

RESET EARTH  
TEACHER'S  
HANDBOOK  
EPISODE 3 LESSON 3



# WHY IT MATTERS

**The ozone layer is an invisible shield that exists 15-35km above the Earth's surface, protecting us from harmful ultraviolet, or UV, radiation, and in doing so protecting all life on earth.**

But in the 1980s, scientists discovered a huge and harmful hole in the ozone layer. The hole was caused by chemicals and gases known as ozone-depleting substances, which at the time were found in almost everything – from aerosol cans to fridges, from computer equipment to the soles of your shoes!

***The story of the ozone layer and how the world joined together to protect it, is a story of hope.***

Across the world, scientists, policy makers and governments worked together, taking urgent steps to control and phase out these ozone-depleting substances. Together they developed the Vienna Convention, and then the Montreal Protocol which became one of the most successful environmental treaties of all time, universally endorsed by 197 nations of the world and the European Union.

And it worked! Thanks to the Vienna Convention, followed by the Montreal Protocol, the hole in the ozone layer is healing, with ozone expected to return to pre-1980s levels by the 2060s.

But the story is not over. In fact, it might never be over. We have to make sure we keep monitoring the gases that enter our atmosphere and the impact that they have on the ozone layer.

The next generation of young people faces many challenges. But the story of the ozone layer and how the world joined together to protect it, is a story of hope. A story that proves that it can be done. That when we act together, and are guided by science, we can solve major global crises.

# DEAR TEACHERS

In January 2021 the Ozone Secretariat of the United Nations Environment Programme launched a short animation series and mobile game called Reset Earth to raise awareness and inspire action among young people about the importance of the ozone layer, and the continued need to protect it.

This teaching toolkit has been designed to build on this, and provide you with ideas, activities, games and discussions that will empower you to engage your students on the issues of the ozone layer. Using the Reset Earth animation series as the foundation, three different lessons have been developed. An accompanying teacher toolkit to help navigate through the content has also been created, including a corresponding student workbook. These printable documents can be adapted and made your own to share with your students.

**INSPIRE YOUNG  
PEOPLE TO CONTINUE  
PROTECTING THE  
OZONE LAYER:  
ANIMATIONS,  
INTERACTIVE GAMES,  
DISCUSSIONS AND  
ACTIVITIES.**

The lessons are diverse and varied. Teachers are encouraged to use what will work best for their students, or adapt and make it their own. Whether the lessons run over three days, three weeks or three months; only one idea is used, or all of them, it is up to you, the teacher, to decide, as you know what's best for you and your students. Most of all we at the Ozone Secretariat hope that through the animations, games, discussions, and activities, you can help us bring the story of the ozone layer to life, and inspire the next generation of young people to continue to protect the ozone layer and the global environment.

*Lesson plans and workbooks are based on fictional animations and not entirely on scientific fact. For facts and accurate timelines, please visit <https://ozone.unep.org/>. If you've used any of our teacher resources, please send feedback, photos or any related learner artwork to [stephanie.haysmith@un.org](mailto:stephanie.haysmith@un.org).*



# CONTENTS

Watch Episode 3 of Reset Earth and see how the heroes work together to repair the ozone layer. This episode is an example of the impact that individuals and group action can have when trying to solve big challenges.

- > **Video & discussion:** Watch Episode 3 of Reset Earth and talk about the challenge the world faced in trying to save the ozone layer, why we needed to work together, and the importance of teamwork.
- > **Group brainstorm:** Have a class brainstorm on how the levels of ozone in the ozone layer can be measured, and what the world did when they realized what the problem was.
- > **Activity 1:** Timeline of the ozone layer – Based on what they've seen in the episode, students can create a timeline of the key events leading up to ozone layer depletion, and what happened that lead to the banning of CFCs.
- > **Activity 2:** Taking action – Ask students to write a letter, design a poster or a piece of art, about the ozone layer that explains or shows why it's so important to keep protecting it.
- > **Activity 3:** Projecting the future – The first lesson we projected what 2100 might look like if the ozone layer continued to deplete. Now that the students have watched the whole series and understand what was done to protect it, draw or create a piece of art that shows what the future will look like now.

