world trade.

Table 5: Production and export of cloth

Period	Total production (million sq mtr)	Export quantity (million sq mtr)	Export value (million US$)
1990–91	2,944.0	1,056.5	675.8
1991–92	3,239.0	1,196.1	819.4
1992–93	3,360.0	1,127.6	863.1
1993–94	3,378.0	1,046.8	820.6
1994–95	3,100.7	1,160.7	1,081.4
1995–96	3,706.0	1,323.1	1,275.9
1996–97	3,781.2	1,257.4	1,262.4
1997–98	3,913.7	1,271.3	1,250.3
1998–99	4,386.8	1,355.2	1,115.2
1999–00	4,958.0	1,574.9	1,096.2
2000–01	5,591.4	1,736.0	1,035.0

Table 6: Pakistan's share of textile in world trade (%)

Period	Cotton yarn Pakistan's share in world exports	Cotton cloth Pakistan's share in world exports
1990	293.4	7.1
1991	30.5	7.6
1992	35.1	7.4
1993	34.8	6.4
1994	27.4	6.3
1995	27.9	5.9
1996	30.1	8.3
1997	25.8	8.7

Table 6 shows that Pakistan owns a significant share of the world export market for yarn and cloth, at respectively 26 per cent and nine per cent. It ranks fourth in the world in production of both cloth and yarn. Thus Pakistan needs to maintain its share, especially as under the Multi-Fibre Agreement (MFA), quotas on textile products of developing countries are to be phased out by 2005. This would expose textile producers and exporters to competition and maintaining present export levels will be difficult. In a quota free, liberalized trade regime, only those companies would survive who are conscious of quality, productivity, social responsibility and customer satisfaction.

The bulk of the leather produced (about 80 per cent) is exported. The major international buyers are the U.S., Italy, Spain, Portugal, Japan, Germany, United Kingdom, France and Hong Kong. Pakistan continued to export raw hides and skins well into the 1970s and it was only after the installation of modern machinery that Pakistan began exporting wet-blue to finished leather products. Pakistan's share of leather products in the world market for the year 2001 is as follows:

Table 7: Pakistan's share of leather exports in the world market in 2001

Items	World Imports US$ Million	Pakistan Exports US$ Million	Market Share %	World Rank
Leather gloves	954	37.0	10.1	2nd
Leather garments	3,566	375.6	8.5	3rd
Leather (finished)	11,891	232.9	1.5	15th
Leather footwear	21,915	35.0	0.1	38th
Leather goods	5,741	13.0	0.1	52nd
Total	44,067	693.5	4.06	

Although, in the past five years the leather industry has emerged as the second largest foreign exchange earner in the manufacturing sector and the third in the overall export sector, there is still considerable potential to increase the export of leather products. Pakistan's share in the world trade of US$44 billion is only US$693.5 million, which is four per cent of the total leather exports. This share can be increased not only by improving the quality of goods but also by taking measures to mitigate the extensive pollution caused by the industry.

Section B – Costs and benefits of compliance

1. The survey process

A questionnaire-based assessment was undertaken to carry out a cost and benefit analysis in the textile and leather sectors. Two sampling methodologies were considered initially:

- Comparison of costs and benefits across complying and non-complying firms
- Comparison of costs and benefits accruing to firms before and after compliance

While, at the outset, one saw advantages to a comparison at one point in time, this consideration was outweighed by the difficulty in controlling for firm structure and hence the second option was selected. Questionnaires were sent to twelve textile firms and twelve leather firms. The response rate was poor as only four textile firms and three leather tanneries completed and returned the questionnaires. Further, only the financial sections were adequate, while the environment sections did not yield much useful information. We followed up with field visits to Lahore, Faisalabad, Kasur and Sialkot to interview the company owners, managers, technical and administrative staff. The team also visited two donor-funded cleaner production tannery projects in Sialkot and Kasur and obtained data from the ETPI project. The cost benefit analysis is based upon firm level information obtained from the three projects. The institutional analysis utilizes information provided directly by the firms.

2. The leather sector

2.1 The production process

The three major tannery clusters in Pakistan, each with between 100–200 tanneries are located in Kasur, Sialkot (Punjab Province) and Karachi (Sindh Province). Chemicals are used intensively at every stage of the tanning process. The lack of proper disposal of the effluents makes the leather industry the highest ranking polluter in the country. The main chemicals used in the various processing stages include sodium chloride, sodium sulphide, sulphuric acid, lime powder, ammonium sulphate, chromium sulphate, pigments, dyes and anti-fungus agents. The processing stages are:

- Pre-tanning (soaking, de-hairing, liming, fleshing, de-liming, washing, bathing and de-greasing)
- Tanning (pickling, chrome tanning, wet blue storage, sorting, splitting, and shaving)
- Dry machine process (sammying/setting, drying, stacking/toggling, shaving, trimming and pressing)
- Finishing (buffing, spraying/coating, drying and glazing/polishing)

As a result of these processes, effluents or untreated liquid wastes are generated that constitute a major environmental and health hazard. Surveys reveal serious health disorders and environmental problems in the areas where tanneries are located, including contamination of soil, underground water and food (SDPI, 1995).[10] An analysis of an effluent sample carried out in Sialkot indicated contamination levels far in excess of the safety levels prescribed by the environmental quality standards (NEQS).

Table 1: Chemical composition of tannery effluents in Sialkot, 1999

Parameters	Test results	NEQS
PH value	7–9	6–10
TSS	2,700–3,000	1150
BOD_5	1,200–1,350	80
COD	3,500–4,000	150
Sulphide	70–80	1.0
TDS	6,000–7,000	3500
SO_4	800–1,000	600
Cl	3,000–3,200	1000
Cr	10–30	1.0

Source: Clean Production Center (CPC), Sialkot, 1999

2.2 Country mitigation initiatives

During the past five years, awareness and concern about the environmental and health risks produced by the tanneries has grown. The public and private sector have collaborated on a number of donor projects to mitigate these risks. The most notable among them are:

- Cleaner Production in Tanneries Project, Sialkot, (inception 1998)
- Tannery Pollution Control Project, Kasur (inception 1996)

In addition, the public sector and the tanneries combined in Korangi, Karachi, to invest in a combined water treatment plant. No donor funds were sought for this project and it is presently facing financial problems and possible closure.

2.2.1 Cleaner production in Sialkot tanneries

The concept of Cleaner Production (CP) has gained worldwide acceptance as an effective means of increasing profits through reducing pollution and waste by using energy and raw materials more efficiently. CP is defined as a preventive strategy aimed at reducing pollution and waste generation at source by implementing environmentally- and financially-sound measures.

[10] Citizen's Report on Sustainable Development, SDPI 1995

The Export Promotion Bureau initiated the CP project in Sialkot. The Punjab government contributed Rs. 23.3 million of the capital cost and NORAD provided co-financing worth NOK 12.56 million (Rs. 77.539 million). The Gloves Manufacturers and Exporters Association is the other stakeholder in the project. The main objectives of the project are to improve the environment by controlling the indiscriminate discharge of polluted wastewater and solid waste, and to enable the exporting tanneries to gain international acceptance.

As a result of the technical guidance and financial support from the Cleaner Production Center (CPC) established to implement the project, sixteen companies completed the CP training program and documented their achievements. Quantifying both environmental and financial results is no easy task and while work is still in process to generate a complete picture of the environmental improvements, the initial results (presented in detail in annex 1) are encouraging. They show that the tanners have exploited win-win opportunities by achieving significant efficiency gains through environmental improvements.

2.2.2 Kasur Tannery Pollution Control Project (KTPCP)

Of the 700 tanneries in Pakistan, 237 are located in Kasur. The average daily input of all tanneries in Kasur is estimated at over 180 tons of wet salted weight, comprising some 8,000 hides (cattle, buffaloes), and between 12,000 and 15,000 skins (sheep and goats) per day. The three tannery clusters discharge about 13,000 m^3 per day of heavily-polluted tannery wastewater, which drains into the river Rohi Nullah. The estimated annual effluents consist of 4,000 tons of BOD_5, 11,000 tons of COD, 10,000 tons of suspended solids, 160 tons of chromium and 400 tons of sulphide. Needless to say, the environmental and health consequences were extremely serious until the project intervened. Stagnant pools of effluents covered permanently an area of about 400 acres, with about 311 additional acres of fertile land being affected during the monsoon period. These have seeped into the water table and pose health risks ranging well beyond the tannery vicinity. The most common medical ailments are eye diseases, mental retardation, cancer, dental and gastro-intestinal problems.

The Kasur Tanneries Pollution Control Project (KTCP) was launched in 1998. The project is a collaborative venture, which includes the federal government, provincial departments, international donors and the tanneries. The project components include both in-plant and end-of-pipe measures.

2.3 Economic costs and benefits

A survey of the tanneries in Kasur and Sialkot revealed that though the techniques adopted for pollution mitigation in the two areas are different, yet substantial efficiency gains and social benefits have accrued in both places. The Sialkot project thrust is on in-plant modifications to minimize waste generation, and reduce the use of raw materials and energy. The Kasur project concentrates on combined end-of-pipe treatment, with some in-plant treatment at the firm level.

2.3.1 The scope for win-wins: in-plant measures (Cleaner Production Center)

2.3.1.1 Mitigation measures

The Cleaner Production Center advised the firms to focus on those areas where pollution mitigation was critical and cost savings could be achieved concurrently. Even though financial and environmental outcomes have not been evaluated completely, initial results show that that the 16 firms have collectively generated net savings amounting to almost Rs. 9 million, about 7.5 per cent of their total capital cost. The programme has led to the identification of fourteen cleaner technology options through a detailed survey of leather tanneries. The measures that are being taken along with their impacts are described briefly:

- *De-salting raw hides and skins:* Through this CP intervention salt is removed from the hides and skins before starting the soaking process. It is estimated that 10kg salt is removed from every 100kg of raw hides by using desalting tables before the hides are processed.
- *Water recycling during the liming/de-liming processes:* Through this intervention, the total quantity of water from the de-liming process is recycled back to the liming drums. This has decreased water to one-thirds of its original consumption.
- *Chrome tanning:* About 4–5 per cent of the basic chromium sulphate salt is being used for chrome tanning, where 33–40 per cent of the salt is wasted and drained with other effluents. The CP intervention proposed for this stage reduces the use of chromium salt by 50 per cent.
- *Re-chroming:* The use of chromium salt at this stage could be reduced substantially through changes in some process conditions. This CP measure reduces the wastage to about 10 per cent of the total chromium salt used.
- *Dying and fat liquoring:* CP interventions at the stages of dying and fat liquoring lead to the reduction in the toxicity of tannery effluents and reduction in the wastage of fat liquor.
- *Buffing and finishing:* Most of the chemicals used at the finishing stages of leather processing are volatile organic compounds (VOCs) that are toxic in nature. CPC has recommended changing some of these chemicals and making arrangements for proper collection of vapors at the spray application stage, thereby reducing the chemical waste by 10–15 per cent. Buffing of dyed leather that is done prior to the finishing process leads to dust accumulation that is harmful for human health. CPC has installed 25 dust collectors and has urged other tanneries to do so.
- *Grits and screening chambers:* To remove solid wastes from liquid effluents, CPC has designed an intervention to construct grit and screening chambers at the main drain for the factories producing wet blue leather. It has been estimated that this measure would remove 23–24 tons of sludge equivalent to 10 tons of solid waste from an estimated effluent quantity of 680–700 m^3 per day.
- *Solar evaporation pans:* Through this measure, 8–10 per cent of sodium chloride contained in the soak liquor can be recovered through solar evaporation in an open pit.
- *Perforated drain covers:* Perforated fibreglass covers on the drains keeps solid wastes separate from liquid effluents. Through this measure, tanneries have covered all the open drains within their factories.
- *Use of water meters:* To conserve water consumption, CPC has installed 258 water meters in 150 tanneries to measure the consumption of water. This would also help in getting a reliable figure for effluent quantity so that further measures are introduced to control it.

