

Little or no education/awareness exists about environmental issues in industrial workers.

CETP in Kasur, is capable of handling 13,000 m³/day effluent from 230 tanneries.

Promote establishing CETP for cluster of industries who cannot afford ETP due to financial, physical and technological limitations.

Cleaner Production Practices should be promoted and incentivized in industrial estates.



Why we are here:

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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2018



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Review of Existing Environmental Laws and Regulations in Pakistan

as well as Focus on the Impacts of Non-Compliance of such Laws on Various Sectors Including Health, Business Development, and Resource Loss

by Sardar Aasif Sial

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Designer: Nadia Aine

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List of Acronyms

CETP	Combined Effluent Treatment Plant
CFR	Code of Federal Regulations
CMC	Carboxymethyl Cellulose
COP	Conference of the Parties
CPI	Cleaner Production Institute
dB(A)	Decibel (A Scale)
DMF	Dimethylformamide
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
GSP	Generalized System of Preferences
HCP	Hearing Conservation Programme
IEE	Initial Environmental Examination
ILO	International Labour Organization
INDC	Intended Nationally Determined Contributions
IUCN	International Union for Conservation of Nature
LLB	Bachelor of Laws
NCS	National Conservation Strategy
NEQS	National Environmental Quality Standards
NOC	No Objection Certificate
NPO	National Productivity Organization
NRR	Noise Reduction Rating
OSHA	Occupational Safety and Health Administration
PEPA	Pakistan Environmental Protection Act
PEQS	Punjab Environmental Quality Standards
PKR	Pak Rupees
PLGMEA	Pakistan Leather Garments Manufacturers & Exporter Association
PM	Particulate Matter
PPE	Personal Protective Equipment
PTA	Pakistan Tanners Association
PTEA	Pakistan Textile Exporters Association
PVA	Polyvinyl Alcohol
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
TDAP	Trade Development Authority of Pakistan
TWA	Time Weighted Average
UAE	United Arab Emirates
UASB	Up-flow Anaerobic Sludge Blanket
UN	United Nations
UNEP	United Nations Environment Programme
USA	United States of America
VOCs	Volatile Organic Compounds
WHO	World Health Organization
WWF	Worldwide fund for Nature

Author's Profile

Sardar Aasif Ali Sial is an Environmental Attorney, Environmental Legal Practitioner & Green Economy Consultant. He has earned Master Degree in English Literature, Political Science and Government, advanced Degree in Law, post graduate Specialization in National and International Environmental Laws & Policy, WTO & International Green Economy/Trade Laws. Mr. Sial is also a member of American Bar Association. He is Visiting Faculty Member of Management & Professional Development Department, Govt. of the Punjab, Punjab Judicial Academy-Lahore High Court, and University of Chicago-USA. He has also been teaching International Environmental Laws in Punjab University Law College, Kinnaird College and UCP, Lahore.

Mr. Sial has written different Articles, published in National and International journals on National and International Environmental Law, Bio waste and its treatment, Ecological economics, Global Trade Liberalization and Sustainable Development, International Green Trade Policy and WTO regime, SEAs, Environmental Legal System in Pakistan, GATS, TPRM, TRIPS, TRIMs & GATT etc. Mr. Sial has executed a number of Environmental Projects and Studies.



1 Introduction

In reaction to rising pollution, most developed states have been successful in endorsing environmental laws. However, developing countries like Pakistan face challenges in enacting environmental regulations which can be owed to, amongst other factors limited capacity, lack of resources and lack of willingness by authorities. There is certainly undisputed substantiation that insufficient compliance with environmental laws is leading to increasing rural and urban pollution. Despite having environmental protection legislation, The Pakistan Environmental Protection Act, (PEPA, 1997), and post-devolution, The Punjab Environmental Protection Act (PEPA, 2012), the pollution quotients related to air and water are major problems, predominantly in industrial areas.

Usually, industries are inclined to comply when a particular purchase order from the client requires them to improve their environmental performance by acquiring environmental approvals from concerned environmental agencies or departments.

In Pakistan, the textile and leather sectors are the major industries that are contributing to the development of the economy. One of the most significant and largest industrial sectors of Pakistan for manufacturing, foreign exchange and employment of workers is the textile sector. It accounts for 57 per cent¹ share of the country's export, 38 per cent of industrial production and employed technical workforce². The sector also accounts for 8 per cent of GDP³. The textile sector consists of a long and complex chain of different production processes. According to the Ministry of Textile (now the Ministry of Commerce and Textile) the textile setup in Pakistan has installed production capacity of 11.3 million spindles, 3 million rotors, 0.35 million power-looms, and 18,000 knitting machines. The textile processing capacity of the country is around 5.2 billion sq. metres⁴ and there are around 420 textile mills in Pakistan registered with All Pakistan Textile Manufacturers Association (APTMA), out of which 13 are in Khyber Pakhtunkhwa (KPK) region, 62 in Sindh-Balochistan region and the remaining 345 are in Punjab⁵. The list of APTMA members is attached as Annexure-1.

Around 65 per cent of industrial units are located in Punjab. The textile industry is characterized by high levels of air and water pollution solid waste. In Pakistan, textile industries discharge effluents directly into water bodies that severely affect human health and aquatic life⁷.

Amongst the manufacturing sector, the leather industry is the second largest foreign exchange contributor to the economy of Pakistan; about ninety percent of finished leather is exported. It was discovered that the leather sector of Pakistan contributes about five percent to gross domestic product (GDP) and about 4.41 percent to the overall earnings of the country from exports. Items in the leather sector that are exported include tanned leather, garments, sports goods, footwear, gloves and other manufacturing goods. Spain, Italy, Germany, China, UAE, Turkey, UK, France, and the USA are the leading purchasers of Pakistani leather products⁸.

The rise of tanneries in Pakistan has caused severe environmental degradation as untreated tannery wastewater is released into nearby water bodies. The major constituent of this wastewater is chromium ion that is highly carcinogenic for both human and aquatic life.

Air pollution also occurs from the burning of tanneries residuals, i.e., hair. However, due to a need for foreign exchange, the government is encouraging the development of tanneries by presenting these industries with export discounts while it fails to implement existing environmental regulations⁹.

In the absence of good governance mechanisms, which can compel industry to voluntarily fulfill the necessary commitment towards environmental protection, the industrial sector does not consider the need for compliance and implementation of environmental laws and regulations as their moral and legal obligation.

Industrialists consider environmental protection as an unavoidable business compulsion imposed by foreign buyers, and willfully neglect to maintain standards of their products utilized by domestic consumers mainly because compliance requires a huge amount of socio-economic responsibility with consistent monitoring, maintenance obligations and resources.

1 Textile Division Government of Pakistan (www.textile.gov.pk)
2 Punjab Industries Sector Plan 2018 (http://www.pndpunjab.gov.pk/system/files/Punjab_Industries_Sector_Plan_2018_0.pdf)
3 Textile Policy 2014-19
4 Textile Policy 2014-19
5 Samad, G., 2015 -Environmental Regulations and Compliance in the Textile Processing Sector in Pakistan: Empirical Evidence
6 Textile Policy 2014-19
7 Samad, G., 2015 -Environmental Regulations and Compliance in the Textile Processing Sector in Pakistan: Empirical Evidence
8 Water & Sanitation Programme (WSP) – 2013 Annual Report
9 Informatory research data gathered during field visit by the SELCON Intl Team

1.1 GSP+ (Generalized System of Preferences +):

In recognition of Pakistan's role in the war against terrorism and losses born by the nation (which also severely affected the country's economy, including the industrial and trade losses internationally) the European Union (EU) granted Generalized System of Preferences (GSP+) status to Pakistan to boost the pace of exports. This was a great opportunity for the country's industrial sector to make up their deficiencies by upgrading their quality of production through best available and feasible solutions by practicing modern techniques and installation of sophisticated equipment and technology for mitigation measures.

The GSP+ scheme was introduced by the EU to help developing countries manage the new trade responsibilities that come with the implementation of 27 core international conventions including labour and human rights, good governance and protection of the environment by exempting duty on export on a set of particular commodities. Pakistan was granted of GSP+ status by the EU in 2014, and since then Pakistan has seen some increased growth, which is still inadequate due to a weak mechanism for the compliance of international labour, environmental laws and regulations as well as the standards set in the GSP+ convention. This aspect makes GSP+ a crucial and mention-worthy issue as it encompasses both the leather and textile industries largely.

1.1.1 Benefits:

- Pakistani industries can take advantage of the GSP+ status through the implementation and compliance of environmental principles and subordinate legislation as it is a crucial part of the maintaining the economic development of the country.
- Environmental conformity of industries will not only ensure the standard of contribution to the betterment of the surroundings but will also be a potential indicator and add-on for a better under international quality and environmental standards.
- GSP+ status is a doorway to more than 600 million consumers based in the EU.
- Pakistan industrial sectors can enhance exports and take advantage of foreign investments to produce internationally competitive products, especially in the textile, garments and leather sectors.

2. Objectives

The objectives of the study are to:

1. Develop an understanding of the environmental legislation in Pakistan for the public as a whole.
2. Understand the challenges of implementation and compliance with environmental laws and regulations in Pakistan.
3. Assess broad-based impacts of non-compliance of environmental legislation on Pakistan's health sector.

3. Methodology

To evaluate the trends and existing status of environmental compliance in the textile and leather industry and to specifically assess the effectiveness of existing environmental laws in local industries, the environmental legislation have been reviewed, and five (5) textile and five (5) leather tanneries of Lahore, Kasur, Faisalabad, and Karachi have been surveyed. The information was collected according to the following steps:

1. Environment related laws, regulation, and legislation and their analysis is given in the forthcoming sections were reviewed.
2. Primary data parameters, i.e., waste water sampling, air quality data, etc., were collected by survey of randomly selected industries.
3. Secondary data related to the current study was collected from All Pakistan Textile Mills Association (APTMA), Pakistan Tanners Association (PTA), Environmental Tribunal, Punjab, Punjab Environmental Protection Agency

and Punjab Health Department through telephone interviews as well as face-to-face meetings.

4. A questionnaire was developed by WWF-Pakistan for the collection of data from industries and concerned departments that are attached as Annexure-III.
5. Survey evidence was also collected and can be found in the photo log.

4. Review of Environmental Laws of Pakistan

4.1 Existing Environmental Legislation

Pakistan Environmental Protection Act, 1997 (PEPA Act, 1997)

The Pakistan Environment Protection Ordinance (PEPO), 1983 was improved, and after extensive consultation with concerned stakeholders the Pakistan Environmental Protection Act (PEPA), 1997 was enacted in December 1997. This was supplemented by existing sectoral laws on factories, forestry, wildlife, motor vehicles, local government, and canal and drainage. The PEPA, 1997 has established a complete regulatory structure for the protection, preservation, conservation, treatment or rehabilitation of the clean environment, prevention or control of contamination/pollution and encouragement or promotion of sustainable development. This act achieved the objective of environmental awareness, but a lot of techno-legal difficulties are still being faced in its compliance.

