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Science Writing

Year 3-4

Harris Cheong

St Andrew's School

Government of South Australia
Department for Education

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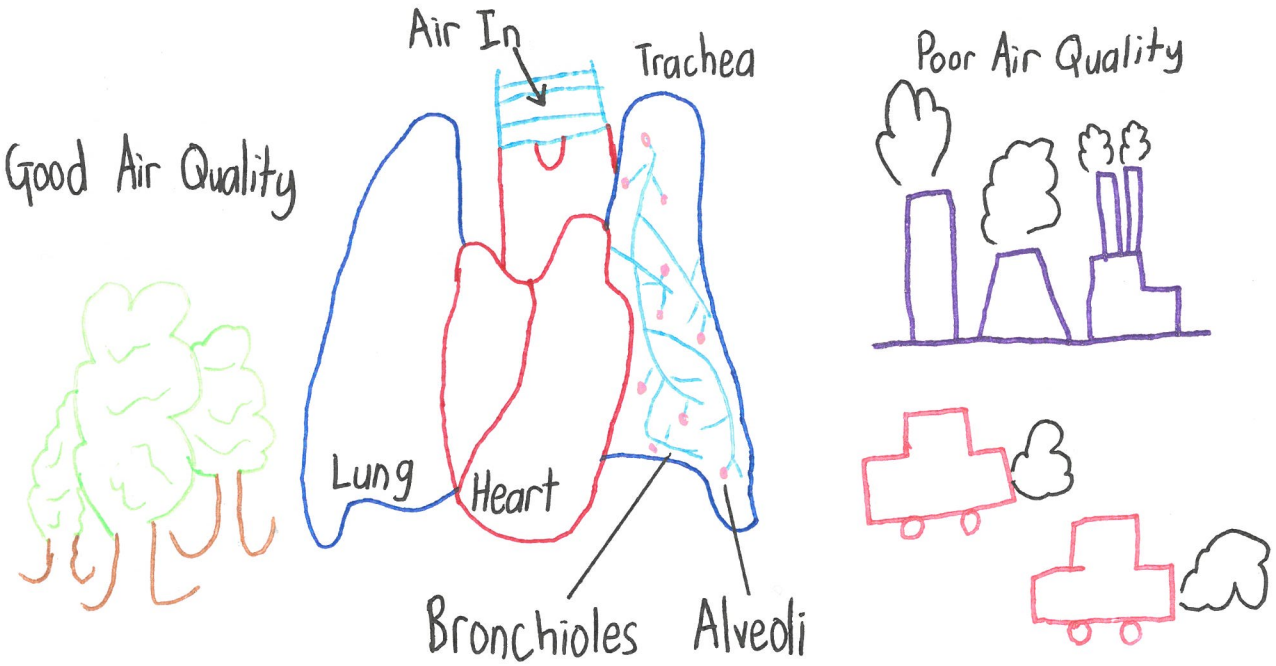
AIR QUALITY

by Harris Zi-Rong Cheong

Air quality matters. Humans take about 25,000 breaths a day. On average, we take 670 million breaths in our lifetime. Therefore, it is important that when we breathe, the 300 million tiny air sacs called alveoli are moving good air quality instead of poor air quality into our body. Alveoli are found at the end of the bronchioles in our lungs. They help us move oxygen into our blood when we inhale air. This fresh oxygenated blood is distributed around the body by the heart.

Breathing is an involuntary reflex. When we breathe in oxygen for our 50 trillion cells in our body, we could also be inhaling harmful pollutants into our lungs and bloodstream. These harmful pollutants can increase our risk in contracting lung cancer and heart attack. Airborne irritants such as tobacco smoke, smoke coming out from manufacturing plants and car exhaust can cause people to suffer emphysema. Emphysema is a disease that will gradually damage the alveoli which causes a feeling of shortness of breath.

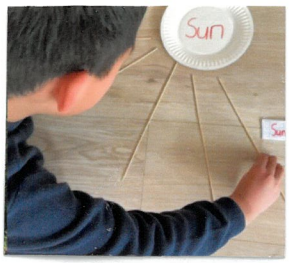
Polluted air quality has caused seven million early deaths every year. If we had the choice to either breathe at an area which is filled with trees and another area that has a lot of smoke, carbon monoxide and fuel, our bodies would certainly prefer to breathe in an area filled with trees. This is because we want to breathe fresh air into our body.

