

Analyzing Impact of Pollution on Tourism Sustainability in Delhi NCR

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ABSTRACT

Delhi is the sixth most populated city in the world and is one of the most polluted cities in India. Pollution is the contamination of earth's environment with materials that interfere with human health, quality of life or the natural functioning of the ecosystems. The various types of pollution include air pollution, water pollution, noise pollution and, finally, the contamination of soil. Other less recognized forms include thermal pollution, which is from heat energy, and radioactive contamination, which is a result of wastage produced by nuclear reactors. However, air and water pollutions are responsible for a large proportion of pollution-related health problems. Pollution is causing economic damage. New Delhi could not host the 2014 Asian Games because of the poor environment [1]. Foreigners tend to avoid New Delhi due to poor air quality index and travel advisories. Embassies of various foreign countries as well as international business in Delhi are now considering reducing staff tenures, providing high-end air purifiers and installing expensive air purifiers in their working spaces and also advising staff to reconsider bringing their children to Delhi to contend with the poor air quality. Delhi airport accounts for 29.7% of foreign tourist's arrivals in the country followed by 18.3% arrivals at Mumbai Airport (Tables 1 and 2). A great engulfment of smog was witnessed in Delhi, in November 2017, and the pollution level spiked way beyond the acceptable level, where the safe limit was 60–100, wherein the actual particulate matter hit 999 $\mu\text{g}/\text{m}^3$, which definitely was beyond the safe limits. This study provides an insight into the status of air pollution in Delhi and its effect on health and its impact on foreign tourist's arrivals. This study recommends how to conserve the natural environment in accordance of carrying capacity of Delhi and promote sustainable tourism.

Keywords: air pollution, inbound tourists, sustainability, tourism

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INTRODUCTION

Air pollution means contamination in the outdoor atmosphere of one or more containments such as dust, fumes, gas, mist, odor, smoke or vapor in quantities dangerous for animal and plant life [2].

High population density and overutilization of scarce resources including water have put heavy pressure on the environment. The quality of air in Delhi is polluted because of road dust, industry, non-serviced engines in transportation, especially diesel-powered

trucks. Noise pollution persists due to automobiles and motorcycle. Pollution of water and lack of solid waste treatment facilities have caused major damage to River Yamuna. Pollution has also done economic damage to Delhi due to potential loss in foreign tourist arrivals (FTAs). According to a study by World Health Organization (WHO) of 1600 cities globally, Delhi stood third in India. Prudent use of earth (Delhi) resource can enhance the quality of life and sustainability (Table 3).

Tourist inflow cannot be directly linked to air pollution or pollution in general. Tourism and travel depend on many variables like location, climate, accessibility, etc. Delhi might be one of the first cities whose tourism industry is affected by low quality of air.

Because of poor air quality, staff tenure of embassies and international business houses in Delhi is being reduced. Staff is advised to reconsider bringing their children to Delhi. Offices are being provided with high-end air purifiers. And due to this, there has been a footfall of foreign visitors to Delhi's historical monument sites for the financial year 2015–2016.

As per the data provided by the Archeological Survey of India (ASI), the footfall of visitors annually decreased from the previous two years. The year 2015 witnessed a fluctuation in the number of foreign arrivals, which was from 19,687 to 67,856 (data for January to September) (Figure 1). For the financial year 2014–2015, the annual footfall was recorded at 68,069, and for the previous year, i.e. 2013–2014, it was recorded at 696,610. However, for the year 2012–2013, it was recorded at a staggering 866,839, which incidentally was the highest during the last four years.

As per superintendent archaeologist Delhi circle, ASI is providing all basic facilities to tourists, be it travel guide or other services like drinking water, food cafes and washrooms besides safety and security to foreign visitors. The popular monuments in Delhi where foreigners visit the most include Jantar Mantar, Khann-i-Khana, Purana Qila, Sultan Ghari Tomb, Tughluqabad, Kotal Feroze Shah, Qutub Minar, Red Fort, Humayun Tomb, Safdarjung Tomb, etc.

Though Qutab Minar as well as Humayun Tomb were the top choices of the foreign

visitors amongst all the monuments, still the foreign tourists registered a visible decline on these monuments too. For the year 2012–2013, the annual footfall was recorded at 324,098 and 344,826, respectively, on both sites, while there was a considerable drop in 2013–2014, the number being 2,598,050 and 270,365, and finally, in 2014–2015, the visitors' figures were recorded at 243,331 and 287,045.

