



CENTER FOR ADVANCING RESEARCH IN
Transportation Emissions, Energy, and Health
A USDOT University Transportation Center

What is in the air?

Student Handouts



Measuring Air Pollution



Measuring Air Pollution

Names:

Instructions: Use the table below to record the results of measuring the levels of PM 2.5 around your school. Think about: *What data should we collect?* Add in appropriate headers.

Location	PM 2.5 Reading		



Measuring Air Pollution around Town

Where should we measure PM 2.5 around our town? Brainstorm places with low and high PM 2.5 levels.

Low Air Pollution		High Air Pollution	
Location	Justification	Location	Justification

Measuring Air Pollution around Town

Write down the final list of locations. What do you predict the PM 2.5 level will be? Use the chart to identify each as: *Good, Moderate, Unhealthy for Sensitive Groups, or Unhealthy*

Location	Prediction	Reading	Notes

PM _{2.5}	Air Quality Index
0 to 12.0	Good 0 to 50
12.1 to 35.4	Moderate 51 to 100
35.5 to 55.4	Unhealthy for Sensitive Groups 101 to 150
55.5 to 150.4	Unhealthy 151 to 200

Influencers of Air Pollution





Names: _____

Contextualizing Air Pollution

Instructions: With your assigned group, prepare a brief report on the air quality of your assigned community. Your task is to identify the current and average air quality readings for your community. In addition, you will research information on the relevant factors that we have identified in class that contribute to decreased air quality. Record your research and findings below.

Our group's location is _____.

What is the air quality in this location? How does this compare to other locations?

What factors contribute to the air pollution in this community?

How has health been impacted by air quality? Search for news articles or other health data.

What policies or changes have been made to improve air quality? Search for news articles or local environmental agencies.

These are some questions and ideas we still need to learn about:

Mystery Town

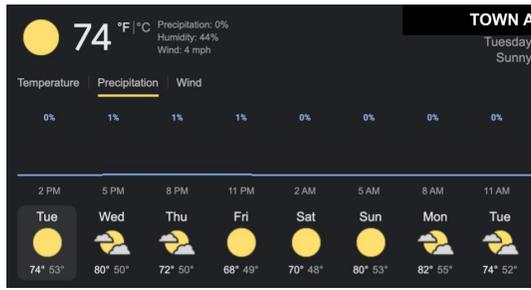
[Click here for additional student handouts](#)



Welcome to

TOWN A

Population 10 million



Local Information

Population Density: 7,009 people per square mile

of Registered Cars: 2,499,764

of Oil Refineries: 5

of Power Plants: 4

Average Rainfall: 14.93 inches per year

Average Snowfall: 0 inches per year



Things around Town

Note these photos are NOT from this town.



Traffic Jams



One of the busiest ports in the nation



Nearby wildfires



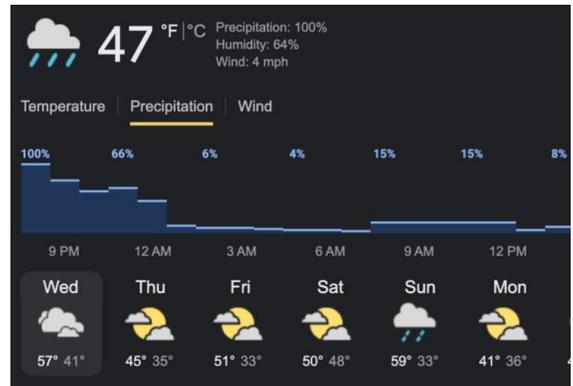
Theme Parks & Tourism



Beautiful Beaches

Welcome to
TOWN B
 Population 8.5 million

Local Information
 Population Density: 27,000 people per square mile
 # of Registered Cars: 4,800,000
 # of Oil Refineries: 0
 # of Power Plants: 3 (2 are hydroelectric plants)
 Average Rainfall: 46.6 inches per year
 Average Snowfall: 25 inches per year
 Note: The Mayor has relatively strict emission controls and set a goal to achieve the cleanest air of any large city by 2030.



Things around Town

Note these photos are NOT from this town.



Food & Culture



Tall buildings



Lots of people drive into the town for work



Various modes of transportation



Lots of people

Welcome to
TOWN C
 Population 85,824

Local Information
 Population Density: 3,828 people per square mile
 # of Registered Cars: 205,000 in county
 # of Oil Refineries: 0
 # of Power Plants: 0
 Average Rainfall: 18.4 inches per year
 Average Snowfall: 4 inches per year



Things around Town

Note these photos are NOT from this town.



