"ASSESSMENT OF THE ODD-EVEN POLICY IN DELHI: AN ANALYSIS OF ITS IMPACT ON AIR POLLUTION

ISHU GOYAL*
Ramjas College, University of Delhi

Abstract

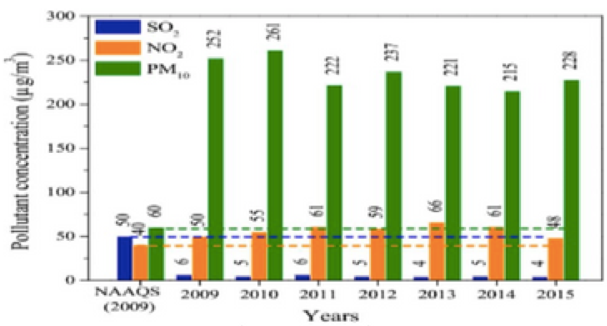
This research paper critically evaluates the effectiveness of the odd-even policy in Delhi in reducing air pollution. The paper conducts a comprehensive review of existing literature on the policy, which has produced varying findings. While some studies have reported a reduction in air pollution and traffic congestion, others have found little or no impact. To analyze the impact of the first round of the odd-even transportation policy, as well as other controlled factors, on pollution levels in Delhi, time series data and OLS regression is used. The data includes daily measurements of the Air Quality Index (AQI) over 69 days in Delhi from 2015 onwards. The explanatory variables include the implementation of the odd-even policy, time variables, and climatic factors. The analysis is based on data from the Central Pollution Control Board offices in Delhi. For the second round, the ambient air quality data is divided into two periods and compare the values of different pollutants between the two periods. Based on the findings, the paper provides policy recommendations for reducing pollution in the city.

JEL Classification: Q51, Q53, Q58
Keywords: Odd-even policy, Air pollution, Delhi, Exemptions, Impact assessment, multi-pronged approach

1. INTRODUCTION

Air pollution in Delhi, India is a significant threat to the well-being of the city. An air pollutant is a substance in the air that can have negative effects on humans and the environment. The major causes of increased pollution in Delhi, as identified in this study, include industrial emissions, weather patterns and temperatures during summer and winter, human activities such as motorization and vehicular traffic, government policies on fossil fuel prices, burning of agricultural waste in neighboring states, traffic congestion, population density, industrial activity, housing, and clustering of housing and industry. Delhi has some of the highest levels of particulate matter pollution, including PM 2.5 and PM 10, in the country. The main sources of PM 2.5 are vehicle traffic and grinding operations, while sources of PM 10 include all types of combustion, such as motor vehicles, forest fires, power plants, residential wood burning, some industrial processes, and agricultural burning. Sulphur dioxide (SO2) mainly comes from fossil fuel at power plants and other industrial facilities, as well as fuel combustion in mobile sources such as trains, ships, and equipment. Nitrogen dioxide (NO2) is primarily from traffic, while carbon monoxide (CO) is from the incomplete burning of carbon-containing fuels like gasoline, natural gas, oil, coal, and wood. In urban areas, the main source of CO is vehicular emissions.

Figure 1: *Air Quality Trends in Delhi (2009-2015) Based on Manual Air Quality Monitoring Stations*



Source: CPCB

Prolonged exposure to particulate matter can lead to respiratory and cardiovascular diseases such as asthma, bronchitis, lung cancer, and heart attacks (Key Facts by WHO, 2018). According to a 2015

*Author's email address: Ishugoyal124@gmail.com

study by the Institute for Health Metric and Evaluation (IHME), outdoor air pollution is the fifth largest killer in India, after high blood pressure, indoor air pollution, tobacco smoking, and poor nutrition (WHO, 2018). The Central Pollution Control Board (CPCB) runs nationwide programs for monitoring ambient air quality known as the National Air Quality Monitoring Program (NAMP). Information on air quality at ITO is updated every week. To effectively control pollution, it is important to have a thorough understanding of emission sources and their effects on air quality. Although the physical and chemical processes of pollution can be complex, mathematical and econometric models can provide insight into the underlying relationships.