The market research done on foreign visitors from the Ministry of Tourism, Government of India, summarized that, in January 2015, the overall percentage of the number of foreign visitors was 36.78% as compared to January 2016, which on an overall level was reduced by 3% (Table 4).

As per WHO, India has the world's highest death rate from chronic respiratory diseases and asthma. Delhi's poor air quality damages irreversibly the lungs of 2.2 million or 50% of all children.

Great smog occurred in Delhi in November 2017 which is a peak tourist season time. Levels of particulate matter, PM 2.5 and PM 10, increase to 999 $\mu\text{g}/\text{m}^3$, while the safe limit is 60 and 100.

MEASURING AIR QUALITY

Ministry of Environment and Forests at the Centre and the Department of Environment of the Government of National Capital Territory of Delhi. The PM 10 standard is generally used for air quality measurement. PM 10 includes particle with diameter of 10 μm or less (0.0004 inches or one-seventh the width of human hair). These small particles are likely to be responsible for adverse health effects because of their ability to reach the lower regions of the respiratory tract (Table 5). According to the Air Quality Guideline by the WHO, the annual mean concentration recommended for PM 10 was 20 $\mu\text{g}/\text{m}^3$, beyond which the risk for cardiopulmonary health effects is seen to increase. The major concern for human health from exposure to PM 10

includes effects on breathing and respiratory systems, damage to lung tissue, cancer and premature death. Patients of chronic lung disease, influenza or asthma are sensitive to air pollution (Figure 2).

As per WHO, in the year 2010, the average PM 10 level in Delhi was $286 \mu\text{g}/\text{m}^3$. In 2013, the PM 2.5 level was $153 \mu\text{g}/\text{m}^3$. These levels are considered very unhealthy. The most affected city Gwalior had the PM 10 and 2.5 levels of 329 and $144 \mu\text{g}/\text{m}^3$, respectively. For comparison, PM 10 and PM 2.5 levels in London were 22 and $16 \mu\text{g}/\text{m}^3$. In December and January 2015, Delhi's average PM 2.5 was $226 \mu\text{g}/\text{m}^3$. Delhi's air is twice as worst as Beijing which had PM 2.5 of 95.

The acceptable levels of PM as per WHO Air Quality Guidelines are $20 \mu\text{g}/\text{m}^3$ (annual mean) for PM 10 and $10 \mu\text{g}/\text{m}^3$ (annual mean) for PM 2.5.

MAJOR POLLUTANTS

Vehicle emissions are one of the major cause of poor air quality. About 80% of PM 2.5 air pollution is caused by vehicular traffic. The other include wood burning, agriculture husk burning, exhaust from diesel generators, dust from construction sites, burning garbage and illegal industries in Delhi.

The thermal power station of Badarpur is another source of air pollution in Delhi.

Delhi is free from kerosene users and around 90% households use LPG for cooking and the remaining 10% uses wood, crop residue, cow dung and coal for cooking.

Fire in Bhalswa landfill is a major reason for airborne pollution in Delhi.

Road dust contributes significantly to air pollution, especially in summer months. Vehicular pollution is caused by frequent halting of vehicles in red lights and for pedestrians to cross the road.

In autumn and winter months, around 500 million tons of crop residues are burnt if winds blow from north and north-west, and towards east, Delhi is covered by smog. Because of annual crop burning, smoke is generated and air pollution hovers over Delhi. The better and latest crop residual techniques need to be innovated. Pollutants must be landfilled, incinerated, recycled, reused and these minimize waste. Waste management audit must be initiated [3].

AIR QUALITY MONITORING STATIONS

The Indian Meteorological Department (IMD) has air quality monitoring stations at various locations in Delhi.

OBJECTIVES

- 1) Analyzing impact of pollution on impact of inbound tourism.
- 2) Recommend air pollution control measures to sustain inbound tourists.

RESEARCH METHODOLOGY

The primary data were collected mostly from foreign travelers visiting Lucknow. A close-ended questionnaire was filled with a remarks column for any feedback.

The tests like *t*-test, hypothesis testing (Figure 3)

Data Collection

Both primary and secondary data were used in the study.

Primary Data

The primary data will be collected through well-designed questionnaires, observations, and survey schedules and discussions with foreign and Indian tourists (Table 6).

