www.aensi.in /Index in Cosmos ISSN 0025-1348 (P), 2456-1356 (O) UGC APPROVED

Received: 2 March Revised: 7 March Accepted: 17 March

Air Pollution, its Sources and Health Effects: A Case Study of Delhi

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Abstract: This study has made an attempt to analyze the impact of air pollution on health, its causes and level of awareness by conducting a field survey on the youth of Delhi, studying in different universities and colleges in Delhi. The survey broadly aims to capture awareness about air pollution, it causes and its health effects. Also the study proposes certain solutions to contain the environmental degradation. For this, a total number of 419 respondents were surveyed during September 2016 to January 2017. The collected data has been assessed with multiple techniques like descriptive statistics, frequency tables, cross tabulation and chi-square test of independence on sources, effects, and solutions to air pollution. The study reveals that vehicular pollution is identified as the major cause of pollution in Delhi followed by industrial pollution and crop burning by neighboring states. The survey reveals that more than 60% of the respondents recognized lung infections as the major health effect of air pollution followed by cold & cough, and bronchitis. Finally, the study concludes that a large number of awareness campaigns should be organized involving a greater participation from all sections of the society along with better implementation of present laws.

Keywords: Air Pollution, Environment Degradation, Health, Environmental Awareness

Introduction

Air pollution means combination of toxic chemicals or compounds (including those of biological origin) in the air, at levels that pose a health risk. Pollutant elements are Carbon dioxide, Monoxide, Sulfur Dioxide, etc. Air pollution is a major environmental risk for health and is estimated to cause millions premature deaths worldwide per year. It costs human lives, it reduces people's ability to work, it affects vital products like food, and damages cultural and historical monuments. Moreover, it reduces the ability of ecosystems to perform functions, societal needs and it costs money in remediation or restoration (UNECE, 2017).

Though it is global problem but developing and newly industrialized countries are suffering from severe air pollution in last few decades and paying its major cost. This has been a result of rampantly growing anthropogenic activities such as urbanization and industrialization. The effects of air pollution on health and the rising costs of continued efforts to improve air quality have raised concerns in the society and state as well. The big metro cities, like Delhi, around the world that are seeing rapid population and economic growth are experiencing severe levels of air pollution as energy consumption and motor vehicle use have been rapidly increasing.

Air pollution will continue to cause problems for mankind. Temporary regulations and planned controls of emissions will not cleanse our atmosphere, but can only slow the increase of pollutants as the world population grows and energy consumption per capita increases. Human activities influence these gases, not only through combustion processes but also through forest and biomass changes. Moreover, decision makers are faced with difficult choices in their attempts to support continued economic growth and at the same time mitigating the adverse effects of growing prosperity.

In this context, the objectives of this paper are (i) to examine the level of awareness of youth of Delhi about air pollution, its causes and its health effects and (ii) to suggest appropriate suggestion based

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on field survey that can be drawn as inputs into the policymaking process. The paper is arranged as follows: section 2 provides the review of selected literature. Section 3 presents data and research methodology. Section 4 discusses various empirical results while section 5 provides concluding remarks.

2. Review of Literature

Environmental studies are interdisciplinary in nature. In economics, it has been popularized by the studies capturing environmental degradation and levels of income in the form of Environmental Kuznets Curve (EKC). The EKC assumes that the relationship between various indicators of environmental degradation and per capita income can be depicted as an inverted-U-shaped curve showing that the environmental pressure increases up to a certain level as income goes up; after that, it decreases. World Bank (1992) and other scholars have attempted to model the pollution-income relationship and generated smooth inverse-U-shaped pollution-income paths. Others have shown evidences of "inverse-V-shaped" pollution-income path. Some have even observed multiple changes of direction and introduced "N-shaped" of EKC. For instance, Common (1995) points out that irreversible damage may occur before the top of the inverted U-shaped curve is reached, and that the relationship need not hold for all impacts. Several authors (Grossman and Krueger, 1994; Shafik, 1994; Grossman, 1995; Ismail and Ahmed, 2016) find evidence of an N-shaped curve for some indicators. The concept of an N-shaped curve seems to imply that at very high level of income, negative impact of scale of the economic activity dominates the positive impact of the composition and technical effects.