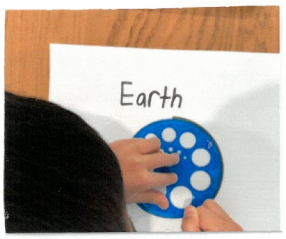


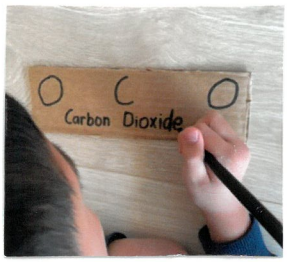
Some air pollutions are caused by natural disasters such as bushfires, dust storms and volcanic eruptions. However, the world's largest source of air pollution is caused by human activities. Humans are burning fossil fuels to produce energy. When we burn fossil fuels, they will release greenhouse gases such as carbon dioxide, nitrous oxide, methane and fluorinated gases. As a result, these emissions will trap heat from the sun in Earth's atmosphere. This will lead to the rise in global temperatures which

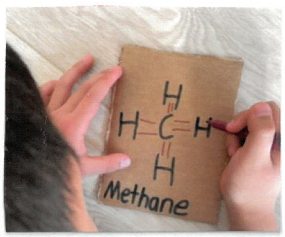
then intensifies air pollution. Another major source of greenhouse gasses and air pollution is transportation. Transportation accounts for 14% of annual greenhouse gas emissions.

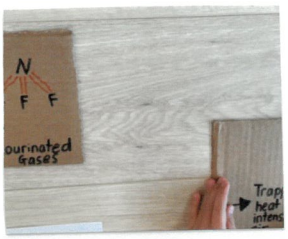
Below: Pictures of me trying to illustrate the concept on how greenhouse gases are trapping heat in Earth's atmosphere which intensifies air pollution.

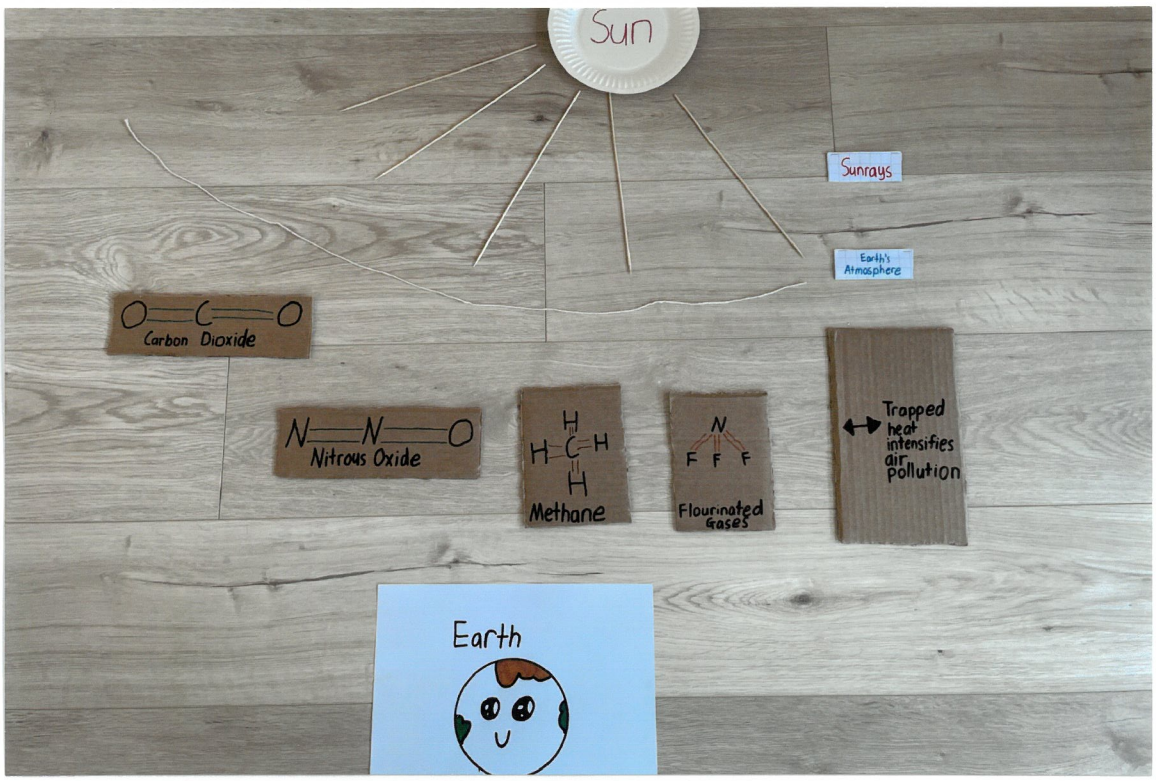












The most major issue when it comes to dealing with air pollution is that it is often invisible. Therefore, it is important to use monitoring devices to continuously detect how clean or polluted the air is.

