



NATIONAL
GEOGRAPHIC
LEARNING

4

PATHWAYS

SECOND
EDITION

Reading, Writing, and Critical Thinking

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Contents

	Scope and Sequence	iv
	Introduction to <i>Pathways</i>	viii
1	CHANGING THE PLANET	1
2	ON THE EDGE	25
3	BEAUTY AND PERCEPTION	47
4	RETHINKING BUSINESS	71
5	WORKING TOGETHER	93
6	LANGUAGE AND CULTURE	117
7	RESOURCES AND DEVELOPMENT	139
8	LIVING LONGER	163
9	TRUTH AND DECEPTION	187
10	IMAGINING THE FUTURE	207
	Vocabulary Extension	231
	Independent Student Handbook	241
	Acknowledgments and Credits	258
	Index of Exam Skills and Tasks	262

Scope and Sequence

ACADEMIC SKILLS

	Unit Title and Theme	Reading Texts and Video	Reading
	<p>1 CHANGING THE PLANET page 1 ACADEMIC TRACK: Environmental Studies</p>	<p>Reading The Human Age by Elizabeth Kolbert (argumentative essay) VIDEO Trees of Life</p>	<p>Focus Understanding Cohesion Understanding Main Ideas and Details, Understanding Infographics</p>
	<p>2 ON THE EDGE page 25 ACADEMIC TRACK: Life Science/Conservation</p>	<p>Reading A Cry for the Tiger by Caroline Alexander (explanatory/persuasive report) VIDEO Tigers in the Snow</p>	<p>Focus Understanding Appositives Understanding Main Ideas and Details, Identifying Problems, Reasons and Solutions</p>
	<p>3 BEAUTY AND PERCEPTION page 47 ACADEMIC TRACK: Art/Sociology</p>	<p>Reading Images of Beauty by Annie Griffiths (expository/classification article) VIDEO Photo Contest</p>	<p>Focus Using a Concept Map Understanding Main Ideas and Details</p>
	<p>4 RETHINKING BUSINESS page 71 ACADEMIC TRACK: Fashion/Business Studies</p>	<p>Reading Changing Fashion by Mike W. Peng (case study article) VIDEO Behind the Brand</p>	<p>Focus Understanding Sentences with Initial Phrases Understanding Main Ideas and Supporting Ideas</p>
	<p>5 WORKING TOGETHER page 93 ACADEMIC TRACK: Life Science/Sociology</p>	<p>Reading The Smart Swarm by Peter Miller (explanatory article) VIDEO Ant Teamwork</p>	<p>Focus Understanding Complex Sentences Understanding Main Ideas, Understanding Purpose, Summarizing</p>

Critical Thinking	Writing	Vocabulary Extension
<p>Focus Inferring an Author's Attitude</p> <p>Recognizing Levels of Formality, Guessing Meaning from Context</p>	<p>Language for Writing Adding information with verbal phrases</p> <p>Writing Skill Writing introductions and conclusions</p> <p>Writing Goal Writing an opinion essay</p>	<p>Word Link <i>ir-, im-, il-</i></p>
<p>Focus Analyzing Point of View</p> <p>Understanding Chronology, Guessing Meaning from Context</p>	<p>Language for Writing Avoiding plagiarism (II) — Referring to sources</p> <p>Writing Skill Researching and note-taking</p> <p>Writing Goal Writing an expository essay</p>	<p>Word Link adjective + <i>economy</i></p> <p>Word Partners <i>distinct</i> + noun</p>
<p>Focus Interpreting Visual Data</p> <p>Personalizing, Synthesizing, Guessing Meaning from Context</p>	<p>Language for Writing Explaining the significance of evidence</p> <p>Writing Skill Planning an argumentative research paper</p> <p>Writing Goal Writing an argumentative essay</p>	<p>Word Partners Words and phrases with <i>life</i></p> <p>Word Link <i>re-</i></p>
<p>Focus Evaluating Research</p> <p>Interpreting, Relating, Guessing Meaning from Context</p>	<p>Language for Writing Introducing results and describing data</p> <p>Writing Skill Summarizing research</p> <p>Writing Goal Writing a research summary</p>	<p>Word Forms Forming nouns with <i>-ance</i> and <i>-ence</i></p> <p>Word Forms Word forms of <i>deceit</i></p>
<p>Focus Reading Literature Critically</p> <p>Interpreting Figurative Language, Making Inferences, Applying, Guessing Meaning from Context</p>	<p>Language for Writing Using a variety of sentence types</p> <p>Writing Skill Writing an analysis of literature</p> <p>Writing Goal Writing an analytical essay</p>	<p>Word Web Words for describing literature</p> <p>Word Web Phrasal verbs with <i>down</i></p>

PREPARING TO READ

BUILDING VOCABULARY

A The words in **blue** below are used in the reading passage. Match the correct form of each word to its definition.