Secondary Data

The secondary data were collected through various publications of the central and state governments, international books, magazines, newspapers, reports and journals.

Effect of Air Pollution on Health

Air pollution affects the respiratory functions and associated morbidity. According to Central Pollution Board Study of 2008, pollution is associated with high levels of chronic headache, eye irritation and skin irritation besides increase in mortality. As per hospital statistics, air pollution aggravates asthma, chronic obstructive airway disease and acute coronary events. Millions of children in Delhi had irreversible lung diseases because of air pollution.

Green consumer base must be developed in Delhi which encourages people to change their habits to consider environment 454%–60% percent of population [4].

Tour guides of Delhi are obvious and direct medium to communicate awareness [5]. More ecotourism sights must be developed in Delhi in lines of ecotourism park of Kolkata.

Recommendations

It is the responsibility of Delhi Development Authority (DDA) to provide lung spaces. Out of city's 44,777 hectares, 8,422 hectares are reserved for the greenery of which the DDA manages more than 5050 hectares. Emphasis is there on action plan to encourage public participation in environment problems. There exists a policy for afforestation, atmospheric pollution, bio-medical waste, domestic refuse, and water and sewage treatment (Figure 4).

Odd–Even Traffic Scheme

According to a notification passed by Delhi government, an odd–even scheme was implemented in January 2016. According to the notification, vehicles with odd number plates were allowed to ply on odd dates and those with even number plates were allowed to ply on even dates.

Supreme Court Ban on Fireworks

Since air pollution is high during Diwali on 9 October 2017, the Supreme Court in India

banned the sale of fireworks. The Delhi schools were closed in view of drastically enhanced pollution levels between 8 and 12 November 2017. Pedestrian rules need to be streamlined to ensure free flow of traffic movement which will minimize pollution from vehicles at least by half.

Delhi Government Measures

The Central Pollution Control Board was set up in 1974 under the Water Act, which is the principal watchdog for carrying out the tasks stated in the environmental acts. The Delhi Pollution Control Board is the body responsible at the state level.

Vehicular Policy

Unleaded petrol was introduced in 1988; in 1995, catalytic convertor in passenger cars; and in 2000, reduction in sulfur content in diesel and reduction of benzene content in fuel. Other measures include construction of flyovers and subways for smooth traffic flow, introduction of metro rail and CNG for public commercial transport. Pollution check certificate with 3-month validity and stringent emission norms for industries and thermal power stations are the other measures. Environmental awareness campaigns are also carried out at regular intervals. The Delhi Pollution Control Board conducts monthly ambient air quality monitoring at 40 locations in Delhi and takes corrective action.

Industrial Policy

Introduced in 1982, the second policy 2010–2021 was issued by Department of Industries, Government of Delhi. It is a comprehensive document envisioning higher industrial development in Delhi.

The other organization needs greater synergy with the government to reduce air pollution. These include Centre of Science and Environment, The Energy and Resources Institute, and The Indian Association for Air Pollution Control (Table 7).

The use of public transport needs to be promoted by encouraging metro.

Community participation and awareness is a must.

FTAs into India have been steadily declining over the past four months on a sequential basis, a pattern that should worry policy-makers, given that earnings from foreign tourists contributed about \$1.70 billion every month. On a year-on-year (YoY) basis, the arrivals do point toward a steady growth.

From 10.37 lakh arrivals in December last year, it declined to be 9.83 lakh next month and 9.56 lakh in February this year, before plunging to 9.05 lakh last month. India's tourism season commences in October and ends in March.

Though India has many tourism hotspots from the Himalayan mountains in the north, the palaces and deserts in Rajasthan and Gujarat, to temples and beaches in Mumbai, Chennai, Bhubaneswar and backwaters in Kerala, the tourist arrivals pale before countries that are much smaller in size like Austria, which saw 26.7 million arrivals in 2015 (World Bank data) as against India's 8 million.

While demonetization-induced restrictions could have disrupted arrivals and spending during the December–March period, other events such as the Jallikattu protests in Chennai could have had some impact (Figure 5).

Foreign exchange earnings (FEEs), or spending by foreign tourists, though remained stable at \$2.26 billion last month and \$2.27 billion in February.

Bangladeshis accounted for the maximum number of arrivals (21.3%), followed by the US and the UK, a pattern that has remained almost unchanged over the months.

