Journal for Social Science Archives

Online ISSN: 3006-3310
Print ISSN: 3006-3302
Volume 3, Number 1, 2025, Pages 1290 – 1304
Journal Home Page
https://jssarchives.com/index.php/Journal/about

Air Quality Degradation in Metropolitan Areas: Causes, Effects, and Policy Solutions in Pakistan

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ARTICLE INFO

Article History:

Received:	*February*	*16, 2025*
Revised:	*March*	*16, 2025*
Accepted:	*March*	*18, 2025*
Available Online:	*March*	*20, 2025*

Keywords:

Air Pollution, Motor Vehicle Emissions, Urban Environmental Issues, Climate Impact, Health Effects, Socioeconomic Impact, Policy Measures,

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ABSTRACT

There are serious physiological, climatic, and economic effects of motor vehicle-induced urban air pollution, which is an increasing global concern. Increased mortality rates in urban areas are a result of growing pollution levels. Environmental conditions are deteriorating due to harmful pollutants like lead, carbon dioxide, methane, nitrogen oxides, CFCs, and particle matter. Urban air pollution has increased due to rapid motorization in Khyber Pakhtunkhwa and other low-income, industrializing regions, making socioeconomic and health issues worse. This study identifies the institutional, behavioral, and technological factors that contribute to the local, regional, and global impacts of vehicle emissions. Additionally, it examines the policy measures put in place to reduce pollution and the difficulties encountered in implementing them. Based on Pakistan's recent experience, the report offers guidance on how to successfully reduce air pollution caused by transportation while taking into account local requirements, capacities, and constraints. These results provide important insights for comparable emerging nations aiming to control urban air quality sustainably.

Introduction

An increasing worldwide concern, pollution, especially air and water pollution, has a disastrous impact on ecosystems and human health. Despite growing awareness, a large number of people still disregard the issue or unwittingly or purposely contribute to it. Every day, pollution destroys ecosystems, puts species in risk, and takes thousands of lives, particularly in places like Africa where access to sanitary facilities and clean water is still scarce. Global cooperation is necessary to

address this issue because individual efforts are insufficient. Laws have been put in place in many industrialized countries to control and reduce pollution, but it is imperative that everyone take responsibility. The main cause of the rising pollution levels is human activity, and reducing them is crucial to preserving a habitable planet for coming generations. Many people, regrettably, disregard their environmental responsibilities, which sets a bad example for future generations. Our top priorities in the fight against pollution must be ecological awareness and efficient waste management, including recycling, which keeps toxins out of the environment. Human health depends on a healthy environment, and protecting it requires lowering pollution. Both direct and indirect pollution damage the biosphere, which has an adverse effect on cultural heritage, industrial development, and the general well-being of society.

Literature Review

[1] claims that inadequate car maintenance dramatically raises vehicle emissions. Diesel vehicles with broken fuel injection systems can increase particulate emissions by 20 times, while badly maintained two-stroke two-wheeled (M2W) and three-wheeled (M3W) vehicles using subpar lubricating oil can increase them by 10 times. Refs [2] and [3] point out that methyl tertiary butyl ether (MTBE) was added to gasoline in 2000 in order to preserve octane ratings following lead removal and benzene reduction. Several provinces in Pakistan have also started blending ethanol into gasoline since 2004. Nevertheless, oxygenates such as ethanol and MTBE can raise reactive aldehyde and nitrogen oxide emissions in cars without catalytic converters, which could exacerbate ozone pollution. Although Pakistan has tightened its car emission regulations, Ref [4] points out that real in-use emissions frequently surpass these regulations because of things like inadequate maintenance and low-quality gasoline. The monitoring system is still insufficient, even with advancements like computerization and surveillance, and many cars fail emission testing in spite of lax standards.

According to Ref [5], Pakistan's motor vehicle activity continues to be extremely polluting even though newer vehicle types have been on the market since the 1990s. In the past, the vast bulk of the fleet's M2W and M3W trucks have been powered by extremely polluting two-stroke engines. According to early 1990s tests, these cars release more hydrocarbons and carbon monoxide per kilometer than buses, which are already major polluters, particularly when it comes to particulate emissions. According to Ref [6], industrial operations and vehicle emissions are the main causes of atmospheric lead pollution in cities. According to Ref [7], air pollution has been repeatedly associated with major health consequences globally, especially in metropolitan outdoor settings. Outdoor air pollution continues to be a major area of research worldwide due to the fast urbanization and growing pollution sources in emerging nations. Only outdoor sources were included in the first estimate of the global burden of disease caused by air pollution.

Because of urbanization [8], rising affluence, and the shift of vehicle production to Asia, motor vehicle activity has increased quickly in the region. Vehicle numbers have doubled every ten years or less in numerous Asian countries over the last thirty years. The number of vehicles in Khyber Pakhtunkhwa, Pakistan, increased by 40% a year in the 1980s and 1990s, dropped to 50% in the 2000s, and is currently expanding at a rate of about 7% per year, according to Ref [9]. Given that transportation uses almost half of the world's oil, Ref [10] cautions that the proliferation of motor vehicles worldwide has significant ramifications for both energy security and climate change. The 1990s saw a roughly one-third increase in transportation-related energy consumption and carbon dioxide emissions, with low-income nations accounting for approximately half of this increase. Additional causes of pollution are listed in Ref [11], which also includes municipal garbage, contaminated food, lead smelters, paints, solder, water pipes, storage batteries, iron mills (using

scrap iron coated with lead), and insecticides. According to reference [12], insufficient deposit control in gasoline can lead to issues with electronic fuel injection technology, such as clogged injectors. Similar to this, although refiners utilize multifunctional additives, in-use fuels frequently fall short of specifications, which can impair the performance of four-stroke engines in M2W cars.

