Extended Essay

Environmental System & Societies

Topic:

Air Pollution and its impact on two urban sectors of Erzurum and Düzce, Turkey

Research Question:

“How far the ecological & human impact is pretentious by levels of air pollution in 2 urban sectors of Erzurum and Düzce, Turkey?”

Word Count: 3985

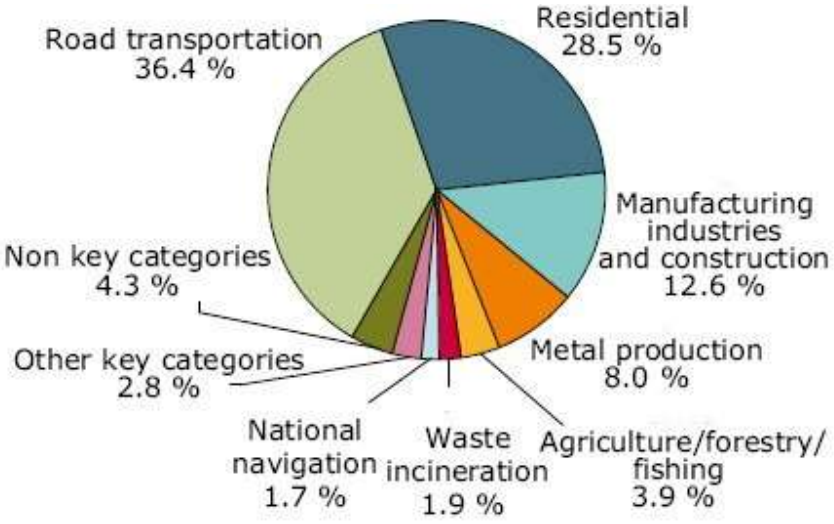
Contents

Chapter 1 | Introduction:

1. Aim of Investigation:

The aim of this investigation is to assess and measure the air quality and its ecological and anthropological impacts in urban sectors as well as deduce which major pollutants are the major causes of this impact.

2. Common Air Pollutants in Urban Sectors



The global trend of increasing air pollution is a threat to the environment as well as the humans occupying the habitat. The key description of air pollution is: "Contamination of the atmosphere by gaseous, liquid, or solid wastes or by-products that can endanger human health and welfare of plant life or animals, which causes a reduction of visibility or other undesirable odors. The major pollutants may include ozone, Sulphur dioxide, nitrogen dioxide, carbon monoxide, and the heavy metal lead. The primary pollutants are observed to enter the atmosphere directly, from sources like smokestack or tailpipe. Secondary pollutants are the result of a chemical reaction between the primary pollutant and some component in the air, an example being water vapor or another pollutant. As per average 36.4% of air pollution is produced by road transportation, 28.5% from residential, 12.6% from Manufacturing industries and construction and 3.9% from agriculture/forestry/fishing.

Therefore, an in-depth study and analysis was in order to discuss the impacts and the reduction of air pollution. The Primary research I will conduct as well as the secondary research I will attain from official sources will guide me to have adequate knowledge of air pollution and its humanitarian and environmental impacts.

1.2 | Why I chose this topic:

Air pollution is one of the most major news highlighted in every part of the world. This essay will be mainly focused on comparing the two major cities which have a high concentration of recorded air pollution in the entirety of Turkey, I chose to study this topic

as my goal further in life is to pursue the usage of clean energies in high-yield environments such as transportation.

I chose the location of Erzurum and Düzce specifically, as I used to live in Erzurum in my early childhood and have seen the unfortunate effects of pollution on the health of residents and the inability of government provided care to be of any solution to this crucial problem. The second reason is that as I am aware of these areas it will be more accessible for me to gather adequate data.

Environmental Context: The issue of air pollution has shown a steep slope worldwide and is in the trend of increasing which results in a vital discussion. The most major issue caused by air pollution is undoubtably, the one it has on health, it effects many people from developing and developed countries alike. However, locally, in Turkey especially in regions where mining is the abundant source of income for many residents, it doesn't only harm the environment, but it goes on to harm the people who are exposed to these gases as well. With the steep increase of population and vehicles, this has been gradually increasing the greenhouse gases and eventually leads up to have a massive contribution to global warming, which will result in a further depletion in the ozone layer.

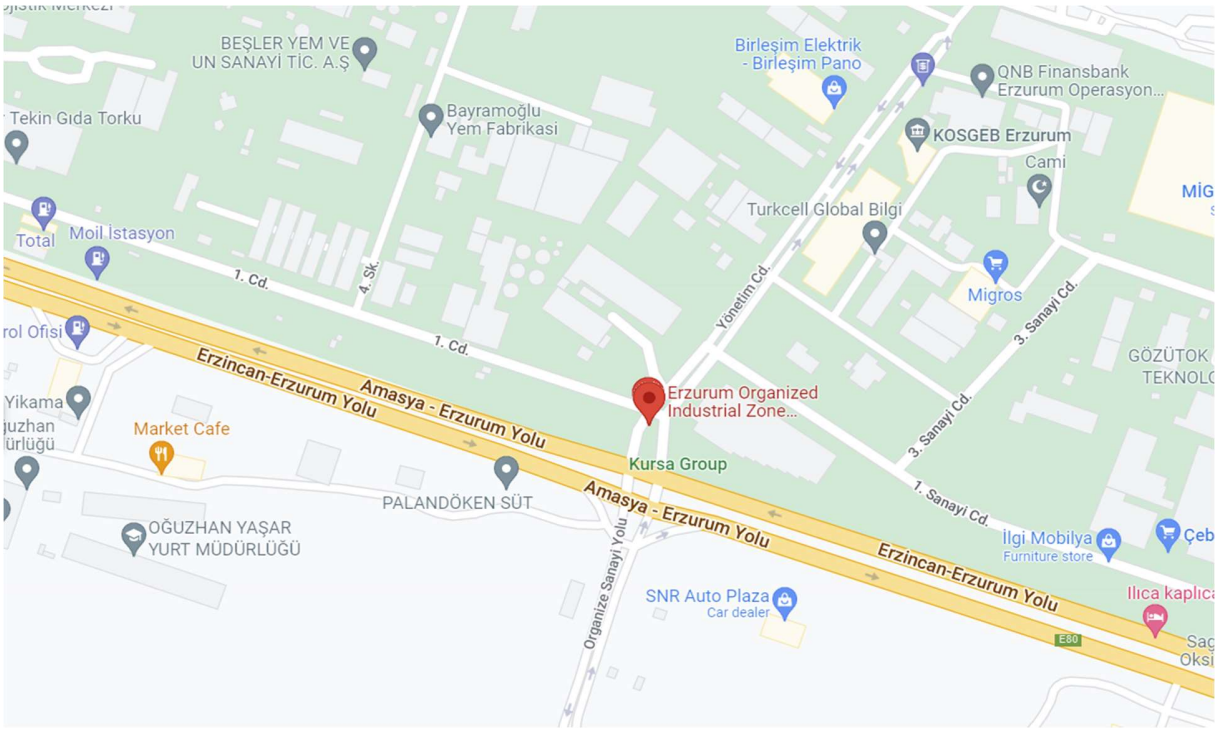
Connection between Environmental Issue & Research Question: Global warming is the increase of temperature in Earth's surface. The increase of temperature was tied to the increase of air pollution, pointed out by the article "The relationship between global warming and air pollution by Lisa Gardiner", which helped me develop my hypothesis, the article sources that air pollution is a major reason for greenhouse gases, The most dominant of these is the release of Carbon Dioxide, which can be cited as a common pollutant from the exhaust of cars and trucks. Global warming is caused by greenhouse gases by trapping the hear from the sun inside Earth's atmosphere, this results in a depletion in the ozone layer due to pollutants such as **NOx, VOC, SOx, etc.** which works in a positive feedback system.

1.3 | Background Information:

1. Area of Study:

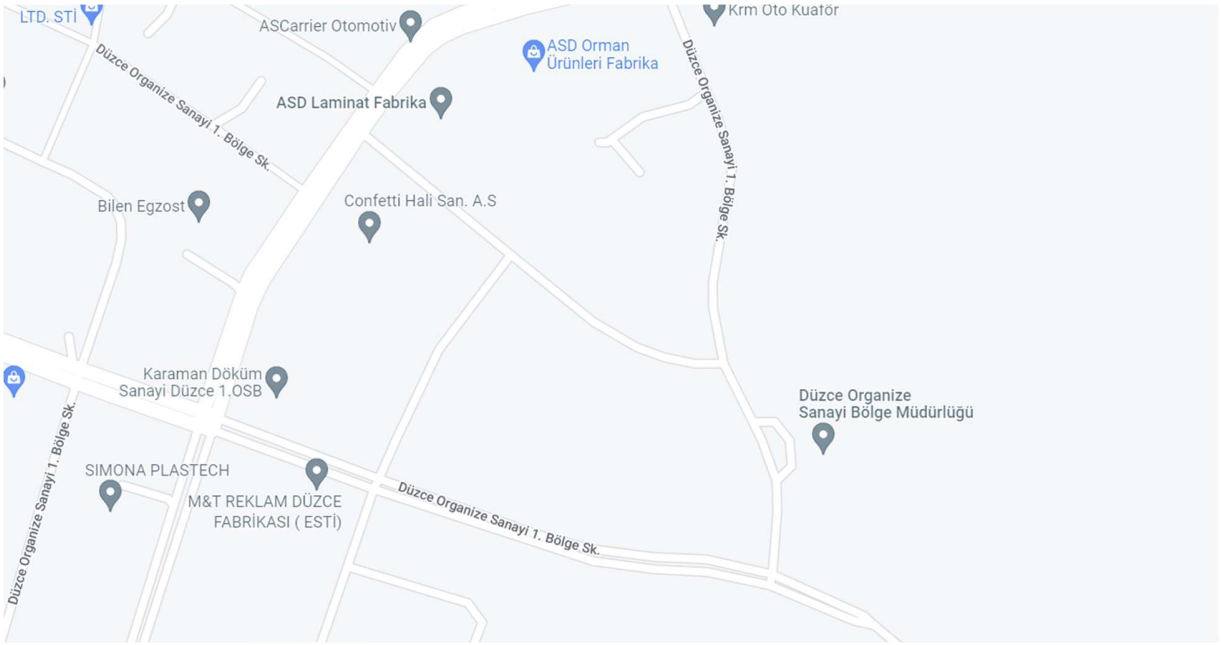
- **Erzurum, Organized Industry Zone**

The organized industrial zone in located in Erzurum, Turkey. It is a major urban area. The pollution locally tied to the region has been in a gradual trend of increasing due to the industrial factories as well as the increasing trend of vehicles due to the close by **“Erzurum-Amasya”** highway.



