



A Changing Planet


**A highly relevant approach
structured around data literacy**

As the first all-digital course solution, Revel® *A Changing Planet* eliminates the need for a conventional textbook and provides the perfect foundation for an active and highly relevant environmental science course that focuses on key concepts and data literacy.



Flexible, self-contained modules allow instructors to easily assign topics that align with their course syllabus and teaching style. Clearly stated learning objectives are addressed in each module and are reinforced with auto-graded assessment questions.

Populations and Communities



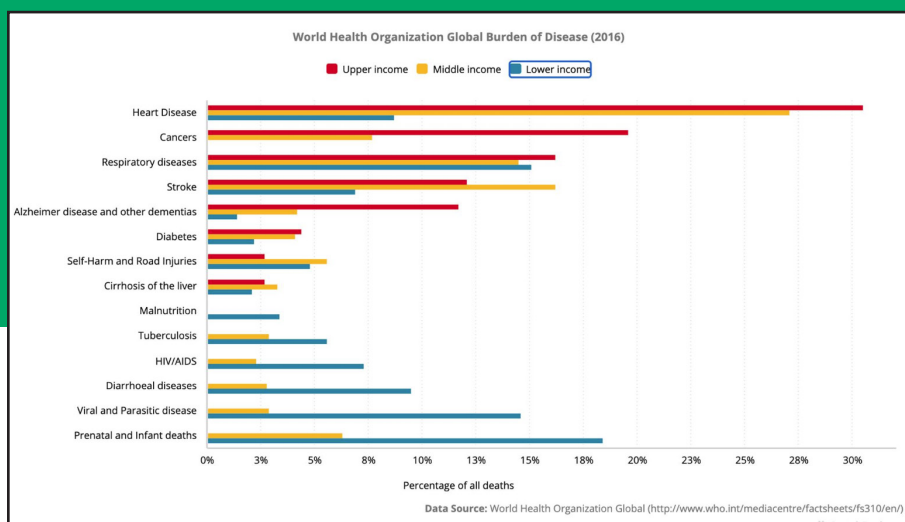
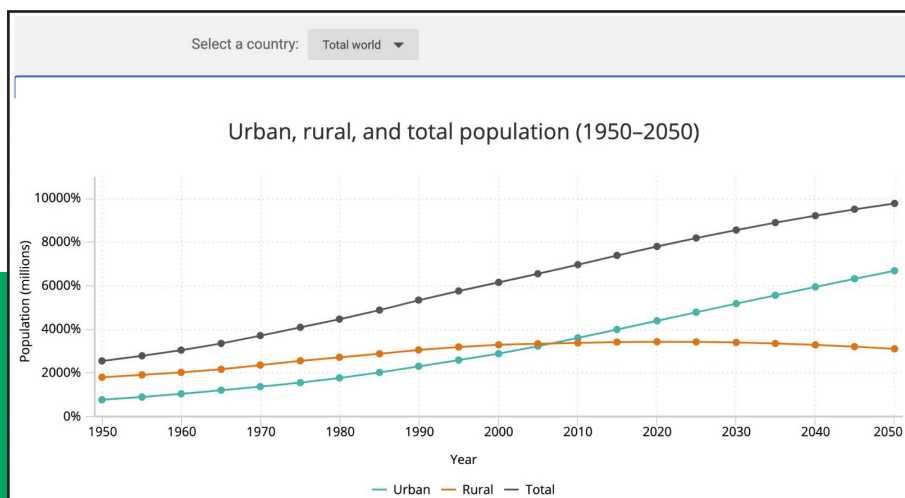
A small herd of impalas and zebras in the African savanna.

Populations and Communities

Biological systems are extraordinarily complex. From the intricate machinery of a single cell to the complex interactions of hundreds of species, the scope of biology can be daunting. Biologists approach this complexity in a variety of ways, but the starting point is generally the recognition of different levels of organization of life on Earth. As a biologist looking out across one of the savannas of Africa, you would see a multitude of different groups of organisms interacting in a variety of ways and immediately recognize patterns that are found in ecosystems around the world. If you had the good fortune to visit the savanna many times, you would know much more about how these groups of animals and plants had changed over time and again would recognize patterns that occur in ecosystems across the planet.