Arrivals on e-tourist visas grew 25.8% YoY last month and for the January–March

2017 period, it rose from 45.6% to 4.67 lakh as compared to 3.21 lakh during January–March 2016 (Table 8).

In a related development, India moved 12 places in the Travel and Tourism Competitive Index of World Economic Forum to rank 40th globally in 2016.

The severe air pollution that Delhi witnessed affects the tourism plans of people, who intend to visit the national capital, online travel portals as well as travel agents (Table 9). Potential tourists are expressing concern over the dangerous levels of pollution and the plans as well as itineraries are being relooked to. As Delhi is the major hub, all the interchanges happen from the city only. Thus the travelers must cross Delhi to reach other small destinations like Shimla and Mussoorie. Earlier, due to rest purposes, people would make a pit stop in Delhi for a day, but in today's time nobody does that. Hence corrective measures need to be taken in time before it's too late.

Companies like Yatra have expressed concern as air pollution is impacting the near and mid-term plans of inbound travelers coming to the country. FTAs in India in November and December are typically the highest during the year (Table 11). Cancellations and change in itinerary take place. If the situation doesn't improve, we can expect more cancellations and a dip in future bookings. Expatriates living in Delhi are taking measures to minimize the impact of the pollution and some are even relocating. Expats who work in New Delhi are considering moving to Jaipur and other cities for the weekends (Table 12).

MODERN INITIATIVES

The concrete pillars of Delhi metro at Sikandra Road, Tilak Marg and Mathura Road got a green makeover in January when they were covered with flower pots bearing foliage plants. They beautify besides keeping minute polluting particles

under check (Table 7). This effort has given a green visual ambience from the conventional signage on pillars. The New Delhi Municipal Corporation had planted such gardens, but plants were being acclimatized constant supervision is a must. Coco peat is a better option than soil drip irrigation as it is more sustainable. Likewise, about 23 flyovers and 8 green corners will have vertical gardens. Coco peat is the natural potting mixture made from coconut husk. Ferns, focus, ribbon grass and blade grass are used in vertical gardens to trap excess dust and thus control PM 2.5 (Figure 4). With Delhi being the most polluted city, there is now consensus that vertical greening could control road dust, which accounts for 35% of PM 2.5 emissions. Vertical gardens reduce urban heat island effect up to 2° and improve aesthetics.

RESEARCH METHODOLOGY

A structured questionnaire was designed. A survey was done on 24 respondents. Data analysis was done using SPSS.

Hypothesis Testing

H0: There is no impact of pollution on tourist arrivals

H1: There is impact of pollution on tourist arrivals

FINDINGS

- 1) The respondents surveyed were between 21 and 55 years.
- 2) 37.5% respondents revealed that they do not check air quality index before planning a tour.
- 3) 95.9% respondents mentioned air pollution as a major deterrent in visiting Delhi followed by 4.2% of water pollution.
- 4) According to 50% respondents, they would avoid travelling to Delhi because of pollution.
- 5) 37.5% were travelling for business purpose, while 29.2% respondents traveled both for leisure and visiting friends and relatives.
- 6) 33.3% respondents recommended afforestation and vertical gardens, while 25% respondents recommending setting up of cleaning chambers.
- 7) According to 91.7% respondents, there will be an impact on tourist's arrival due to pollution.
- 8) There will be a decline in foreign tourists' arrivals as mentioned by 79.2% respondents.
- 9) Therefore, we reject H0 null hypothesis and accept alternative hypothesis H1, i.e. there will be negative impact on tourist arrivals due to air pollution.

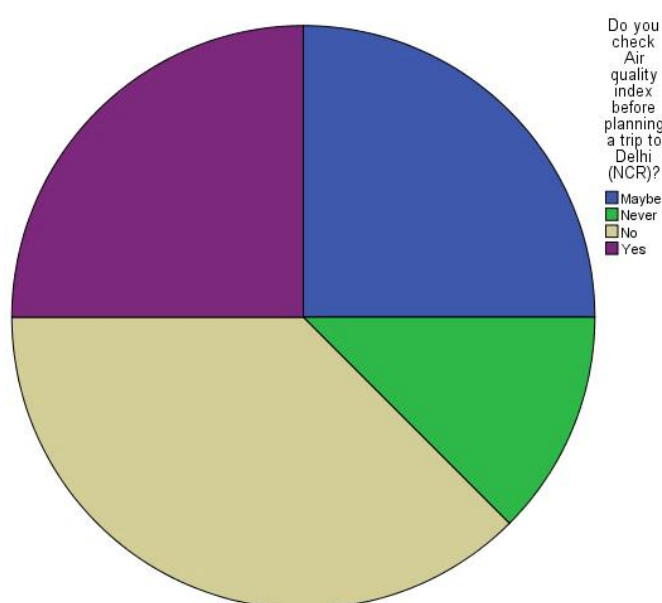


Fig. 1. Pie chart showing awareness of air quality index.

