BIOZONE

CLASSROOM GUIDE

ENVIRONMENTAL SCIENCE

Contents

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FAQs ABOUT Environmental Science

Using this Classroom Guide

This Classroom Guide is designed to help teachers make the most of the *Environmental Science* worktext and ancillary resources. It provides insights into the program's features, and offers practical suggestions for planning, delivering, and assessing an engaging program in your classroom. To maximize the benefits of our resources, we recommend reviewing this guide before incorporating the *Environmental Science* worktext into your teaching.

Use the contents and FAQs in this Classroom Guide to quickly find answers to your questions about course structure, key components, assessment tasks, teacher resources, BIOZONE's pedagogy, and more.

Who should Use Environmental Science?

This worktext offers a comprehensive and versatile study of environmental science. It is not tied to any specific program or syllabus, so is able to meet the needs of students across various educational levels. This includes high school students (grade 10-12) enrolled in a range of environmental science programs (including elective or honors courses), and it may also be suitable for students taking undergraduate environmental science courses.

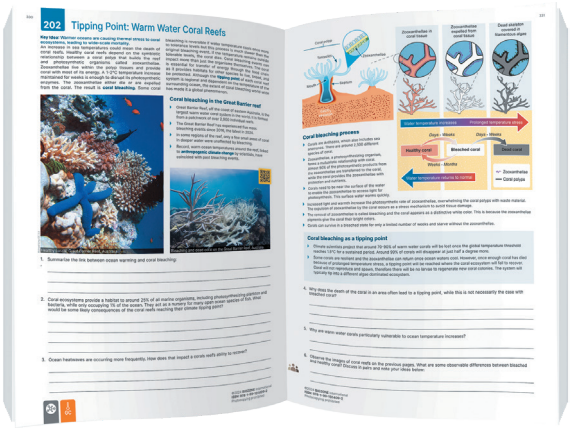
The worktext is divided into four sections: Earth's Systems, The Living World, Global Resources, and Global Change. This approach provides students with well balanced content by which to explore Earth's physical and biological systems, and provides context for examining the interactions of humans with the environment.

Environmental Science is available as a print or digital resource, allowing teachers the flexibility of delivering the content across dual media if required. Our Teacher Toolkit resources support teachers to plan and deliver an engaging program. More information about our delivery options and the Teacher Toolkit is provided in this Classroom Guide.

BIOZONE's Pedagogy

A worktext approach

BIOZONE's delivery method is a departure from a traditional textbook. We combine the very best features of a textbook with the utility of a workbook, producing a **worktext** resource. Importantly, the worktext is owned by the student: it is their own resource to utilize. Whether they are using the print or digital version, students customize their worktext with notes and annotations, checking off their progress in the contents and chapter introductions, and input their answers on the pages as they work through the activities.

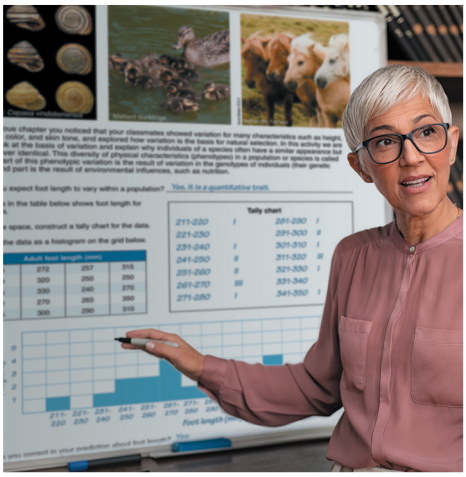


Using a highly graphical approach and short blocks of text, we deliver textbook quality information in an accessible and engaging way, ensuring students are not overwhelmed by large amounts of reading. As students interact with the stimulus material and work through activities, they are encouraged to input their answers directly onto the page. This simple act reinforces the learning moment and forms a **record of work** as they progress through the material. Revision is simplified because the stimulus material, questions, and their answers are in one place.

We have included a wide range of material in *Environmental Science*. This includes case studies, data analysis, research activities, and assessment tasks. The variety of activity types provides flexibility in the way teachers can assign them. For example, work can be set as homework, completed in class, or set for revision. Teachers can assign students to work on activities individually or set work as a group. The activity based approach simplifies assigning work, and teachers can utilize this to set work for substitute teachers in their absence.

Not all answers need to be graded!

Within the activities, there are plenty of opportunities for students to record answers to the questions in the spaces provided. This approach reinforces the learning moment and allows students to use the resource as a revision tool when they are preparing for assessments. This approach does not mean that teachers are expected to review or grade all student responses. We suggest that only key activities or questions are graded. This might be assessment tasks at the end of each chapter. You may also choose to grade activities with content that students have traditionally found challenging, or where there is often a misunderstanding of the topic. Teachers can also choose to share answers with students. Sharing the model answers via a shared screen allows students to self report grades: an exercise known to be a powerful pedagogical learning tool (Hattie, 2009). Having access to model answers also allows students to refine their initial response if needed. This provides a **powerful second learning moment** to consolidate and extend understanding. Teachers can utilize the show/hide model answer feature in the digital platform to share answers.



Features to accelerate student learning

Student learning can be influenced by many factors. A synthesis of more than 1,400 meta studies by Hattie (2009) involving over 80,000 individual studies and 300 million students has revealed some of the major influences to student learning. Some factors negatively influence student learning (red, right) while others have positive effects (yellow, green, and blue, right).

BIOZONE's approach incorporates many of the factors shown to positively influence student learning; these are underlined in red on the diagram (right). By utilizing *Environmental Science*, these factors are organically incorporated into content delivery and enhance the teacher and learner experience.

Hattie, J. (2009). Visible Learning. Routledge

The Teacher Toolkit

BIOZONE's *Environmental Science* worktext is supported by the Teacher Toolkit, a suite of resources specifically developed to help plan and deliver an engaging program. A brief description of the tools available are provided below and on the following pages.

TEACHER'S EDITION

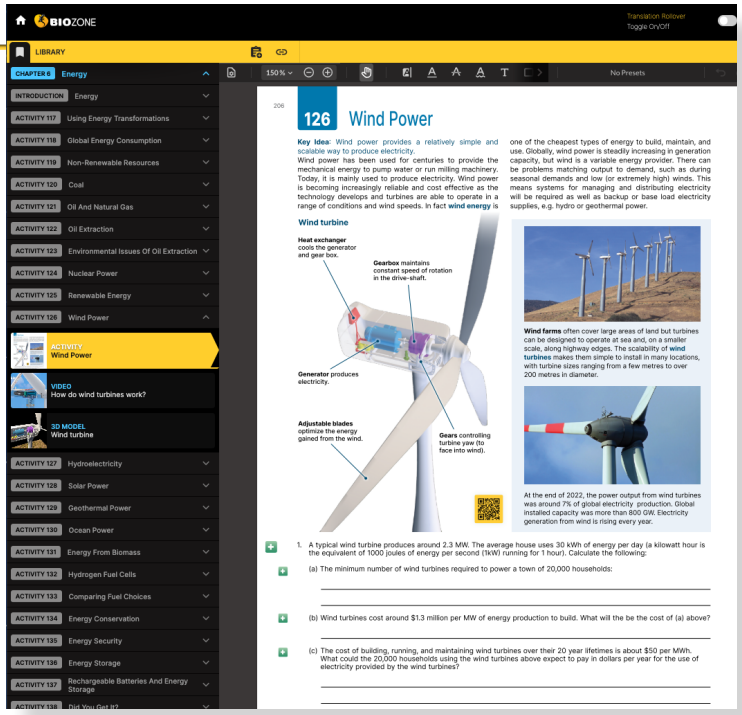
The *Environmental Science* Teacher's Edition is the teacher's companion to the student worktext. Use this resource to gain insight into the features of the resource and how to use them in your planning and delivery. The Teacher's Edition follows the same flow as the Student Edition for easy navigation.

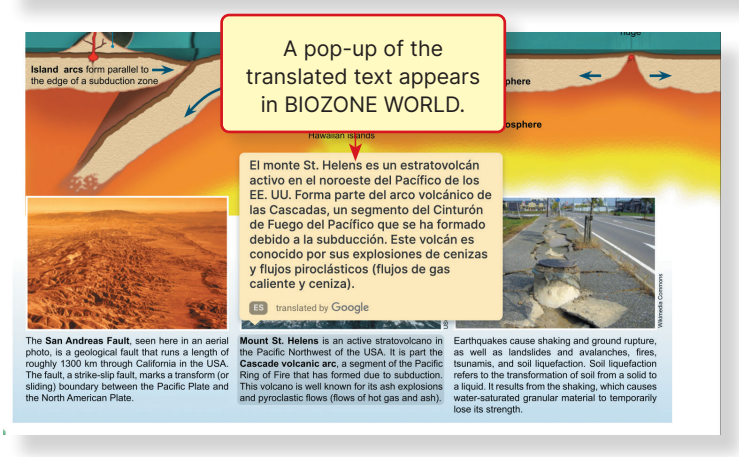
Features of the Teacher's Edition include:

- Suggested model answers in place for each activity.
- A Classroom Guide at the beginning of the Teacher's Edition provides a guide to the best use of BIOZONE's resources. It includes strategies for teaching in a differentiated classroom, information about the assessment tools, and the benefits of collaborative learning.
- An overview of the Teacher Toolkit, resources to support the delivery of the environmental science program, is provided.

BIOZONE WORLD

BIOZONE WORLD, our **science digital platform**, brings our digital worktexts and rich collection of digital resources together in a single location for easy use. Click on an activity to access the additional resources provided. These include: presentation slides, interactive 3D models, and curated videos and weblinks. Educators can easily plan lessons, assign work, and grade student responses using BIOZONE WORLD.





- **Students' access** to BIOZONE WORLD allows them to use tools to markup, highlight, and bookmark content. They can also answer questions online, and submit their work for review or grading. Students have access to the embedded collection of digital resources (presentation slides, 3D models, and curated videos and weblinks).
- **Teacher access** to BIOZONE WORLD includes the features available to students plus additional teacher-only features, including:
  - Managing class student enrolments.
  - The ability to view, grade, and give feedback on submitted student work.
  - Forced hand-in feature.
  - Ability to display the content on a shared screen or projector to introduce or review an activity, or highlight areas of particular importance (e.g. an important step in a practical investigation).
  - Model answers are in place. Use the show/hide buttons to toggle answers on and off; ideal for sharing data or answers with students. *Students do not have access to model answers on BIOZONE WORLD.*
- The **translation tool** within BIOZONE WORLD translates the content into over 150 languages.

Find out more: biozone.com/us/biozone-world

RESOURCE HUB

The BIOZONE **Resource Hub** is a free resource available to students and teachers. It offers a curated collection of Open Educational Resources (OER) specifically chosen to support the content of the worktext. Resources include videos, animations, games, 3D models, spreadsheets, and source material.

Print users access BIOZONE's **Resource Hub** content through QR codes and links provided in the introductory chapter of the worktext (page *ix*). The codes have also been provided in this guide for easy reference (below). For digital users, the resources are embedded in BIOZONE WORLD and appear in the resource list when an activity is selected.

The BIOZONE **Resource Hub** is an effective tool to engage students of all abilities within a differentiated classroom. Most resources can be used by students of all abilities. 3D models, videos, games, and simulations are great tools for engaging students in a topic, or supporting striving students in their learning journey.

