Marina Robles, Emma Näslund-Hadley, María Clara Ramos, and Juan Roberto Paredes

Module 4

Energy

Savings, Efficient Use, and Alternative Technologies

IDB

Rise Up Against Climate Change!
A school-centered educational initiative
of the Inter-American Development Bank

Rise Up

Against Climate Change

A school-centered educational initiative of the Inter-American Development Bank

Elaborated by Maria Robles, Emma Näslund-Hadley, María Clara Ramos, and Juan Roberto Paredes.
Editor: Steven Kennedy.
Design and illustration: Sebastián Sanabria.

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Modules in the Toolkit

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Contents of module 4


Rise Up
Against Climate Change

Identifying the problem

How much energy do you think is needed to light and mobilize all the machines and devices operating on the planet? Have you ever thought that by turning on a light in your house or school you are impacting the environment and emitting gases into the atmosphere?

Energy is an essential component of our lives. Omnipresent and invisible as it is, we often forget that our basic, everyday activities depend on it.

To move the goods we consume from one place to another, we use energy-fueled vehicles. If we are cold, we activate a heater; if it is hot, we use air-conditioning or a fan. We are surrounded by gadgets and machines that require energy to operate and to meet our needs.

For any good that we consume, some kind of energy is used for machines to manufacture it, for vehicles to transport it, for lights to display it. Much of the energy consumed is in the form of fossil fuels. Sixty-six percent of the world's electricity—one of the most commonly forms of energy that we consume—is generated from fossil fuels, with their corresponding emissions of local pollutants and greenhouse gases (GHGs).

Strangely enough, despite the large quantities of pollutants involved in making electricity, when we turn on a light or an electrical appliance, we erroneously regard it as "clean" just because it appears so.

Circulation patterns in the atmosphere

Because of circulation patterns in the earth's atmosphere, we all share pollution.