Many researchers (Folinsbee, 1993; Collins and Stevent, 1993; Grunig, et. al, 2014) have shown the health effects on human beings and its causes. These studies highlighted that the particulates from air pollution are implicated in causing or exacerbating respiratory, lung function and changes in airway reactivity and inflammation and systemic cardiovascular diseases. These particulates are thought to be among the leading causes of respiratory morbidity and mortality. Since air pollution causes vast damaging effects on health in various ways, it is important to have the estimates of health damages associated with it. These estimates can provide both an impetus for environmental controls and a means of evaluating the benefits of specific pollution control policies (Cropper et al, 1997).

Researchers have suggested various ways to measure health benefits of improved air quality. Alberini and Krupnick (1997) argued that the health benefits of improved air quality are usually obtained by combining epidemiologic evidence linking pollution levels to health outcomes with the value of avoiding such outcomes. Unfortunately, very few original epidemiologic or willingness-to-pay studies have been conducted in developing countries, leading analysts to offer recommendations based on extrapolating both concentration-response functions and the value of avoiding illness from U.S. studies. However, this approach neglects differences between the United States and the target country in pollution levels, cultural factors, baseline health, the age distribution of the population, etc. that might affect perceptions of illness and pollution and behavioral responses.

Gerking and Stanley (1986) conducted a study on the adult residents of St. Louis, Missouri where individuals are viewed as producers of health and good health is desired for both consumption and investment purposes. The study shows that the marginal willingness to pay for the "average" employed person for a 30% reduction in ozone range from $18.45 to $24.48 per year. Bresnahan et al. (1997) argues that people use defensive measures to protect themselves from air pollution. The study indicates that persons who experience smog-related symptoms spend significantly less time outdoors. Many people also report making other behavioral changes to avoid smoggy conditions and adjust daily activities to defend against acute health effects of air pollution. Gordian et al. (1996) examined the associations between average daily particulate matter less than 10 um in diameter (PM10) and temperature with daily outpatient visits for respiratory disease including asthma,

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bronchitis, and upper respiratory illness in Anchorage, Alaska. The results show that an increase of 10 ug/m3 in PM10 resulted in a 3-6% increase in visits for asthma and a 1-3% increase in visits for upper respiratory diseases. These findings are consistent with the results of previous studies and provide evidence that the coarse fraction of PM10 may affect the health of working people.

Chen,et. al (1998) evaluated the effects of ambient air pollution on respiratory symptoms and diseases of school children. Respiratory health was assessed by evaluation of the children's respiratory symptoms and diseases. The school children in the urban communities had significantly more respiratory symptoms (day or night cough, chronic cough, shortness of breath, and nasal symptoms) and diseases (sinusitis, wheezing or asthma, allergic rhinitis, and bronchitis) when compared with those living in the rural community. An interesting study by Brunekreef, et. al (1997) in Netherland examined health status of children living near roads. The study shows that the association was stronger in children living closest (<300 m) to the motorways. Lung function was also associated with the concentration of black smoke, measured inside the schools, as a proxy for diesel exhaust particles. The associations were stronger in girls than in boys. The results indicate that exposure to traffic-related air pollution, in particular diesel exhaust particles, may lead to reduced lung function in children living near major motorways.

Rizwan, et al (2013) assesses change in levels of pollutants in Delhi and their impact on health. It also advocates ways to curb the air pollution. They found vehicular pollution and industrial pollution as a reason towards rising indoor and outdoor pollution in Delhi. The study finds that the increasing level of pollution has been responsible for rising mortality and morbidity. Despite the continuous efforts of controlling the level of pollution in Delhi, air pollution is not abated; strenuous efforts are needed to be done.

It is essential to control for air pollutants due its damaging effects on human health. These effects include premature death as well as increases in the incidence of chronic heart and lung disease. It is important to have the estimates of health damages associated with air pollution since they can provide both an impetus for environmental controls and a means of evaluating the benefits of specific pollution control policies. It is important to examine the level of awareness of youth of Delhi about air pollution, its causes and its health effects

3. Data and Methodology

This empirical study is based on a sample survey of the State of Delhi. The data was collected by using a schedule blended with suitable closed and open-ended questions. The respondents were university students in Delhi. The schedule contains two parts: first contains personal information of the respondents and second part contains questions related to various dimensions of environment. The survey captures broad three dimensions, namely air pollution, water pollution, noise pollution and their health effects, causes, etc. The data of the respondents was collected during September 2016 to January 2017. The sample represents a cross-section of youth of different age groups, sex, geography, educational levels; income levels of respondents.