This paper mainly focuses on the 1st round of odd even policy (1Jan -15 Jan 2015), we use statistical methods to analyze the relationship between this new transportation policy adopted by the Delhi government, other controlled factors such as weather conditions, fossil fuel prices, and the AQI (Air Quality Index) which is based on the concentration of different pollutants in the air. Econometrics/Regression analysis is also used to help determine if the first round odd-even transportation policy has been effective in reducing pollution in Delhi, and its impact on existing pollution levels in the city.

The odd-even transportation policy, which requires odd-numbered vehicles to be driven on odd-numbered days and even-numbered vehicles to be driven on even-numbered days, was first implemented for Fifteen days from January 1st to 15th, 2016, and once again in the summer month of April 16th to 30th, 2016. The policy is in effect from 8:00 AM to 8:00 PM. (See appendix for second rounds analysis)

Exemptions to this policy include two-wheelers, trucks, women-driven cars, VIP and emergency vehicles, student-driven vehicles, public transport buses, and CNG-operated passenger/private cars. The goal of the policy is to reduce vehicular pollution in Delhi. The city has 3 million cars, 6 million scooters and motorbikes, and 0.2 million private vehicles. The odd-even transportation policy only applies to four-wheeler vehicles.

1.1. OBJECTIVE

In recent years, the National Capital, Delhi, and adjoining areas have experienced alarmingly poor air quality and therefore it is becoming necessary to come out with an analysis to look at such factors explaining pollution in Delhi.

Firstly, the goal of this study is to evaluate the effectiveness of the odd-even policy in reducing pollution levels in Delhi and to determine whether such policies can be used to combat rising pollution levels in the city. Additionally, the study aims to identify the changes required to make such policies successful. The study will analyze the factors that contribute to air pollution in Delhi, India, using daily time series data. The impact of climate factors on pollution levels will be examined, and statistical methods will be used to analyze the relationship between the odd-even policy and other factors, such as fossil fuel prices, on pollution levels in different locations in Delhi. The study will also use regression analysis to determine the impact of the odd-even policy on air pollution in the city. By conducting this analysis, the study aims to provide insights into the effectiveness of policies aimed at reducing pollution levels in Delhi and to identify the changes required to make such policies successful.

2. LITERATURE REVIEW

The existing literature on the odd-even policy in Delhi presents a complex picture, with studies reporting varied outcomes and highlighting different aspects of the policy's impact. To better understand the policy's effectiveness and how it differs from previous research, it is essential to weave a coherent narrative that connects these studies and identifies the gaps that our study aims to address.

The story begins with the mixed results reported by the Centre for Science and Environment (CSE) and the Indian Institute of Technology (IIT) Delhi. While the CSE study found a 15-17% reduction in air pollution and improvements in traffic congestion and public transport usage, the IIT Delhi study reported a negligible 1-4% reduction in air pollution and little impact on traffic congestion. This discrepancy raises questions about the policy's true effectiveness and warrants further investigation.

Critics of the policy highlight its disproportionate impact on low-income families and its failure to address the root causes of air pollution and traffic congestion. These concerns are supported by studies from the Ministry of Road Transport and Highways and the Delhi Transport Corporation (DTC), which point to poor enforcement of traffic laws, inadequate public transportation infrastructure, and a decline in public transport usage as key contributors to the ongoing issues in Delhi.

The literature also reveals implementation challenges, such as inconsistent enforcement and a lack of proper infrastructure, which have limited the policy's effectiveness. Experts suggest that a more comprehensive approach, including increased investment in public transportation, improved traffic law enforcement, and promotion of non-motorized transportation modes, is necessary to address the underlying issues.

This study aims to build on this existing literature by examining the odd-even policy's impact on air pollution and traffic congestion in Delhi through a more comprehensive lens. The paper will explore the policy's effectiveness in addressing the root causes of these issues, its impact on different socio-economic groups, and the potential benefits of implementing additional measures alongside the policy. By doing so, we hope to provide a more nuanced understanding of the policy's implications and contribute to the ongoing debate on the best strategies for combating air pollution and traffic congestion in Delhi.

3. DATA AND METHODOLOGY

To assess the effectiveness of the 1st round Odd-Even policy on AQI, a multiple linear regression analysis was conducted using the collected data from CPCB reports for the period of 69 days, analyzing data from 24 days prior to the introduction of the odd-even policy, during the implementation of the odd-even scheme, and 30 days after the end of the odd-even scheme. Specifically, the data analyzed covered the time period from December 8, 2015, to February 14, 2016. By including data from before, during, and after the implementation of the policy, this study aims to capture any short-term changes in AQI that may have been caused by the Odd-Even policy. The analysis of this specific time period also allows for a more accurate assessment of the policy's effectiveness, as it accounts for any potential confounding factors such as seasonal variations in air pollution.