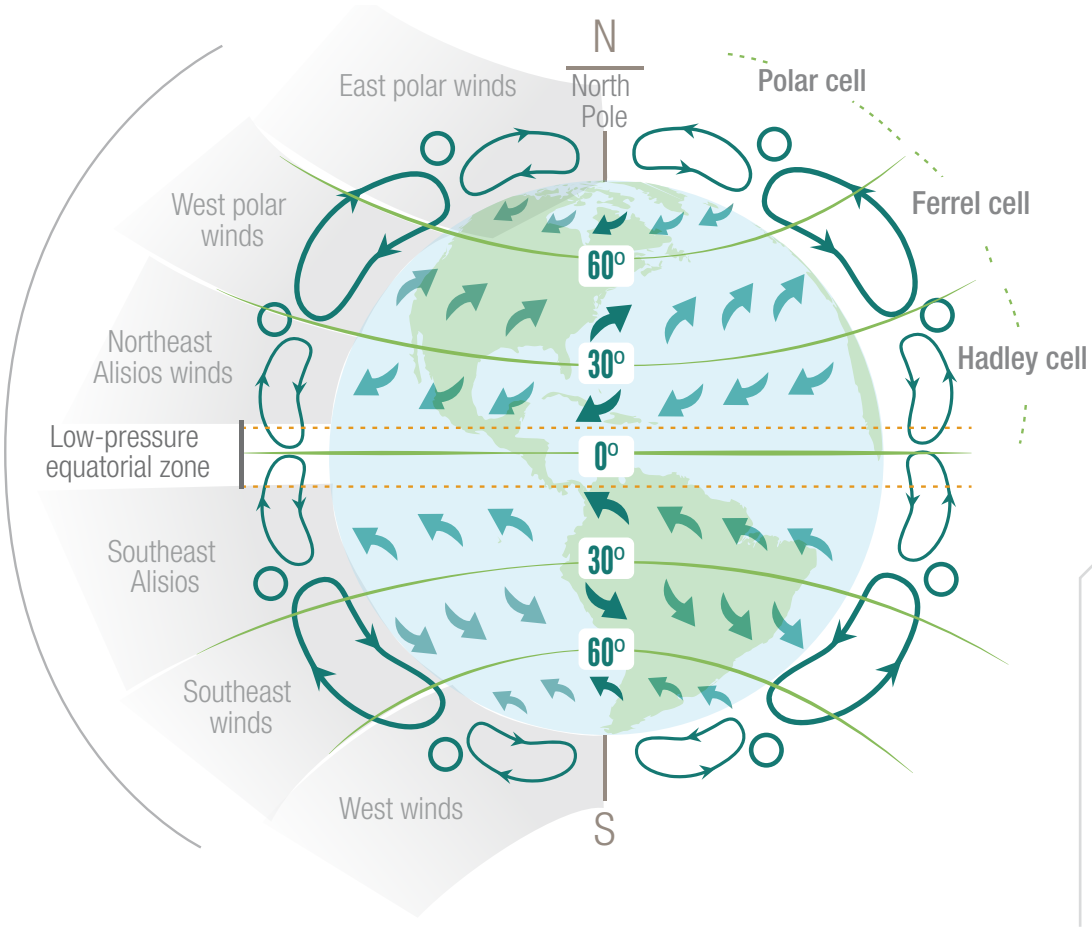


Figure 1. Circulation patterns in the atmosphere

In recent decades, increased consumption of energy for transportation, industrial activity, and the processes of everyday modern life have caused levels of GHGs to rise, with consequences for the global climate. Although the same amounts of contaminants are not released in all parts of the planet, we all share the same atmosphere. The actions of each of us affect all.

Solutions to problems as large and complex as this demand action. Many countries, cities, and citizens are realizing this, but the challenge is not simple. It requires us to improve or switch fuels, lower our reliance on the automobile, change the ways we use electrical and gas appliances, and, of course, integrate nonpolluting alternative technologies—those that come from renewable energy sources such as water, air, and the sun—to produce the energy we can't stop using.

Making a change in your school

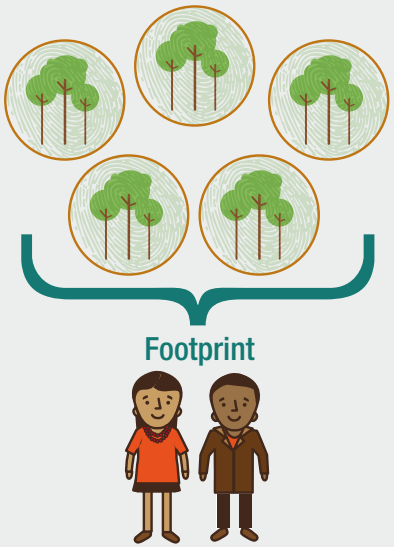
In schools—as in other spaces of human activity—goods such as water, energy, and space are needed, in this case to carry out educational activities.

Meeting each one of these needs leaves an impact on nature that we can and need to reduce in order to mitigate harmful climate change. Even though schools in Latin America are not necessarily the region's major generators of GHGs, their energy conservation will contribute to the global good immensely. Smart use of natural resources will give us clean air and water, and productive land.

If environmentally responsible actions to lower emissions are learned and practiced at school, students can transmit this knowledge to their families and to their children in the future, thus preparing future generations for the challenges of climate change.

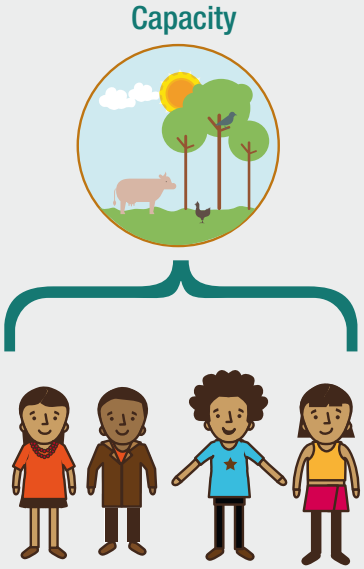
Box 1.
The ecological footprint and ecosystem capacity

The ecological footprint and ecosystem capacity are closely related concepts. While the ecological footprint refers to the amount of land and resources that people, communities, or countries need to keep up current lifestyles, ecosystem capacity refers to the organic needs (for food, space, air, water, and so on) that a particular ecosystem can adequately sustain. Factors such as air pollution and decomposing waste can seriously compromise this capacity.