Table 1. Age-wise distribution of respondents.

Frequency Table				
Age	Frequency	Percent	Valid percent	Cumulative percent
21	5	20.8	20.8	20.8
22	1	4.2	4.2	25.0
23	4	16.7	16.7	41.7
24	3	12.5	12.5	54.2
25	2	8.3	8.3	62.5
28	2	8.3	8.3	70.8
37	1	4.2	4.2	75.0
41	1	4.2	4.2	79.2
42	1	4.2	4.2	83.3
45	2	8.3	8.3	91.7
47	1	4.2	4.2	95.8
55	1	4.2	4.2	100.0
Total	24	100.0	100.0	

Table 2. Awareness of air quality index.

Do you check air quality index before planning a trip to Delhi (NCR)?					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	Maybe	6	25.0	25.0	25.0
	Never	3	12.5	12.5	37.5
	No	9	37.5	37.5	75.0
	Yes	6	25.0	25.0	100.0
	Total	24	100.0	100.0	

Table 3. Types of pollution in Delhi.

Which is the major deterrent in visiting Delhi (NCR)?				
	Frequency	Percent	Valid percent	Cumulative percent
Air pollution	1	4.2	4.2	4.2
Water pollution	1	4.2	4.2	8.3
Air pollution	22	91.7	91.7	100.0
Total	24	100.0	100.0	

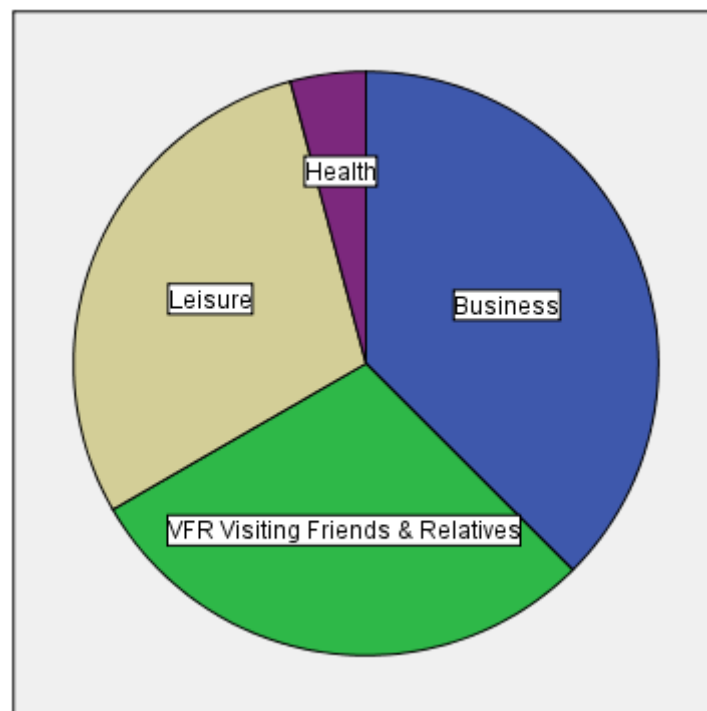


Fig. 2. Profile of tourists visiting Delhi.

Table 4 Number of travelers avoiding travel to Delhi.

In case of poor air quality index, would you avoid travelling to Delhi (NCR)?				
	Frequency	Percent	Valid percent	Cumulative percent
Occasionally	1	4.2	4.2	4.2
No	6	25.0	25.0	29.2
Occasionally	5	20.8	20.8	50.0
Yes	12	50.0	50.0	100.0
Total	24	100.0	100.0	

Table 5. Purpose of travel to Delhi.

What is your purpose of travel to Delhi (NCR)?				
	Frequency	Percent	Valid Percent	Cumulative Percent
VFR visiting friends and relatives	7	29.2	29.2	29.2
Leisure	1	4.2	4.2	33.3
Business	9	37.5	37.5	70.8
Health	1	4.2	4.2	75.0
Leisure	6	25.0	25.0	100.0
Total	24	100.0	100.0	

Table 6. What is your purpose of travel to Delhi (NCR)?