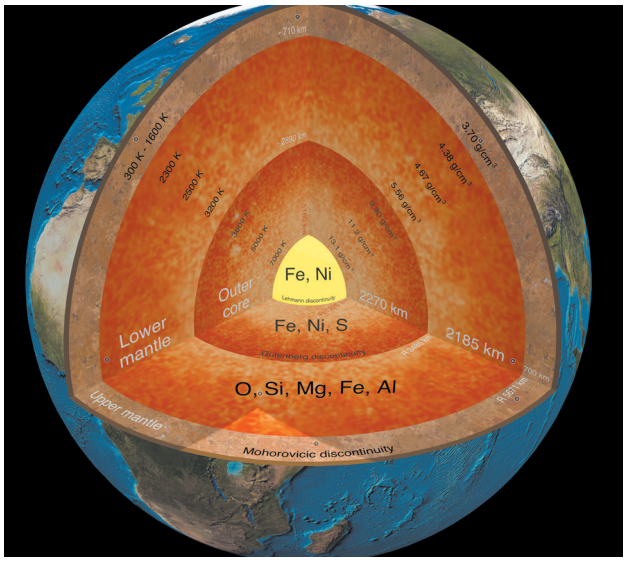
Some components have been tagged as extension material and can be used to extend capable or gifted students. These types of resources may require more reading or synthesis of information. Our spreadsheet models can be used as is, or you can have students graph the information themselves. You may wish to challenge more capable students to build their own models or manipulate the ones provided to observe the outcomes.

Some Resource Hub material is tagged as a teacher resource. Teacher resources often provide background or additional material to an activity. Capable students, or students with a particular interest in the topic, can be assigned this material at your discretion.

SUMMARY OF RESOURCE HUB MATERIALS

Resource type	Number of resources*
PDFs	12
3D models	71
Videos	212
Weblinks	112
Interactives	55
Spreadsheets	4

* approximate number of resources



Accessing the Resource Hub

Navigate to the **Resource Hub** either by following the instructions below, or by utilizing the bitly tag or QR code found on each chapter introduction (below):

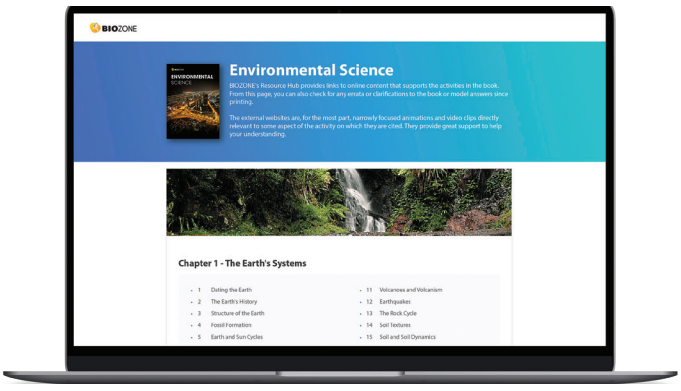
Step 1: Navigate to the BIOZONE **Resource Hub**

Step 2: Enter this code in the box displayed.

Step 3: Bookmark this page.

www.BIOZONEhub.com

ENS4-4092



bit.ly/3LhnHRm

Use this bitly tag or QR code to directly access the BIOZONE Resource Hub.

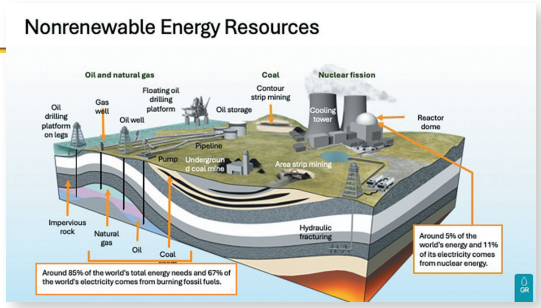
PRESENTATION SLIDES

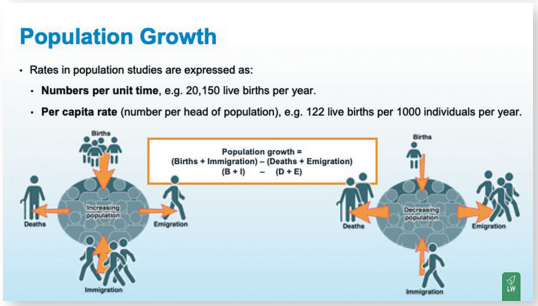
Presentation Slides are a very popular way for teachers to deliver a lesson in a presentation style format either in class or via remote delivery.

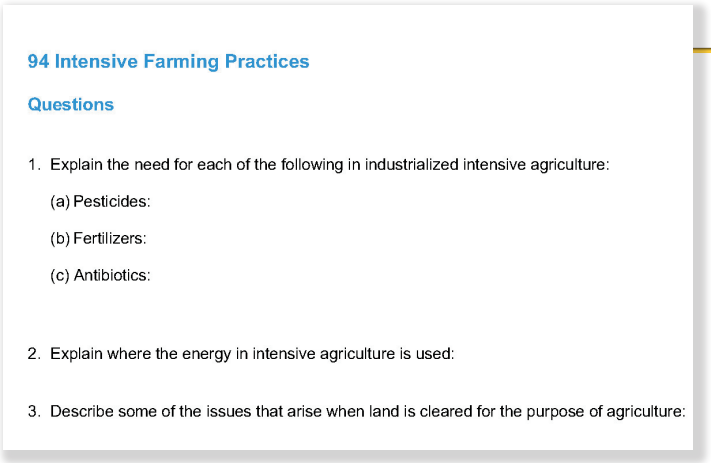
The Presentation Slides are a sizeable collection of slides specifically designed to support and enhance the content of the worktext. A set of slides is available for each chapter of *Environmental Science*.

Quiz slides present a series of multi-choice questions (and answers) allowing for a fun, informal way to gauge student understanding of the content.

The presentation Slides are embedded into BIOZONE WORLD and automatically appear in the resource list when an activity is selected.







94 Intensive Farming Practices

Questions

1. Explain the need for each of the following in industrialized intensive agriculture:

   (a) Pesticides:

   (b) Fertilizers:

   (c) Antibiotics:

2. Explain where the energy in intensive agriculture is used:

3. Describe some of the issues that arise when land is cleared for the purpose of agriculture:

QUESTION LIBRARY

All questions in *Environmental Science* worktext are extracted into Question Library files. Provided in QTI and RTF files, the questions can be ingested into a range of learning management systems or other digital delivery tools.

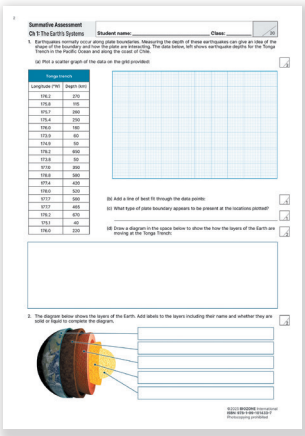
The Question Library content is **fully editable**, providing teachers with flexibility and control in assigning questions within a differentiated classroom. The questions can be customized to match a student's learning ability or reading level.

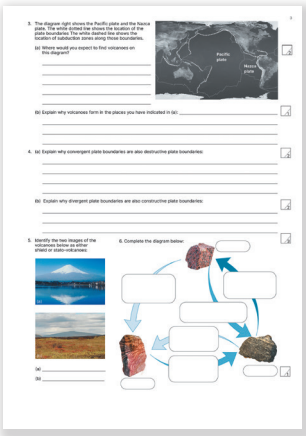
Access to the question library is complementary with multi-year purchases.

ADDITIONAL ASSESSMENTS

An additional set of summative assessment tasks are provided as download files for teachers. These complement the end of chapter assessment tasks found within the worktext. Students do not see the additional assessment tasks prior to you providing them. Questions are designed to prompt students to analyse and evaluate information, and synthesize answers. The tasks are suitable to use for formal grading or reporting.

The summative assessment tasks are provided through a download link, and include student versions (stimulus material and questions only) and teacher versions (with answers provided).





TEACHING PLANNER & PROGRESS TRACKER

Utilize the teacher planning tool and progress tracker to streamline your lesson plans and confidently deliver and assess the environmental science content.

The teaching planner resource contains lesson planning tools, teaching notes, pace delivery guidance, and provides suggestions for differentiated learning. Streamline your teaching of the program by incorporating this information into your own planning document.

A progress tracking tool is provided as a Google sheet, and is an excellent way to track student progress through the program.

The teaching planner and progress tracker can be download free from the BIOZONE Resource Hub.

A Roadmap Through The Course

A concept map for the entire course

Environmental Science is divided into four sections: Earth's Systems, The Living World, Global Resources, and Global Change. Each section is introduced with a concept map. A concept map for the entire course is provided below and on page x of the Student Edition. This provides a broad overview and "big picture" of the course. Encourage students to interact with the content map; they can draw on it to make connections between different parts of the course if they wish.

The Earth's Systems

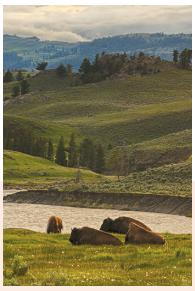
- **Geological systems**
  - Age of the Earth
  - The Earth's surface
  - Plate tectonics
- **The atmosphere**
  - The atmosphere
  - Atmospheric circulation
  - Weather and climate
- **Global water resources**
  - Oceanic water
  - Fresh water
- **Rocks and soil**
  - Rocks and minerals
  - Soil dynamics

The resources used by humans are a result of constantly changing global systems.

The Living World

- **Ecosystems**
  - Biomes and ecosystems
  - Energy flow
  - Species interactions
- **Natural ecosystem change**
  - Biogeochemical cycles
  - Ecosystem stability
- **Populations**
  - Features of populations
  - Population growth
- **Investigating ecosystems**
  - Sampling populations
  - Abiotic factors
  - Classification

Complex systems arise as a result of the interactions between organisms and their environment.

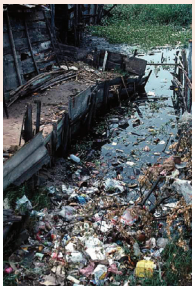


Environmental Science

All of the Earth's systems are connected. Changes in one system may cause changes in other systems.

Environmental science is an interdisciplinary field of study involving both natural and social sciences.

Resources must be carefully managed to ensure they are available to future generations.



Understanding environmental systems is critical to understanding the environmental effects of human activities.