2. Quantifying efficiency gains

The above-mentioned measures, their individual pay-back periods and related financial savings are presented in Annex I. Table 2 below summarizes these results. These summary results represent the sum total of the savings associated with each individual measure (project in CPC terminology).

Table 2: Summary of the CP assessment

	All projects			Projects with payback<1yr.		
	Yearly savings (in '000 Rupees)	Net savings in first year (in '000 Rs)	Average PB period - all measures (months)	Yearly savings (in '000 Rupees)	Net savings in first year (in '000 Rs)	Average PB period—only measures with PB in less than one year (months)
Dilawar tannery	272.0	146.6	5.5	125	120	0.5
Niaz tannery	225.0	104.2	6.4	215	194.4	1.1
Aiesha enterprises	4,456.0	1,966.5	6.7	4,456	1,966.5	6.7
Aleem Usman tannery	703.0	579.8	2.1	686	633.5	0.9
Mohsin tannery	94.8	20.9	9.4	72	58.1	2.3
Hansa leather garments	3,759.0	142.6	7.4	3,759	142.6	7.4
Inter Home leather industry	101.3	25.8	8.9	61.5	51	2.0
Mashallah tannery	374.5	280.5	3.0	338	334	0.1
Amjad leather wear	206.5	120.5	5.0	200.5	126.5	4.4
Fiaz leather	205.0	48.1	9.2	99	72.1	3.3
Rasa international	116.5	93.1	2.4	113.5	94	2.1
New national tannery	62.6	36.6	5.0	61.4	46.4	2.9
Arfeen tannery*	140.0	-170	26.6	0	0	n.a.
Dr. Saeed tannery	273.5	192.8	3.5	219.5	208.8	0.6
Leather field (finishing Process)	1,929.0	1,149.0	4.9	1751	1,251	3.4
Leather field (dye-house process)	2,066.7	1,126.7	5.5	2055	1,185	5.1
Leather field 1680.5 (finishing process)	1,663.5	0.1	1,680.5	1,663.5	0.1	
Sum	16,666	8,811	5.7	15,893	9,431	4.9

Source: EPB (2001)
** Only company with accumulated pay back > 1 year*

Net savings refer to revenue minus the cost of equipment in the first year, whereas yearly savings are the projected savings for the years ahead. It is evident that the measures with a pay-back period of less than one year have high savings. Of the Rs. 17 million in annual savings generated by all the projects in the sixteen tanneries, almost Rs. 16 million were due to the projects with a pay-back period of less than one year. Since the focus of the CP programme is on introducing house keeping measures and better in-house treatments, a majority of the investments have a short pay-back period. Thus, by making these one-time investments, firms can potentially cut their costs substantially, without compromising product quality.

A point to note is that the tanners are using environmentally-friendly dyes which, in most cases—are four to five times more expensive than the hazardous ones. However, this has not had a significant impact on profitability, as these additional costs are low as a proportion of total operating costs and can also be partly absorbed by price increases negotiated with the clients.

2.3.2 End-of pipe treatment (Kasur Tannery Pollution Control Project)

2.3.2.1 Mitigation measures

The key project elements are:

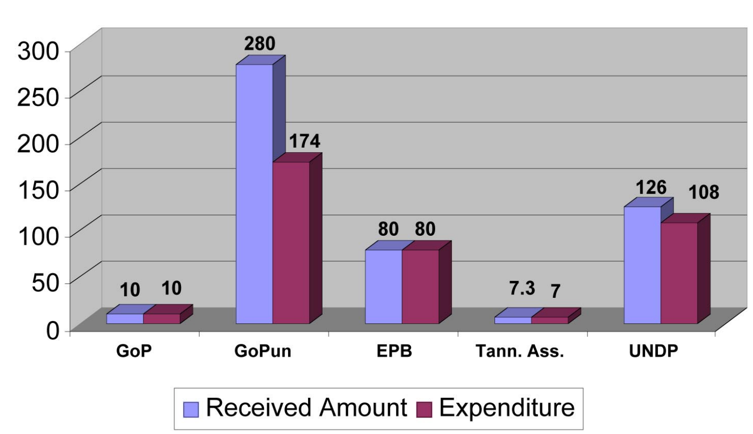
- Construct a preliminary common effluent treatment plant. Its sub-components are:
  - evacuate the stagnant pools of tannery effluent spread over the entire area
  - provide an effluent collection and disposal system
- Provide in-house pollution control methods
- Install a chrome recovery plant on a pilot basis
- Implement the solid waste management system
- Improve the sanitary conditions of the inhabitants of Kasur and;
- Enhance the occupational and health safety of tannery workers.

2.3.2.2 Cost benefit assessment

The total capital cost allocation for the project is Rs.503/- million against which Rs.379/- million has been expended. Fig.1 provides a breakdown of the stakeholders making a financial contribution to the project. They are:

- The Government of Pakistan
- The Government of the Punjab
- The Export Promotion Bureau
- UNDP/UNIDO
- Tanneries

Fig.1: Comparison of Received Amounts and Expenditures (Rs. in millions)



The bulk of expenditures have been incurred on the combined effluent treatment plant and the chrome recovery pilot plant.

According to a techno-economic study completed under the UNDP/UNIDO Preparatory Assistance Project, the estimates of the annual recurrent costs of the plant are as follows:

Operating and management costs:	Rs. 13.96 million
Depreciation:	Rs. 7.94 million
Total:	Rs. 21.90 million

The following benefits have been identified. While some of these are quantified, data on the others is still to be collected.

- Chrome recovery
- Reduced use of water (indirect benefits such as savings in electricity, dyes)
- Waste recycling for energy
- Land reclamation

The pilot chrome recovery plant has been in operation since September 2001, caters to about 50 tanneries and recovers 99 per cent of the total chrome. The unit cost per kilo of recovered chrome is Rs. 17/-. Tanners buy this at the subsidized rate of Rs. 20/- per kilo (market rate is Rs. 50/- kilo) and pay Rs. 7/- per kilo for two-way haulage from the plant. The estimated payback period for a plant of this size is 3 years.

The quantifiable environmental benefits are associated with land reclamation. The stagnant pools have been evacuated by pumping the effluent into the common effluent pre-treatment plant and the reclaimed land is being used for cropping, residential and commercial purposes. At the current rate of Rs. 400,000 per acre, the value of the reclaimed land is over Rs. 160 million. In addition, the 311 acres agricultural land degraded during monsoon overflows has also been reclaimed. Assuming an incremental rental value of Rs. 2,000/- per acre (the prevailing rental is Rs. 6,000/- per acre), this comes to Rs. 0.62 million.

Table 3 compiles the information on capital and recurring costs and benefits.

Table 3: Consolidated costs and benefits

	Total Costs (million rupees)	Total Benefits (million rupees)
Capital		
Total Capital Costs (water treatment plant, chrome recovery plant, in-plant initiatives)	379.00[1]	
Land Reclamation		462.00[2]
Recurring (annual)		
Water treatment	21.90[3]	
Plant operation	(13.96)	
Depreciation	(7.94)	
Chrome recovery (unit costs)		
Plant operation	1.87	2.53

Note:
1. The breakdown of these three components is not available
2. This accounts for reclaimed land as well as improvement of degraded/polluted agricultural land.
3. Recurring costs for the combined water treatment plant, comprising annual running costs and depreciation
4. The running costs of the chromium recovery plant were calculated by multiplying the estimated chromium recovered annually (110 tons) by the cost per kilo of recovered chromium (Rs. 17/-). This cost includes the salaries, chemical, utilities, etc. The benefits are calculated by taking the difference between the market price of chromium (Rs. 50/kilo) and the subsidized price (Rs. 27/kilo) and multiplying it with the estimated chromium recovered.

Capital costs and the reclamation/appreciation of agricultural land have a one-off character. Only recurring costs are relevant from a project sustainability perspective. The transfer of the water treatment facility to tanneries is reviewed in more detail in Section 3, Institutional Analysis. Chrome recovery is clearly profitable and while a pilot project, shows potential for being replicated by the tanners themselves.

2.4 Environmental and health benefits

Quantifying environmental and health benefits entails using complicated methodologies, so we have limited ourselves to just enumerating such gains. The only exception is the land reclamation and appreciation which we have quantified in the preceding section.

2.4.1 Cleaner production center

The pollution from the tanneries can be divided into the following effluent/emission groups:

- Chrome reduction (in water)
- Salt reduction (in water)
- Biological oxygen demand (BOD)/Chemical oxygen demand (COD) reduction in water
- Chemicals – sulphates, fat liquors, dyes and others (in water)
- Water consumption
- Volatile organic compounds (in air)
- Solid waste

The following table reports on the proposed cleaner production options introduced by the CPC and their potential impacts on pollution loads:

Table 4: Proposed cleaner production options in tanneries

No.	Proposed CP option	Impact on pollution load
1.	Reduced amount of salt for preservation	Reduces salt amount and TDS
2.	Mechanical desalting before soaking	Eliminates salt and reduces TDS
3.	Counter current soaking	Reduces water consumption
4.	Enzyme assisted soaking	Reduces water consumption and processing time
5.	Green fleshing	Reduces chemical consumption, solid wastes and improves chemical exhaustion
6.	Enzyme sulphide free dehairing-liming	Reduces concentration of sulphides up to 80% and lime by 90%, COD in effluent up to 60%
7.	Hair saving dehairing-liming	Reduces concentration of nitrogen, BOD, COD and sulphide in effluent
8.	Direct recycling of liming floats	Reduces chemical and water consumption, BOD, COD and sulphides in effluent
9.	Automatic water/chemical dozing system	Reduces water consumption by 15–20% and chemical consumption by 10–15%
10.	Ammonia free deliming using alternate deliming agents such as carbon dioxide	Reduces nitrogen concentration in effluent by 40%. Cleaner leather grain
11.	Chrome recovery, high chrome exhaustion and/or chrome liquor recycling	Reduces concentration of chromium in effluent up to 1g/lt. Reduces chrome exhaustion up to 95%. High chrome fixation in leather

No.	Proposed CP option	Impact on pollution load
12.	Reduction in water consumption through better house keeping	Water conservation
13.	Vegetable tanning with exhaustion (powder tanning)	Tanning uptake 75–95 per cent with uniform tanning, reduces tanning time, BOD and COD
14.	Environment friendly finishing methods	Reduces solvents to admissible concentration. Reduction in health hazards.