The PEPA, 1997 is comprehensive, but in its legislative scheme, most of its provisions can be operationalized only subject to the rules and regulations to be prescribed there under. As this is the first special comprehensive legislation on environmental law, it contains specific provisions to address the already existing and emerging environmental problems caused by climate change. As a result of the commitment made by Pakistan while participating in the United Nations (UN) Conference on Environment and Development held in Rio de Janeiro in 1992, Pakistan signed the Rio Declaration in conformity with Agenda 21. Post-devolution and following the implementation of 18th amendment, federal laws have been delegated to the provinces leading to the implementation of the Provincial Environmental Protection Act and Strategies.

Rules & Regulations Made Under the PEPA Act, 1997

There are ten notified and two draft rules, while one draft and two notified regulations had been prescribed under this Act. Details are included as Annexure-IV. Industry specific rules and regulations are mentioned as below:

1. National Environmental Quality Standards (Self-Monitoring and Reporting by Industries) Rules, 2001.
2. Self-Monitoring and Reporting by Industries Rules, 2001-Amended.
3. Draft Hazardous Waste and Hazardous Substances Rules, 2016 under section 13 and 14 of the Pakistan Environmental Protection Act, 1997.
4. Compound of Offences and Payment of Administrative Penalty Rules October, 2015.
5. Environmental Samples Rules, 2001.
6. Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000.
7. The Pollution Charge for Industry (Calculation and Collection) Rules, 2001.
8. Draft Hazardous Substances Rules, 2003.
9. Pakistan Biosafety Rules 2005.
10. National Environmental Quality Standards (Environmental Laboratories Certification) Regulations, 2000.
11. Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000.

The Punjab Environmental Quality Standards (PEQS), 2016

Under Section 6 (I) (c) of PEPA Act 1997, the National Environmental Quality Standards (NEQS), now called the Punjab Environmental Quality Standards (PEQS) post-devolution, have also been set for liquid effluents, gaseous

emissions, noise levels and drinking water quality such as;

(i) Liquid Effluents and Gaseous Emissions

The PEQS (2016) specifies the following standards for:

- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment facilities, and the sea (three separate sets).
- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources.
- Maximum allowable concentration of pollutants (2 parameters) in gaseous emissions from vehicle exhaust.
- Maximum allowable noise levels from vehicles.

(ii) Drinking Water Quality

The PEQS notified documents provide standard values for following 37 parameters:

- Biological (6 parameters)
- Physical (7 parameters)
- Chemical (19 parameters)
 - a) Essential inorganic (9 parameters)
 - b) Toxic inorganic (10 parameters)
- Organic (3 parameters)
- Radioactive (2 parameters)

(iii) Motor Vehicle Exhaust and Noise

Under the PEQS (2016), different areas/zones have been categorized to specify PEQS (2016) limiting values depending on land use and exposure level of sensitive receptors in different environmental conditions. Four types of areas have been mentioned with specific values for the noise level during day and night times in this regard¹⁰. These are:

- Residential area
- Commercial area
- Industrial area
- Silence Zone

A copy of the revised PEQS gazette notifications is included as Annexure-V.

Rules and Regulations made under the Punjab Environmental Protection Act, 1997 (Amended) 2012

There are six rules related to the Punjab Environmental Tribunal, Administrative Penalty, Motor Vehicles, Bio-safety, Hospital Waste Management and Punjab Environmental Protection Council (Procedure), seven PEQS for industrial gaseous emissions, treatment of liquid, disposal of biomedical waste by incineration, auto cleaving, microwaving and deep burial, municipal and liquid industrial effluents, noise, ambient air, motor vehicles exhaust and noise, and drinking water which have been prescribed under PEPA 1997.

Details are included as Annexure-IV.

As a new development the Punjab Ambient Air Quality Standards were introduced on 12 August 2016, under the same Act, to monitor ambient air quality in order to assess the impacts of industrial emissions to prevent conditions in which urban air quality can be adversely affected in the future. Relevant ambient air quality standards are mentioned below:

Ambient Air Quality

¹⁰ <http://Environment.gov.pk>, Punjab Environmental Quality Standards, 2016

The newly notified PEQS 2016 specifies standards for nine parameters in total regarding ambient air quality include the following:

- Five (5) ambient gaseous parameters of SO₂, NO, NO₂, O₃, and CO¹¹.
- Three (3) numbers ambient particulates parameters of SPM, PM₁₀, and PM_{2.5}¹².
- One (1) parameter of Pb (Lead).

4.2 Relevant Laws Related to Water, Air, Noise and Solid Waste Pollution Control¹³

The Canal and Drainage Act, 1873 (Water Pollution Control)

The Canal and Drainage Act, 1873 amended in 1952, 1965, 1968, 1970 and the Punjab Minor Canals Act, 1905 are the earliest statutes governing water pollution in the Indus basin. The Canal and Drainage Act prohibits corrupting or fouling of canal water which may be used for domestic purposes in localities nearby. The Act provides for imposing a fine of PKR. 500 or one month imprisonment or both to the contraveners.

The Forest Act, 1927

The Forest Act, 1927, authorizes provincial governments to forbid the clearing of forests for farming, foraging, hunting, eliminating forests; or excavation and felling, trimming and topping of trees, twigs in reserved areas under Section 5 in contravention of rules made by the government.

The Factories Act, 1934 (Amendment 2012)

The Factories Act, 1934 coupled with the Provincial Factory Rules 1952 under Clause 14 on "Disposal of waste Effluents" states that effective arrangements shall be made in every factory for the disposal of waste and effluents from the manufacturing process and imposes fines for polluters. The Factories Act under Section 33Q allows provincial governments to establish rules for factories whose operation expose persons to serious risks of bodily injury, poisoning and disease. This act relates mainly to the health, safety, and well-being of workers, and dumping of solid waste and sewage that harm public and private property. This act also presents regulations for managing and disposing of hazardous toxic materials. In subsequent amendments in the Factories Act, the penalties/fines in case of committing offenses under Sections 2, 13 15, 16, 18, 23, 33K, and 33L (prohibition of dust smoke bad hazards) have been increased many times as compared to those formerly charged on people committing the offense.

The Pakistan National Conservation Strategy, 1992

The central cabinet approved the National Conservation Strategy (NSC) of Pakistan in 1992. It was the primary policy document related to environmental problems in the country¹⁴. The NCS has 14 core areas, including:

- Sustainable development;
- Conservation of natural resources;
- Efficiently manage and use of resources.

The National Environmental Policy, 2005

This policy aims to protect, conserve and restore Pakistan's environment to recover citizen's quality of life by sustainable development. The principal objectives of this policy are:

- Conservation, restoration and proficient management of the environmental resources.
- Incorporation of environmental considerations in the policy making and planning process.
- Capacity building of governmental agencies and other stakeholders at all levels for better environmental management.

¹¹ Sulphur Dioxide, Oxides of Nitrogen, Ozone, Carbon Monoxide
¹² Suspended Particulate Matter, Respirable Particulate Matters
¹³ www.na.gov.pk
¹⁴ (EUAD/IUCN, 1992).

- Meeting international obligations efficiently in line with national aspirations.
- Creation of a demand for the environment through mass awareness and community mobilization.

National Sanitation Policy, 2006

The National Sanitation Policy of Pakistan provides an extensive framework and policy guidelines to the federal government, provincial governments, federally administered territories and local governments in order to enhance and support sanitation coverage in the country through the formulation of sanitation strategies, plans and programmes at all the respective levels to improve the quality of life of the people of Pakistan and also the physical environment necessary for a healthy life.

The primary focus of sanitation for this policy is on the safe disposal of excreta away from dwelling units and workplaces by using a sanitary latrine, and includes the formation of an open evaluation free environment along with the safe disposal of liquid and solid wastes; and the promotion of health and hygiene practices in the country.

Solid Waste Management Guidelines, 2005

Solid waste management must be carried out according to the Solid Waste Management Guidelines (draft), 2005 published by the Pakistan Environmental Protection Agency along with the requirements as laid down by the Tehsil Municipal Authority.

National Drinking Water Policy, 2009

The Government of Pakistan believes that access to safe drinking water is the fundamental right of every citizen and that it is the constitutional responsibility of the state to ensure its provision to all citizens. It is committed to providing an adequate quantity of safe drinking water to the entire population at an affordable cost and in an equitable/sustainable manner.

To fulfil this commitment, the Ministry of Environment, in line with provisions of the National Environment Policy and Vision 2030, has formulated the National Drinking Water Policy through a countrywide consultation process¹⁵. Its related sections are Section 5(a), (b),(c), (d), (e); Section 6.3, 6.4, 6.6.

Punjab Environmental Policy, 2015

The Punjab Environment Policy, 2015 provides an overarching framework to address environmental issues such as the pollution of freshwater bodies (7.1 and 7.2), air pollution (7.4), noise pollution (7.5), soil pollution and proper waste management (7.6) and climate change (7.12), etc. The theme of the Punjab Environment Policy 2015 is sustainable development in order to enhance human wellbeing. The policy has been approved by the Punjab Environmental Protection Council under Section 4 (b) of the Punjab Environmental Protection (Amended Act) 2012 and remains enforced.

Policy on Controlling Smog, 2017

This policy was introduced by the Environmental Protection Department, Punjab to combat the prevailing issue of smog occurring since the last few years. The policy provides an action plan to respond to the issue of smog and identifies different short term and long term measures. This policy suggests greening of industrial processes and emphasizes the use of low sulfur fuels.

4.3 Other relevant provisions from PEPA

Section 11 of PEPA

Section 11: Prohibition of Certain Discharges or Emissions

¹⁵ (National Drinking Water Policy....(n.d.)) retrieved from http://epd.punjab.gov.pk/system/files/National_Drinking_Water_Policy.pdf

- 1- Subject to the provisions of this Act and the rules and regulations made thereunder no person shall discharge or emit or allow the discharge or emissions of any effluent or water or air pollutant or noise in an amount, concentration or level which is in excess of the [54] [Punjab Environmental Quality Standards] or where applicable, the standards established under sub-clause (i) of clause (g) of subsection (1) of section 6.
- 2- The [55] [Government] may levy a pollution charge on any person who contravenes or fail to comply with the provisions of sub-section (1), to be calculated at such rate, and collected by such procedure as may be prescribed.
- 3- Any person who pays the pollution charge levied under sub-section(2) shall not be charged with an offense concerning that contravention or failure.
- 4- The provision of sub-section (3) shall not apply to projects, which commenced industrial activity on or after the thirtieth day of June 1994.

Summary: Section 11 of the PEPA Act, 1997, (Amendment 2012) deals with gaseous emissions, air pollutants like smoke, particulate matter, NOx, SOx or noise, etc., into the ambient atmosphere and discharge of municipal and liquid industrial effluents into the recipient body from the source more than the NEQS or PEQS limits. This Section 11 also regulates the levy of pollution charge on any person who fails to comply with the provisions of the environmental legislation.

