

7 AFFORDABLE AND CLEAN ENERGY



ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL

Energy is power: power to do, participate and build. Energy also powers our economy, transportation, health and livelihoods. However, not everyone has access to this kind of power. Harnessing and harvesting energy resources, like wind, solar, water, oil and gas, impacts our environment and the ability for future generations to do the same. This goal seeks to establish sustainable energy systems that reduce our impact on the planet, and address energy inequalities that constrain human and economic development.

TARGETS

- Ensure access to affordable, reliable and modern energy services through new infrastructure and better technology.
- Promote energy efficiency by developing technology that wastes less energy.
- Increase the use of renewable energy sources globally compared with other sources of energy.
- Work together to research and develop renewable and clean energy resources.
- By 2030, infrastructure and upgrades in developing countries will be expanded to supply modern and sustainable energy services to everyone.

“Some solutions are relatively simple and would provide economic benefits: implementing measures to conserve energy, putting a price on carbon through taxes and cap-and-trade and shifting from fossil fuels to clean and renewable energy sources.”

David Suzuki

Canadian environmental activist



LEARNING OBJECTIVES

- 1 Learners will understand different energy resources – both renewable and nonrenewable – and their advantages and disadvantages regarding environmental, health, safety, and sustainability issues.
- 2 Learners will understand what energy is used for in different regions of the world.
- 3 Learners will understand how policies can influence the development of energy production, supply, demand and usage.
- 4 Learners will be able to communicate the need for energy efficiency and sufficiency.
- 5 Learners will be able to apply and evaluate measures in order to increase energy efficiency and sufficiency in their personal spheres of influence.

CURRICULUM CONNECTIONS

Media

What do you need to know to be critical of media stories about energy usage and conservation?

Environment

What are the impacts of energy overconsumption on our environment?

Poverty, Wealth and Power

How is energy usage related to the poverty cycle?

Indigenous Peoples

What are the experiences of Indigenous Peoples in relation to energy development?

Oppression and genocide

What happens to energy supplies during times of conflict?

Health and biotechnology

How are health and technology impacted by energy consumption?

Gender politics

How is energy usage a gendered issue?

Social justice and human rights

Should energy access become a human right?

Peace and conflict

What are some examples of conflict and resolution over energy resources?



THE BIG QUESTIONS

1 Where did it begin?

- The central issue surrounding our energy crisis revolves around the concern that the world's demand for natural resources is greater than the supply that we have. It takes hundreds of thousands of years to replenish the supply of **fossil fuels** we have been using to power our cars, charge our phones, and light up our cities. We use fossil fuels, such as coal, oil, or gas, through combustion to make power. At the same time, this combustion process generates large amounts of **greenhouse gases** and other kinds of pollution.
- Overconsumption, overpopulation, poor infrastructure, unexplored renewable energy options, energy wastage, natural disasters, and political events all contribute to imbalances in our energy supply and the deterioration of our ecosystems to obtain and dispose of these resources.
- By-products of energy use like CO₂, oil spills and greenhouse gases accelerate **climate change** and impact the well-being of our planet and its population. If we don't develop and use a sustainable and stable energy supply, countries will not be able to power their economies.
- The solution to ensuring we have enough energy lies in **renewable resources**. The rise of modern day environmental movements campaigning for these renewable energy resources began in the 1960s and 70s. Renewable resources are derived from resources that can be replenished sustainably and with less negative environmental impacts, such as hydro, solid and liquid biofuels, wind, sun, geothermal and marine sources.
- A **non-renewable resource** is a resource that cannot be readily replaced by natural means on a level equal to its consumption. Fossil fuels like oil, natural gas, and coal are not sustainable because they take billions of years to make.
- Our global total renewable energy consumption has increased slowly, from 17.4 per cent in 2000 to 18.1 per cent in 2012. More telling is the fact that modern renewable energy consumption, which excludes solid biofuels used for traditional purposes, grew rapidly, at a rate of 4 per cent a year between 2010 and 2012, and accounted for 60 per cent of all new power-generating capacity in 2014.¹

2 Why does this issue matter?

● Energy needs to be cleaner

Without access to clean energy sources in the home, the number of people relying on polluting fuels and technologies for cooking, such as solid fuels and kerosene, has increased, reaching an estimated three billion people. More than four million people die prematurely from illnesses caused by household air pollution, often from wood- or solid fuel-burning stove.² In addition, fuel gathering consumes a considerable amount of time for women and children in particular, taking away from school and work. Education and community level programs that help design and implement healthy fuel alternatives are essential to addressing this risk.