Source: Sebcon (2001)

The presumptive environmental benefits of the project (measured in terms of pollution reduction per year) are summarized below:

Table 5: Environmental benefits of the CP Project[11]

Substance	Chromium (kg)	Salt (kg)	Water use (m^3)	Effluent (m^3)	Solid waste (kg)	VOC (kg)	Chemicals[1] (kg)
Reduction/yr.	28,000	138,000	55,500	4,500	9,000	10,000	50,000

1 Chemicals include sulphates, fat liquors, dyes and other tannery substances.
Source: EPB (2001)

These figures illustrate the effectiveness of the CPC measures in reducing effluent and emission levels. The Export Promotion Bureau (2001) reported that the companies had achieved a 10–20 per cent reduction in water consumption, 50 per cent reduction in salt use and an average 25 per cent reduction in the use of chrome. The spray booths and roller coaters had achieved VOC reductions of, respectively 90 per cent and 25 per cent. In addition, the ambient environment within the tanneries had improved considerably as a result of the dust collectors installed to control toxic dust emissions during buffing operations. The key achievement of the project is in demonstrating that relatively simple housekeeping measures, which yield economic benefits have the potential to reduce pollution by over 25 per cent.

2.4.2 Kasur Tannery Pollution Control Project

The water treatment plant has reduced pollutant loads considerably, as can be seen in the following table.

Table 6: Pollution reduction

Pollutants	Reduction		
	%	tons/day	tons/annum
Suspended solids	99	40	14,000
COD	60	30	11,000
BOD	75	23	8,300
Cr	98	0.311	110
Sulphide	70	1	350

Source: Malik, S. (2002)

[11] The figures presented in the table are approximate as quantification of benefits has been a key difficulty so far due to lack of basic monitoring equipment like water meters, which are presently being supplied to tanneries. The results have been calculated by comparing the chemical use, water use, energy use and so forth at the beginning of the project with those at the end of it. The data has been generated by CPC, Sialkot, examining the purchase records, electricity bills, etc.

There is little doubt that environmental conditions in Kasur were detrimental to the health and well-being of the inhabitants, the tannery workers and the farmers. The treatment plant has proved to be a primary step in dealing with the problem and is a successful example that can be replicated for other tannery clusters in Pakistan.

3. The textiles sector

3.1 The production process

Pakistan's textile industry is concentrated in the Faisalabad, Lahore, Gujranwala and Karachi regions.

Textile processing utilizes a variety of chemicals, which include detergents, dyes, acids, sodas, salts and enzymes. The process of converting a raw fabric to a finished textile product may be split into three categories, i.e., pre-treatment, dyeing and printing and finishing. These operations lead to large quantities of highly polluted wastewater, making liquid waste the most prominent environmental problem associated with the textile industry. Currently, the textile mills are discharging the wastewater into the municipal drains and rivers without any treatment, which has serious impacts on natural water bodies and land in the surrounding areas. Other environmental impacts, less hazardous in nature, are solid wastes, air emissions, noise pollution within the firms and health risks to workers from over exposure to chemicals.

3.2 Country mitigation initiatives

During the past few years, awareness of environmental concerns among the textile firms has increased considerably due to pressure from importers. The more modern and large firms have responded with various environmental initiatives. One category of initiatives can be referred to as wins-wins, where both private (efficiency) and public (environmental) gains accrue. This is achieved through machinery upgrades, water and energy conservation and recycling chemicals. However, this does not bring down effluents and emissions to prescribed levels and firms need to supplement these efforts with high cost investments in measures, such as water treatment plants.

We visited four vertically integrated textile units in Faisalabad, Lahore and Raiwind. Their operations include spinning, weaving and printing of cloth with the entire production being exported to the U.S. and EU. All of the firms are leading exporters of fabric and various products and are ISO 9002 and Oeko-Tex Standard 100 certified. While the bulk of the treatments instituted by these firms were in-plant, in one case we observed energy efficient devices installed in a captive energy power plant (see Table 7).

Table 7: Environmental measures implemented

Environmental Initiatives	Description
Reverse osmosis	This process leads to the de-mineralization of water and decreases TDS in water. As a result of this, less water and electricity is consumed at the processing stage.
Eco-dyes	These dyes pose no threat to the environment or human health and are being used in place of azo dyes that are banned world wide due to their carcinogenic effects.
Environment-friendly chemicals	The practice of using formaldehyde based chemicals that are now known to have carcinogenic effects has also been discontinued and now environment and human health friendly chemicals are being adopted. Similarly, biodegradable detergents that are less environmentally damaging are being used.
Dyes recycling plant	Installation of a dyes recovery plant in the textile unit in Raiwind. This leads to a significant reduction in the consumption of dyes and in the quantity of effluents being discharged.
Recovery of condensate from boiler feed water	This saves energy and conserves water.
Solid waste management	The cotton wastes are not thrown in the open and are baled and sold. These wastes are used by small entrepreneurs for making low quality cloth or as filler material.
Continuous bleaching plant	Boiling of the chemicals in closed cylinders so that toxic fumes are not let out in the open air.
Automation of boiler	This reduces fuel consumption and emission of carbon and nitrogen oxides.
Insulation of conduits	Insulation of stream carrying conduits reduces energy losses and increases energy efficiency.

The Environment Technology Programme for Industries (ETPI) has introduced both in-plant and end-of-pipe measures in its project scope. Details of these measures and their economic impacts are described below in section 3.3.

3.3 Economic costs and benefits

3.3.1 In-plant treatment: Environment Technology Program for Industries

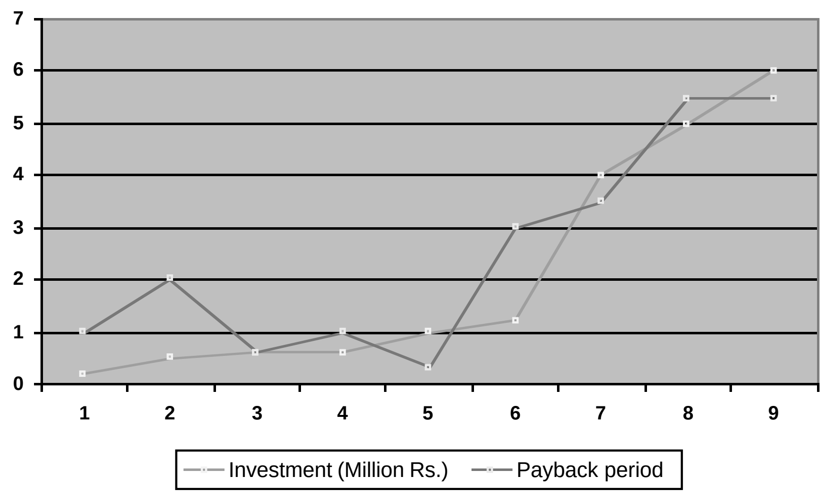
3.3.1.1 Quantifying efficiency gains

The Environment Technology Programme for Industries (ETPI) carried out a survey of textile firms, identified a number of CP and end-of-pipe treatment options and presented rough cost estimates and payback periods for them. The CP (in-plant) options (see Table 4) have the potential to reduce effluent loads, which in turn reduce the end-of-pipe treatment costs.

Table 8: Adoption of cleaner production options in textile mills

Recommended measures	Technical requirements	Estimated Investment	Estimated Payback Period
Caustic recovery from mercerising	caustic evaporator	Not quantified	
Direct reuse of waste caustic from mercerising in scouring	caustic evaporator	Rs. 1 million	3 months
Counter current washing and replacement of nozzles at printer table blankets	3 washing compartments per printer, plus nozzles	Rs. 500,000 per printer	2 years
Pigging of dye paste from printing equipment (lance, tubes)	Pigging equipment	Rs. 100,000	
Installation of a tray at the printers to avoid spilling	A waste tray, parallel to the printing tables	Rs. 200,000	
Installation of Shorter tubes between paste drums and printer	Alternate arrangement of the paste drums at the printers	Not quantified	
Addition of displacement bio-dyes in dye/finish equipment existing process equipment	displacement body, e.g., in padding/saturation part of	On needs basis	
Introduction of pad batch dyeing system	Storage space required	Variable	
Application of reactive dyes with higher fixation degrees	–	Variable	
Reduction of dye paste losses by in-line dye paste dosing	Pumps, mixers, piping etc.	Not quantified	
On-line conductivity measurement in washing process	Conductivity sensors plus display	Rs. 200,000 per set	
Installation of automatic water shut down valves	Water valve plus control system	Rs. 200,000 per valve	Less than 1 year
Reuse of Boiler off-gas	Off-gas condenser (heat exchanger) plus piping	Rs. 1.2 million per boiler	3 years
Reuse of off-gas in the drying sections of the rotary printers	Piping, fans, valves, control system	Rs. 6 million	5–6 years
Reuse of energy from blow down with flash tanks	Flash tanks plus piping and steam control unit	Rs. 5 million	5–6 years
Countercurrent regeneration of ion exchangers	Technical refitting of the existing ion exchangers (piping)	Rs. 600,000	Less than 1 year
Treatment of boiler feed water by R O	Reverse osmosis (R O) membrane installation, including high power pumps	Rs. 4 million	3–4 years
Heat recovery from wastewater by heat exchange	Heat exchange equipment, piping plus control system	Rs. 600,000 per unit	6 months
Excess water removal after washing with the help of vacuum suction boxes	Suction box, fan, air-water separator, off-gas piping	Not quantified	
Anti-corrosion measures	Repairs; change in used materials	Varies with requirement	

Fig 2: Investment Cost - Payback Period Correlation



Not surprisingly there is a direct correlation between cost of investment and payback period, as can be seen in the following figure. However, firm financial constraints suggest the need for prioritizing mitigation investments. An obvious criteria for prioritizing such investments is their cost but an additional efficiency parameter can be imposed on this, namely, the payback period in relation to investment cost (preferred options are those where the payback period converges to, or is less than the investment cost).

3.3.2 End of Pipe Treatment: ETPI

The ETPI firm level survey identified the following end-of-pipe treatment options. Their potential for mitigation and relative capital and recurring costs are presented in Table 9.

This end-of-pipe initiative is the most effective because of the large volume of water that is treated and important from the viewpoint of the national environmental quality standards (NEQS). However, high costs preclude firm-level investments. Their intentions are limited to planning designs and stated intentions to construct water treatment plants. Also, textile plants are dispersed, unlike the tannery clusters which attract project funding for remediation.

