

Environmental Pollution and Regulatory and Non-Regulatory Environmental Responsibility (Reviewing Pakistan Environmental Protection Act)

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Abstract

Pakistan is the fifth most populous country of the world, and also the most polluted countries of the world with severe air quality, water scarcity, soaring and frequent rising temperature, devastating floods and droughts at the same time. This study evaluates the efforts done by the Government to deal with air-pollution. This study briefly reviews the environmental protection law of Pakistan and analyzes the pollution data from 1990 to 2020 to check the pollution level in Pakistan. The rapid population growth and urbanization, industrial development and unchecked and uncontrolled PM and carbon emissions are causing significant ill environmental in the country. Government of Pakistan has formulated various acts and polices to combat pollution, like National Environment Action Plan (NEAP), Pakistan Environmental Protection Act, 1997 (PEPA-97), and Environmental Impact Assessment (EIA), and CLEAN Central Laboratory for Environmental Analysis and Networking. Unfortunately, the role of Government and regulatory authorities is questionable as they are not prioritizing this sever issue, resultantly, environmental degradation and impacting public health.

Keywords

Pakistan, Environment, Pollution, Urbanization, PEPA, Regulations, Public Health

1. Introduction

Pakistan, officially “Islamic Republic of Pakistan” situated in South Asian region is the fifth most populous country of the world consisting population of 243 mil-

lion people, and in terms of area, it is the 33rd largest country of the world spanning 881,913 square kilometers (Worldometer, 2023). It is expected that Pakistan's population will exceed more than 300 million at the end of 21st century which is even greater than entire United States of America (United Nations). Pakistan is facing multiple issues like, political instability, corruption, huge financial crisis, terrorist attacks, monarchy, and huge indetermination among the people living there (Girling, 1997; Hafeez, 2005). Apart from such serious issues, Pakistan is one of the most polluted countries of the world with severe air quality, water scarcity, soaring and frequent rising temperature, devastating floods and droughts at the same time. Pollution growth contributes big time in environmental degradation (Faruqee & Kemal, 1996). The rapid population growth and urbanization, industrial development and unchecked and uncontrolled carbon emissions are causing significant ill environmental issues in the country (Javed et al., 1997). South Asia is one of the most effected regions because of climate change (Falak et al., 2022). Pakistan, India and Bangladesh are facing sever deforestation, water pollution, air pollution and other environmental issues. Environmental issues are critical and perilous, because most of the people are not aware of its consequences and risks (Leiserowitz, 2005). The Global Climate Index listed Pakistan seventh most vulnerable country to Climate change (Eckstein et al., 2018). In developing countries, mostly textile, chemical, pharmaceutical, cement, pesticide, glass, ceramic, electrical and electronic equipment, pulp and paper board and leather tanning industries across the country are not familiar with proper waste discharge practices (Iqbal et al., 2022). Solid Waste Management (SWM) is one of the biggest challenges in every city across Pakistan but unfortunately, the role of Government and regulatory authorities are not prioritizing this sever issue, resultantly, environmental degradation and impacting public health particularly in urban areas (Iqbal et al., 2022). Today, every single country of the world is discussing and conferring this issue at every possible platform to ensure the safety of the people and other species living across (World Economic Forum). There are many environmental issues that are reverting Pakistan big time.

Objective of the Studies:

This study evaluates the efforts done by the Government of Pakistan to deal with Environmental issues. This study briefly reviews the environmental protection law (PEPA-1997), efforts and amendments done so far to achieve its goals. I have analyzed the pollution data from 1990 to 2020 from the Our World in data to check the pollution level in Pakistan and compared it with neighboring countries.