Air quality can be measured by using AQI. AQI stands for Air Quality Index. It measures how polluted or clean the air is by using a numerical score. Different countries apply their own hazard indexes. That is why different air quality indexes are used in different countries.

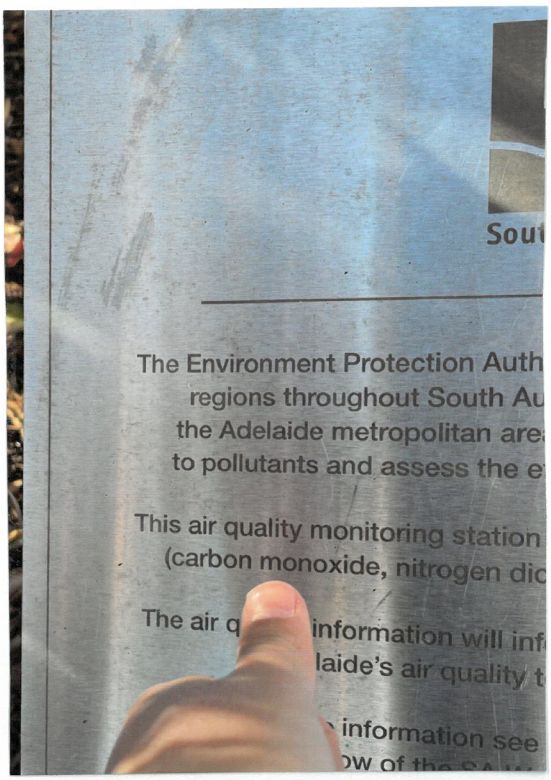
In Australia, every state and territory are responsible in monitoring its own air quality index in accordance with the National Environment Protection Measure (NEPM). The pollutants measured in South Australia are:

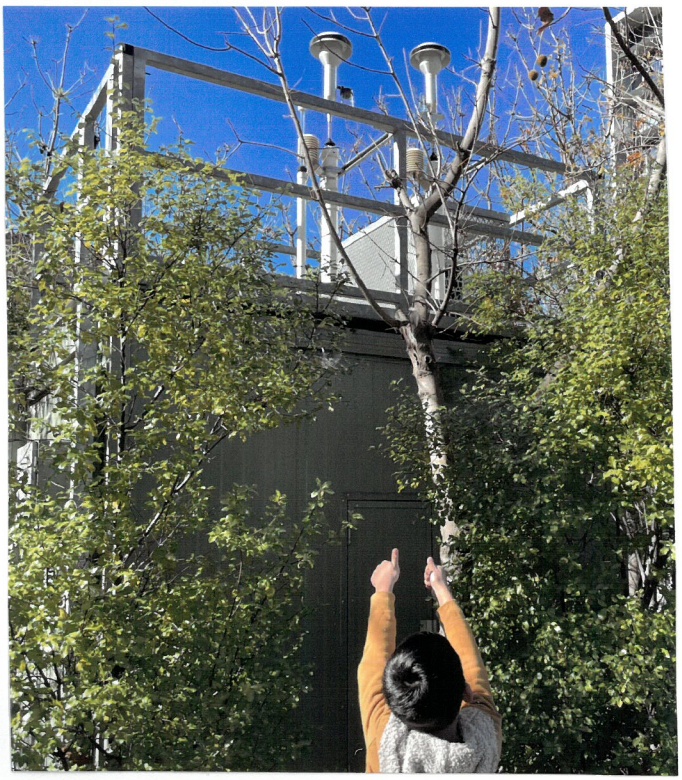
- Carbon Monoxide: pollutant from motor vehicles.
- Nitrogen Dioxide: pollutant formed during combustion processes.
- Ozone: formed from oxides of nitrogen and organic compounds under solar radiation.
- Sulfur Dioxide: an industrial emission.
- Particulate Matter (PM10 and PM2.5): particles from fossil fuel combustion.

