SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Prize Winner

Science Writing

Year 3-4

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Global Warming is still so important – what is new in the field?

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About this report

Topic	Global warming is still so important: What's new in the field?
Focus area	Carbon Capture and Storage
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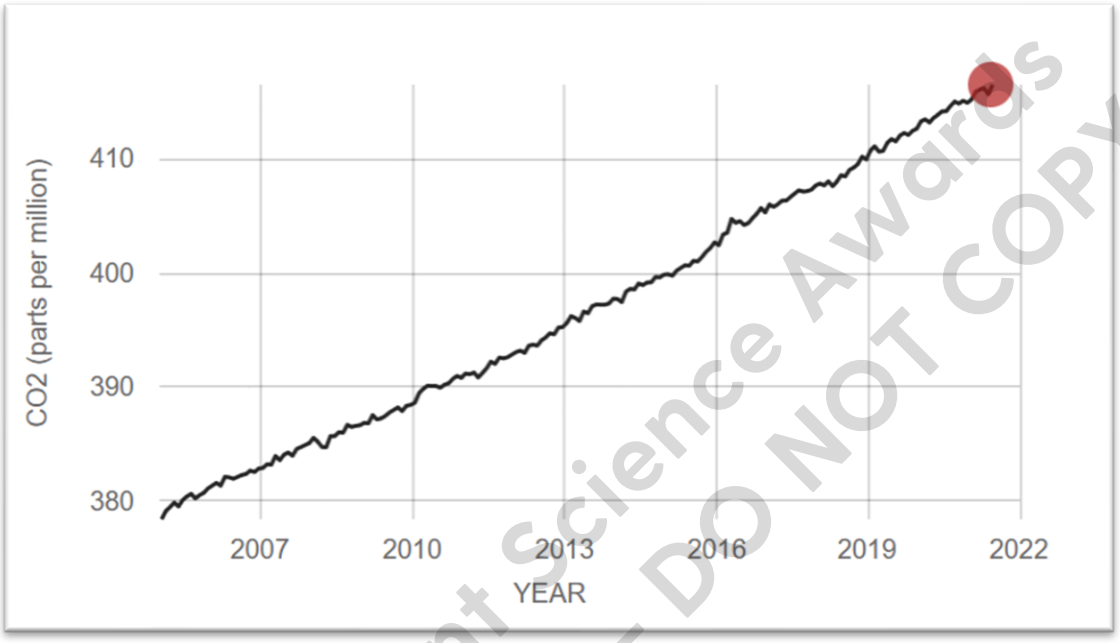
School	East Torrens Primary School, Year 3
Word count	783, not including Table of Contents, About this Report section, titles, labels, illustration referencing, bibliography and acknowledgments

Introduction

"**Nineteen of the warmest years have occurred since 2000".** This single statistic represents global warming in a nutshell. Over the past 171 years, human activities have raised the carbon dioxide levels by 48% above levels found in 1850. Carbon dioxide levels are currently at 416 parts per million and are at their highest in 650,000 years.

Carbon dioxide (CO_2) is an important heat-trapping (greenhouse) gas, which is released through human activities such as deforestation and burning fossil fuels, as well as natural processes such as respiration. The graph below shows CO_2 levels measured at a Hawaii Observatory, in recent years.



***Graph** on carbon emissions taken from www.climate.nasa.gov*

Countries are in a race against time and many avenues are being considered to reduce global warming. The obvious ones we hear about are the shift to renewables as a source of energy, efforts at 'global greening' or reforestation. One of the technologies being examined is Carbon Capture and Storage (CCS).

What is Carbon Capture and Storage?

CCS is the process of capturing carbon dioxide before it enters the atmosphere, transporting it, and storing it for centuries. Usually, the CO_2 is captured from large sources, such as a fossil fuel plant, and then stored underground (see Diagram A). The aim is to prevent the release of CO_2 from heavy industry into the atmosphere. Although research reveals that CO_2 has been injected into geological formations for several decades for various purposes, including enhanced oil recovery (see Diagram B), the long-term storage of CO_2 is a relatively new concept.