The dependent variable in the analysis was AQI, and the independent variables were petrolps, dieselps, temperature, humidity, wind speed, and oddevendummy. The regression equation was estimated using the ordinary least squares (OLS) method. The assumption of linearity, normality, and homoscedasticity of residuals was checked and met before proceeding with the analysis.

To control for the potential confounding effect of meteorological variables, we included them as independent variables in the model. We also included a binary variable indicating whether on a given day the odd-even policy was in effect or not, as this is the key element of the Odd-Even policy.

The statistical software R, Excel, and Gretl was used to perform the regression analysis and to obtain the estimates of the regression coefficients, standard errors, and associated p-values. The coefficient of determination (R-squared) was used to measure the overall goodness of fit of the model.

For the second round of analysis, we collected ambient air quality data from Delhi using a combination of Continuous Ambient Air Quality Monitoring Systems (CAAQMS) and manual stations (NAMP) located throughout the city. The data includes measurements of pollutants such as PM10, PM2.5, Sulphur Dioxide (SO2), Benzene, Ozone (O3), Nitrogen Dioxide (NO2), and Carbon Monoxide (CO). The data was gathered from stations operated by the Central Pollution Control Board (Shadipur, Dwarka, Dilshad Garden, DCE, and ITO) and 8 manual stations (Pitampura, Sirifort, Janakpuri, Nizamuddin, Shahzada Bagh, Shahdara, BSZ Marg, and ITO). The data, as recorded in the CQMS systems operated by Delhi Pollution Control Committee, were also collected for 4 stations (Mandir Marg, R. K. Puram, Punjabi Bagh, and Anand Vihar). We analyzed the data for two periods: pre-odd-even days (April 1-14) and odd-even days (April 15-30). (See Appendix for analysis.)

The results of this analysis will be used to assess the effectiveness of the Odd-Even policy in reducing AQI levels in Delhi and to identify any potential challenges or limitations of the policy. The findings of this study will be useful for policymakers and public health officials in making informed decisions about the implementation of similar policies in the future.

Table 1: *Variable Description And Data Sources*

Variable	Variable Description	Source	Hypothesis
AQI	Air Quality Index in Delhi	Central Pollution Control Board Report	This is the Dependent variable
Temp	Average Daily Temperature of Delhi in Fahrenheit	Central Pollution Control Board websites	Affects positively
Petrol ps	Petrol price per liter in Delhi in Rupees	Website Of Indian Oil	Affects Negatively
Diesel ps	Diesel price per liter in Delhi in Rupees	Website Of Indian Oil	Affects positively
Humidity	Average Relative Humidity % of Delhi	Central Pollution Control Board websites	Affects positively
Wind	Average Wind Speed (mph) in Delhi	Central Pollution Control Board websites	Affects Negatively
oddevendummy	Dummy for the day odd-even rule was introduced	Central Pollution Control Board websites	Affects Negatively

Source: Authors' descriptions

3.1. HYPOTHESIS/EXPLANATION OF VARIABLES

1. AQI: This is the dependent variable

AQI (Air Quality Index) is used to measure the level of air pollution in urban areas in real-time and inform the public. AQI is based on human exposure and health effects and takes into account pollutants such as PM10, PM2.5, NO_2, O_3, CO, SO_2, NH_3, and Pb. AQI values are reported on a scale of 0-500, with higher values indicating higher air pollution. The data obtained from online air quality monitoring stations is used to determine AQI. The worst sub-index reflects overall AQI. There are six AQI categories, namely Good, Satisfactory, moderately polluted, Poor, Very Poor, and Severe, and color bands are used to represent the different levels of AQI for ease of understanding.

Table 2: *AQI Categories*

AQI Category	Good	Satisfactory	Moderately Polluted	Poor	Very Poor	Severe
AQI	0-50	51-100	101-200	201-300	301-400	401-500

Source: CPCBs

2. Odd-even dummy: The dummy variable is assigned a value of 1 during the days when the policy is in effect and a value of 0 during the days when the policy is not in effect. This allows for a comparison of air quality between days when the policy is in effect and when it is not, in order to measure the effectiveness of the policy on reducing air pollution. This can be done by comparing the average AQI during the days when the policy is in effect with the average AQI during the days when the policy is not in effect. Odd-even dummy in the Regression model is hypothesized to have a *negative* impact on pollution in Delhi.

