Outdoor Air Pollution: A Case study of Gujrat City

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Abstract

Air pollution is one of the major problems faced by the world. This is a result of hike rapidly in urbanization, industrialization and huge volume of traffic in both developed under developed nations of the world. Air pollution from different sources harmfully affects to population health and a major cause to deteriorate ecosystem of the world. The study focused on major pollutants from different sources and impact of pollutants on human health. The study hypothetically provides links between air pollution and human health. Investigation finds out a complete scenario of air pollution of the study area Gujrat city. Study also includes a gentle discussion regarding willingness to pay and the general behavior of respondent toward problem.

Keywords: Air Pollution, Traffic, Willingness to Pay, Human Health.

Introduction

"Air pollution is contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere" (World Health Organization). Air pollution has been increasing in both developed and developing countries since industrialization and urbanization. Swiftly increase in traffic volume also a major cause to damage the global ecosystem and environmental degradation. Air pollution is in the form of point source such as Sulphur dioxide (SO_2), hydrogen fluoride, non-point sources such as carbon monoxide, oxide of nitrogen, hydrocarbons, regional source like ozone-depletion, chlorofluorocarbon and continuous source like emission from electric power plants, municipal waste treatment plants and other secondary pollutants harmfully affect to population health and a main cause to deteriorate ecosystem of the world. According to the World Bank's report transport essentially contributes to air pollution and is one of the most serious threats for public health in Pakistan. The report found that more than 22,600 deaths per year are directly or indirectly attributable to ambient air pollution at the national level (Triana, Afzal, Biller & Malik, 2013). The total population of Punjab with the growth rate of 2.64% is about 73 million. It is the most densely populated province of Pakistan and has a population density of 358.5 people per square kilometer moreover about 31 percent of its population resides in urban centers where as rest lives in rural areas (Census, 1998).

According to 1998 Population and Housing Census, total population of Gujrat district is **20, 48,000 persons** out of which 10, 26,000 (50.1%) are males and 10, 22,000 (49.9%) are females. Density of population in the district is **642** persons per square Kilometer. Percentage break-up of the Rural and Urban population is 72.3% and 27.7% respectively. The City is located in 74° -5 ^{o} east longitude and 32°-34 ^{o} north eastern direction from Provincial Capital Lahore. The Climate of the City is extreme hot during summer and cold during the winter. The months of March, April, September, October and November are pleasant. December and January are coldest months, when minimum temperature falls down to 2 degree centigrade,

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whereas in the summer season the highest temperature goes up to the 45 degree centigrade in the moths of June and July, but the hot spells are comparatively shorter due to proximity of Azad Kashmir Mountains. The average rain-fall on Kharian is 75 cm, at Gujrat 67 cm (GCP, 1998). Gujrat like other cities of Pakistan has air pollution problem due to rapid increase in vehicular emission and industry. There is all type of and almost all categories like two wheelers, three wheelers and four wheelers vehicles in Gujrat, two and three wheelers contribute more in air pollution. Rickshaws are also big source of air pollution in Gujrat. Large burden of different vehicles on roads and industries with the use of fossil fuels are increasing countless diseases and are destroying the ecosystem of the city. The major impacts of air pollution are in kind of respiratory diseases, eye irritation; reduce visibility, loss of vegetation and harmful effects on plants' growth.

Total environmental degradation cost is Rs.365 billion, out of this cost urban air pollution cost is Rs.65 billion (Economic Survey of Pakistan, 2013-14). According to recent study, average air pollution in big cities of Pakistan is about 4 times higher than the WHO limits (EPDP, 2012). So, air pollution has emerged a crucial threat for the health of urban environment, quality of life and population. High density area with industrial and vehicular emissions is provoked by low air dispersion. Major sources of air pollution in Pakistan are industrial emission, vehicular emission, waste disposal system, burning of solid waste and dust fall (EPDP,2012). Vehicular emissions represent the greatest source of air pollution in the country. In the result, motor vehicle emissions account for about 90 percent of total emissions of hydrocarbons, all of which have dangerous health implications, especially in densely populated urban centers (ESP, 2012-13).