Footprint

What people need to maintain their lifestyles



Capacity

Number of individual lifestyles an ecosystem can sustain

Diagnosis

A school's energy use can be measured in several ways. We suggest (i) calculating the carbon footprint (measuring GHG emissions from daily activities),(ii) recording each form of energy used by the school community, and (iii) measuring the consumption associated with traditional forms of transportation to and from school.

Measuring your school's carbon footprint is useful for comparison with other institutions worldwide and lends a global perspective on your school's energy consumption.

Several websites can help you calculate your carbon footprint. Conducting this exercise is useful, since it helps us understand the pressure that we humans are exerting on the planet. It will also be helpful to invite your colleagues—both students and teachers—to perform a similar exercise.

In the curriculum development manual that comes with this kit, there is a calculator for this environmental performance indicator

Estimating your school's energy use

To raise the awareness of the group of colleagues or students with whom you wish to undertake this project, conduct a group survey that tests how much you and your colleagues know about energy-related issues in your town and school. This can be done during class or in a teachers-only meeting. A sample survey is provided in table 1.

To learn more about how energy is used in the school, conduct an inventory of all energy-using equipment. Take a tour of the school and record your findings. The tour can be conducted in one organized group or by several individuals or teams covering specific areas of the school, followed by a meeting in which the results are shared. The sample questionnaire provided in table 2 distinguishes between electric and gas appliances; table 2 depicts an inventory of lighting systems, with some examples showing you how to fill it out.