2. Environmental Regulatory Authorities and Theoretical Framework

Pakistan Environment Ministry was established in 1975 following up Stockholm declaration in 1972, they drafted initial environment protection law Pakistan

Environmental Protection Ordinance (PEPO) in 1983 (Ahsan & Khawaja, 2013). Environmental regulations refer to the compulsory and strict environmental standards in any country to ensure safety of its people and implement strict limits on production and operational firms to keep an eye on waste and pollution discharge (Arrow et al., 1996). Market-based-approaches are referred as clever form of governmental practices to control environmental pollution. The government constructs environmental protection regulations and implement them under the administration of the government formed institutions and bodies. Government of Pakistan has formulated various acts and polices to combat pollution, like National Environment Action Plan (NEAP), Pakistan Environmental Protection Act, 1997 (PEPA-97), and Environmental Impact Assessment (EIA), and CLEAN Central Laboratory for Environmental Analysis and Networking (Nadeem & Hameed, 2008).

2.1. Pakistan Environmental Protection Act, 1997 (PEPA-97)

Pakistan Environmental Protection Act, 1997 (PEPA-97) was formulated and implemented in 1997 to prevent and control pollution and attainment of stable development with an agenda of protection, conservation, and rehabilitation of environment. And there has been series of amendments in rules and regulations till 1997 to make them more beneficial and useable.

Functions of PEPA:

PEPA usually operates under Federal Agency and provincial Agencies and investigates environmental issues either of its own accord or complaints of individuals or organizations to check manipulations (Sanchez-Triana et al., 2013). Main function of PEPA is preparation, establishment, and revision of net explosive quantity (NEQ's) which includes,

- Ensure enforcement of NEQ's
- Setting standards for quality of air, land, and water
- Establishing a system in which pollution should be controlled and prevented.
- Taking regular surveys, monitoring, and inspection
- Estimating the cost associated with cleanup process and rehabilitation
- Certify and approve laboratories to conduct tests and analysis of environment
- Providing advice and assistance and promoting education and public awareness of environmental issues and challenges
- Encourage the formation of village organizations and NGO's to educate people and take necessary measures to control pollution and promote sustainable development.

2.2. Central Laboratory for Environmental Analysis and Networking (CLEAN)

CLEAN Pakistan Environmental protection Agency was established under section 5 of Pakistan Environmental Act (PEPA) 1997. Main functions of CLEAN are to enforce PEPA 1997 rules and regulations.

2.3. Legal Enforcement Directorate of Pakistan Environmental Protection Agency

Legal Enforcement (L/E) Directorate of Pakistan Environmental Protection Agency plays an important role in enforcement and implementation of National Environmental Quality Standards (NEQS) and environmental laws.

Identify and overcome constraints effecting enforcement of environmental laws as well as National Environmental Quality Standards (NEQS).

- 1) Determination of new legislation and propose amendments if needed in the existing laws.
- 2) Provide legal opinion on any environmental issue which is under considerations.
- 3) Submission of proposal and legal sanctions under section 16 of PEPA Act, 1997.
- 4) Ensure check and balances to avoid violations by Environmental Monitoring Team.
- 5) Serve summon notices or Environmental Protection Order (EPO) to the offender when required.
- 6) Preparation of cases for Environmental Protection Tribunal (EPT), sending appeals in the High Courts for further legal procedures.
- 7) Obtain search warrants for inspection of pollution sources.
- 8) Discharging duties and coordination with Environmental Magistrate.
- 9) Submission of stance of the Govt. in the courts and defending Federal Government.
- 10) Work with other regulatory bodies and NGO's to ensure environmental safety and development.

3. Environmental Pollution and Role of Regulations (Review and Data Analysis)

Unfortunately, the regulatory authorities, political parties and people are doing not enough efforts to deal with environmental issues (Khwaja, 2012). Government plays necessary role to protect environment, but the question becomes "how they can". Market-based-approaches are successful in many developed countries where Government take some serious actions and engage private firms and individuals to protect environment (West & Wolverson, 2005). These market based regulations includes economic incentives such as emission taxes, tax subsidies, environmental subsidies and introducing tradeable pollution permits. In contrast government also introduces some Command-and-control regulations. Pakistan is facing the biggest financial crisis followed by the political instability, corruption, and law and order situation which are superseding the environmental goals. In recent years, Pakistan has seen massive development and especially experienced GDP growth rates and declines in poverty and stability in economic growth (WDI). Despite economic development, Pakistan's natural resources and environment is highly polluted and under stress (Asian Development Bank, 2008). In