Diplomats and scientists from around the world met to discuss climate issues at the 2016 United Nations Climate Change Conference in Marrakech, Morocco. The conference was **devoted to** discussing the reduction of global carbon emissions, which contribute to global warming. The dominant **perspective** on global warming is that it is a **consequence** of human activities. A **dramatic** increase in carbon emissions in the last several years has had a **profound** effect on the global climate. While most experts agree that it is impossible to completely **eliminate** carbon emissions, they do believe it is possible to cool down the planet.

1. _____ (adj) very noticeable; sudden and surprising
2. _____ (adj) focused only on one thing
3. _____ (v) to remove completely
4. _____ (n) a way of thinking about something
5. _____ (adj) very great
6. _____ (n) the effect or result of an action

► Participants pose for a photo at the opening ceremony of the 2016 United Nations Climate Change Conference in Marrakech, Morocco.



Human beings have altered the planet so much in just the past century or two that we now have a new name for a new epoch: the Anthropocene.

1.1

The word *Anthropocene* was coined by Dutch chemist Paul Crutzen in 2002. Crutzen, who shared a Nobel Prize for discovering the effects of ozone-depleting compounds, was sitting at a scientific conference one day. The conference chairman kept referring to the Holocene, the epoch that began 11,500 years ago, at the end of the last ice age, and that—officially, at least—continues to this day.

“Let’s stop it,” Crutzen recalls blurting out. “We are no longer in the Holocene. We are in the Anthropocene.” It was quiet in the room for a while. When the group took a coffee break, the Anthropocene was the main topic of conversation.

Way back in the 1870s, an Italian geologist named Antonio Stoppani proposed that people had introduced a new era, which he labeled the Anthropozoic. Stoppani’s proposal was ignored; other scientists found it unscientific. The Anthropocene, by contrast, struck a chord. The human impact on the world has become a lot more obvious since Stoppani’s day, in part because the size of the population has roughly quadrupled,¹ to nearly seven billion.

When Crutzen wrote up the Anthropocene idea in the journal *Nature*, the **concept** was immediately picked up by researchers working in a wide range of disciplines. Soon, it began to appear regularly in the scientific press. At first, most of the scientists using the new geologic term were not geologists. Jan Zalasiewicz, a British geologist, found the discussions intriguing. “I noticed that Crutzen’s term was appearing in the serious literature, without quotation marks and without a sense of irony,” he says.

In 2007, Zalasiewicz was serving as chairman of the Geological Society of London’s Stratigraphy² Commission. At a meeting, he decided to ask his fellow stratigraphers what they thought of the Anthropocene. Twenty-one of twenty-two thought the concept had merit. The group agreed to look at it as a formal problem in geology. Would the Anthropocene **satisfy** the **criteria** used for naming a new epoch?

The rock record of the present doesn’t exist yet, of course. So the question was: When it does, will human impacts show up as “stratigraphically significant”? The answer, Zalasiewicz’s group decided, is yes—though not necessarily for the reasons you would expect.

¹If something quadruples, it increases by a factor of four.

²Stratigraphy is a branch of geology concerned with the study of rock layers.

Earth's Geological Timeline

start of the Anthropocene?