The main objective of study is to find out the major source of emission in the city and to analyze the impact of air pollution on ecosystem in Gujrat city. The study also examine the general behavior and perception of particular people about air pollution and its treatment as well as to investigate generally willingness to pay of the city dwellers in order to overcome the problem of air pollution. We also identify the enthusiasm of citizens in order to their participation in mitigation of air pollution activities and to study how urban green spaces are helping in decreasing pollution level in the atmosphere of the City.

Literature Review

Anwar, Ahmed and Asghar (2012) carried out a similar study in Bahawalpur (Pakistan) in which they found a strong relationship between air pollution and human health by using both primary and secondary data. Khwaja et al. (2012) conducted a study in Karachi (Pakistan) about the effects of air pollution on daily morbidity from August 2008 to August 2009. The study finds that the concentration of $PM_{2.5}$ in Karachi is one of the major sources of damaging human health.

Majid, Madl and Alam (2012) reviewed the metropolitan cities (Karachi, Lahore, Rawalpindi, and Peshawar) of Pakistan. They used PM and found that averaged concentration of PM_{10} and $PM_{2.5}$ in all four cities is 6 times higher than WHO principles. Out of 17 million Ton of petroleum, 45.88% and out of 19.35 Million Tons oil, 46.2% oil is consumed by transport sector only in Pakistan which has become major source of air pollution (Qadir, 1996).

Khan and Zaidi (2005) investigated that the problems of morbidity and death in children also had strong connection with indoor air pollution (IAP) due to massive use of biomass fuel in Pakistan. Another paper (Triana , Afzal , Faiz , Ali and shuja, 2010) collects data on particulate matters like carbon monoxide, sulphur and nitrogen oxides and ozone in Karachi (Pakistan) and uses techniques standard valuation to measure the health effects through air pollution from 2007 to 2010. On the other hand, Gupta, Khan, Silva and Patadia (2013) analyzed atmospheric aerosol in Karachi and Lahore.

Kampa and Castanas (2008) hypothetically discussed the link of air pollutants with premature mortality and diminution in life expectancy and suggested that endeavor should be intensified by taking the adequate measures in order to reduce the likelihood of human contaminant exposure. Zubair, Nadeem, Raza and Akram (2104) are identified strong relation between CO_2 emission and global health. They say that greenhouse gas adversely affects universal health.

Ilyas (2007) discussed the local, regional, and global impacts of air pollution discharge from motor vehicles' activity and technological, behavioral, and institutional factors that have contributed to these contaminations in Pakistan. The swift growth in motor vehicles in Pakistan and rapidly industrializing low-income countries are contributing to high levels of urban air pollution, among other adverse socioeconomic, environmental, health, and welfare impacts. The paper reveals some implement issues and provides suggestions to effectively address the transport air pollution problem in Pakistan.

Methodology

This study is used primary and secondary data sources. Primary data is obtained from the inhabitants, educational institutions particularly from those instructors and students who live in Gujrat city and bear the consequences of air pollution, shopkeepers located on the road aside; especially the shopkeepers who have their shops nearby an industry, factory employees and traffic workers. There are many types of industries in the city like Service industry, fan industry pipe industry etc... All employees are taken from these industries. We also fill the questionnaires from traffic workers these include traffic police, rickshaw drivers and other persons related to traffic activities. Secondary data is obtained from government reports, Gujrat city profile (1998) and census of 1998. Field investigation involved three levels. First level was interview with the inhabitants about the air pollution, knowing their views about the air quality of the area and ratio of different diseases caused by air pollution. Secondly, in depth interviews have been taken to know the concentration of particular pollutant in ambient environmental of Gujrat city which is highly affect to their health, and passion and participation in mitigation activities regarding environmental degradation. The data obtained after completing the field research is tabulated by applying statistical techniques along with some graphical analysis and we comprehensively describe the particular behavior of the respondent towards ambient environment. Finally, field observation which is the most important part of the research, involving people's attitude in producing and controlling the air pollution and how people minimize the effects of air pollution by using the nearby park or green spaces to refresh their mind. Moreover, we also try to find out their willingness to pay to control environmental degradation in the form of time and prices. Another technique we used to collect primary data is electronic mail. About one-fifth portion of data instrument is filled by mail.