2017, The World Bank reported that Air pollution, noise pollution and inadequate supply of drinking water to the major cities are the major environmental issues of the country. Unprecedented urbanization, industrial growth, and population pressure drinking water is one of the most critical issues of Pakistan (Jabeen et al., 2015). Scarcity of water and polluted water was not even discussed in Pakistan until the early 1990s. Pakistan Medical Research Council recognized that drinking polluted water is one of the prime reasons of diseases in Pakistan. Poor Water quality brings diseases like hepatitis, typhoid, cholera, dengue fever and malaria, chaotic urbanization, poor hygienic conditions, industrialization, and inappropriate water resource management collectively increasing these diseases (Ahmed et al., 2016). To overcome this issue a lot of efforts were being made by the Government and nearly half of the population had access to clean water by 1990 but varies by area to area. In Punjab, for example 90% of drinkable water comes from groundwater while only 9% in Sindh. Noise pollution is yet another major issue in Pakistan, especially in mega cities such as Karachi, Lahore, Faisalabad, Islamabad, Peshawar, and Rawalpindi (Table 1). One of the key reasons behind noise pollution is traffic noise caused by auto rickshaws, heavy trucks, buses, cars, water tankers and motorcycles. A recent study from the Pakistan Council of Scientific and Industrial Research on noise pollution is really alarming which showed that traffic noise on G.T road Karachi is more than 90 Db and it is expected to reach about 110 Db which is extremely alarming because it is much higher than ISO's average standard noise level of 70 Db (Aziz et al., 2022). The Environmental Protection Agency set the traffic noise levels limit to 85 Db as National environment quality standards. This high level of noise pollution has caused many auditory (includes the loss of hearing sensory cells) and no auditory (includes sleeping disturbance, noise and cardiovascular diseases and psychiatric disorders) health issues. Unfortunately, there are few laws and policies to control traffic noise, but nobody cares which puts the question mark on the performance and accountability of the regulatory bodies of Pakistan.

Every day Federal and Provincial Environmental protection agencies of Pakistan receives thousands of complaints to control noise pollution from the public but there is a complete silence from the authorities and regulatory bodies due to legal constraints and absence of National Noise level standards in Pakistan. Climate change is one of the major problems of the world and emission of Greenhouse gas has affected the people and the environment around the world. Although Pakistan is not the larger emitter of Greenhouse gases as compare to other major countries of the world, however being a global phenomenon, it has greatly affected the country.

The above pictures (Figure 1) show the normal October day in Lahore, the picture displays number of the traffic rules violations and level of smog (Acid rain) is extremely high. You can rarely see traffic coming from the opposite side. Economic Survey of Pakistan 2020-21 has reported the "increase in frequency and intensity of extreme weather events coupled with erratic monsoon rains causing frequent and intense floods and droughts in Pakistan". The survey also

Table 1. Top 5 most polluted cities of the World.

Major city	US AQI
Karachi, Pakistan	191
Lahore, Pakistan	183
Hanoi, Vietnam	183
Chiang Mai, Thailand	180
Shanghai, China	179

**Figure 1.** Questionable role of regulations.

mentioned about the frequent changes in weather patterns and climate changes are the most prominent concerns of Pakistan. It had destroyed infrastructure and taken many lives of the people due to heavy floods devastating agriculture sector of Pakistan, which has negatively affected economy of Pakistan. According to the BBC Survey and its Climate Asia report, majority of the people living in Pakistan has observed directly or indirectly consequences of Climate changes because of floods, droughts and most importantly unavailability of energy and water. More than 53% of the Pakistani's felt that their lives are worse off than they were few years ago due to pollution and continuous climate changes. Air is the most integral and crucial need of people but sadly air is more vitiated than others. Heavy clouds of Smokes yielding from manufacturing plants, vehicles, profit-making enterprises, and homes are constructing of air contamination (Lee & Greenstone, 2021, Annual Update, Air Quality Life Index).