	Age	Do you check air quality index before planning a trip to Delhi (NCR)?	Which is the major deterrent in visiting Delhi (NCR)?	In case of poor air quality index, you would avoid travelling to Delhi (NCR)	What is your purpose of travel to Delhi (NCR)?	How can you tackle air pollution in Delhi?	Will air quality and pollution impact domestic and foreign tourist arrival?	Will air quality lead to decline in domestic and foreign travelers and sustainability in Delhi (NCR)?
Valid	24	24	24	24	24	24	24	24
Missing	0	0	0	0	0	0	0	0

Table 7. How can you tackle air pollution in Delhi?

	Frequency	Percent	Valid Percent	Cumulative Percent
Decongestion	1	4.2	4.2	4.2
Setting up green chambers	1	4.2	4.2	8.3
Afforestation	8	33.3	33.3	41.7
Setting up cleaning chambers	6	25.0	25.0	66.7
Vertical Gardens	8	33.3	33.3	100.0
Total	24	100.0	100.0	

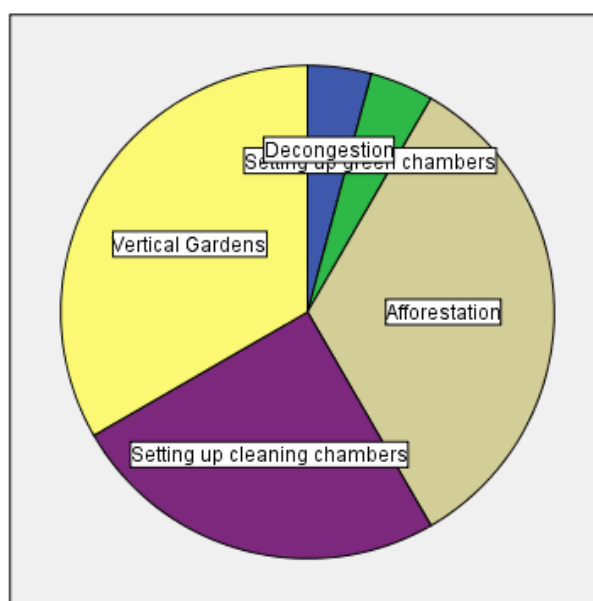
**Fig. 3.** Pie chart depicting means of controlling pollution.

Table 8. Will air quality and pollution impact domestic and foreign tourist arrival?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Some what	2	8.3	8.3	8.3
	Yes	22	91.7	91.7	100.0
	Total	24	100.0	100.0	

Table 4. Will Air quality lead to decline in domestic and foreign travelers and sustainability in Delhi (NCR)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	19	79.2	79.2	79.2
	No	2	8.3	8.3	87.5
	Some what	3	12.5	12.5	100.0
	Total	24	100.0	100.0	

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The categories of Age occur with equal probabilities.	One-Sample Chi-Square Test	.530	Retain the null hypothesis.
2	The categories defined by Gender = Male and Female occur with probabilities 0.5 and 0.5.	One-Sample Binomial Test	1.000 ¹	Retain the null hypothesis.
3	The categories of Nationality occur with equal probabilities.	One-Sample Chi-Square Test	.000	Reject the null hypothesis.
4	The categories of Do you check Air quality index before planning a trip to Delhi (NCR)? occur with equal probabilities.	One-Sample Chi-Square Test	.392	Retain the null hypothesis.
5	The categories of Which is the major deterrent in visiting Delhi (NCR)? occur with equal probabilities.	One-Sample Chi-Square Test	.000	Reject the null hypothesis.
6	The categories of In case of poor Air quality index you would avoid travelling to Delhi (NCR) occur with equal probabilities.	One-Sample Chi-Square Test	.016	Reject the null hypothesis.
7	The categories of What is your purpose of travel to Delhi (NCR)? occur with equal probabilities.	One-Sample Chi-Square Test	.027	Reject the null hypothesis.
8	The categories of How can you tackle Air Pollution in Delhi? occur with equal probabilities.	One-Sample Chi-Square Test	.032	Reject the null hypothesis.
9	The categories defined by Will Air Quality and Pollution impact domestic and foreign tourist arrival = Yes and Some what occur with probabilities 0.5 and 0.5.	One-Sample Binomial Test	.000 ¹	Reject the null hypothesis.
10	The categories of Will Air quality lead to decline in domestic and foreign travellers and sustainability in Delhi (NCR)? occur with equal probabilities.	One-Sample Chi-Square Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

¹Exact significance is displayed for this test.