Global Resources

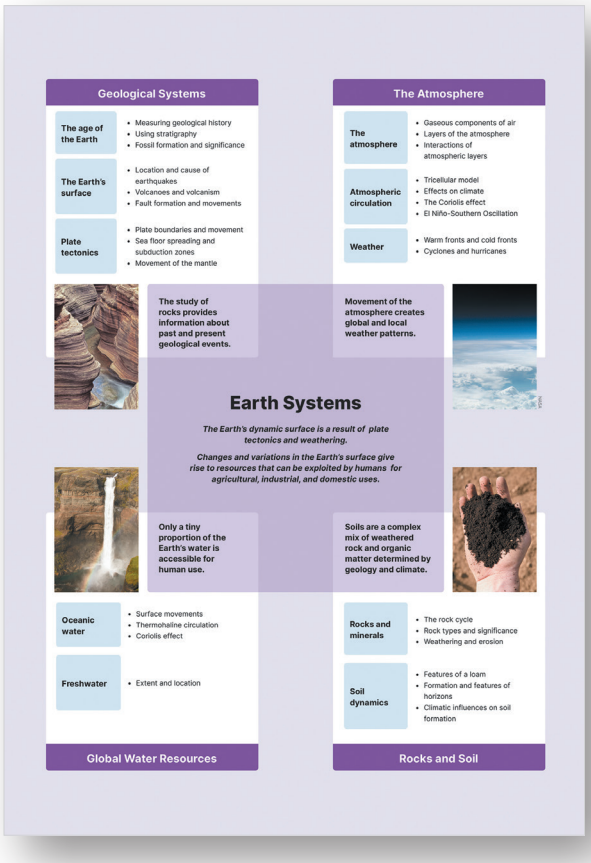
- **Food production**
  - Agriculture
  - Land management
- **Earth's Resources**
  - Fisheries
  - Irrigation
- **Energy sources**
  - Energy
  - Non-renewable energy
  - Renewable energy
- **Energy security**
  - Energy conservation
  - Energy threats
  - Energy storage

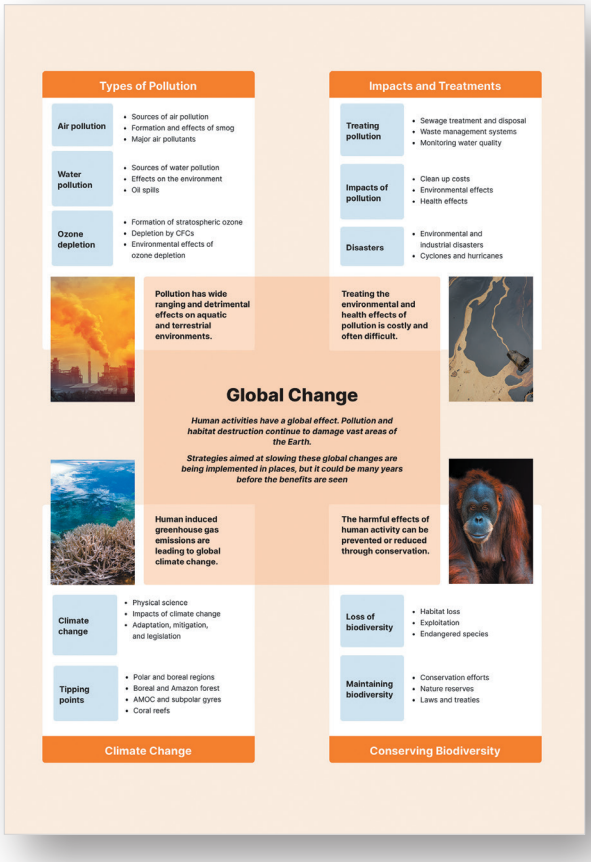
Global Change

- **Types of pollution**
  - Air pollution
  - Water pollution
  - Ozone depletion
- **Impacts and treatments**
  - Treating pollution
  - Impacts of pollution
  - Disasters
- **Conserving biodiversity**
  - Loss of biodiversity
  - Maintaining biodiversity
- **Climate change**
  - Climate change science
  - Tipping points

Concept maps for each section

Each section begins with a section concept map. These provide a more focussed summary of the content within each section and provide cues and information for students about key points. Encourage students to refer to these as they work through the material and to interact with them to enable connections to be made between different parts of the course.





Using the Section Focus Activities

Double page infographics follow the section concept maps. These spreads are designed to captivate students' attention and provide a visual and contextual overview of a specific aspect of the upcoming topic. Students actively engage with the infographic, and are encouraged to analyse, question, and expand on the material presented. This approach helps to develop essential skills such as critical thinking, research, and communication, as students are prompted to explore the information further and share their insights with peers. These versatile activities can be used in several ways:

- Incorporate into a classroom session and use as stimulus material to introduce a new section.
- Extension material for students who would like to explore the "Take a Deeper Look" points provided.
- Set as extra credit tasks.
- Set as a research task (individual or group work) to enhance research and communication skills.

Section and Chapter Structure

Environmental Science consists of 10 chapters: nine content chapters and a science practices chapter. The content chapters deliver the course material and are aligned to one of the four sections. Each section and content chapter follow the same structure making it easy to navigate through the title and utilize the inbuilt pedagogical features. Their structure and organization are explained below.

The Science Practices chapter contains activities to support students with the math and science practices associated with environmental science. It is not associated with any particular section and students can refer to it at any time. To learn more about utilizing the Science Practices chapter, see page CG23.

Structure of a Section and Chapter

Section concept map

A concept map begins each section and provides an overview of content.

Did You Get It?

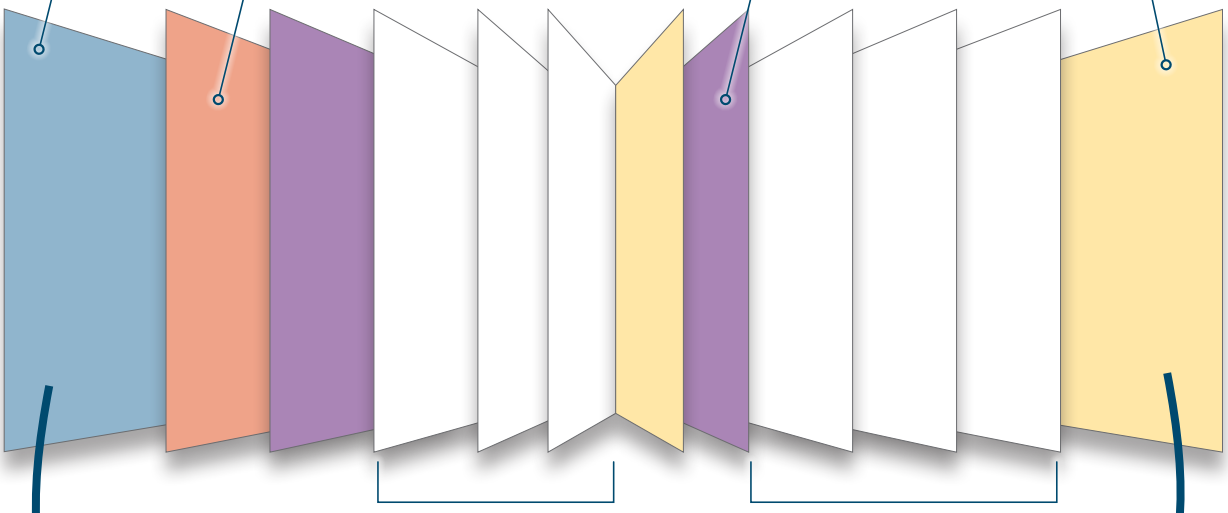
An assessment task allowing students to demonstrate their knowledge of the chapter's content.

Section focus

A graphical double page spread highlights key ideas in the section.

Chapter introduction

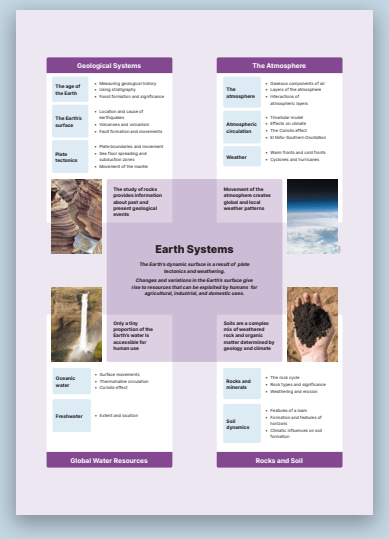
Short statements summarize what students need to know for each chapter.



Activity Pages **Activity Pages**

Most activities have questions for students to answer. These form a record of work and demonstrate a student's understanding of the content.

Section concept map

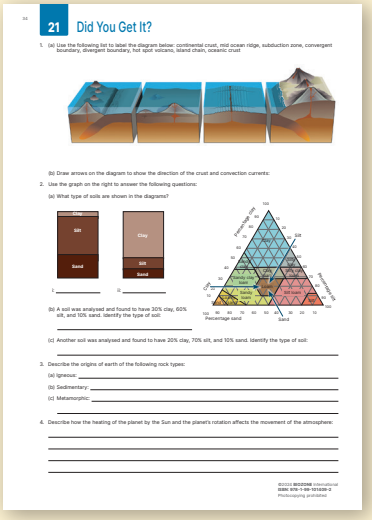


The concept maps divide the worktext in four sections:

- Earth's Systems
- The Living World
- Global Resources
- Global Change

They provide an overview or big picture approach to what will be covered in the course.

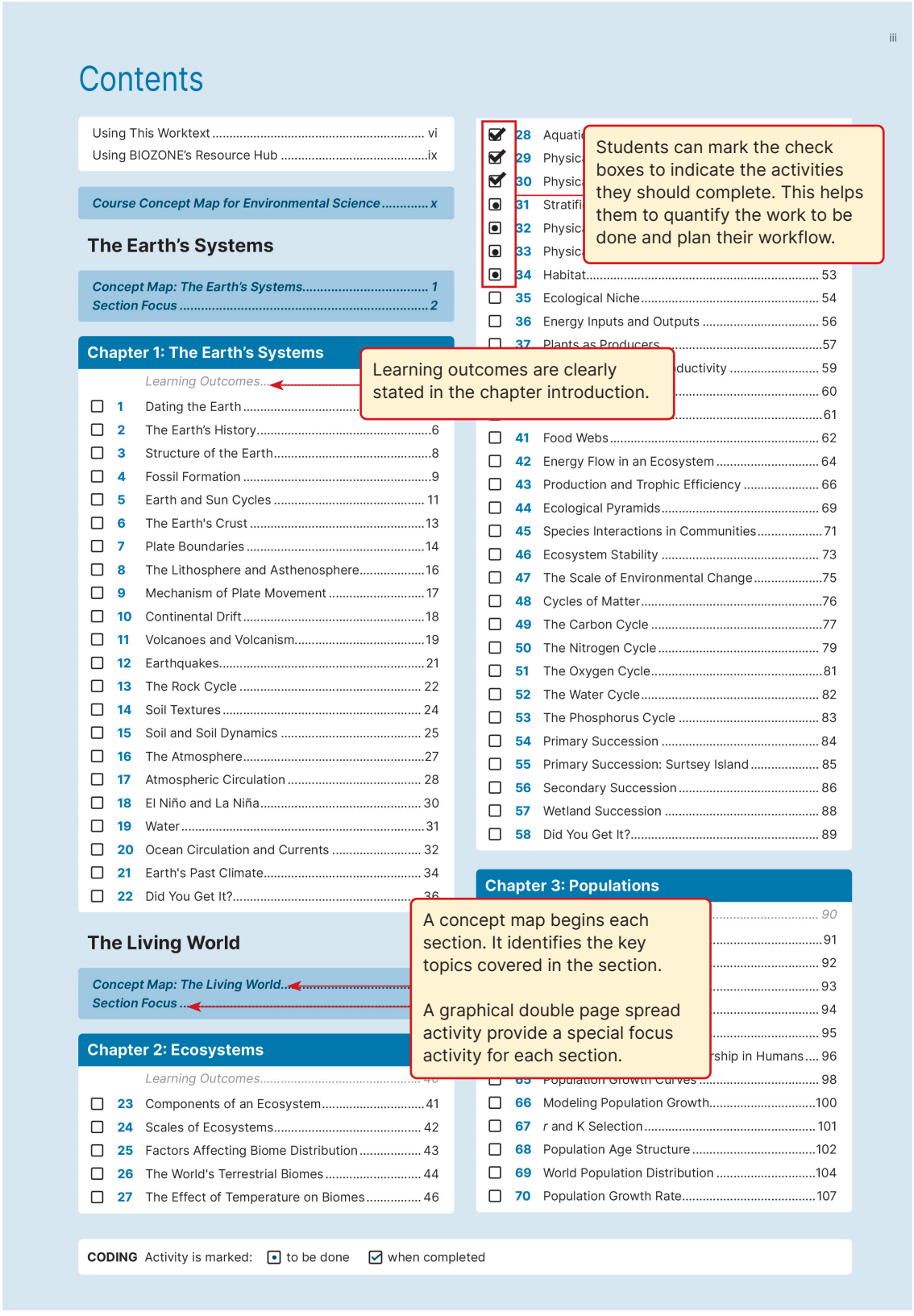
Assessment: did you get it?