We simply used non-probability sampling design on judgmental basis. We mostly filled the questionnaires from location convenient persons. Due to two main constraints, one is time and other is cost, the sample size is critical. Moreover, respondents feel shy to respond the questions and one thing is that people are less responsive about survey. Instead of these limitations, the study is still very useful because this is the first study about environment quality in the city. In future, we will conduct an empirical study on ambient quality of the city.

Descriptive Analysis

In figure 1, most of the Inhabitants of Gujrat city perceive that here the quality of air is not supportive to health. 70% our respondents have negative view about air quality, 19%

respondents said that air quality is fair; means not very bad or good, only one person did not know about the quality because of his/her daily busy life he/she has no time to observe the phenomenon and 16% people have positive view about the quality of air in the city.

Figure 1
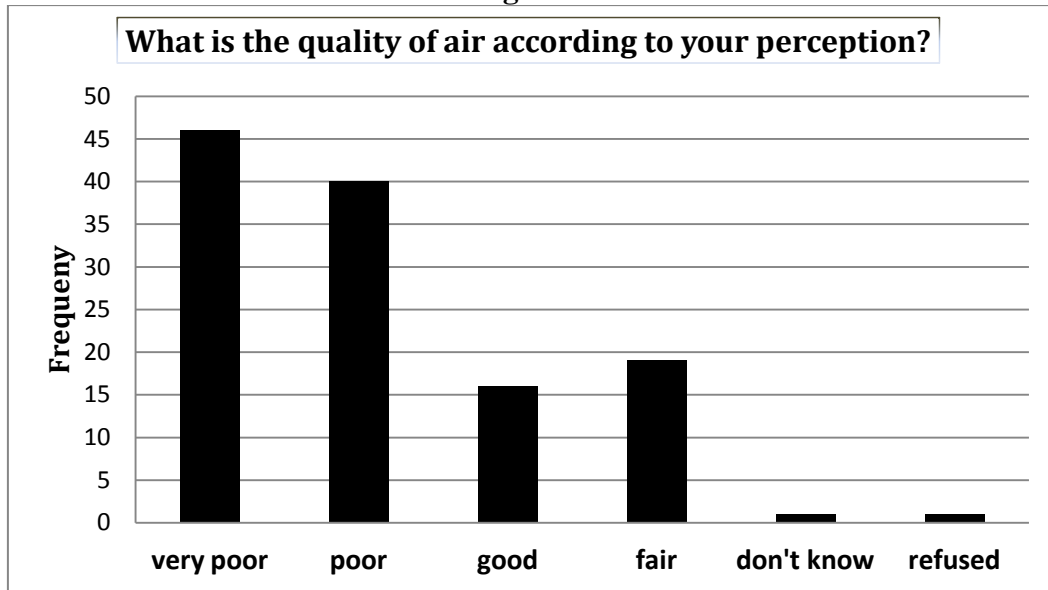
There are several sources which cause to spread chemical in air to make air harmful for bionetwork of the world like point, non-point local and regional sources etc... Figure 2 shows that major source of air pollution in Gujrat city is traffic which supports to our literature. 56.9% respondents said traffic is main cause of air pollution whereas 23% people view industries are the most polluted source and about 15.4% and 3.3% citizens consider waste burn and smoke of cigarette are key elements of air pollution respectively. In addition, figure 3 depicts that rickshaw is the most harmful for air superiority. 70% city dwellers believe that rickshaw extremely contributes to air pollution in traffic. 9% residents said trucks discharge more emission but 11% persons are in favor of bus. So, we can conclude here that the quality of air in the city is very poor and hence health affects shoddily.
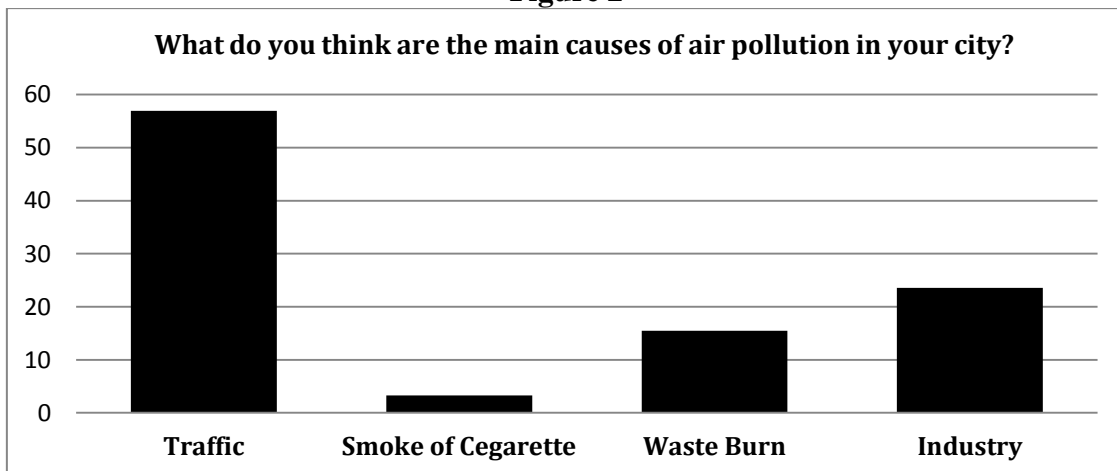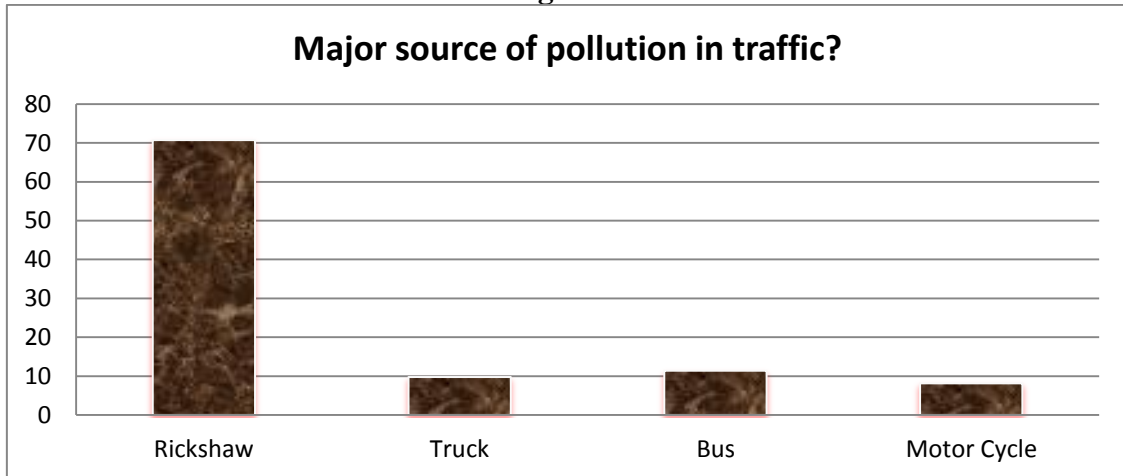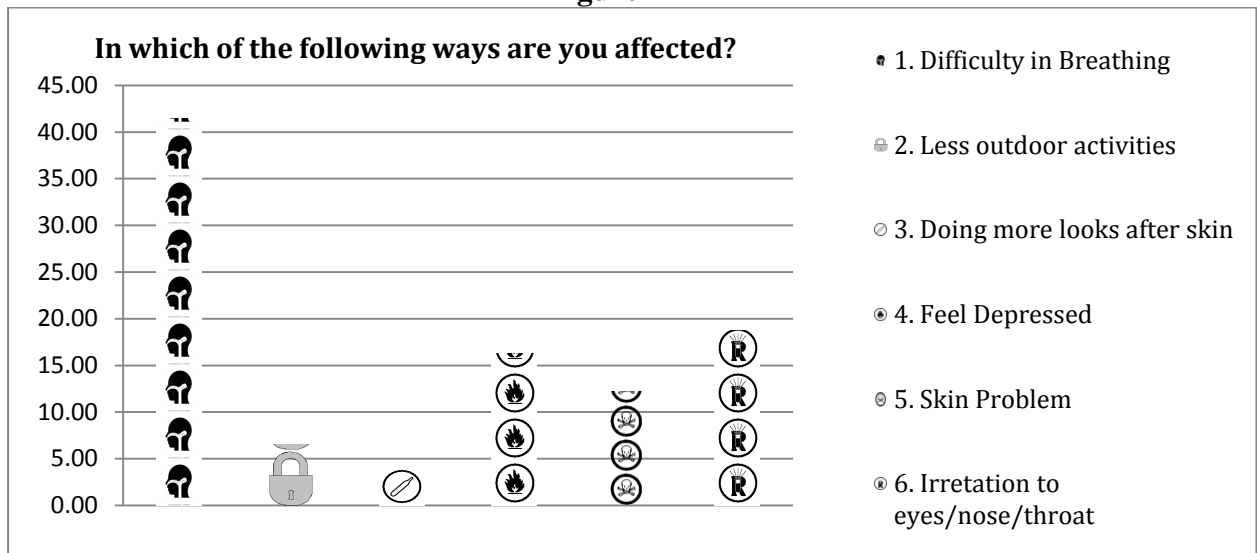
Figure 2