This chapter will cover the following modules:

- Limitations on the Growth and Survival of Organisms
- Populations and Population Growth
- Carrying Capacity
- The Structure of Communities
- Energy Flow through Communities: Trophic Structures and Food Webs
- Changes in Communities over Time



Guided Data Explorations require students to manipulate data to help them develop quantitative reasoning and analytical skills. Each activity guides students to practice data analysis skills using a series of multiple-choice auto-graded assessment items.

Exploring Solutions modules, included in 6 chapters, walk students through how to perform simple calculations around potential solutions to environmental issues such as, How many solar panels are needed to power an entire town?

Exploring Solutions: Meeting Renewable Energy Targets with Solar Power



Why Explore Solutions?
Interested in exploring possible solutions to real environmental problems? Start here! We'll take you step-by-step through how you can use real numbers and some calculations to explore solutions. Your work will provide insight into ways we can move past describing problems and start thinking about how to address them.

What's the Problem?
In recent years, the European Union (EU) has been a global leader in pursuing alternative sources of energy to support their demand. Solar is one of the fastest growing sources of power but only provided about 4% of total EU electricity in 2018.^{1,2} By 2050, the EU wants to use all renewable energy sources, and they want solar and wind to supply 36% of that total.³

To keep this simple, imagine that the EU is moving toward a strictly solar target. While the cost for solar is at or near that of natural gas or wind, one possible issue is the space required to install solar panels to power all of the homes and businesses in urban or high-density areas.

To explore solar as an energy solution in the EU, you can calculate how much land would it take if the EU were to switch to 36% solar energy today.

How much land area in the European Union is needed...

...to meet its solar energy target?

Imagine that solar power will be generated using large, concentrated solar thermal power plants in areas with low population density. You will also assume that solar power can be used anywhere. A few years ago, this would not have been the case, but technology is changing. There are now a number of cost-effective ways to store electricity on the electric grid.

Work through this calculation, it is broken into three steps. At each step, you'll have a question to fill in the correct equation.


Exploring Solutions: Meeting Renewable Energy Targets with Solar Power

Calculations

Step 1
Estimate the amount of energy demand that needs to be met by solar based on the EU's 2018 electricity generation of 12 exajoules (EJ) and the goal of supplying 36% of total energy from solar.

Fill in the equation then click "=" to determine how many exajoules would be met by solar in this scenario.

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 **HINT** Attempt 1 of 3

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The Atmosphere and Air Pollution	Renewable Energy
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Instructor Resources help bring essential content to life and include:

- **Guided Data Exploration worksheets** help students develop data literacy skills and challenge them to think critically beyond the concepts presented in the modules.
- **Test bank questions** are provided for each chapter, cover each part of the Bloom's taxonomy scale, and are organized by learning objective. Approximately 800 assessment items include multiple choice, scenario-based and short answer question types.
- **Class Preparation Resources**, developed as PowerPoint slides to accompany each chapter, present examples that illustrate key concepts and environmental issues. Embedded discussion questions allow instructors to efficiently prepare a relevant and impactful lecture.



About the author

Jason C. Neff is Associate Professor and Director for Undergraduate Studies in the Environmental Studies Program at the University of Colorado at Boulder. Jason has taught the large introductory environmental science course at CU Boulder for over a decade and has experimented with a variety of active learning and new science education techniques in that time. Jason received his BA from CU Boulder and his Ph.D. from Stanford University. Jason is a biogeochemist whose research includes studies of carbon and nutrient cycling on land and in the atmosphere in locations from the Amazon to the Arctic.

Revel

Learn more and explore the content at www.pearsonhighered.com/Revel

Revel offers an immersive, flexible, and entirely digital learning experience that engages students in the Environmental Science course. Concise modules integrate the author's narrative with interactive explorations and assessment questions, allowing students to learn, experience, and understand key concepts without breaking stride. Instead of simply reading about environmental science concepts, students can use Revel to develop data literacy skills and check their understanding with frequent assessment along the way. By providing opportunities to "read a little, do a little" in tandem, Revel ensures that your students are ready to explore the most exciting aspects of environmental science.