PM10's diameter is 10 micrometers or less and PM2.5's diameter is 2.5 micrometers or less. A human's hair is about 100 micrometers. Therefore, particles which are in the range of PM2.5 and PM10 are smaller than the diameter of a human's hair. That is why, humans can breathe PM2.5 and PM10 particles into their lungs without noticing. If the particles are larger than PM10, they will get trapped in the nose instead.

If we look into the air quality category of PM2.5, an index value between 0 and 25 is considered good. At this level, people can spend time outdoors. When the index value reaches between 25 and 50, it is considered fair. If the index value goes up to between 50 and 100, the air quality is considered poor. The air is likely to be dusty, and at this level, sensitive groups with health issues are advised to reduce outdoor activities. When the index value reaches to between 100 and 300, the air is very dusty and smoky. In this situation, people should avoid outdoor physical activities and should stay indoors. Any value that is above 300, the air quality is considered extremely poor.

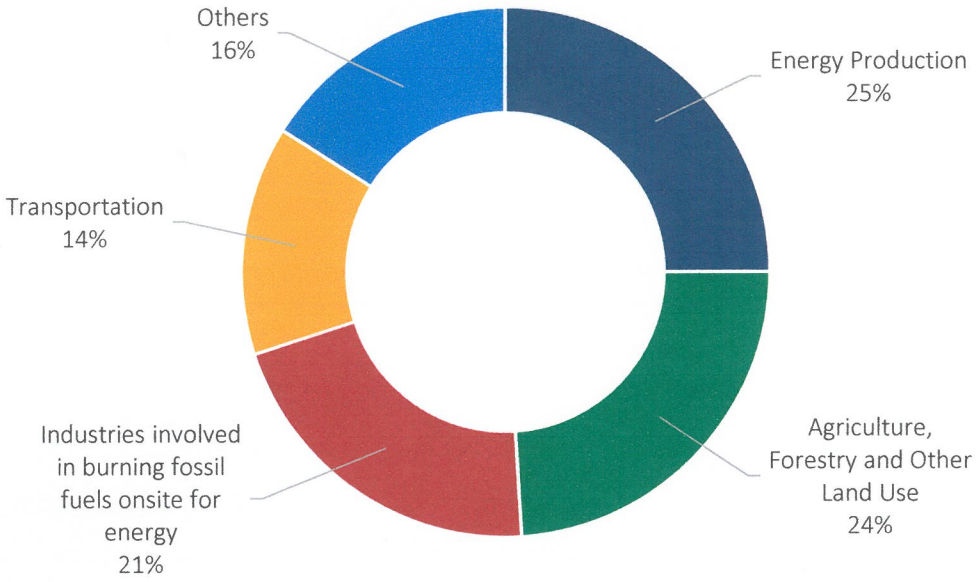
Below: Here are pictures of me at the Air Quality Monitoring Station in Adelaide CBD, South Australia. This station measures carbon monoxide, nitrogen dioxide, PM2.5 and PM10.





We can make differences in our lifestyle to improve our air quality. People should quit smoking tobacco and stop using and burning plastics. We should also switch to renewable energy such as solar and wind energy. We should also walk to our local grocery stores and limit the frequent use of vehicles. All these will help us reduce greenhouse pollution.

Below: A pie chart outlining the greenhouse gas emissions by sources.



Our Earth is an amazing planet. However, there is now an increase in air pollutants in our planet. Therefore, it is important that everyone plays a role in improving our air quality. Afterall, there is only one Earth that we live in.

Word Count: 794 words

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Air Quality
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Air Quality Monitoring
https://www.epa.sa.gov.au/environmental_info/air_quality/new-air-quality-monitoring

Ambient Air Quality Monitoring Plan for South Australia
https://www.epa.sa.gov.au/files/12061_airnepm.pdf

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https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data

How is Air Quality Measured?
https://scijinks.gov/air-quality/#:~:text=The%20Short%20Answer%3A,of%20pollution%20in%20the%20air.

Standards for Air Quality Indices in Different Countries (AQI)
https://atmotube.com/blog/standards-for-air-quality-indices-in-different-countries-aqi

ACKWNOLDGEMENT

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I would also like to thank my parents for bringing me to the air quality monitoring sites in Adelaide and Northfield. This has helped me to understand what air quality monitoring stations look like and what they measure.