Figure 2 reviews the serious health issues caused by the Air pollution, particularly focusing on particulate matter (PM) globally. Particulate Matter 2.5 (PM_{2.5}), referred as particle pollution is a composite mixture of extremely tiny particles (that are one half microns, micron is used to measure distance like miles, meters, centimeters, and inches. One inch consists of 25,000 microns.) and liquid droplets that are discharged into the air. PM 2.5 is one of the most severe air pollutants to health-related issues. All air pollutants have negative health impacts, but Particulate Matter 2.5 has more concerns because of its smaller diameter which is less than 2.5 μm since they can infiltrate into the lungs causing respiratory health disorders. Air pollution is a thriving environmental argument in Pakistan, especially in the populous metropolises.

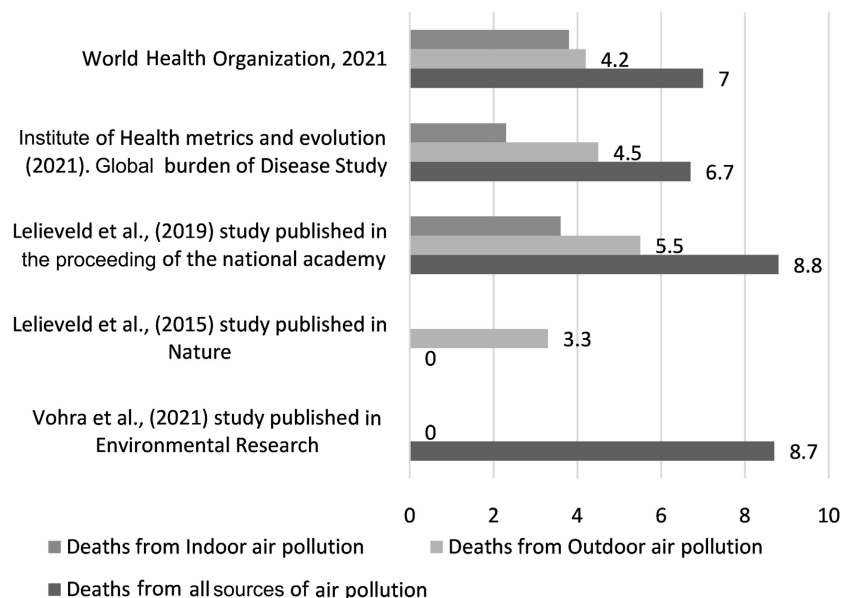


Figure 2. Air pollution and number of casualties in millions (from different studies).

According to a World Bank report, “Pakistan’s urban air pollution is among the most severe in the world and it engenders significant damages to human health and the economy”. Households air pollution (HAP) caused by the solid fuels for the daily life remains one of the leading risk factors for the global disease burden because of ambient particulate Matter (P.M 2.5) pollution (Bennitt et al., 2021). The careless and unskilled use of energy, expansion in the number of vehicles, development in unchecked industrial emissions and the burning of plastic and rubber materials, solid wastes and other garbage have committed the maximum to air pollution in metropolises. Air pollution and Combustion emissions of carbon and other deadly gases from domestic and commercial use mostly in densely populated regions contributes to excessive mortality rates because of respiratory issues, cardiovascular and other linked disease (Lelieveld et al., 2019). The developing fetus, children (younger than 5 years of age) biologically and neurologically are more susceptible to the adverse effects of air pollutants from than adults (Vohra et al., 2021). According to a recent study, Pakistan’s Environment Protection Department verifies that the average level of pollution in urban areas of Pakistan is more or less four times greater than the limits set by the World Health Organization. These uncontrolled smokes and poisonous toxic gases emissions have destructive effects on individuals causing respiratory diseases, loss of vegetation, reducing visibility, and other deadly diseases (Figure 3).