Each chapter has an end of chapter test. It allows you to test student understanding of the content covered.

The Contents: A Planning Tool

The contents pages are not merely a list of the activities. Encourage your students to use them as a planning tool for their program of work. Students can identify the activities they are to complete and then tick them off once completed. Ticking off the activities as they are finished gives students a sense of progression and helps them to be more personally organized in their work and time management. Teachers can see at a glance how a student is progressing through the set work. Any concerns with progress can be addressed early.



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Contents

CODING Activity is marked: ◉ to be done ☑ when completed

Students can mark the check boxes to indicate the activities they should complete. This helps them to quantify the work to be done and plan their workflow.

Learning outcomes are clearly stated in the chapter introduction.

A concept map begins each section. It identifies the key topics covered in the section.

A graphical double page spread activity provide a special focus activity for each section.

Chapter Introductions

Encourage students to interact with the chapter introductions as they work through the material as this will help them to understand key learning points for the course. The chapter introductions provide a concise list of learning outcomes that students should be able to demonstrate knowledge of by the time they complete the chapter. The chapter introduction also contains key concept and key term panels (see the example page below).

The key concepts provide a summary of the main points that students should take away from this chapter. Students can elaborate on the key concepts using the knowledge they have gained from completing the activities. The key terms draw student attention to the language they should be using when studying environmental science. Encourage your students to use these terms regularly in their writing and oral communications to build scientific literacy. Definitions for the key terms can be found in the glossary section of both the student and teacher edition.

As students complete each activity in a chapter, they can mark off their progress by ticking the relevant check box on the chapter introduction page.

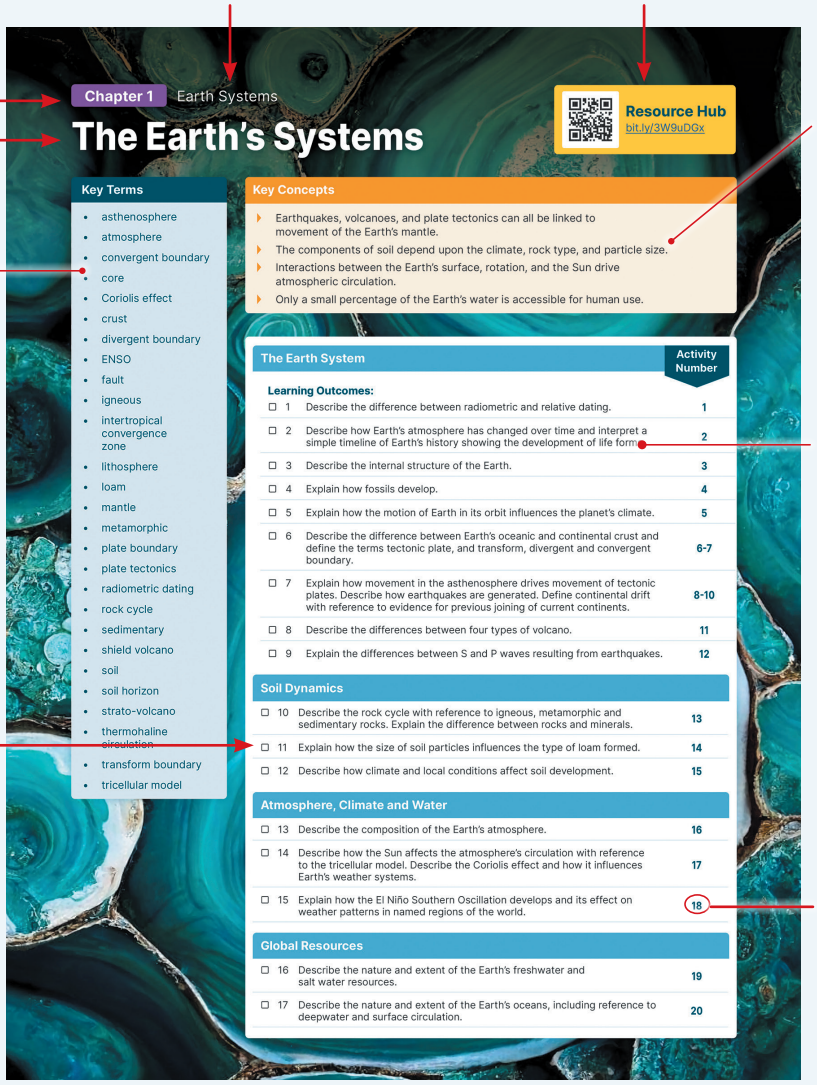
The section of the worktext is identified for easy navigation.

QR codes allows quick access to helpful videos and models on BIOZONE's **Resource Hub.**

Chapter number and chapter title are identified for quick navigation.

Key terms
Important vocabulary students should understand and use during the course. Definitions are provided in the glossary at the back of the book.

Check boxes
Encourage students to use the check boxes to identify activities to be done (•) and to tick them off (✓) when the learning outcome is completed.



Key concepts
These are the important key ideas for the chapter. Direct students to these and ensure they understand the concepts summarized here.

Learning outcomes
These provide a point by point summary of what students need to know or do by the end of the chapter. .

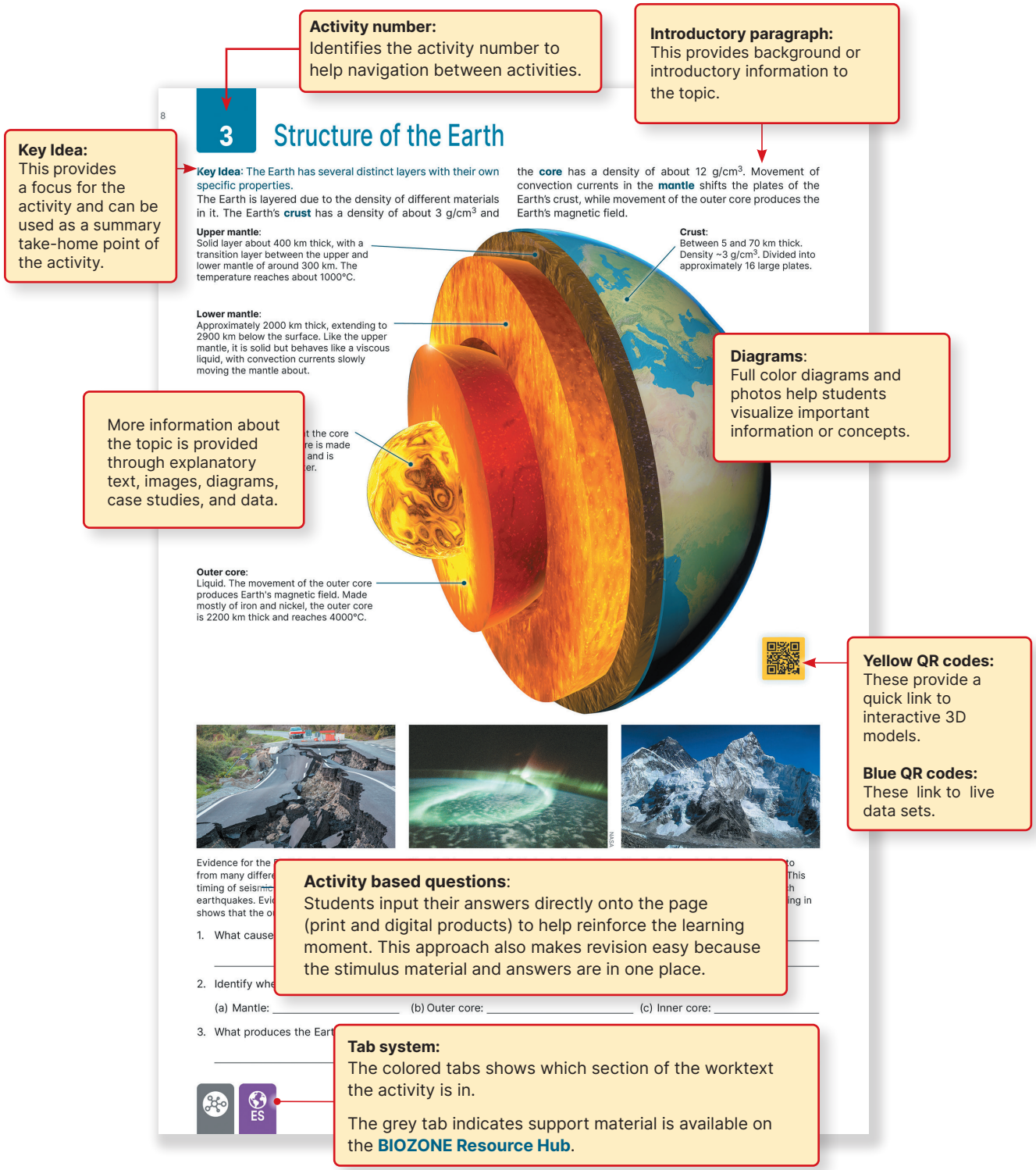
Activity numbers
The activity number for each learning outcome is identified.

Features of the Activity Pages

The activity pages have been carefully designed to provide high quality information to students in an easily accessible format. They include a number of features designed to engage students and help them unpack and understand the information. Guide students through the features of the activity pages to ensure that they make the most of the material.

Features include:

- Short blocks of text so that students do not feel overwhelmed with too much reading.
- High quality, informative graphics.
- QR codes link directly to 3D models (following page). These provide fun engagement and learning moments.
- Question and answer sections allow students to demonstrate their understanding of the content. By having the stimulus material and their answers in one place, students can easily revise for assessments.
- The tab system identifies when there is support material on the **Resource Hub**. Tabs also identify what section the activity is in (see following page).