I would also like to acknowledge my parents for bringing me to the library to borrow books so that I can read and learn about air quality. They have also helped me in the editing of the document layout, and they have also helped me to develop the photos.

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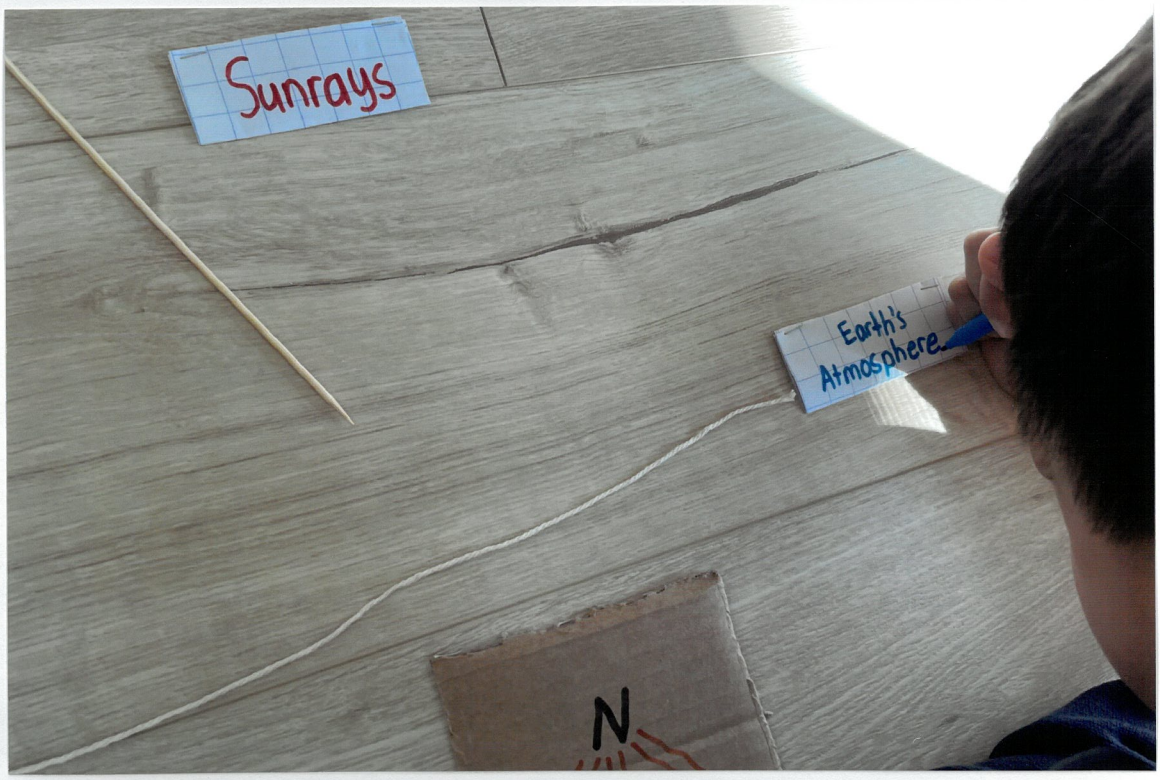
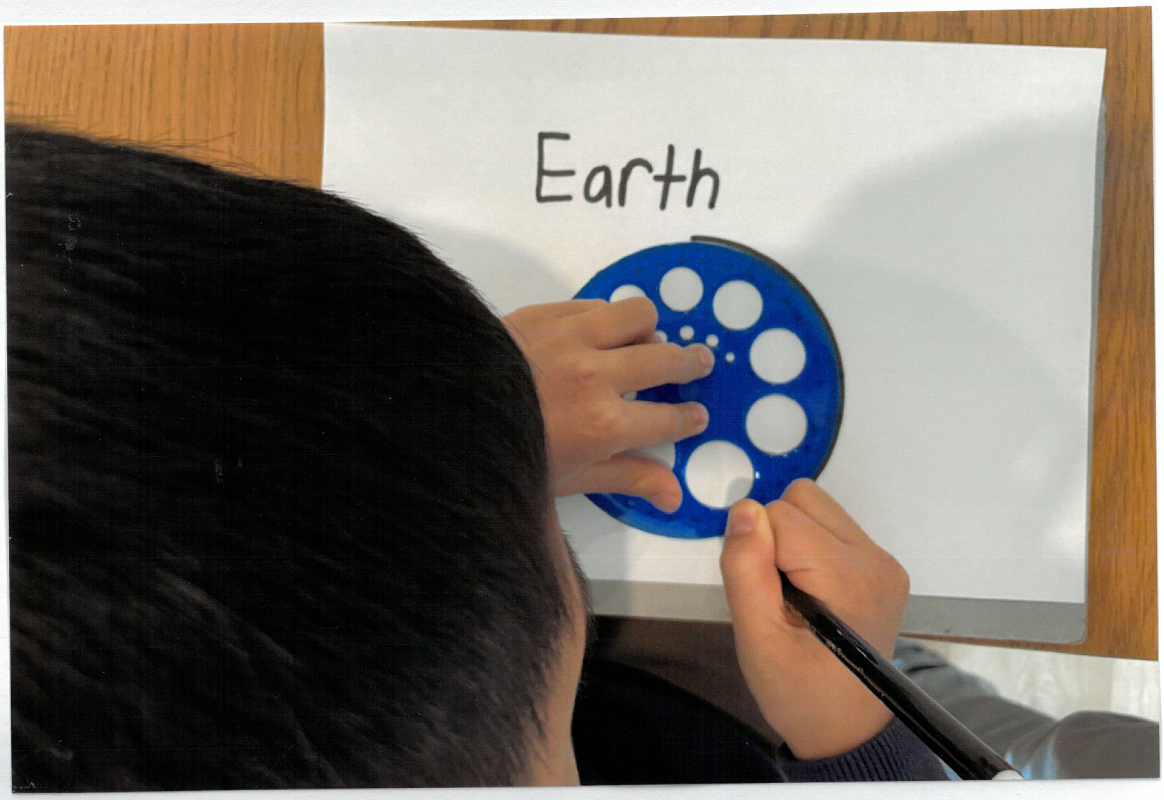