The survey was conducted in various educational institutions and metro and bus stations near to colleges and universities in Delhi. The respondents were resident in 129 localities of Delhi and NCR. The youth respondents were covering 15 states of India. 10% were respondent were those whose birth place is Delhi while remaining respondents are from 14 states living in Delhi for more than 2 years.

In the present paper, an analysis of questions related to air pollution has been done. Total number of schedules is 419 and hence selected for the analysis. The analysis has been carried out with the help of descriptive statistics, frequency tables, cross tabulation and chi-square test of independence on sources of air pollution, effects of air pollution, solutions to air pollution, etc. A cross tabulation is a joint frequency distribution of cases based on two or more categorical variables. Displaying a

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distribution of cases by their values on two or more variables is known as contingency table analysis and is one of the more commonly used analytic methods in the social sciences. The joint frequency distribution can be analyzed with the Chi-Square ($\chi 2$) to determine whether the variables are statistically independent or if they are associated. Chi-Square ($\chi 2$) tests compare the expected and actual distribution of data across categories. If a dependency between variables does exist, then other indicators of association can be used to describe the degree which the values of one variable predict or vary with those of the other variable. For chi-square analyses, the effect sizes are phi (Φ) or Cramer's V are used.

4. Empirical Analysis

The present study is based on the primary survey among university and college students in Delhi regarding youth participation in Environmental Sustainability. It is focused on youth perception about air pollution in Delhi, its causes, its health impacts and solutions. Descriptive analysis of the survey indicates that the average of respondents is 20.45 years, with minimum age of 17 years and maximum age of 34 years. Average years of education of respondents are 15.94 years, with minimum age of 15 years and maximum age of 20 years. Average years of education of mother and father of respondent are 9.39 and 4.71 years respectively (Table 1).

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	419	17.00	34.00	20.45	2.12
Resp_edu	419	15.00	20.00	15.94	1.31
FE	419	.00	18.00	9.39	4.92
ME	419	.00	11.00	4.71	3.073

Table 2 indicates frequency of Years of Education of Respondents and Gender Classification of Respondents. It is also revealed by summary statistics that average years of education of 61.6% respondents are 15 years, of 27.2% respondents are 17 years, of 7.9% respondents are 18 years and 3.3 % respondents are 20 years. 164 out of 419 (39.1%) respondents are males and 255 out of 419 respondents are females. It implies that this survey captures the opinion of educated youth who has either completed or presently pursuing education in higher learning institutions.

Table 2: Frequency Table

Years of Education of Respondents				
	Frequency	Percent	Valid Percent	Cumulative Percent
15	258	61.6	61.6	61.6
17	114	27.2	27.2	88.8
18	33	7.9	7.9	96.7
20	14	3.3	3.3	100
Total	419	100	100	
Gender Classification of Respondents				
	Frequency	Percent	Valid Percent	Cumulative Percent
1.00	164	39.1	39.1	39.1
2.00	255	60.9	60.9	100.0
Total	419	100.0	100.0	

Table 3 presents summary of air pollution awareness among respondent youth. The respondents were asked whether they are aware about the air pollution in Delhi. Results reveal that 94% respondents were aware about the problem of air pollution. However, 6% respondents were not

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aware about the problem of air pollution despite their higher education. It implies that majority of educated youth in Delhi are aware about air pollution as a problem.

Table 3: Air Pollution Awareness

Air Pollution Awareness	Frequency	Percent
Yes	394	94.0
No	25	6.0
Total	419	100.0

Table 4 presents the results of cross tabulation between gender and air pollution awareness. Results show that 38.1% of respondents having awareness of air pollution are male while 61.9% of respondents are female. Within Gender, 91.5% of males have awareness of air pollution whereas proportion of female respondent is higher and close to 96%. Of total, 35.8% of respondent are male and have awareness of air pollution while, 58.2% of respondent are female and have awareness of air pollution. Results further reveal that 56% of respondents not having awareness about air pollution are males while 44% are females. Results indicate that female youth are more sensitive and aware compared to male youth about air pollution.

Table 4: Air Pollution Awareness (Air_Pl_AW) * Gender

		Gender		Total
		1.00	2.00	
1.00	Count	150	244	394
	% within Air_Pl_AW	38.1%	61.9%	100.0%
	% within Gender	91.5%	95.7%	94.0%
	% of Total	35.8%	58.2%	94.0%
2.00	Count	14	11	25
	% within Air_Pl_AW	56.0%	44.0%	100.0%
	% within Gender	8.5%	4.3%	6.0%
	% of Total	3.3%	2.6%	6.0%

Table 5 presents Chi-Square results to test whether there is significant association between air Pollution Awareness and Gender. The results of the "Pearson Chi-Square" reveal that the null hypothesis of no statistically significant association between Gender and Air Pollution awareness is accepted at 5% level of significance. This is because asymptotic significance value is not less than 5%. In other words, it infers that there is no statistically significant difference about Air Pollution Awareness between male and female.