## Additional resources:

**Educational animation:** [Short video](#) explaining how the world protected the ozone layer.



# GLOSSARY

**SCIENCE**



**HUMAN IMPACT**



**LONG-TERM PROGRESS**



**EXTRA EXAMPLES**



**WRITTEN ACTIVITY**



**DISCUSSION POINTS**



**WATCH A VIDEO**







## THE BIG IDEA

There were many events throughout history that led to the depletion of the ozone layer in the film (the true events led to the reduction in CFC and other halogen source gas emissions). Individual action for the environment can make a difference, especially those actions that continue over time (i.e long-term behaviour change, continued efforts). While halogen source gases have been regulated, there are other sources that will continue to deplete the ozone layer as time progresses (for example, volcanoes and other uncontrolled gases including some greenhouse gases (GHGs)).

## CRITICAL QUESTIONS

- > How is the ozone layer measured in the atmosphere?
- > Has the Montreal Protocol been successful in reducing ozone-depleting substances in the atmosphere?
- > How is the ozone layer expected to change in the coming decades?

## I CAN / I WILL / OUTCOME STATEMENT FOR STUDENTS

- > I can identify the key events that played a role in ozone layer depletion, as well as its protection.
- > I understand how the ozone layer is measured and recorded across the globe, as well as the importance of science.
- > I can take action and inspire change.

# LESSON 3 GUIDE

The below suggested times of activities are a helpful guide for this lesson. Actual time can differ based on needs and interests of students, resources, and available time.

## INTRO AND PRIMER VIDEO

### LESSON TIME:

0-10 MINS

### GLOBAL COMPETENCY:

N/A

### LESSON DESCRIPTION:

Watch [Reset Earth Episode 3](#) & have a popcorn-style review.

### LEARNER OBJECTIVES:

Knowledge



#### Human Impact

**H3** - Appreciate that this challenge requires international regulations and cooperation.

**H4** - Appreciate that individual personal behaviours and consumer choices have an impact on the ozone layer.



#### Long-term Progress

**L2** - Acknowledge the role of global regulations and the ozone treaties.

**L4** - Understand continued progress relies on Assessment Panels.

**L5** - Acknowledge ozone layer recovery is a source of hope for other global environmental challenges.

### GO TO

[Reset Earth Episode 3](#)



## CLASS ACTIVITY

### QUESTIONS TO ASK:

- > What do we know about the heroes' mission?
- > What is the problem?
- > Why did this happen?
- > How did they try to solve the problem?
- > Were they successful?

# DISCUSSION

## LESSON TIME:

10-15 MINS

## GLOBAL COMPETENCY:

**GC1** - Examine local, global and intercultural issues.

## LESSON DESCRIPTION:

After you've watched Episode 3, engage your students in the class activity below.

## UNEP QUESTIONS:

<https://ozone.unep.org/20-questions-and-answers>



## LEARNER OBJECTIVES:

*Reflection*



### Human Impact

**H3** - Appreciate that this challenge requires international regulations and cooperation.

**H4** - Appreciate that individual personal behaviours and consumer choices have an impact on the ozone layer.



### Long-term Progress

**L2** - Acknowledge the role of global regulations and the ozone treaties.

**L4** - Understand continued progress relies on Assessment Panels.

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# CLASS ACTIVITY

## QUESTIONS TO ASK:

- > What plan did the heroes lay out? What events did they visit in history and why? What happened in Antarctica? What message did Terran relay through his note? What was wrong with the satellite at NASA? How did changing its course impact the future? Why didn't these changes work?
- > What was the outcome of the Montreal Protocol in the story?
- > Knox risked her life to jump back in time - why do you think she did this? Would you do the same thing?



# GROUP BRAINSTORM

## LESSON TIME:

15-20 MINS

## GLOBAL COMPETENCY:

**GC1** - Examine local, global and intercultural issues.

## LESSON DESCRIPTION:

A class brainstorm on possible ways the ozone layer can be measured.

## DISCUSSION POINTS:

- > How did the heroes know that the ozone layer had depleted?
- > How is it measured?
- > Can you see the ozone layer?
- > Can you feel it?