- **Energy needs to be more affordable**

Alternatives to fossil fuels are essential to reducing our carbon footprint and the improving the health of our planet. However, the cost for governments and communities transitioning and developing new energy infrastructure, such as photovoltaic panels and wind turbines, can act as a barrier to implementing them in low-income situations.

- **Energy needs to be more reliable**

Blackouts are a daily occurrence in many countries in the Global South, where electricity generating capacity is often underfunded and infrastructure may be poorly managed. When demand is accurately forecasted and the equipment and infrastructure needed to manage supply and access are maintained, we can ensure people won't be left in the dark.

- **Energy needs to be more sustainable**

The world's population is growing, and people are seeking a higher standard of living. In order to supply this demand, we need to find ways of producing energy that creates less waste, lowers CO₂ emissions and reduces the negative effects of climate change.

3 Who and what are affected?

- **The Environment**

Greenhouse gases are emitted by natural processes and human activities. However, human-driven releases of greenhouse gases are likely the dominant cause of global warming since the mid-20th century. The impact of increased greenhouse gases in our atmosphere has contributed to a rise in annual temperatures, decreases in sea ice coverage, increases in drought from heat waves and lost **biodiversity** from warmer climates.³ Close to home, Canada's northern ecosystems are particularly vulnerable to these changes. And what happens elsewhere on our planet ultimately impacts us all in the end.

- **The Global South**

Over 1.2 billion people—one in five people of the world's population—do not have access to electricity. The majority are concentrated in about a dozen countries in Africa and Asia.⁴ Another 2.8 billion people rely on wood, charcoal, dung and coal for cooking and heating, which results in over four million premature deaths a year due to indoor air pollution.⁵ Regions with the greatest energy deficits—Sub-Saharan Africa and South Asia—need assistance improving energy access, reliability and sustainability. Doing this will help us ensure clean, efficient and affordable alternatives to health-damaging cook stoves and fires.

- **Women and Girls**

The quest for reliable energy is a gendered issue. Without electricity, women and girls have to spend hours fetching water and more time cooking, clinics cannot store vaccines for children, many school children cannot do homework at night, and people cannot run competitive businesses. Women and girls are often largely responsible for food preparation in the home, and suffer most of the effects of indoor air pollution. Increasing energy access and reliability requires an understanding of how socio-cultural gender norms impact women and girls.



4 What needs to be done?

- At a national level, countries can accelerate the transition to affordable, reliable and sustainable energy systems by investing in renewable energy resources, prioritizing energy efficient practices and adopting clean energy technologies and infrastructure. Governments are already putting in place policies to reduce GHG across different sectors of the economy and in household use. The Pan-Canadian Framework on Clean Growth and Climate Change was implemented in 2016 to support the Sustainable Development Goals to reduce Canada's emissions.
- Businesses need to maintain and protect ecosystems to be able to use and further develop hydropower sources of electricity and bioenergy, and commit to sourcing 100 per cent of operational electricity needs from renewable sources.
- Employers can reduce internal demand for transport by prioritizing telecommunications and incentivizing less energy intensive modes such as wind-powered trains over auto and air travel. Investors can invest more in sustainable energy services, bringing new technologies to the market quickly from a diverse supplier base.
- On an individual level, we can save our resources by reducing the amount of energy we use. We save electricity by plugging appliances into a power strip and turning them off completely when not in use, including computers. We can also bike, walk or take public transport to reduce carbon emissions.

“ The climate challenge illustrates how we have to change. The developing countries need more support and opportunities to develop and use clean energy. Because if the current situation continues, then the world will not be able to handle this burden. ”

Gro Harlem Brundtland

Prime Minister of Norway and former director general of the World Health Organization



CONNECTION TO THE OTHER GOALS



When clean energy sources are limited, it is often women and children, particularly girls, who bear the brunt of gathering fuel and cooking for the family. In this way, addressing energy access and reliability, we are undertaking a mission of gender equality. Access to affordable and clean energy improves education, whether by powering classrooms or homes so children can study.



Through overconsumption and overpopulation, our industrial efforts for resource extraction are negatively impacting our **natural ecosystems**. Controlling our emissions are a means of reducing our climate impact. When we stay conscious of how we are contributing to greenhouse gases through our actions and policies, we are committing to safeguard the biodiversity and sustainability of our planet.