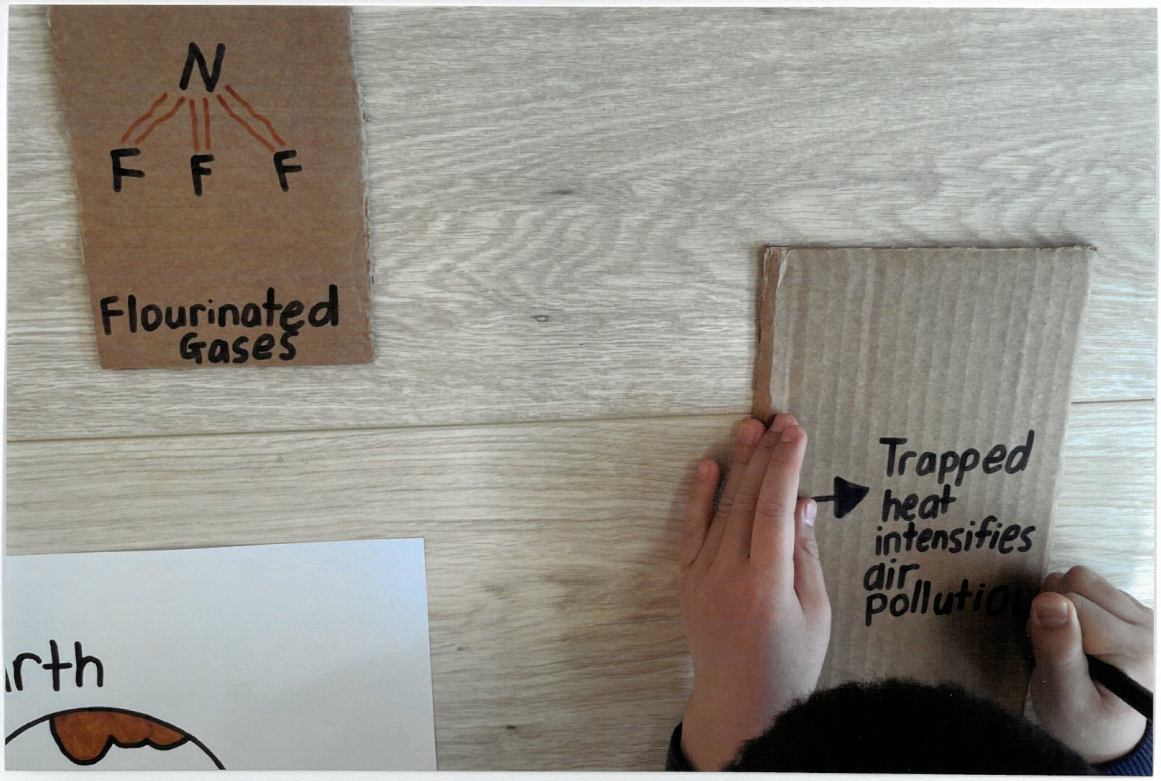
Lastly, I want to acknowledge that the land I am doing this science writing is on the Kaurna land. I pay respect to the Kaurna people who are the Traditional Custodians of this land. I would also like to pay my respects to the past, present and emerging and extend that respect to the other Aboriginal and Torres Strait Islanders.