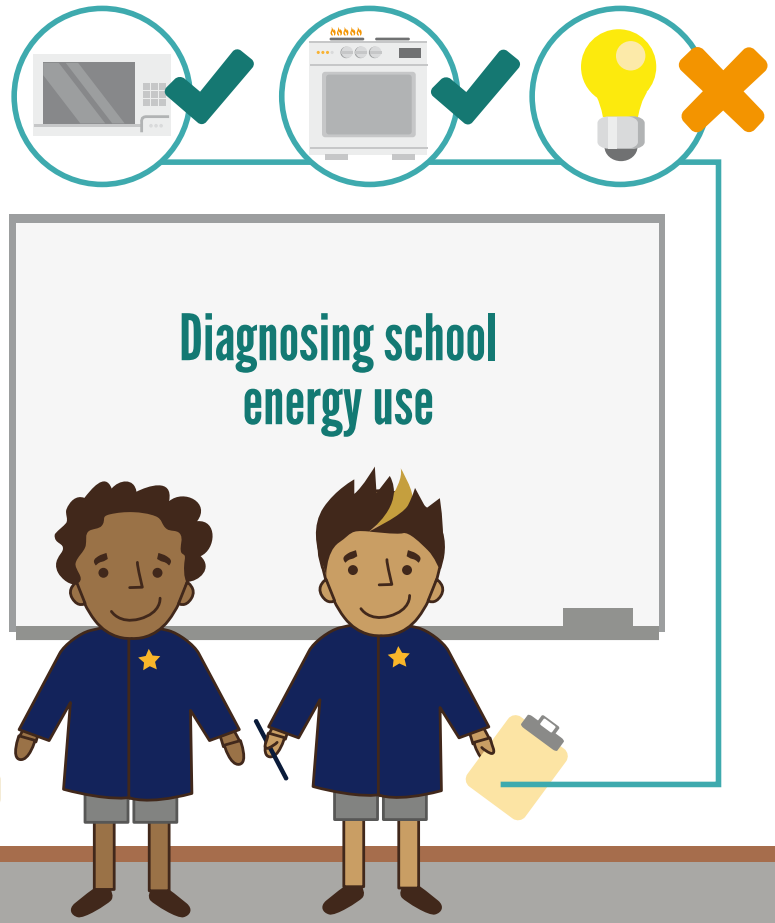


Table 1. Diagnosing school energy use

Survey respondent (teacher, student)	Question	Answer
	What types of energy are used in the school (gas, electric, wood, other)?	
	Where does the electrical energy come from? (Water, coal, gas, wind, other)?	
	What is the quality of the electrical energy service (supply)?	
	How is the electrical energy that arrives at the school produced?	
	What natural resources are involved in its production (taking into account generation, transportation, and distribution)?	
	Do you know if there are negative environmental impacts close to your town caused by using these sources of energy?	
	What is the school's monthly cost for electricity? for gas or other fuel?	
	Do you think your school is a high-energy consumer? Does it have appliances that aren't necessary?	
	Does the school have a properly working electric meter?	

Table 2. School equipment that uses electricity or gas

Type of energy	How is it used?	Hours per day connected (even when not in use)	Hours per day used	Who uses it?	How is it used?	What condition is it in (including cable and pins)?	Who is responsible for its use and maintenance?
Electricity	Pencil sharpener	24	Roughly 0.50	Secretary.	Only sporadically for administrative area.	Good	Principal's secretary.
Electricity	Microwave oven	24	5	Person in charge of the cafeteria.	To heat soup, make popcorn, and heat other food requested in the cafeteria.	Good	Kitchen staff.
Gas	Water heater	24; pilot light	1	Workers, gardeners.	Hot water in kitchen.	Poor	Maintenance person.
Gas	Burners (stove)	24; pilot light	6	Cafeteria cooks.	Food for breakfast and lunch for students and teachers is prepared every day.	Irregular flame, damaged.	Cook and person in charge of cafeteria.

As each of the school's rooms is equipped with lights and sockets, we recommend devising a simple plan and inventory for each room.

Table 3. School lighting systems

Name of room	Switch in the room	Number of lights	Type of lights	Wattage	Hours used	Hours lit	Is natural light sufficient?	Who uses them?	How are they used?	Who turns them on and off?
Classroom 1	Yes	3	Fluores-cent	80	7:00-15:00	6:00-18:00	Yes	4th grade students; maintenance staff	During class; for cleaning tasks	Cleaning staff

As you complete the chart, you may add additional columns as needed, one to explain the problem and another for solutions considered. For example, if there are rooms where lights are used only 6 hours a day but stay on for 10, you need to investigate whether this is because those responsible neglect to turn them off, or because there is only one switch for several classrooms, and so on.

Thus, possible remedial actions may include installing individual switches for each classroom, providing independent controls for each lamp or area within the same room, replacing bulbs or lamps with others that save energy or are more efficient, and so on.

But remember that, important as it is to ensure that bulbs or lamps are turned off when not in use, good lighting during class and study hours in classrooms and work spaces is a very important requirement for learning.

Traveling to and from school

A survey of the school community can be used to identify problems associated with the means of transport used. The survey may be conducted during class or (for younger children) may be sent home for parents to fill out. Some of the potentially useful questions for diagnosing transportation conditions and finding solutions are given in table 4.

Table 4. Diagnosing transportation use

Survey respondent (teacher, student, parent)	Question	Answer
	How far do you live from the school (in blocks, miles)?	
	How do you get to school (public transportation, school bus, on foot, by bike, by car)?	
	Do you share transportation with other members of your family? With how many?	
	Do you share transportation with other classmates or school colleagues? With how many?	
	What is spent monthly on fuel for your family's vehicle? What is spent monthly on public transportation?	
	Does the school have extracurricular activities? How do you commute to attend them?	
	How else could you get to school?	

