International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: SJIF: 5.995
Available Online at www.journalijcar.org
Volume 7; Issue 2(L); February 2018; Page No. 10436-10442
DOI: http://dx.doi.org/10.24327/ijcar.2018.10442.1768

Research Article

WATER POLLUTION AND ITS SOURCES, EFFECTS & MANAGEMENT: A CASE STUDY OF DELHI

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A R T I C L E I N F O

Article History:
Received 19th November, 2017
Received in revised form 20th December, 2017
Accepted 5th January, 2018
Published online 28th February, 2018

Key words:
Environment Sustainability, Water Pollution, Health Effects
JEL Classification: Q50, Q53, I12

A B S T R A C T

Water pollution is a national and global issue. Humans and all living species in the world are facing worst results of polluted water. The present study investigates the level of awareness about water pollution in Delhi, its causes, its health effects and solutions among the youth in Delhi. The paper has used primary data collected through a *schedule* from university/college students in Delhi. The study concludes that the majority of educated youth (94%) perceives water pollution as environmental challenge and 52% respondents ranked it (1-3) as most important threat. The study identified dumping of waste as one of the most important causes of water pollution; untreated sewage as the second most important cause of water pollution and iindustries discharge as the third most important cause of water pollution. The study identified Typhoid, Diarrhoea, Dengue, Cholera, Jaundice, Malaria, Chikungunya, etc are associated with water pollution on the basis survey. The study suggests awareness campaign involving citizens and strict enforcement of environmental laws by concerned agencies as the appropriate solution to control environment degradation. It is recommended that there should be proper waste disposal system and waste should be treated before entering in to river and water bodies.

INTRODUCTION

Water pollution occurs when unwanted materials enter in to water (e.g. lakes, rivers, oceans, aquifers and groundwater) and contaminate the quality of water. This form of environmental degradation occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds. This is harmful to environment and human health. Water pollution affects the entire biosphere of plants and organisms living in these water bodies, as well as organisms and plants that might be exposed to the water. In almost all cases the effect is damaging not only to individual species and populations, but also to the natural biological communities (Wikipedia, 2018).

Safe drinking water is necessary for human health all over the world. Being a universal solvent, water is a major source of infection. According to world health organization (WHO) 80% diseases are water borne. 3.1% deaths occur due to the unhygienic and poor quality of water (Pawari, et. al., 2015). Among different kinds of environmental pollution (air, water, land, noise and radiation), water pollution is the most severe in its implications for the health and well being of people. Water pollution inflicts economic burdens on the users of water resources. It imposes costs on municipal and industrial water supply and human health and damages variety of water based activities including recreational activities and commercial fishing (Dasgupta *et al* 1985).

The specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, etc. Discharge of domestic and industrial effluent wastes, leakage from water tanks, marine dumping, radioactive waste and atmospheric deposition are major causes of water pollution. Heavy metals, industrial waste and toxins in industrial waste are the major cause of immune suppression, reproductive failure and acute poisoning. Polluted water causes infectious diseases, like cholera, typhoid fever and other diseases gastroenteritis, diarrhea, vomiting, skin and kidney problem. Water pollutants are killing sea weeds, mollusks, marine birds, fishes, crustaceans and other sea organisms that serve as food for human. Insecticides like DDT concentration is increasing along the food chain. These insecticides are harmful for humans (Owa, 2013). Pollution across rivers have been causing acute water-borne diseases and health problems that are affecting the human population which needs to be treated and also poses an economic cost on people.

Water pollution is a major environmental issue in India. Across India, an estimated 62,000 million litres per day (MLD) sewage is generated in urban areas while there is treatment capacity for only 23,277 MLD. Due to operational and other infrastructural constraints, the actual amount of sewage treated stands at 18,883 MLD as only 522 out of 816 sewage treatment plants listed across India. Thus, at least 70% of sewage generated in urban India is being dumped in rivers, seas, lakes and wells, polluting water bodies and

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contaminating fresh water sources. Partially treated or untreated sewage is responsible for large part of the pollution in streams and water bodies (SANDRP, 2016).

Water pollution and a lack of solid waste treatment facilities have caused serious damage to the river on whose banks Delhi grew, the Yamuna. Water in Delhi has been contaminated by various sources viz domestic and industrial. Sewage treatment plants could not keep pace with rising population and waste generation. Yamuna, which is the lifeline of Delhi and provides 70% of the city's water, is also among the world's most polluted rivers. It literally turns into a toxic sewage drain during its 22 kilometer journey through the city with 21 drains emptying 850 million gallons of sewage into the river every day (Chaudhary, 2015). As per SANDRP (2016), Delhi generates 3,800 MLD of waste and has a present installed treatment capacity of 2,693.7 MLD of which the actual utilization is 1,575.8 MLD. Thus, only 41% of wastewater is treated and the remaining 2,225 MLD of untreated water is either seeping into the ground or being discharged into Yamuna. It is evident from the abysmal state of Yamuna.