## LEARNER OBJECTIVES:

Knowledge



### Science

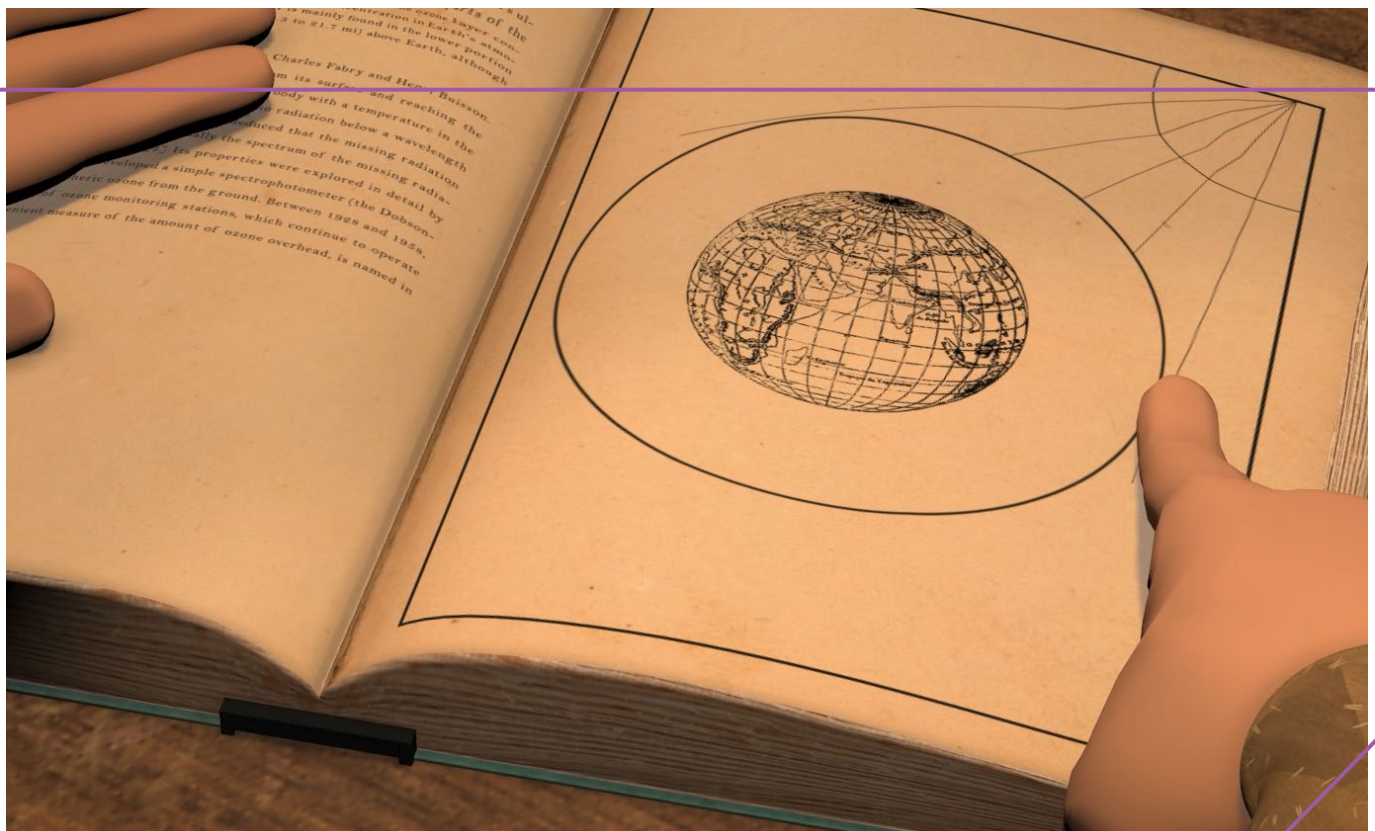
**S1** - Explain ozone layer formation / characteristics.