Based on the answers to the survey, work with survey respondents to identify the main means of transportation used, as well as any transportation problems. Is there sufficient public transport to get to school and attend extracurricular activities? If not, could the school take the initiative of providing a school bus? Could parents organize a car pool? is the main means of transport car or bicycle?

Recommendations

Modifying your school's environmental impact by reducing its energy consumption can be accomplished in several ways. These include: (make both lines clickable and lead to contents in detail)

- Decreasing consumption through changes in habits and customs
- Adopting more-efficient or otherwise alternative energy production technologies

While both options complement each other, a good place to start is addressing the community's habits and customs to lower power consumption. The importance of making even modest changes, such as turning off lights or electrical appliances whenever not in use, is great: consumption can drop as much as 30 percent.

The first actions to take when designing a program for saving energy and boosting efficiency at school are:

- Based on the inventory, identify the appliances in poor condition or those replaceable by other, more energy-efficient models. Discontinuing the use of these devices, and removing or replacing them has an immediate impact on energy use and efficiency.
- Audit drains on electricity. To do this, all lights must be turned off, all electrical appliances disconnected, and no electricity should be used in any place inside the school. Then check to see whether the disc in the meter is running. If it is, there must be a drain on the electricity supply, and the installation should be checked.
- Audit for vampire energy. This involves electrical appliances that remain connected and consume power even when turned off. Many have small indicator lamps that stay in standby mode, ready for immediate use. An estimated 10 percent of all household energy consumption may be attributable to this phenomenon.

If we were to add up the potential energy savings attainable through these adjustments alone, it would be well worth the effort.

Decrease consumption by changing habits

The various actions described below can be included in the school curriculum or integrated into special projects led by work teams comprised of students, administrative staff, and teachers.

Schools around the world are empowering students to be the promoters and stewards of change in energy consumption habits. Student-led initiatives include competitions, discussions, workshops, and presentations to encourage good everyday practices and to discourage those that are not environmentally friendly. In some schools, regular audits are performed by teams of students to verify compliance with energy-saving plans; the best-performing teams or areas of the school receive recognition.

Box 2.
A UK school conserves energy

For several years now, Okehampton High School in Devon, a city in the United Kingdom, has been spearheading changes in the school's infrastructure, and in the organization and participation of the school community and its educational programs.

In addition to changing the type of lamps or bulbs used and installing alternative power generation technologies, the entire community participates in encouraging habits that boost energy conservation. Children and young people keep the community motivated with a traffic light used to regulate behavior. It turns green if all energy care and savings agreements are adhered to, yellow if certain groups fail to comply, and red if motivation requires revitalization.

Success has been so noteworthy that this high school has achieved a 50 percent decrease in its municipal electric bills and has also encouraged other schools to follow its example.

Okehampton has obtained funding from several foundations and groups that support such initiatives.

Photos: Asden Awards

Savings and efficient use of energy at a school must be given thought and planned out taking various types of energy use into account. Below is a series of recommendations on the specific topics of:

- Lighting
- Cooling and/or heating systems
- Electrical appliances
- Gas used in restrooms and kitchens
- Transportation

For each topic, the school might want to organize a small initiative to address the problems identified in the diagnosis, discuss possible solutions, identify people responsible for promoting and maintaining progress, decide how progress and achievements are monitored, and inform the school community of progress. To prepare, outline project phases using table 5, which you may modify to suit your needs and aspirations.