Section13 of PEPA deals with the prohibition of import of hazardous waste

Section 14: Handling of Hazardous Substances

Subject to the provisions of PEPA, no person shall generate, collect, consign, transport, treat, dispose of, store, handle or import any hazardous substance except:

- i. Under a license issued by the [65] [Provincial Agency] and in such manner as may be prescribed; or
- ii. By the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or another instrument to which Pakistan is a party.

Section14 deals with the handling of hazardous substances

Section 15: Regulation of Motor Vehicles

Subject to the provisions of this Act and the rules and regulations made thereunder, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the [66] [Punjab] Environmental Quality Standards], or where applicable the standards established under Clause (g) of Sub-section (1) of Section 6.

For ensuring compliance with the standards mentioned in Sub-section (1), the [67] [Provincial Agency] may direct that any motor vehicle or class of vehicles shall install such pollution control devices or other equipment or use such fuels or undergo such maintenance or testing as may be prescribed where a direction has been issued by the [68] [Provincial Agency] under Sub-section (2) in respect of any motor vehicles till such direction has been complied with¹⁹.

Section15 regulates air pollutants, noise (vehicular pollution). There are two principal actors which play a vital role in this regard that are:

1. Environmental Protection Agencies
2. Environmental Tribunals

¹⁶ The Pakistan Environmental Protection Act 1997

¹⁷ <http://www.na.gov.pk/uploads/documents/Pakistan=Environmental-Protection-Act-1997.pdf>

¹⁸ Pakistan Environmental Protection Act 1997, <http://www.na.gov.pk/uploads/documents/Pakistan=Environmental-Protection-Act-1997.pdf>

¹⁹ The Punjab Environmental Protection Act 1997.(n.d.). Retrieved from <http://punjablaws.gov.pk/laws/2192a.html>

The Pakistan Environmental Protection Act 1997 <http://www.na.gov.pk/uploads/documents/Pakistan=Environmental-Protection-Act-1997.pdf>

4.4 EPA's Effectiveness in Environmental Conservation

Environmental Protection Agencies are the regulatory authorities to control pollution, protect and conserve the environment and are duty bound under Section 6(1) (o) (q) of the PEPA Act to ensure the compliance of environmental legislation either by launching public awareness campaigns, by providing literary guidance or by extending educational and technological assistance for the adoption of engineering solutions by commercial or industrial organizations to prove its effective role in environmental conservation. The EPA is empowered to stop objectionable pollution generated by commercial or industrial activities. The EPA is also entitled to impose an administrative penalty on violators of environmental legislation under Section 17(7) of the Act, 2012, read in conjunction with Punjab Environmental Protection (Administrative Penalty Rules, 2013).

The value of administrative penalty in the case of contravention under Sub-section (1) of Section 17 of the Act, cannot be less than PKR. 10,000 for every day the contravention continues while in case of a contravention punishable under Sub-section (2) of Section 17 of the Act, the amount of administrative penalty cannot be less than PKR. 1,000 for every day, the contravention continues. It is interesting that S.15 of the Act deals with air and noise pollution (Regulation of Vehicular Pollution) which is the primary source of contamination in cities but the minimum amount of administrative penalty can be only PKR. 200 which shows the low priority of the legislature to conserve or protect the environment adequately.

4.5 The Effective Role of Environmental Tribunals in Environmental Conservation

Environmental tribunals were established under Section 20 of the PEPA 1997 (Amendment 2012) and exercise their exclusive jurisdiction by taking cognizance in environmental matters under Section 21 as a trial forum while under Section 22 as an appellant forum of the Act 2012. The tribunal has the competence to punish industrial polluters/violators or contraveners of air, water, noise and solid waste related provisions of environmental law under Section 17(1), with fine or penalty which may extend to PKR. 5 million and in case of continuing infringement failure, with an additional fine which may extend to PKR. 100,000 for every day that such a violation continues²⁰.

The Tribunal under Section 17(2) of the Act also has also the jurisdiction to award/impose penalty or impose fine or punish the offenders of Section 14 and Section 15 (air and noise pollution related provisions of environmental legislation), with a fine which may extend to PKR. 500,000 while in case of continued contravention with an additional fine which may extend to PKR. 1,000 for every day that such a violation continues.

Analysis reveals that the EPAs and environmental tribunals can play an effective role in environmental conservation through the strict implementation of environmental legislation of Pakistan within their areas of jurisdiction.

Currently, the environmental tribunal is non-functional due to the existence of vacancy of its chairman and technical member which is a defect in its constitution for unknown reasons, and which is vacant since 9 August 2017 when the former chairman relinquished his charge.

²⁰ The Pakistan Environmental Protection Act 1997 <http://www.na.gov.pk/uploads/documents/Pakistan=Environmental-Protection-Act-1997.pdf>

5. Effectiveness of Environmental Laws

5.1 Law Enforcement Mechanism in the Industrial Sector

The EPA of Pakistan was the primary a regulatory body for monitoring and implementation of environmental laws. Industrial environmental actions are regulated in several ways. First, regulations of the Punjab Environment Protection Act (2000) for Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) state the requirements for the preliminary review of environmental impacts. The IEE/EIA, undertaken by a firm, is likely to be given to the EPA, concerned industrial associations, library, and local chambers. Second, firms/industries are expected to follow the National Environmental Quality Standards, and self-monitoring and reporting by the industry to the EPA on a monthly/quarterly basis depending on the pollution level of that industry. Samples of effluents have to be inspected and verified by a laboratory that is certified by EPA. The regional Environmental Protection Agency is also allowed to setup laboratories for research, evaluate effluents and report about pollutants to the EPA/environmental tribunal (Samad, G. et al., 2015).

Before the commencement of a project, the Environmental Protection Agency, under Section 12 of PEPA 2012, issues a notice in a local newspaper to evaluate if the community has reservations about the construction of the proposed project. A public hearing is then conducted to share details of the purpose of the project and scope of treatment plants, if any wastewater/emission will be released. Textile processing units have to attain an environmental certificate before they are operational. After the submission of IEE/EIA along with monitoring and testing reports, a No Objection Certificate (NOC) is issued. The industries and firms where wastewater is generated have an obligation to setup wastewater treatment plants within 4 months of starting wet processing industries. Pakistan Environmental Protection (Amended) Act, 2012 allows provincial authorities to levy a pollution charge on firms that are in non-compliance with environmental laws. The Pollution charge is calculated by dividing the existing discharge rate by the production units, details of the calculation of pollution charge for liquid and gaseous effluents/emissions is attached as Annexure-VI²¹. The Environmental Tribunal Rules of 1999 gave the provincial government the authorization to setup environmental tribunals (Samad, G. et al., 2015).

It is pertinent to mention that, prior to the formation of the environmental laws; industries were bound to implement Factory Act, 1934. It is a set principle that legislation or enactment has its legal effect on enforcement from the date of gazette notification. Under these circumstances, it is established that the industries established before the environmental enactment have no obligation to acquire environmental approval/no objection certificate from the concerned EPAs under section 12 of PEPA Act 1997 or PEPA (Amended) Act, 2012. However, all kind of commercial entities and industries having an obligation to comply with the existing environmental legislation, rules and regulations and guidelines, made there under for the protection of the environment, prevention and control of pollution and promotion of sustainable development.

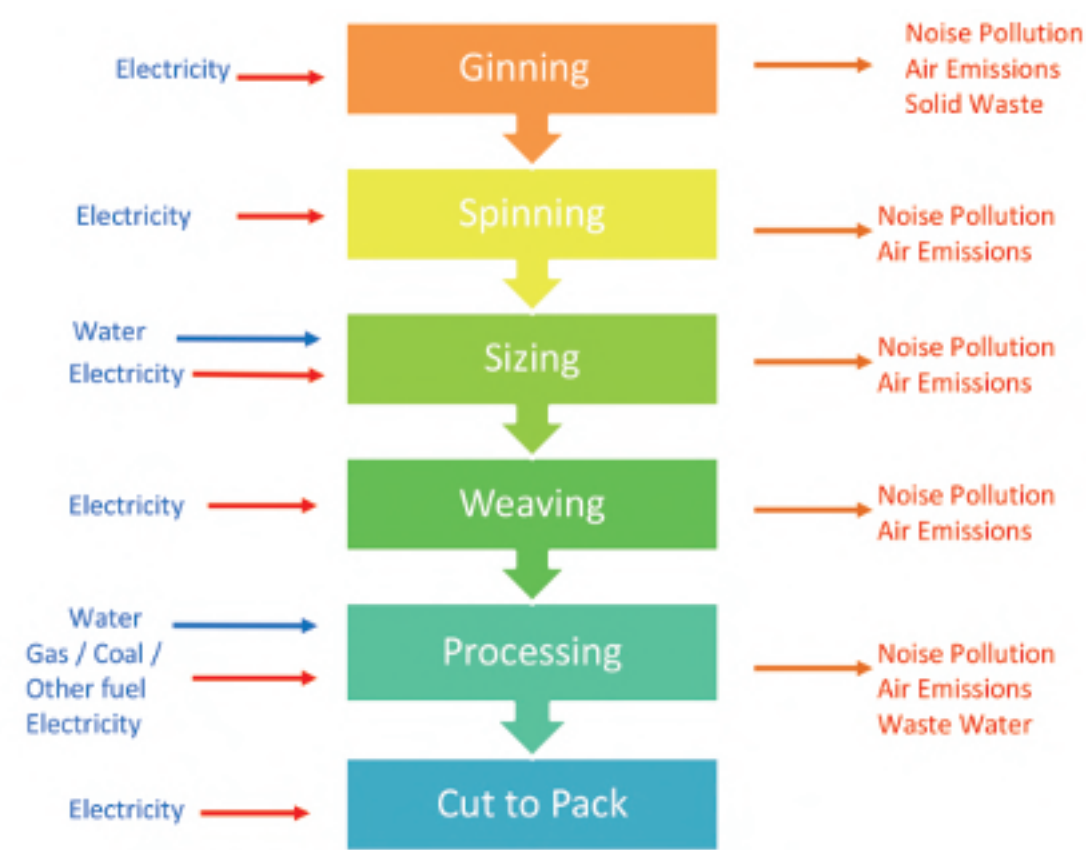
5.2 Environmental Noncompliance in Textile and Leather SMEs

Textile Sector

The textile industrial sector is one of the most vital and largest industrial sectors of Pakistan with respect to production, foreign exchange earnings and labour force employment as discussed in section 1 of this report.

²¹ Notification – Pollution Charges Rules 2001 – EPD Punjab http://epd.punjab.gov.pk/system/files/Pollution_Charge_Rules_2001.pdf

The processes carried out in textile industry are given below in the following flow sheet diagram:



Flow sheet diagram to illustrate the sequence of process carried out in textile Industry

Wastewater

Wastewater characteristics are shown in Table1 . The pollutants characterizations from wastewater are shown below.