Fig. 4. Hypothesis testing.

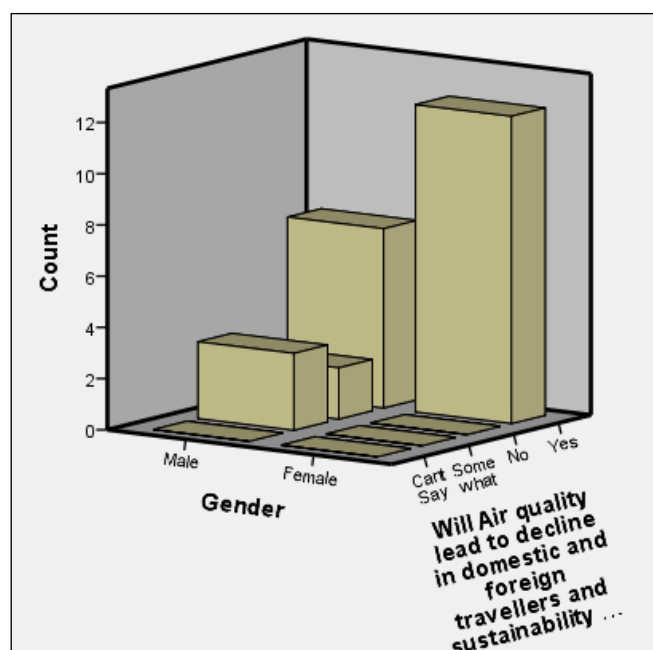


Fig. 5. Bar chart showing gender-wise opinion on impact of pollution on tourism.

Table 9. Do you check air quality index before planning a trip to Delhi (NCR)?

Age	N
21	5
22	1
23	4
24	3
25	2
28	2
37	1
41	1
42	1
45	2
47	1
55	1
Total	24

Radial Basis Function

Table 11. Case processing summary.

	N	Percent
Sample	Training	17 70.8%
	Testing	7 29.2%
Valid	24	100.0%
Excluded	0	
Total	24	

Table 12. Network information procedure.

Input layer	Factors	1	Do you check air quality index before planning a trip to Delhi (NCR)?
	Number of units	4	
Hidden layer	Number of units	5 ^a	
	Activation function	Softmax	
Output layer	Dependent variables	1	Will air quality lead to decline in domestic and foreign travelers and sustainability in Delhi (NCR)?
	Number of units	3	
	Activation function	Identity	
	Error function	Sum of squares	

^aDetermined by the testing data criterion: the "best" number of hidden units is the one that yields the smallest error in the testing data.