In this context, the objectives of this paper are (i) to examine the level of awareness of youth of Delhi about water pollution, its causes and its health effects and (ii) to suggest appropriate inferences based on field survey and recommend appropriate policy suggestions. 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.

LITERATURE REVIEW

Many researchers have highlighted the causes and effects of water pollution. Yogendra *et al*, (2008) highlighted that freshwater is of vital concern for humans. The surface water bodies, which are the most important sources of water for humans and related activities are unfortunately under severe environmental stress and are being threatened as a consequence of developmental activities. The Pneumonia and Diarrhoea Progress Report (2016) published by John Hopkins in its report states that Pneumonia and Diarrhoea claimed lives of 1.5 million children under the age of five. This prevails disproportionately in a few countries as 72 percent of these two diseases among children deaths occur in just 15 countries. In India, 296,279 children under the age of five died due to Pneumonia & Diarrhoea in 2016

Srinivasan *et al* (2009) in their paper examined the cost of illnesses for households living in areas irrigated with wastewater and comparing it to areas irrigated with normal quality of water along Musi River. The study found that nutrients present in wastewater are beneficial to agriculture but contaminants present in it hamper the environmental growth and poses health issues. Also it was found that higher morbidity rates existed in areas irrigated with wastewater that compared to areas irrigated with normal quality water. Kumar *et al* (2017) points out the causes of water pollution in the State of Punjab. Industrial waste and domestic sewage gets discharged directly into water bodies as the predominant causes of water pollution. They revealed that about 70 per cent of the water pollution is caused due to sewage which pollutes drains and eventually affecting river water and affects the ground water in towns and cities in the state of Punjab. Vijaya and Mythili (2011) in their study discussed the deteriorating water quality of the Powai Lake in Mumbai. It consists of rich ecosystem of considerable value and interest, supporting wide variety of flora and fauna and a habitat for wild variety of aquatic animals. Now, it is increasingly being impacted by human activities, resulting in choking off the shoreline, and deteriorating water quality. This study attempts valuing improvement in water quality through 'Contingent Valuation Method' (CVM) and analyses the factors determining the WTP by the users for improvement in water quality. On an average, salaried class is willing to pay 30% more according to 2007 survey. The respondents attach more values to the aesthetic benefits.

Mishra (2010) points several reasons of water pollution in Delhi such as sewage and waste water, dumping of solid wastes and litters in water bodies, industrial waste, acid rain, global warming, eutrophication, etc. The study highlighted that the 22 km stretch in Delhi, once described as the life line of the city, today has become one of the dirtiest rivers in the country. Zafar and Alappat (2004) indicate that the most landfills are located along the banks of rivers flowing through the cities in India. The quantity of waste generation is one of the biggest sources of environmental degradation in Delhi, India's capital. It contributes to river pollution in a significant way through landfill leachate and runoff, especially during the rainy season. All the landfill sites except Tilak Nagar, Hastal and Chattarpur are located close (0-6 km) to the river Yamuna. The leachate produced by landfills finally percolates to the porous ground surface at the landfills or finds its way to nearby drains. A large portion of landfill leachate and runoff produced by these landfill sites finally reaches the Yamuna through ground water flow or surface water flow through the drains. They indicate that river water quality is affected by the presence of landfill locations.

Dhote *et al*. (2001) argue that the toxic chemicals used in making the idols tend to cause serious problems of water pollution and also pose a serious threat to the underwater ecological system. When immersed, these colors and chemical dissolve slowly leading to significant alteration in the water quality. Kaur *et al*., (2013) study on assessment of idol immersion on physic-chemical characteristics of river Yamuna in Delhi stretch revealed that idol immersion activity has negative impact on water quality of river Yamuna. The composed data was analyzed for the year 2011, to understand deterioration in the water quality of the river due to idol immersion practices. According to the results, the value of DO, BOD, Total Solids and COD were found to vary from 6.0-7.5 mg/L; 3.3-38 mg/L; 430-1268 mg/L; 28- 136 mg/L respectively. The low levels of DO and high BOD and Total solids levels at different sites indicate the poor water quality due to idol immersions.