- **Düzce, Organized Industry Zone**

The organized Industry zone is in Düzce, Turkey. It is also the most prominent urban area in the city of Düzce, there are many industries as well as industrially focused companies taking place in this sector.



Chapter 2 | Background Information:

1. Thesis & Aim:

The aim of this research is to be able to study, take measurement and compare the level of air pollution and its impact on two different and most abundant of air pollution cities of Turkey, Erzurum and Düzce, the compared effects are studied in two different factors: environmentally and anthropologically. The study was done to ascertain the practical impact of air pollution on the daily lives of the people, through the distribution of questionnaires with a strategy of random sampling.

2. Hypothesis:

Especially in the organized industry zones of these cities containing major pollutants such as carbon monoxide, methane, etc. are inhaled daily, which will have major lethal conditions in the future.

This can have a major negative impact on the life of the locals as these toxic chemicals can result in extreme harm in inside organs as well as prove to be legal at some point.

A probable link can be established between prolonged exposure to air pollution and issues affecting human health caused by air pollutants. It can be anticipated, from the findings, that the main cause behind respiratory disorders or other health issues are the pollutants emitted into the air, the main ones would be SOx, NOx, VOCs and CO2.

A new probable link can be established between the emancipation of greenhouse gases and the accountability which they hold in contributing to the global mean temperature of the earth.

Another different link can also be established between air pollution and its issues that have adversely affected the ozone layer, which would have a sizeable contribution to ozone depletion. An anticipation can be made that there is an extremely strong connection between the ozone hole and global warming.

Scientific Justification: The hypothesis was made after careful consideration after reading the article named: “The relationship between global warming and air pollution by Lisa Gardiner”, the article had suggested that there has been many factors indulged in effecting human health.

2.1 | Objectives of Survey:

Primary data that was collected in the form of a survey was for many listed purposes:

1. Collecting basic information about the affected people, such as: Age, Profession, any previous respiratory problems, etc.
2. To collect the levels of pollution through the Air Quality Index
3. Understanding the effects of air pollution on human health who is in the selected region and their opinions of the air quality
4. Understanding the main source of air pollution on different sectors.
5. To collect data about the preventative measures taken by the local authorities

2.2 | Methodology:

Primary Data:

After finalizing the two recorded places which are The Organized Industrial Zone of Erzurum and the Organized Industrial Zone of Düzce. The process of data collection had started. The primary date included the interviews conducted with the local residents

living in the selected sectors of Erzurum and Düzce. The primary data included interviews of the local residents in these two sectors with the aim of obtaining their opinions regarding pollution and the preventative measures implemented by local authorities and their effectiveness.

To have a better understanding of the two places and to see the effectiveness of the measures taken by local authorities daily measurements of air quality of these two sectors was also had for the duration of 5 days through an app called Air Quality | Air Visuals, to deduce which sector is more polluted and vulgar to effect the ecology as well as the human health and general well-being.

Secondary Data:

With the aim of accessing to more information secondary sources like websites, books, magazines, newspapers and internet was used for reference to enrich and attain official and required knowledge, some of these crucial knowledge include local knowledge of the area, main pollutants, the measurements taken by the authorities, etc.

Chapter 3 | Research & Data Representation:

Procedure-Primary Data:

Aim: The aim is to assess & measure the air quality and ecological and human impacts due to air pollution.

Research Question: “How far the ecological & human impact is pretentious by levels of air pollution in 2 urban sectors of Erzurum and Düzce, Turkey?”

3.1 | Graphical Representation:

The collected date is labelled as primary data. The air pollution level measured was taken from 2 different places situated in Erzurum and Düzce, specifically their organized industrial zones. It is measured by the Air Quality Index and the level of pollution was recorded daily for 5 days in both of the regions. An app for the Android system, called “**Air Quality | Air Visual**” which serves as a hub for air pollution information was utilized to track the real-time and forecast of air quality index levels and not of the ways to reduce residual risk to health. In an official and scientific manner, National Ambient Air Quality Standard (**NAAQS**) measure the air quality standard which is further determined and supervised by the **EPA (United States Environmental Protection Agency)**.

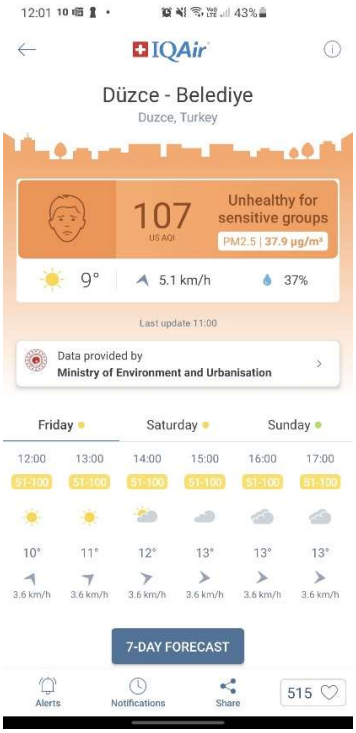
The purpose of the Air Quality Index is to help the reader understand what local air quality means to the health of the local residents. To make it more easier to study the impacts of the air pollution to the health of an individual.

Air Quality Index (AQI) Values	Levels of Health Concern
0 to 50	Good
51-100	Moderate
101-150	Unhealthy for Sensitive Groups
151-200	Unhealthy
201-300	Very Unhealthy
301 to 500	Hazardous

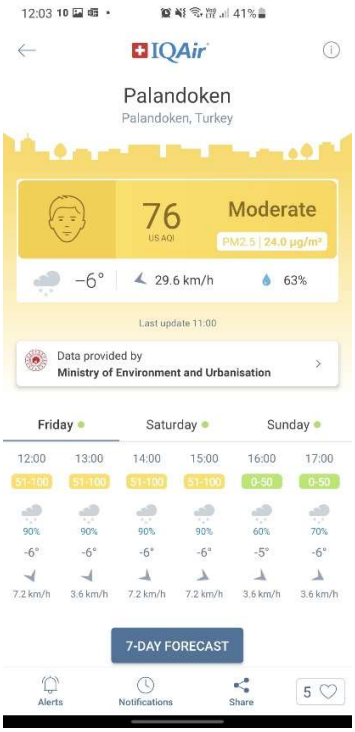
In order to interpret the collected data, a total of 10 graphs on the basis of data collection were made through the stated app, a daily AQI from day 1 to 5 were made in each sector of Erzurum and Düzce.

The following Graphs include the y-coordinate as the Air Quality Index (AQI) this was measured in the units of particulate matter of 2.5 which is given as PM2.5. The x-coordinate gives the time of the day from 1 am to 3pm