Methodology of the Study

The present study is designate to evaluate the pollution in Khyber Pakhtunkhwa. In the study we find how to people says about pollution and what the comments at pollution. The data was collected through the questionnaire; questionnaire consist of 17variables (factors). the questionnaire was filed personally itself by remember in the form of an interview and discussion. In our research, we have to select two departments from the government superior science college Peshawar. Department of sociology and department of Mathematics.

Data collection instruments

The computed existence for all varieties in the research area was measured on a four point like scale ranging from agrees to strongly disagree.

Sources of data

The resource of data for this study is primary data acquired throughout the questionnaire. One hundred (100) questionnaires were distributed.

Statistical tools

Mean percentage and Kruskal-Wallis H test through the appropriate statistical packages for social science (SPSS) and Microsoft office.

Standard Deviation

Sum of the positive square roots of variance is called standard deviation

Kruskal –Wallis H test

A nonparametric alternative producer to one-way analysis of variance of f-test testing the equality of several means is the Kruskal – Wallis H test.

Cronbach's Alpha

Cronbach's alpha is the most commonly used measure of reliability (internal consistency). It was originally derived by [13] for dichotomously scored data (0 or 1) and later generalized by Cronbach (1951) to account for any scoring method.

Result and Discussion

The present research report was prepared in line with the survey procedure. A sampling design comprised of two departments. Questionnaires were comprised of 12 questions. Questions were filled with personally itself by the authors of the report, which was conducted in the form of interview and discussion and all the fill out of the relevant questions according to four options given, in which are agree, strong agree, disagree and strong disagree. The interview and discussion was qualitatively and suggestive in nature. So each student gets a complete insight of question and researcher, at the end of each questionnaires, an open space for this purpose was given [14 - 17].

Table 4.1: Observation of the questionnaires

Serial no	Observation	Agree	Strong agree	Disagree	Strong disagree	No comment	Standard devation
1	Air pollution	46	20	20	6	8	0.881
2	Environmental pollution	46	12	28	6	8	1.153
3	Land pollution affect	37	38	11	7	7	1.134
4	Water pollution affect	38	25	21	8	6	1.065
5	Air pollution problem	32	47	10	7	4	0.998
6	Water pollution caused	33	40	6	3	18	1.014
7	Khyber Pakhtunkhwa	28	33	22	7	17	0.849
8	Causes of air pollution	48	38	6	5	5	0.963
9	Government of Pakistan	39	33	15	9	4	0.862
10	Ecosystem	28	59	6	3	4	0.969
11	Metal production factories	23	50	6	9	12	0.979
12	Urbanization and industrialization	35	42	15	3	5	0.958

Table (4.1) shows that the first question takes down to the research or the data collection source was about the air pollution are a serious problem. It was revealed that 46% agreed, 20% strongly agreed, 20% disagreed and 6% strongly disagree and 8% is no comments and the standard deviation 0.881

Air pollution pie chart

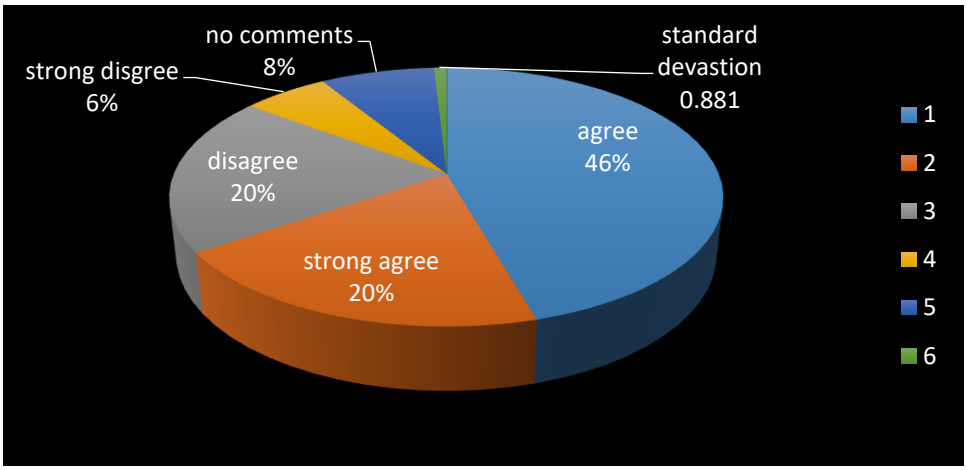


Table (4.1) shows that the 2nd question take down to environmental pollution affect so the answer received for this question is that 46% people agreed 12% strongly agree 28% disagreed and 6% strongly disagree and 8% is no comments and the standard deviation is 1.153 [18-21].

Environmental pollution pie chart

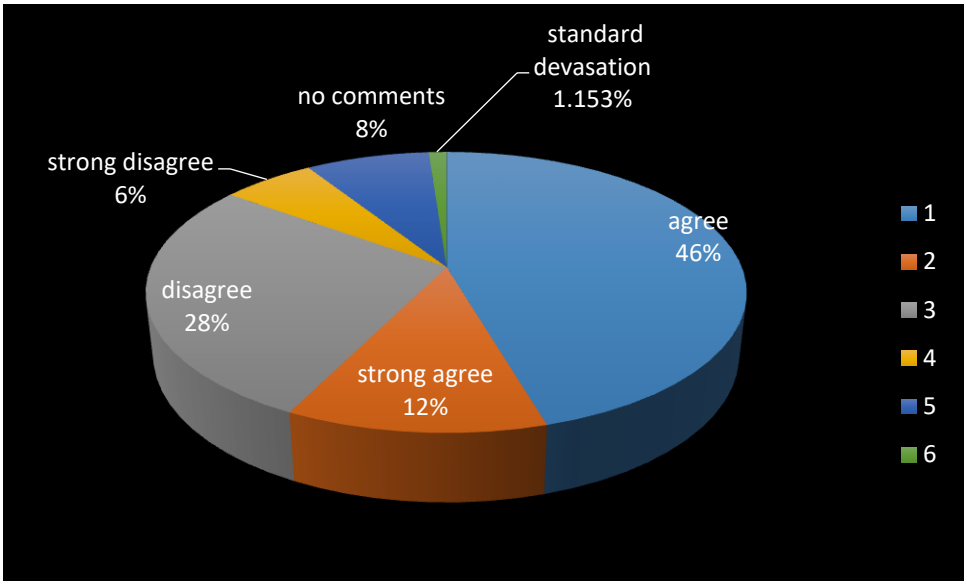


Table (4.1) shows that the 3rd question was about the land pollution affect our life, so the answer of this question 37% agreed 38% strongly agree 11% disagreed and 7%strongly disagree and7% is no comments and the standard deviation is 1.134