Historic downtown



Agriculture



Healthcare industry



Nearby wildfires

Welcome to

TOWN D

Population 2,304,580



Local Information

Population Density: 3,632 people per square mile

of Registered Cars: 3,424,674 in county

of Oil Refineries: 10

of Power Plants: 18

Average Rainfall: 50 inches per year

Average Snowfall: 0 inches per year

7 mph	6 mph	6 mph	6 mph	8 mph	5 mph	7 mph	8 mph
↗	↗	→	→	→	→	↖	↖
1 AM	4 AM	7 AM	10 AM	1 PM	4 PM	7 PM	10 PM
Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed
☀	☁	☀	☁	☀	☀	☁	☁
70° 45°	71° 47°	73° 50°	66° 39°	60° 42°	67° 48°	70° 61°	73° 55°

Things around Town

Note these photos are NOT from this town.



Large port and railroad industry



International Airport



Diverse Community



Humid climate



Museum District

Welcome to

TOWN E

Population 4.3 million



Local Information

Population Density: 3,632 people per square mile

of Registered Cars: ~ 5 million

of Oil Refineries: 1

of Power Plants: 9

Average Rainfall: 33.5 inches per year

Average Snowfall: 33 inches per year

7 mph	10 mph	12 mph	13 mph	12 mph	13 mph	10 mph	9 mph
↑	↑	↑	↑	↑	↑	↑	↑
2 AM	5 AM	8 AM	11 AM	2 PM	5 PM	8 PM	11 PM
Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed
38° 25°	33° 24°	39° 20°	24° 4°	19° 10°	25° 9°	31° 25°	42° 28°

Things around Town

Note these photos are NOT from this town.



Welcome to
TOWN F
 Population 647,610

Local Information

Population Density: 2,425 people per square mile

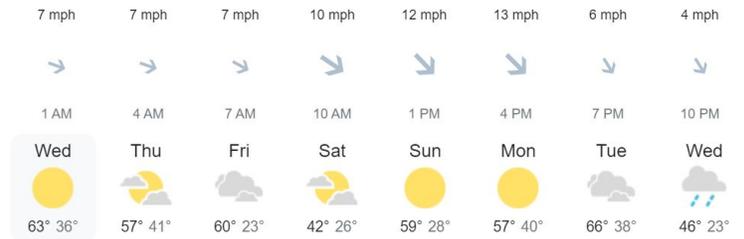
of Registered Cars: ~ 700,000

of Oil Refineries: 0

of Power Plants: 3

Average Rainfall: 33.9 inches per year

Average Snowfall: 12.7 inches per year



Things around Town

Note these photos are NOT from this town.



International Airport



Aircraft Manufacturing



Birthplace of Pizza Hut



Affordable place to live



Greenways and parks

Mystery Town Activity: Answer Key



TOWN A: Los Angeles, California

2020 Yearly Average PM 2.5 Levels: 14 (Min of 6, Max of 26)

Find live data here: <https://www.iqair.com/us/usa/california/los-angeles>



What is the air quality?

- Among the worst in the United States for particulate matter.
- Does not meet EPA's national air quality standards.
- 1 in 10 children have been diagnosed with asthma and people have an increased risk of cancer.
- Lock-down measures from COVID-19 dramatically decreased air pollution due to a decrease in traffic.

What are sources of air pollution?

- **Large population:** Contributes to high emissions from cars and traffic congestion as well as power consumption and other local emissions.
- **Shipping ports:** Port of Los Angeles and Port of Long Beach have a high concentration of fossil fuel or diesel to power ships and other transportation.
- **Wildfires:** During the summer months with strong winds and dry conditions.
- **Geography:** Los Angeles is a basin surrounded by mountains that trap air pollution.

TOWN B: New York City, New York

2020 Yearly Average PM 2.5 Levels: 6.5 (Min of 6, Max of 9)

Find live data here: <https://www.iqair.com/us/usa/new-york/new-york-city>



What is the air quality?

- Despite being the most populous city in the United States, NYC has relatively little air pollution on average.
- Strict emission controls and has invested in increasing regulations on emission sources and improved monitoring of PM 2.5 levels.
- However, the current levels still pose a health threat with particulate matter leading to 3,000 deaths from heart and lung conditions every year. Reducing the particulate matter by 10% could reduce the number of deaths by 300 people every year.
- The COVID-19 lockdown resulted in 25% reduction in particulate pollution in a 3-week period.