Graph 4: AQI of Düzce

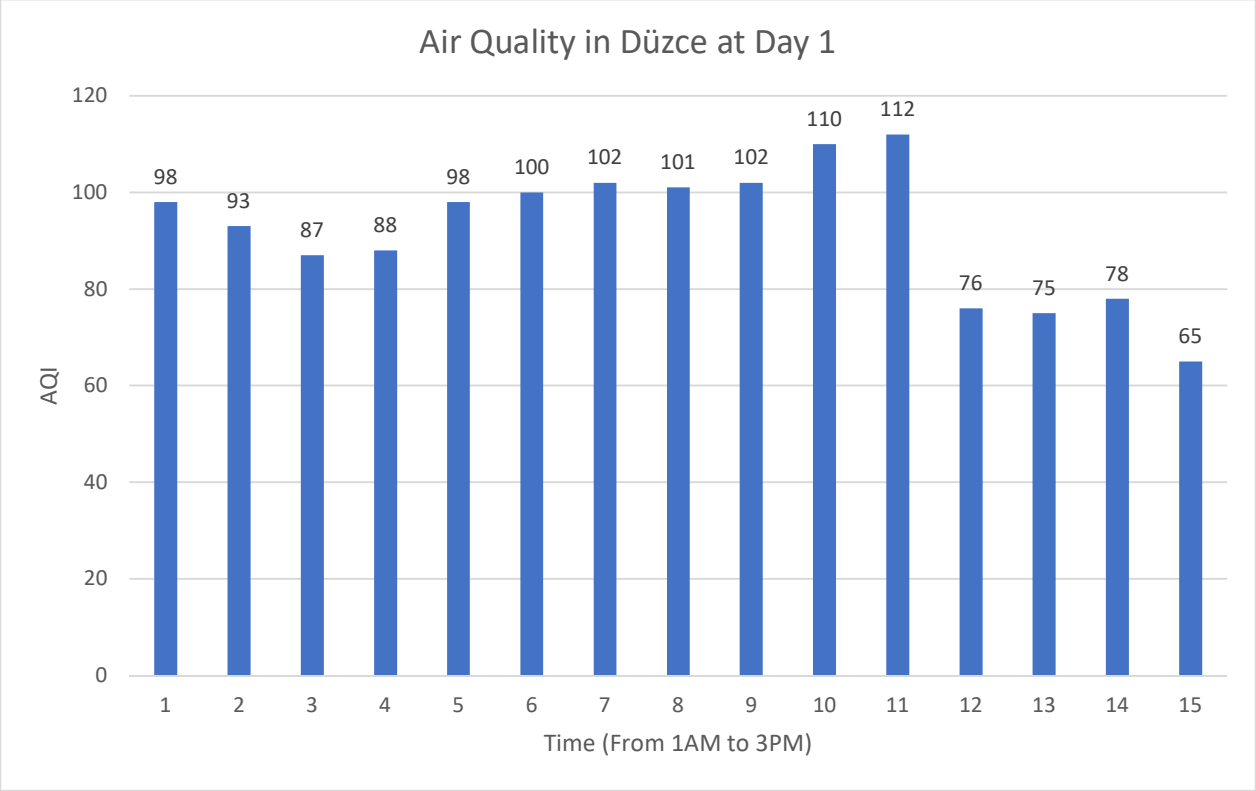


Graph 5: AQI of Erzurum, Palandoken



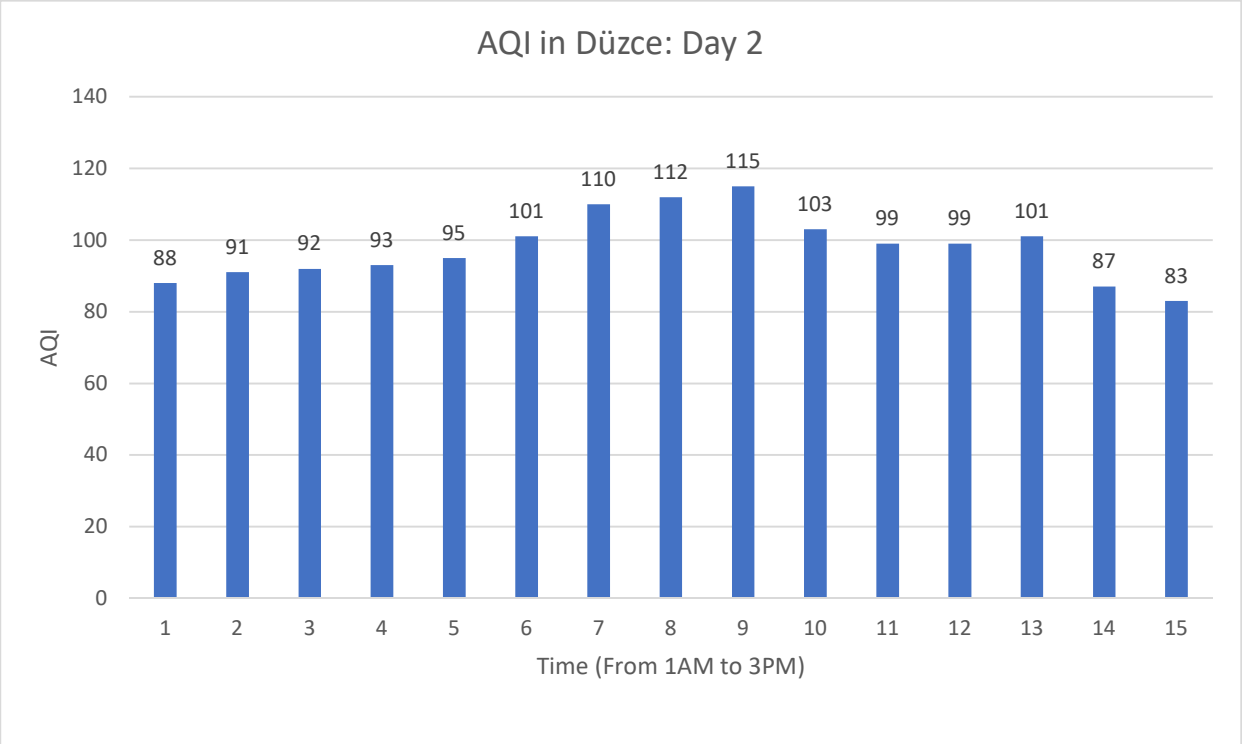
Düzce

Day 1:



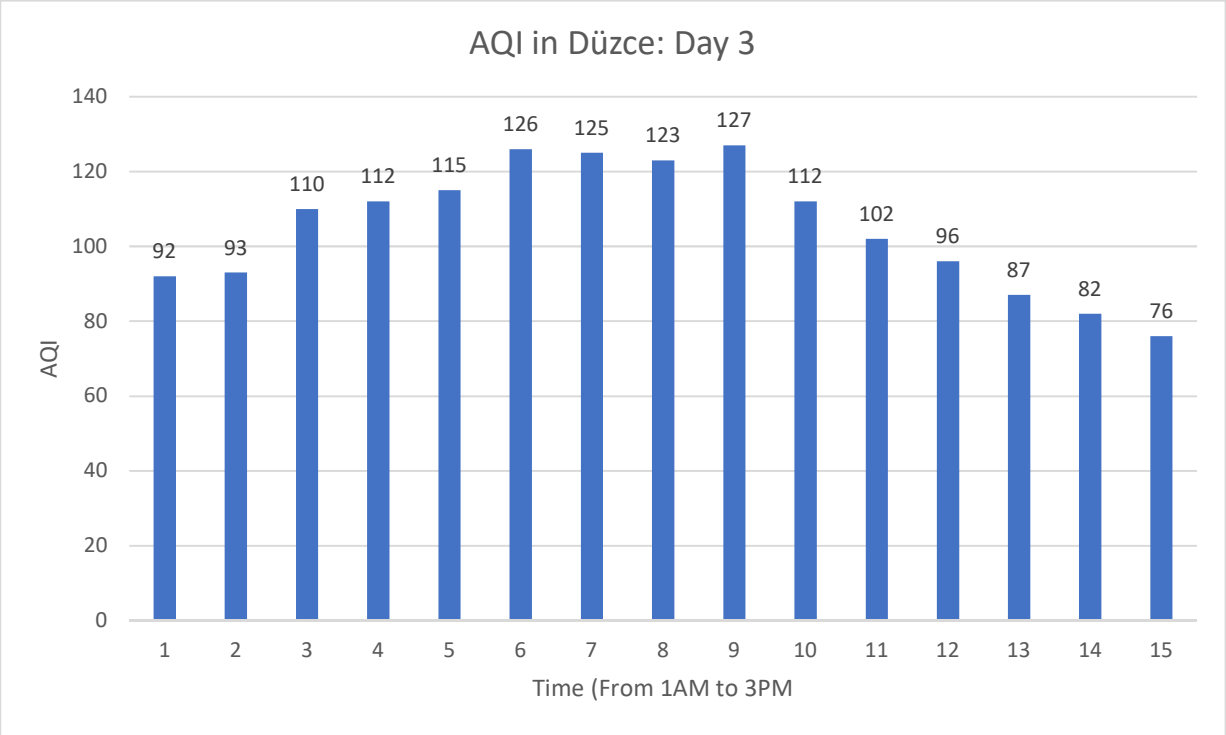
Data Follows a basic trend. It increases with a gradual fashion until 11 AM which is 112. This would mean that the present air pollution would affect sensitive people. “92.3” is the total average AQI that has been recorded in the past day. The maximum and minimum AQI differ by exactly 47 points which is a large amount. (The max is 112 and the min is 65)

Day 2:



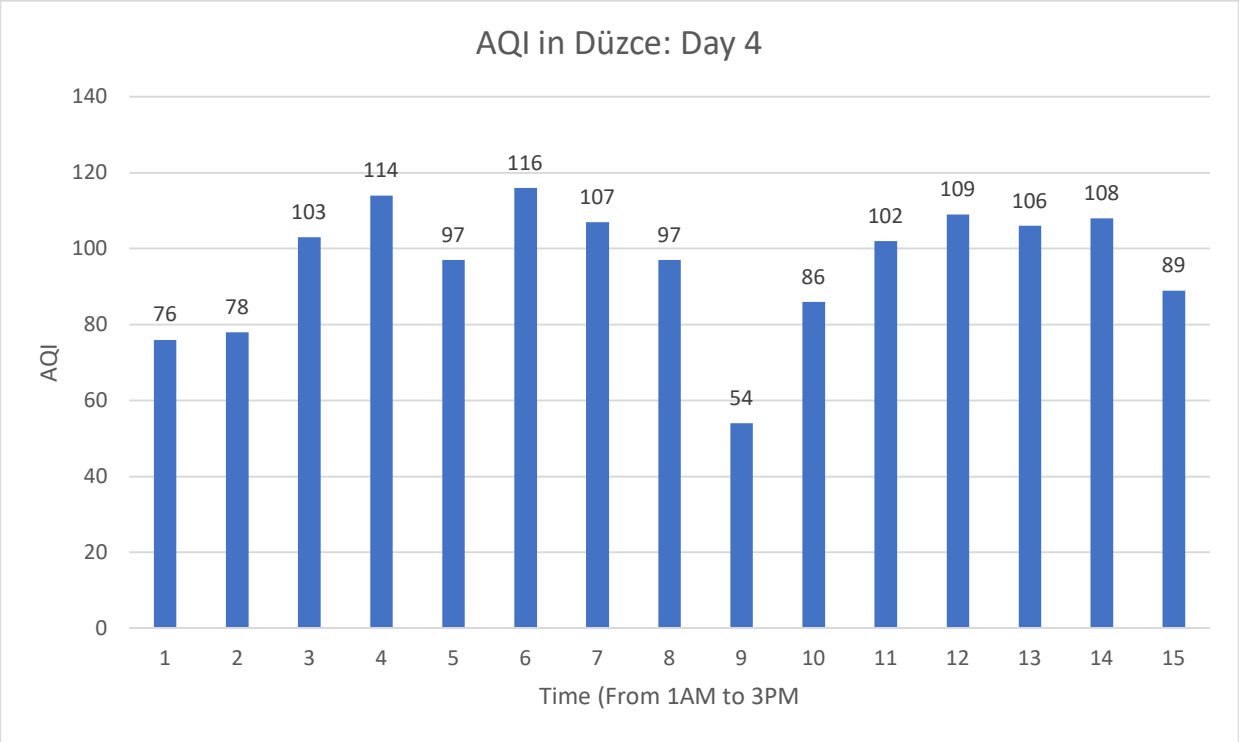
The importance of the given data here is the insights one can acquire from the formation and transportation of the given pollution in a single area. “97.3” is the average PM2.5 AQI in the past 24 hours. This high amount of air pollution can cause health issues. To tie back to the research question at hand, the VOC amount must be minimized to stop the formation of secondary pollutants.

Day 3:



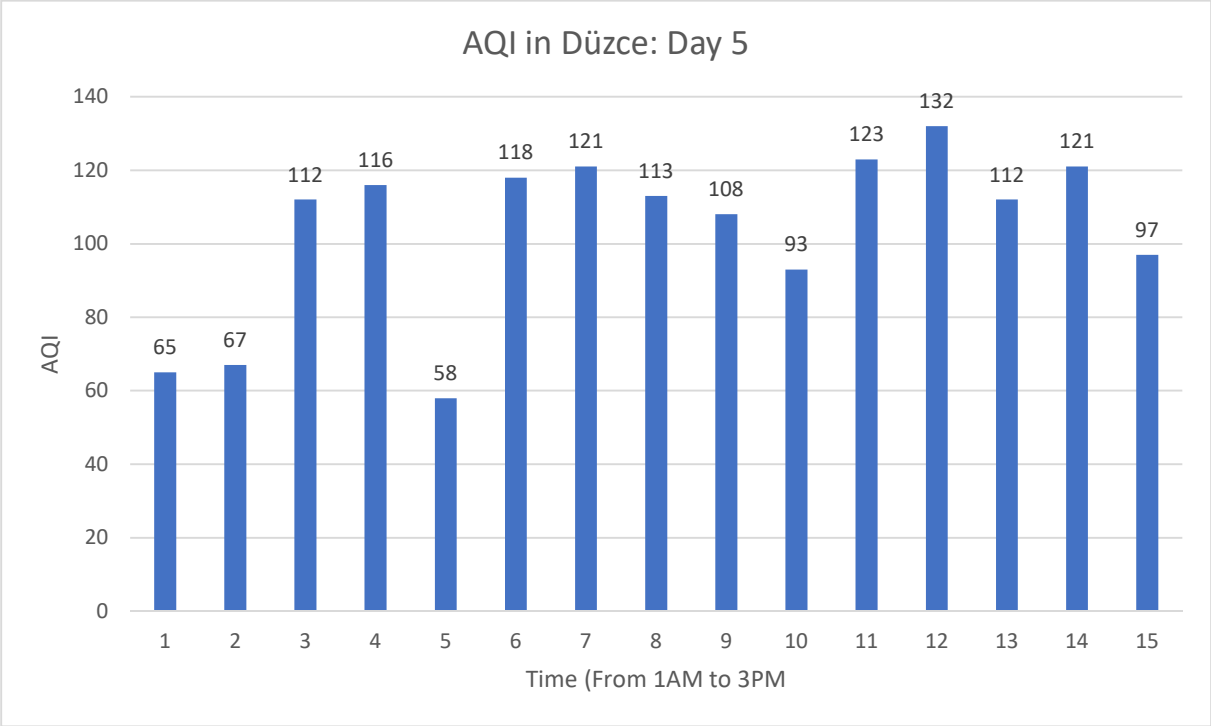
The graphic clearly displays the correlation between primary and secondary pollutants. 105.2 is the total average AQI which is much higher than the moderate AQI. The worst AQI is 127 which would hint at the usage of modes of transport around 9 AM.