Processes	Main Chemicals Used	Pollutant Nature
Sizing	Polyvinyl Alcohol (PVA), Starch, Wetting Agents, Carboxymethyl Cellulose (CMC), the Waxes,	BOD, COD
De-sizing	Starch, Waxes, (CMC) PVA, Fats, Pectin	BOD, COD, Suspended Solids, Dissolved Solids
Bleaching	Hydrogen Peroxide, Sodium Hypochlorite, Sodium Chloride, Sodium Hydroxide (NaOH), acids, surfactants, NaSiO ₃ , Sodium Phosphate	Alkalinity, Suspended Solids
Mercerizing	Sodium Hydroxide (NaOH),	pH, BOD, TDS
Dyeing	Reducing agents, the oxidizing agents, acetic acid, detergents, wetting agents	Heavy metals, Color, BOD, TDS,
Printing	Pastes, oils, urea, binders, starches, gums, acids, thickeners,alkali, fixer	Color, BOD, Suspended Solids, Alkalinity

Table 1-Wastewater Characteristics of Textile Industry Processes

Air Emissions

Some industrial processes along with sources and related pollutants are shown in following Table 2.

Processes	Source	Nature of Pollutant
Energy Production	Boiler, Generators	Particulates, CO ₂ , CO, NO _x , SO ₂
Coating, dyeing and curing	High-temperature ovens	Volatile Organic Compounds (VOCs)
Cotton handling activities	Carding, combing and fabrics manufacturing	Particulates
Sizing	Sizing compounds (gums, PVA)	NO _x , SO _x , CO
Bleaching	Chlorine Compounds	Chlorine, Chlorine Dioxide
Dyeing	Disperse dyeing using carrier sulfur dyeing, Aniline dyeing	Hydrogen Sulfide (H ₂ S), Aniline Vapors
Chemical storage	Emission from storage tanks for commodity and chemicals	Volatile Organic Compounds (VOCs)

Table 2-Air Emissions of Textile Industry Processes

Noise Level

Following Table 3 shows the section of the textile industries in which level of noise is high.

Section	Noise Level (dBa)
Blow Room	80-83
Carding	84-89
Draw Frames	84-88
Ring Frames	86-90
Winding	82-86
Wrapping	80-86
Sizing	73-86
Loom Shed	94-99
Boilers	85-90
Generators	90-100

Table 3-Noise Level in Different Sections of Textile Industries

Solid Waste

Solid waste generated from textile industry includes trimmings, fabrics cuttings, yarn, used dyes and pigments etc. The type of the solid waste generated associated with different textile processes are given in Table 4.

Source	Type of Solid Waste
Mechanical operation of cotton and synthetics	
Yarn Preparation	Fiber and yarn
Knitting	Fiber and yarn
Weaving	Fiber, yarn and cloth scraps
Dyeing and finishing of woven fabrics	
Sizing, de-sizing, mercerizing, bleaching, washing and chemical finishing	Cloth scraps
Mechanical finishing	Flock
Dyeing/printing	Dye and chemical containers
Knitted fabrics	Cloth scrap
Dyeing and finishing of carpets	
Tufting	Yarn and sweeping
Selva trim	Selva
Fluff and shear	Flock

Table 4-Solid Waste Characteristics of Textile Industry Processes

Leather Sector

Various processes associated with leather production include soaking, liming, fleshing, pickling, chrome tanning, shaving, drying, trimming and finishing. The processes in leather industry are shown in Figure 4.



Figure 4-Process Flow Diagram of Leather Production

Wastewater

Leather manufacturing is a water intensive industry. It takes 50 to 150 litres of water to convert one kilogram of raw hides into finished leather. The leather industry is also a big contributor to wastewater; average daily liquid effluent discharge from medium to large leather industries ranges from 280 to 800 cubic meters (WSP, 2013). The characteristics of wastewater in leather industry are given in Table 5. Various processes associated with leather production include soaking, liming, fleshing, pickling, chrome tanning, shaving, drying, trimming and finishing.

Processes	Pollutant Nature	Pollution Parameters
Soaking	Protein, Fats, Salts,	BOD, COD, TSS, TDS
Unhairing and Liming	Hydrogen Sulfide, Lime, Hairs, Protein, Fats	
Fleshing	Protein, Fats, Sulphides	pH, BOD, COD, TSS, TDS
De-liming and Bating	Sulphides, Protein, Ammonium Salts	BOD, COD, TDS
Pickling	Salts	pH, BOD, COD, TDS, TSS
Chrome Tanning	Chromium Salts	Cr

Table 5-Wastewater Characteristics of Leather Industry

Air Emissions

During leather processing, various air pollutants including H_2S , NH_3 , SO_2 , CO_2 , Cl_2 , fumes of formic acid and volatile organic compounds are discharged into the atmosphere. H_2S , NH_3 , and Cl_2 are produced in liming, de-liming and pickling operations of the leather finishing process. A significant part of the air pollution by the leather tanneries is caused by the need for energy. Table 6 shows the sources of leather industries that cause air emissions.

Processes	Nature of Pollutant
Unhairing/liming	Hydrogen Sulfide (H_2S)
De-liming/Bating	Ammonia Gas, Hydrogen Sulfide (H_2S)
Finishing	Solvents, formaldehyde
Thermal Heating	CO , CO_2 , NO_x , SO_2
Energy Production	Particulates (Ash), NO_x , SO_2 , CO_2
Chemical Storage	VOCs

Table 6-Air Emissions from Leather Industrial Processes

Noise Level

In leather supply chain, wet processing industries employ heavy machinery for their operations as compared to finishing industry. Utility Department is a major source of noise pollution in leather industry, where noise is produced through the boilers, generators and compressors. Some machines on production floor, either due to nature of process or lack of maintenance, also produce noise.

Solid Waste

The major type of solid waste produced in leather industry is hair and flushing from soaking and liming processes. The processes that cause solid waste generation are given in Table 7.

Processes	Solid Waste
Rawhide Storage	Salts, Raw trimmings
Unhairing and Liming	Hair, Lime,& Organic matter
Fleshing	Fleshing Residue
Chrome tanning	Tanned Waste
Dry and Wet Shaving	Shaving parts

Table 7 -Solid Waste Characteristics of Leather Industrial Processes

6. Case Study Report

i) Introduction

The visited leather tannery was established in the 1970s. The industry runs 8 hours and production is at the peak after 3 months of Eid-ul-Adha. Most of the production from this industry is exported to Italy. This industry was approved by the Environment Protection Agency (EPA). The buyers do not require any international environmental certification. However, they demand approval from local environmental authorities. The industry was in the process of certification from Leather Working Group (LWG)²². There were 700-800 workers in the industry.

ii) Processes:

Following processes were carried out in the said industry:

- Soaking: In this process, the moisture is removed and a minimum of 300 small or 17 large pieces are soaked daily. This process is run for 12-14 hours. The size of the drum was 10'x 11'. An automated system supplies water, and water consumption ratio was 20-150 per cent. Wastewater generated was drained to wastewater treatment plant. Fleshing waste is produced from the soaking process is called which is further used for to extraction of oil.
- Liming: In this process, hair is removed from the skin by using Calcium Hydroxide and Sodium Sulfide. The unnecessary flush is removed by flushing machine and is used for poultry purposes.
- Pickle: In this process, the limed product is acidified by adding Sulfuric acid and Sodium Chloride salt at pH 3.

iii) Emissions:

- Air Emissions: The major sources of air emissions were boilers used in dyeing and finishing area, but the exhaust emissions are re-used in de-liming process.
- Wastewater: For wastewater treatment, an effluent treatment plant (ETP) is installed, that consists of Equalization Tank, Primary Sedimentation, and Decantation. The primary treatment of wastewater removes 40 per cent of pollutants.

iv) Health and Safety:

For the workers, health and safety goggles, helmets, gloves, masks, drum boots and safety boots were provided. The Labour Department frequently inspected the premises. There were few incidences of skin and lung disease in workers working in the chemical warehouse.

v) Comments by Industry Representative:

- Environmental legislation is not effective/adequate;
- Difficulty in ensuring Personal Protective Equipment usage among workers due to climatic conditions;
- NEQS are not industry specific.

²² A Leather Working Group Audit is an assessment of the environmental compliance and performance capabilities of leather manufacturers, against the Leather Working Group environmental auditing standard. (blcleathertech.com)

Variables	Textile industries			Leather Industries		
	Large	Medium	Small	Large	Medium	Small
Region	Faisalabad	Lahore	Karachi	Raiwind	Kasur	Lahore
Total Production	9125 tonnes per anum	8300 tonnes per annum	5000 tonnes / annum	25 million sqft/year	15 Million sqft/year	1.3 million sqft/year
Years of Operation	14	23	-	60	-	15
No.of Employees	600	500	-	509	350	250-300
Type of process/es	Knitting Dying Finishing Operations	Cotton Bale, Opening, Cleaning, processing, carding silver, drawing, simplex roving, last winding & packing.	Dyeing, Processing, Printing, Stitching, Packaging.	Raw Material, Wet Blue, Neutralization , Rechroming, Dyeing, Finishing.	Wet Blue to crust, crust to dye	Leather Tanning & Finishing
Effluent Generation m ³ /day	3500	2500	2200	3000	2000	1800
International Certification	Oeko-Tex-100 ISO 9001:2008 WRAP – ISO 14001	N/A	OekoTex , ISO 9001, ISO 14001	ISO 14001:2004 ISO 9001	Nil. International buyers	ISO 9001 ISO 14001 SADEX
Environmental Officers	Yes	Yes	Yes	Yes	Yes	Yes
Penalty (Yes/No)	No	No	No	No	No	No

Table-9: Note: The Statistical Data Variables for Textile & Leather Industries

7. Overall Status of Environmental Compliance

The information regarding compliance to environmental laws was obtained from 10 textile industries and 10 leather industries, which were selected from a list given by Lahore Chamber of Commerce, Faisalabad Chamber of Commerce and Sialkot Chamber of Commerce. The overall status of environmental compliance and non-compliance is presented in Table10.

Variables	Textile Industries			Leather Industries		
	Large	Medium	Small	Large	Medium	Small
Environmental policy	Yes	Yes	Yes	Yes	No	Yes
Provided environmental training	Yes	Yes	Yes	Yes	Yes	Yes
Environmental audits	Yes	No	Yes	Yes	Yes	Yes
Having EMPs	Yes	Yes	Yes	Yes	Yes	Yes
IEE/EIA	Yes	Yes	Yes	Yes	Yes	Yes
Wastewater treatment plant (Operational)	Yes	Yes	Yes	Yes	Yes	Yes
Wastewater treatment plant (non-operational)	No	No	No	No	Yes	No
Pressure from communities	No	No	No	No	No	No
Penalties	No	No	No	No	No	No
International certification	Yes	No	No	Yes	No	Yes

Table-10: Status of Environmental Compliance in textile and leather industries

8. Magnitude of Penalties and Punishments for Non-Compliance of Environmental Laws

8.1 Rationale

Compliance means confirmation that a manufacturer can do what they say they can according to the rules and standards required by a contract²³. Industry, factory and commercial or public organization are said to be in noncompliance if they are defiant to environmental laws, regulations, standards and other requirements related to the environment. According to the Punjab Environmental Protection (Amended) Act 2012, the Environmental Tribunal shall penalize those who contravene or fail to comply with the provisions of section 11, 12, 13 or 16 as discussed in section 4.2.5.1 of this report. To find out the magnitude of penalties and punishments due to non-compliance with environmental legislation details of conviction cases from the year 2012-2016 were acquired from the environmental tribunal.