The above-mentioned graphs are showing annual exposure of PM 2.5 in micrograms per cubic meter from 1990 to 2017 (Figure 4 & Figure 5). These visuals are showing different trends of air pollution in different countries. It can be observed there is a great variation of annual exposure of PM 2.5 among different countries. Especially countries like Saudi Arabia, Egypt, and Libya are extremes. They are roughly making exposures at $105 \mu\text{g}/\text{m}^3$, which is approximately twenty times higher as compare to countries across Europe, North America, and Ocea-

nia as they had moderate level of annual exposures of PM 2.5 at 5 - 10 $\mu\text{g}/\text{m}^3$. And if talk about Pakistan, India, and China air pollution is one of the key problems of South Asian countries. Air pollution is constantly increasing in India

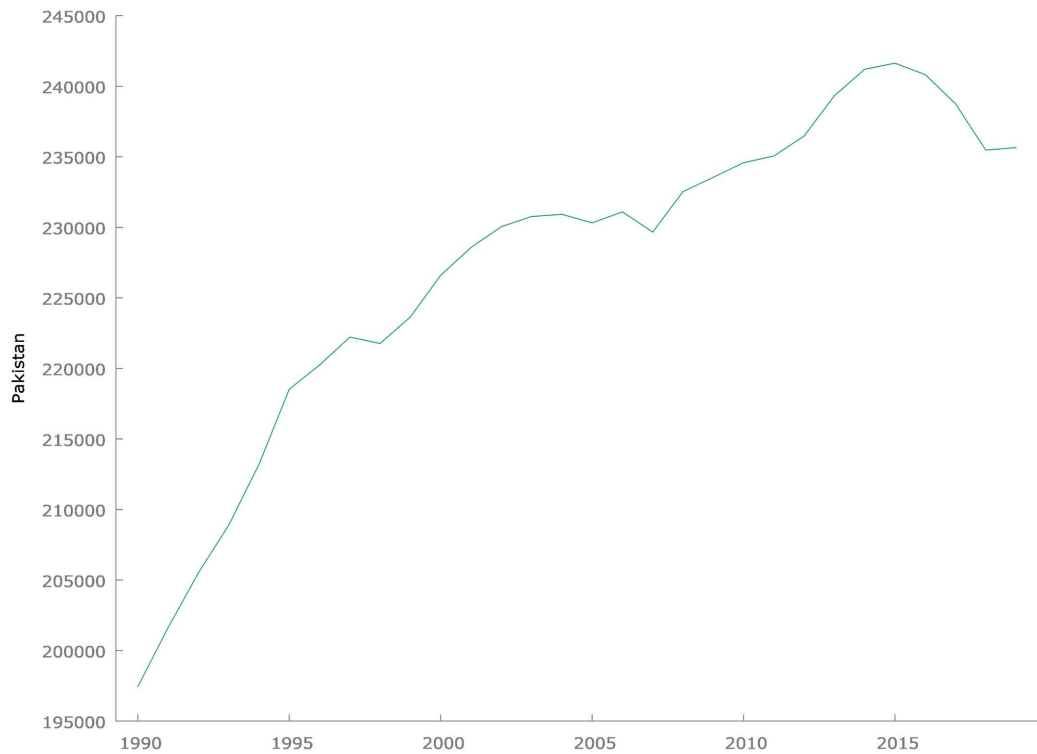


Figure 3. Deaths from air pollution in Pakistan from 1990 to 2020. Source: Shaffer et al. (2019) Environmental Health Perspectives.