What are sources of air pollution?

- **High population density:** Contributes to high emissions from cars and traffic congestion as well as power consumption and other local emissions.
- **Vehicle emissions:** from cars, trucks, ships, and planes.
- **Industry:** on the outskirts of the city.

Mystery Town Activity: Answer Key



TOWN C: Medford, Oregon

2020 Yearly Average PM 2.5 Levels: 16 (Min of 3, Max of 92)

Find live data here: <https://www.iqair.com/us/usa/oregon/medford>

What is the air quality?

- Moderate level of air quality.
- Recently seen record-breaking levels of air pollution.
- Pollution prevention policies have reduced vehicle emissions.



What are sources of air pollution?

Wildfires: Oregon has been affected by some of the worst air quality in the world. With such dense concentrations of tiny particles from wood smoke, it's been considered unhealthy or even hazardous to breathe. The worst times are the end of June and the start of September.

TOWN D: Houston, Texas

2020 Yearly Average PM 2.5 Levels: 10 (Min of 8, Max of 13)

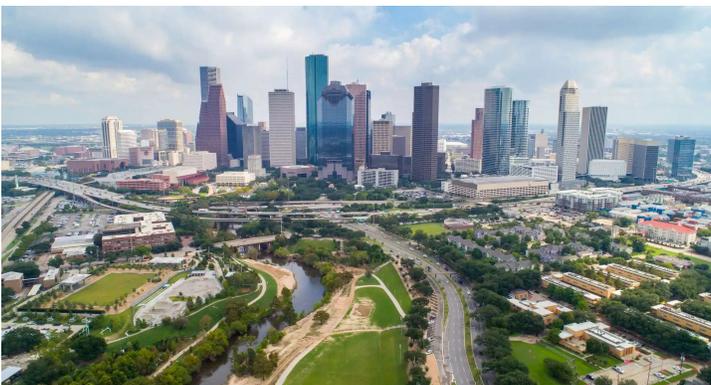
Find live data here: <https://www.iqair.com/us/usa/texas/houston>

What is the air quality?

- Generally good air quality.
- Improved air quality due to increased regulations on emissions, but PM 2.5 levels continue to increase each year.
- Higher-density parts of Houston have higher air pollution levels.
- Low-income areas of the city are disproportionately impacted by air pollution.
- Despite generally low air pollution, the PM 2.5 levels in Houston contribute to 5,000 premature deaths.

What are sources of air pollution?

- **Shipping port:** The Port of Houston is one of the nation's busiest, producing 4.1 tons of smog-forming pollution each year.
- **Vehicle emissions:** Resulting from a large number of cars and other transportation.
- **Industrial emissions:** Coming from factories such as concrete processing plants.



Mystery Town Activity: Answer Key



TOWN E: Detroit, Michigan

2020 Yearly Average PM 2.5 Levels: 10 (Min of 7, Max of 13)

Find live data here: <https://www.iqair.com/us/usa/michigan/detroit>

What is the air quality?

- One of the most polluted cities in Michigan.
- While air pollution has been generally improving since the 2000s, annual particle pollution in Detroit is in the top five percent of all cities measured.
- The southwest section of the city is the most highly polluted region due to its dense concentration of heavy industry that emits higher levels of harmful particulate matter than other areas.

What are sources of air pollution?

- **Oil refinery**
- **Plants powered by coal:** Two plants alone release a combined 34,000 tons of sulfur dioxide into Detroit's air, contributing to fine particle pollution that causes harm to the lungs.
- **Multiple transportation corridors:** Including heavily trafficked highways and a 6-lane bridge.
- **Wood burning:** Many homes burn wood in fireplaces to generate heat, especially during colder months.



TOWN F: Wichita, Kansas

2020 Yearly Average PM 2.5 Levels: 7 (Min of 5, Max of 10)

Find live data here: <https://www.iqair.com/us/usa/kansas/wichita>

What is the air quality?

- Good air quality levels,
- Yearly average within the World Health Organization's target goal of 10 $\mu\text{g}/\text{m}^3$ or less for PM 2.5 levels,

What are sources of air pollution?

- **Wildfires:** Occasionally occur, and vast clouds of smoke and haze blow over from neighboring cities.
- **Transportation:** Being a large city, vehicular emissions are a concern with huge amounts of cars and other smaller personal vehicles on the road, along with larger heavy-duty vehicles such as trucks and buses.