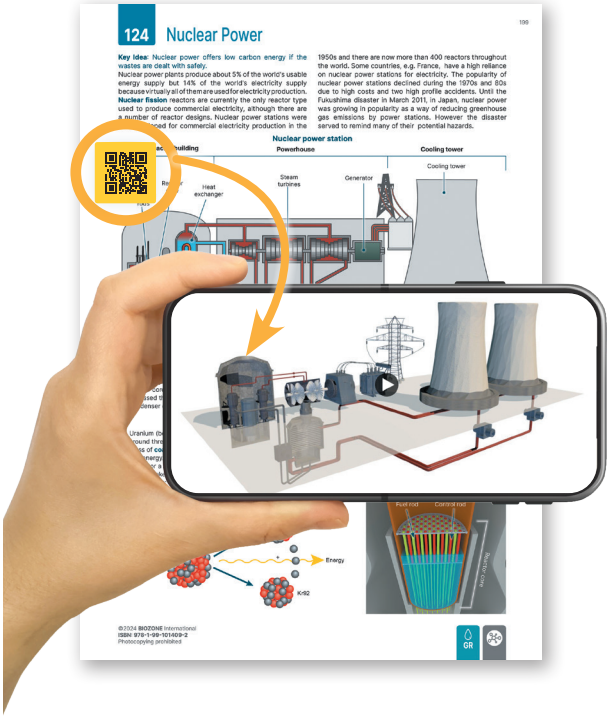
Using the QR codes on the pages

Some activities have QR codes on the pages (circled, below). These link directly to informative and engaging 3D models or live data sets. If your school does not allow students to access phones in class time, students can still access the models and data sets through the Resource Hub and via BIOZONE WORLD. Students can either bookmark the Resource Hub or quickly access it using the bitly tag found on each chapter introduction (right).

Resource Hub
bit.ly/3W9uDGx

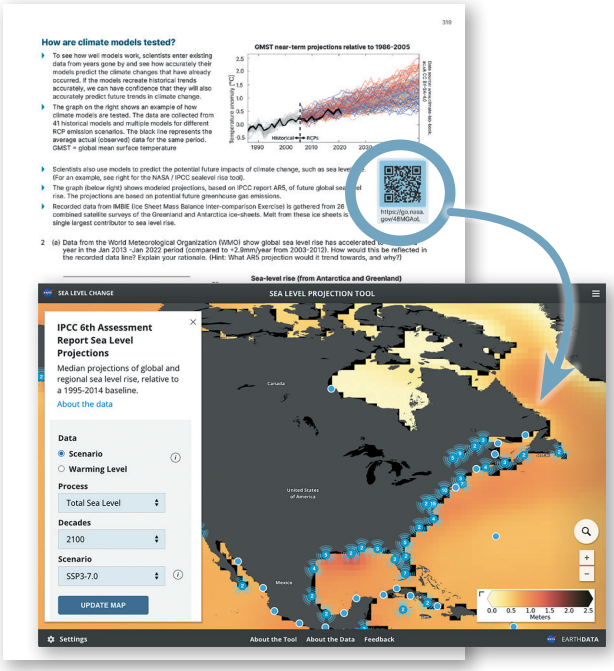
Yellow QR codes

Some activities have yellow QR codes on the pages (circled, below). These link directly to informative and engaging 3D models. All models can be rotated and zoomed, and some contain informative annotations.



Blue QR codes

Some activities have blue QR codes on the pages (circled, below). These link directly to live data sets that are updated regularly, providing up-to-date data for some rapidly changing areas of environmental science.



Understanding the Tab System

A tab system is found at the bottom of the first page of each activity. The colored tabs identify which section of the worktext you are in. The gray tabs indicate whether support material is provided on BIOZONE's **Resource Hub**. The tab system is explained below.

The **gray hub tab** indicates that the activity has online support via BIOZONE's **Resource Hub**. This may include videos, animations, articles, 3D models, and more.

Four colored tabs represent the four sections within *Environmental Science*. Use these as a visual cue to quickly navigate and orientate through the content.

Earth's Systems | **The Living World** | **Global Resources** | **Global Change**

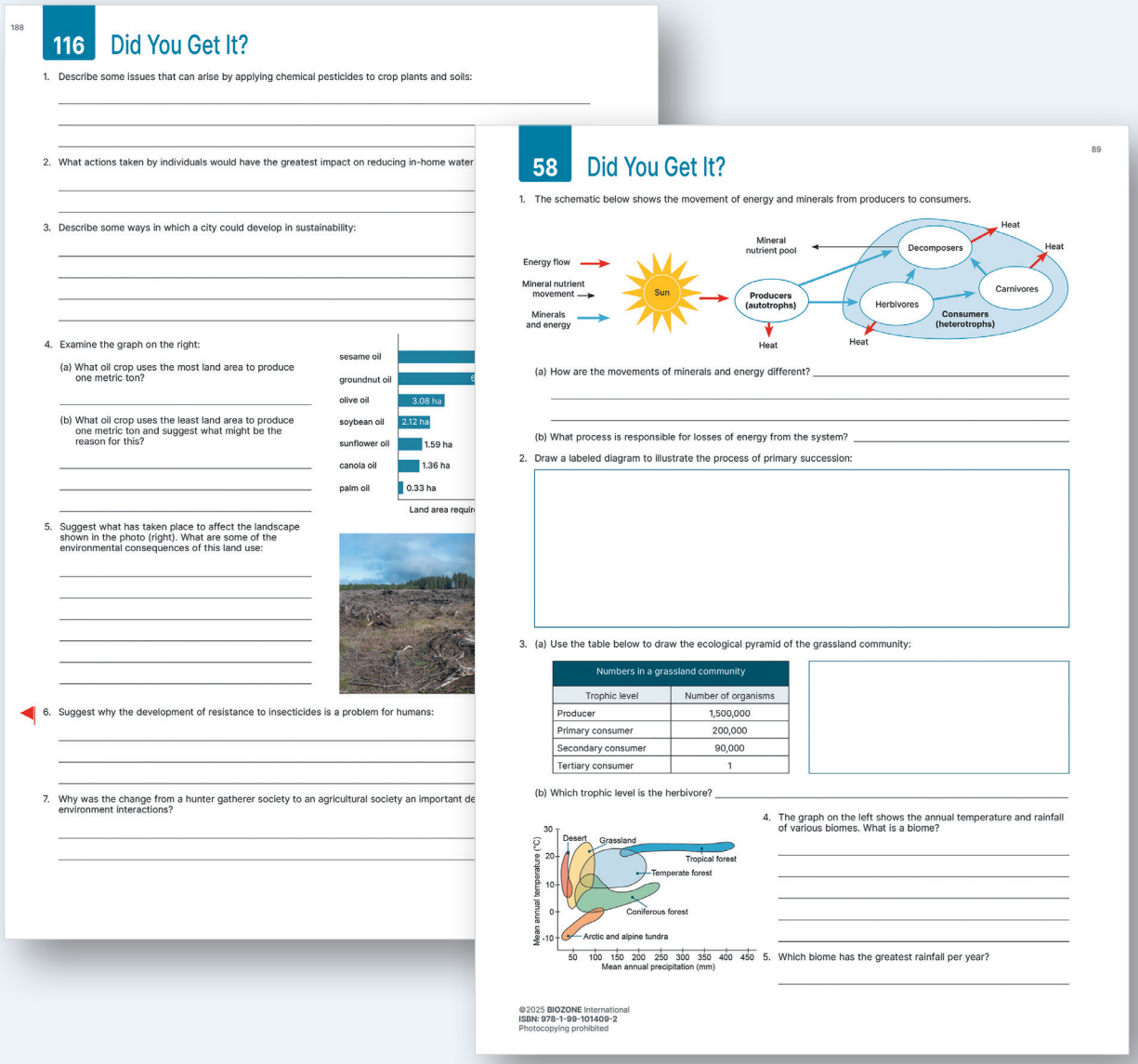
Evaluating Student Performance

While most activities require students to record a response (answer the questions provided), we do not recommend that every question is graded. In most instances, the activities have been designed so that student answers form an individual record of work, allowing students to review their answer within the context of the activity at any time.

We recommend teachers are selective about activities or questions they choose to review or grade to avoid assessment fatigue. Focus on content that students typically find challenging or on activities that cover essential material for the course. We highly recommend that end of chapter assessments and the additional summative assessment tasks are graded. Both of these provide formal opportunities to test student understanding of the content. Find out more about the formative and summative assessment tasks below, and on the following page.

Chapter assessments: Did You Get It?

Chapters 1-9 each conclude with a *Did You Get It?* assessment task. These have been designed to test student understanding of the chapter content, and can be used to help identify any gaps or misconceptions which still need to be addressed before moving on. You may wish to use the chapter assessment as a practice test before asking students to complete the summative assessment task (see more information on the next page).



188

116 Did You Get It?

1. Describe some issues that can arise by applying chemical pesticides to crop plants and soils:

2. What actions taken by individuals would have the greatest impact on reducing in-home water

3. Describe some ways in which a city could develop in sustainability:

4. Examine the graph on the right:

(a) What oil crop uses the most land area to produce one metric ton?

(b) What oil crop uses the least land area to produce one metric ton and suggest what might be the reason for this?

sesame oil
groundnut oil
olive oil 3.08 ha
soybean oil 2.12 ha
sunflower oil 1.59 ha
canola oil 1.36 ha
palm oil 0.33 ha

Land area requir

5. Suggest what has taken place to affect the landscape shown in the photo (right). What are some of the environmental consequences of this land use:

6. Suggest why the development of resistance to insecticides is a problem for humans:

7. Why was the change from a hunter gatherer society to an agricultural society an important de environment interactions?

89

58 Did You Get It?

1. The schematic below shows the movement of energy and minerals from producers to consumers.

Energy flow
Mineral nutrient movement
Minerals and energy
Sun
Mineral nutrient pool
Producers (autotrophs)
Decomposers
Herbivores
Carnivores
Consumers (heterotrophs)
Heat

(a) How are the movements of minerals and energy different?

(b) What process is responsible for losses of energy from the system?

2. Draw a labeled diagram to illustrate the process of primary succession:

3. (a) Use the table below to draw the ecological pyramid of the grassland community:

Numbers in a grassland community	
Trophic level	Number of organisms
Producer	1,500,000
Primary consumer	200,000
Secondary consumer	90,000
Tertiary consumer	1

(b) Which trophic level is the herbivore?