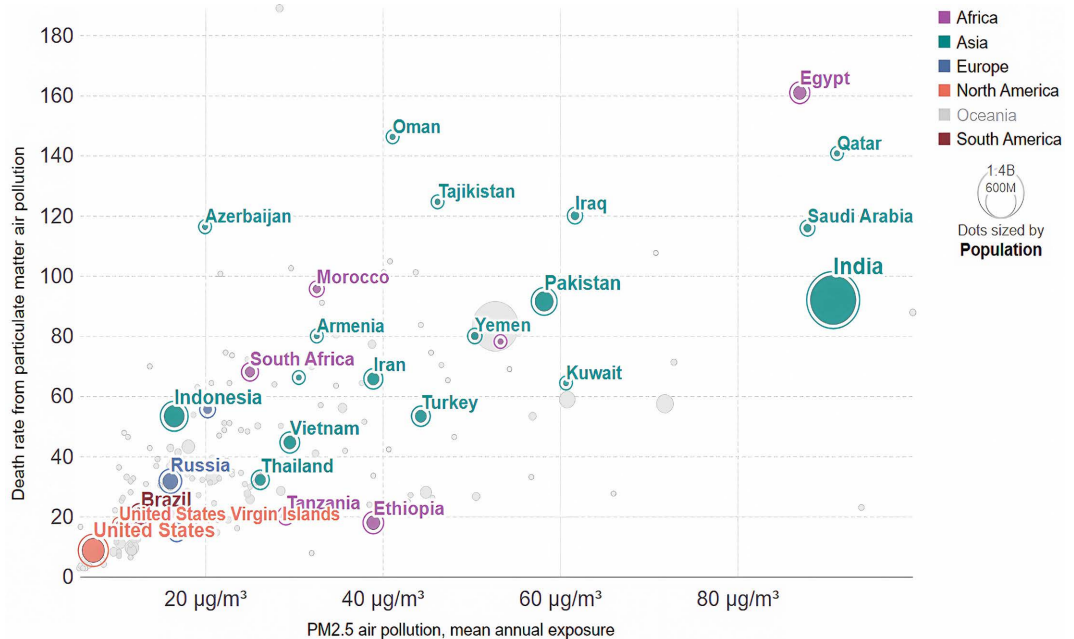


Figure 4. Death rates from PM 2.5 air pollution. Source: Cohen et al. (2017) via World Bank/our world in data.

Exposure to air pollution with fine particulate matter, 1990 to 2017

Population-weighted average level of exposure to concentrations of suspended particles measuring less than 2.5 microns in diameter (PM_{2.5}). Exposure is measured in micrograms of PM_{2.5} per cubic metre ($\mu\text{g}/\text{m}^3$).

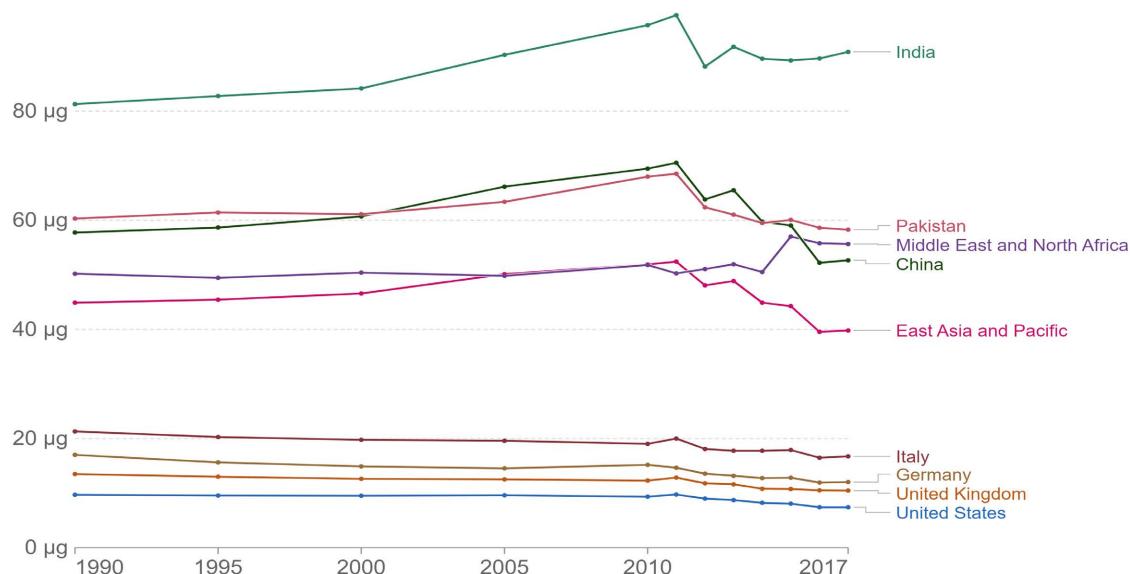


Figure 5. Exposure to air pollution from with fine particulate matter. Source: Cohen et al. (2017) via World Bank/our world in data (Roser, 2021).