The penalties should not be considered as the only way forward because only penalties or fines will not serve the cause of environmental conservation or protection and eradication of pollution. It is, in one way, giving a green signal for industries to pollute and pay for it. Industries may keep the cost of fines in their production; so in the end, it is the environment which is at a loss. It is understood that environmental laws are mitigation/remedial natured legislation instead of punitive sort of law. Therefore, the EPAs and environmental tribunals or green courts may encourage the execution of four main components of Paris Agreement of COP 21 in 2015 such as Mitigation, Adaptation, Climate Finance and Technology Transfer by the polluters/industrial sector while discouraging the penalties culture to ensure a maximum reduction in pollution at source. Pakistan is signatory of the Paris Agreement. The mechanism of its application in the country should be developed in light of intended nationally determined contributions (INDC) which Pakistan submitted in COP21.

8.2 Penalties

The record of awarded penalties obtained from the Environmental Tribunal shows that most of the complaints were filed in the Tribunal by the Environmental Protection Agency (Punjab). The record also discloses that 90 per cent of the

²³ Blacks Law Dictionary.

conviction cases were against the industrial units working in the Punjab which violated the environmental laws and regulations. The detailed document on penalty cases, obtained from the Environmental Tribunal is attached as Annexure-VII. The analysis is showcased by the following figures:

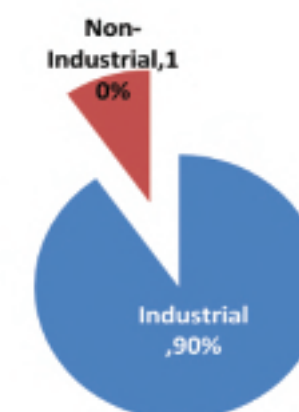


Figure 5-Comparison of Conviction Cases between Industrial and Non-Industrial Units (2012-2016)²⁴

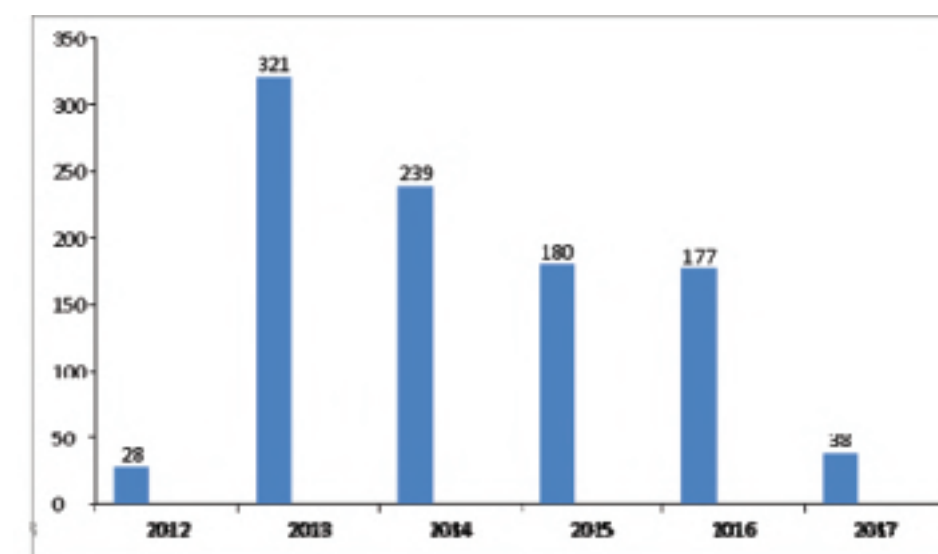


Figure 6- No. of Conviction Cases Filed in Environmental Tribunal from 2012-2016²⁵

²⁴ The pollution charge for industry (calculation and collection) Rules, 2001

²⁵ Table tabulated through information collected from the environmental tribunal (Annexure VIII)

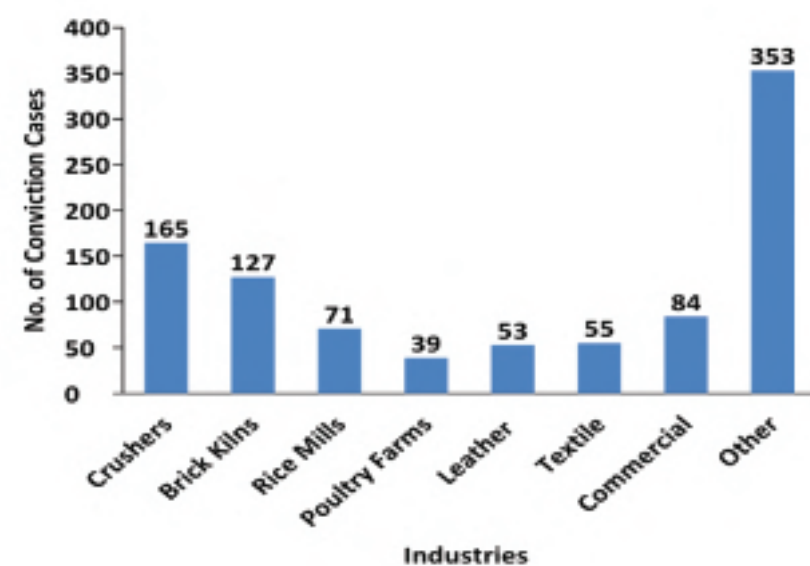


Figure7- Comparison of Scale of Penalties in Different Industries from Year 2012-2017²⁶

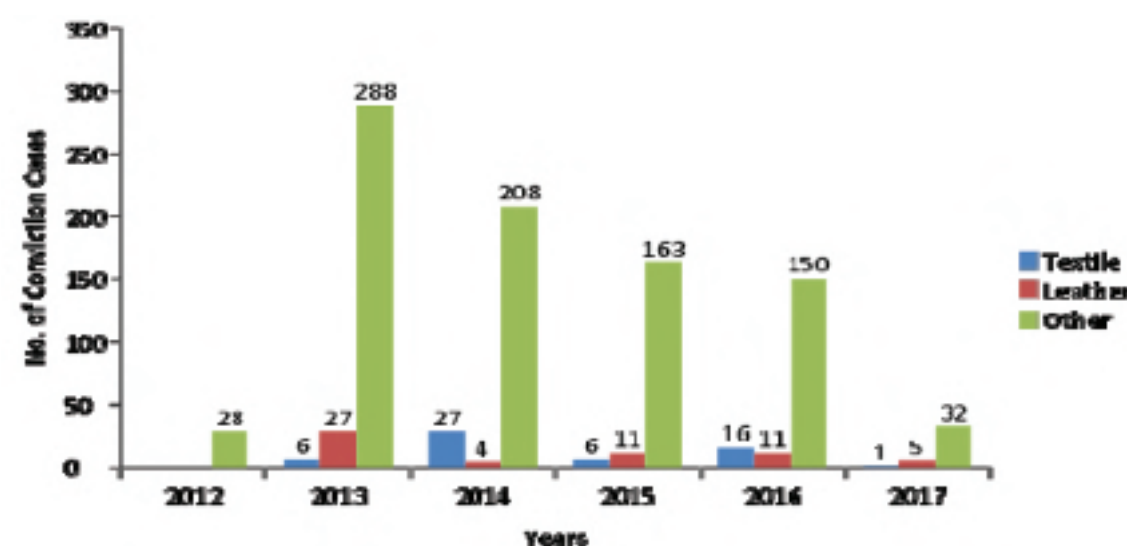


Figure 8- Comparison of the Number of Conviction Cases In Textile and Leather Industry with Other Industries²⁷

9. Challenges Faced by SMEs in Complying with the Local Environmental Laws

As discussed in the previous section, textile and leather sector has massive impacts on the economy of Pakistan, yet these industries are currently facing several challenges due to which they are in non-compliance with the local environmental laws. Some of these major challenges include lack of involvement from the management, financial resources, technological restraints, lack of involvement from the employees, lack of government incentives, uncertainty about environmental regulatory changes, and lack of capacity of industry owners and employees.

²⁶ Registrar Office – Punjab Environmental Tribunal
²⁷ Registrar Office - Punjab Environmental Tribunal, Lahore

9.1 Capital Cost, Operating Cost and Area Requirement for Wastewater Treatment Plants

The challenges for the installation of effluent treatment plants are generally related to the cost of construction and area requirement. Effluent Treatment Plants (ETPs) can be costly to build and operate because they require high capital, complex technology, skilled manpower for operation and maintenance, mechanical spare parts, high energy, and sludge disposal area. However, capital cost, operating cost, land size and complexity of effluent treatment technologies rise with the quantity/quality of the waste produced. The other main reason is those public and private sectors have failed to recognize the impact of effluent treatment and also not giving importance to the availability of safe water for human consumption.

10. Impacts of Non-compliance of Environmental Laws on Health Sector

10.1 Existing Health Surveillance²⁸

Expectancy of life in Pakistan has increased from 54 (1978) to 63 (today) and is still short by comparable standards. In the last twenty five years, child mortality rate has reduced from 120 in 1978 to 74 in 2017. More than 35 per cent of children under five are malnourished. Data from the Ministry of Health, government of Pakistan demonstrates that most deaths occur due to communicable diseases. In 2000, major causes of deaths in Pakistan were diarrheal and respiratory diseases. However, the current demographic and socio-economic change in Pakistan has witnessed a double challenge in the count to the prevailing communicable disease. Recent data on people's household expenditure shows that a considerably higher proportion of households spend more on the care of non-communicable diseases rather than the contagious diseases.

Since the past few years, the economic situation of Pakistan has enhanced noticeably that has produced an extraordinary financial space making extra resources available. This is further authenticated by the last 3 years comparative notable growth rate of about 7-8 per cent with an unparalleled rise in per capita income. The trends in the budget 2006-07 have also shown more funds for progress and an extensive increase along with prominence on public health concerns such as maternal and child health, water-borne diseases, and other communicable diseases.

The data of health and diseases survey is attached as Annexure- VIII.

10.2 Working of ILO, Labour Department, and WHO

According to the current assessment of the International Labour Organization (ILO), each year about 159-269 million employees, encounter work-related diseases or accidents. The dreadful condition of Occupational Health and Safety (OH&S) in the developing countries like Pakistan is due to many reasons, such as inadequate health services, lack of training for workers and lack of concerned data about illness and calamity. Healthy and well-trained workers are an advantage to both production and economic achievement.