Land pollution pie chart

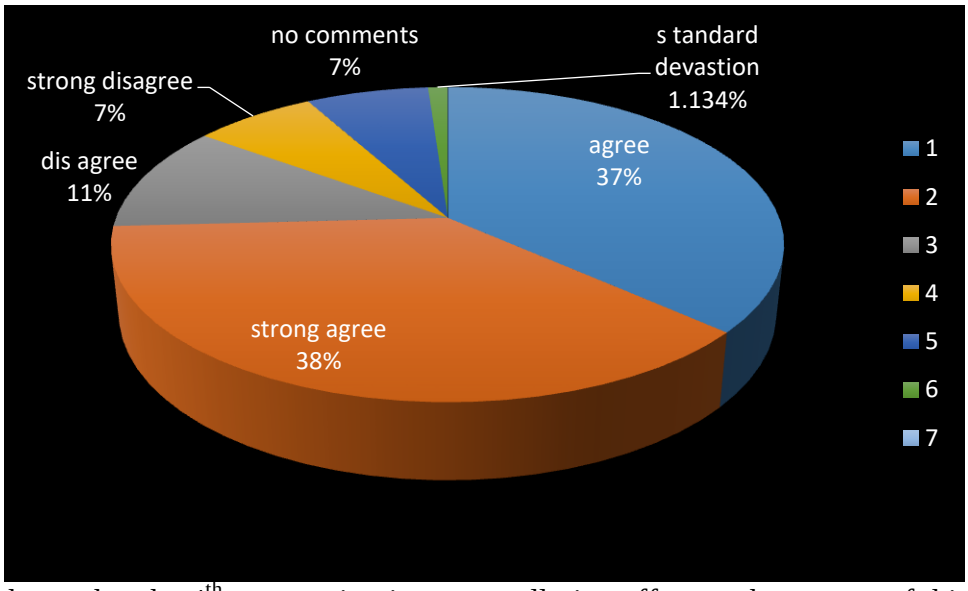


Table (4.1) shows that the 4th no question is water pollution affect so the answer of this question is 20thIs agree 19% strong agree 18% disagree and 13% is strong disagree so the response mean was 1.065 [22-25].

Water pollution affects pie chart

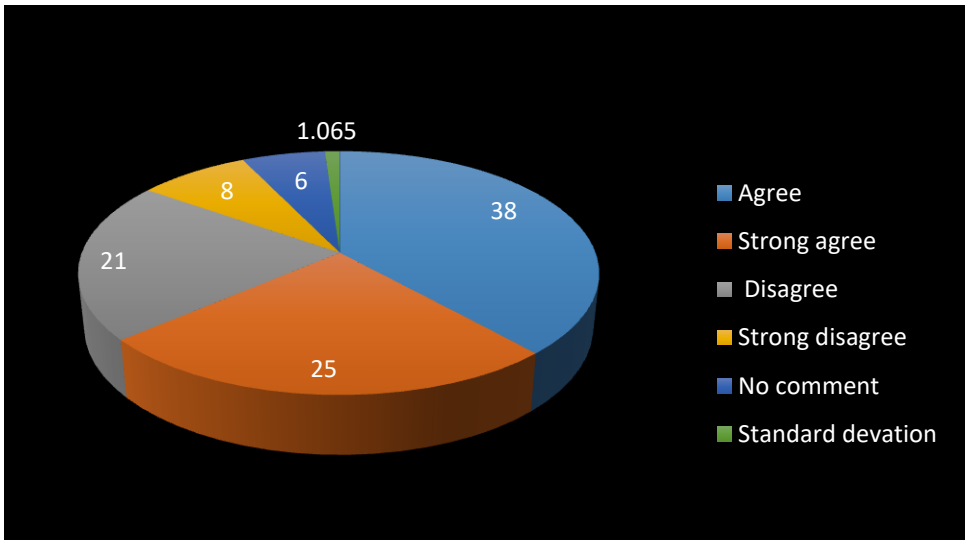


Table (4.1) shows that the question no 5th about the air pollution will the air pollution become a serious problem 32% agreed 47% strongly agree 10% disagreed and 7% strongly disagree and 4% no comments and the standard deviation is 0.998