Table 5: Chi-Square Tests (Air_Pl_AW and Gender)

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.172[a]	1	.075		
Continuity Correction[b]	2.464	1	.116		
Likelihood Ratio	3.083	1	.079		

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Fisher's Exact Test				.091	.060
Linear-by-Linear Association	3.165	1	.075		
N of Valid Cases	419				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.79.					
b. Computed only for a 2x2 table					

Table 6 presents the perception of youth about air pollution as environmental challenge. Respondents were asked to rank 1(most important) to 9 (least important) the environmental challenges. The challenges were: rise in temperature; drought; flood; air pollution; noise pollution; water pollution; loss of biodiversity; urban solid waste; and others(specify). The study indicates that every respondent identified and ranked air pollution as an environmental challenge in Delhi. The results found that 34.8% respondents ranked air pollution as 1, a most important challenge for the environment; 28.2% respondents ranked air pollution as 2; 13.1% respondents ranked air pollution as 3 and so on. Out of 9 ranks, revealing aspect of the survey is that the 76% respondent ranked air pollution at 1 or 2 or 3, which indicates gravity of challenge in the perception of youth. It implies that vast majority of educated youth perceive air pollution as a threat to the environment.

Table 6: Perception of Youth about Air Pollution as Environmental Challenge (1-Most Important to 9-Least Important)

Code	Frequency	Percent
1.00	146	34.8
2.00	118	28.2
3.00	55	13.1
4.00	46	11.0
5.00	18	4.3
6.00	14	3.3
7.00	4	1.0
8.00	2	.5
9.00	0	0.0
Total	403	96.2
Missing Response	16	3.8
Total	419	100.0

Table 7 shows the awareness about the causes of air pollution. Respondents were asked that whether they are aware about the causes of air pollution. 90% respondents were responded in 'Yes' while 10% respondent were responded in 'No'. Table 8 presents results of cross tabulation between Gender and Causes of air Pollution. Results show that 38.7% of respondents having awareness of Causes of Air Pollution are male. 89.0% of males have awareness of Causes of Air Pollution. Of total respondents, 34.8% of respondent are both male and having awareness of Causes of Air Pollution. 61.3% of respondents having awareness of Causes of Air Pollution are female. 90.6% of females have awareness of Causes of Air Pollution. 55.1% of respondent are female and have awareness of Causes of Air Pollution. Results further reveal that 42.9% of respondents not having awareness about Causes of Air Pollution are males while 57.1%% are females.

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Table 7: Awareness of Causes of Air Pollution

Code	Frequency	Percent
1.00	377	90.0
2.00	42	10.0
Total	419	100.0

Table 8: Awareness of Causes of Air Pollution (C_Air_Pl_AW)* Gender

		Gender		Total
		1.00	2.00	
1.00	Count	146	231	377
	% within C_Air_Pl_AW	38.7%	61.3%	100.0%
	% within Gender	89.0%	90.6%	90.0%
	% of Total	34.8%	55.1%	90.0%
2.00	Count	18	24	42
	% within C_Air_Pl_AW	42.9%	57.1%	100.0%
	% within Gender	11.0%	9.4%	10.0%
	% of Total	4.3%	5.7%	10.0%
	Count	164	255	419
	% within C_Air_Pl_AW	39.1%	60.9%	100.0%
	% within Gender	100.0%	100.0%	100.0%
	% of Total	39.1%	60.9%	100.0%

Table 9 presents Chi-Square results to test whether there is no significant association between Awareness of Causes of Air Pollution and Gender. The results of the "Pearson Chi-Square" reveal that the null hypothesis of no statistically significant association between Awareness of Causes of Air Pollution and Gender is accepted at 5% level of significance. It implies that there is no statistically significant relationship between Awareness of Causes of Air Pollution and Gender.