Table 9: End-of-pipe treatment for textile wastewater

Recommended Measures	Environmental benefits	Capital cost estimates	Recurring cost estimates (annual)	Remarks
Integrated Macrosorb treatment	Removal of some 60% of COD and some 95% of overall dyestuff effluents	Rs. 11,000–Rs.14,000/m^3	Rs. 11,000–Rs.14,000/m^3	A large volume of effluent can be treated through this method, although it is relatively more expensive than the others.
Macrosorb treatment of concentrated dye bath/ wash water	Removal of some 6% of COD, 10% of Nkj and 80% of dyestuffs	Rs. 4,000/m^3	Rs. 5,600/m^3	This method is economical as only a small stream, highly polluted with dyes, can be treated.
Separate removal of size from desizing wastewater and COD from scouring wastewater by ultra filtration	Removal of 50% COD and 5% BOD	Rs. 8,000/m^3	Rs. 4,800/m^3	Effluent may require further biological treatment to reduce BOD level.
Combined removal of size from desizing and scouring wastewater by ultra filtration	Removal of 65% COD and 20% BOD	Rs. 7,000/m^3	Rs. 4,900/m^3	Effluent may require further biological treatment to reduce BOD level.
On-site color removal of heavily colored effluents with the help of ozone	Removal of some 7% of COD, 5% of BOD and 80% of dyestuffs	Rs. 16,000/m^3	Rs. 4,800/m^3	

3.4 Environmental and health benefits

3.4.1 Firms visited directly

The following data was provided by one of the textile mills we visited in Faisalabad.

Table 10: Composition of the effluents

Testing parameter	Composite sample 1	Composite sample 2	NEQS
PH	6.257	6.292	6–10
TSS mg/l	180	210	200 mg/l
TDS mg/l	2,520	2,040	3,500 mg/l
COD mg/l	851	909	150 mg/l
Sulphate mg/l	185	239	600 mg/l
Sulphide mg/l	0.544	1.63	1 mg/l
Oil and grease mg/l	18	13.1	10 mg/l
Chromium mg/l	10.32	5.16	1 mg/l

Composite samples 1 and 2 were prepared by mixing samples from the different drains of the firm. The results show that as a result of various in-plant measures most of the parameters fall within the NEQS limits. However, the plant sent its samples to a private laboratory and one is not quite sure about the results, particularly as the plant has not yet installed a water treatment plant.

3.4.2 Environment Technology Programme for Industries (ETPI)

The presumptive environmental benefits enumerated under the ETPI project are presented in Table 11.

Table 11: Adoption of cleaner production options in textile mills

Recommended measures	Environmental benefits
Caustic recovery from mercerising	50% savings in caustic consumption
Direct reuse of waste caustic from mercerising in scouring	Savings in caustic consumption
Counter current washing and replacement of nozzles at printer table blankets	50–70% reduction in water use in washing
Pigging of dye paste from printing equipment (lance, tubes)	Reduction of dye paste emissions to water
Installation of a tray at the printers to avoid spilling	Reduction of dye paste emissions to water
Installation of Shorter tubes between paste drums and printer	Reduction of dye paste emissions to water
Addition of displacement bio-dies in dye/finish equipment	Reduction of water and chemicals consumption
Introduction of pad batch dyeing system	Saving of chemicals and water Prevention of chemicals emission
Application of reactive dyes with higher fixation degrees	Prevention of dyestuff emission
Reduction of dye paste losses by in-line dye paste dosing	Reduction of dye paste losses and emissions to water
On-line conductivity measurement in washing process	Reduction of wash water Better utilization of equipment
Installation of automatic water shut down valves	5–10 % savings in water consumption and discharge
Reuse of Boiler off-gas	Savings in energy consumption
Reuse of off-gas in the drying sections of the rotary printers	Savings in energy consumption
Reuse of energy from blow down with flash tanks	Energy conservation
Countercurrent regeneration of ion exchangers	Energy conservation Reduction in the use of regeneration salt
Treatment of boiler feed water by R O	Energy conservation Reduction in blowdown
Heat recovery from wastewater by heat exchange	Savings in energy
Excess water removal after washing with the help of vacuum suction boxes	Reduction of water and chemical use and chemicals discharge water, chemicals
Anti-corrosion measures	Reduction of water and chemical consumption Prevention of related safety problems

Note: 1. In all cases, energy conservation will reduce CO_2-emissions as well.

Section C: Institutional analysis

1. Environmental mitigation strategies in the leather and textile sectors

1.1 Pressure for mitigation

Tanneries and textile mills face various kinds of pressure to adopt environmental mitigation strategies. Importer specifications constitute pressure from outside the country, which is directed at exporting industries. National laws and regulations embrace production for domestic as well as international markets. While their focus is not on the export sector *per se*, synergies in the form of concessions, technical assistance and institutional capacity building can be achieved by interfacing national laws and regulations with international requirements. Community pressure tends to be exerted when environmental degradation and pollution and the health problems they pose become intolerable.

1.1.1 Importer specifications

A taxonomy of these specifications or standards was presented in Section A. Recapping, such standards can be product or process based and can take the form of technical regulations (government mandated) or be voluntary in nature (usually propounded by NGOs or buyers). Pakistan's major trading partners, the U.S., EU and Japan, have stringent environmental regulations which Pakistani exporters were generally unfamiliar with in the past. In recent years, these are being overtaken by voluntary standards, reflecting consumer purchasing preferences. Exporting firms are becoming aware of importer specified "codes of conduct" pertaining to environmental and social-standards. Our interactions with large textile and leather exporters pointed to responses in the shape of relatively low-cost, in-plant mitigation measures, particularly those which reduce production costs as well. There was much less evidence of more expensive end-of-pipe treatment. Often compliance is facilitated by donor interventions. In the case of the Sialkot tanneries, the donor initiative was pitched as much at cleaning the export sector, as it was with promoting the national environmental agenda.

The number of certifications can be seen as an indicator of a country's application of voluntary environmental standards. Out of a total of 103 countries, Pakistan ranks 56th with only ten ISO 14001 certified firms (see Table 1).[12] Weighting such certifications by GDP drops Pakistan even lower in the ranking.

Table 1: ISO 14001 Certification

Country	Rank according to no. of certified companies	Rank according to GDP (in US dollar million per certificate)	Country	Rank according to no. of certified companies	Rank according to GDP (in US dollar million per certificate)
Pakistan	56	92	Japan	1	15
India	19	69	Germany	2	19
Sri Lanka	90	93	UK	3	18
Bangladesh	81	102	U.S.	6	70
Afghanistan	69	68	Australia	8	13

[12] The number of ISO 14001 certified firms in the world is 35,823 in 103 countries.

1.1.2 National laws, regulations and their implementation

The first draft of the Pakistan Environmental Protection Ordinance (PEPO, 1983) was prepared in 1976 and promulgated in 1983. This created a legal basis for environmental policies, national standards and environmental impact assessments. A concerted effort to implement the NEQS for industrial effluents and emissions was made at the first meeting of the Pakistan Environmental Protection Council (PEPC) in 1993. The NEQS set limits to air emissions, effluents and noise pollution.

An innovative response to the weak enforcement capabilities of the EPAs was the move to rationalize existing environmental standards (which were too stringent) and implement them through a self-monitoring and compliance program, which includes a combination of self-assessed pollution charges and random external audits (see Annex III for details).

1.1.3 Community pressure

Another source of pressure for environmental action is civil society groups, which exert pressure on the government to impose standards to protect the environment and public health from dirty processes. The Kasur tanneries are an important example where communities residing adjacent to the tanneries and various public welfare organizations lobbied successfully to get the KTCP initiative launched.[13]

1.2 Status and problems in compliance

1.2.1 Importer specifications

Many grey areas exist that need policy attention. While the ISO 14000 certification requires documented proof of compliance with national environmental quality standards (NEQS), some firms have secured such certification even though they do not appear to be in full compliance. Also, a number of firms are being granted ISO 14001 and/or bilateral certification ahead of full compliance, by demonstrating partial compliance or intent to comply. This provides an opportunity for dilatory tactics at best and spurious compliance at worst. A textile firm that we visited in Faisalabad has been provided ISO 14001 certification with the understanding that it would be treating its wastewater at the time of certificate renewal. While a number of firms stated their intentions—and one showed us a plan—to construct water treatment plants, none had been installed. There is however strict compliance with product standards banning the use of carcinogenic dyes and other substances harmful to human health.

1.2.2 National laws, regulations and their implementation

The EPAs have called in large producers, indicated they are in violation and threatened them with closure. By and large, exporters obtain stay orders or ignore such warnings. Compounding this problem is the fact that the warnings are frequently issued without on-site checks. While voluntary compliance is seen as a way of addressing the weak technical and enforcement capabilities of the EPAs, the process has not reached operational maturity. There still appears to be a clear lack of understanding of the NEQS process among exporting firms. Conversely, the EPAs seem unaware of international environmental standards. Neither entity seems aware of the

[13] See SDPI (1995)

potential interface between the two. In principle, international standards can inform and refine the NEQS process, while the NEQS standards can be viewed as a useful benchmark for phasing in international standards.

1.2.3 Community pressure

In Pakistan's case, community pressure evoked two major responses in the leather sector one by donors, the other by the tanners themselves. In Kasur, a donor (UNDP) responded to a request for assistance from the government that, itself, was under intense social pressure. The project installed a combined water treatment plant and some in-plant measures.

In Korangi, Karachi, Pakistan Tanner's Association initiated the Korangi Environmental Management Program (KEMP) to reduce the pollution generated by the tanneries in the area. It developed a comprehensive levy system to cover operation and maintenance costs. The levy was to be collected from the members based on their existing production capacity (Khan, 2002). However, financial problems have forced the project to close down.

2 Concerns on the effectiveness of environmental mitigation

The incentive for exporting firms to comply is the prospect of ISO certification, and bilateral pressure, as reflected in eco-labelling schemes or codes of conduct. One could then ask why more firms do not comply? This could be due to a lack of information on the specifications and access to technology. Lack of information can be compounded by capital market imperfections because loans are not often easily available for lumpy capital investments, as when water treatment plants need to be installed. The SMEs, in particular, are doubly indemnified as more often than not they are not even aware of the international standards that affect them.

However, there can be demonstrable economic paybacks as well. In this case, the continued lack of compliance could be explained in terms of the "grey area" we alluded to earlier, where pressure from northern importers stopped short of becoming binding and created loopholes for evasion or spurious compliance. One of the explanations for this could be the value chain context. If large import wholesalers and retailers require environmental cleanup from their clients, it would cut into their margins, assuming they are already optimizing with regard to price. Thus, there is a conflict of interest, where the lead firms higher up in the value chain have an incentive to condone spurious compliance. This could also be due to the fact that there are transaction costs associated with identifying new suppliers. While all this, admittedly, is inferential reasoning we visited a number of plants where the mitigation measures did not justify the ISO 14000 and bilateral certifications the firms had secured. In other words, working conditions, emissions and effluents levels were patently unacceptable.

Similar concerns exist regarding the collective effort required to operate the combined water treatment plant once the donors phase out. Despite the obvious cost advantages associated with collective action (economies of scale) it may not actually be observed. For instance, Olsen (1971) was sceptical of collective action because of the free-rider problem. This is very much in evidence in the case of the Kasur tanneries with widespread delinquency in mandatory contributions by the tanneries.