10.3 Existing Policies for Industrial Workers

Government of Pakistan Labour Policy, 2010

Labour Policy also aims to attain the objectives in a way best suited to resources of the country and state of the economy. There is a legitimate obligation to enhance awareness of their obligations among workers and employers. Concurrently, government identifies that workers and employers must have reasonable profits as can be sustained by the financial system without setbacks. Keeping these anomalies in view, the government believes that a balanced labour policy should be made on the following:

- Workers can form unions, and an institutional framework must be present to promote close relationship between workers and employers at management level.
- Employers and workers have equal rights in an atmosphere of synchronization.
- There should be effective consultations between workers and employers on issues of interest to the organization and well-being of workers.

²⁸ Pakistan Demographic and Health Survey -
www.nips.org.pk/.../PDHS%20Final%20Report%20as%20of%20Jan%2022-2014.pdf

- Adequate protection of jobs should be accessible to the workers, and there should be quick redressal of their complaint.
- On the basis of merit, promotion of jobs to be provided to all levels and proper planning to be done in this regard.
- Facilities for suitable matching of job prospects and the profession seekers to be reinforced and customary procedures to be streamlined.
- Schemes for social insurance to be further strengthened.
- Impartiality and humane conditions of work assured to all workers.
- Forced labour in all its forms to be eliminated.
- Requirements relating to the service of children to be strictly held and be obligatory.

Mines Act, 1923

Operational Health and Safety is concerned about mines and provision of water for drinking, restrooms, cafés, shelters, first-aid, working hours, extra salary for overtime, leaves and holidays, notice of mishaps and occupational illnesses and safety actions to be observed at workplaces. (Pasha, 2003)

Workmen Compensation Act, 1923

The employer is bound to give compensation to his workers due to injury in accidents and the Occupational Diseases. (ILO, 1923)

Factories Act, 1934 (Amended 1997)

This law governs the health and safety of workers in industries or factories having ten or more workers. The Act under sections 33, 33 A, 33 K , 33 L and 33 Q offers regulating the Occupational Health and Safety facilities such as ventilation, control of temperature, control of dust and fumes, overcrowding, proper lighting, supply of clean drinking water, precautions against communicable diseases, stipulation of canteen for workers, safety measures in case of fire, proper fencing and maintenance of machinery and prohibit employment of young people on unsafe lifting machines and crane, pressure plants, explosive or inflammable things. Each province will enforce its own laws with the consent of Factories Act as amended in 1997.

Provincial Employees Social Security Ordinance, 1965

The Provincial Employees Social Security Ordinance, 1965 under section 2(10) read with column (1) of the schedule contained in The West Pakistan Employees Social Security (Occupational Diseases) Regulation, 1967 portrays the occupational diseases, such as anthrax, asthma, cancer, pneumoconiosis²⁹.

11. Short-term and Medium-term Impacts³⁰

1) Health Impacts of Textile Industry

²⁹ 4010209 Noshi Health Safety Brick Industries.(n.d.). Retrieved from http://www.scientific-journals.co.uk/web_documents/4010209_health_safety_brick_
³⁰ Source: SELCON Intl Team research

Sr.No.	Exposure	Source	Health Impacts
1.	Cotton Dust	Spinning, Weaving, Cutting, Ginning	Respiratory diseases i.e byssinosis (brown lung)
2.	Chemical Agents	Weaving + Dyeing, Printing finishing, bleaching, washing, dry cleaning,	Contact and irritative dermatitis and cancer of: Gastrointestinal tract Thyroid Testis Non-Hodgkin's Lymphoma Throat Bladder Lung nasopharyngeal Oral cavity
3.	Noise	Machines, generators, boilers	Damage to eardrum and hearing loss, sleep disorders

Table-11: Health Impacts of Textile Industry

2) Health Impacts of Leather Industry

Areas	Health Impacts
Raw trimmings	The waste from raw hides if dumped openly can cause diseases such as anthrax.
Adhered dusted salt from rawhide	It is dumped openly in the area nearby and contains blood, hair, bacteria, etc which causes infectious diseases.
Fleshing	Waste from fleshing is also used to make poultry feed, it contains sulfide which can cause harmful effect.
Chrome wet trimmings and shaving waste	It has high Chrome concentration, and is secondarily used in poultry feeds from where it could end up in the human body, and could have carcinogenic effect.
Dry shaving	If not properly controlled it is emitted to surrounding air in the form of particulate matter (PM), which contains Chromium Oxide can cause respiratory problems.
Toxic air emission (Hydrogen Sulphide and Ammonia gas) from pre-tanning	Low level, long-term exposure to these gases can cause central nervous system diseases and respiratory problems. High level, short-term exposure to these gases can cause on spot death.
Wastewater	Wastewater goes into drains, and natural water bodies with dissolved high Chromium and other heavy metals end up in groundwater and could lead to cancer. High-level organics and chemicals (BOD & COD) in the wastewater is disastrous to aquatic life.

Table-12: Health impacts of Leather Industry.

12. Impacts of Textile and Leather Industries³¹

12.1 Short-term and Medium-term Health Impacts of Textile Industries

Textile industry particularly wet processing, uses variety of synthetic chemicals which also appears in the final effluent due to process constraints and inefficiencies. A portion of the chemicals present in the effluent of textile leaches out to groundwater which results in contamination of resources. Based on field visits to the industry, it has been found that textile effluents are highly polluted and seriously affecting the health of the near by communities. The residents suffered from bad odour of the textile wastes and were commonly suffering from asthma, and were also experiencing frequent headaches, sneezing, and influenza.

³¹ Literature review was verified by the field visits

12.2 Short-term and Medium-term Health Impacts of Leather Industries

- The intake of polluted groundwater near tannery areas can cause different hygienic problems such as skin ailments, allergies, neoplastic, and gastrointestinal problems.
- High acidity in water by effluents and heavy metals binding to the sulfhydryl group of amino acids can result in intestinal, mucosal, corrosion and inhibition of essential enzymatic activities.

Long-term/Chronic Impacts of Exposure

Textile

Chronic exposure may cause lung airway obstruction (which reduces ventilator capacity) and leads to disability and premature death³².

Leather

- The long-term exposure to leather dust, lead, NO₂, SO₂, H₂S in tannery may cause a high rate of morbidity and mortality.
- Aromatic amines and benzene based dyes are considered carcinogens. The prolonged exposure to these dyes causes bladder cancer in tannery workers.
- Prolonged exposure to the dimethylformamide (DMF) causes testicular cancer in the workers of tannery finishing department. The ratio of testicular cancer is 7.2 per cent among tanners as compared to others³³.
- Soft tissue sarcoma can be caused by exposure to Chlorophenols that is used in pre-tanning and tanning process.
- Exposure to leather dyes and fats causes skin cancer in tannery workers. The ratio of skin melanoma and skin cancer in female tannery workers is greater than males.
- The buccal cavity and pharynx cancer is observed in workers of tanning and liming workshops.
- The exposure to formaldehyde in tannery workers is leads to development of pancreatic cancer.

Heavy Metals in Textile and Leather Industries

Following table depicts the health impacts associated with heavy metals used in textile and leather industries:

³² Verified by field visits of SELCON Intl Team.
³³ Investigation Of A Testicular Cancer Cluster Using A Case ... (n.d.). Retrieved from https://www.researchgate.net/publication/20780526_Investigation_of_a_Testicular_

Toxic Heavy Metals	Type of Industry	Health Impacts
Arsenic (As)	Textiles	Nausea, vomiting, abnormal heart beat, skin and liver cancer.
Barium (Ba)	Textiles	Short-term exposure: vomiting, abdominal cramps, diarrhoea, difficulties in breathing, increased or decreased blood pressure, numbness around the face, and muscle weakness. Long-term exposure: high blood pressure, heart problems or paralysis.
Cadmium (Cd)	Textiles	Short-term exposure: irritation of stomach, vomiting, and diarrhoea. Long-term exposure: kidney problems, damage to lung, and fragile bones.
Chromium (Cr)	Textiles and Leather	Short-term exposure: nose ulcers, asthma, cough, shortness of breath and wheezing. Long-term exposure: damage to liver, kidney, circulatory and nerve tissues and skin irritation.
Lead (Pb)	Textiles	Long-term exposure: In adults can result in decreased performance of the nervous system; feebleness in fingers, wrists, or the ankles; small rises in blood pressure; and anaemia. Exposure to high lead levels can severely damage brain and kidneys and ultimately cause death.
Mercury (Hg)	Textiles and Leather	High levels can cause damage to the brain, kidneys, and developing foetuses. Short-term exposure: lung damage, nausea, increases in heart rate or blood pressure, vomiting, diarrhoea, skin rashes and eye irritation.
Selenium (Se)	Textiles	Short-term exposure: nausea, vomiting, and diarrhoea Long-term exposure: sclerosis (hair loss, nail brittleness, and neurological abnormalities)
Nickel (Ni)	Textiles	Exposure to high quantity of nickel can cause lung embolism, respiratory failure, birth defects, asthma and chronic bronchitis and heart disorders.
Aluminium (Al)	Textiles	Exposure to significant concentrations of aluminium cause damage to the nervous system, dementia, loss of memory, listlessness, severe trembling.
Cobalt (Co)	Textiles and Leather	Uptake of high concentrations of cobalt cause vomiting and nausea, vision problems, heart problems and thyroid damage.
Zinc (Zn)	Textiles	Uptake of large amounts of zinc can cause health problems i.e. stomach cramps, skin irritations, vomiting, nausea, and anemia.

Table-13: Health Impacts of Heavy Metals Used In Textile and Leather Industries³⁴

³⁴ Based on the survey research carried out by SELCON Team.

13. Impacts of Non-compliance of Environmental Laws on Health

13.1 Industrial workers

Health Assessment of workers

Through field surveys i.e. consultation with industrial workers and enquiring about the relevant health issues, the health of workers can be assessed. During surveys to the industries the following issues were observed that may cause health problems:

1. Workers do not use the Personal Protective Equipment (PPE);
2. Workers are ignorant of the health and safety protocols in the workplace;
3. Lack of interest of the employer;
4. Poor handling of hazardous chemicals;
5. Poor machinery management;
6. Poor internal drainage system;
7. Lack of safety signs and hazard indicators in the workplace;
8. Unavailability of complete data from substandard chemical suppliers.