Air pollution pie chart

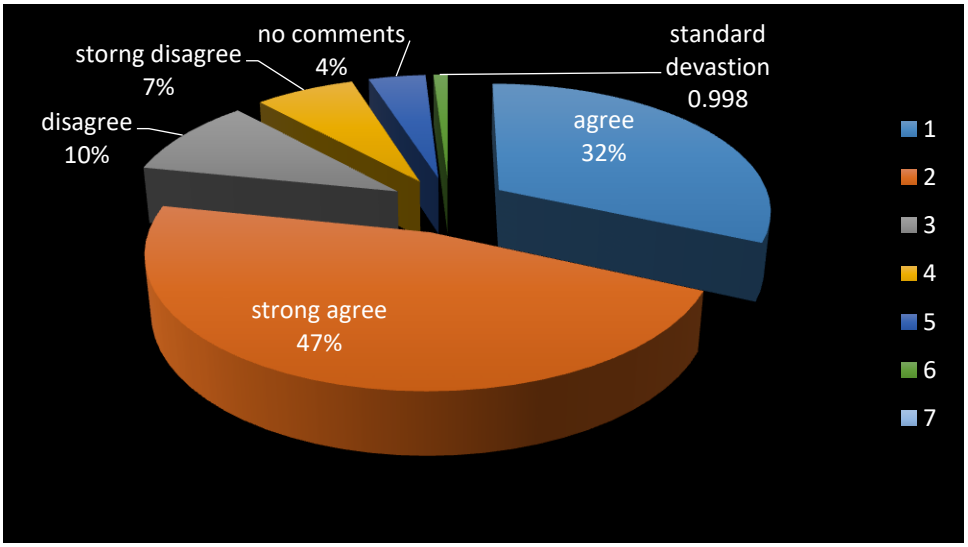


Table (4.1) shows that the question no 6th lie the student decide about the water pollution while water pollution caused by industries. There are 33% agreed 40% strongly agree 6% disagreed and 3% strongly disagree 18% no comments and the standard deviation is 1.104

Water pollution pie chart

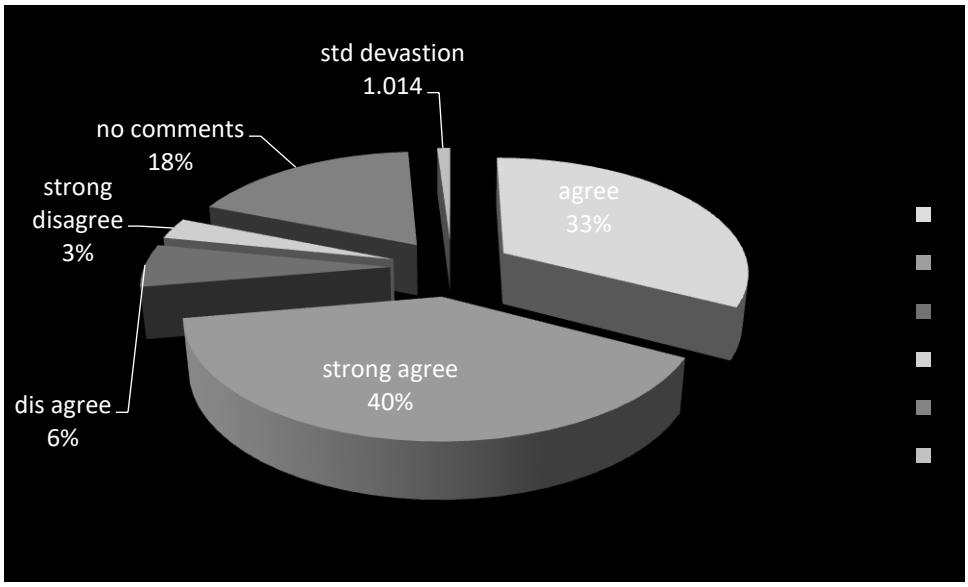


Table (4.1) shows that the question no 7th about the province of Khyber Pakhtunkhwa. Khyber Pakhtunkhwa is the polluted province. The answer of this question 28% agreed 33% strongly agree 22% disagreed and 7% strongly disagree and 17% is no comments and the Standard deviation is 0.849

Khyber Pakhtunkhwa pollution pie chart

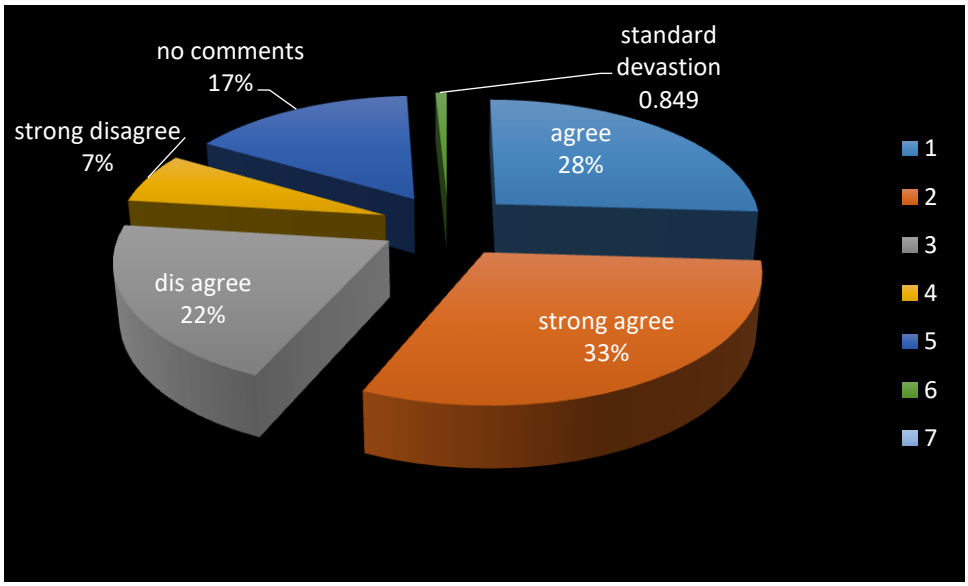


Table (4.1) shows that The question no 8th consider about the Vehicle emissions are one of the leading causes of air pollution, the answer of this question 48% agreed 38% strongly agree 6% disagreed and 5% strongly disagree and 5% no comments and the standard deviation is 0.963 [26-27].

