CAROLE WILKINSON

EDUCATION RESOURCE BOOKLET

ATMOSPHERIC
THE BURNING STORY OF CLIMATE CHANGE

CAROLE WILKINSON

Classroom ideas by GREG REID
Talking about the weather used to be small talk, now it’s the hottest topic on earth. For billions of years our atmosphere has supported life on Earth, from primitive algae, to the human race. But something is happening. Slowly but surely, what we are doing to our atmosphere is changing Earth’s climate. *Atmospheric* cuts through the many voices raised around climate change to tell the story of our atmosphere, what is putting our climate at risk and what we can do about it. This could be the most important book you read in your life.

**CAROLE WILKINSON** is an internationally award-winning and much loved author of books for children. She has won both literary and children’s choice awards. Carole is interested in the history of everything and is passionate about the issues surrounding climate change.

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**ABOUT CAROLE WILKINSON**

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**ABOUT WALKER BOOKS CLASSROOM**

**WALKER BOOKS CLASSROOM** is the perfect destination for teachers and librarians to find the right book to use in the classroom and find free teacher resources.

For more information visit: classroom.walkerbooks.com.au

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**THE DRUM SERIES**

This award-winning history series uses first-person accounts and non-fiction to bring history roaring to life. Perfect for use with lower and mid-secondary history classes.

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**BLACK DOG BOOKS**

**BLACK DOG BOOKS** is a multi-award-winning imprint of Walker Books, with a roster that includes some of Australia’s most highly-regarded authors and illustrators.

For more about Black Dog Books and Walker Books visit: www.walkerbooks.com.au
In 2009, I had been waiting for two years for the federal government to fulfil its election promise to come to terms with climate change. By that time it was pretty clear what they were going to do – nothing. I strongly believed that climate change was the most important issue of our time, but all I had done up to that point was shout at politicians on the television, which was equivalent to doing nothing. I decided it was time I did something. So I joined my local climate action group.

Over the last six years I have written submissions to three levels of government. I have attended rallies and protests on the steps of the Victorian parliament. I have chalked messages on the footpath outside politicians’ offices. I have read a lot about the science behind climate change and I have tried to convince others that it is essential for individuals, businesses, towns and countries to change the way they live in order to reduce the amount of greenhouse gas emissions we all produce.

Black Dog Books publisher and friend Maryann Ballantyne knew about my climate activism, and it was she who suggested I write a book on climate change. I didn’t hesitate. I said yes. I had studied science subjects at school and worked in laboratories for the first 15 years of my working life. That time had always seemed completely disconnected from my later life as an author. For the first time since I started writing, my scientific background looked like being useful. I am not intimidated by science. I hoped that would help me communicate the scientific evidence to support climate change to my young readers.

Climate change is a huge topic. As with my previous books, I had to tell a story, one that would engage my readers. Except this particular story could well turn out to be the most important in human history. No pressure!

I attended a climate change panel where the panelists discussed how scientists are often not good at interpreting climate science in a way that can be understood by the general populous. They said it was necessary to translate the science to make it available to new audiences. They emphasised how important it was to stand up for science. That panel session helped crystalise my approach to the book. I knew what I had to do — I had to stand up for climate science and translate it in a way that young people would understand.

Who better to write a book dealing with the complex issues of climate change than Carole Wilkinson? In the voices raised around climate change I knew Carole’s meticulous research and common sense style would be the perfect way to give context to issues that are sometimes difficult to understand.

But even knowing what I know about Carole’s writing, Atmospheric took me by surprise. Carole has chosen to tell the story of our atmosphere - something that links us all. Through history, Carole details the small pieces of information that have come together over hundreds of years to make up the picture that we have of our atmosphere. It is a beautiful discussion of the meeting between science and history. It is the story of the environmental consequences of the choices we make, both negative and positive. But what inspires me most about Atmospheric is the stories Carole tells of people - some of them ordinary people like the Marsham family who over centuries made and recorded observations of the changing of the seasons on their family farm, data that has been used by modern day climate scientists. And other people who were observant of change, everyone from ordinary people who were committed to the environment to scientists making remarkable links.