Figure 3

**Major source of pollution in traffic?**

Air pollution is caused many serious health problems because it contains mixer of harmful chemicals discharge from different sources of pollution. Different people affect differently by air pollution. Some feel difficulty in breathing and others face skin problems etc... The figure 4 demonstrates behavior when they pass by a pollutant area. 51 persons out of 123 (41.5%) face respiratory problem, 28.5% citizens victim skin problems and psychologically depression due to high level of dust and smoke of vehicles. One more interesting thing in the figure that people are reckless and don't look after their skin instead of high skin problems they face. Eyes, nose and throat irritation is 18.9% which is also a reflection of vehicular and industrial emissions as well as high level of dust in the air.

Figure 4

In which of the following ways are you affected?

- 1. Difficulty in Breathing
- 2. Less outdoor activities
- 3. Doing more looks after skin
- 4. Feel Depressed
- 5. Skin Problem
- 6. Irretation to eyes/nose/throat

Daily visit to green places such as park, field etc. plays a vital role on human health and has a positive impact on air quality (Anwar, 2008). By analyzing data with frequency distribution on SPSS in figure 5, it is clear that only 30% visit daily to the nearby green spaces, 13% go weekly and 13.8% exercise monthly in green spaces whereas 31% citizen never visit to any green space due to the ignorance. Lack of such places is another reason for less exercising to a park or green field.

Figure 5

How many times do you visit to green places?