Table 5. Identifying ways to save energy

Problem to address	Possible solution or action	Reason for action	Monitoring	Plan for keeping the school community informed	Leaders responsible
Lighting expenses					
Cooling or heating expenses					
Poor operation and use of electrical appliances					
High gas consumption					
Excessive use of school or community vehicles					
Other					

Recommendations for saving energy: Lighting

- ***Turn off lights when not needed.*** Set up a routine check to turn off exterior lights (which people commonly forget to turn off during the day) at dawn. During holidays and at night, switch off all lights not necessary for security purposes. If there is no lab equipment or any other equipment that must stay on continually, you can even lower the intensity to save overall costs. Furthermore, motion sensors could be connected to safety lights. If possible, an automated system could be installed to turn lights or unused devices off during certain periods (at night, on weekends, or during vacation periods).
- ***Use energy-efficient lamps*** (bulbs or energy savers, compact fluorescents, or LEDs); many alternatives are available on the market. Energy-efficient bulbs are more expensive but last up to 10 times longer than incandescent light bulbs, and electricity savings can quickly recoup the investment made.
- ***Substitute lower-wattage bulbs*** in areas where higher intensity light is not required, as in bathrooms.
- ***Maximize the use of daylight.*** In rooms or classrooms with windows, keep curtains or shutters open to allow natural light in and keep overhead lights off. In other areas it will be convenient to place external shade—trees, canopies, or decks—that allow light to go through without dazzling or making it uncomfortable to work inside the classroom.
- ***Improve lighting installations.*** Take advantage of existing windows and cover them with materials that let light through, paint rooms with light colors, and take advantage of skylights. This avoids the need to turn on lights for several hours a day.
- ***Keep lamps, light bulbs, and screens free of dust.*** This makes better use of lighting.
- ***Post reminders*** next to light switches to remind people of the school's energy-saving program.
- ***Install motion sensors*** in areas such as bathrooms or on safety nightlights.