Causes of air pollution pie chart

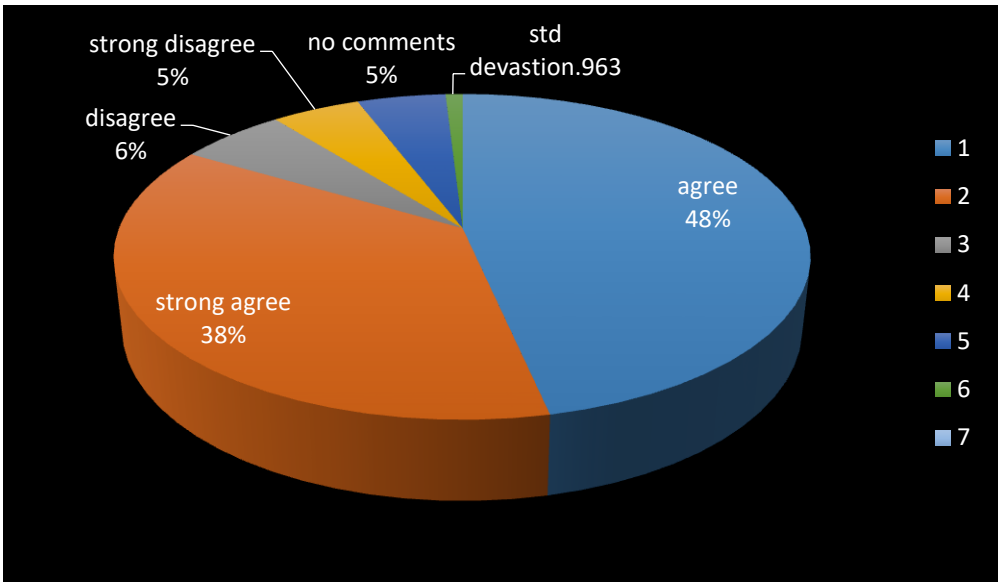


Table (4.1) shows The question no 9th about the government of Pakistan and student decide to did the government of Pakistan control the land pollution, the answer of the question 39% agreed 33% strongly agree 15% disagreed and 9% strongly disagree and 4% no comments and the standard deviation is 0.862

Government of Pakistan pie chart

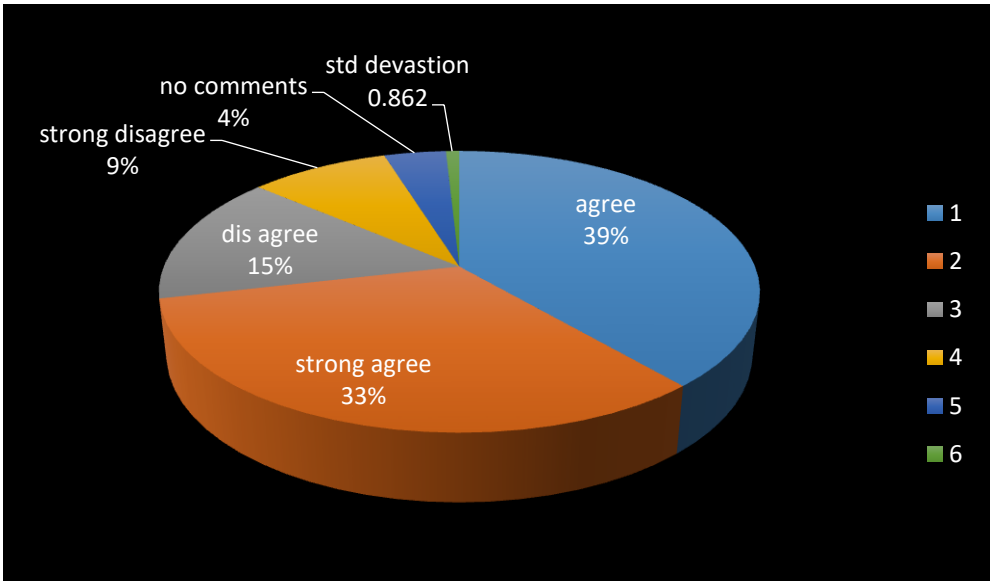


Table (4.1) shows that The question no 10th about the ecosystem how to pollution effect the ecosystem, the answer of the question 28% agreed 59% strongly agreed 6% disagreed and 35% strongly disagreed and 4% no comments the standard deviation is 0.969

Ecosystem pie chart

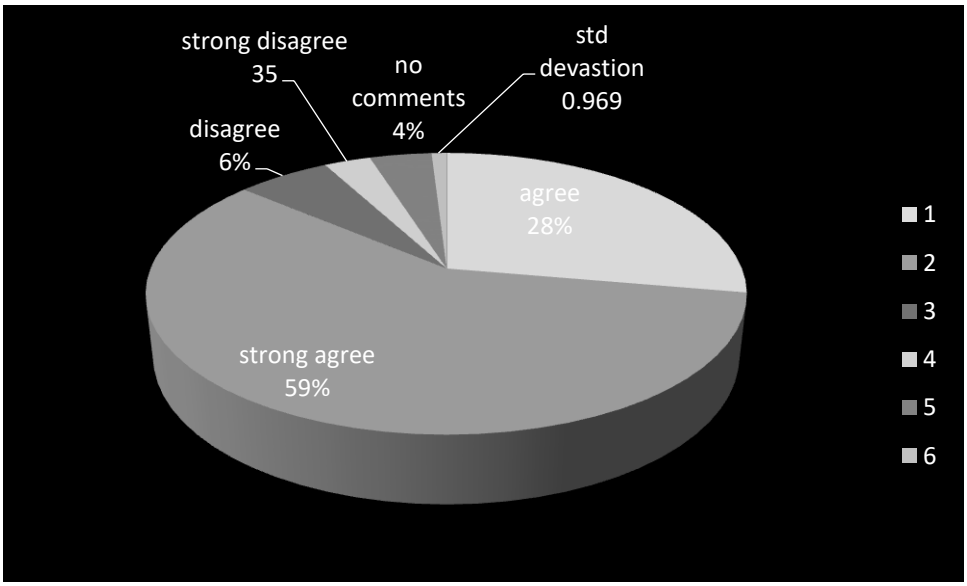


Table (4.1) shows that the Question no 11th about the metal production factories and other heavy industry contribute to land pollution, the answer of this question was that the 23% agreed 50% strongly agrede 6% disagreed and 9% strongly disagreed and 12% no comments and the standard deviation is 0.979