Daily   After two days   Weekly   Monthly   No visit
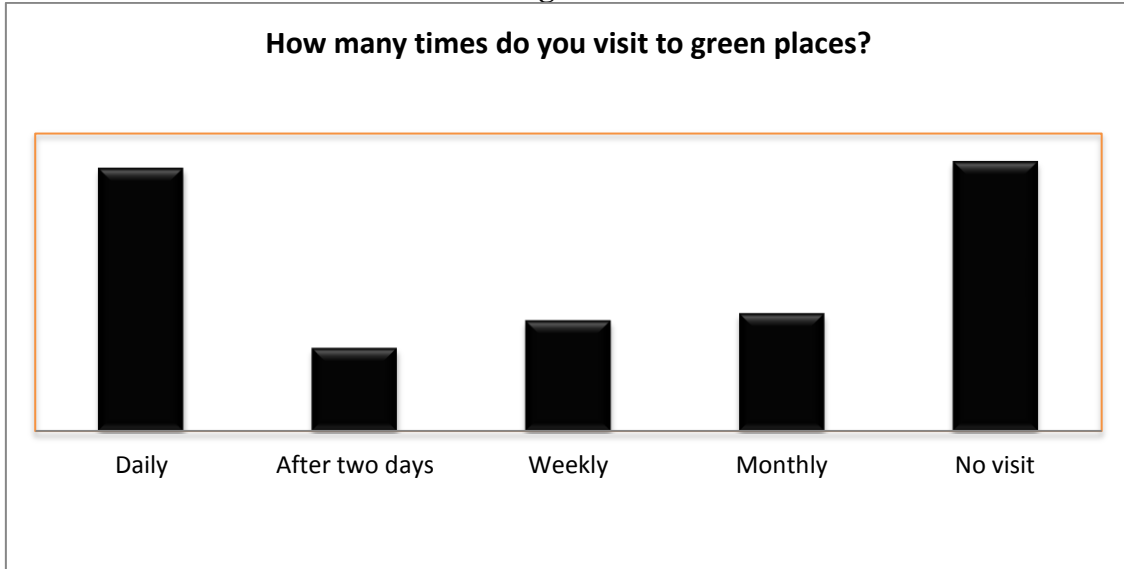
Willingness to Pay

Willingness to pay is value side analysis of the goods which demonstrates that how much a person gives value or prefers to the particular thing. Value could be measured in the form of money and time which someone spends to get objective commodity. In our perception based analysis, we ask some questions to examine the motivation of citizens regarding air pollution and their willingness to pay to overcome the problem. One question is related to time and other two inquiries are related to the money in the form of taxes. Former question is "Police should stop and check vehicle emissions more frequently even if it causes traffic *delays*" and latter two are "Government should do more to promote and encourage a better environment even if our *taxes* have to go up slightly" and "Power stations and factories should switch to cleaner processes even if consumer bills and *prices* have to go up". The result shows in figure 6.

Figure 6

Willingness to pay

strongly agree   agreee   strongly disagree   disagree

⊕ **Time**   ⊙ **Tax**   ⊜ **price**
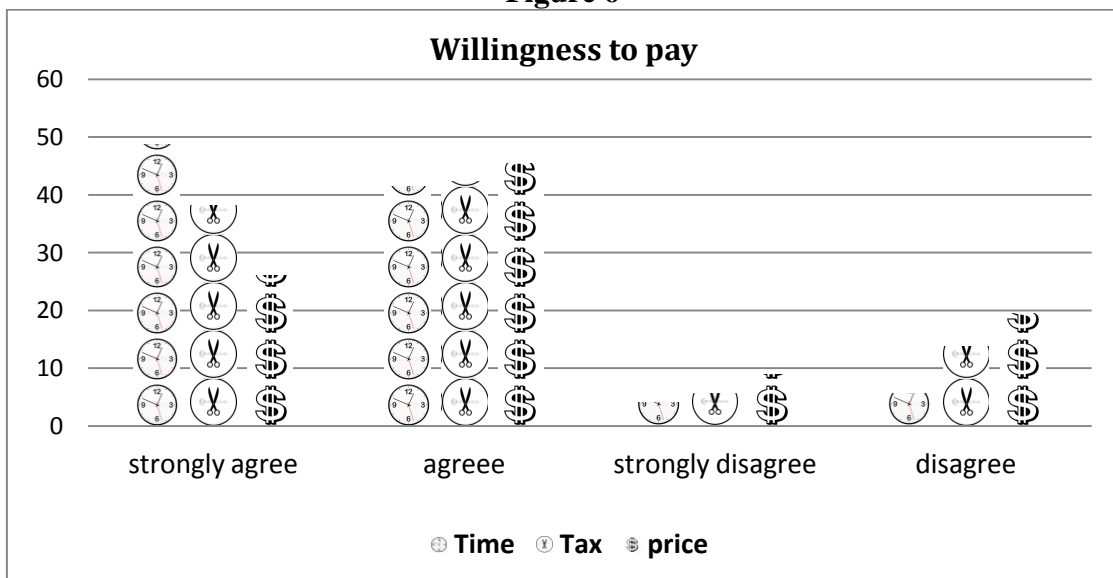
Time is, here, for willingness of inhabitant of the city which they want to spend during the checking of polluted vehicles. 65% respondents are extremely advocated of the opinion while 24% residents are also in favor of this attitude. Only 10.6% people have negative response in this regard. One the other hand, 42.7% and 38.7% dwellers are strongly agree and agree to pay extra taxes for cleaner environment respectively. This demonstrates their willingness to pay for better quality of air and for healthy life. But 18.6% have opposite point of view on this. 73% people cumulatively want to pay more for cleaned processed electricity to prevent them from air pollution. 26% respondents said that electricity is already much expensive, therefore they did not agree to pay more or cleaned processed electricity.