During surveys in both textile and leather industries following potential hazards were identified:

- Fire
- Explosions
- Toxic release
- Chemical/gas leakage or reaction

Hazardous Chemicals	Health Hazards / Sickness
<ul style="list-style-type: none">• Explosives• Flammable Gases• Flammable Aerosols• Oxidizing Gases• Gases Under Pressure• Flammable Liquids• Flammable Solids• Self-Reactive Substances• Pyrophoric Liquids• Pyrophoric Solids• Self-Heating Substances• Substances which, in contact with water, emit flammable gases• Oxidizing Liquids• Oxidizing Solids• Organic Peroxides• Corrosive to Metals	<ul style="list-style-type: none">• Acute Toxicity• Skin Irritation• Hearing Damages• Eye Irritation• Respiratory or Skin Sensitization• Germ Cell Mutagenicity• Carcinogenic• Reproductive Toxicology• Target Organic Systematic Toxicity – (Single Exposure)• Target Organic Systematic Toxicity – (Repeated Exposure)

13.2 Workers Health / Sickness monitoring

Audiometric Tests for Workers

To reduce the health hazards and hearing loss caused by contaminated air and exposure to high noise levels, the main driver is to introduce audiometric testing into a workplace, that helps identify any immediate hearing limitations that may present a risk to workers operating in safety-sensitive role in the environment. The objective of the assessment is to determine whether an individual is suitable to perform his or her job without risk to himself or for others³⁵.

Hearing Protection

Noise exposure depends on the following aspects as per our findings during study:

Level of sound, measured in decibels on the A-scale(dBA).

Duration of employee's exposure to sound at various levels throughout the work period.

Calculation with noise dosimeter, which specifies daily noise dose in percent.

When is Hearing Protection Required?

As with other types of hazards, there is a need to implement feasible engineering and work practice controls before resorting to PPE, in this case, hearing protection.

OSHA's noise standard (29 CFR 1910.95 – set in the year 1995) requires the use of hearing protection when the employee's noise exposure exceeds an 8-hour time-weighted average sound level (TWA) of 90 dBA (dose of 100 per cent).

Employees who are exposed to an 8-hour TWA of 85 dBA (dose of 50 per cent) and who have measured hearing loss (as prescribed by the OSHA standard) are also required to wear hearing protection³⁶.

Hearing Conservation Programme (HCP)

All employees whose noise exposures equal or exceed an 8-hour TWA of 85 dBA must be included in a HCP.

According to OSHA, HCP is comprised of five basic elements:

- i) Exposure monitoring
- ii) Audiometric testing
- iii) Hearing protection
- iv) Employee training
- v) Record-keeping

Monitoring

Following are the important factors to reduce the exposure of employees to high noise level of 85 dBA or more:

- Regular noise monitoring in major processes including production and utility operations,
- Monitoring of any other employees that may be exposed due to their location or orientation, or
- Hearing protectors being used may be rendered inadequate.

³⁵ March 2013 Data Sheet Audiogram - Cannamm.(n.d.). Retrieved from <http://www.cannamm.com/wp-content/uploads/2013/12/Datasheet-Audiogram.pdf>
³⁶ Osha Training And Reference Materials Library - Ppe Assessment.(n.d.). Retrieved from https://www.osha.gov/dte/library/pep_assessment/pep_assessment.html

Audiometric Testing Program

- Monitors employee hearing acuity over time.
- Includes standard and annual audiograms and initiates training and follow-up procedures.
- Tests must be conducted by a professional or trained technician in an appropriate test environment.

Hearing Protection

- Must be made accessible to all the employees that are exposed to an 8-hour TWA of 85 dBA or more.
- Is mandatory for those who have experienced hearing loss, defined as a “Standard Threshold Shift” in the OSHA standard.
- Common types include earplugs and earmuffs.
- Hearing protector reduction capacity shown by its Noise Reduction Rating (NRR) on package.
- Proper fit is essential.

Training

Annual training required in:

- Effects of noise;
- Purpose, advantages, disadvantages, and attenuation characteristics of various types of hearing protectors;
- Selection, fitting and care of protectors; and
- Purposes and procedures of audiometric testing.

Record-keeping

- Noise exposure records must be kept for 2 years.
- Records of audiometric test results must be maintained for duration of affected employee's employment.

13.3 Community Health Impacts

As per the information gathered from the industries through field survey, following diseases are associated with textile and leather industry:

Waterborne diseases:

- Malaria
- Typhoid
- Abdominal Pain

Airborne diseases:

- Asthma
- Eye Irritation
- Bronchitis
- Skin diseases

14. Critical Analysis of Environmental Laws

14.1 The effectiveness of existing different sectoral laws on water, air, noise and solid waste:

To assess the scope of effectiveness for different sectoral laws, mentioned in this report, for the general public, there are two main factors which may attract people to comply with such laws, rules and regulations, made thereunder, such as:

14.1.1 Rewards/Awards/Positive Incentives

In existing general laws related to water, air, noise and solid waste, there is no mechanism provided for launching effective public awareness campaign to educate the masses about the concept of clean environment as a basic human right and responsibility we all share to maintain a healthy environment. Article 9 of the Constitution speaks about pollution free peaceful and healthy environment.

Due to lack of awareness and education about environmental issues, it is difficult to encourage industries to compliance with such legislation. There is a need to educate them about the value of cleaner production and it will equally be beneficial to awareness general public to see clean environment as their legal right. This step will inspire people to participate in environmental conservation activities. This will eventually pressurize the industries to voluntarily comply with environmental legislation as compared to imposing fines or penalties. It is understood that environmental laws of Pakistan are remedial in nature rather than punitive.

14.1.2 Imposition of Penalties/Punishments/Convictions

The magnitude of penalties/conviction/punishments provided in general legislation on water, air, noise and solid waste are important factors to evaluate their effectiveness in environmental conservation. The quantum of fines/penalties in general sectoral laws is very low; fines start from PKR 100 up to PKR 1,000 only and imprisonment from a month to 2 years. These light penalties and punishments do not prove effective in compliance of existing legislation. For effective compliance of said laws, there is a need to introduce amendments therein by increasing the fine/penalty amount in conformity with the capacity of polluters to pay the penalties, as well as, to address the need for combating the prevailing increase in the ratio of environmental crimes.

15. Evaluation of the Compliance Effectiveness of Different Provisions of Existing Environmental Legislation

15.1 Ineffective Compliance:

One of the main reasons of ineffective compliance of existing environmental legislation is that Pakistan did not make appropriate investments in developing the capacity of professional cadres of Environmental Managers, Lawyers, Specialists, and Experts to administer and implement the these laws and policies. The EPAs were ignored in budgetary allocations for trainings and no Environmental Laboratories with advanced equipment to monitor and evaluate data were set up³⁸.

In result under-resourcing of EPAs, Pakistan still lacks managerial, professional and techno-legal capability to support effective compliance with environmental laws and policies. The government did not commit to educating public or developing contemporary environmental syllabus in educational institutions from primary onwards. This is the major reason that environmental management has not been mainstreamed in our national policy.

³⁸ The Official Budget Document for Fiscal Year 2017-2018

Another pertinent contributing factor towards lack of awareness on environmental issues and non-compliance may be the lack of interest by university students to take up environmental legal education as a subject which is apparent from the data obtained from the University of Punjab, for students in LLB Part III exams³⁹.

In the absence of incentives provided by environmental institutions, students are showing less interest in opting for environmental law as an optional subject.

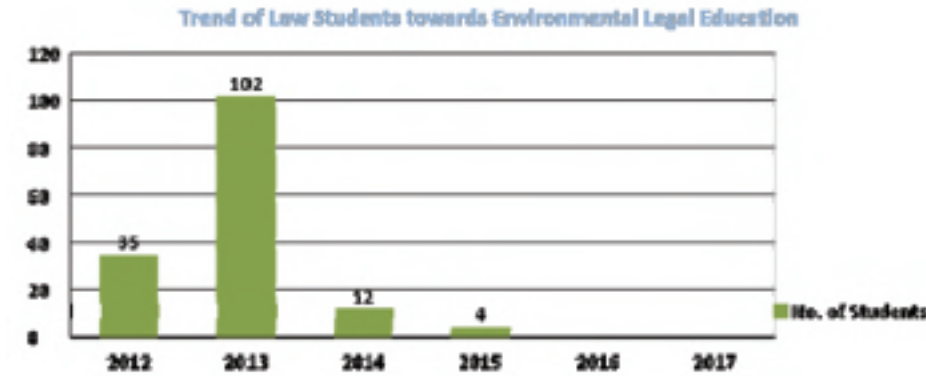


Figure 9: Depicting the number of Law students appeared in LLB Part-III Exams with Environmental Law paper comprising 100 marks (as an optional subject) from Law colleges affiliated with the University of the Punjab from the year 2012 to 2017⁴⁰.

Other reasons behind ineffective compliance of environmental legislations include lack of public awareness about filing a case against environmental grievance, non-functioning of some of the Environmental Tribunals and Environmental Magistrates, irregular meetings of the Environmental Protection Councils, stringent NEQS which are difficult for the industry to meet with and lack of trained and motivated personnel in the provincial EPAs.

Note: A case law on pollution related to Leather Industry is attached as Annexure IX.

15.2 Concluding Remarks

For increase effectiveness of said legal and institutional arrangements, there should be a credible monitoring and enforcement system immediately put into place, and innovative technologies and modern techniques should be introduced. It is estimated that about 80 per cent of the industrial units are medium and small size industries having insufficient knowledge of environmental issues and so much, so they have no up-to-date technical competence and not enough financial resources to solve these environmental problems.

To redress their grievances, there is need to provide the industries sustained technical support for self-monitoring of their pollution levels, and afterward, they may report the same to the regulatory authorities such as EPAs.

It is concluded that alongside air, water, noise and solid waste laws, there is a need for additional rules and regulations for effective compliance with environmental legislation, such as:

- a) Noise Pollution Control Rules
- b) Odour Pollution Control Rules
- c) Radiation Protection Rules
- d) Vibration Control Rules
- e) Municipal Solid Waste Management Rules

By introducing a regular process of engaging public as a whole through awareness campaigns and by developing community participatory mechanisms, public pressure can be built to improve efforts in effective compliance with environmental laws/legislation and the rules and regulations made thereunder for environmental conservation.

³⁹ Data obtained from the Registrar's office in The University of Punjab

⁴⁰ Data collected from Office of the Controller Examination – University of the Punjab

16. Opportunities for Enhanced Implementation of Environmental Legislations in Leather and Textile Sector

16.1 In-House Improvement

Cleaner Production

The global demand in environment friendly products and services has increased due to pollution caused by industries. While industries in Pakistan faces serious challenges in attracting investment and human capital needed to meet these demands. In 1989, UNEP introduced cleaner production concept, which offers incentives to industries to implement environmental and other regulatory standards. The basis of cleaner production is the efficient use of resources, and it is defined as increasing the scale of production while minimizing the exploitation of limited resources across the value chain and life cycle of a product.