Day 4:



The major risk in a high AQI rating is the reduction of life expectancy as several health issues could be linked back to it. The average PM 2.5 AQI was “96.5” which would pose a serious threat to those who are prone to illnesses. The increase in air pollution might be directly correlated to the increase of health issues. The residents should be encouraged to use public transport and to stay away from the outside world if they are especially sensitive.

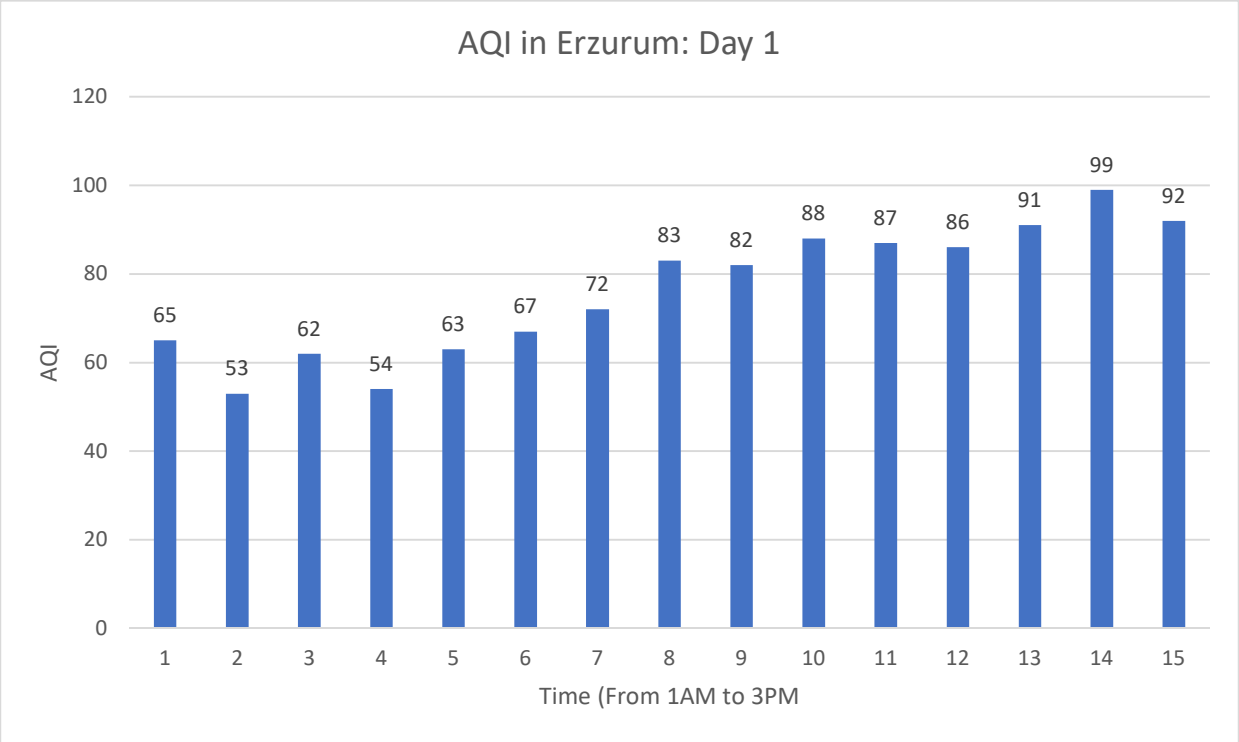
Day 5:



The graph interprets the area as being highly polluted. The average PM 2.5 AQI is “103.73”. This is on the high end of the spectrum and people who are living in this area are sure to be affected by health. The highest PM 2.5 AQI recorded was “132”. This would mean a greater personal vehicle presence with increased traffic jams.

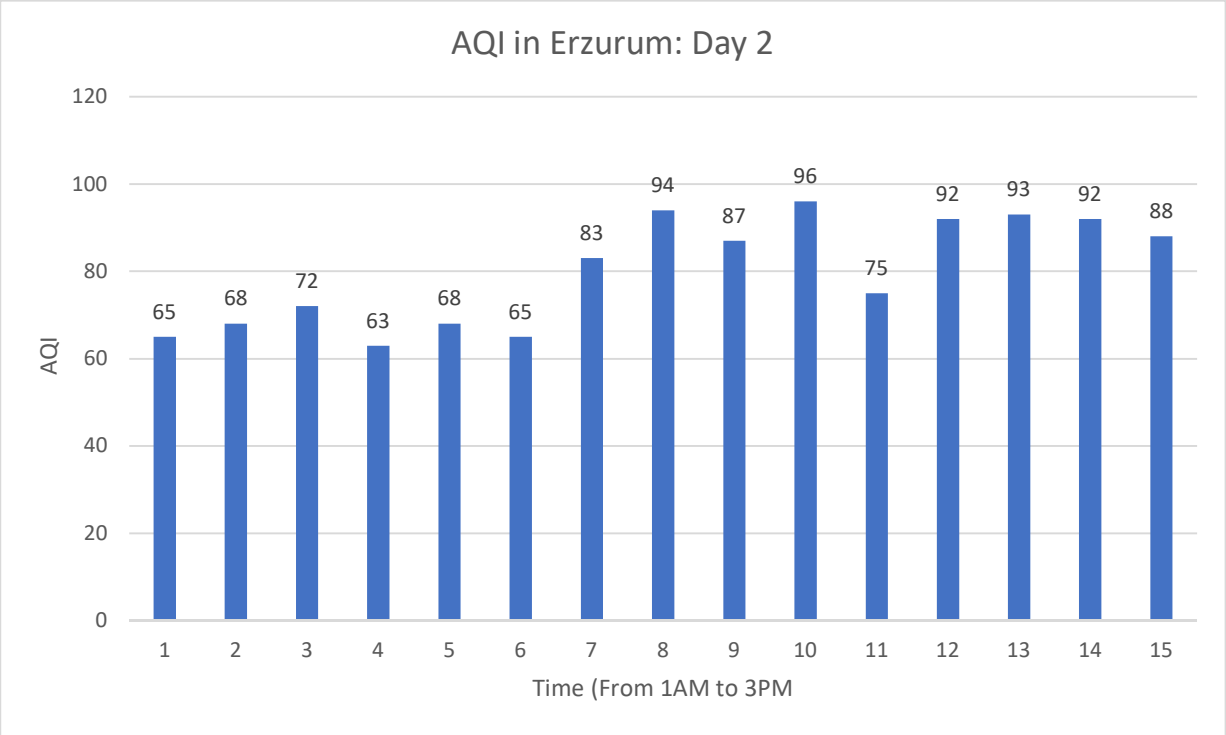
Palandoken, Erzurum:

Day 1:



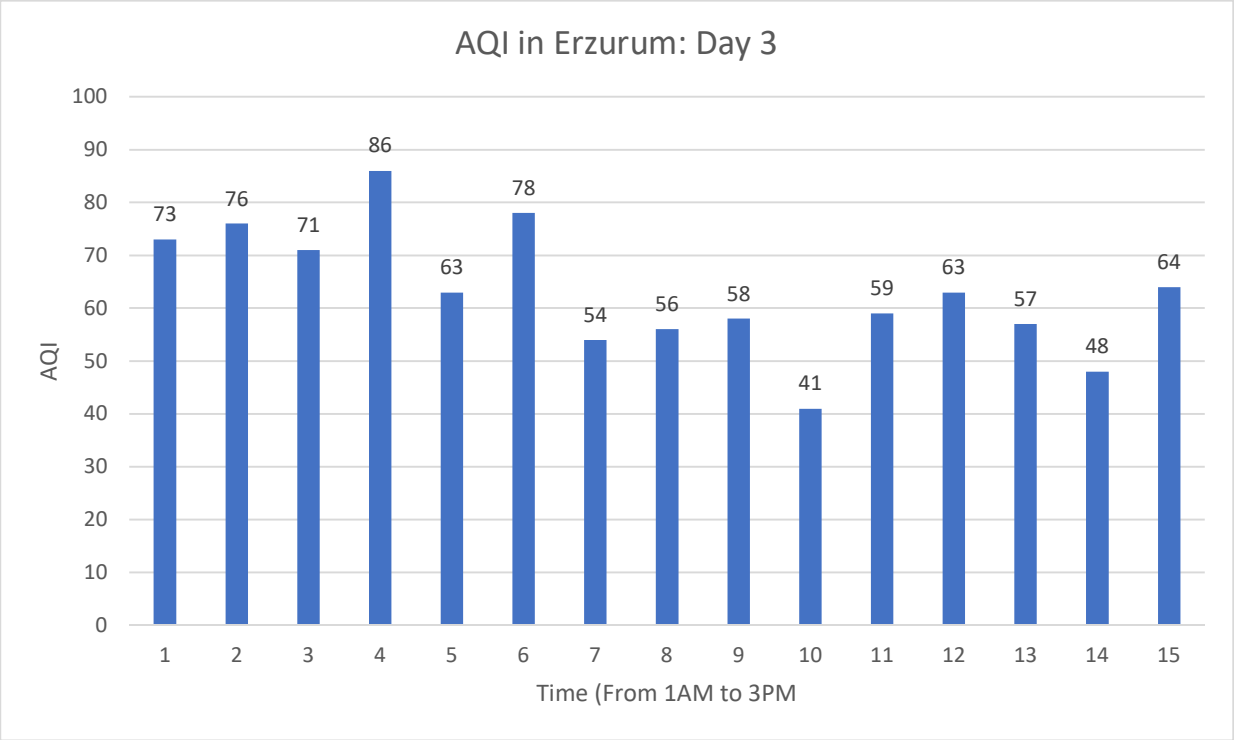
The area can be considered as an health hazard as the average PM 2.5 AQI recorded was “76”, although this is dangerous it is not close to the values recorded in Düzce. This PM 2.5 AQI value would indicated that the people who are prone to be affected by air pollution illnesses will be affected but the majority will only experience being uncomfortable. Moving forward to the link of the given data with the stated research question. Pollutants such as NOx & VOCs should be low. This would mean that sensitive people could avoid contact with smog and ground-level ozone which can be given as O_3