There are different views on the management of environment. Many argues centralized regulation while others support a bottom-up or decentralized regulation involving civic society and local communities and with a very limited role of the government could save transaction costs and get rid of political and bureaucratic corruption. This approach draws theoretical support from the Coase Theorem (Coase 1960). The Coase Theorem states that the optimal level of pollution control could be realized through the bargaining between the polluters and the affected parties, given the initial property rights to either of the parties in the absence of transaction costs. Recent empirical experiences show that the bargaining between the communities

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and polluters helped in reducing the water pollution when the government had been protecting the property rights to the environmental resource to the people (Murty *et al*. 1999; Pargal and Wheeler 1996; World Bank 1999).

The management of environmental resources can no longer be taken as the responsibility of a single institution like a market or the government (Murty 2008). Collectively, market agents, consumers, producers, and stockholders have incentives for controlling pollution. Consumers regulate the market for pollution intensive commodities by expressing preferences for green products or commodities produced using cleaner technologies. Investors also have incentives to invest in industries using cleaner technologies. Higher level of observed pollution in a firm is an indication to the investors that the firm uses inefficient technology resulting in the loss of profits. Profit losses may occur because of reduced demand for its products by green consumers, increased costs due to higher penalties imposed by the government for non-compliance with pollution standards, and the settlement of compensation to victims. In this case there may be a downward revaluation of the firm's stocks in the capital market. On the other hand, a good environmental performance by a firm may result in an upward evaluation of its stocks (Murty 2008).

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, noise pollution and water pollution, 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 in 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 water pollution has been done. Total numbers of schedules are 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, etc**.** A cross tabulation is a joint frequency distribution of cases based on two or more categorical variables. Displaying a 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

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 water 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 of mother and father of respondent is 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 describes the frequency of Years of Education and Gender Classification of Respondents. It is also revealed by summary statistics that average years of education of 62.3% respondents are 15 years, of 26.5% respondents are 17 years, of 7.9% respondents are 18 years and 3.3 % respondents are 20 years. 164 out of 419 (39.1%) are males and 255 are females out of 419 respondents. It implies that this survey captures the opinion of educated youth who has either completed or presently pursuing education in higher learning institutions. Female youth are relatively more in number compared to male respondent.

Table 2 Frequency Table

Years of Education of Respondents				
Years	Frequency	Percent	Valid Percent	Cumulative Percent
15	261	62.3	62.3	62.3
17	111	26.5	26.5	88.8
18	33	7.9	7.9	96.7
20	14	3.3	3.3	100.0
Total	419	100.0	100.0	
Gender Classification of Respondents				
Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	164	39.1	39.1	39.1
Female	255	60.9	60.9	100.0
Total	419	100.0	100.0	

Table 3 present summary of water pollution awareness (WP_AW) among respondent youth. The respondents were asked whether they are aware about the water pollution in Delhi. Results reveal that 93.8% respondents were aware about the problem of water pollution. However, 6.2% respondents were not aware about the problem of water pollution. The results indicate that the majority of educated youth in Delhi are aware about water pollution as a problem.

Table 3 Water pollution Awareness

Water pollution Awareness	Frequency	Percent
Yes	393	93.8
No	26	6.2
Total	419	100.0

Table 4 presents the results of cross tabulation between gender and water pollution awareness. Results show that 38.4% and 61.6% of respondents having awareness of water pollution are male and female respectively. 92.1% of males have awareness

of water pollution within Gender. 36% of respondent are male who are aware about water pollution. 94.9% of females have awareness of water pollution within Gender. 57.8% of respondent are female and have awareness of water pollution. Results further reveal that 50% of respondents who are not aware about water pollution are males and females.

Table 4 WP_AW * Gender

			Gender		Total
			1.00	2.00	
WP_AW	1.00	Count	151	242	393
		% within WP_AW	38.4%	61.6%	100.0%
		% within Gender	92.1%	94.9%	93.8%
		% of Total	36.0%	57.8%	93.8%
	2.00	Count	13	13	26
		% within WP_AW	50.0%	50.0%	100.0%
		% within Gender	7.9%	5.1%	6.2%
		% of Total	3.1%	3.1%	6.2%
Total		Count	164	255	419
		% within WP_AW	39.1%	60.9%	100.0%
		% within Gender	100.0%	100.0%	100.0%
		% of Total	39.1%	60.9%	100.0%

Table 5 presents Chi-Square results to test whether there is significant association between Water Pollution Awareness and Gender. The results of the "Pearson Chi-Square" reveal that the null hypothesis of no statistically significant association between Gender and Water pollution awareness is accepted at 5% level of significance. It implies that there is no statistically significant difference about Water pollution Awareness between male and female.