PROJECT: ILLUSTRATING HOW GREENHOUSE GASES INTENSITIFY AIR POLLUTION.




Earth

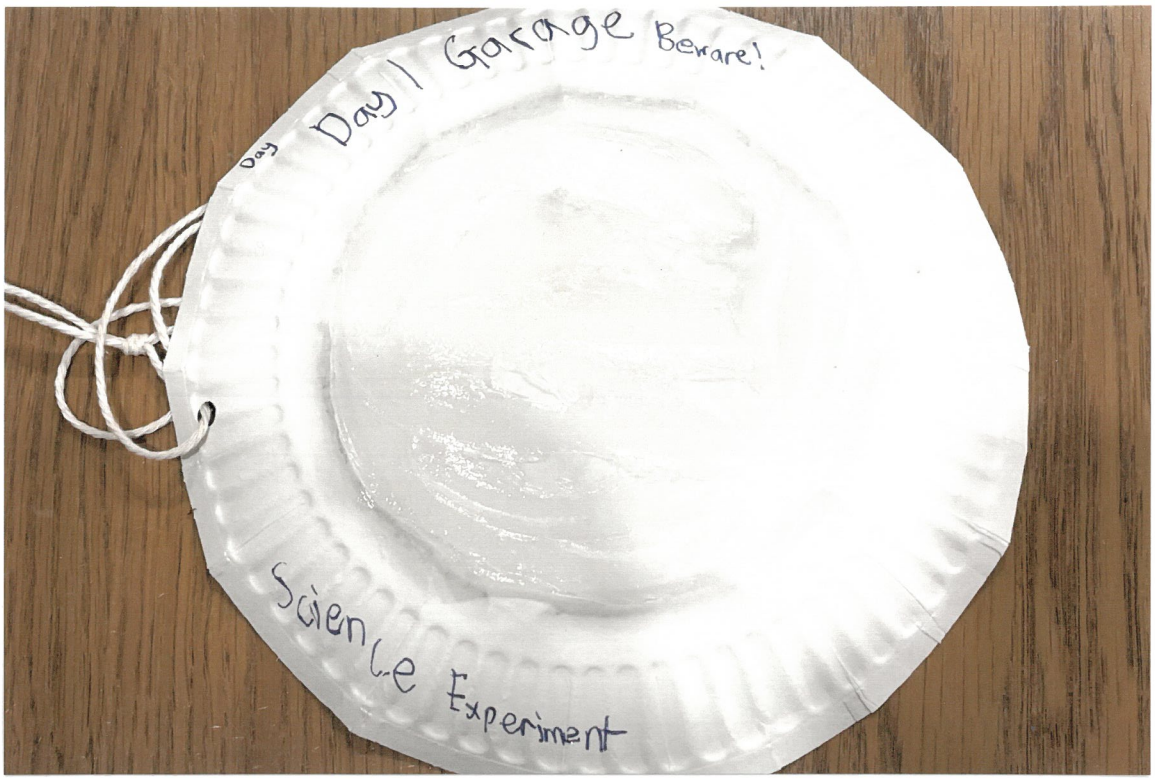

N
F F F
Flourinated Gases
Trapped heat intensifies air

SITE VISITS: VISITING AIR QUALITY MONITORING SITES IN ADELAIDE AND NORTHFIELD.

ILLUSTRATING THAT AIR POLLUTANTS EXIST.

After 1 day at Garage.

Number of dusts found on Vaseline jelly = 10.



After 5 days at Garage.

Number of dusts found on Vaseline jelly = 30.