Building resilient infrastructure while undertaking sustainable industrialization incorporate a focus on sustainability, reduced emissions and renewable energy sources. How we develop, produce and consume goods is interwoven with how we produce and use energy.



Consequences of Inaction

- With a growing population and increased standard of living, our consumption of energy is only going to go up from here. If we fail to curb our emissions and invest in renewable resources today, we will likely see ourselves facing an energy crisis like never before in the future. Reaching a point of peak oil consumption will result in the full depletion of this resource, causing incredible downturn for resource dependent industries. Additionally, we can expect to see economic downturn at local, national, and international levels as well as a rise in food costs.
- Environmentally, the sustained use of fossil fuels will only increase the impacts of climate change. Rising ocean levels, increased temperatures and increased extreme climate events will have negative impacts on the resilience of our ecosystems and the biodiversity of the species living there. And of course, what happens to our environment ultimately impacts us, making environmental inaction a singularly destructive force.

REFLECTION AND ACTION QUESTIONS

- 1 How do you feel about the issue now that you know more about it?
- 2 How might this issue have been prevented? What could have been done differently?
- 3 How has this problem changed over time? Where do you see it going in the future?
- 4 What questions do you still have?

“Nature is inexhaustibly sustainable if we care for it. It is our universal responsibility to pass a healthy earth on to future generations.”

Sylvia Dolson
Naturalist and photographer



RESOURCES

How to take action

- **Reduce energy use.** Adopt energy-saving habits. Remember to turn off the lights when you leave a room. Another top tip is turning off your computer and unplugging electronics when they're not being used.
- **Stop the drop.** Reduce your water consumption by fixing any drips or leaks in your house. Turn off that tap between brushes. Conserving water helps reduce energy and carbon emissions.
- **Recycle.** Choice is our best tool to ending our energy crisis. If we choose to recycle, buy items with minimal and recyclable packaging, and dispose of electronics in an environmentally responsible manner, we can do our part to minimize our ecological footprint.
- **Repurpose.** It takes energy to produce, transport and house new products. Give your clothing or household goods a second chance at life by donating them to charity or exchanging with friends. Turn your t-shirts into rags, or donate your old toaster to a garage sale or organization in need. We can do our part to reduce waste sent to landfill sites while others benefit from our goods.
- **Plant for the planet.** When finding plants for your garden, choose ones that are well suited for the climate and uses less water. Even better, plant a tree and reduce the amount of CO₂ in the atmosphere.
- **Turn off what you're not using.** Look at how your classroom, school, and community use energy and explore what actions could help reduce energy used. Have one day a week where you use natural light in the classroom rather than electricity. Turn off individual printers and other equipment at night and on the weekends. Enable energy saving modes on electronics used in the classroom such as computers or tablets.
- **Buy and use energy efficient products** such as lightbulbs, appliances or transportation methods.
- **Explore different ways to live your life more energy efficiently.** Different methods include saving energy, conserving water, reducing waste and travelling smarter. Take ideas from the [Australian Government's Energy Saving](#) or [Global Action Plan!](#)
- **Challenge the big companies to take action.** Clean and affordable energy is possible, even for large companies. Investigate the companies you interact with the most and see how they are doing their work and how they could be working within a more energy efficient model. Engage with businesses, local and national governments and your fellow community members and take action by demanding energy efficient and renewable energy solutions.



Educational resources

- Visit the World's Largest Lesson to explore [teaching resources](#) for sustainable energy and renewable resources.
- Learn how to [teach students about your local energy grid](#) and discover how to reduce your impact from Hydro Manitoba.
- [Energy Hog](#) is an online resource for both teachers and students that focuses on reducing energy waste through activities. Students will learn good energy-saving habits, bring lessons home to help their families, and learn to protect natural resources for future generations. Teacher and student guides and workbooks, posters and materials, assembly plans and [interactive online games](#) are all available.
- Explore the [EduKits](#) from Let's Talk Energy, an initiative of Ingenium: Canada's Museums of Science and Innovation. [Energy for Tomorrow](#) (Grades 4 to 6) allows students to explore how energy is produced in today's world through activities on the basics of electromagnetism and renewable electrical energy sources. [Alternative Energy and Green Vehicle Technologies](#) (Grades 9 and up) includes hands-on activities that allow students to create a fuel-cell vehicle.
- [Save The World](#) is an interactive online game that addresses the world's energy supply crisis. Students learn about different power sources, alternative energy and how we generate electricity to power our lives.
- Looking for ways to save energy costs and reduce your carbon footprint? Powerhouse TV has over [100 ways](#) for you to do just that.
- [Renewable Energy: How can we keep the lights on?](#) is a resource developed by the British Council in partnership with the Royal Society. It includes an overview of the importance and science of renewable energy as well as three activities, one of which has students build basic windmills and then investigate how they can be more efficient.
- Play [Serious Game](#) by [2020 Energy](#), a game that introduces energy issues through sustainable development. The online interactive game covers the topics of saving saving, energy efficiency and renewable energy through three levels, individual, local and global. The resource also includes a teaching sheet and lesson plan that outlines an introduction, play & debate stage, assessment and further discussion.