Day 2:



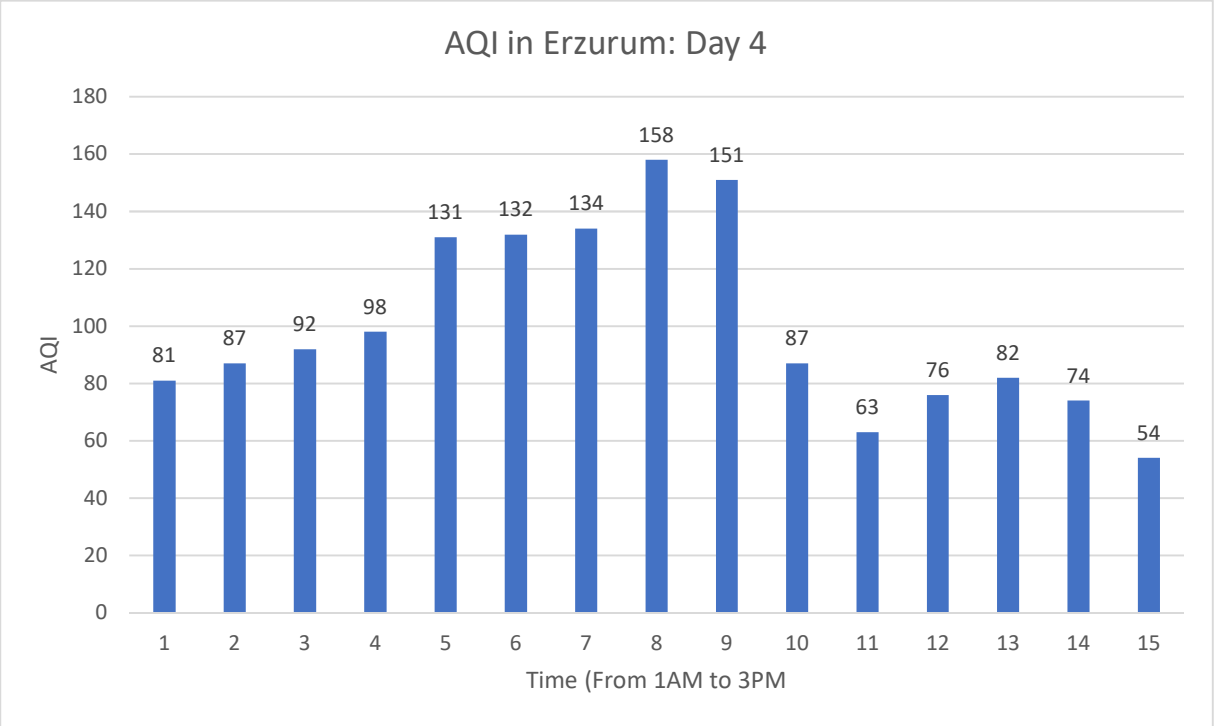
The minimum PM 2.5 AQI is “63” and the maximum PM 2.5 AQI is “96” which would mean a difference of AQI of 33 which would not be considered a large difference as the data follows a general trend. The highest PM 2.5 AQI recorded is at 10 AM, meaning that several moderative means should be established in order to protect the citizens of Erzurum at these time points. Also, the presence of CO_2 SO_2 NO_x will experience a high increase at this given point of time.

Day 3:



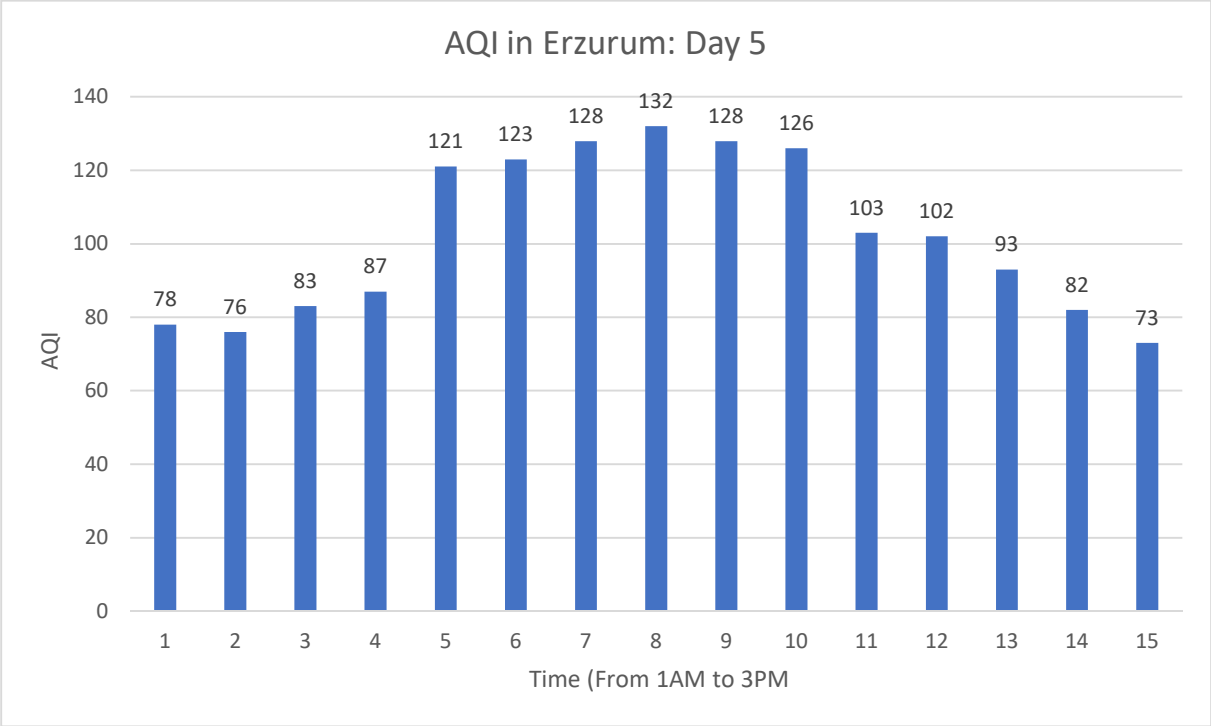
This is a highly varied data, which at times creates very unhealthy and unhealthy results. The least unhealthy is 2.5 PM AQI 41 at 10AM, which still poses a risk to those prone to illnesses relating to air pollution. Now we will connect back to the research question. The highest recorded 2.5 PM AQI was 86 which would pose a threat to domesticated animals as well as to the human populations in Erzurum. This effect will be due to the release of pollutants such as VOCs, NO_2, SO_2, and CO_2.

Day 4:



This is the highest PM 2.5 AQI recorded in Erzurum with an Average of 100 AQI. This would mean a greater risk when it comes to the presence of toxic pollutants. The residents will suffer from respiratory diseases, especially the children, which will be at great risk from the pollutants in the air. Mentioning the research question at hand, the AQI index poses a great risk to the residents of Erzurum, especially those who are prone to air-borne illnesses.

Day 5:



This was one of the highest PM 2.5 AQI average collected in Erzurum which was 100. In this AQI sensitive groups are likely to be affected but the general public will only experience minor health issues. Connecting back with the research question: The least pollutant is O_3. This could cause serious issues like respiratory illness, cardiovascular problems.

3.2: Data Processing:

Three values are taken for both sectors. These values are the mean, median and the mode. The mean is the indicator of the average AQI. It is measured in Atmospheric Particulate Matter (PM2.5). The median is the midpoint of the AQI values and the mode is the AQI that occurs most frequently.

Düzce:

1. **Avg. Air Quality in PM2.5 For Day 1:**

$$Avg. = \frac{Sum\ of\ Observations}{\#\ Observations}$$

$$= \frac{98 + 93 + 87 + 88 + 98 + 100 + 102 + 101 + 102 + 110 + 112 + 76 + 75 + 78 + 65}{15}$$

$$\Longrightarrow Avg. = 92.3333$$

Mode = 98,102

Median = 98

2. **Avg. Air Quality in PM2.5 For Day 2:**

$$Avg. = \frac{Sum\ of\ Observations}{\#\ Observations}$$

$$= \frac{88 + 91 + 92 + 93 + 95 + 101 + 110 + 112 + 115 + 103 + 99 + 99 + 101 + 87 + 83}{15}$$

$$\Longrightarrow Avg. = 97.9333$$

Mode = 101, 99

Median = 99

3. **Avg. Air Quality in PM2.5 For Day 3:**

$$Avg. = \frac{Sum\ of\ Observations}{\#\ Observations}$$

$$= \frac{92 + 93 + 110 + 112 + 115 + 126 + 125 + 123 + 127 + 112 + 96 + 87 + 82 + 76}{15}$$

$$\Longrightarrow Avg. = 105.2$$

Mode = 112

Median= 110

4. Avg. Air Quality in PM2.5 For Day 4:

$$Avg. = \frac{Sum\ of\ Observations}{\#\ Observations}$$

$$= \frac{76 + 78 + 103 + 114 + 97 + 116 + 107 + 97 + 54 + 86 + 102 + 109 + 106 + 108 + 89}{15}$$

$$\Longrightarrow Avg. = 96.13333$$

Mode = 97

Median = 102

5. Avg. Air Quality in PM2.5 For Day 5:

$$Avg. = \frac{Sum\ of\ Observations}{\#\ Observations}$$

$$= \frac{65 + 67 + 112 + 116 + 58 + 118 + 121 + 113 + 108 + 93 + 123 + 132 + 112 + 121 + 97}{15}$$

$$\Longrightarrow Avg. = 103.7333$$

Mode = 112, 121

Median = 112

Erzurum:

1. Avg. Air Quality in PM2.5 For Day 1:

$$Avg. = \frac{Sum\ of\ Observations}{\#\ Observations}$$

$$= \frac{65 + 53 + 62 + 54 + 63 + 67 + 72 + 83 + 82 + 88 + 87 + 86 + 91 + 99 + 92}{15}$$

$$\Longrightarrow Avg. = 76.26667$$

Mode = N/A

Median = 82

2. Avg. Air Quality in PM2.5 For Day 2:

$$Avg. = \frac{Sum\ of\ Observations}{\#\ Observations}$$

$$= \frac{65 + 68 + 72 + 63 + 68 + 65 + 83 + 94 + 87 + 96 + 75 + 92 + 93 + 92 + 88}{15}$$

$$\Longrightarrow Avg. = 80.06667$$

Mode = 65, 68, 92

Median = 82

3. Avg. Air Quality in PM2.5 For Day 3:

$$Avg. = \frac{Sum\ of\ Observations}{\#\ Observations}$$

$$= \frac{73 + 76 + 71 + 86 + 63 + 78 + 54 + 56 + 58 + 41 + 59 + 63 + 57 + 48 + 64}{15}$$

$$\Longrightarrow Avg. = 63.13333$$

Mode = 63

Median = 63

4. Avg. Air Quality in PM2.5 For Day 4:

$$Avg. = \frac{Sum\ of\ Observations}{\#\ Observations}$$

$$= \frac{81 + 87 + 92 + 98 + 131 + 132 + 134 + 158 + 151 + 87 + 63 + 76 + 82 + 74 + 54}{15}$$

$$\Longrightarrow Avg. = 100$$

Mode = 87

Median = 87

5. Avg. Air Quality in PM2.5 For Day 5:

$$Avg. = \frac{Sum\ of\ Observations}{\#\ Observations}$$

$$= \frac{78 + 76 + 83 + 87 + 121 + 123 + 128 + 132 + 128 + 126 + 103 + 102 + 93 + 82 + 73}{15}$$

$$\Longrightarrow Avg. = 102.333$$

Mode = 128

Median = 102

Standard Deviation of Düzce:

$$Standard\ Deviation\ Formula = \ \sigma = \sqrt{\frac{\sum(X - \mu)^2}{N}}$$

$$\sigma = \frac{(92.33 - 99)^2 + (97.93 - 99)^2 + (105.2 - 99)^2 + (96.13 - 99)^2 + (103.73 - 99)^2}{5}$$

$$\sigma = 23.27$$

Standard Error for Düzce:

$$Standard\ Error\ = \frac{\sigma}{\sqrt{N}}$$

$$\frac{23.27}{\sqrt{5}} = 10.40$$

Standard Deviation of Erzurum:

$$Standard\ Deviation\ Formula = \ \sigma = \sqrt{\frac{\sum(X - \mu)^2}{N}}$$

$$\sigma = \frac{(76.27 - 84)^2 + (80.07 - 84)^2 + (63.13 - 84)^2 + (100 - 84)^2 + (102.33 - 84)^2}{5}$$

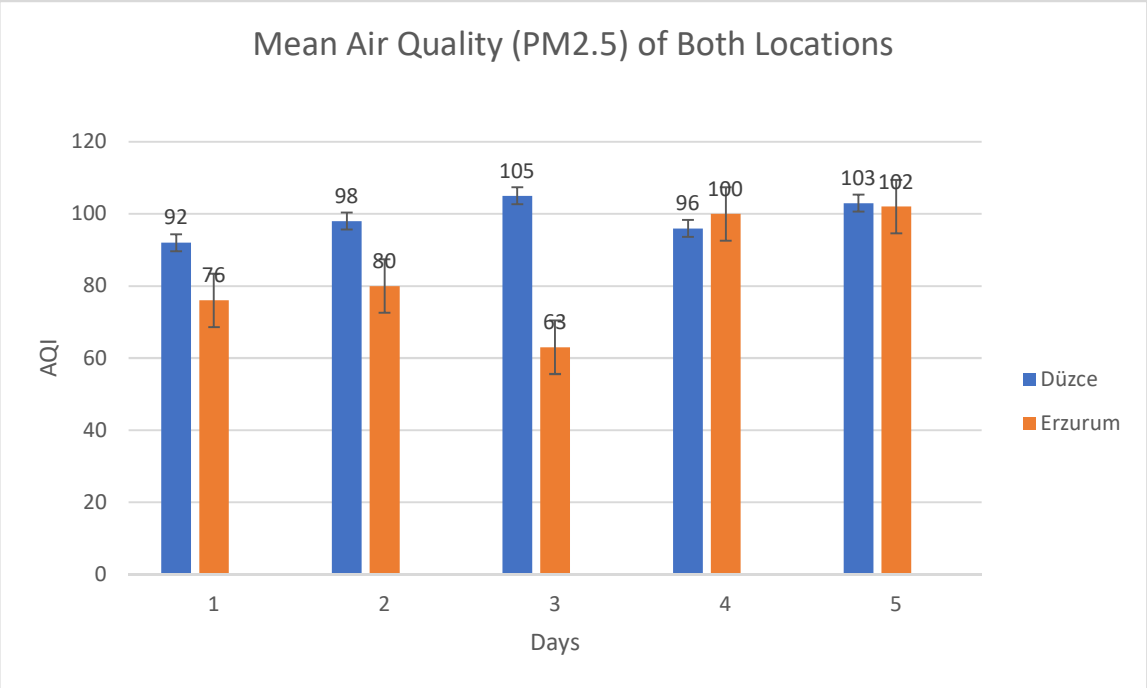
$$\sigma = 220.2$$

Standard Error for Erzurum:

$$Standard\ Error\ = \frac{\sigma}{\sqrt{N}}$$

$$\frac{220.2}{\sqrt{5}} = 98.48$$

3.3 Data Analysis



Graph 16: Mean AQI at the 2 inspected Locations. The blue graphs are Düzce and the Orange Graphs are Erzurum as given in the legend.

The given graph is a clustered column bar graph. After conducting a T-Test on the means of both towns, it yielded a result of 0.119914, which would mean that Düzce has a higher PM 2.5 AQI compared to Erzurum. The last two days are closer together as they are both major industrial towns located in Turkey. Düzce has a higher concentration of pollutants which would mean that the most people who are prone to air pollution illnesses should be more careful in Düzce. Düzce follows a consistent scale with the minimum AQI being 92 and the maximum AQI being 105 with a difference of 13. Although it is consistent, the

average AQI of Düzce is 98.8, which can be classified as very unhealthy. The sensitive residents of Düzce must be wary of the air pollution. Erzurum has a lower average AQI of 84.2 and it increased in the last 2 days. As they are very similar cities, the lower AQI of Erzurum can be the result of better city management.

Linking back to the research question, the residents of Erzurum and Düzce are prone to face issues such as shortness in breath and may even be more serious for sensitive people. These problems will occur due to pollutants such as CO_3, NO_2, SO_2, CO_2, Methane and CFCs. They also affect things like wildlife and agriculture.

3.4: Survey Questions:

Primary Data:

Aim: Deducing the effect which air pollution has on the residents of both locations and examine the methods of reducing air pollution.

Research Question: "How far the ecological & human impact is pretentious by levels of air pollution in 2 urban sectors of Erzurum and Düzce, Turkey?"

[The Questionnaire in digital form is attached in the Appendix]

The survey was done in the industrial districts of the two cities with 50 random residents. The questions at the appendix were asked to them.

3.5 Field Work Procedure:

1. A questionnaire to detect the measures against air pollution and their management strategies as well as their effects on the residents was created.

2. The survey was given to a constants amount of people in both of the cities (50 people)

3. Both Male & Female answerers were used in the survey and each person had approximately 10 minutes to finish the survey.

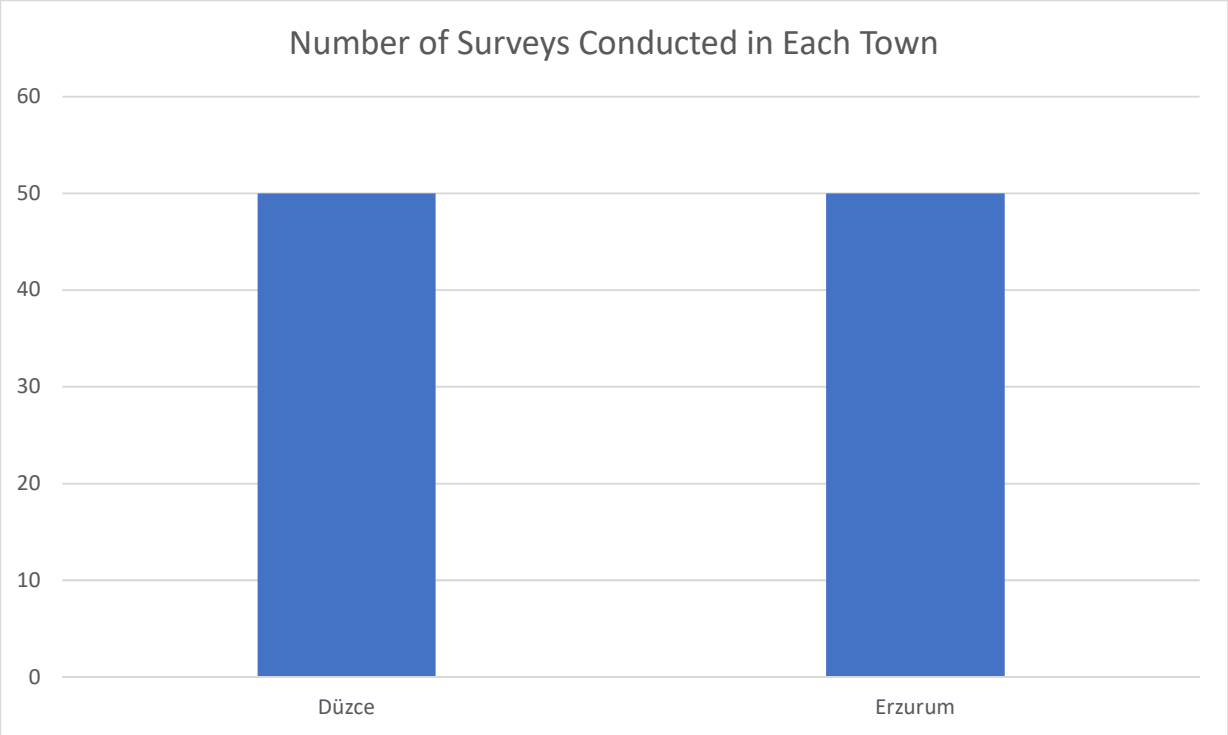
4. The results were compiled with the date and graphs were drawn for visual representation.

3.6 Risk Assessments

- The investigator should be wearing necessary PPEs (Personal Protective Equipments) to avoid health hazards. This is because the investigated areas can be the cause of major air pollution and might be dangerous to the investigator.
- Obtain necessary precautions for known hazards.
- Hands must be clean at all times by carrying hand sanitizers and face wash with the inspector at all times.
- Contact with the eyes must be avoided.
- Contaminated areas must be avoided.