3. Climatic factors such as *wind speed* are known to play an important role in *reducing* the level of pollution in the environment. These factors help to carry away the pollution particulates, thereby reducing the concentration of pollutants in the air.

4. Temperature and humidity can *increase* pollution levels. High temperatures can increase emissions and chemical reactions in the atmosphere. High humidity can make it harder for pollutants to disperse, leading to higher concentrations in the air and increased formation of secondary pollutants.

5. Petrol and Diesel prices are hypothesized to have positive and negative impacts on pollution levels respectively. This may be because petrol and diesel may be substitutes for each other, leading to the replacement of petrol-driven cars by diesel-driven cars once the price of petrol goes up, which in turn would lead to a rise in pollution levels. On the other hand, if the price of diesel goes up, then people may reduce consumption of diesel-driven cars leading to reductions in pollution levels.

The above arguments are based on the fact that diesel causes more pollution than petrol. Therefore, it's important to include petrol and diesel prices as variables when conducting regression analysis.

The Descriptive Statistics for the data are given as follows:

Table 3: *Descriptive Statistics*

Variable	Mean	Standard Error	Range	Minimum	Maximum
AQI	329.4783	7.734942	294	140	434
Petrol ps	59.85551	0.045246	1.45	59.03	60.48
Diesel ps	45.28377	0.089079	2.37	44.18	46.55
Temperature (° F)	58.26087	0.516362	18	48.7	66.7
Humidity (%)	78.67971	0.884415	33.7	59.4	93.1
Wind Speed (mph)	2.469565	0.199843	6.9	0	6.9

Source: Authors' calculation

3.2. LIMITATIONS

One limitation encountered during the research was the unavailability of data, which resulted in an uneven analysis of the first round of the odd-even policy. The analysis was conducted before and after the implementation phase, with durations of 24 and 30 days, respectively. Similarly, the second round of the policy was also affected by the unavailability of data, as several monitoring stations did not have data for various pollutants.

4. ECONOMETRIC MODEL AND ESTIMATION METHODS

To evaluate the effectiveness of the odd-even policy in reducing pollution levels, we hypothesized that the odd-even dummy variable would have a negative impact on the Air Quality Index (AQI). To test this hypothesis, an econometric model that takes the form shown in Equation (1) has been utilized:

$$AQI = \beta_0 + \beta_1\ Petrolps + \beta_2\ Dieselps + \beta_3\ Temp + \beta_4\ Humidity + \beta_5\ Wind + \beta_6\ OddEvenDummy + ui \quad (1)$$

Where AQI is the dependent variable, and Petrolps, Dieselps, Temp, Humidity, Wind, and OddEvenDummy are the independent variables. The model also includes the error term, ui. The coefficients (β_0, β_1, β_2, β_3, β_4, β_5, and β_6) were estimated using Ordinary Least Squares (OLS) method, and the data was collected from observations 1-47. The model was then used to determine the relationship between AQI and the independent variables and to test whether the odd-even dummy variable has a statistically significant impact on AQI.

5. RESULTS AND INTERPRETATION

Table 4: *Regression Results*

Variable	coefficient	std. error	t-ratio	p-value
Intercept	−2450.26	1329.83	−1.843	0.0702*
Petrolps	68.1229	26.3599	2.584	0.0121 **
Dieselps	−40.1311	9.35905	−4.288	6.42e-05 ***
TemperatureAF	3.92771	1.32958	2.954	0.0044 ***
Humidity	3.89266	0.776158	5.015	4.72e-06 ***
WindSpeedmph	−10.5086	3.26375	−3.220	0.0020 ***
oddevendummy	47.5529	20.8671	2.279	0.0261 **

Source: Authors' calculation

*Note: Significance codes: '***' 0.01 '**' 0.05 '*' 0.10*

(2) Equation represents the linear regression model

$$\hat{aqi} = \underset{(1.33e+03)}{-2.45e+03} + \underset{(26.4)}{68.1}*Petrolps - \underset{(9.36)}{40.1}*Dieselps + \underset{(1.33)}{3.93}*TemperatureAF + \underset{(0.776)}{3.89}*Humidity - \underset{(3.26)}{10.5}*WindSpeedmph + \underset{(20.9)}{47.6}*oddevendummy$$