since 1990 with annual exposure of $75 \mu\text{g}/\text{m}^3$ approximately, followed by Pakistan $60 \mu\text{g}/\text{m}^3$. If we compare Pakistan with India and China, it is the second largest country exposed to PM 2.5 but it is very smaller in size and population comparatively. Air pollution linked to PM 2.5 causes many health issues, including chronic obstructive pulmonary disease (COPD), impacting ozone (O₃), cerebrovascular disease (CEV), ischemic heart disease (IHD), lung cancer (LC) and acute lower respiratory illness (Lelieveld et al., 2015). There are many reasons of such higher pollution patterns in Pakistan but the regulatory and non-regulatory approaches to control pollution are not valid or not doing their work properly. There are so many driving forces affecting environment in Pakistan. Short-term interests, and unplanned developmental projects have contributed most to resource degradation and environment (Park, 2013, The Environment and Climate Change Outlook of Pakistan). The deteriorating urban air quality and intense climate changes are affecting atmospheric ecosystem across country. Unchecked and uncontrolled automobiles, enhanced use of chemicals and no proper monitoring from the government side are alarming. If you travel to Pakistan, you will observe extreme violations of the rules and regulations from the production units and individuals as well. Last year, during my visit to the country, I have observed industrialists discharge deadly gases freely into air and throw their chemical waste water without any treatment. There is not even a concept of getting fitness certificate for their vehicles. Traditional bricks production methods are very much active in Pakistan. Government of Pakistan has never talked about this in any platform across the country. Traditional brick production, where clay bricks are put into fire using coal, wood or other biofuels use lot of energy and inefficient (Figure

6). These productions methods pose serious threat to human health.

These production practices are very much common everywhere in Pakistan causing multiple health issues realizing large amounts of particulate matter (PM), Sulphur dioxide (SO₂), carbon dioxide (CO₂), black carbon and many other deadly pollutants (Climate and Ocean Air Coalition) (Table 2). There is a significant mitigation potential in brick production sector in Pakistan. It is believed that 90% of the pollutant emission can be reduced by switching to more efficient production technologies. These safer technologies not only increase the production capacities but also provide safe environment to the workers. The Environment protection department (EPD, Punjab) and National Energy Efficient Conversation Authority (NEECA) has signed an agreement and become the partner with International Centre for Integrated Mountain Development (ICIMOD) in 2017



Figure 6. Traditional brick production and Carbon emissions.

Table 2. Different environmental issues and their health impacts from the Literature review.

Environmental problems	Health Effects
Air Pollution	Respiratory Issues, Heart diseases, eye side problems, skin irritations, strokes
Global warming	Heat strokes, Hyperthermia
Climate changes	Disrupt food availability, cardiovascular diseases, water-borne illnesses
Water pollution	Typhoid, Cholera, diarrhea, hepatitis A, dysentery
Noise pollution	Multiple psychological issues (anxiety, sleep disorder, stress), blood pressure, cognitive impairment in children, annoyance
Improper sanitation and waste management	diarrheal diseases, intestinal worm infections, typhoid, spread of antimicrobial resistance

to ensure safe environment with their production capacities in bricks kilns across Pakistan. But so far there has been done nothing. All the bricks producers are still following the traditional methods and violating rules and regulations and unfortunately, Federal and Provincial Environmental protection agencies are complete silent and are doing nothing.