For me, Atmospheric by Carole Wilkinson is a timely reminder that everyone in the community has the capacity to influence the environment. I am proud to publish it in the Black Dog Books list.
### Australian Curriculum Overview

#### English

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<th>Text Structure and Organisation</th>
<th>Expressing and Developing Ideas</th>
<th>Literature and Context</th>
<th>Responding to Literature</th>
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<tr>
<td>Year 8</td>
<td>ACELA1543, ACELA1766, ACELA1809</td>
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<td>ACELY1732, ACELY1733, ACELY1734, ACELY1742, ACELY1743, ACELY1744, ACELY1745, ACELY1752, ACELY1754</td>
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<td>ACELA1557</td>
<td>ACELT1633, ACELT1639</td>
<td>ACELT1641, ACELT1812</td>
<td>ACELT1772</td>
<td>ACELY1752, ACELY1754</td>
</tr>
<tr>
<td>Year 10</td>
<td>ACELA1568</td>
<td>ACELA1569, ACELA1570, ACELA1572</td>
<td>ACELT1639</td>
<td>ACELT1643, ACELT1774</td>
<td>ACELY1752, ACELY1754</td>
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</table>

#### Geography

<table>
<thead>
<tr>
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<th>Geographical Knowledge and Understanding</th>
<th>Geographical Inquiry and Skills</th>
<th>Interpreting, Analysing and Concluding</th>
<th>Communicating</th>
</tr>
</thead>
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<tr>
<td>Year 7</td>
<td>ACHGK037, ACHGK042, ACHGK045</td>
<td>ACHGK059</td>
<td>ACHGS057</td>
<td>ACHGS053, ACHGS056</td>
</tr>
<tr>
<td>Year 8</td>
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</tr>
<tr>
<td>Year 9</td>
<td>ACHGK070, ACHGK073, ACHGK074, ACHGK075</td>
<td>ACHGS074</td>
<td>ACHGS074, ACHGS076, ACHGS077</td>
<td>ACHGS079</td>
</tr>
<tr>
<td>Year 10</td>
<td>ACHGK070, ACHGK073, ACHGK074, ACHGK075</td>
<td>ACHGS074</td>
<td>ACHGS074, ACHGS076, ACHGS077</td>
<td>ACHGS079</td>
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</tbody>
</table>

#### Science

<table>
<thead>
<tr>
<th>Year</th>
<th>Science Understanding</th>
<th>Science as a Human Endeavour</th>
<th>Science Inquiry Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 7</td>
<td>ACSUU116, ACSUU222</td>
<td>ACSHE119, ACSHE1223</td>
<td>ACSIS129, ACSIS130</td>
</tr>
<tr>
<td>Year 8</td>
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<td>ACSHE134, ACSHE1226</td>
<td>ACSIS144, ACSIS144</td>
</tr>
<tr>
<td>Year 9</td>
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<td>ACSHE157, ACSHE135</td>
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</tr>
<tr>
<td>Year 10</td>
<td>ACSUU153, ACSUU180</td>
<td>ACSHE191, ACSHE192</td>
<td>ACSIS203, ACSIS204</td>
</tr>
</tbody>
</table>

*Key content descriptors have been identified from the Australian Curriculum. However, this is not an exhaustive list of Australian Curriculum content able to be addressed through studying this text.*
Before Reading

What is your understanding of climate change? Write several paragraphs about whether you believe climate change is an actual phenomenon, what you believe are the causes and if anything can be done to slow, stop or reverse it. Revisit your answer to this question after reading Atmospheric to compare it to what you have learned from the book.

Narrative extracts before each chapter

• Give reasons why you think Carole Wilkinson has chosen to insert narrative extracts before each chapter.

• How effective do you think these extracts are in achieving the author’s purpose?

• Comment on the gender and ages of the people who have "written" the narratives. Suggest why the author has chosen the specific people for the extracts.

• Choose one narrative and explain why the character appeals to you.

Character spotlights

• What is the purpose of this structural feature of the text?

• Why have these features been set out in a different way to the rest of the text?

• Choose one character spotlight and explain the significance of this person to our knowledge of climate change.

Through greed, we have established an economy that destroys the web of life. We have changed our climate and drown in despair. Let oceans of justice flow. May we learn to sustain and renew the life of our Mother Earth.

Archbishop Desmond Tutu, prayer for the People’s Climate March, September 2014.

What does this quotation reveal about the perspective of the author?

Introduction

Briefly outline the author’s reasons for writing this book.

Chapter 1 – A Narrow Band of Blue

Explain how the greenhouse effect works. Why is this essential for life on Earth?

What is global warming and which gas is largely responsible?

Comment on the importance of CO2 to global warming.

Make a list of greenhouse gases other than CO2

How are other greenhouse gases measured?

Using the table of greenhouse gases in Earth’s atmosphere, elaborate on how the “main human sources” listed contribute to the production of each greenhouse gas.

Chapter 2 – Buried Deep

What are fossil fuels and why are they so named?

Briefly explain how oil forms.

In what way does the formation of natural gas differ from that of oil?

Chapter 3 – Seeds of Knowledge

What was the significance of Ruddiman’s 2001 hypothesis?

How does deforestation affect climate change?

Complete the below table of ancient beliefs about climate change. Research other ancient cultures or scholars not mentioned in the book to discover their beliefs about weather and climate change.