Era	Period	Epoch	Millions of Years		
Cenozoic	Quaternary	Holocene	1.5		
		Pleistocene			
	Neogene	Pliocene			
		Miocene			
	Paleogene			Oligocene	2.3
				Eocene	
Paleocene					
Mesozoic	Cretaceous		65		
	Jurassic				
	Triassic				
Paleozoic	Permian		250		
	Carboniferous	Pennsylvanian			
		Mississippian			
	Devonian				
	Silurian				
	Ordovician				
	Cambrian				
Precambrian	Proterozoic		540		
	Archean		2500		
	Hadean		3800 4600		

In geology, **epochs** are relatively short time spans, though they can extend for tens of millions of years. **Periods**, such as the Ordovician and the Cretaceous, last much longer, and **eras**, like the Mesozoic, longer still. The boundaries between epochs are defined by changes preserved in sedimentary rocks³—for example, the emergence of one type of commonly fossilized organism, or the disappearance of another.

PROBABLY THE MOST OBVIOUS way humans are altering the planet is by building cities, which are **essentially** vast stretches of man-made materials—steel, glass, concrete, and brick. But it turns out most cities are not good candidates for long-term preservation: they're built on land, and on land the forces of **erosion** tend to win out over those of sedimentation. From a geologic **perspective**, the most plainly visible human effects on the landscape today “may in some ways be the most transient,⁴” Zalasiewicz observes.

Humans have also **transformed** the world through farming; something like 38 percent of the planet's ice-free land is now **devoted to** agriculture. Here again, some of the effects that seem most significant today—runoff from the use of **fertilizers** on fields, for example—will leave behind only subtle traces at best. Future geologists are most likely to grasp the scale of 21st-century industrial agriculture from the pollen⁵ record—from the monochrome⁶ stretches of corn, wheat, and soy pollen that will have replaced the varied record left behind by rain forests or prairies.

³ Sedimentary rocks are formed from sediment—solid material that settles at the bottom of a liquid.

⁴ Transient describes a situation that lasts only a short time or is constantly changing.

⁵ Pollen is a powder produced by flowers that fertilizes other flowers of the same species.

⁶ If something is monochrome, it is all one color.

The leveling of the world's forests will send at least two coded signals to future stratigraphers, though deciphering the first may be tricky. Massive soil erosion is causing increasing sedimentation⁷ in some parts of the world—but at the same time, the dams we've built on most of the world's major rivers are holding back sediment that would otherwise be washed to sea. The second signal of deforestation should come through clearer. Loss of forest habitat is a major cause of extinctions, which are now happening at a rate hundreds or even thousands of times higher than during most of the past half billion years. If **current** trends continue, the rate may soon be tens of thousands of times higher.

Probably the most significant change, from a geologic perspective, is one that's invisible to us—the change in the composition of the **atmosphere**. Carbon dioxide emissions are colorless, odorless, and—in an immediate sense—harmless. But their warming effects could easily push global temperatures to levels that have not been seen for millions of years. Some plants and animals are already shifting their ranges toward the Poles, and