**S4** - Acknowledge ozone layer recovery and seasonal changes.

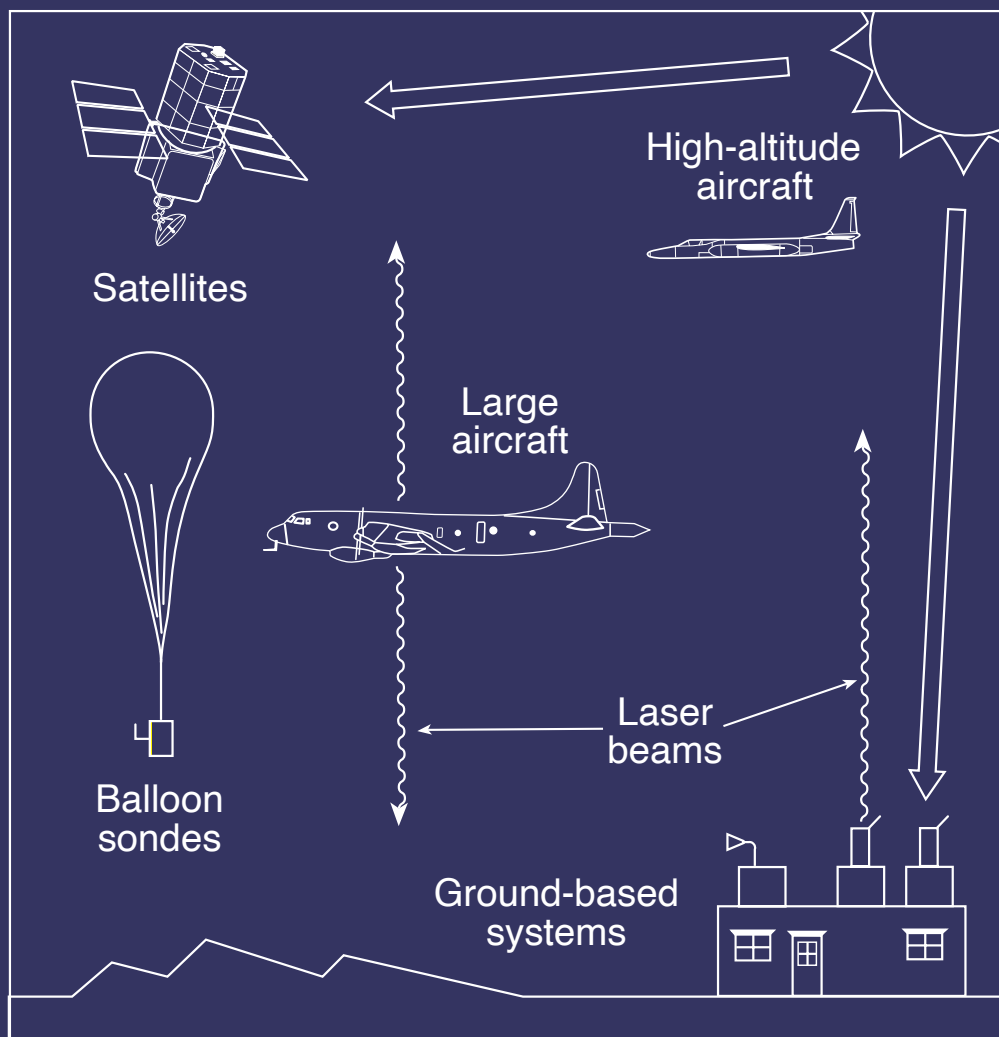


### Human Impact

**H2** - Recognise that pollution from the previous generation persists and will impact future generations.



# CLASS ACTIVITY



- > Highlight instruments used (ground-based systems, aircraft, high-altitude balloons, and satellites).
- > Local measurements: ground and lower level samples are obtained at different locations using various equipment such as a Dobson spectrophotometer, or Dobsonmeter, a Brewer spectrophotometer or flask to collect samples.
- > Remote measurements: more remote samples to measure ozone are obtained by satellites, aircraft, high-altitude aircraft and also ozone sondes attached to high altitude balloons.

## REVIEW MEASUREMENTS OF DEPLETION AND RECOVERY OVER TIME

- > Students to review ozone layer measurements over Antarctica throughout time on their worksheet. They need to circle the reading that had the lowest ozone layer measurement and answer questions about what they observe from the measurements.

# ACTIVITY I - TIMELINE OF OZONE LAYER

## LESSON TIME:

20-30 MINS

## GLOBAL COMPETENCY:

**GC1** - Examine local, global and intercultural issues.

## LESSON DESCRIPTION:

Students to create a timeline of key events leading up to ozone layer depletion.

- > What happened during each of these events that led to the ban of CFCs at the Montreal Protocol in 1987?

The outcome of the Montreal Protocol was the creation of the Assessment Panels. The three different panels assess the latest available information on depletion and protection of the ozone layer.

### > **Technical and Economic Assessment**

**Panel:** Provides information on the availability, cost and feasibility of new technologies being developed and implemented (particularly in the cooling sector) that do not use ozone-depleting substances. The Panel also looks into new technologies that use chemicals that have a low-global-warming-potential making them more efficient, sustainable and environmentally friendly.

- > **Scientific Assessment Panel:** Assesses and monitors the state of the ozone layer based on atmospheric observations monitoring and data. The scientists check that levels of banned substances under the Montreal Protocol in the atmosphere are reducing or alert the parties if they detect an increase of an ozone-depleting substance illegal under Montreal Protocol that could set back ozone layer recovery.