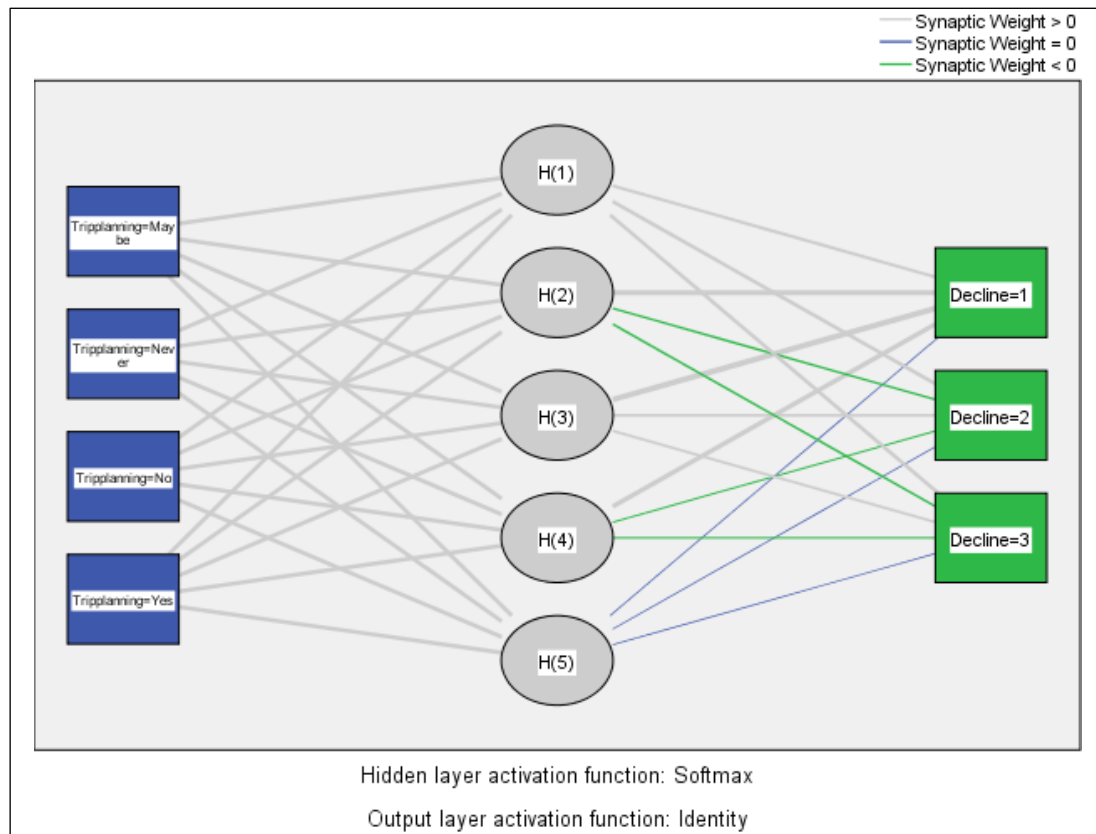


Fig. 6. Model depicting trip planning to Delhi.

Table 13. Model summary of the findings.

Training	Sum of squares error	2.971
	Percent incorrect predictions	23.5%
	Training time	0:00:00.02
Testing	Sum of squares error	0.642 ^a
	Percent incorrect predictions	14.3%
Dependent variable: Will air quality lead to decline in domestic and foreign travelers and sustainability in Delhi (NCR)?		
^a The number of hidden units is determined by the testing data criterion: the "best" number of hidden units is the one that yields the smallest error in the testing data.		

Table 14. Classification of prediction and testing.

Sample	Observed	Predicted			Percent correct
		1	2	3	
Training	1	13	0	0	100.0%
	2	2	0	0	0.0%
	3	2	0	0	0.0%
	Overall Percent	100.0%	0.0%	0.0%	76.5%
Testing	1	6	0	0	100.0%
	2	0	0	0	0.0%
	3	1	0	0	0.0%
	Overall Percent	100.0%	0.0%	0.0%	85.7%

Dependent variable: Will air quality lead to decline in domestic and foreign travelers and sustainability in Delhi (NCR)?

RECOMMENDATIONS

Instead of diesel and petrol, more battery-operated vehicles should be introduced in Delhi (NCR). More six-lane express

highways should be built like NH24. More plants should be planted throughout the roads in Delhi (NCR). Not only the government, but also NGOs and public

should be careful about it. The use of public transportation instead of individual helps to reduce air pollution somehow. Educate people and focuses more on technologies like hybrid and electric cars. IATO and Government of India should join hands in promoting ecotourism by plantation drives near monuments of Delhi by tourists.

Free distribution of plants should be initiated during rainy season and people should be encouraged to keep indoor plants to improve air quality inside house and hotels.

All the agricultural wastes of husk which are burnt by farmers need to be converted to ethanol which can be used as biofuels for cars. Cars in Delhi should have a kit of dual mode to run even on biofuel. All the hotels in New Delhi in any category should have ecofriendly and sustainability measures as part of project approval. Smog-free tower should be installed in Delhi at all strategic places which can purify approximately 30,000 m³ of air per hour, collecting more than 75% of two kinds of pollutants, PM 2.5 and PM 10, which contribute to smog. Roof-top gardens should be encouraged at homes and offices. Major Green parks may be given to corporate as a CSR activity for branding and maintenance. Model and draft policy should be developed (Figure 6).

CONCLUSION

Ministry of environment and land development should launch a massive afforestation drive in Delhi like that happening in Paris. The government should have mandatory restrictions on high-rise buildings to install air purifiers as part of corporate social responsibility. A year-round monitoring is a must rather than just waiting for winter season. Awareness and strict action and law must be initiated against farmers burning staple. Biodiesel plants should be set up in around Delhi where farmers can sell stable on good price.

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