N = 69, R-squared = 0.602
(standard errors in parentheses)

Table 5: *Regression Statistics*

Mean dependent var	329.4783
S.D. dependent var	64.25126
Sum squared resid	111629.1
S.E. of regression	42.43193
R-squared	0.602346
Adjusted R-squared	0.563864
F(6, 62)	15.65242
P-value(F)	7.67e-11

Source: Authors' calculation

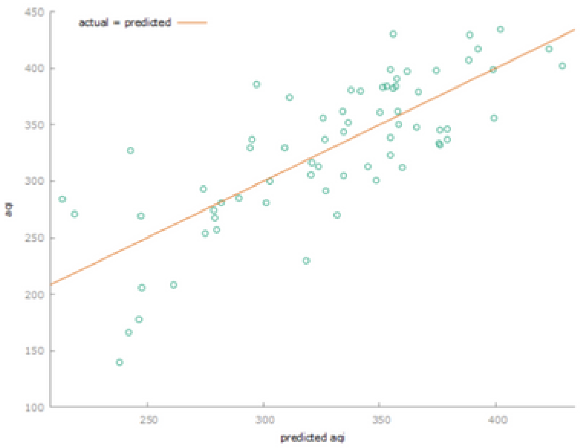
The results of the model show that all of the independent variables have a significant impact on the AQI.

- The coefficient for petrol price is positive, indicating that as petrol price increases, AQI increases.
- The coefficient for diesel price is negative, indicating that as diesel price increases, AQI decreases.
- The coefficient for temperature is positive, indicating that as temperature increases, AQI increases.
- The coefficient for humidity is positive, indicating that as humidity increases, AQI increases.
- The coefficient for wind speed is negative, indicating that as wind speed increases, AQI decreases.
- The coefficient for the odd-even scheme is positive, indicating that when the odd-even scheme is in effect, AQI is higher than when it is not in effect. (Not as per Hypothesis, see conclusion for the explanation)

The model has an R-squared value of 0.6, indicating that 60% of the variation in AQI can be explained by the independent variables included in the model. The adjusted R-squared value is 0.56, indicating that 56% of the variation in AQI can be explained by the independent variables after adjusting for the number of variables in the model. The F-statistic and P-values are also significant, indicating that the model as a whole is significant.

The model was also tested for autocorrelation, heteroskedasticity, Multicollinearity, and normality of residuals. The test for heteroskedasticity and Multicollinearity showed that there is no evidence of heteroskedasticity or multicollinearity in the residuals of the model. The test for the normality of residuals showed that the residuals are normally distributed. And the test for autocorrelation of order 1 showed that our data doesn't suffer from this problem. (See Appendix)

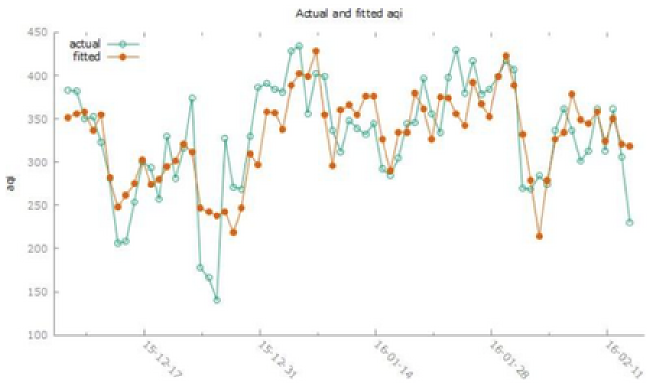
Figure 2: *Regression Line*



Source: Authors' calculation

Overall, the results of the model show that petrol price, diesel price, temperature, humidity, wind speed, and odd-even scheme have a significant impact on AQI in Delhi. The model explains 64% of the variation in AQI and is a good fit for the data.

Figure 3: *Graph Showing Actual and Fitted Values of The Model*



Source: Authors' calculation

5.1 POLICY RECOMMENDATIONS

Delhi's air pollution has been a persistent problem for many years, and it is clear that a multifaceted approach is needed to effectively address this issue.