## LEARNER OBJECTIVES:

*Action*



### Long-term Progress

**L2** - Acknowledge the role of global regulations and the ozone treaties.

**L3** - Acknowledge that continued progress on the ozone layer requires a broad base of awareness and support.

**L4** - Understand continued progress relies on Assessment Panels.

**L5** - Acknowledge ozone layer recovery is a source of hope for other global environmental challenges.



### LESSON EXTENSION:

Create a timeline of key events leading to global climate change (indicated in film). Which events would you go back to to create environmental change? **EXTRA RESOURCE:** [Ozone Timeline](#)

### > **Environmental Effects Assessment**

**Panel:** This Panel reviews the effects of ozone layer depletion (UV-B radiation) on the earth's biodiversity – human, animal and plant life. Based on available data and information they are able to show how the Montreal Protocol has helped us avoid such things as increased levels of skin cancer or food insecurity due to crop damage.

Students to brainstorm two ideas, measurements or topics that each panel may bring to help with the ozone layer project.

# ACTIVITY 2 - LETTER AND ACTION

## LESSON TIME:

30-45 MINS

## GLOBAL COMPETENCY:

**GC4** - Take action for collective well-being and sustainable development.

## LESSON DESCRIPTION:

Knox wrote a letter to the Young Scientists' Academy. Why do you think Knox was able to make a difference? What is it that she did and said that persuaded others to act differently?

## LEARNER OBJECTIVES:

*Action*



### Human Impact

**H3** - Appreciate that this challenge requires international regulations and cooperation.

**H4** - Appreciate that individual personal behaviours and consumer choices have an impact on ozone layer.



### Long-term Progress

**L5** - Acknowledge ozone layer recovery is a source of hope for other global environmental challenges.

## CLASS ACTIVITY

### ACTIVITY 1

Draft a letter or design a poster to an environmental leader of your choice to empower them to continue their journey of environmental change. This leader can have a role in protecting the ozone layer, or another environmental issue of your choice.

### ACTIVITY 2

Individual actions can make a difference. What are some key actions that individuals can take to prevent your identified environmental issue? Create a pledge of one action you and your family can take to protect our planet.

# PROJECTION OF FUTURE

## LESSON TIME:

45-50 MINS

## GLOBAL COMPETENCY:

**GC1** - Examine local, global and intercultural issues.

## LESSON DESCRIPTION:

In the first lesson, we made a projection of what 2100 may look like if the ozone layer continued to deplete, and if the smog was still utilised as a barrier to harmful UV rays.

Knowing that our heroes played a role in legislative changes to prevent future ozone layer depletion, and knowing that individuals can make a difference through your action plans, what do you think 2055/2084/2100 will look like now?