4. Conclusion and Discussion

Apart from formulation and implementation of National Environment Action Plan (NEAP), Pakistan Environmental Protection Act, 1997 (PEPA-97), and Environmental Impact Assessment (EIA), and CLEAN Central Laboratory for Environmental Analysis and Networking and many other environmental regulatory bodies, a very little work has been done to control pollution. The government has done one significant effort to control air pollution by switching from fuel oil to natural gas consumption in industry and vehicles. Industrial pollution level should be ensured and proper checked of the existing industry to the limits specified by the regulatory authorities and NEQ's. So far initial response of the industrial sector is very discouraging and violating, perhaps due to unawareness, non-availability of modern and eco-friendly technology, and lack of resources. This is a difficult task to change the mind set and convincing industrial community of the harmful and severe side effects of emission of poisonous gases. Two different approaches have been adopted by the PEPA to effectively implement NEQ's through development of Environmental improvement plans (EIP's) which is a self-monitoring and reporting system and second approach is the issuance of Environmental Protection orders under section 16 of the PEPA-1997. The first approach is a "Common Sense Approach" in which industrial sector voluntarily checks and provides their level of pollution to EPA and cooperates to ensure safety and healthy environment. On the contrary, second approach is "Command and Control approach" because those industries neither want to join self-monitoring system nor trying to improve their environmental conditions. Implementation of pollution charges can enhance awareness and address environmental protection and rehabilitation.

There are many reasons of such higher pollution patterns in Pakistan but the regulatory and non-regulatory approaches to control pollution are not valid or not doing their work properly (Naureen, 2009). Environmental policies should be understood with respect to mitigate environmental risks and its consequences on human health without compromising developmental activities (Khan & Xu, 2021). Environmental improvement plans (EIP's) are well formulated with passionate objectives to control and check pollution but practically they are huge failure. If you ever visit industrial areas in major cities, you will notice openly violations of the rule and regulations in every production and operational sector. The idea of market-incentive-environmental regulations is working wonders in advanced countries like USA, Canada, and in European countries. PEPA in 1997 introduced the idea of self-monitoring of pollution and reporting to the Government known as "The National Environmental Quality Standards and Rules"

and implemented it in 2001. It was believed that it will help Government to control environmental pollution. Regulatory authorities of Pakistan have done several meetings with leading industrialists and provincial governments and build consensus on the mechanism of collection, calculation, and deposition of pollution charges. Fine and pollution charges will be deposited in Sustainable Development Fund (SDF). Pollution charge formula was constructed by PEPA and PEPC and mechanism was discussed with the industry representatives.

But this scheme was huge failure as because there were miss-communications and lack of trust between the authorities and Government of Pakistan as industrialists believed they were not provided any proper guidelines and technology to monitor pollution (Lau, 2018). Similarly, in 2014 the federal Government further amendments in Pakistan Environmental Protection Act, 1997 and again there were huge conflicts between federal and provincial governments. At the end, all provinces introduced their own environmental framework rules: “The Sindh Environmental Protection Act, 2014” introduced by Sindh provincial Government; KPK also introduced “The Khyber Pakhtunkhwa Environmental Protection Act”, and “The Baluchistan Environmental Protection Act” leading to multiple rules and regulations but “Are they practically valid?” There is a lot of legislation and bureaucracy in every institution. All the provincial Governments claim that there is a shortage of funds, improper communications between the local, municipal, regional or provincial and federal Environmental committees. This miss-communication gap, bureaucracy, lack of funds, and corruption in all regulatory and non-regulatory bodies is reverting Pakistan big time. Contributions are needed not only by the Government, but also by the individuals to understand this major issue. Pakistan’s Ex-prime minister launched a campaign “Make Clean and Green Pakistan” in 2018-2023 and collaborated with multiple environmental organizations across Pakistan and globally, such as “Muslim Aid Pakistan” and “National Council of Social Welfare (NCSW)” and “Paris Agreement” to control carbon emissions and ensure massive tree plantation scheme known as “Ten Billion Tree Tsunami”. But the new Government has reversed and slowed down this great initiative with a fact that this project was globally acknowledged was completely transparent. We should work with coordination with regional, provincial and federal level environmental organizations to ensure safe and healthy environment globally as air cannot be divided like land (Abas et al., 2019). Climate change is indeed the most frightening problem of our time and there is no vaccine for global warming. It must be unanimous and coordinated efforts as there is no short cut solution.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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