One of the key ways to reduce pollution in Delhi is through the implementation of measures to reduce acid rain. Acid rain is caused by emissions of sulfur and nitrogen oxides, which can have a detrimental effect on the environment and human health. By implementing measures to reduce these emissions, we can help to reduce the acidity of rain and improve air quality in the city.

Another important strategy for reducing pollution in Delhi is the development of elevated road corridors. These corridors can help to reduce congestion on the roads and reduce the number of vehicles on the road, which in turn can help to reduce emissions. Additionally, connecting different parts of the city with metro rail can provide a sustainable transportation option that can help to reduce pollution in the city.

Improving public transportation that runs on CNG is another important strategy for reducing pollution in Delhi. CNG is a cleaner burning fuel than gasoline or diesel and can help to reduce emissions from public transportation. Furthermore, using alternative fuels based on Jethropha, mustard, and Sarso plants can help to reduce the dependence on fossil fuels and decrease pollution.

Investing in renewable energy is another key way to reduce pollution in Delhi. This can include investing in solar and wind power, which can help to reduce the need for fossil fuels and decrease emissions. Additionally, investing in electric vehicles can help to reduce the number of vehicles on the road and decrease emissions from transportation.

Reducing industrial emissions by shifting industries out of Delhi and taxing private vehicles can also effectively reduce pollution in the city. This can be achieved by implementing appropriate land allocation policies, reducing diesel-run vehicles, and investing in climate-smart goods such as electric vehicles, renewable energy, and public transportation running on CNG. Furthermore, improving the city's green cover can help absorb carbon emissions and improve air quality.

Increase enforcement: The model suggests that the odd-even policy positively reduces air pollution in Delhi. However, the impact is not as significant as expected. One reason for this could be weak enforcement of the policy. To improve the effectiveness of the policy, enforcement measures such as fines or penalties for violators should be increased.

Target high-pollution areas: The model shows that the odd-even policy has a greater impact on reducing air pollution in areas with higher pollution levels. To improve the effectiveness of the policy, the government should target high-pollution areas and implement stricter measures such as carpooling or car-free days.

Overall, it is clear that a comprehensive approach is needed to effectively address the problem of pollution in Delhi. This can include a combination of strategies such as reducing acid rain, developing elevated road corridors, connecting different parts of the city with metro rail, improving public transportation running on CNG, using alternative fuels, investing in renewable energy, reducing industrial emissions, taxing private vehicles, appropriate land allocation policies, reducing diesel-run vehicles, investing in climate-smart goods, and improving green cover in the city.

6. CONCLUSION

In conclusion, our regression equation for 1st round shows that the odd-even policy has a positive coefficient, which suggests that it increases the Air Quality Index (AQI) in Delhi. However, this result should be interpreted with caution as it does not necessarily mean that the policy is ineffective in reducing pollution. And for 2nd it is clear from Tables 7-13, indicated by the red arrows, that there is an increase in the concentration of pollutants at most of the monitoring locations during the odd-even periods when compared to the pre-odd-even period. (See Appendix for tables)

In practice, the odd-even policy may not have had a significant impact due to several exemptions given during its implementation, such as for women, two-wheelers, and student-driven vehicles, among others. These exemptions meant that a significant number of vehicles were not subject to the restrictions imposed by the policy, diluting its potential impact. Additionally, the policy was only implemented for short periods of time, such as during the winter months when pollution levels in the city are at their highest. This may not have been long enough to positively reduce pollution levels, as the policy would need to be implemented consistently over an extended period of time to have a meaningful impact. Furthermore, people started shifting their travel schedules to beat the 8 am - 8 pm restrictions imposed by the policy, and because of the odd-even policy, people started buying or using two cars, which defeated the purpose of the policy.

However, it's worth noting that air pollution in Delhi is due to multiple factors and this policy alone cannot solve the problem. To address the underlying problem of air pollution in Delhi, it would be necessary to take a comprehensive and integrated approach to multiple sources of pollution. This may include measures to reduce emissions from vehicles, industrial sources, and other sources of pollution, as well as measures to improve energy efficiency and promote sustainable transportation options. Additionally, addressing other factors that contribute to pollution in Delhi, such as the price of fossil fuel, would also be necessary to see a significant reduction in pollution levels in the city. The government must take a comprehensive approach and consider all the factors that contribute to the pollution problem in Delhi. The success of any policy aimed at reducing pollution in the city will depend on its ability to address the root causes of the problem and not just its symptoms.

