WHAT ARE THE CHALLENGES FOR SUSTAINABILITY?

Think about your daily routines and surroundings. What prevents you from leading a more sustainable lifestyle? Working toward sustainability takes time and effort. However, how we approach sustainable living also depends on our living conditions.

In some parts of the world, people’s basic needs are not always met. These needs include having clean water, food, shelter, electricity, education, healthcare, and proper sanitation. The UN encourages all countries to meet the basic needs in life for their citizens first. Then they can look at ways to improve sustainability. There are other challenges to achieving sustainability, including changing population patterns and increasing demands on resources.

DECLINE IN RURAL POPULATIONS

More and more people are moving from rural areas to urban areas. What will happen to sustainability in rural communities as more people leave? Employment opportunities and social interactions may decrease. Meeting people’s basic needs could become more difficult. However, rural planning can help communities manage their resources sustainably (Figure 4.6). For example, rural planners can help communities maintain their roads. Proper roads are important for social interaction and access to jobs. Planners can also make sure that road maintenance does not disturb nearby habitats.

FIGURE 4.6 These farmers in Sierra Leone are working together with a rural farm expert on ways to improve their rice crops.

INCREASE IN URBAN POPULATIONS

Thousands of people are arriving each day in already densely populated cities. Many rural migrants end up living in slums for a number of reasons. In most cases, the cost of proper housing is too expensive. In 2012, the UN estimated that 863 million people live in slums. Over 90 percent of these slums are located in the developing world. However, there are slums in more developed countries as well, such as the slum in Santa Cruz de Tenerife, Spain (Figure 4.7).

Slums are often overcrowded. The housing in these settlements is usually built out of cheap material. Access to clean water, proper sanitation, or electricity can be limited. These conditions are harmful to the environment and people’s health. People living in slums may not have educational opportunities or even a chance to apply for jobs. This is because of the many social barriers associated with living in a slum. These environmental, social, and economic issues make the challenge of urban sustainability difficult to address.
**HEROES IN ACTION**

**ANN MAKOSINSKI: THE HOLLOW FLASHLIGHT**

Having access to electricity is something that many people take for granted. In some parts of the world, however, people do not have access to electricity. They need alternative ways to light their homes. Using battery-powered flashlights is not a sustainable option. Many batteries end up in landfills, where they can leach toxic chemicals into the ground.

Ann Makosinski, a 16-year-old from Victoria, British Columbia, wants to change all that. After hearing about a struggling friend in the Philippines who did not have electricity in her home, Makosinski decided to find a way to help. Makosinski invented a flashlight that uses the thermal energy produced by humans (Figure 4.8). She says, “I chose to investigate human energy when I found out that we are like walking 100-watt light bulbs.”

The body of her flashlight is covered with a strip of Peltier tiles. These tiles produce electricity when one side is heated and the other side is cooled. The Peltier tiles surround a hollow tube through which air can pass. This air cools down the tiles from the inside. When someone holds the flashlight, thermal energy heats the tiles from the outside. The circuit in the tube uses the available electricity to produce light.

Makosinski calls her invention the Hollow Flashlight since it works without batteries. She admits that, at times, the project was very difficult. She never knew, for sure, that her flashlight would work until it did. Makosinski says, “You just kind of have to keep going.”

Makosinski believes that her flashlight will prevent the unnecessary use of batteries. Her flashlight provides a cheap, renewable source of light to those without electricity. In total, the materials for each flashlight cost around $26. They could cost less if the flashlight were mass produced. Makosinski hopes to start a not-for-profit organization that will allow her to provide the Hollow Flashlight to people in developing countries.

**FIGURE 4.8** Ann Makosinski was only 15 years old when she invented a flashlight powered by the thermal energy in the user’s hand.

**A CALL TO ACTION**

1. Renewable energy exists all around us. Research other creative ways that people are harnessing renewable energy.

2. Think of a sustainability problem that you would like to solve. What would be your first step in working to solve it?

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**IMPROVING LIVING CONDITIONS**

Demographers predict that 1.03 billion people will be living in slums in 2020. However, there are many hopeful signs that slum living can become more sustainable. In 2012, researchers from Stellenbosch University in South Africa created the iShack (which stands for “improved shack”). The goal of this project was to create a sustainable living option in slums (Figure 4.9).

For $675, people can buy a shack built from recycled materials. The shack has a solar panel roof to power three lights, a cellphone charger, and an outdoor light. The sloped roof of the iShack can also collect rainwater. The exterior walls are coated with fire-protective paint. The floor is made of solid brick. The iShack is safe and clean, and it gives people more opportunities to connect with their community.

In some countries, such as Morocco, governments are trying to remove slums completely. In 2004, the Moroccan government launched the Cities without Slums program. The goal of this program is to provide more affordable housing in the city. Affordable housing is a smart growth principle for sustainability. Providing safe and affordable housing will help build a city with less environmental impact and better living conditions.

In Morocco, the program to eliminate slums is working. New housing units are being built quickly (Figure 4.10). However, providing all the necessary services for the new homes is still a big obstacle.
REDUCING THE USE OF FOSSIL FUELS

Many settlements around the world depend on fossil fuels for heat and energy. Extracting and using fossil fuels is not sustainable. It creates pollution, and fossil fuels are a non-renewable resource. Investment in renewable energy, such as wind power, will help a country become more sustainable.