However, there are success stories as well. In the Sialkot CPC project, a combination of project-instigated awareness and subsidies induced firms to buy into CPC activities initially. The project had the foresight to recognize that hard-headed business men would not subscribe to public interest issues unless these were underpinned by economic benefits. Consequently, it introduced a number of in-plant measures (see section B) with short to medium-term paybacks. The take-up by firms both within the project and outside has been encouraging. Conversely, many environmentally-friendly options—for example, dust collectors for the buffing stage of leather processing—yield no economic benefits and firms have shown no interest in them.

How enduring are the firm-project; firm-community; firm-government; firm-client; or a combination of these interfaces? For instance, it appears reasonably certain that firms do respond to international pressures—unequivocally to product-based standards, less so to process-based ones. Also, social pressures, triggered by the enormous social and environmental costs engendered by firm activities, can push firms into multi-stakeholder mitigation arrangements, such as in Kasur—although their post-project viability is doubtful. We were even less convinced about the NGO-government-firm nexus, as embodied in the reconstituted NEQS and voluntary compliance program (see Appendix II). The systemic problem here appears to be one of lack of political will and implementation capabilities in the provincial EPAs.

3. The way ahead: tapping into the WTO

As tariff restrictions are being phased out under various trade accords, non-tariff barriers to trade represented by quality, environmental and social standards are phasing in. Further, legally binding technical regulations are being overtaken by a bewildering array of voluntary standards. As these fall outside the government remit—not being governed by international trade rules—they have the potential to become instruments of protection. By the same token, because they reflect a combination of consumer sovereignty and social pressure, exporting countries like Pakistan can ill-afford to ignore them.[14] We have attempted to show that in the best case scenario, exporting firms can comply with such standards and reap economic benefits from doing so. However, this is premised upon a support infrastructure that, presently, does not exist. Specifically, Pakistan does not have the institutional and technical capacity to help its industries respond to the plethora of voluntary standard requirements, or tap into the export prospects that they offer.

In this context, the WTO Agreements on Technical Barriers to Trade (TBT) and on the Application of Sanitary and Phytosanitary Measures (SPS) agreements—to which Pakistan is signatory—present both an opportunity and a constraint. The two agreements seek to increase market access for the exports of its member countries. As constituted, the agreements require that those importing governments that formulate standards do so according to rules related to transparency, fairness and sound science. However, developing countries like Pakistan come up short in two respects: first, they lack the the institutional and technical capacity to test for and certify compliance with such standards, and have to rely on costly foreign testing bodies. Second, they lack the resources to participate meaningfully in the development of standards, whether in the context of developing standards in international standards-setting bodies, or in responding to proposed national-level standards in the countries to which they export.

While Article 11 of the TBT Agreement makes provision for technical assistance to developing countries, the following specific and general concerns, expressed by stakeholders suggest that Pakistan has not tapped into these opportunities.

[14] This has special relevance for Pakistan, especially after the MFA phase-out in 2005, when it will no longer enjoy quota entitlements for its exports. Not only will it be exposed to market competition but the goods and the processes which produce these goods will undergo environmental and social scrutiny.

Specific

- The standards set by the international standards setting organizations are largely those relevant to the industrial countries, as there is very little participation of the developing countries in these organizations.

General

- While harmonizing standards would reduce discretion and flexibility, no account would be taken of the different levels of development of member countries. Specifically, the special and differential provisions (TBT Article 12) remain largely unimplemented.
- The adoption of standards by majority vote and not by consensus in many standards setting organizations, such as Codex Alimentarius and others, marginalizes Pakistan in the final standards setting process.
- While standards legitimately promote consumers' environmental interest, they also create barriers to trade.

Technical assistance from developed countries under the WTO, TBT and SPS agreements should be preceded by a capacity and needs assessment under the following broad categories (Halle, 2001):

- Risk assessment and sound science, namely, how technically empowered is the country in question to justify its environmental standards and technical regulations.
- Access to information. Is there an effective domestic network in place which ensures that relevant national government agencies, industry groups are aware of impending standards and have the opportunity to comment on them?
- Does the country have a competent standards body that has relevant legal and economic expertise, that complies with the standards code and that can enter into agreements with competent authorities on technical equivalence issues?
- Does the country have a robust conformity mechanism in place, which includes testing and metrology equipment, experimental techniques and procedural rigour?

Such an assessment is key to interventions aimed at developing: a) the capacity for risk assessment; b) administrative structures needed to implement the TBT and SPS agreement provisions and; c) effective national standards and conformity assessment bodies. It will also provide a regional and national context to such interventions.

4. Conclusion

We had visualized three scenarios at the outset of the study: win-win; net win; and net loss. In the course of the study, two sector specific contexts emerged in relation to the outcomes and the take-up of mitigation.

In the leather sector, mitigation was sourced in public pressure and in the existing and anticipated onset of international standards. The conjunction of in-plant measures with combined waste-water treatment for tannery clusters demonstrated clear win-wins. This was evident in the relatively short payback periods for in-plant measures, the dispersion of recurring costs associated with end-of-pipe treatment across the cluster and the land reclamation gains. Clean-ups on this scale also yielded impressive environmental and health benefits. With regard to take-up, however, the situation was more ambivalent. While firms were willing to institute in-plant measures because of their relatively quick paybacks, they were less willing to pay for the costs of running the combined water treatment plant. Essentially, collective action of this kind faced free rider problems. It might be added that in-plant measures are a necessary but not sufficient condition to meet the NEQS/international standard requirements and that they need to be supplemented with end-of-pipe treatment.

From a policy perspective, the large one-off investments are feasible and likely to elicit donor interest. Since the bulk of tanneries in the country are clustered, there is merit in a concerted attempt to leverage financial support for additional plants, as well as to address the post-project sustainability constraints. One possible option could be for the government to take on the responsibility of running these plants for which they could charge a mandatory fee from the tanneries. Another option could to contract the plants out to the private sector. While they would, presumably, charge relatively higher fees, by the same token they could also be expected to run the plants more efficiently.

We lumped textiles in the net-win category, primarily because they do not enjoy the benefit of clustering. However, we found the internal pressure for compliance to be much stronger in this sector. We feel this is due to the fact textile plants are already well into the standards regime and have a clearer perception of the consequences of the MFA phase-out. The exporting firms comply unequivocally with product standards because non-compliance would mean a discontinuation of orders. Process standards are more of a grey area. An example of this is ISO 14001 certification. Some firms have secured such certification, even though they do not appear to be fully compliant with the NEQS. Also, a number of firms are being granted ISO or bilateral certification ahead of full compliance, by demonstrating partial compliance or intent to comply. This provides an opportunity for dilatory tactics. Thus, for instance, while we saw numerous plans for water treatment plants, none had actually been installed.

Buyers were equally culpable. If large importers (wholesalers, retailers) require environmental cleanup from their clients, it would cut into their profit margins, assuming they are already optimizing with regard to price. This gives rise to a conflict of interest, where firms higher in the value chain have an incentive to look the other way when it comes to compliance.

By our somewhat crude reckoning, small and medium enterprises fell into the category of net losses. In the first place, most of these firms lack information on what technology to get and from where. On the whole they have poor institutional representation and one of its consequences is their inability to get loans for lumpy capital investments, such as water treatment plants. However, this is a problem which afflicts the larger firms as well. SME's present a strong case for government incentives.

Pakistani exporters, though late in tuning into the urgency surrounding international standards are, nonetheless, taking steps to ensure their competitiveness in the world market. This is even as the government and civil society representatives struggle to develop a common and informed stance on the issue. There is a lack of awareness on the part of both industry and government regarding the overlaps and potential synergies that exist between international and national standards. The fact that these commonalities are not being stressed and both parties keep each other at arms length needs to be explored further. The government needs to adopt a more pro-active strategy towards bridge building.

For all the developing countries including Pakistan, the challenge is to integrate trade and environmental policies harmoniously in such a way that maximum synergies are achieved. In other words, the ideal paradigm is one where trade policies become environmentally-sensitive and environmental policies are not trade-restrictive. A key requirement is that the developing countries be encouraged and assisted in every possible way to take advantage of emerging green markets. While the south has its own environmental agenda, which coincides with many northern environmental concerns, the task is to ensure that these two converge. In this context, taking advantage of the capacity building opportunities offered under the WTO, TBT and SPS agreements will be key.

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Annexes

Annex I – Detailed economic and environmental data

Results of Cleaner Production Project implemented in Sialkot tanneries

Projects/Options	Investment (Rs.)	Saving/ Year(Rs.)	Pay back Period	Environmental Improvements	Comments
DILAWAR TANNERY					
Process improvement (pH, Bume, Float length, weighing of chemicals, maintenance of chemical store	500	53,000	Immediate	• Reduction of BOD, COD • 1900m³ water saving/yr. (12%) • 600kg chemical savings/yr. • 675kg chrome savings/yr	Implemented
De-salting table (by CPC)	4,000	12,000	4 months	4.4 tons saving of salt/yr.	Implemented
Change of pulley	500	60,000	3 days	Reduction of chrome wastage	Implemented
Installation of new drum	120,000	146,600	~10 months	2.5 ton saving of chrome/year	Implemented
NIAZ TANNERY					
General Cleanliness	3,000	Not quantified		Improved OH&S	Implemented
Process improvement (System of chemical & equipment, labelling and handling of chemicals and instruments)	16,300	200,000	1 month	• Noise reduction • Chemical reduction • Effluent reduction	Most activities implemented
De-salting table (by CPC)	4,000	14,700	~ 3 months	84 tons reduction of salt in effluent/ year	Implemented
Limed pelt washing liquor	100,000	98,00	10 yrs.	18m³ reduction in effluent/day	Before April 2001
Dust collector	10,000	Not calculated		Reduced dust emissions, better in-house environment	NEQS will be achieved
AIESHA ENTERPRISES					
Roller coater	2,300,000	3,563,000	8 months	11kg reduction of VOC emissions/day	Within next 2 yrs
Process monitoring (pH, temperature, boil test and drum rpm)	500	65,000	Immediate	• 24kg dyes saving/yr • 380kg fat liquor saving/yr • 1330kg chrome saving/yr	Implemented
Cleanliness, repair and maintenance	36,000	Not calculated		Noise reduction	Implemented