Table 9: Chi-Square Tests (C_Air_Pl_AW and Gender)

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.271[a]	1	.603		
Continuity Correction[b]	.125	1	.724		
Likelihood Ratio	.268	1	.605		
Fisher's Exact Test				.620	.359
Linear-by-Linear Association	.270	1	.603		
N of Valid Cases	419				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.44.					
b. Computed only for a 2x2 table					

Table 10 reveals the causes of air pollution as perceived by educated youth in Delhi. Respondents were asked to identify the most important cause of air pollution. Results of the survey indicate that 46.30% respondents identified vehicles (aeroplanes, rail, car, buses, bike, etc) as the one most important cause of air pollution. 30.79% respondents identified industries as the second most important cause of air pollution. Around 13.84% respondent identified crop burning and 6.68%

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identified CFCs as the causes of air pollution. The study reveals that causes of air pollution are common knowledge. Only less than 1% respondent could not identify any cause of air pollution.

Table 10: Causes of Air Pollution in Delhi

Code	Frequency	Percent	Causes
1	194	46.30	Public and Private Vehicles
2	129	30.79	Industries
3	58	13.84	Crop Burning
4	28	6.68	CFCs
5	4	0.95	Population Density
6	3	0.72	Deforestation
0.0	3	0.72	Not Mentioned
Total	419	100.0	

Table 11 presents the perception of respondents about health effect of air pollution. Respondent were asked to identify the health problems associated with air pollution in Delhi. The survey results indicate that 66.11% respondents identified lung Infections and related problems associated with air pollution. 7.16% respondents identified cold & cough; 5.49% respondents identified bronchitis and 3.82% identified allergies and skin problems associated with air pollution. However, 9.79% respondents were not aware about the health effects of air pollution. It implies that the majority of educated youth understand the health related implications of air pollution in Delhi.

Table 11: Perception of Respondents about Health Effect of Air Pollution

Code	Frequency	Percent	Health Problem
0	41	9.79	Not able to Identify
1	16	3.82	Allergies and Skin Problems
2	**277**	66.11	**Lung Infections**
3	**23**	5.49	Bronchitis
4	12	2.86	Cancer
5	30	7.16	Cold & Cough
6	2	0.48	Headache
7	7	1.67	Heart Problem
8	1	0.24	Influenza
9	1	0.24	Irritation
10	2	0.48	Nausea
11	4	0.95	Throat problem
12	3	0.72	Eyes Related Problems
Total	419	100	100.0

Table 12 shows participation of youth in environment improvement activities. Respondents were asked whether they have participated or done any action or activity to reduce any type of environment pollution. Result reveals that 54.4% of respondent responded in 'Yes' while remaining 45.6% in 'No'. It seems that approximately 46% of the respondents have not involved themselves in

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any activity for the environment improvement purpose. This reflects negligent attitude towards environment protection even in highly educated youth of the capital city of the country

Table 12: Youth Participation in Environment Improvement Activities

Code	Percent	Percent
1	228	54.4
2	191	45.6
Total	419	100.0

Table 13 presents results of cross tabulation between Gender and Participation in Environment Improving Activities (PEIMA). Results show that 34.2% of respondents participating in Environment Improving Activities are males while 65.8% are females. 47.6% of males are participating in Environment Improving Activities. 18.6% of respondent are male, participating in Environment Improving Activities. 58.8% of females are participating in Environment Improving Activities. 35.8% of respondent are female participating in Environment Improving Activities. Results further reveal that 45% of respondents who are not participating in Environment Improving Activities are males while 55% are females. 52.4% male respondents are not participating in Environment Improving Activities while 41.2% are female respondents. Female youth seems to participate more in Environment Improving Activities

Table 13: Participation in Environment Improving Activities (PEIMA) * Gender

			Gender		Total
			1.00	2.00	
PEIMA	1.00	Count	78	150	228
		% within PEIMA	34.2%	65.8%	100.0%
		% within Gender	47.6%	58.8%	54.4%
		% of Total	18.6%	35.8%	54.4%
	2.00	Count	86	105	191
		% within PEIMA	45.0%	55.0%	100.0%
		% within Gender	52.4%	41.2%	45.6%
		% of Total	20.5%	25.1%	45.6%
Total		Count	164	255	419
		% within PEIMA	39.1%	60.9%	100.0%
		% within Gender	100.0%	100.0%	100.0%
		% of Total	39.1%	60.9%	100.0%

Table 14 presents Chi-Square results to test whether there is no significant association between Gender and PEIMA. The results of the "Pearson Chi-Square" reveal that the null hypothesis of no statistically significant association between Gender and PEIMA is rejected at 5% level of significance. It implies that there is a statistically significant relationship between Gender and PEIMA. Table 15 present results of symmetric measures, namely Phi and Cramer's V. Phi and Cramer's V results reveal that the strength of association between the variables is significant but the magnitude of the effect size is small to moderate.