Metal production factories pie chart

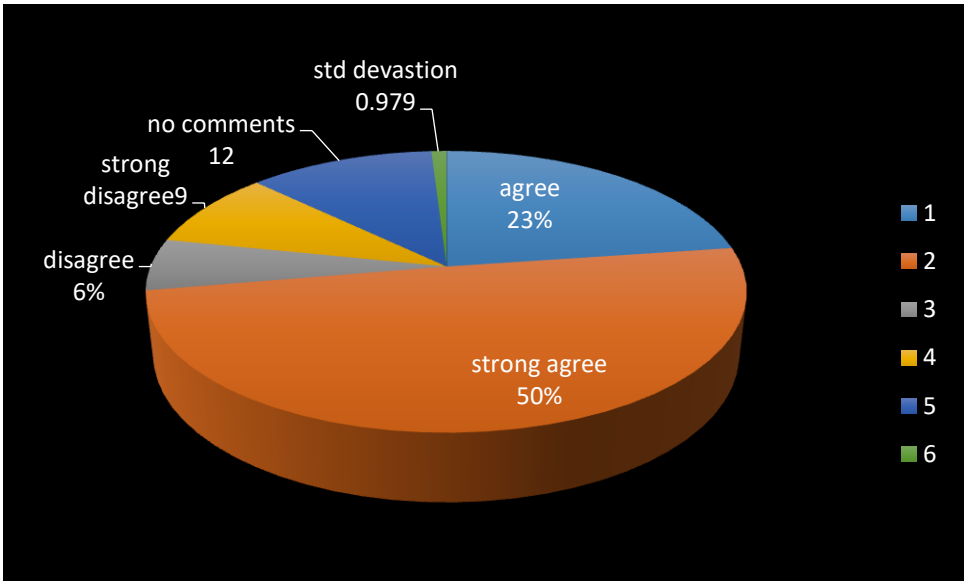
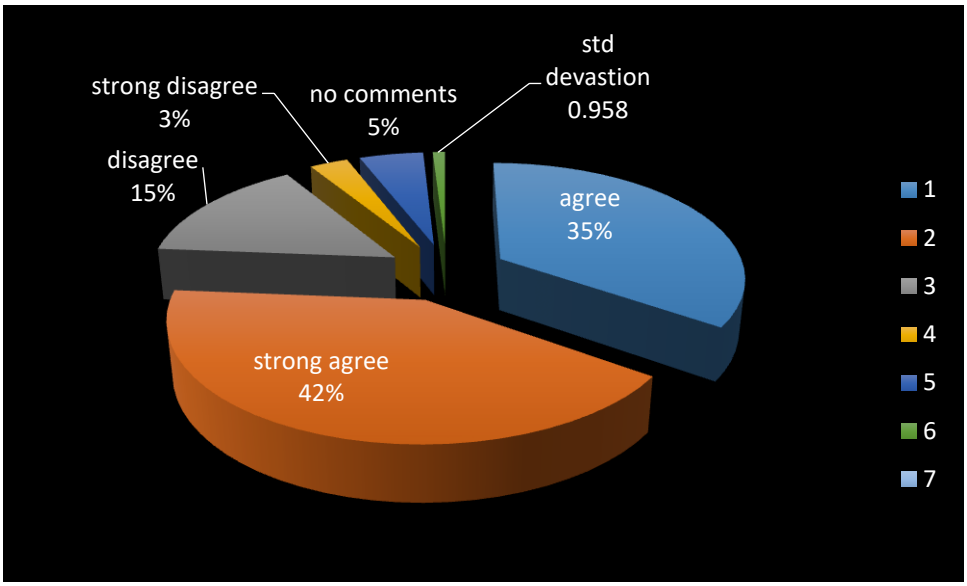


Table (4.1) shows that the Urbanization and industrialization are major causes of land pollution this is the question no 12th the answer of the question 35% agreed 42% strongly agree 15 %disagreed and 3% strongly disagree and 5% is no comments and the standard deviation is 0.958

Urbanization and industrialization pie chart



Air pollution problem

Null hypothesis	**Test**	**p-value**	**Decision**
The problem of air pollution is a serious	Independent samples Kruskal-Wallis test	0.04	reject the null hypothesis

Asymptotically significances are displayed .The significance level is 0.05

Null hypothesis is rejected, so that air pollution is a serious problem has plays a significant affect in the pollution of Khyber Pakhtunkhwa

Environmental pollution affect

null hypothesis	**Test**	**p-value**	**Decision**
the environmental pollution affect our life	Independent samples Kruskal-Wallis test	0.02	reject null hypothesis

Asymptotically significances are displayed. The significance level 0.05

Ho is rejected so that the environmental pollution affect our life has plays a significant rolet in the pollution of Khyber Pakhtunkhwa

Land pollution affect

null hypothesis	**Test**	**p-value**	**Decision**
The land pollution affect our life	Independent samples Kruskal-Wallis test	0.018	reject null hypothesis

Asymptotically significances are displayed. The significance level 0.05

Ho is rejected so that the land pollution affect our life has plays a significant affect in the pollution of Khyber Pakhtunkhwa

Water pollution affect

null hypothesis	Test	p-value	Decision
The water pollution affect our life	Independent samples Kruskal-Wallis test	0.101	Do not reject null hypothesis

Asymptotically significances are displayed. The significance level 0.05

Ho cannot be rejected so the water pollution affects our life this problem has no serious affect in pollution of kpk