## LEARNER OBJECTIVES:

*Reflection*



### Human Impact

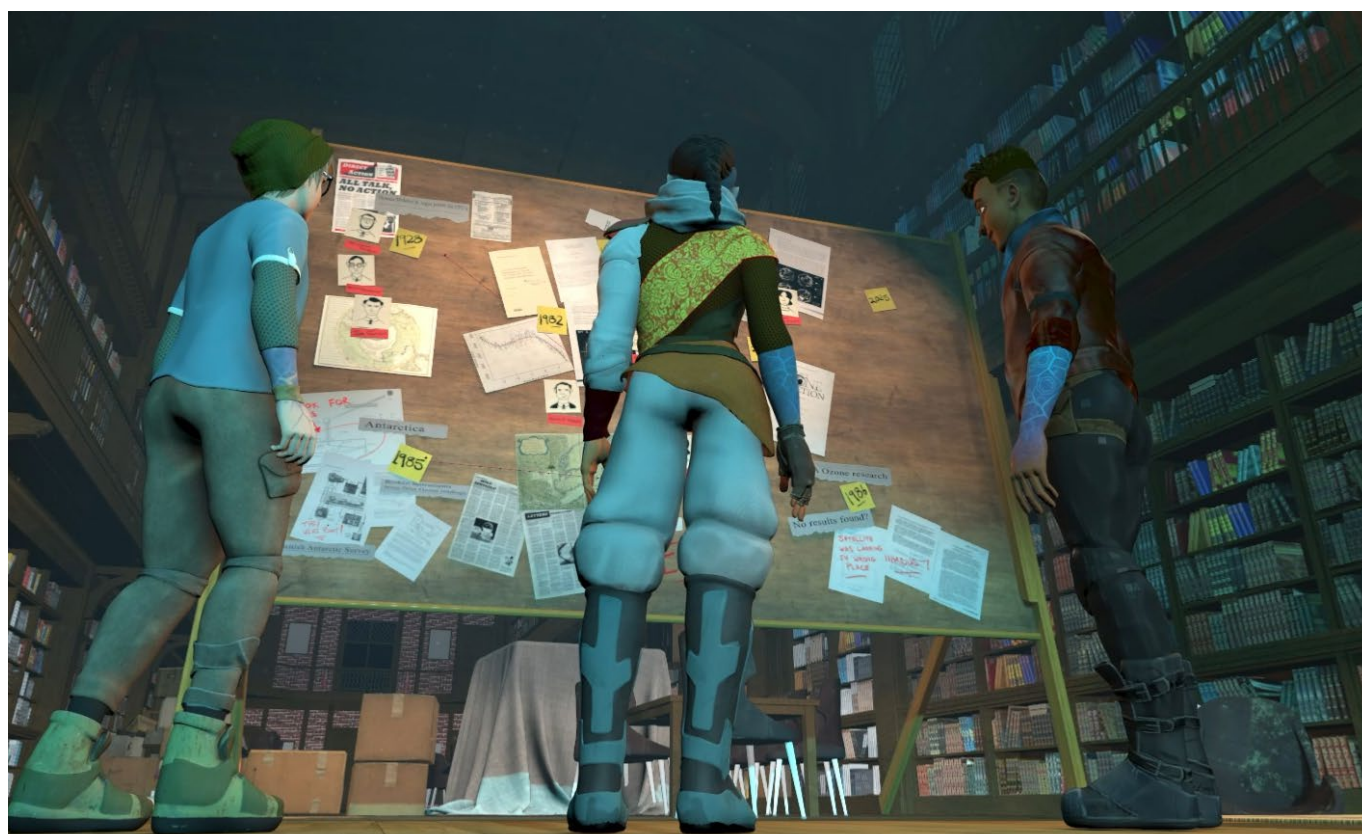
**H2** - Recognise that pollution from the previous generation persists and will impact future generations.

**H5** - Recognise the impact of the ozone layer on a local / regional / global scale.



### Long-term Progress

**L5** - Acknowledge ozone layer recovery is a source of hope for other global environmental challenges.





# CONCLUSION

## LESSON TIME:

55-60 MINS

## GLOBAL COMPETENCY:

**GC3** - Engage in open, appropriate and effective interactions.

## LESSON DESCRIPTION:

Personal Mind Maps

- > Return the mind maps to students from the first lesson, and using a different coloured pen, have students add anything extra that they have learned about ozone layer to their mind map. This is a great visual representation of learning. Display around the class, and use it as a prompt for discussion.

## LEARNER OBJECTIVES:

*Reflection*



### Science

- S1** - Explain ozone layer formation / characteristics.
- S2** - Recognise the important role of the ozone layer in protecting species from UV radiation.
- S3** - Identify how the ozone layer and climate are connected, but not causal.
- S4** - Acknowledge ozone layer recovery and seasonal changes.
- S5** - Understand natural impacts on ozone layer such as volcanoes and the sun.



## Human Impact

- H1** - Identify the pollution that affects the ozone layer - ODS (ozone-depleting substances such as CFCs and the halons).
- H2** - Recognise that pollution from the previous generation persists and will impact future generations.
- H3** - Appreciate that this challenge requires international regulations and cooperation.
- H4** - Appreciate that individual personal behaviours and consumer choices have an impact on ozone layer.
- H5** - Recognise the impact of the ozone layer on a local / regional / global scale.



## Long-term Progress

- L1** - Identify the consequences of continued ozone layer depletion.
- L2** - Acknowledge the role of global regulations and the ozone treaties.
- L3** - Acknowledge that continued progress on the ozone layer requires a broad base of awareness and support.
- L4** - Understand continued progress relies on the Assessment Panels.
- L5** - Acknowledge ozone layer recovery is a source of hope for other global environmental challenges.

# LESSON RESOURCES

Click on the links below to download the lesson resources:

- > [Lesson 3 Worksheet \(colour\)](#)
- > [Lesson 3 Worksheet \(print friendly\)](#)
- > [Reset Earth Story Book Chapter 3](#)
- > [UNEP Q&A](#)

# PREPARATION

- > Access To Reset Earth Episode 3
- > Lesson 3 Worksheet



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