4. The graph on the left shows the annual temperature and rainfall of various biomes. What is a biome?

Desert
Grassland
Tropical forest
Temperate forest
Coniferous forest
Arctic and alpine tundra
Mean annual temperature (°C)
Mean annual precipitation (mm)

5. Which biome has the greatest rainfall per year?

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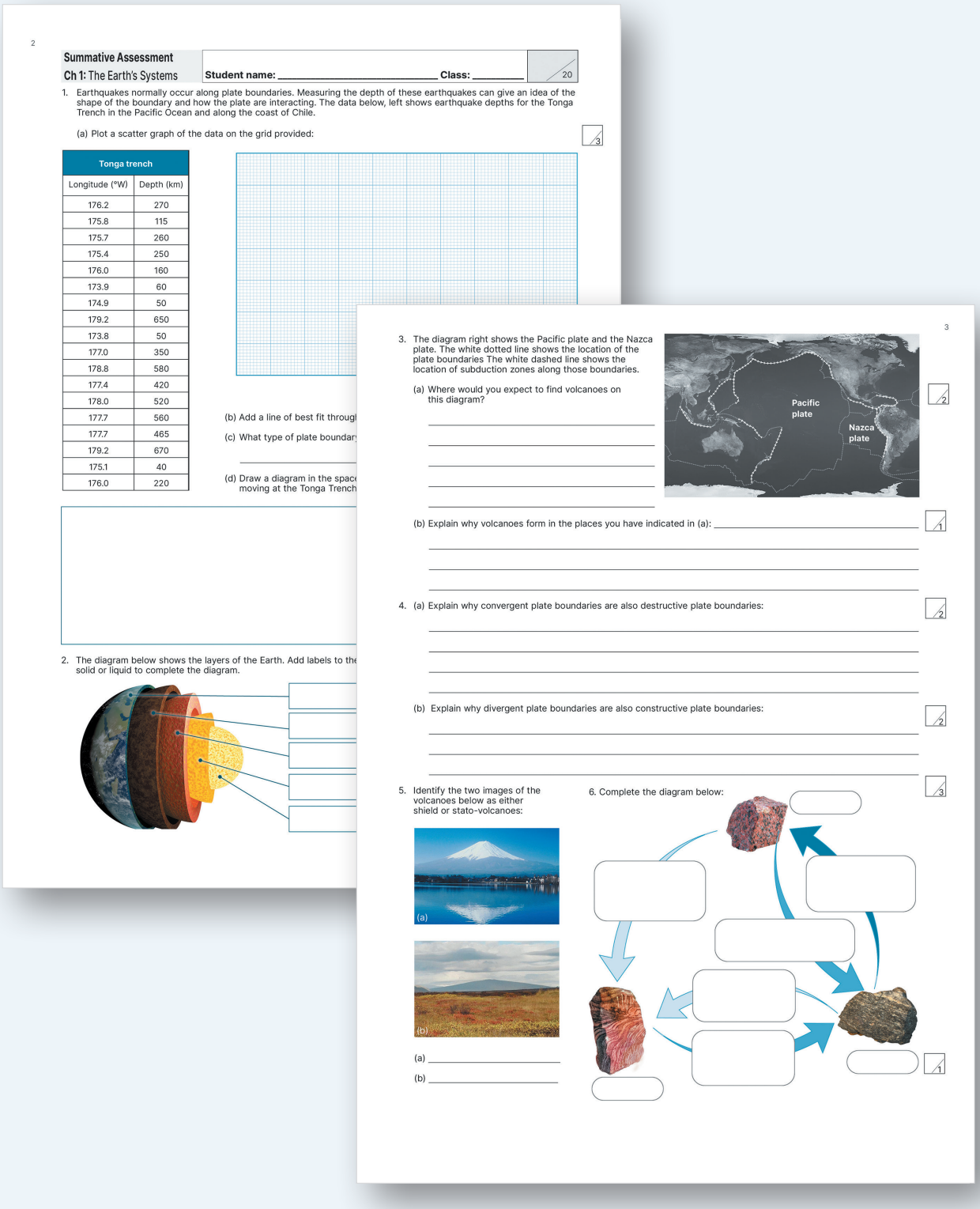
Summative assessments

Longer, summative assessment tasks are provided as download tasks for each chapter. Unlike end of chapter "Did You Get It?" assessments, students do not see these tasks prior to you providing them. There are a variety of questions types allowing students to demonstrate understanding and application of their acquired knowledge. Questions are designed to encourage students to analyze, evaluate, and synthesize information, and are suitable to use for formal grading or reporting tasks.
The summary assessment tasks are provided through a download link. There are student versions (questions only) and teacher versions (with answers provided).



2

Summative Assessment
Ch 1: The Earth's Systems

Student name: _____ **Class:** _____ /20

1. Earthquakes normally occur along plate boundaries. Measuring the depth of these earthquakes can give an idea of the shape of the boundary and how the plate are interacting. The data below, left shows earthquake depths for the Tonga Trench in the Pacific Ocean and along the coast of Chile.

(a) Plot a scatter graph of the data on the grid provided: /3

Tonga trench	
Longitude (°W)	Depth (km)
176.2	270
175.8	115
175.7	260
175.4	250
176.0	160
173.9	60
174.9	50
179.2	650
173.8	50
177.0	350
178.8	580
177.4	420
178.0	520
177.7	560
177.7	465
179.2	670
175.1	40
176.0	220

(b) Add a line of best fit through

(c) What type of plate boundary

(d) Draw a diagram in the space moving at the Tonga Trench

2. The diagram below shows the layers of the Earth. Add labels to the solid or liquid to complete the diagram.

3

3. The diagram right shows the Pacific plate and the Nazca plate. The white dotted line shows the location of the plate boundaries The white dashed line shows the location of subduction zones along those boundaries.

(a) Where would you expect to find volcanoes on this diagram? /2

Pacific plate
Nazca plate

(b) Explain why volcanoes form in the places you have indicated in (a): /1

4. (a) Explain why convergent plate boundaries are also destructive plate boundaries: /2

(b) Explain why divergent plate boundaries are also constructive plate boundaries: /2

5. Identify the two images of the volcanoes below as either shield or stato-volcanoes: /3

(a)

(b)

(a) _____

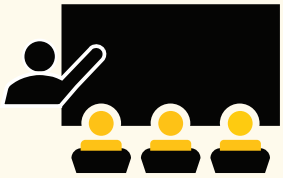
(b) _____

6. Complete the diagram below: /1

Suggestions for Planning, Delivery, and Assessment

Lesson planning

- Refer to the downloadable Teaching Planner while planning. These provide suggestions for delivering content, opportunities to support or extend students, and ways to incorporate BIOZONE's Resource Hub material into teaching. Copy and paste the teaching notes to streamline lesson planning requirements.
- Add interest to your lessons by utilizing the BIOZONE **Resource Hub**. These FREE, resources can easily be incorporated into your planning. We have curated high quality resources to support the content of the activities to save you planning time. Use these as a way to introduce and prepare students for upcoming topics, or to consolidate understanding after lessons. Note: where there are QR codes on activity pages, these link directly to interactive 3D models and add interest to lessons.
- Use the coding in the Teacher's Edition to view where there are opportunities for extension (red flag), collaborations (group icon) or support for math and science practice skills (Need help? icon).



Teaching

- Content delivery is flexible and can be delivered in an order which best fits your teaching plan and sequence. The Science Practices chapter does not need to be taught as a discrete chapter. It has been designed to dip into when, and if, students require support with math or science practices skills.
- Switch up delivery by utilizing the Presentation Slides in our digital platform, BIOZONE WORLD. Students could be encouraged to use the slides to deliver the content themselves, providing an alternative way to engage students with the material.
- Encourage peer-to-peer learning by assigning students to groups of mixed abilities when working in breakout groups or carrying out research.
- Activities that manipulate data using statistical formulas or model data may be supported by fully editable spreadsheets on BIOZONE's **Resource Hub**. Tailor how you use the spreadsheets: for example, students can analyze the spreadsheet model provided, then change the data and observe the outcome. Where applicable, students could add formulae to enhance the model.
- Enhance and extend students' scientific vocabulary by encouraging them to look up unfamiliar words in the glossary and encourage them to use the words as they navigate through the environmental sciences program. Words listed as key terms in the chapter front or written in blue bold on activity pages are defined in the glossary.
- Look to extend capable students by assigning sections or questions from the worktext with a red flag in the margin of the Teacher's Edition. Some material on BIOZONE's **Resource Hub** is also tagged as extension.

Assessment

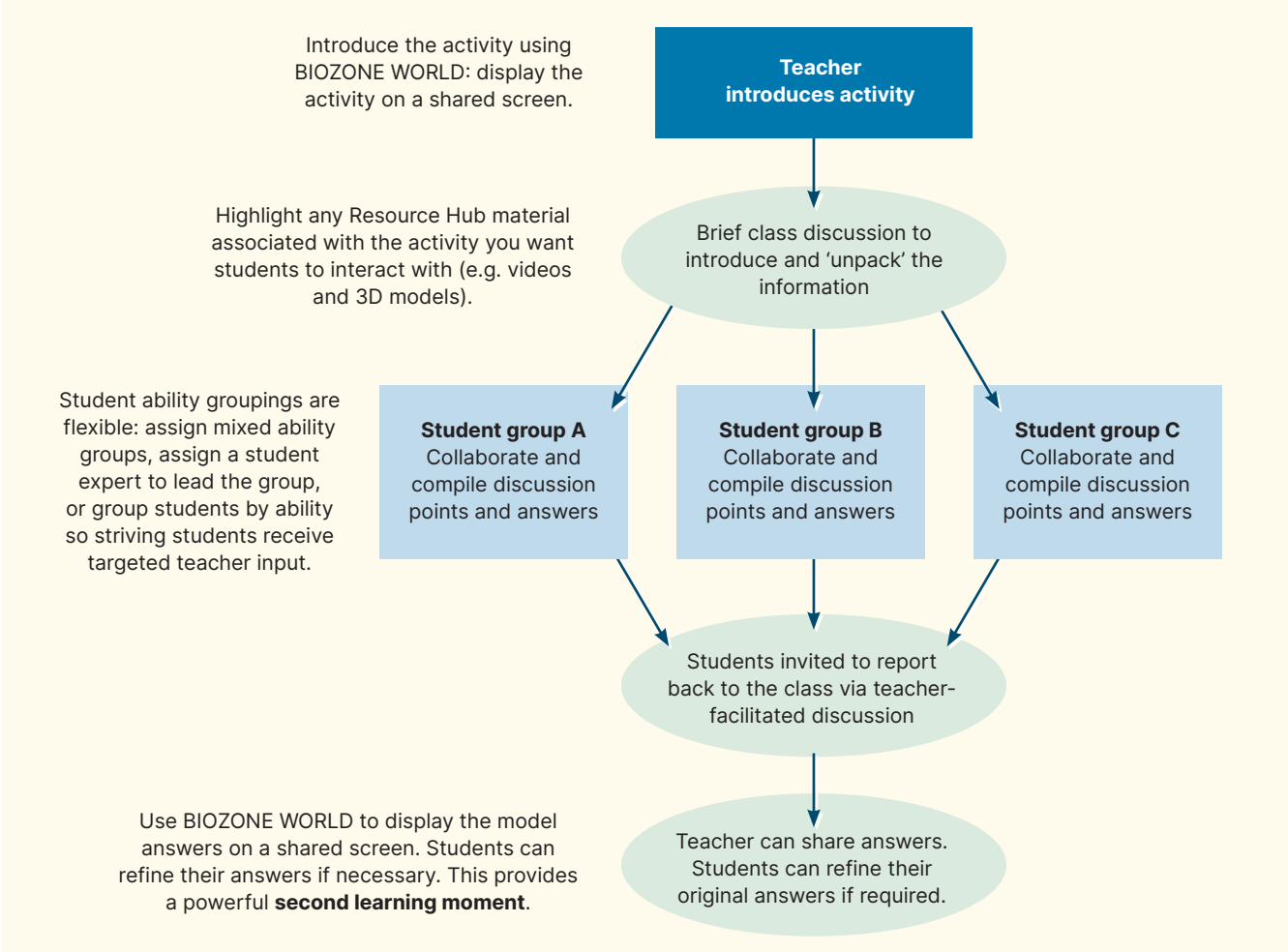
- Provide feedback (formative and summative) to students to update them on their progress. This can highlight areas of strength or areas needing work.
- Select activities as a formative assessment task to identify areas a student or the class needs to revisit before progressing to the next topic or chapter. Methods of formative assessment include reviewing student answers on selected activities or evaluating their contribution to discussions and group work.
- Each set of Presentation Slides contains quiz slides designed to test student understanding of the content just covered. Use these to quickly gauge student understanding and confidence level with the material.
- Use the Did You Get It? assessment tasks at the end of each chapter to assess student understanding. This could be carried out as a test in class. Alternatively, you can set them as homework or open book assessments if you wish. You may wish to use these assessments to identify if there are any gaps or misconceptions which still need to be addressed before moving on.
- Use the additional Summative Assessment tasks (available to download) as a second assessment task after completing a chapter. Students have no prior exposure to these assessments, so they form the basis of a formal testing moment.