APPENDIX

A.1 Diagnostic tests:

- **White's test for heteroskedasticity:**
  - Null hypothesis: Heteroskedasticity is not present in the residuals.
  - Test statistic: LM = 30.5394
  - p-value: 0.134536
  - Interpretation: The p-value is greater than 0.05, which means we fail to reject the null hypothesis. This suggests that there is no strong evidence of heteroskedasticity in the residuals.
- **LM test for autocorrelation up to order 1:**
  - Null hypothesis: There is no autocorrelation in the residuals.
  - Test statistic: LMF = 3.71732

- p-value: 0.0585092
- Interpretation: The p-value is greater than 0.05, which means we fail to reject the null hypothesis. This suggests that there is no strong evidence of autocorrelation in the residuals up to order 1.

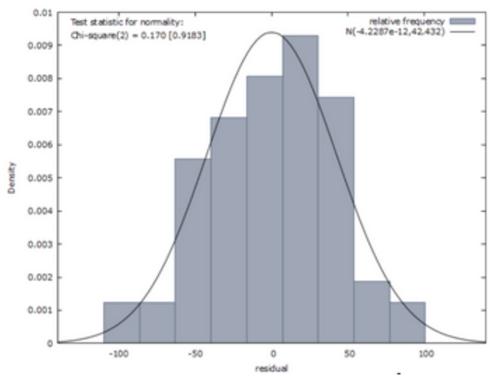
- **Test for normality of residuals:**

  - Null hypothesis: The error term is normally distributed.
  - Test statistic: Chi-square (2) = 0.170366
  - p-value: 0.918344
  - Interpretation: The p-value is much greater than 0.05, which means we fail to reject the hypothesis. This suggests that the error term is normally distributed, which is an important assumption for the validity of the OLS regression model.

- **Multicollinearity Statistics:**

  - Using Variance Inflation Factors
  - Minimum possible value = 1.0
  - Values > 10.0 may indicate a collinearity problem

Figure 4: *Graph Showing Frequency Distribution for Residuals*



Source: Authors' calculations

Table 6: *Multicollinearity Statistics*

Variables	Variance Inflation Factors(VIF)
Petrolps	3.707
Dieselps	1.811
TemperatureAF	1.228
Humidity	1.228
WindSpeedmph	1.109
oddevendummy	2.839

Source: Authors' calculations

A.2. Second Round Odd Even Policy Analysis:

The data collected from these 17 stations for the entire month of April 2016, which includes both pre-odd-even days (April 1-14) and odd-even days (April 15-30), are presented in Tables 7 to 13 below:

Table 7: *PM2.5 μg/m3*

Stations	PRE ODD EVEN			DURING ODD EVEN		
	Max	*Min*	*Average*	*Max*	*Min*	*Average*
DMS Shadipur	135	111	126	146	103	123
NSIT Dwarka	147	96	121	192	103	137↑
IHBAS Dilshad Garden	182	92	143	157	97	121
ITO	147	46	87	252	76	143↑
DCE	188	49	95	190	78	145↑
Pitampura	82	55	69	NA	NA	NA
Nizamuddin	106	28	63	189	74	112↑
Sirifort	79	33	56	201	49	99↑
Shahzada Bagh	62	33	45	249	57	111↑
Janakpuri	115	49	74	328	124	182↑
Shadhara	NA	NA	NA	85	43	63
Parivesh Bhawan	63	32	45	151	42	87↑
DPCC Stations						
R.K. Puram	137	68	102	126	126	156↑
Mandir Marg	83	39	57	126	126	85↑
Punjabi Bagh	123	38	66	126	126	107↑
Anand Vihar	222	46	130	126	126	174↑
Average	125	54	85	190	75	123↑
Note: NA indicates non availability of Data						

Source: Authors' calculations

Table 8: *PM10 μg/m3*

Stations	PRE ODD EVEN			DURING ODD EVEN		
	Max	*Min*	*Average*	*Max*	*Min*	*Average*
Pitampura	173	89	132	414	217	271↑
Nizamuddin	236	189	206	421	206	303↑
Sirifort	405	270	316	696	279	434↑
ShahzadaBagh	300	253	276	464	257	361↑
Janakpuri	324	226	255	423	191	304↑
Shadhara	441	246	343	701	235	387↑
Parivesh Bhawan	260	194	226	411	241	311↑
ITO BSZ Marg	199	120	146	389	170	270↑
Average	292	198	238	490	225	330↑