Table 5 Chi-Square Tests (WP_AW * Gender)

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.372[a]	1	.241		
Continuity Correction[b]	.929	1	.335		
Likelihood Ratio	1.342	1	.247		
Fisher's Exact Test				.300	.167
Linear-by-Linear Association	1.369	1	.242		
N of Valid Cases	419				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.18.
b. Computed only for a 2x2 table

Table 6 presents the perception of youth about water 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 94.0% respondent identified and ranked water pollution as an environmental challenge in Delhi. The results found that 6.00% respondents ranked water pollution as 1, a most important challenge for the environment; 21.5% respondents ranked water pollution as 2; 24.3% respondents ranked water pollution as 3 and so on. Out of 9 ranks, revealing aspect of the survey is that the 51.8% respondent ranked water 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 water pollution as a threat to the human and environment.

Table 6 Perception of Youth about Water pollution as Environmental Challenge (1-Most Important to 9-Least Important)

		Frequency	Percent	Valid Percent	Cumulative Percent
9Valid	1.00	25	6.0	6.3	6.3
	2.00	90	21.5	22.8	29.2
	3.00	102	24.3	25.9	55.1
	4.00	79	18.9	20.1	75.1
	5.00	42	10.0	10.7	85.8
	6.00	37	8.8	9.4	95.2
	7.00	15	3.6	3.8	99.0
	8.00	4	1.0	1.0	100.0
	9.00	0	0	0	100.0
	Total	394	94.0	100.0	
Missing Response		25	6.0		
Total		419	100.0		

Table 7 describes the causes of water pollution (WPC_AW). Respondents were asked that whether they are aware about the causes of water pollution. 86.2% respondents have responded in 'Yes' while 13.8% respondent in 'No'. Table 8 presents results of cross tabulation between Gender and Causes of Water Pollution. Results show that 37.1% and 62.9% of respondents having awareness of Causes of Water pollution are male and female respectively. 81.7% of males and 89.0% of female have awareness of Causes of Water pollution. 32% of respondent are male and have awareness of Causes of Water pollution. 54.2% of respondents having awareness of Causes of Water pollution are female. Results further reveal that 51.7% and 48.3% respondents who are not aware about the Causes of Water pollution are males and females respectively.

Table 7 Awareness of Causes of Water pollution

Code	Frequency	Percent
1.00	361	86.2
2.00	58	13.8
Total	419	100.0

Table 8 WPC_AW * Gender

			Gender		Total
			1.00	2.00	
WPC_AW	1.00	Count	134	227	361
		% within WPC_AW	37.1%	62.9%	100.0%
		% within Gender	81.7%	89.0%	86.2%
		% of Total	32.0%	54.2%	86.2%
	2.00	Count	30	28	58
		% within WPC_AW	51.7%	48.3%	100.0%
		% within Gender	18.3%	11.0%	13.8%
		% of Total	7.2%	6.7%	13.8%
Total		Count	164	255	419
		% within WPC_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 Water pollution and Gender. The results of the "Pearson Chi-Square" reveal that the null hypothesis of no statistically significant

Table 9 Chi-Square Tests (WPC_AW * Gender)

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.475[a]	1	.034		
Continuity Correction[b]	3.883	1	.049		
Likelihood Ratio	4.378	1	.036		
Fisher's Exact Test				.042	.025
Linear-by-Linear Association	4.464	1	.035		
N of Valid Cases	419				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 22.70.
b. Computed only for a 2x2 table

association between Awareness of Causes of Water pollution and Gender is rejected at 5% level of significance. It implies that there is statistically significant association between Awareness of Causes of Water pollution and Gender.

Table 10 Symmetric Measures (WPC_AW * Gender)

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.103	.034
	Cramer's V	.103	.034
	Contingency Coefficient	.103	.034
N of Valid Cases		419	

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.

Table 11 reveals the causes of water pollution as perceived by respondents in Delhi. Respondents were asked to identify the most important cause of water pollution. Results of the survey indicate that 63.25% respondents identified Waste Dumping as the one most important cause of water pollution. 21.48% respondents identified industries as the second most important cause of water pollution. Around 9.07% respondent identified industrial discharge and 4.30% identified Chemical wastes as the causes of water pollution. The study reveals that causes of water pollution are common knowledge. Only less than 1.91% respondent could not identify any cause of water pollution.