Teaching Strategies for Classroom Use

Achieving effective differential instruction in classes is a teaching challenge. Students naturally have mixed abilities, varying backgrounds in the subject, and different language skills. Used effectively, BIOZONE's worktexts and supporting resources can make teaching a mixed ability class easier. Here, we suggest some approaches for delivering content.

Making a start

Regardless of which activity you might be attempting in class, a short introduction to the task by the teacher is a useful orientation for all students. For collaborative work, the teacher can then divide the class into appropriate groups, with ability levels chosen at your discretion. Depending on the activity, the class may regroup at the end of the lesson for discussion or to present their findings, and you may choose to share model answers with the class for marking purposes.



The teacher introduces the topic. They provide structure to the session by providing background information and setting up discussion points and clear objectives. Collaboration is emphasized to encourage participation from the entire group. If necessary, students in a group can be assigned specific tasks.

Students work in small groups so that everyone's contribution is heard. They collaborate, share ideas, and engage in discourse. The emphasis is on sharing ideas, discussing questions, and formulating answers. Students may even come up with additional questions and discussion points.

Students report back on their findings. Each student should have enough knowledge to report back on the group's findings. Reporting consists primarily of providing answers to questions, but may involve presenting a report, model, or slide show, or contributing to a debate. Students can revise their original answers, providing a powerful second learning moment.

Using collaboration to maximize learning outcomes

- The structure of *Environmental Science* allows for a flexible approach to unpacking the content with your students.
- The content can be delivered in a way to support collaboration, where students work in small groups to share ideas and information to answer and gain a better understanding of a topic, or design a solution to a problem.
- By working together to ask questions and evaluate each other's ideas, students maximize their own and each other's learning opportunities. They are exposed to ideas and perspectives they may not have come up with on their own.
- Collaboration, listening to others, and voicing their own ideas is valuable for supporting English language learners to become confident in using English. It also builds and develops English and scientific vocabularies in all students.
- Use a short, informal, collaborative learning session to encourage students to exchange ideas about the answer to a question.
- A collaboration icon (right) indicates where there is an opportunity for students to work together.

Peer to peer collaboration and support

- Peer-to-peer learning is emphasized throughout the worktext, and is particularly valuable for more challenging activities in which the content is more complex or the questions require students to draw on several areas of their knowledge to solve a problem.
- Stronger students can assist their peers and, in doing so, both groups benefit from verbalizing their ideas. Students for whom English is an additional language can ask their classmates to explain unfamiliar terms or ideas, and this benefits the understanding of both parties.
- *Environmental Science* encourages students to think about, and share, what they already know and then build on this knowledge by exploring and explaining new content. This could be carried out in a more formal role. For example, assign groups to work together to complete an activity, to research questions, or design a solution to a problem.

Student A is capable. He helps to lead the discussion and records the discussion in a structured way.

Students B and C are also capable but less willing to lead discussion. They will add ideas to the discussion but need a little direction from A to do so.

Student D is less able but gains ideas and understanding from the discussion of students A, B, and C. She may add to the discussion as she gains confidence in the material being studied.

Extending students

Some students may require extension. We have tagged certain sections or questions in the Teacher's Edition with a red flag (right) in the margin to identify extension material. You can set these tasks for capable students, or all students can attempt them, but some may require additional teacher or peer support to complete them.

We have also identified extension material on the BIOZONE **Resource Hub**. A gifted and talented tag next to a resource indicates it is suitable extension material for students who may want to dive into the content in greater detail.

Reviewing work and providing answers

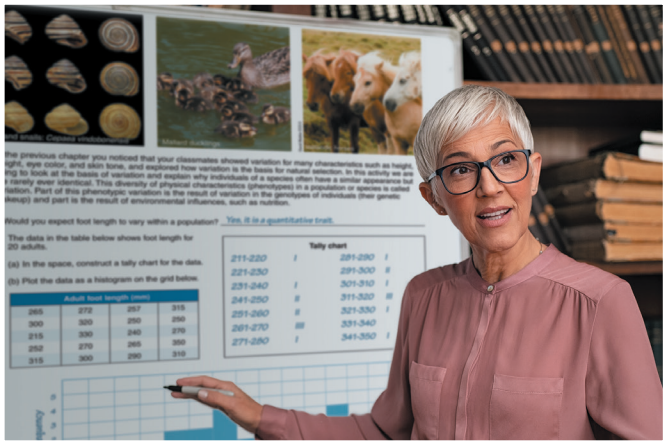
Our worktext approach encourages students to demonstrate their understanding of the content by inputting their answers on the activity page, either by writing it into the printed book or typing answers onto the digital version in BIOZONE WORLD. This approach makes it easy for students to record and share their answer and ideas with other students and their teacher. They can also review their own work or peer-review the work of others. Teachers can easily review an individual's work and see how they are progressing through the content. Model answers are provided for each activity and these can be shared with students at the teacher's discretion. Self reported grading is a powerful tool for accelerating learning (CG4) and should be encouraged where possible. Students should also be encouraged to refine their answers (if needed) and deepen their level of understanding. This enhances the learning moment.

Peer feedback

Dividing students into small groups allows them to share their answers and ideas and receive immediate peer feedback. Sharing ideas and discussing alternative perspectives and solutions can broaden each student's understanding or perspective. Students may or may not come to a consensus answer through this process. Some students may wish to refine their original answer after the discussion.

Class discussion to review answers

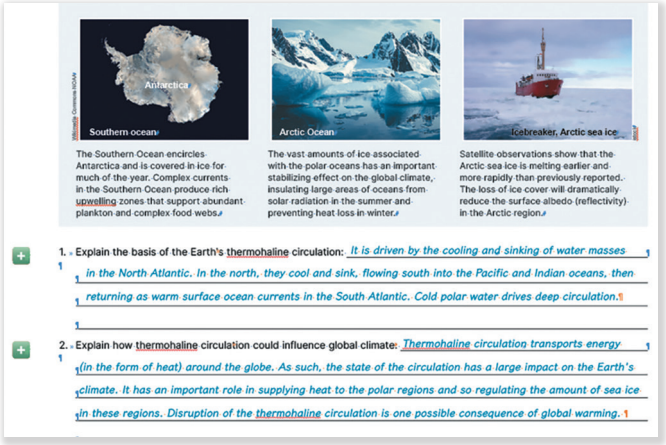
Small groups can partake in collaborative summarizing when brought together as a larger group or class. Students can share ideas and answers through structured discussion, either as a class or within larger groups. The class benefits from hearing a range of ideas, and teachers can guide the discussion to ensure efficient use of time. At the end of the discussion, the teacher may wish to share the model answer with the class.



Review answers in class via BIOZONE WORLD

The teacher view in BIOZONE WORLD has model answers which can be toggled on and off using the show/hide buttons on an activity page. View activities in BIOZONE WORLD on a shared screen and reveal the answers as required. This is ideal for:

- Providing a concise model answer after a group or class discussion.
- Self marking by students. Students can amend their answer if necessary, providing a powerful secondary learning moment.
- Providing a quick review of answers if time is short.



Teacher review of student work

Students using the print version of *Environmental Science* write their answers directly into the space provided on the page. Teachers can revise or grade student responses as required.

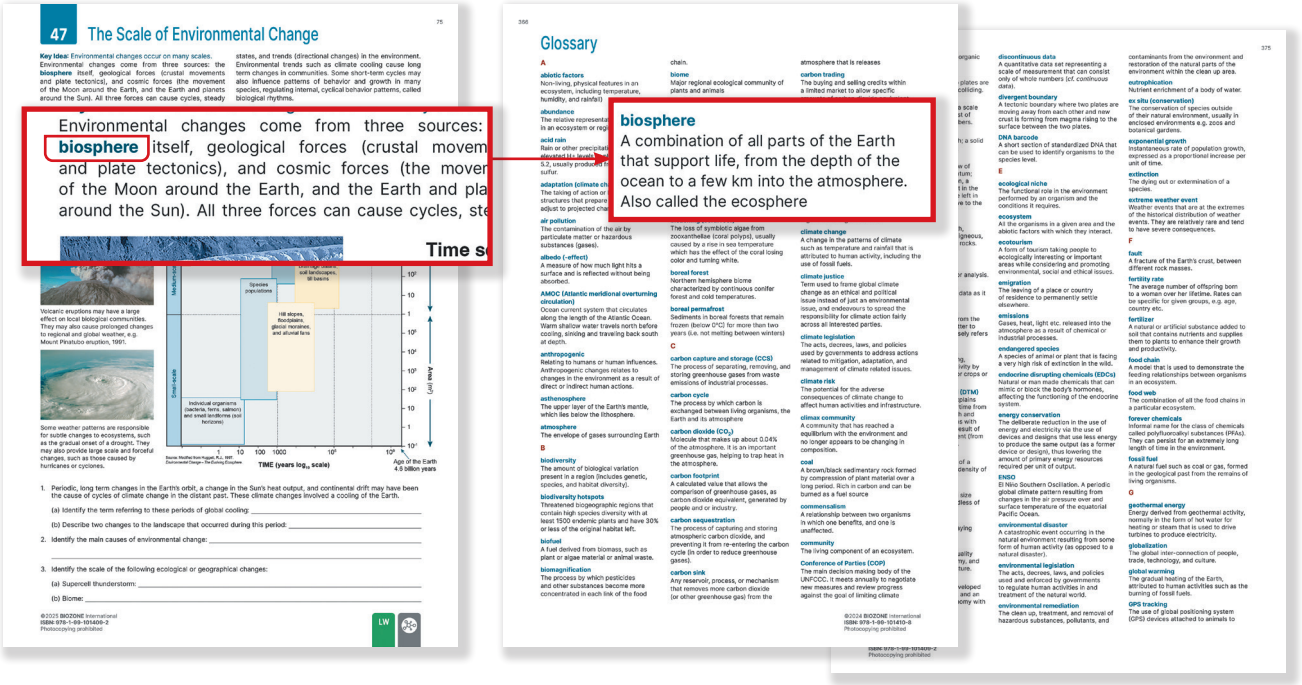
Students using the digital version of *Environmental Science* input and submit their answers via the digital platform, BIOZONE WORLD. Teachers can revise or grade activities as required.

How are Language Skills Supported?

BIOZONE has several support mechanisms in place to support the development of language skills. These include collaborative tasks to build communication and listening skills, and writing answers to provide practice in written skills. The inclusion of a glossary helps to develop the scientific literacy of all students. In the digital version of the worktext (BIOZONE WORLD), a translation function support ELLs in their learning journey. More information on these supports are provided below.