Diagram A *- How carbon capture and storage work*

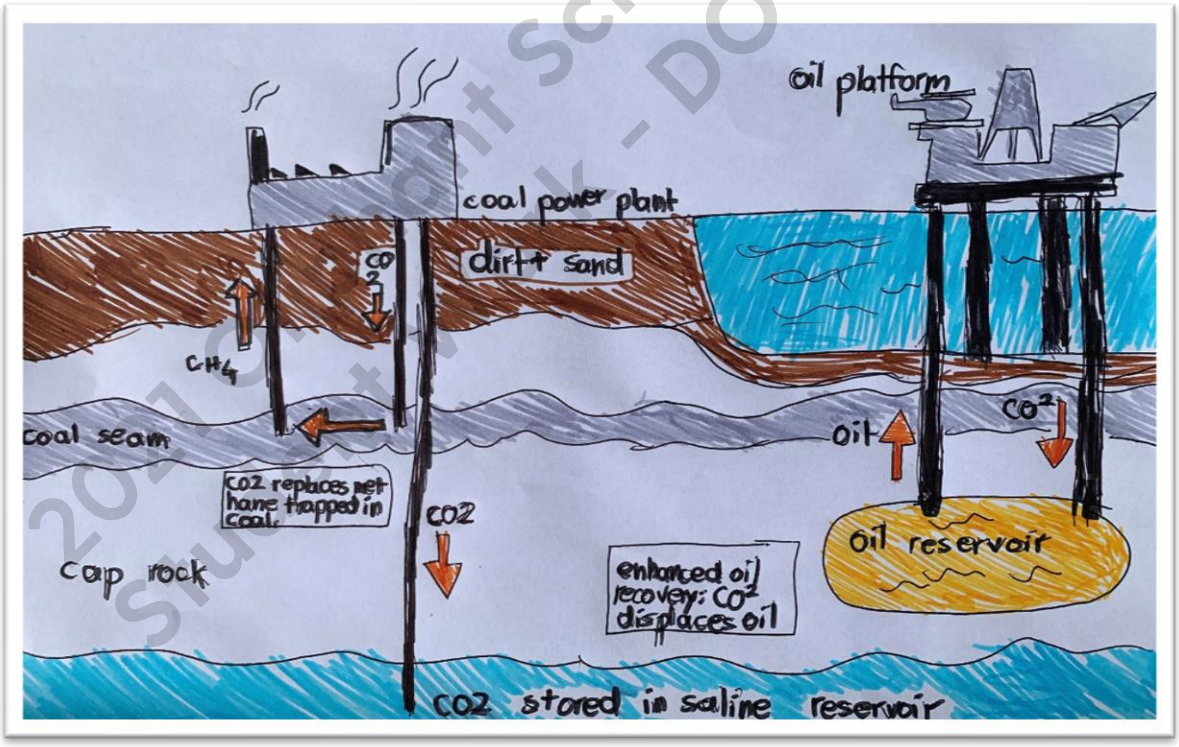


Diagram B *- Enhanced oil recovery - When you inject CO_2 into oil deposits that are difficult to reach, the oil starts to swell, increases in volume, and moves closer to the surface, enabling more production. At the same time, most of the injected carbon stays trapped, replacing the oil that was there. This is known as CCS and enhanced oil recovery (EOR).*

Why do we need to explore Carbon Capture and its storage?

The energy sector is a major source of global emissions and therefore holds the key to responding to climate change. Despite the pledges of governments to tackle the causes of global warming, CO_2 emissions from industry have increased by 60% in the last thirty years. Global commitments are growing, but they still fall short of what is needed to limit the rise of global temperatures to 1.5 degree celsius and avert the worst impacts of climate change.

The International Energy Agency (IEA) has recently laid out a **Net Zero by 2050 Roadmap** that has milestones to decarbonise the global economy. Some of the solutions in the roadmap include renewables, electrification, hydrogen-based fuels and carbon capture, utilisation and storage.

As per the Net Zero by 2050 Roadmap, carbon capture, utilisation and storage (CCUS) contributes to the transition to net zero in multiple ways. These include tackling emissions in some of the sectors where emissions are hardest to reduce like cement and enabling some CO_2 to be removed from the atmosphere. It states that as we rapidly increase renewable energy, we must construct thousands of CCS plants worldwide that could bury more than 3 gigatons to 7 gigatons of CO_2 annually.

Status of CCS in South Australia

South Australia has many storage reservoirs suitable for CCS, particularly in the depleted oil and gas fields of the Cooper and Otway basins. The implementation of CCS will decarbonise existing emission-intensive industries such as cement, steel manufacturing and natural gas processing.

One of the projects proposed by Santos is CCS at Moomba. This project aims to permanently store into the depleted oil and gas fields of the Cooper Basin, 1.7 million tonnes a year of carbon dioxide currently vented from the Moomba gas processing plant. In the long term, carbon storage in the Cooper Basin could store 20 million tonnes a year from other industrial emitters for more than 50 years. It is understood that there is significant potential for enhanced oil recovery in the Cooper and Eromanga basins.

Conclusion

When all sources of greenhouse gas emissions are taken into account, reaching net zero by 2050 looks challenging. Analysis by expert international bodies has shown that CCS is essential to the path towards meeting global climate targets.

However, the technologies underlying CCS must improve. So far most of the projects have failed to live up to expectations and have resulted in significant delays and cost blow-outs.

Increasingly popular are the development of industrial CCUS hubs with shared CO_2 transport and storage infrastructure. CCS can only be one part of an overall plan and more efforts are needed to make the technology more efficient and cheaper and share resources. It is only then that we are likely to see the success of carbon capture and storage as one of the solutions towards reducing global warming.

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- https://www.dw.com (reference for articles containing expert views on the topic)
- https://thefifthestate.com.au/ (reference for articles containing expert views on the topic)
- Illustrations reference for diagrams – stock photos from the internet

Acknowledgement

I would like to acknowledge **Sonia Sharon Devadatta** (my mother) for helping with guidance on research, editing and formatting (paragraphs, spelling, diagram editing, creating a Table of Contents, references and the Acknowledgement section) of the information report. She also took photographs of the diagrams I drew for this report.