Table 1:   The pollution is out of my control and I cannot do anything to change it.

Occupation	Strongly Agree	Agree	Strongly Disagree	Disagree
Shopkeeper	3	21	12	6
Factory	2	16	6	4
Traffic	2	9	2	3
Student Or Teacher	3	13	8	11
Total	10	59	28	24

Table 1 gives the reaction of respondent about control air pollution individually. Out of forty two shopkeepers 57% believe that they are unable to control air pollution while 43% think that each one can control effluents individually. Moreover, people work in different industries of Gujrat also considers that air pollution is out of their control and they are incapable to do anything. 68% respondents related to the traffic field are opposite to individual managing of air pollution and only 32% are in favor. The respondents selected from educational institution are only those who live in Gujrat city, almost 45% responders are agreed that air pollution is out of their control and remaining is disagreed. A cumulative result of this idea is that fifty seven percent repliers have opposite view to control air pollution independently while 43 percent respondents think that they can contribute positively in controlling pollution alone.

Air pollution is public good with non-excludable and non-rivalrous attributes. One cannot manage it individually and hence we never stop anyone to getting benefits from air quality. It is responsibility of each citizen to contribute actively to improve ambient environment. 95% our respondents are in favor of collective responsibility to overcome the problems related to the air pollution although 5% are opposite to this thought. 7% shopkeepers are disagreed and 100% industrial workers have positive view in this regard. There are 94% and 95% respondents from traffic and educational institutions are considered that improving the environment is the responsibility of every citizen respectively.

Table 2

Improving the environment is the responsibility of every citizen.					
Occupation	Strongly Agree	Agree	Strongly Disagree	Disagree	Total
Shopkeeper	25	14	2	1	42
Factory	20	8	0	0	28
Traffic	8	8	1	0	17
Student Or Teacher	25	8	2	0	35

Improving the environment is the responsibility of every citizen.					
Occupation	Strongly Agree	Agree	Strongly Disagree	Disagree	Total
Shopkeeper	25	14	2	1	42
Factory	20	8	0	0	28
Traffic	8	8	1	0	17
Student Or Teacher	25	8	2	0	35
Total	78	38	5	1	122

The point of view of citizens about collective decision to mitigate contamination in environment advocates to the principle of Kyoto Protocol "Common but Differentiated Responsibilities".

Conclusion

Each living creature uses air for its survival. The average adult requires 15 kilogram air for a whole day (EPA, 2009). The importance of air, therefore, can be understood. Health of ecosystem of the world in general and human being is particular highly dependent on air quality of their surroundings. Large burden of vehicles on roads and industrial emissions are influencing badly to the quality of air of the city. Air pollution produces different type of disease in which respiratory infections are the most common. As study reveal, that four stroke rickshaws are relatively more polluted source in traffic, so our authority can overcome it by providing two stroke rickshaws as an alternative. As green spaces are very important for human health but there is a lack of green spaces and parks in research area. On the other hand, city dwellers are less interested to visit parks. The most interested thing is that the majority of citizens are willing to pay to control environmental degradation which assures their awareness about hazardous impact of air pollution. Not only authorities ought to make framework for environment protection but also we individually should actively play positive role to keep clean atmosphere. Finally, there is a dire need to conduct scientific studies on the current levels of air pollution and their health effects in various regions of the country.

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