Projects/Options	Investment (Rs.)	Saving/ Year(Rs.)	Pay back Period	Environmental Improvements	Comments
Water saving awareness	0	3,000	Immediate	1000m³ effluent reduction/yr	Implemented
Energy saving capacitor	150,000	480,000	4 months	Electricity saving	December 2001
Water heater	39,000	345,000	40 days	6.9 tons chrome saved/ yr	December 2001
Demo installation by CPC (Screen grit chamber, dust collector, water meter)	97,000	Will be calculated after installation		• 6% decrease in BOD & COD • 90% leather dust reduction • 15–20% water reduction (1000m³ water saving/yr)	August 2001
HANSA LEATHER GARMENTS					
Process Management (Machine repair, labelling of chemicals, control on water use)	18,000	46,175	10 months	• Noise reduction • 160m³ water reduction (15–20%) • Chemical reduction • Power saving	Implemented
Repair of drum	15,000	150,000	~1 month	• Control leakage • Chemical and water saving	Implemented
Roller coater	2,30,000	3,563,000	~8 months	• Reduction in solvent emission • Saving of chemicals	December 2001
FIAZ LEATHER					
Process monitoring (Cleanliness, chemical saving, equipment adjustments, water saving, electricity saving)	21,500	58,000	Immediate	• 220kg of chemical saving/year • Reduction in solid waste • Reduction in accidents • Reduction in COD, BOD • 60m³ water saving/year	Implemented
Installation of water heater	5,400	41,000	1.6 months	• 330kg fat liquor savings/year • 5kg of dyes saving/year	December 2001
Installation of eco-friendly spray booth	50,000	36,000	1.4 years	• 384kg gaseous emissions arrested in water/year (80–90%)	Within next 2 years
Installation of water softening plant	80,000	70,000	~1.2 years	20% improvement in chemical up-take	Within next 2 years

Projects/Options	Investment (Rs.)	Saving/ Year(Rs.)	Pay back Period	Environmental Improvements	Comments
Modern tanning unit	Not estimated so far			Reduction in pollution load	Next 5 years
Demo water meter	13,000	Will be calculated after installation		52.5m³ water reduction/year (15–20%)	August 2001
ALEEM USMAN TANNERIES					
Repair work, chemical and water saving	32,000	98,500	8.5 months	990kg chrome saving/yr	Implemented
Safety equipment	137,500	Not quantified		Improved OH&S	Implemented
Salt elimination from re-chroming	Nil	20,000	Immediate	20 ton saving of salt/year	Implemented
Re-cycling of steam condensate	5,000	45,000	35 days	Effluent and energy saving	Implemented
Lab testing facility	50,000	7,500	6.7 yrs	Better process control and less pollution	Implemented
Roller coater	15,000	522,000	9 days	Improved OH&S	Impemented
Gas connection and electric cable changing	650,000	Will be calculated later		80–90% decrease in air pollution, energy saving	December 2001
Demo installation by CPC (Dust collector)	10,000	Not calculated		Improved OH&S, minimization of leather dust collection 6.4kg/day	Implemented
Demo installation by CPC (Water meter)	20,000	8,775	2.3 yrs	20% water reduction (3600m³ water saved/yr)	Implemented
MOHSIN TANNERY					
Proper management, maintenance and water conservation	13,500	71,600	8 months	• Reduced BOD, COD • 80m³ water saving/yr	NEQS achievable
Repair of floor	5,000	Not calculated		Better drainage system	Implemented
Dry milling drum	54,000	21,000	2.6 yrs	Less noise and dust pollution	Implemented
Demo water meter	6,000	1,750	3 yrs	110m³ water reduction/yr (15–20% water reduction)	Implemented
INTER HOME LEATHER INDUSTRY					
Process monitoring and maintenance work	450	44,000	41 days	• 7m³ water saving • 9.3kg chemical saving/day • Less noise pollution • Reduced BOD, COD	Implemented

Projects/Options	Investment (Rs.)	Saving/ Year(Rs.)	Pay back Period	Environmental Improvements	Comments
Change in drive mechanism pulley	5,000	3,750	1.3 yrs	Reduced noise pollution	Implemented
Water heater	10,000	17,500	7 months	• 5.5kg chemical saving/day • Reduced BOD, COD	Implemented
Eco-friendly spray booth	50,000	35,000	1.4 yrs	• 6.4kg VOC reductions/day	End of 2002
Demo water meter	10,000	1,000	10 yrs	1m³ water reduction/day (15–20%)	Implemented
MASHALLAH TANNERY/CROCOPAK TANNERY					
Process monitoring (chemical, water and power saving)	Nil	210,050	Immediate	• 17kg chemical reduction/day (50%) • Less BOD, COD • 690m³ water saving • 220kg solid waste reduction/yr (5%)	Implemented
Chrome recovery and re-use	By CPC	120,000	N/A	2.4 ton chrome redn./yr (30%)	Implemented
Salt de-dusting (by CPC)	4,000	8,000	6 months	23 ton salt saving in effluents/yr.	Implemented
New drum	90,000	36,500	2.5 yrs	730kg chrome saving/yr	October 2001
Demo screen grit chamber and water meter installation	80,000	Not calculated		• 60% BOD, COD reduction • 9m³ water reduction/day (20%)	NEQS achievable
AMJAD LEATHER WEAR					
Process improvement (pH, temperature, weighing, boil test, float length, maintenance work and power saving)	9,000	70,000	2.5 months	• 135m³ reduction in effluent/yr • Noise reduction • Improved OH&S	December 2001
Construction of drying chamber	15,000	38,500	~5 months	300kg chemical reduction/yr	NEQS achievable
Eco-friendly spray booth	50,000	92,000	6.5 months	5.0kg arrestment of gas emissions/ day	
Demo water meter	12,000	6,000	2 yrs	1m³ water reduction/day (15–20%)	Implemented
RASA INTERNATIONAL COMPANY					
Maintenance work and repair	4,000	9,500	1.3 yrs	• Noise reduction • 680 litres effluent redn./day (136m³/yr)	Implemented

Projects/Options	Investment (Rs.)	Saving/ Year(Rs.)	Pay back Period	Environmental Improvements	Comments
Proper trimming and shaving	15,000	24,000	7.5 months	Decrease in chemical use	Implemented
Electricity saving and use of personal safety equipment	3,900	3,000	~10 months	• Improved health • Reduced effluent load	Implemented
Change of drum pulley	500	80,000	Immediate	Chemical reduction	Implemented
NEW NATIONAL TANNERY					
Process monitoring (cleanliness, chemical saving, equipment adjustments, water saving, electricity saving)	4,500	23,950	Immediate	• 240kg solid waste reduction/yr • Improved OH&S • 21m³ water saving/yr	Implemented
Installation of water heater	10,500	37,400	~3 months	• 45kg dyes saving/yr • 273kg oil saving/yr • 10–20% better chemicals up-take	December 2001
Demo installation of dust collector	10,000	Not calculated		320kg arrestment of leather dust/yr (80%)	May 2001
Demo installation of water meter	11,000	1,200	9 yrs.	75m³ water saving/yr (15–20%)	July 2001
ARFEEN TANNERY					
Process monitoring (cleanliness, chemical saving, equipment adjustments, water saving, electricity saving)	20,000	19,100	1 yr.	• Reduction in pollution load • 240m³ water saving/yr • 240kg of chrome saving/yr • 1 ton common salt saving • Improved OH&S	Implemented
Installation of water heater	10,000	Under study			
Eco-friendly spray booth	50,000	41,000	1.3 yrs	1.3 ton gaseous emissions arrested in water/yr (80–90%)	December 2001
Installation of new drum	240,000	80,000	3 yrs	• 4.3kg chemical redn/lot (860 kg/yr) • 400ltr water consumption/lot (80 ton/yr)	July 2001
Demo installation of water meter	7,000	Not calculated		600ltr water saving/day, 120t/yr (15–20%)	July 2001

Projects/Options	Investment (Rs.)	Saving/ Year(Rs.)	Pay back Period	Environmental Improvements	Comments
DR. SAEED TANNERY					
Process improvement (salt saving, acid saving, process weighing, change of drive pulley)	1,500	89,700	Immediate	• 5 ton saving of salt/yr • 750kg reduction of nitrogen effluent/yr • 150kg acid savings/yr • Chrome saving	Implemented
Installation of water heater	5,200	120,000	16 days	2.08 ton chrome saving	September 2001
Installation of new drum	70,000	54,000	1.3 yrs	1.08 ton chrome saving	In the next 2 yrs.
Demo installation of water meter	7,000	Study underway		13.5m³ water reduction/day (15–20%)	August 2001
Lime pelt wash liquor collection tank	120,000	Study underway		9.4m³ saving of water/day (20%)	December 2001
Chrome segregation channel and pit	100,000	Study underway		• 4.02 ton chrome recovery • 18-25m³ water saving	December 2001
De-salting table	4,000	9,800	5 months	5 ton reduction of salt going to effluent/yr (50%)	Implemented
LEATHER FIELD (TANNING PROCESS)					
Process monitoring and process improvement (water saving, proper weighing, technology, improvement, repair and maintenance, general cleanliness)	500,000	1,751,000	8.5 months	• 900m³ water saving, effluent reduction • 5 ton chrome saving/yr • Reduced BOD, COD • Improved OH&S	Implemented
Water meter installation	80,000	31,000	2.6 yrs	28,000m³ water saving	June 2002
Ammonia free de-liming	20,000	Study underway		• Help achieve NEQS • 30–35 ton saving of ammonium sulphate in effluents	Next 3 yrs.
De-salting drum	200,000	147,000	16 months	600ton salt saving	Next 2 yrs
LEATHER FIELD (DYE-HOUSE PROCESS)					
Process improvement (trimming, water saving)	750,000	1,815,000	5 months	• 7.2 ton solid waste redn. • 1300m³ water saving • Chemical saving	Implemented
Installation of water softening plant	120,000	240,000	6 months	Better chemicals uptake	Next year

Projects/Options	Investment (Rs.)	Saving/ Year(Rs.)	Pay back Period	Environmental Improvements	Comments
Installation of water meter	70,000	11,700	6 yrs	10,500m³ water saving/yr	December 2001
LEATHER FIELD (FINISHING PROCESS)					
Process improvement (installation of exhaust fan, adjustment of equipment, water reduction)	12,000	180,500	Immediate	• 30kg saving of finishing mixture/ day (2%) • 450m³ water saving/yr • Improved OH&S	Implemented
Use of roller coater	Book value: 1,400,000; Repair cost: 5,000	1,500,000	11 months	• 3.6 ton reduction in solvent emissions • Reduced ozone layer depletion	Existing roller coater now in use following repair
Use of water base finishes	Nil	Not calculated at this stage		• Saving of ozone layer • No end-of-pipe treatment needed	
Process and quality control laboratory	1,500,000	Not calculated at this stage		• Better control of process • Decrease in pollution load	Next 2 yrs.

Source: Export Promotion Bureau (2001)

Annex II: ISO 14000 Series – published standards

The International Standards Organization has published the following standards.