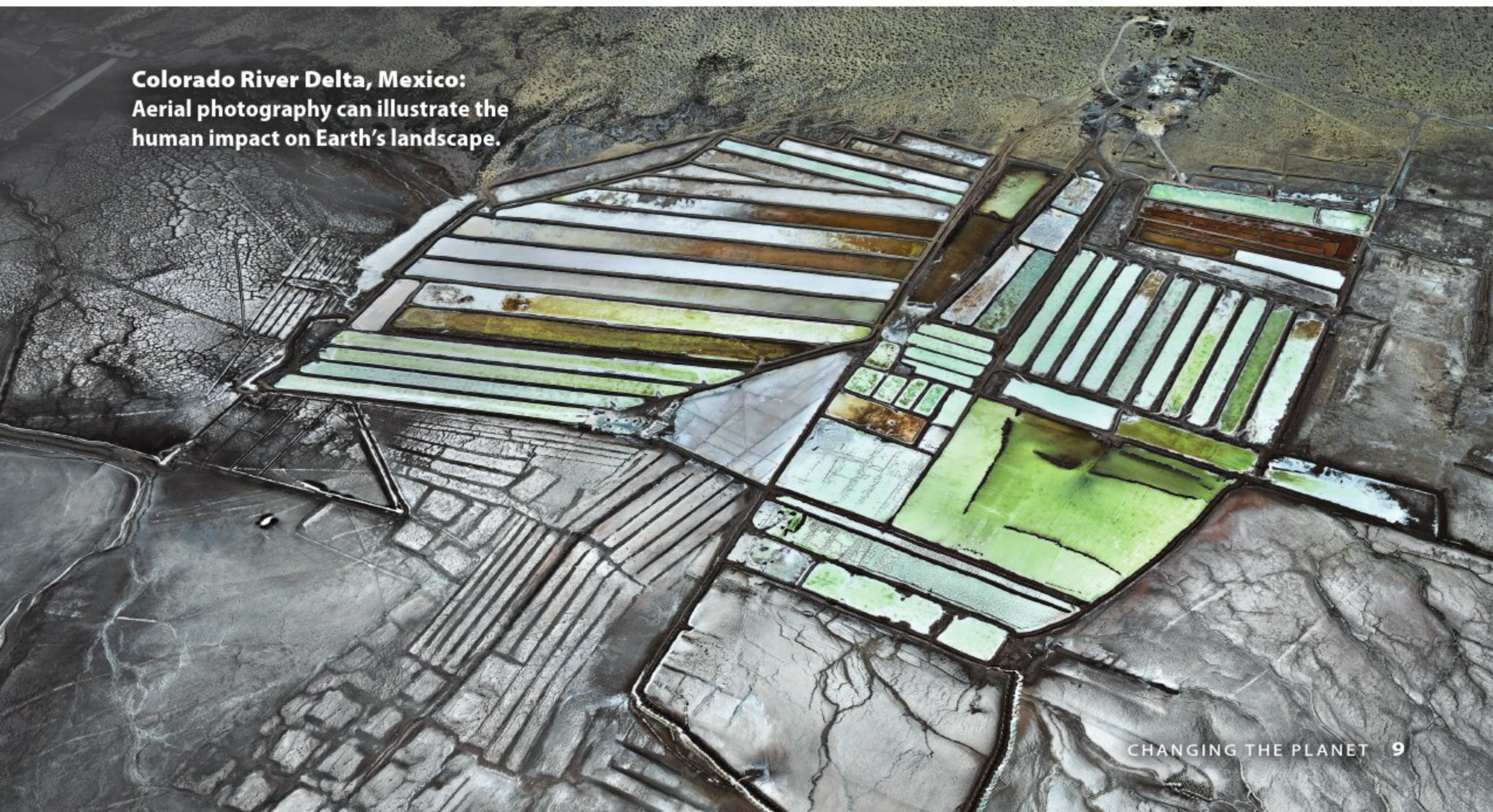
those shifts will leave traces in the fossil record. Some species will not survive the warming at all. Meanwhile, rising temperatures could eventually raise sea levels 20 feet or more.

Long after our cars, cities, and factories have turned to dust, the **consequences** of burning billions of tons' worth of coal and oil are likely to be clearly discernible. As carbon dioxide warms the planet, it also seeps into the oceans and acidifies them. Sometime this century, they may become acidified to the point that corals can no longer construct reefs, which would register in the geologic record as a “reef gap.” Reef gaps have marked each of the past five major mass extinctions. The most recent one—which is believed to have been caused by the impact of an asteroid—took place 65 million years ago, at the end of the Cretaceous period; it **eliminated** not just the dinosaurs but also the plesiosaurs, pterosaurs, and ammonites.⁸ Since then, there has been nothing to match the scale of the changes that we are now seeing in our oceans. To future geologists, Zalasiewicz says, our impact may look as sudden and **profound** as that of an asteroid.

⁷ Sedimentation is the process by which solid material—especially earth and pieces of rock—settles at the bottom of a liquid.

⁸ Plesiosaurs, pterosaurs, and ammonites are extinct prehistoric organisms.

Colorado River Delta, Mexico:
Aerial photography can illustrate the human impact on Earth's landscape.



“ Do we decide the Anthropocene’s here, or do we wait 20 years and things will be even worse? ”

IF WE HAVE INDEED entered a new epoch, then when exactly did it begin? When did human impacts rise to the level of geologic significance?

William Ruddiman, a paleoclimatologist at the University of Virginia, has proposed that the invention of agriculture some 8,000 years ago—and the deforestation that resulted—led to an increase in atmospheric CO₂ just large enough to stave off what otherwise would have been the start of a new ice age. In his view, humans have

Trotternish, Isle of Skye: Millions of years of history are recorded in the rocks of Scotland. Are we creating a new chapter in Earth’s geological history?