Unfortunately, for many countries, economic concerns often outweigh concerns for the environment. Many countries do not have the money to invest in renewable resources, or they depend on extracting fossil fuels to make money. This puts the goals of sustainability out of balance.

Coal is a fossil fuel that powers homes and businesses in many countries. China is one country that is very dependent on coal. Since the country is so large, China consumes 49 percent of the world’s coal. Almost 80 percent of the country’s electricity is powered by coal. China, in turn, also produces the most coal in the world (Figure 4.12).

There are serious environmental and health issues linked to using coal. Toxic pollutants from burned coal can fill the air and people’s lungs. However, in 2014, China pledged to restrict its carbon emissions by 2030. China also announced it would double its use of renewable energy by 2030.

REDUCING FOREST LOSS

Deforestation is occurring worldwide. Forests near growing settlements are vulnerable because of urban sprawl. As well, forests are destroyed to create farmland to feed our growing population.

In many countries, farmers burn or cut down trees so that they can use the soil for farming. Deforestation not only destroys trees and habitat, but it also contributes to climate change. One study found that almost half of the greenhouse gases released in South America, Mexico, and the Caribbean over one year were the result of agriculture and deforestation.

Mexico, Peru, and six other South American countries have committed to fighting deforestation (Figure 4.11). Their goal is to work with communities, farmers, and landowners to plant enough new trees to cover 20 million ha (hectares) by the year 2020. This replanting project, known as Initiative 20x20, is part of a global effort to plant hundreds of millions of trees. Many experts believe protecting and restoring forests is one of the best ways to lower greenhouse gas emissions, improve farming, and reduce poverty across the globe.

INCREASING DEMANDS ON RESOURCES

With the world’s population on a steady increase, settlements will become larger and denser. Careful planning is required to protect the environment as we work to increase Earth’s carrying capacity. How do we balance growing demands on resources with sustainability goals?

I wonder where the money comes from for projects like this?

I wonder if Canada uses coal to produce energy?

Can you explain how planting trees helps the environment and the economy?

Can you explain how planting trees helps the environment and the economy?

I wonder where the money comes from for projects like this?

I wonder if Canada uses coal to produce energy?

FIGURE 4.11 A worker cares for seedlings being grown for Peru’s replanting project. Peru has committed to replanting an area more than four times the size of Algonquin Park by 2020.

FIGURE 4.12 Workers in Jiujiang, China, unload coal from trains. China is the world’s largest producer of coal.
1. **EVALUATE AND DRAW CONCLUSIONS**
   With a partner, review the challenges to sustainability. What other challenges can you identify?

2. **COMMUNICATE**
   Explain to a classmate how declining rural populations affect sustainability.

3. **INTERPRET AND ANALYZE**
   Describe how reducing forest loss can help meet the goals of sustainability.

4. **FORMULATE QUESTIONS**
   Write two inquiry questions a community would need to answer before switching to using only renewable energy sources.

5. **INTERRELATIONSHIPS**
   What is the connection between living in slums and sustainability? Come up with one idea of your own to help slums be more sustainable.

6. **SPATIAL SIGNIFICANCE**
   Why will buses be beneficial in large cities in developing countries?

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### CHANGING DEMOGRAPHICS

Think back to the impacts of growing urban centres on sustainability. Can you think of some other consequences? One result is that more people may be driving cars. For example, in 2026, 37 percent of India’s population may have enough money to buy a car. That statistic represents half a billion people. If many of these people buy cars, it could add millions of cars to city roads. How will this affect sustainability in India?

Some cities in India have started to improve public transit systems to fight traffic and pollution. In 2013, Bhopal was the latest city in India to introduce a bus rapid transit system. Bhopal’s MyBus passengers are charged a maximum fare of 64 cents. The system’s 26 air-conditioned buses travel along a 24 km route, the longest bus route in India. All of the buses can be tracked via GPS for location and speed (Figure 4.14). Hopefully, as more investment is put into efficient transit systems in India and around the world, more people will choose public transit over cars.

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### USING RENEWABLE ENERGY

Every day, the world consumes enough oil to fill 122 million bathtubs, or all the bathtubs in North America! Since 2000, fewer new sources of oil and gas have been found. This means companies have started looking at new sources for oil, like the Canadian oil sands. It is often more expensive to produce oil from these new sources. What will countries do when oil prices continue to increase? What will settlements do when non-renewable energy sources run out? Communities may start to consider investing in renewable energy sources.

Geothermal energy is thermal energy from Earth. It is a renewable energy source that can provide heat for electricity production. Below Earth’s surface, there are sources of steam and hot groundwater, created by Earth’s internal thermal energy. Geothermal groundwater can heat homes, offices, and greenhouses. It can even be used to heat roads and sidewalks in the winter to melt snow. In Iceland, many buildings are heated by geothermal energy. Iceland also has many hot springs (Figure 4.13) that are heated by geothermal energy.

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**FIGURE 4.13** Iceland’s famous Blue Lagoon is near a geothermal power plant, which you can see in the background. Hot groundwater fills the lagoon and is turned into electricity at the plant.

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**FIGURE 4.14** In Bhopal, India, local residents take advantage of low fares to travel about the city. The goal of Bhopal’s bus system is to reduce traffic and air pollution.