“ We simply must balance our demand for energy with our rapidly shrinking resources. By acting now we can control our future instead of letting the future control us.”

Jimmy Carter
US president and
humanitarian



CASE STUDIES

1 William Kamkwamba

In 2009, fourteen-year-old [William Kamkwamba](#) dreamed of bringing electricity and running water to his small village in Malawi. His community was plagued by droughts, which killed thousands of people and left his family on the brink of starvation. Fascinated by science, he taught himself how to build a windmill to make electricity and pump water for the 200 villagers in his community. He gained global attention through the media and became an activist for **informal education** and small-scale sustainable energy investment.

2 Indigenous Energy Independence

Many of Canada's Northern communities depend on diesel-generated electricity brought up from the South. This can create a problem of pollution from emissions and transportation. Daniel T'seleie, an Indigenous activist from Behchoko, Northwest Territories and founder of [Dene Nahjo](#), has been developing solutions for Indigenous communities to gain energy independence while combating climate change. Through government investment and public and private support, improvements to solar power capacity and storage have begun to harness the territory's ample summer sunlight to store for the winter. With these investments, diesel consumption is expected to be reduced by 30 per cent.

3 Wyke Farms

Fancy a little green cheese with your green eggs and ham? [Wyke Farms](#) in the UK is serving up the first slice of sustainable cheese - they are the first national cheese brand to be 100 per cent self-sufficient in solar and biogas energy. **Biogas**, or fuel made from combusting raw materials and organic matter, is made from cow manure and leftover whey. Their investments in water recovery have also been able to save 90 per cent of the water used in the factory.

4 Canadian Lutheran World Relief

Using charcoal burning stoves in close quarters can cause serious health damages to the human respiratory system. However, for many marginalized groups, like refugees, charcoal and informal shelters are all they have access to. [Canadian Lutheran World Relief](#), is working to reduce vulnerabilities resulting from the use of firewood for cooking fuel among refugees in Bambasi Camp, Ethiopia. The refugees receive training and material to use environmentally-friendly bio-gas stoves which do not require women to collect firewood, a task which puts them at risk of physical attack.



5 Providence University College and Seminary

Biochar is the process of adding charcoal, usually from burned plant matter, to increase soil fertility, lower soil pH, increase agricultural productivity and protect against soil-borne diseases. [Providence University College and Seminary](#) is working to help refugees in Uganda use biochar production as a start-up business. The business will provide employment for people in an area where few jobs are available, while using local resources to create local products and supply a local market in the Kyaka II refugee settlement.

6 Hawaii Portable Classrooms

[Hawaii Portable Classrooms](#) are making a wave in the education sector. Designed by Anderson Anderson Architecture, the classrooms provide a healthy educational environment, while minimizing energy use through careful use of natural daylight and ventilation. The portable classroom simultaneously use photovoltaic panels to generate more power than they consume. The portable classroom conserves, as well as collects and generates natural resources, including electrical energy, daylight, wind energy, and rainwater. With this innovation in alternative spaces and energy, students are able to learn in the building and from it at the same time.

End notes

¹<https://unstats.un.org/sdgs/report/2016/goal-07/>

²<http://www.who.int/mediacentre/factsheets/fs292/en/>

³<https://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=D4C4DBAB-1>

⁴http://www.un.org/sustainabledevelopment/wp-content/uploads/2016/08/7_Why-it-Matters_Goal-7_CleanEnergy_2p.pdf

⁵http://www.un.org/sustainabledevelopment/wp-content/uploads/2016/08/7_Why-it-Matters_Goal-7_CleanEnergy_2p.pdf