<table>
<thead>
<tr>
<th>Ancient Society</th>
<th>Beliefs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ancient Chinese</td>
<td></td>
</tr>
<tr>
<td>Norse</td>
<td></td>
</tr>
<tr>
<td>Hindu</td>
<td></td>
</tr>
<tr>
<td>Ancient Egyptian</td>
<td></td>
</tr>
<tr>
<td>Ancient Greek</td>
<td></td>
</tr>
<tr>
<td>Ancient Roman</td>
<td></td>
</tr>
<tr>
<td>Christian</td>
<td></td>
</tr>
</tbody>
</table>
How did erratics challenge the belief at the time that the overall climate of the world was stable?

Chapter 4 – Heat and Ice
What contributions did Joseph Fourier and John Tyndall make to the study of climate?

Explain the significance of Louis Agassiz and James Croll’s theories about ice ages. Suggest why the ideas of both these people were controversial at the time.

What role did Svante Arrhenius play in our understanding of climate change?

Chapter 5 – Chimneys and Machines
Comment on the importance of steam and coal to the Industrial Revolution. Why was James Watt’s invention critical to the Industrial Revolution?

Why is Richard Arkwright known as the “father of the modern industrial factory system”?

What helped spread the Industrial Revolution from Britain to the rest of the world?

What modern conveniences were developed in the Industrial Revolution?

What were some of the costs of the Industrial Revolution?

Chapter 6 – The Big Smoke
List the dangers the people of Victorian England experienced by living amongst the output of the new factories, furnaces and fireplaces. Describe the argument that industrialists used to justify air pollution.

Why is John Evelyn a significant figure in the history of climate change?

Why was the 1853 Smoke Nuisance Act enacted?
What did the Smoke Nuisance Act try to do and why was it unsuccessful?

How did Rollo Russell’s London Fogs contradict the views of factory owners and doctors?

Outline the role Octavia Hill played in addressing air pollution.

Describe the origins of the Clean Air Act of 1956.
How did the Clean Air Act change air quality in London?

Chapter 7 – Black Gold and Tin Lizzies
What is black gold? Why is it called this? Briefly describe how it has been used through history.

What significance did the invention of the electric light globe and the automobile have on oil production?

Why has the author used the heading “Cars to the rescue”?

Describe the role Bertha Benz played in the development of the car.

What is OPEC? Why is OPEC significant?
Why was coal still required as the twentieth century progressed?

How was the problem of engine “knock” solved?
What problems did this solution create?

Why did General Motors keep the knowledge secret that lead was dangerous to people’s health?

List the dangerous waste products that cars produce.

What is photochemical smog and what impact does it have on human health and the environment?

Explain what the sub-heading “Cleaning up” means in relation to air pollution by cars.

Comment on the role of industrialists in London and Los Angeles.
Using the information in Chapter 7, complete the below table to compare and contrast the experiences of London and Los Angeles in relation to smog.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>London</td>
<td></td>
</tr>
<tr>
<td>Los Angeles</td>
<td></td>
</tr>
</tbody>
</table>

Chapter 8 – Solid Science

How did Milutin Milankovic explain ice ages on Earth?

What theory did Guy Stewart Callendar propose? How did meteorologists receive his theory?

Describe Charles Keeling’s contribution to the understanding of Earth’s climate.

What bold prediction did Bert Bolin make in 1959?

What are climate proxies?

Complete the below table listing climate proxies by briefly describing how each records meteorological events.

<table>
<thead>
<tr>
<th>Climate Proxy</th>
<th>How Meteorological Events are Recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees</td>
<td></td>
</tr>
<tr>
<td>Coral</td>
<td></td>
</tr>
<tr>
<td>Stalactites/stalagmites</td>
<td></td>
</tr>
<tr>
<td>Pollen</td>
<td></td>
</tr>
<tr>
<td>Ice cores</td>
<td></td>
</tr>
<tr>
<td>Lake sediments</td>
<td></td>
</tr>
<tr>
<td>Deep sea sediments</td>
<td></td>
</tr>
</tbody>
</table>

What are ice cores and which areas provide them?

What "secrets" are contained in ice cores? What are isotopes of oxygen? Why are they important?
Chapter 10 – Hotting Up

Why did knowledge of Earth’s climate begin to accelerate in the 1980s?

Explain the significance of the New York Times article by NASA scientists led by Dr James Hansen.

How did the NASA measurements and those of the British scientists complement each other?

What was Veerabhadran Ramanathan’s shocking discovery in 1975?

What was the significance of Ramanathan’s discovery about the other greenhouse gases?

What are synthetic greenhouse gases and what is their global warming potential?

Why were CFCs added to the Montreal Protocol?

What is methane? Where does methane come from? Why have methane levels risen rapidly in recent times?