Glossary

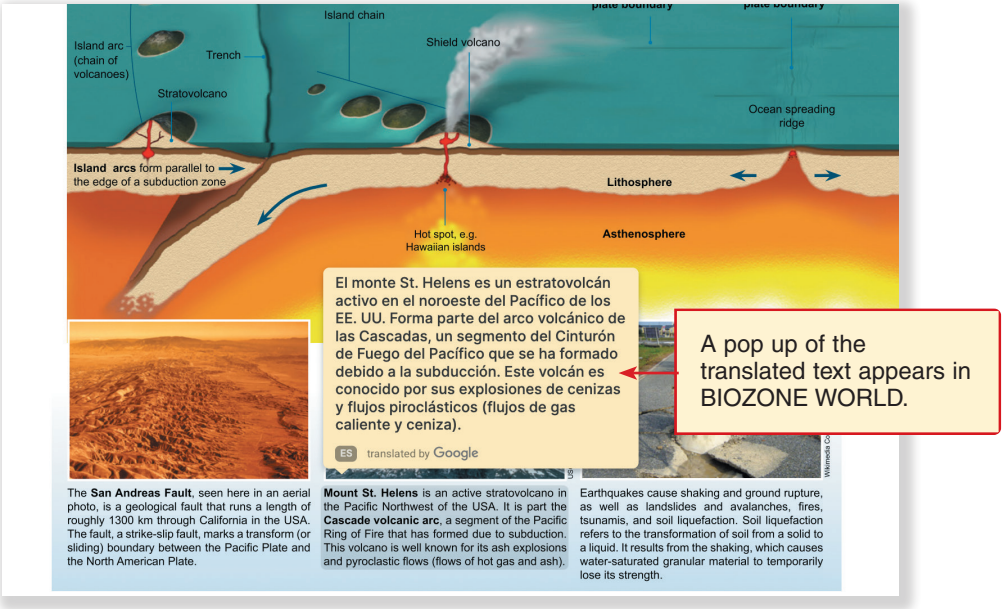
Key terms, which have been **blue bolded** within an activity, are included in the glossary. Key terms are only bolded the first time they appear within an activity.



Translation function

BIOZONE WORLD, our digital platform, provides a translation feature to support students who have English as a second language. The content can be translated into ~150 languages.

Activate the translation feature, choose the desired language, and hover the cursor over the text to translate. A pop-up box with the translated text will appear, while the original English text remains visible. This dual-language view helps students develop their English language skills while providing the comfort of having their first language accessible.



The **San Andreas Fault**, seen here in an aerial photo, is a geological fault that runs a length of roughly 1300 km through California in the USA. The fault, a strike-slip fault, marks a transform (or sliding) boundary between the Pacific Plate and the North American Plate.

Mount St. Helens is an active stratovolcano in the Pacific Northwest of the USA. It is part the **Cascade volcanic arc**, a segment of the Pacific Ring of Fire that has formed due to subduction. This volcano is well known for its ash explosions and pyroclastic flows (flows of hot gas and ash).

Earthquakes cause shaking and ground rupture, as well as landslides and avalanches, fires, tsunamis, and soil liquefaction. Soil liquefaction refers to the transformation of soil from a solid to a liquid. It results from the shaking, which causes water-saturated granular material to temporarily lose its strength.

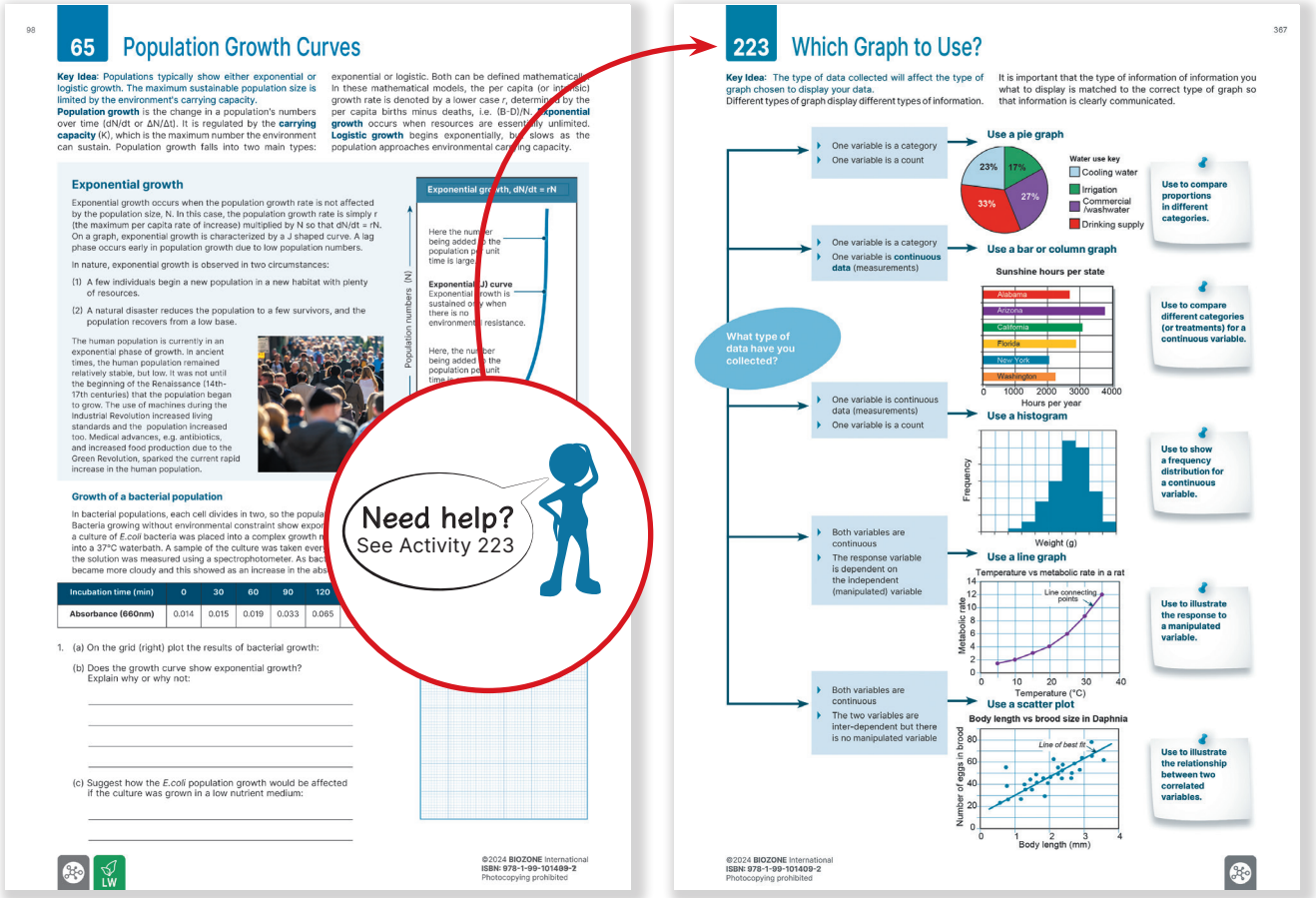
How are Math and Science Practices Supported?

A dedicated Science Practices chapter supports students to competently use fundamental math and science practices needed for their environmental science course. Many teachers use this chapter to provide "just in time delivery" of the skills students need to complete a particular activity. For example, students may be encountering graphing for the first time in the course. They can be directed to the Science Practices chapter to revise the skills needed to select and draw an appropriate graph. The activities in the Science Practices chapter can be set as homework or as a pre-activity in class so students have the skills to progress confidently through the activities.

The Need help? icon (right) alerts students and teachers that support for a skill on the activity page is provided in the Science Practices chapter. The icon will directly reference the activity number for easy navigation.

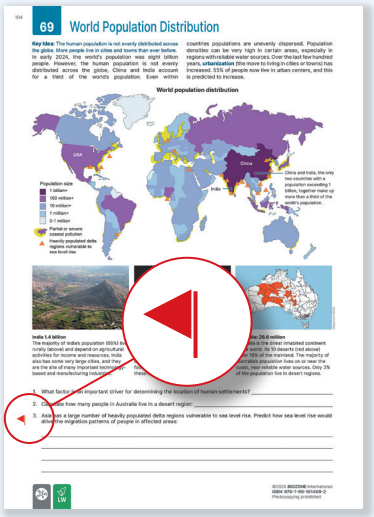
Encourage students to use the support activities often to build their confidence and skill set.

The Need help? icon points directly to the support activity in the Science Practices chapter.

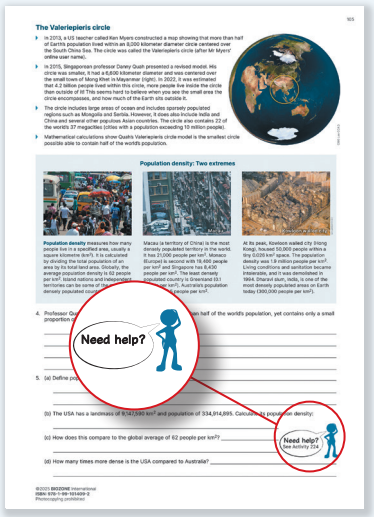


Differentiated Learning Tools

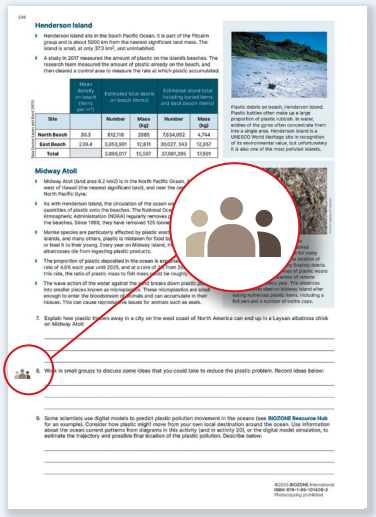
Environmental Science promotes differentiated instruction and has been designed to cater for students with a wide range of abilities. There are several ways you can utilize the tools in the *Environmental Science* program to support differential instruction in your classroom.



Extension Questions:
Red flag icons beside a section or question (in the Teacher's Edition) indicate that the material is suitable for extending more able students. Other students can attempt the material too, but they may need extra guidance from the teacher. **Resource Hub extension**: Some material on the **Resource Hub** is tagged as extension material.

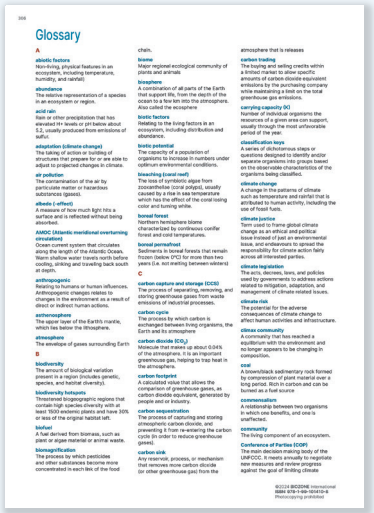


Need Help? Icon:
The NEED HELP? icon identifies where material is available in the Science Practices chapter to support a particular math skill or science practice. Set these activities as a refresher before the students attempt the activity that requires the skill. Encourage students to refer to the Science Practices chapter often.



Collaboration Icon:
A group symbol indicates where students can work together. Group work provides opportunities for student collaboration and peer-to-peer support to explore and develop ideas. By speaking and listening to each other, communication skills and scientific vocabulary are extended.

Resource Hub
BIOZONE's **Resource Hub** supports learners of all abilities and also provides teacher support materials (CG5). Use the videos, games, and animations to help striving learners with their understanding of content. Some material is specifically tagged for students needing extension, or as teacher resources.



Glossary:
A glossary has been provided to help improve scientific literacy. Encourage students to refer to the glossary whenever they are unsure about the meaning of a key term. Key terms are identified by **bold blue text** the first time they appear in an activity. The are also listed in the chapter introductions.