Air pollution problem

null hypothesis	Test	p-value	Decision
The air pollution become a serious problem later	Independent samples Kruskal-Wallis test	0.644	Do not reject null hypothesis

Asymptotically significances are displayed. The significance level 0.05

Ho cannot be rejected so the air pollution become a serious problem later so this problem has no serious affect in pollution of kpk

Water pollution caused

null hypothesis	Test	p-value	Decision
Water pollution caused by industries	Independent samples Kruskal-Wallis test	0.722	Do not reject null hypothesis

Asymptotically significances are displayed. The significance level 0.05

Ho cannot be rejected so the water pollution caused by industries so this problem has no serious affect in pollution of kpk

Vehicle emissions causes of pollution

null hypothesis	Test	p-value	Decision
Vehicle emissions are one of the leading causes of air pollution	Independent samples Kruskal-Wallis test	0.989	Do not reject null hypothesis

Asymptotically significances are displayed. The significance level 0.05

H_o cannot be rejected so the vehicle emissions are one of the leading causes of air pollution so this problem has no serious affect in pollution of kpk

Government of Pakistan

null hypothesis	Test	p-value	Decision
The government of Pakistan control the land pollution	Independent samples Kruskal-Wallis test	0.532	Do not reject null hypothesis

Asymptotically significances are displayed. The significance level 0.05

Here we have p equal to 0.532 i.e. p value is greater than 0.05 therefore we concluded that the government of Pakistan control the land pollution insignificantly [27].

Eco system

null hypothesis	Test	p-value	Decision
Pollution greatly affect the eco system	Independent samples Kruskal-Wallis test	0.532	Do not reject null hypothesis

Asymptotically significances are displayed. The significance level 0.05

Here we have p equal to 0.663 i.e. p value is greater than 0.05 therefore we concluded that the pollution greatly affect the eco system insignificantly.

Metal production factories

null hypothesis	Test	p-value	Decision
Metals production factories and industry all contribute to land pollution	Independent samples Kruskal-Wallis test	0.361	Do not reject null hypothesis

Asymptotically significances are displayed. The significance level 0.05

Here we have p equal to 0.361 i.e. p value is greater than 0.05 therefore we concluded that the metals production factories and industry all contribute to land pollution insignificantly.

Reliability analysis

Cronbach's Alpha	No of observation
0. 67	12

For the reliability of a data, we used Cronbach's alpha test. Here alpha is equal to 0.67 which indicate the data was reliable.

Conclusion

The first question takes down to the research or the data collection source was about the air pollution is a serious problem. It was revealed that 46% agreed, 20% strongly agreed, 20% disagreed and 6% strongly disagree and 8% is no comments. the 2nd question take down to environmental pollution affect, so the answer received for this question is that 46% people agreed 12% strongly agree 28% disagreed and 6% strongly disagree and 8% is no comments. the 3rd question was about the land pollution affect our life, so the answer of this question 37% agreed 38% strongly agree 11% disagreed and 7%strongly disagree and7% is no comments. that the 4th no question is water pollution affect so the answer of this question is 20thIs agree 19% strong agree 18% disagree and 13% is strong disagree. the question no 5th about the air pollution will the air pollution become a serious problem 32% agreed 47% strongly agree 10% disagreed and 7% strongly disagree and 4% no comments. the question no 6th lie the student decide about the water pollution while water pollution caused by industries. There are 33% agreed 4o% strongly agree 6% disagreed and 3% strongly disagree 18% no comments. the question no 7th about the province of Khyber Pakhtunkhwa. Khyber Pakhtunkhwa is the polluted province. The answer of this question

28% agreed 33% strongly agree 22% disagreed and 7% strongly disagree and 17% is no comments. that The question no 8th consider about the Vehicle emissions are one of the leading causes of air pollution, the answer of this question 48% agreed 38% strongly agree 6% disagreed and 5% strongly disagree and 5% no comments. The question no 9th about the government of Pakistan and student decide to did the government of Pakistan control the land pollution, the answer of the question 39% agreed 33% strongly agree 15% disagreed and 9% strongly disagree and 4% no comments. The question no 10th about the ecosystem how to pollution effect the ecosystem the answer of the question 28% agreed 59% strongly agree 6% disagreed and 35% strongly disagree and 4% no comments. the Question no 11th about the metal production factories and other heavy industry contribute to land pollution the answer of the question 23% agreed 50% strongly agree 6% disagreed and 9% strongly disagree and 12% no comments. the Urbanization and industrialization are major causes of land pollution this is the question no 12th the answer of the question was 35% agreed 42% strongly agree 15 %disagreed and 3% strongly disagree and 5% is no comments

We also applied Kruskal-wallis test. According to this test we observed that air pollution, have played serious role in the pollution in KPK. While acceptance pollution have played minor effect in the pollution of KPK

Suggestion and recommendation

In order to reduce pollution and bring sustainable development at national and global level, we must follow a few points. The basic factor in controlling the pollution in Khyber Pakhtunkhwa is to control of population growth, at the same time, we have to closely monitor and develop strategies to handle, macro-environmental factors like: climatic changes, depletion of natural resources, use of organic and sustainable methods in agriculture, control the pressure of urbanization and micro-environmental like: dust, noise, radiation and ozone layer.