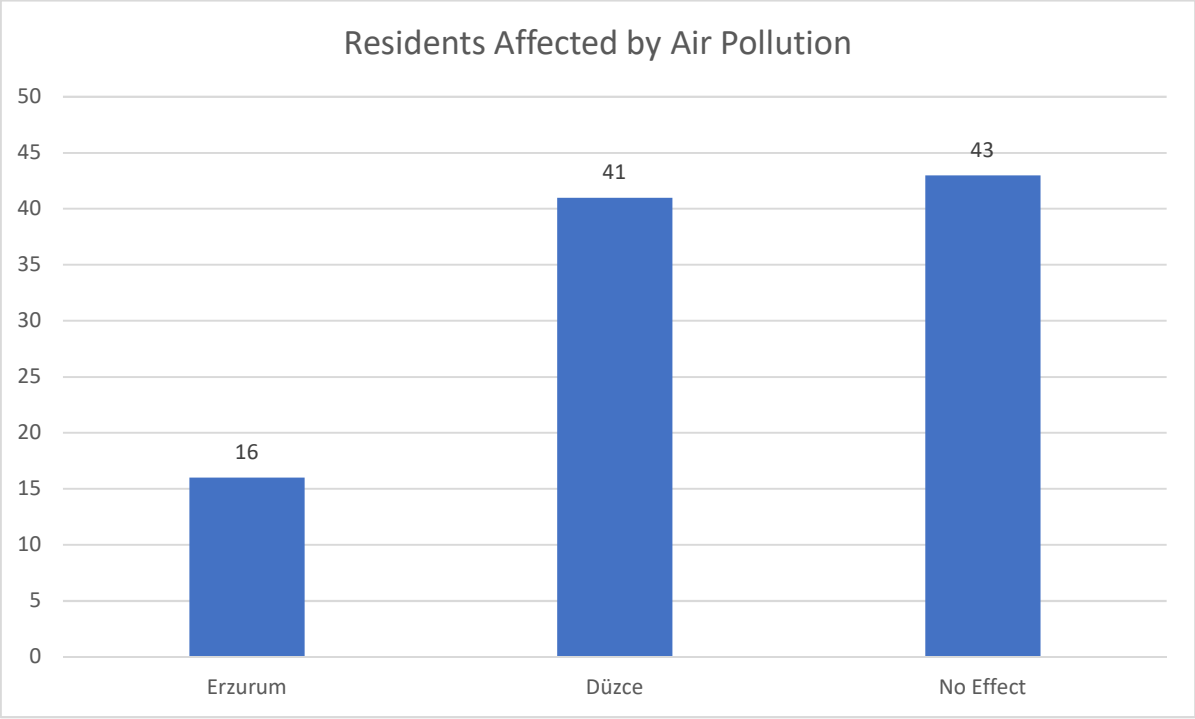
The Processed Data was made into graphs for Visual Representation

Number of People Surveyed in Each City:



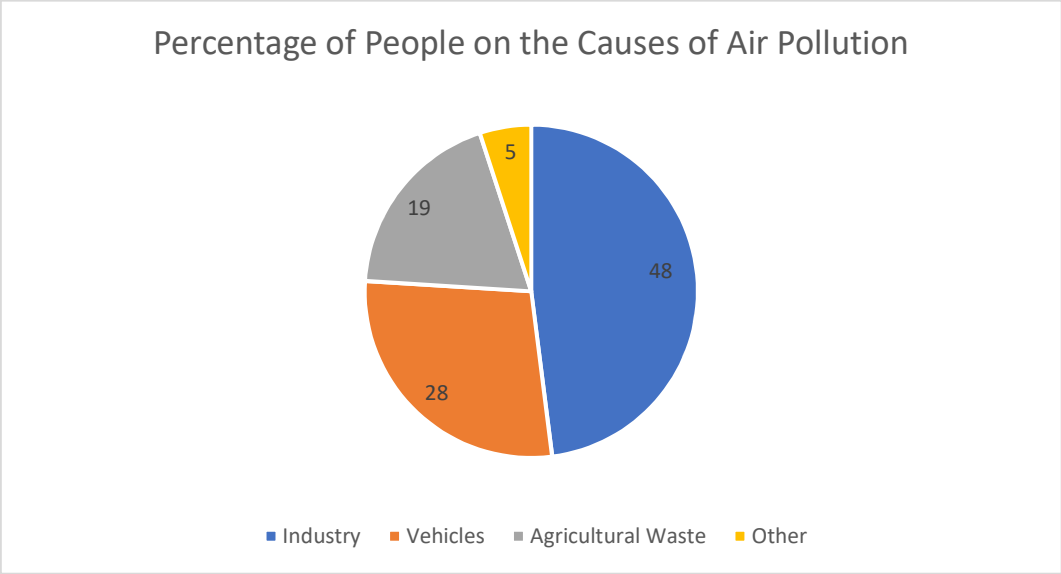
Graph 18: The Number of People surveyed in each town.

1st Question: Has Your Health been Affected by Air Pollution?



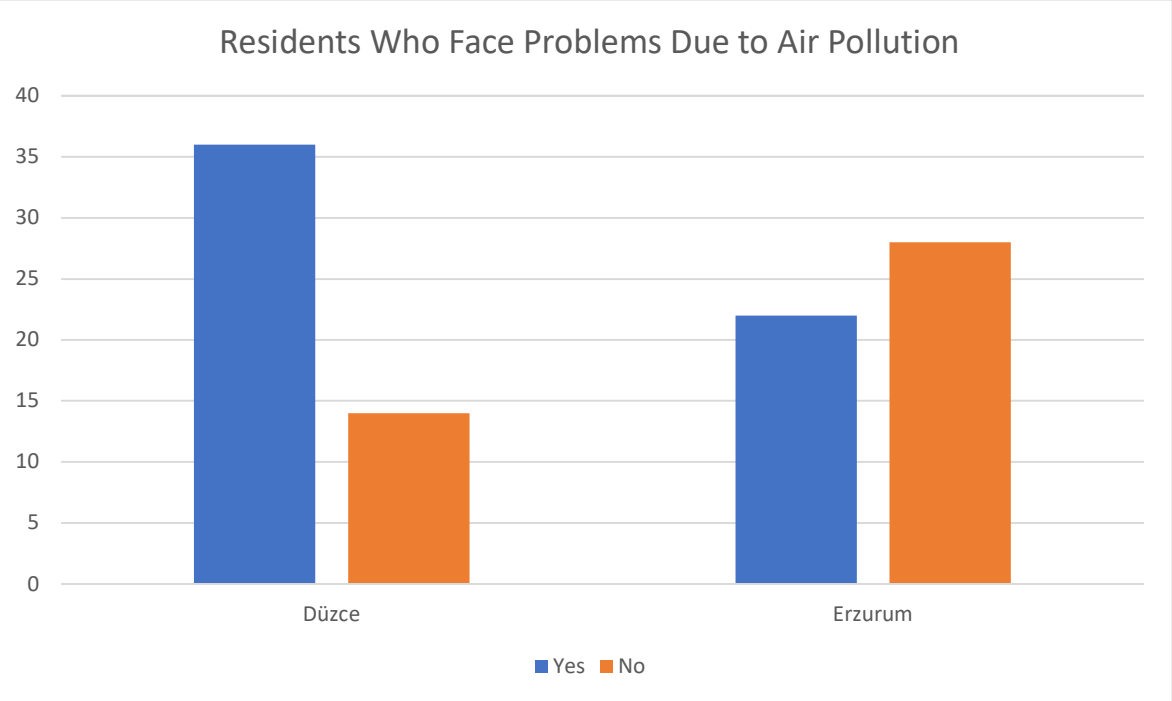
Graph 19: Residents who have been affected by pollution.

2nd Question: What are the Main Emitters?



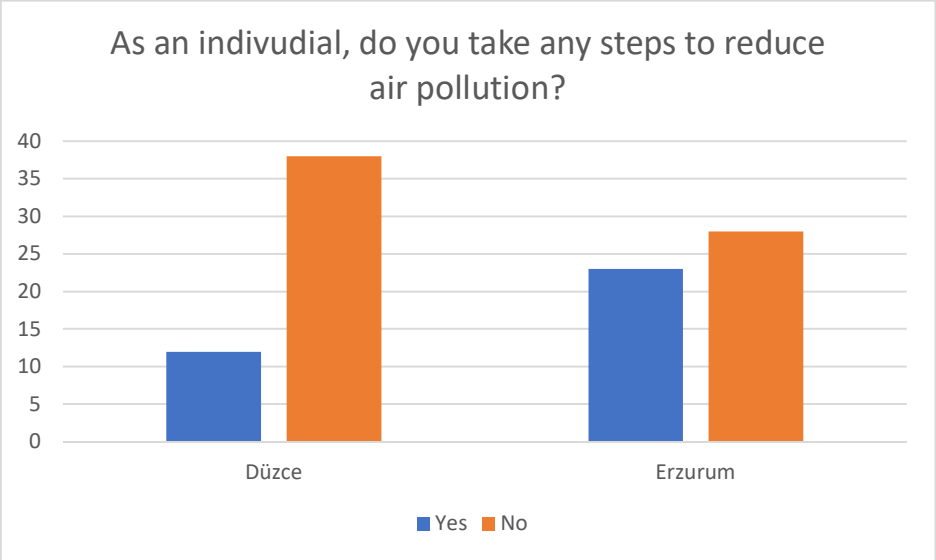
Graph 20: The residents were asked to fill out the most polluting industry in their opinion.

3rd Question: Do you face Problems due to the air pollution?



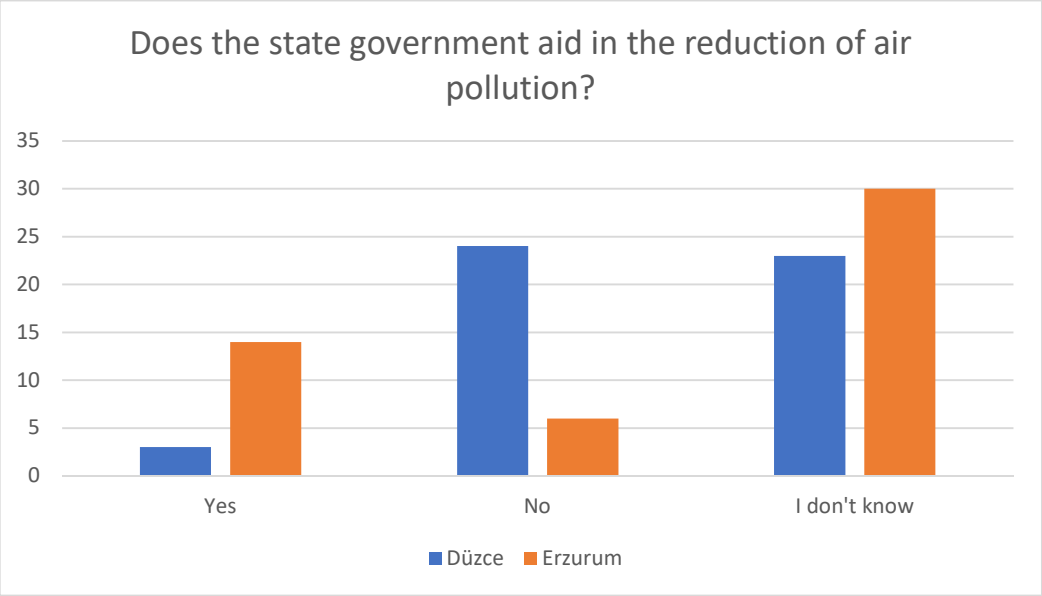
Graph 21: Residents Were Asked if they face any problems due to the pollution of the air.