Standard	Description
ISO 14001	Deals effectively with effective environmental management systems
ISO 14004	Assists those organizations interested in obtaining additional guidance on design and implementation of an EMS.
ISO 14010	Is intended to guide organizations, auditors and their clients on general principles of the execution of environmental audits.
ISO 14011	Is designed specifically for auditing of the EMS. An international EMS standard must be assessed and verified in common and consistent manner if certification is to be credible.
ISO 14012	Establishes common qualification criteria for environmental auditors.
ISO 14015	Environmental management-Environmental assessment of sites and organizations (EASO)
ISO 14020	Sets general guidelines for different types of labels.
ISO 14021	Environmental labels and declarations – self declared
ISO 14040	Represents life cycle assessment, principles and guidelines.
ISO 14041	Environmental management – Life cycle assessment – Life cycle interpretation
ISO 14042	Environmental management – Life cycle assessment – Life cycle impact assessment
ISO 14043	Environmental management – Life cycle assessment – Life cycle interpretation
ISO/DTR 14047	Illustrative examples on how to apply ISO 14042 – Life cycle assessment – Life cycle impact assessment
ISO/TS 14048	Environmental management – Life cycle assessment – Data documentation format
ISO/TS 14049	Environmental management – Life cycle assessment – Examples of application of ISO 14041 to goal and scope definition and inventory analysis
ISO 14050	Represents environmental management vocabulary
ISO 14050 2nd Ed.	Environmental management – vocabulary
ISO 14061	Provides information to assist forestry organizations in the use of ISO 14001
ISO/TR 14061	Information to assist forestry organizations in the use of Environmental Management System standards ISO 14001 and ISO 14004
ISO/TR 14062	Guidelines for integrating environmental aspects into product development
ISO/WD 14063	Environmental management – Environmental communication – Guidelines and examples
ISO Guide 64	Guide for the inclusion of environmental aspects in product standards

Source: www.inem.org

Annex III – Institutional measures

1.1 Green courts

On Friday June 5, 1999, the Federal Government announced setting up of two Environmental Tribunals, in accordance with the legal requirement under the Pakistan Environmental Protection Act, 1997. This also came close upon the heels of a Supreme Court order for setting up of tribunals to decide pollution cases exclusively. The order followed a Human Rights petition filed by the residents of Islamabad against the Capital Development Authority against a Steel Mill that was causing pollution. The first case was filed against smoke emitting industrial units located in Islamabad and a decision was made in favour of the litigants and has been implemented.

1.2 Technology Transfer for Sustainable Industrial Developments (TTSID)

The Technology Transfer for Sustainable Industrial Developments (TTSID) was an important initiative in the family of donor funded public-private sector environmental projects. Funded by the Swiss Federal Office for Foreign Economic Affairs and housed at SDPI, the project provided support for the promotion of sustainable industrial production. A key initiative of this project was facilitating the process by which industries took upon themselves the responsibility of monitoring and reporting of effluents and emissions, coupled with random audits by the EPAs. The PEPC approved the 'Guidelines for Self-monitoring and Reporting by Industry' on August 26, 1999. These guidelines included details on the sampling procedures, handling, transport, storage and preservation of samples, procedures for analyses of various pollutants and their flow rate measurements. The reporting of compliance with NEQS from all industrial units were to be placed in the public domain to enable researchers NGOs to assess the performance of the entire system. Any entities found wilfully hiding or falsely declaring the level of pollutants in their report would be open to prosecution under the harsher clauses of the Environmental Protection Act.

The training component of the TTSID developed training materials by conducting environmental studies, followed by hands-on training and workshops. The Self Monitoring and Reporting (SMART) training program being implemented as a pilot with SDPI's own resources based on funds generated from its environmental training program. Its purpose was to sensitize industries about the voluntary pollution charge regime and train them in the use of user-friendly software designed for pollution monitoring and reporting.

While the training on the SMART software package developed by SDPI with TTSID resources is underway on a small scale, the plan it to take this to scale with the help of an ADB (Asian Development Bank) grant to the Government of Pakistan.

2. Environment Technology Programme for Industries (ETPI)

The Environmental Technology Program for Industries (EPTI) was a joint initiative of the Federation of Pakistan Chambers of Commerce and Industry (FPCCI) and the Dutch Government to extend technical services to industry and the government. The equity base was 67:33, with the 33 per cent grant provided by the Government of Netherlands. Its primary objective was to promote the use of environmentally safe technologies in the industrial sector. This five-year project began in 1996 and worked with Pakistani industries and their associations in identifying the most economical pollution prevention and abatement technologies and in implementing these solutions. The five components of the program included: the development of a user-friendly database of relevant information; institutional networking within and between key industrial institutions of the country: dissemination and communication to promote cleaner industrial production; institutional support and training to create in-house environmental capacity within chambers and industrial associations and; demonstration projects in 20 selected industrial sub sectors to demonstrate the economic feasibility and environmental efficacy of environmental technologies.

1.3 Advocacy on environmental issues

Not much progress is evident in this area. The government is extremely tardy when it comes to acquiring information and passing it on to the exporters. At present the handful of efforts that have been taken in this regard include the following:

Environmental News: The FPCCI started its own monthly environmental magazine "Environmental News" from February 1998, to keep the industries abreast of the new environmental regulations and initiatives. With a circulation of around 5000–8000 copies, it is sent to most of the important industrial units, industry associations, local chambers, local and international research & development institutions, education institutions, and the trade consulate in the country. UNEP, APCT, and UNIDO are the major international audiences.

International Network on Environmental Management (INEM): FPCCI is planning to start an International Network on Environmental Management (INEM) with the support of INEM international. The major functions of the INEM will be to:

- Promote environmentally-friendly actions by industry through training workshops, seminars and roundtables.
- Promote Pakistan's industry environmental actions in the international market.
- Information dissemination and communication, locally and internationally.
- Private sector environmental monitoring and evaluation of industrial units.
- Support to local chambers and industry associations on environmental issues.
- Assist members in obtaining technical and financial assistance from local and international sources.
- Co-ordinate with local and international regulatory bodies in developing sustainable regulatory frameworks.
- Promote link-ups with other INEM chapters world wide.

INEM is considered an extension of ETPI soft components.

Green Pages: The first directory of environmental technology vendors and R&D institutions, entitled "Green Pages" has been published in collaboration with the Environmental News. It comprises profiles of technology vendors and research and development institutions. The publication cost was raised through advertisements, mainly from different private sector organizations. It is envisaged that industrialists, technology vendors, consultants and R&D institutions will use the directory.

Green press: IUCN would be able to help with this since they set this up. The have also instituted an annual environmental journalist award.

Civil society groups: Could mention the environmental advocacy done by NGOs like Sungi, CREED, JRC, etc., for a clean environment.

Annex IV – Environmental standards in industrial countries

Table IV-A: Environmental laws on textile products

Country	Products	Law	Status	Standard	Parameter
Germany	Clothing, clothing material, bedding, towels, underwear, outer clothing, sportswear	Fourth Act amending the German Commodity Goods Act, July 1995	Legislation	Prohibition	Azo dyes (Appendix I)
The Netherlands	All garments, footwear, bed linen	Dutch Commodity Goods Act (warenwet)	Legislation	Prohibition	Azo dyes (Appendix I)
Sweden	Clothing, clothing material, bedding, towels, underwear, outer clothing, sportswear	Not available	Future legislation	Prohibition	Azo dyes (Appendix I)
Germany	Textile articles intended for skin contact	Dangerous Substance Act, 1993	Legislation	Compulsory labelling when exceeding 1500 ppm	Formaldehydes
France	Textile articles intended for skin contact	Not available	Future legislation	Not to exceed 200 ppm	Formaldehydes
The Netherlands	Textile articles intended for skin contact	Not available	Unofficial standards	Not to exceed 100 ppm	Formaldehydes
Germany	Textile products	Chemical Act, 1993	Legislation	Not to exceed 5 mg/kg	Tetrachlorophenol
The Netherlands	Textile products	Staatscourant nr.35, Act, 1994	Legislation	Not to exceed 5 mg/kg	Tetrachlorophenol
Sweden	Textile products	Not available	Future legislation	Not to exceed 5 mg/kg	Tetrachlorophenol
Germany	Textile products intended for skin contact	German Commodity Goods Act, 1992	Legislation	Compulsory labelling when exceeding 0.5 $ug/cm^2/week$	Nickel and nickel compounds
The Netherlands	Textile products intended for skin contact	Not available	Future legislation	Probably compulsory labelling when exceeding 0.5 $ug/cm^2/week$	Nickel
Sweden	Textile products intended for skin contact	KIFS 1996. Amendment to the Chemical Products Act, 1985 and KIFS 1992	Legislation	Compulsory labelling when exceeding 0.5 $ug/cm^2/week$	Nickel
European Union	Textile articles intended for skin contact	Directive 76/769/EEC, 1976	Legislation	Prohibition	Flame retardants
Germany	Textile articles intended for skin contact	German Commodity Goods Act, 1992	Legislation	Prohibition	Flame retardants

Country	Products	Law	Status	Standard	Parameter
The Netherlands	Textile articles intended for skin contact	Textile Articles Decree, 1974	Legislation	Prohibition	Flame retardants
Sweden	Textile articles intended for skin contact	Chemical Product Act, 1985	Legislation	Prohibition	Flame retardants
European Union	Textile accessories	Directive 76/769/EEC, 1976	Legislation	Maximum 100 ppm	Cadmium
Germany	Textile accessories	Chemical Act, 1993	Legislation	Maximum 100 ppm	Cadmium
The Netherlands	Textile accessories	Staatscourant 1990	Legislation	Maximum 50 ppm	Cadmium
Sweden	Textile accessories	Chemical Product Act, 1985	Legislation	Prohibition	Cadmium
European Union	Protective clothing and furnishing textiles	Directive 76/769/EEC, 1976	Legislation	Prohibition	Asbestos
Germany	Protective clothing and furnishing textiles	Chemical Act, 1993	Legislation	Prohibition	Asbestos
The Netherlands	Protective clothing and furnishing textiles	Staatscourant 1983	Legislation	Prohibition	Asbestos
Sweden	Protective clothing and furnishing textiles	Chemical Product Act, 1985	Legislation	Prohibition	Asbestos

Table IV-B: Environmental standards on leather products

Country	Products	Law	Status	Standard	Parameter
Germany	Leather products intended for skin contacts that includes outerwear, shoes, etc. but excludes purse and other like products	Fourth Act amending the German Commodity Goods Act, July 1995	Legislation	Prohibition	Azo dyes (Appendix I)
The Netherlands	Similar to German legislation	Dutch Commodity Goods Act (warenwet)	Future legislation	Prohibition	Azo dyes (Appendix I)
Germany	Any leather product	Chemical Act, 1993	Legislation	Maximum 5 mg/kg (5 ppm)	Pentachlorophenol
European Union	Any leather product	Directive 76/769/EEC, 1976	Legislation	1,000 ppm	Pentachlorophenol
The Netherlands	Any product	Not available	Unofficial standards	Maximum 5 ppm	Pentachlorophenol
Germany	Leather products dyed by surface treatment	Chemical Act, 1993	Legislation	Maximum 100 ppm	Cadmium
The Netherlands	Products using cadmium as a stabilizer, pigment or coating	Staatscourant 1990	Legislation	Maximum 50 ppm	Cadmium