The application of cleaner production will help enhance productivity of industries, give a boost to the national economy and build up the Pakistani “brand” as a green supply chain, while also decreasing the pollution and harm to the environment. Companies will have more profits and will be more competitive in the international market. Manufacturing high-quality and cost-effective products, developed on cleaner production techniques will not only reduce industrial requirements of energy, water, and material use, but also reduce environmental degradation. (NPO, CPI)

The following table shows cleaner production techniques:

Methods of Cleaner Production	
1. Purchasing and Storage	<ul style="list-style-type: none">● Promote cheaper source of energy, water, and materials● Perform predictive analysis of the resources price● Limit utilization of emergency sources
2. Process Operation	<ul style="list-style-type: none">● Identification of consuming processes● Training of workers at floor level● Load management to limit consumption peaks● Control process deviations● Set up corrective action plans
3. Maintenance	<ul style="list-style-type: none">● Effectively diagnose the problems● Improve reliability of equipment through Reliability Centred Maintenance● Set up corrective action plans
4. Process Optimization and Process Control	<ul style="list-style-type: none">● Introduce environmentally benign processes● Introduce automation and control
5. New Equipment Infrastructure	<ul style="list-style-type: none">● Invest in cleaner equipment● Invest to improve efficiency of the process● Improve efficiency of resource distribution systems

Table-15: Ways of Cleaner Production

16.2 Resource Efficiency

Energy efficiency measures include:

- Metering,
- Installation of energy efficient lighting,
- Thermal insulation of steam lines and valves,
- Thermal insulation of the boiler,
- Tuning of the boilers' burners and improvement of the air to fuel ratio,
- Installation of heat recovery from exhaust-flue gases,
- Repair of steam and condensate leakages,
- Limit unnecessary use of compressed air,
- Improve maintenance operation,
- Installation of energy efficient motors,
- Recover heat from wastewater,
- Control temperature of drying process, and
- Improve maintenance of machines and equipment.

Water efficiency measures:

- Water metering
- Reuse of cooling water in the process,
- Water optimization through automation, and
- Reuse of RO rejected water.

16.3 Combined Effluent Treatment Plants (CETP)

The primary objective of the combined effluent treatment plant (CETP) is to benefit communities and to meet the NEQS and other standards which are the requirement of the foreign customers. The installation of CETP is not only beneficial for human and environment, but it also enhances the export of textile and leather products.

The first plant was installed in Kasur with the support of the United Nations Industrial Development Organization (UNIDO). The combined effluent treatment plant was based on primary treatment only and capable of handling 13,000 m³/day effluents from 230 tanneries⁴¹. Presently the UNIDO is facilitating the installation of combined effluent treatment plant in Sialkot tannery zone, as well⁴².

In Pakistan the first combined effluent treatment plant having secondary treatment was setup in Korangi Industrial Area, Karachi for tanneries wastewater treatment by the partnership of different stakeholders such as Pakistan Tanners Association (PTA) (Southern Zone); Trade Development Authority of Pakistan (TDAP); Ministry of Commerce, government of Sindh; government of Pakistan; government of Netherlands, and City District Government, Karachi. The total cost of the combined effluent treatment plant (CETP) was PKR. 492 million. The CETP covered the area of about 15 acres and fulfilled the requirement of 150 tanneries of Korangi cluster. The capacity of CETP was 42,000 m³/day. The plant was based on Up-flow Anaerobic Sludge Blanket (UASB), a Dutch technology which has low maintenance and operational cost. Tannery effluent was brought from the individual tannery to the main CETP over a distance of 12 km (PTA).

⁴¹ <https://leatherpanel.org/content/kasur-tannery-pollution-control-project-pakistan>
⁴² <https://leatherpanel.org/content/kasur-tannery-pollution-control-project-pakistan>

17. Environmental Rights of Citizens

The citizens should have a right to safe environment for their well-being and health. They should also work with environmental organizations or the government to get access to information about the current environmental state. They should be involved in public hearings/meetings on the impacts to the environment of the planned project at all the stages of the design, construction and operation, conducted by concerned authority and proponents. They should be active stakeholders in conversing and making implications to the draft rules, resources for the construction of projects that may concern the environment, and also have a right to present proposals to national and local environment governing authorities involved in decision making.

18. Environmental Awareness and Public Access to Environmental Justice

Following are the ways, using which we can create awareness:

Making environmental education a compulsory part of the syllabus from the school level.

Educate masses about rising environmental issues through electronic and print media such as:

- writing articles on environmental issues;
- conduct environmental rallies;
 - organize plantation drives;
 - TV serials and movies on real stories of eco-disasters and conservation efforts successes.

Provide the vulnerable communities with the indispensable orientation and training by organizing training programmes and workshops.

- The ministry of environment and other environment related departments can publicize environment-related issues in the form of pamphlets or booklets.
- Social media should also be used as a potent medium for awareness campaigns, especially to the younger generation.
- Voluntary associations can be established who facilitate the government by informing about local environmental matters and also interact at the grass-root levels for their involvement in the solving of problems.

19. Conclusion

Through a detailed review and after an intensive study and observation, it is concluded that:

1. Lack of environmental education or awareness among workers;
2. Widely unplanned land use models, industrial expansions without environmental assessments;
3. No advice and assistance from EPA to ensure compliance with the set environmental standards during their commercial and industrial activities; and
4. Insufficient energy and power generation.

It was observed that water and air pollution was common in leather and textile sector, causing a high degree of environmental degradation. As per objectives of the study, it was tried to critically observe the current state of non-compliance of environmental legislation in leather and textile sector, the challenges involved therein and the adverse impacts on the health of industrial workers and the surrounding communities.

Government is integrating environmental protection into development plans. However, in different infrastructure development projects in Punjab, government did not take into account the requisite provisions of relevant legislation to mitigate the severity of adverse effects of the development work causing damage to the environment. This resulted in initiation of environmental litigation in superior courts of law, wherefrom due to the issuance of restraining orders, the underway projects remained suspended for a while. Generally, the initiatives like setting up, expansion and operation of industrial units often result in objectionable effluents and emissions polluting the environment. This leads to various environmental issues and causes disturbance to nearby residents which ultimately results in public complaints against

such industrial units and subsequent legal proceedings initiated by the law enforcing agency in the Green Courts of Law. To address environmental issues, an environmental legislation, which is duly enforced, is essential. The Pakistan Environmental Protection Act 1997 attains the Federal Status whereas all the provinces have promulgated their own Environmental Protection Acts. Punjab has also promulgated its environmental law titled, The Punjab Environmental Protection Act 1997 (Amendment), 2012.

It was also observed that support of civil society organizations (like IUCN, WWF, etc.) and legal community has also been helpful in the development of a green lobby in Pakistan. It is concluded that the objectives of the study can be accomplished by ensuring the smooth compliance of environmental legislation by removing deficiencies, discrepancies, lacunas and flaws, found in its text.

20. Recommendation to Improve Environmental Laws and Policies

Following are recommendations to be considered with optimistic approach during the course of environmental legal review process by the concerned institutions and government functionary, in future.

Encourage industrial sector to adopt modern treatment techniques and technologies by the installation of electronic emissions control devices, as well as, effluent treatment plants, as the case may be.

- Establish combined effluent treatment plants for a cluster of industries who cannot afford to run individual effluent treatment plants due to financial, physical, and technological limitations.

The government should publicize environmental reports and devise a moderate rating system to provide incentives/rewards/tax rebates to the relevant industrial entrepreneurs according to their performance in compliance with environmental legislation.

- In all small and medium industries, environmental management system should be made compulsory along with mandatory capacity building of the workforce through trainings and workshops.

All Pakistan Textile Mills Association (APTMA), All Pakistan Textile Processing Mills Association (APTPMA),

- Pakistan Textile Exporters Association (PTEA), Pakistan Tanners Association (PTA), Pakistan Leather Garments Manufacturers and Exporters Association (PLGMEA), Chamber of Commerce and Industries,
- Water and Sanitation Agency (WASA), Provincial Environmental Protection Agencies (EPAs) and other relevant public sector organizations should be part of one forum for better coordination and collaboration in environmental compliance through training of their staff and joint research.

Cleaner production practices should be promoted and incentivized in the industrial estates.

Industrial symbiosis should be introduced at master plan of industrial estate.

- During all level of project's phases such as planning, designing, construction, and operation, the relevant person of the project or organization should comply with environmental and socio-economic requirements.
- Ensure active participation of NGOs, INGOs, academia and civil society in environmental protection activities.

In case of damage to health, safety, or property of industrial workers and nearby community as a result of a violation of environmental legislation, the rating procedure for the compensation paid by the polluters and industry owners to the aggrieved should be prescribed.

- An online automated system for acquiring any information regarding analytical and environmental auditing system should be evolved to get access to up to date ambient environmental conditions in and around the industries.
- Industrial estates and zones should be established far from populated areas where the community would not get adversely affected or displaced due to the pollutants discharged from the industries.

Pak-EPA and other provincial environmental protection agencies should set industry specific standards rather than general or uniform standards and also take into account the geographical and ecological conditions of the area where the industry is proposed to be installed.

- Educational resources, awareness materials and compliance assistance tools should be prescribed for the use of community, small and medium businesses and efforts are made for their application in reducing the sources of pollution.

- A standardized computerized system should be developed at provincial and national level for collecting, sustaining and utilizing data of compliance and enforcement of environmental laws and regulations.
- An effective mechanism should be developed that would facilitate to minimize the communication gaps between communities and environmental management authorities to resolve environmental issues. In this regard, city-wide partnership forums should be established in all the major cities of Pakistan.
- Most importantly the particular subject of environmental protection and awareness should be a compulsory part of syllabi from primary onwards, especially in legal and technical educational institutions.
- The national and provincial environmental protection councils should launch awareness campaigns on all mediums, especially social media to sensitize people about their environmental rights and how to obtain justice should these rights get infringed.
- National and Provincial governments should make a panel of environmental lawyers/attorneys who may initiate environmental litigation in public interest through green benches established in superior constitutional courts of law for getting directions to the concerned quarters for the implementation/compliance of environmental legislation in letter and spirit for pollution free environment.

The environmental councils and agencies in collaboration with the health department should make regulations by prescribing procedures to meet new and emerging environmental challenges.

Policymakers, Chambers of Commerce and Industry and regulators must develop a joint programme

- giving awareness about the benefits of adopting cleaner production technologies by facilitating SMEs in obtaining green loans from banks to acquire the specific energy-efficient technologies, train the workforce and technology service providers to enhance their efficiency performance to comply with relevant environmental laws and policies.

Integration of environmental concerns in landscaping, economic and spatial planning.

The regulations to deal with noise pollution from railway engines, aircraft, industrial or construction activities should be promulgated.

- Provincial effluent control standards for end of pipe industrial, commercial and municipal wastewater should be made.
- The provincial emissions control standards for flue gases, process gases, burning products, incineration products, combustion products and particulate matter entering from industrial activities, motor vehicle exhaust standards should also be notified.
- Modern and relevant guidelines and legal framework for controlling water pollution should be introduced by the environmental protection councils and agencies to combat water pollution.
- The provisions of suomotu powers under suomotu modusoperandi vested to the Environmental Tribunal to notice, adjudicate, prosecute or punish the offenders/contraveners/violators/defaulters to resolve the environmental controversies/conflicts effectively should be incorporated in the PEPA Act 1997 Amended 2012.

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