4th Question: Have you taken any steps by yourself to reduce pollution?



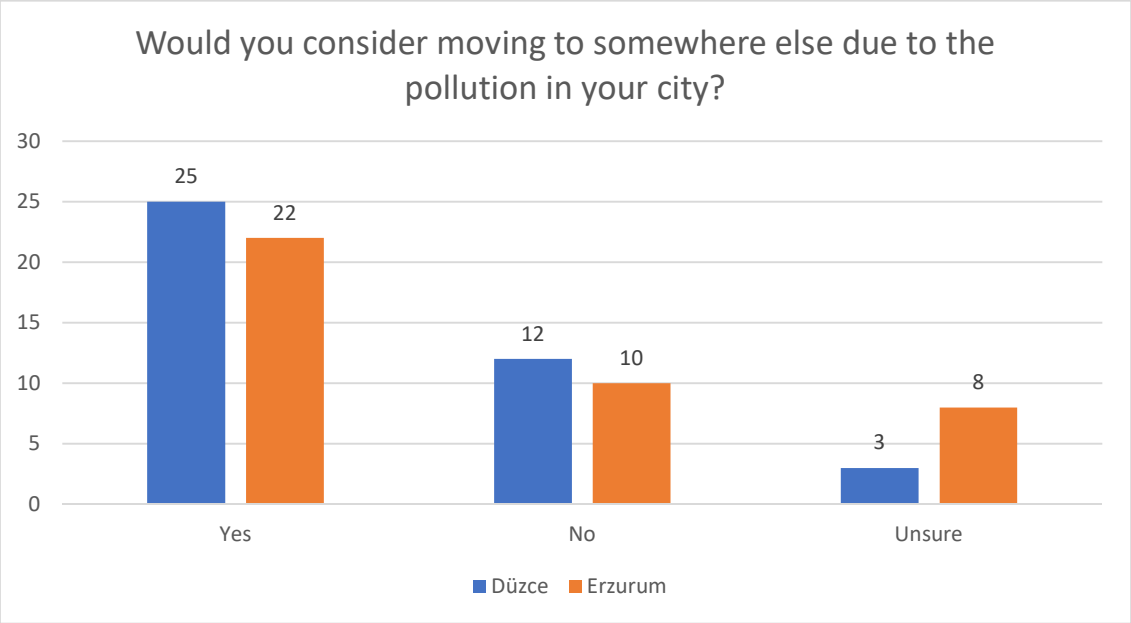
Graph 22: Individuals were asked if they take any initiatives to reduce air pollution by themselves.

5th Question: Does your local legislative body take enough action to reduce air pollution?



Graph 23: Residents were asked if they thought their Government took enough actions to reduce air pollution

6th Question: Would you relocate due to the environmental issues in your city?



Graph 24: Residents were asked if they considered moving to another city due to the pollution in their current one.

3.7 Discussion:

I had the aim of investigating the impact of air pollution on two major industrial cities in Turkey. The Average PM2.5 AQI for Düzce and Erzurum was 98.8, 84.2, respectively.

From Graph 16, it can be seen that both of the cities were consistent in having unhealthy amounts of air pollution. Erzurum has much less, but it spiked during the last two days, this might be due to Erzurum being managed better compared to Düzce as it has a much wealthier government. The peaks on the last two days might be due to traffic jams. Although the average AQI might differ, both of the cities are dangerous for sensitive people and can cause respiratory damage issues.

Having a high PM2.5 AQI will continue to cause many more problems if proper measures are not installed. Referring to the research question, exposure to pollutants such as NO_x, SO_x, CO, O_3, and VOCs will cause damage to the overall ecosystem and can cause a unstable equilibrium which contributes to the climate change and the increase of greenhouse gases.

Referring back to the research question, it is likely for people to immigrate to other cities for more clean-living standards unless polluting activities are not managed by the government.

Chapter 4: Conclusion & Evaluation

4.1 Conclusion:

With the collected secondary and primary data, I would be confident to state that my claims and hypotheses about the damage air pollution has are correct.

Air Pollution is a major issue for everyone, but there are people who are much more sensitive to illnesses caused by air pollution, hence it is most wise to discuss this issue in 3 different aspects.

Economic Aspects: According to data, 57 residents suffered from sir pollution, hence it can be deduced that air pollution has a large impact on residents which might create an impact on the economy

Social Aspects: According to data, 47% of people considered moving to safer cities. This is due to air pollution affecting the daily life and physiology of the residents.

Ecological Aspect: Global climate change is one of the most major problems in the current world. This issue is affected by the emission of greenhouse gases and air pollution, which in turn negatively affects the health of humans.

Global warming is the increase of temperature in Earth's surface and works as a positive feedback system.

To conclude, governmental bodies must enact stricter laws to reduce pollution in industrial cities to increase the health of their residents and increase quality of life.

4.2 Evaluation:

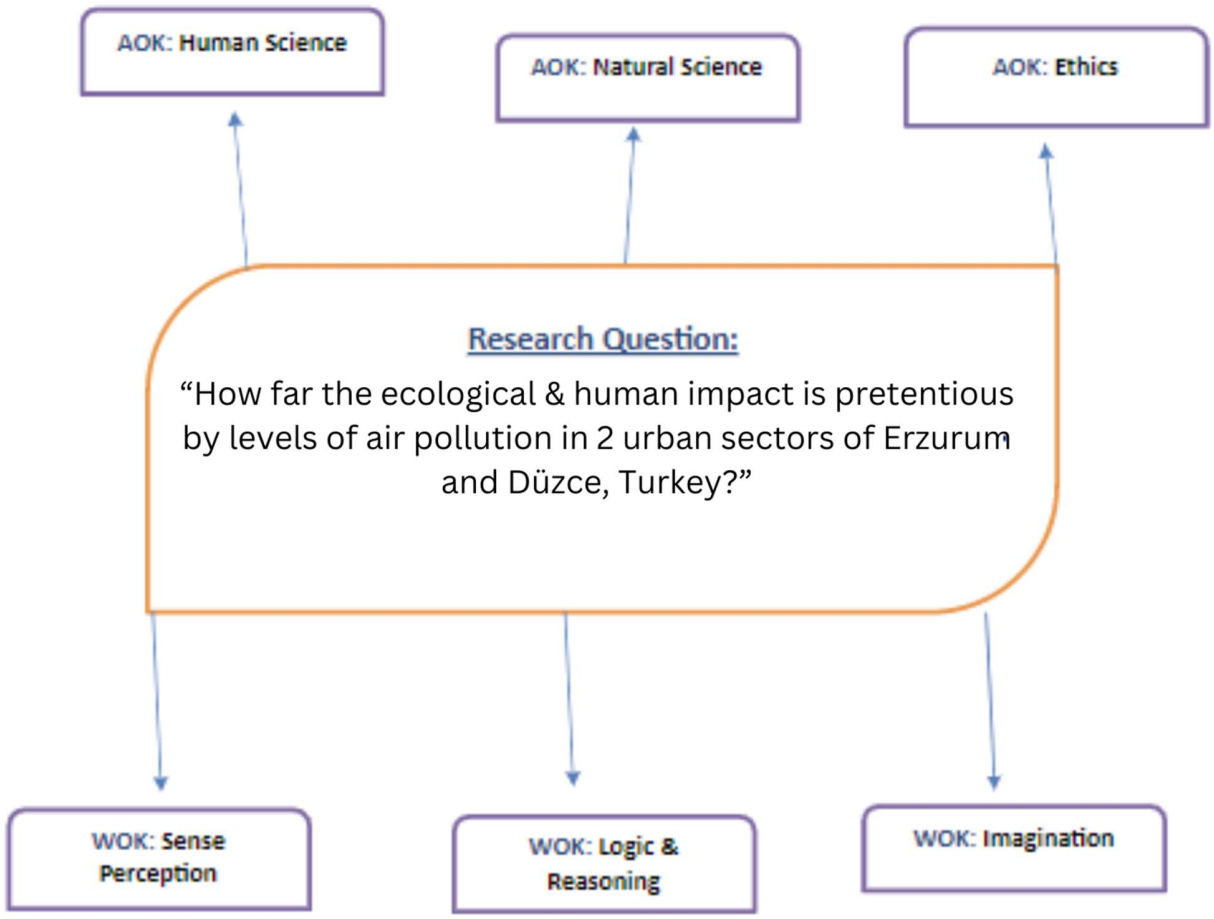
Problems During the Survey Process:

Problems	**Possible Solutions**
The gathered data did not vary as some answers were common.	Surveying could have been done in less focused areas.
The Survey might not be clear.	Add more distinct answers.
The visited areas were not hygienic	Bring more PPEs.

It is of extreme importance to have effective restrictive measures to decrease air pollution. Here are some strategies that can be implemented by governments.

- Maximum Achievable Control Technology
- Reasonably Available Control Technology
- Alternative use of Clear Energy
- Montreal & Kyoto Protocol.

4.3 Linking the Research Question with TOK:



Bibliography:

(Sources of Air pollution graph) https://www.researchgate.net/figure/EU-27-emission-sources-of-carbon-monoxide-2006-EEA-2008_fig16_221909194

(Air Pollution Index) https://qz.com/1913459/what-is-the-air-quality-index/

Appendix 1 : The Survey given to residents (Translated into English from Turkish)

Survey

Please Fill the Survey Below, Thank you very much for your contribution!

Name: _____

Age: _____

Occupation: _____

Area: _____

1. **Has Your Health been Affected by Air Pollution?**
   A -) Yes
   B -) No

2. **What is the Main Emitter in your opinion?**
   A -) Industry
   B -) Vehicles
   C -) Agricultural Waste
   D -) Other

3. **Do you face problems due to Air Pollution?**
   A -) Yes
   B -) No

4. **Have you taken steps by yourself to reduce pollution?**
   A -) Yes
   B -) No

5. **Does your local legislative body take enough action to reduce air pollution?**
   A -) Yes
   B -) No

C -) I don't know

6. **Would you relocate due to environmental issues in your city?**
   A -) Yes
   B -) No
   C -) Unsure

Appendix 2: The Agreement Form Filled by residents (For Privacy Reasons):

By Signing This Box, You Will Agree for this Data to be used for my High-School Grade Extended Essay for Environmental Systems and Societies. You name and generally everything regarding yourself will be kept anonymous, only your answers will be used.