If we consider above factors and improve education, mass and media and literature on the subject, it will bring awareness in the rural areas. We will definitely reduce the negative impact of pollution on the ecosystem and this will bring peace and prosperity in the universe

References

1. Shah, J. J., and T. Nagpal (1997). Urban air quality management strategy in Asia-Greater Mumbai report. World Bank Technical Paper No. 381.The World Bank, Washington, DC, 227pp
2. Humberto Bravo, A., J. R. Torres, and E. R. Sosa.1991. Motor vehicle pollution control in Mexico City. SAE Technical Paper No. 912426. Society of Automotive Engineers, Warren dale, PA, 6 pps
3. Roychowdhury, A. 2002. Submission to Discussion forum on Enforcing Emission Standards for In- use Vehicles, July 17, The World Bank, Washington, DC; available at http:// lnweb18.worldbank.org/SAR/sa.nsf/All/2F391E 72031478F6.
4. Syed Zafar Ilyas, (2005). “Environmental Simulation in Quetta, Pakistan”, Unpublished, PhD thesis, university of Balochistan, Quetta, Pakistan
5. M.J. Quinn. “Factors affecting blood lead concentration in the U.K. Results of the EEC blood lead surveys”, Int. J. Epidemiol., 14(1985), 420-431, 1979-81.
6. Hong, C. (1995). Global Burden of Disease from Air Pollution. Geneva, World Health Organization. Humberto Bravo, A., J. R. Torres, and E. R. Sosa.1991. Motor vehicle

pollution control in Mexico City. SAE Technical Paper No. 912426. Society of Automotive Engineers, Warren dale, PA, 6 pp.
7. Walsh, M. P. 1994. Trends in automotive transport: implications for environmental protection, energy efficiency and sustainable development
8. UN Population Division, Department of Economic and Social Affairs, United Nations Secretariat, New York, 182 pp.
9. Gru bler, A. 1994. The transportation sector: growing demand and emissions. Pages 44–57
10. M.Hutton and C. Symon. "The quantities of cadmium, lead, mercury and arsenic entering the UK environment from human activities", Sci.Total Environ., 57, 129-150 (1986).
11. Iyer, N. V. 2002. Submission to Discussion Forum on Enforcing Emission Standards for In-Use Vehicles, July 11, The World Bank, Washington, DC; available at http://lnweb18.worldbank. org/SAR/sa.nsf/All/2F391E72031478F6.
12. Gonzales, S. M., Iftikhar, H., & López-Gonzales, J. L. (2024). Analysis and forecasting of electricity prices using an improved time series ensemble approach: An application to the Peruvian electricity market. Aims Math, 9(8), 21952-21971.
13. Qureshi, M., & Ahmed, N. (2022). Forecasting Cryptocurrencies using the Classical Time Series Approach. KASBIT Business Journal, 15(2), 15-27.
14. Iftikhar, H., Bibi, N., Canas Rodrigues, P., & López-Gonzales, J. L. (2023). Multiple novel decomposition techniques for time series forecasting: Application to monthly forecasting of electricity consumption in Pakistan. Energies, 16(6), 2579.
15. Yousfani, K., Haider, B., Qureshi, M., & Ishaq, K. (2024). Exploring the Impact of Personal and Administrative Issues Faced by Female Students on Satisfaction Levels with Hostel Facilities and their Influence on Lifestyle: A Statistical Investigation. Pakistan Journal of Humanities and Social Sciences, 12(2), 1616-1631.
16. Iftikhar, H., Khan, M., Khan, Z., Khan, F., Alshanbari, H. M., & Ahmad, Z. (2023). A comparative analysis of machine learning models: a case study in predicting chronic kidney disease. Sustainability, 15(3), 2754.
17. Yousfani, K., Qureshi, M., Daniyal, M., & Ismail, M. (2024). Comparative Study of Machine Learning (ML) and Conventional Time Series Methodologies in Modelling the Exports Trade of Pakistan. Indus Journal of Social Sciences, 2(2), 349-367.
18. Alshanbari, H. M., Iftikhar, H., Khan, F., Rind, M., Ahmad, Z., & El-Bagoury, A. A. A. H. (2023). On the implementation of the artificial neural network approach for forecasting different healthcare events. Diagnostics, 13(7), 1310.
19. Daniyal, M., Qureshi, M., Marzo, R. R., Aljuaid, M., & Shahid, D. (2024). Exploring clinical specialists' perspectives on the future role of AI: evaluating replacement perceptions, benefits, and drawbacks. BMC Health Services Research, 24(1), 587.
20. Cuba, W. M., Huaman Alfaro, J. C., Iftikhar, H., & López-Gonzales, J. L. (2024). Modeling and analysis of monkeypox outbreak using a new time series ensemble technique. Axioms, 13(8), 554.
21. Qureshi, M., Daniyal, M., & Tawiah, K. (2022). Comparative Evaluation of the Multilayer Perceptron Approach with Conventional ARIMA in Modeling and Prediction of COVID-19 Daily Death Cases. Journal of Healthcare Engineering, 2022(1), 4864920.
22. Iftikhar, H., & Rind, M. (2020). Forecasting daily COVID-19 confirmed, deaths and recovered cases using univariate time series models: A case of Pakistan study. MedRxiv, 2020-09.
23. Qureshi, M., Ishaq, K., Daniyal, M., Iftikhar, H., Rehman, M. Z., & Salar, S. A. (2025). Forecasting cardiovascular disease mortality using artificial neural networks in Sindh, Pakistan. BMC Public Health, 25(1), 34.

24. Hussain, I., Qureshi, M., Ismail, M., Iftikhar, H., Zywiołek, J., & López-Gonzales, J. L. (2024). Optimal features selection in the high dimensional data based on robust technique: Application to different health database. Heliyon, 10(17).
25. Iftikhar, H., Khan, M., Żywiołek, J., Khan, M., & López-Gonzales, J. L. (2024). Modeling and forecasting carbon dioxide emission in Pakistan using a hybrid combination of regression and time series models. Heliyon, 10(13).
26. Tawiah, K., Daniyal, M., & Qureshi, M. (2023). Pakistan CO2 emission modelling and forecasting: a linear and nonlinear time series approach. Journal of Environmental and Public Health, 2023(1), 5903362.
27. Ramzan, S., & Qureshi, M. (2022). The influence of macroeconomic variables on capital structure decisions: Investigation from cement sector. International Journal of Emerging Business and Economic Trends, 1(1), 51-65.