Explain the significance of nitrous oxide from human sources to global warming.

Why has the accuracy of forecasting increased significantly since the 1950s?

Describe two ways that CO₂ levels can be measured over time.

Why does the author describe the title of the 1985 climate conference as “clumsy”?

What did the report that Bert Bolin compiled predict about climate change?

What urgent action did climate scientists call for?

What is the IPCC and what is its role?

Chapter 11 – Action

What was Ramanathan’s response to the African student? How did this affect his future work?

What is the Global Climate Coalition and what is its aim?

Chapter 12 – Running on Empty

What does this story reveal about Søren Hermansen and Torben Tranberg’s father?

Describe the predicted supplies of the main fossil fuels.
What are unconventional fossil fuels? Why are unconventional fossil fuels expensive and polluting?

List sources of renewable energy.

Suggest reasons why the international oil industry is reluctant to diversify and start investing in renewable energy.

Discuss why Australia established and then abolished a carbon tax.

Suggest reasons why the Australian federal Government is reluctant to abandon coal-fired power plants and encourage the use of renewable energy.

Comment on how future generations are likely to view Tony Abbott’s quotation on coal.

What amazing thing happened between 2006 and 2013 in Australia?

Distinguish between natural and man-made “forcings” on Earth’s climate.

Explain how climate feedbacks can influence climate.

Why are climate processes hard to stop once they are set in motion?

Chapter 13 – People Power

What specific actions has Vincent Dwyer taken to reduce his family’s carbon footprint?

How does the author suggest that readers verify if websites are trustworthy?

What recommendations does the author make to save electricity and gas?

Explain how the concept “refuse, re-use, recycle” can reduce carbon footprints.

Why shouldn’t we waste food?

As you read the book, keep a list of any unfamiliar words. Research the definition of these words and create your own extended glossary for *Atmospheric*.

In small groups, brainstorm a future that is 4 degrees warmer than current average temperatures. What would this mean? Find reliable sources to base your predictions on. How would this change in temperature affect rural communities and urban communities? Present your finding to the class.

Imagine a future where renewable energy is dominant, rather than fossil fuel energy. How would this affect your daily life? What other effects would this have on society?

Hold a series of debates on the following subjects:
- Climate change is a myth
- It is too late to combat climate change
- The benefits of using fossil fuel outweigh the damage to the environment
- One person cannot make a difference

USEFUL RESOURCES:

**AUSTRALIAN GOVERNMENT DEPARTMENT OF THE ENVIRONMENT: CLIMATE CHANGE**

**AUSTRALIAN GOVERNMENT DEPARTMENT OF THE ENVIRONMENT: CLIMATE CHANGE IMPACTS ON YOUR STATE**

**CLIMATE CHANGE IN AUSTRALIA**

**WORLD WILDLIFE FOUNDATION: CLIMATE CHANGE**
http://www.wwf.org.au/our_work/people_and_the_environment/global_warming_and_climate_change/

**Q&A: CLIMATE DEBATE**
http://www.abc.net.au/tv/qanda/txt/s3487316.htm

**THE CLIMATE REALITY PROJECT AUSTRALIA: EDUCATION RESOURCES**

**NSW GOVERNMENT OFFICE OF ENVIRONMENT & HERITAGE: CLIMATE CHANGE RESOURCES**
WORKSHEET  Layers of the Atmosphere
#1 Fill in the names of the layers of the atmosphere in the below diagram.

WORKSHEET  Excuses, Excuses, Excuses
#2 Complete the following table of arguments to combat climate change action excuses. Add other excuses and arguments not mentioned in the book. Refer to pages 210 - 213.

<table>
<thead>
<tr>
<th>EXCUSE</th>
<th>ARGUMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia’s emissions are insignificant</td>
<td></td>
</tr>
<tr>
<td>My emissions are insignificant</td>
<td></td>
</tr>
<tr>
<td>Plenty of people think climate change doesn’t exist</td>
<td></td>
</tr>
<tr>
<td>Someone in the future will fix it</td>
<td></td>
</tr>
</tbody>
</table>
### WORKSHEET #1: My Action Plan

Use this action plan worksheet to make a list of changes you can make to reduce your carbon footprint.

<table>
<thead>
<tr>
<th>AREA</th>
<th>MY ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronics</td>
<td>• e.g. Turn TV off at the wall</td>
</tr>
<tr>
<td>Transport</td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td></td>
</tr>
<tr>
<td>Recycling</td>
<td></td>
</tr>
<tr>
<td>Washing/Cleaning</td>
<td></td>
</tr>
<tr>
<td>Community engagement (political/social)</td>
<td></td>
</tr>
</tbody>
</table>
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Resources for early childhood to young adult
Find the best books by theme, format or age
Classroom ideas written to the Australian curriculum
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