Country	Products	Law	Status	Standard	Parameter
European Union	Leather products dyed by any treatment process	Directive 76/ 769/EEC, 1976	Legislation	Maximum 100 ppm	Cadmium
Germany	Any product	Chemical Act, 1993	Legislation	Prohibition	Polychlorinated Biphenyles and Eerphenyles
The Netherlands	Any product	Dangerous Substances Act, 1993	Legislation	Prohibition	Polychlorinated Biphenyles and Eerphenyles
European Union	Any product	Directive 76/ 769/EEC, 1976	Legislation	Prohibition	Polychlorinated Biphenyles and Eerphenyles
European Union	Articles intended for skin contact	Directive 94/ 27/EC, 1994	Legislation	Max. release of 0.5 ug/cm^2 per week of nicket to skin	Nickel
Germany	Articles intended for skin contact	German Commodity Goods Act, 1992	Legislation	Max. release of 0.5 ug/cm^2 per week of nicket to skin	Nickel
The Netherlands	Articles intended for skin contact	Not available	Future legislation	Max. release of 0.5 ug/cm^2 per week of nicket to skin	Nickel

Table IV-C: European eco-labelling scheme for textile products

Ecological Criteria	Requirement	Compliance verification
1. Acrylic	Residual acrylonitrile content < 1.5 mg/kg of yarn Emission to air of acrylonitrile < 1.5 mg/kg of fiber produced	Test required on application
2. Cotton Less than 50% cotton	aldrin, captafol, chlordane, DDT, dieldrin, endrin, heptachlor, hexachloroben-zene, hexachlorocyclohexane (total isomers), 2,4,5-T, chlordimeform, chlorobenzilate, dinoseb and its salts, and monocrotophos < 0.05 ppm	Test method: US EPA recommended Test report required on application
3. Polyster Fiber	Antimony < 300 ppm VOCs emissions < 1.2 g/kg of produced polyster resin	Test method: direct determination by atomic absorption spectrometry
4. Carding and Spinning oil, waxes, lubricants, sizes	90% by weight biodegradable	Test method: ISO and OECD recommended Test report required on application
5. Tetrachlorophenol TCP and penta-chlorophenol PCP	Prohibited	
6. Formaldehydes	Prohibited for stripping	
7. Detergents	(a)Alkylphenolethoxylates(APEOs), bis (hydrogenated-tallowalkyl) dimethylammoniumchloride (DTDMAC), distearyldimethylammoniumchloride (DSDMAC), di (hardenedtallow) dimethyl ammoniumchloride (DHTDMAC) and andethylenediaminetetraacetate (EDTA) are prohibited	Test method: ISO and OECD recommended Test report required on application
(b) At each wet-processing site	90% by weight biodegradable	

Ecological Criteria	Requirement	Compliance verification
8. Bleaching agents	AOX emission < 40 mg C1/kg	Test method: ISO and OECD recommended Test report required on application only if chlorinated bleaching agents are used
9. Impurities in dyes	As < 50 ppm; Cd < 20 ppm; Cr < 100 ppm; Cu < 250 ppm; Hg < 4 ppm; Ni < 200 ppm; Pb < 100 ppm; Sb < 50 ppm; Sn < 250 ppm; Zn < 1500 ppm	
10. Impurities in pigments	As < 50 ppm; Cd < 50 ppm; Cr < 100 ppm; Hg < 25 ppm; Pb < 100 ppm; Sb < 250 ppm; Zn < 1,000 ppm.	
11. Chrome mordant dyeing	Potassium dichromate < 1.8 % Sodium dichromate < 1.5 %	Test method: atomic absorption spectrometry
12. Metal complex dyes	< 7% of the dyestuff applied (input to the process) shall be discharged to waste water treatment (whether on-site or off-site)	Test report required on application only if chrome mordant dyeing or metal complex dyes are used
13. Azo Dyes	Prohibited (Appendix 1)	Test method: German or French method recommended Test report required on application
14. Carcinogenic, mutagenic or toxic dyes	C.I. Solvent Yellow 1; C.I. Solvent Yellow 2; C.I. Solvent Yellow 3; C.I. Basic Red 9; C.I. Disperse Blue 1 and C.I. Acid Red 26 are prohibited Any dye or dye preparation that may cause cancer, may cause heritable genetic damage, may impair fertility or may cause harm to the unborn child as defined in Council Directive 67/548/EEC, as last amended by Commission Directive 98/73/EEC is prohibited	
15. Potentially sensitizing dyes	C.I. Disperse Blue 3;C.I. Disperse Blue 35; C.I. Disperse Blue 106; C.I. Disperse Blue 124; C.I. Disperse Yellow 3; C.I. Disperse Orange 3; C.I. Disperse Orange 37/76 and C.I. Disperse Red 1 are prohibited if fastness level is less than 4	Test method: ISO recommended Test report required on application only if one or more of these dyes are used
16. Halogenated carriers	Not allowed	
17. Printing	Printing pastes used shall not contain more than 5% volatile organic compounds (VOC) Plastisol-based printing is not allowed.	
18. Formaldehyde	< 30 ppm for products intended for infants of less than 2 years of age < 75 ppm for products that come into direct contact with the skin < 300 ppm for all other products.	Test method: Japan Law 112 or Finnish standard Test report required on application (except for yarns)
19. Waste water discharges from wet-processing	< 25 g/kg of COD content pH between 6 and 9 Temperature < 40 C	Test report and appropriate data required on application
20. Flame retardant	Prohibited	

Table IV-D: Nordic eco-labelling scheme for textile products

Ecological Criteria	Requirement	Compliance verification
1. Raw Cotton Fibers	Pesticides are prohibited	Certification from an expert organization Test Method: US EPA
2. Polyster Fiber	Antimony < 300 ppm VOCs emissions < 1.2 g/kg of produced polyster resin	Certification from an expert organization
3. Chemicals	A complete list of all chemical products used, including formulas for each Chlorophenyls; PCB (polychlorinated biphenyls); Halogen-based anti matting agents; Halogen-based moth proofing agents; Chlorine-based bleach; Bromo- and chloro-organic flame-retardants; Organic tin compounds and PVC are prohibited APEO (alkylphenol ethoxylates); LAS (linear alkylbenzene sulphonates); DADMAC (dialkyl dimethyl ammonium Chloride); Phthalates; EDTA and Halogenated solvents < 1% by weight of chemical product purchased	Certificates from chemical suppliers (Appendix 3)
4. Spinning oils and knitting oils	Polycyclic aromatic hydrocarbon < 1.0 % by weight	Product information sheet
5. Azo dyes	Prohibited (Anex)	Certificate from the dye manufacturer
6. Adhesive dressing	At least, inherently biodegradable	Certificate from the supplier or information sheet
7. Pickling	Prohibited with metals	Certificate from dye works
8. Emission of oxygen demanding substance	For inorganic fiber < 25 g/kg For organic fiber < 60 g/kg	Laboratory Report
9. Energy and water consumption	A plan for minimizing electricity and heat showing how many litres of water and kWh are consumed	Documentation from the original textile manufacturer
10. Metals	As < 0.20 mg/kg; Cd < 0.10 mg/kg; Cr < 2.0 mg/kg; Cu < 50.0 mg/kg; Hg < 0.02 mg/kg; Ni < 4.0 mg/kg; Pb < 0.80 mg/kg; Sb < ????; Sn < 250 ppm; Zn < 60.0 mg/kg	Laboratory Report
11. Formaldehydes emission from textile products	Children clothes < 30 ppm Clothes < 30 ppm Outdoor clothes < 100 ppm Curtains < 300 ppm Furniture fabrics < 300 ppm Carpets < 300 ppm Bed textiles < 30 ppm Other textiles < 30 ppm	Laboratory Report
Marketing	Train marketing personnel regarding eco-labelling requirements	Certificate from marketing personnel as shown in Appendix
Inspection	Conducted by eco-labelling body	
Certification body	Accredited by the International Federation of Organic Agriculture Movements	Approval by eco-labelling organization

Table IV-E: European eco-labelling scheme for leather products

	Ecological Criteria	Requirement	Compliance verification
1.	Residues in the final product	Chromium (VI) < 10 ppm Arsenic < 10 ppm Cadmium < 10 ppm Lead < 10 ppm	Test method: direct determination by atomic absorption spectrometry
		Free and partially hydrolysable formaldehyde (a) Textile components of footwear < 75 ppm (b) Leather components of footwear < 150 ppm	Textiles: Japan Law Leather: IUC Test report required on application
2.	Emissions from the production of material	75% reduction of the COD contents in waste water	Test method: ISO and OECD recommended Test report required on application
3.	Tetrachlorophenol TCP and Penta-chlorophenol PCP	Prohibited	
4.	Formaldehydes	Prohibited for stripping	
5.	Use of harmful substances (up until purchase)	(a) Pentachlorphenol (PCP) and its salts and esters shall not be used.	Test method: Textiles: gas chromatography (GC) with electron capture detection (ECD), limit value 0.05 ppm leather: (a) mass spectrometry (MS) or (b) electron capture detection (ECD); limit value 5 ppm.
		(b) No azo dyes shall be used that may cleave to any of the aromatic amines (Annexure 1)	Textile: German or French method Leather: standard DIN, limit 30 ppm.
6.	Use of volatile organic compounds (VOCs) during final assembly of shoes	(a) General sports, children, occupational, men's town, specialist cold: 30 gr VOC/pair, (b) Casual, women's town < 25 gr VOC/pair, (c) Fashion, infants, indoor < 20 gr VOC/pair.	Test method: ISO and OECD recommended Test report required if chlorinated bleaching agents are used
7.	Electric components	The footwear shall not contain any electric or electronic components.	
8.	Packaging of the final product	(a) Cardboard boxes shall be made from a minimum of 80% recycled material. (b) Where plastic bags shall be made from recycled material.	
9.	Consumer information	Potassium dichromate < 1.8 % Sodium dichromate < 1.5 %	Test method: atomic absorption spectrometry
		< 7 % of the dyestuff applied (input to the process) shall be discharged to waste water treatment (whether on-site or off-site);	Test report required on application only if chrome mordant dyeing or metal complex dyes are used

Ecological Criteria	Requirement	Compliance verification
10. User instructions	The following information shall be supplied with the product: (a) these shoes have been treated to improve their water resistance. They do not require further treatment. (This criterion is applicable only to footwear that has been water-resistant treated), (b) where possible repair your footwear rather than throw them away. This is less damaging to the environment.	
11. Fitness for use criteria	(a) Uppers flex resistance (b) Uppers tear strength (c) Uppers bondability (d) Outer soles flex resistance (e) Outer soles abrasion resistance (f) Outer soles bondability (g) Insoles water absorption and desorption (h) Uppers water resistance (i) Outer soles water resistance	Test report required on application
12. Printing	Printing pastes used shall not contain more than 5% volatile organic compounds (VOC) Plastisol-based printing is not allowed.	
13. Formaldehyde	< 30 ppm for products intended for infants of less than 2 years of age < 75 ppm for products that come into direct contact with the skin < 300 ppm for all other products.	Test method: Japan Law 112 or Finnish standard Test report required on application (except for yarns)
14. Waste water discharges from wet-processing	(a) < 25 g/kg of COD content (b) pH between 6 and 9 (c) Temperature < 40 C	Test report and appropriate data required on application
15. Flame retardant	Prohibited	

Source: Khan, S. R. (2001)