Source: Authors' calculations

Table 9: *CO μg/m3*

Stations	PRE ODD EVEN			DURING ODD EVEN		
	Max	*Min*	*Average*	*Max*	*Min*	*Average*
DMS Shadipur	1264	423	776	1801	643	1191↑
NSIT Dwarka	949	371	575	1493	626	942↑
IHBAS Dilshad Garden	740	466	584	991	478	640↑
DPCC Stations						
R.K. Puram	2754	497	1209	4194	818	2308↑
Punjabi Bagh	2645	611	1312	3088	769	1588↑
Average	1670	474	891	2313	667	1334↑

Source: Authors' calculations

Table 10: *NO2µg/m3*

Stations	PRE ODD EVEN			DURING ODD EVEN		
	Max	*Min*	*Average*	*Max*	*Min*	*Average*
DMS Shadipur	72	36	51	87	38	66↑
NSIT Dwarka	26	12	18	39	13	23↑
IHBAS Dilshad Garden	42	21	33	78	26	52↑
Pitampura	41	31	37	84	21	48↑
Nizamuddin	47	43	45	83	31	55↑
Sirifort	48	47	47	72	31	54↑
ShahzadaBagh	61	51	55	95	46	65↑
Janakpuri	57	47	52	75	42	52
Shadhara	66	56	60	63	31	49
PariveshBhawan	35	23	28	72	28	46↑
ITO BSZ Marg	66	38	57	112	35	74↑
DPCC Stations						
R.K. Puram	109	50	69	138	45	87↑
Mandir Marg	66	25	41	102	27	59↑
Punjabi Bagh	96	56	80	131	59	91↑
Anand Vihar	109	50	82	163	67	109↑
Average	63	39	50	93	36	62↑

(Source: Authors' calculations)

Table 11: *SO2 µg/m3*

Stations	PRE ODD EVEN			DURING ODD EVEN		
	Max	*Min*	*Average*	*Max*	*Min*	*Average*
DMS Shadipur	30	13	22	38	14	23↑
NSIT Dwarka	19	9	13	24	3	11
IHBAS Dilshad Garden	17	8	13	18	9	13
Pitampura	5	4	5	31	4	17↑
Nizamuddin	4	4	4	15	5	8↑
Sirifort	4	4	4	26	5	10↑
ShahzadaBagh	9	6	7	25	9	14↑
Janakpuri	5	4	4	20	7	11↑
Shadhara	12	7	9	30	7	18↑
PariveshBhawan	29	5	16	50	14	31↑
ITO BSZ Marg	17	7	13	37	6	17↑
DPCC Stations						
R.K. Puram	74	21	47	62	28	47
Mandir Marg	29	13	21	81	14	38↑
Punjabi Bagh	58	19	31	62	16	43↑
Anand Vihar	118	18	39	69	11	36
Average	29	9	16	39	10	34↑

(Source: Authors' calculations)

Table 12: *O3 µg/m3*

Stations	PRE ODD EVEN			DURING ODD EVEN		
	Max	*Min*	*Average*	*Max*	*Min*	*Average*
DMS Shadipur	72	38	52	77	23	60↑
NSIT Dwarka	61	35	xa	107	21	73↑
DPCC Stations						
R.K. Puram	117	38	89	177	54	114↑
Punjabi Bagh	114	63	79	137	51	100↑
AnandVihar	31	15	24	61	12	45↑
Average	79	38	59	112	32	78↑

(Source: Authors' calculations)

Table 13: *benzene µg/m3*

Stations	PRE ODD EVEN			DURING ODD EVEN		
	Max	*Min*	*Average*	*Max*	*Min*	*Average*
DMS Shadipur	4	2	3	5	1	3
NSIT Dwarka	1	1	1	2	1	1
DPCC Stations						
R.K. Puram	6	2	4	8	2	5↑
Punjabi Bagh	1	0	1	1	0	1
AnandVihar	36	9	19	26	2	16
Average	10	3	6	8	1	5

(Source: Authors' calculations)

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