Table 11 Causes of Water Pollution in Delhi

Code	Frequency	Percent	Causes
1	265	63.25	Waste Dumping
2	90	21.48	Untreated Sewage
3	38	9.07	Industries Discharge
4	18	4.30	Chemical wastes
0.0	8	1.91	Not Mentioned
Total	419	100.0	

Table 12 presents the perception of respondents about health effect of water pollution. Respondent were asked to identify the health problems associated with water pollution in Delhi. The survey results indicate that 15.5% respondents identified Typhoid, and related problem associated with water pollution. 15% respondents identified Diarrhoea; 13.1% respondents identified Dengue and 10.3% identified Cholera and 9.3% identified Jaundice with water pollution. However, 11.7% respondents were not aware about the health effects of water pollution. It implies that the majority of educated youth understand the health related implications of water pollution in Delhi.

Table 12 Perception of Respondents about Health Effect of Water pollution

Code	Frequency	Percent	Health Problem
0	49	11.7	Not able to Identify
1	65	15.5	Typhoid
2	63	15	Diarrhoea
3	55	13.1	Dengue
5	43	10.3	Cholera
6	39	9.3	Jaundice
7	18	4.3	Malaria
8	14	3.3	*Chikungunya*
9	9	2.1	Stomach Infection
10	64	15.27	Other Water Borne Diseases
Total	419	100	100.0

Despite known causes and health implications, the problem has not been tackled properly. In Delhi,, there are eight types of housing settlements for the residents, of which only one is termed 'planned' and the other seven are 'unplanned' colonies. The number of 'unauthorized' colonies has also increased from 110 in 1962 to 1,639 in June 2014—largely occupied by lower-middle class and poor residents of the city (Haider, 2007). The clean and safe drinking water is highly biased in favour of the rich, the powerful, and the influential while majority lower-middle class and poor residents of the city has no or limited access to safe drinking water.

Table 13 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 respondent has not involved themselves in any activity for the environment improvement purpose. This reflects on negligent attitude towards environment protection even in highly educated youth of the capital city of the country

Table 13 Youth Participation in Environment Improvement Activities

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

Table 14 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 not participating in Environment Improving Activities are males while 55% are females. 52.4% male respondents are not participating in Environment Improving Activities are males while 41.2% are females. Female youth seems to participate more in Environment Improving Activities

Table 14 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 15 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 16 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.

Table 15 Chi-Square Tests (PEIMA * Gender)

	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 16 Symmetric Measures (PEIMA * Gender)

		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 17 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. It 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 17 Solution to Environment Degradation

Code	Frequency	Percent
2.00	134	32.0
3.00	79	18.9
23.00	44	10.5
1234.00	36	8.6
1.00	34	8.1
4.00	17	4.1
12.00	13	3.1
123.00	11	2.6
24.00	10	2.4
34.00	7	1.7
234.00	7	1.7
13.00	6	1.4
124.00	4	1.0
14.00	3	.7
134.00	2	.5
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

CONCLUDING REMARKS

Water pollution is a global issue and world community is facing worst results of polluted water. This paper is focused on problem of water pollution in Delhi, its causes, health effects and solutions as perceived by the youth. The study concludes that majority of the youth is aware about water pollution and its causes in Delhi. The study reveals that the vast majority of educated youth (94%) perceives water pollution as environmental challenge and 52% respondents ranked it (1-3) as most important threat. The study identified dumping of waste as one of the most important causes of water pollution; untreated sewage as the second most important cause of water pollution and industries discharge as the third most important cause of water pollution. The study identified Typhoid, Diarrhoea, Dengue, Cholera, Jaundice, Malaria, Chikungunya, etc are associated with water pollution on the basis survey. It implies that the majority of educated youth understand the health related implications of water pollution in Delhi.

Finally, the study suggests that Social and Behavioural Change of Citizens and Strict Enforcement of Environment and Water pollution related Laws is the pre-requisite for an improvement in the environment. It is suggestive of awareness campaign involving citizens and strict enforcement of environmental laws by concerned agencies as the appropriate solution to control environment degradation. It is recommended that there should be proper waste disposal system and waste should be treated before entering in to river. Educational and awareness programs should be organized to control the pollution.

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How to cite this article:

Shahid Ahmed and Saba Ismail (2018) 'Water Pollution and its Sources, Effects & Management: A Case Study of Delhi', *International Journal of Current Advanced Research,* 07(2), pp. 10436-10442.
DOI: http://dx.doi.org/10.24327/ijcar.2018.10442.1768

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