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Table 14: Chi-Square Tests (Gender and PEIMA)

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.104[a]	1	.024		
Continuity Correction[b]	4.660	1	.031		
Likelihood Ratio	5.102	1	.024		
Fisher's Exact Test				.027	.015
Linear-by-Linear Association	5.092	1	.024		
N of Valid Cases	419				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 74.76.					
b. Computed only for a 2x2 table					

Table 15: Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.110	.024
	Cramer's V	.110	.024
N of Valid Cases		419	
a. Not assuming the null hypothesis.			
b. Using the asymptotic standard error assuming the null hypothesis.			

Table 16 present the solution to the environment degradation. Four solution options were given to the respondent. These were: 1=Technology Innovation; 2=Social and Behaviour Change of Citizens; 3=Strict Enforcement of Environment Laws; and 4=Enactment of New Environmental Laws. Respondents were asked to suggest any one or more from the solution options. Results indicate that 32% respondent suggested solution option 2, i.e., Social and Behavioural Change of Citizens while 18.9% respondent suggested solution option 3, i.e., Strict Enforcement of Environmental Laws. 10.5% respondent suggested joint solution option 2 & 3. Results reflect that 63% respondent think to act on solution option no. 2 & 3 to control environment degradation. Surprisingly, only 8.1% of respondent believe in technology innovations as a solution to control environment degradation. Only a small fraction (4%) of respondent feels to enact new laws as a solution to environmental degradation. Thus, our study is suggestive of awareness campaign involving citizens and strict enforcement of environment laws by concerned agencies as the appropriate solution to control environment degradation.

Table 16: Solution to Environment Degradation

Code	Frequency	Percent
1.00	34	8.1
2.00	**134**	**32.0**
3.00	**79**	**18.9**
4.00	17	4.1
12.00	13	3.1
13.00	6	1.4
14.00	3	.7
23.00	44	10.5

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24.00	10	2.4
34.00	7	1.7
123.00	11	2.6
124.00	4	1.0
134.00	2	.5
234.00	7	1.7
1234.00	36	8.6
Total	407	97.1
Missing Response	12	2.9
Total	419	100.0

Code Classification: 1=Technology Innovation; 2=Social and Behaviour Change of Citizens; 3=Strict Enforcement of Environment Laws; and 4=Enactment of New Environmental Laws

5. Concluding Remarks

This study has attempted to analyze the impact of air pollution on health by conducting a field survey on the youth of Delhi, studying in different varsities and colleges in Delhi NCR. Our respondents have obtained, on an average, 16 years of education. The survey broadly aims to capture awareness about air pollution, it causes and its health effects. Also proposes certain solutions to contain the environmental degradation. For this, a total number of 419 respondents were surveyed during September 2016 to January 2017. The collected data has been assessed with multiple techniques like descriptive statistics, frequency tables, cross tabulation and chi-square test of independence on sources, effects, and solutions to air pollution.

The study indicates that proportion of female respondents having awareness about air pollution is fairly higher than proportion of males. However, using Chi-Square tests there is no statistically significant difference about air pollution awareness between the two genders. Vehicular pollution is identified as the major cause of pollution in Delhi by the respondents followed by industrial pollution and crop burning by neighbouring states. The survey reveals that more than 60% of the respondents recognized lung infections as the major health effect of air pollution followed by cold & cough, and bronchitis. However, 10% of total respondents were not aware about any health effects of air pollution.

The survey also gauged on youth participation in environmental improvement activities. It is found that nearly half of the respondents have participated in such type of activities and among them females participation is higher than males'. At last, students were inquired to provide solutions towards minimizing the environmental degradation. Amongst the multiple solutions like technology innovation, social and behaviour change of citizens, strict enforcement of laws, and enactment of new environmental laws, one-third of the students proposed for change in social behaviour of citizens while around one-fifth advocated for strict enforcement of existing environmental laws. The study concludes that a large number of awareness campaigns should be organized involving a greater participation from all sections of the society along with better implementation of present laws.

Acknowledgement: Authors acknowledge the financial support extended by the Advisory committee of UGC-SAP-DRS-II of Department of Economics, Jamia Millia Islamia, New Delhi for conducting the primary survey.

Received: 2 March Revised: 7 March Accepted: 17 March

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Received: 2 March Revised: 7 March Accepted: 17 March

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