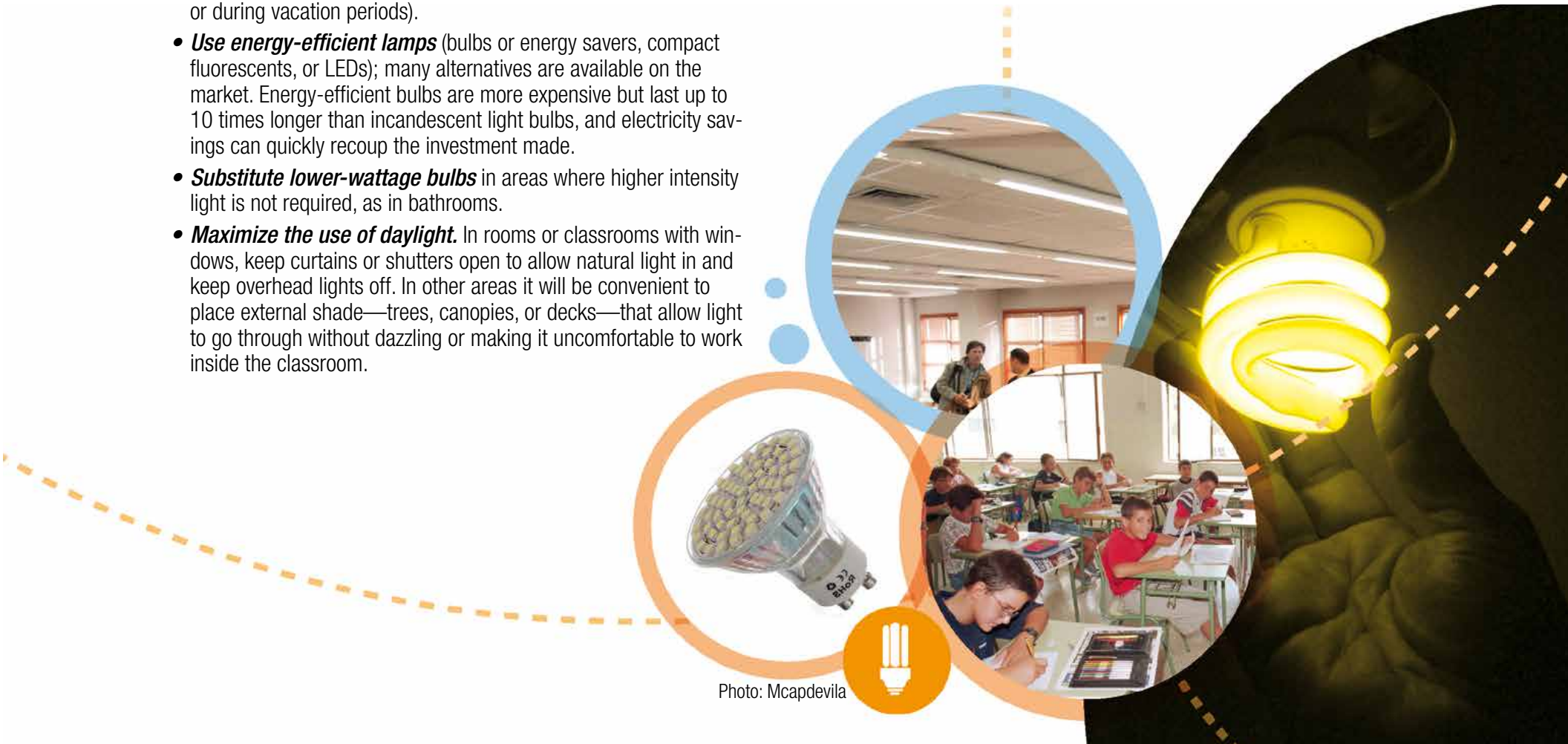


Photo: Mcapdevila

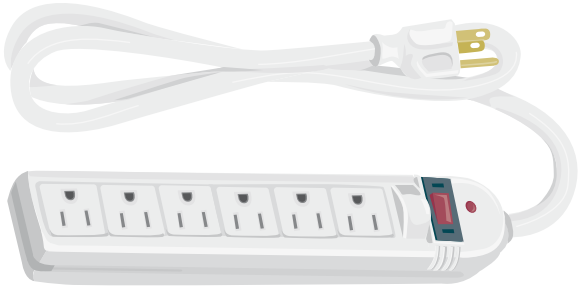
Recommendations for saving energy:
Heating and cooling systems

- **Insulate walls, ceilings, and windows.** The green roofs or vertical gardens described in module 7 are one option. Use insulation materials outlined in module 3 and double-glazed windows.
- ***Use window shades, blinds, and curtains*** to maintain an even room temperature.
- To maintain the temperature in rooms where chillers are used, ***open and close doors and windows as little as possible*** (allowing for ventilation from time to time). Set the device to a comfortable temperature—depending on the outside temperature it can range between 22 and 27°C. Make sure that the thermostat is working, disconnect the device when the room is empty, and check and service equipment regularly.
- ***Turn off fans in empty rooms*** and install independent controls for fans in each room. Clean fans and service them periodically to minimize energy demand. Keep doors and windows open to allow air to circulate.
- ***Keep heating at a comfortable temperature***, between 19 to 20°C. Open and close doors and windows as little as possible. Make sure that the thermostat is working and disconnect it when the room is empty. Let sunlight in through windows to warm up rooms. Check and service equipment regularly.

Photos: INFONAVIT, TonyTheTiger

Recommendations for saving energy:
Electrical appliances

- ***Make sure that the cable and pins of all appliances are in good condition.***
- ***Disconnect all appliances when not in use*** to prevent the electrical vampire effect. If multiple devices are connected to a multicontact strip or bar, shut it down at the switch.



- ***Keep the use of electric ovens and microwaves to a minimum-***as well as electric teapots, which are high consumers of energy. Limit their use to only heating small portions of food and on an occasional basis.
- ***In the kitchen, make sure that the blender's blades are sharp and not broken or worn.***
- Wash the blender immediately to protect the edge of the blades. Chop food into small pieces before blending, and grind food in the shortest time possible.
- ***If possible, replace old refrigerators with newer units,*** as these are more energy efficient. Keep the seals in good condition, making sure the refrigerator is leveled properly for proper door closure. Open the door as little as possible, defrost it often if it is a refrigerator that requires regular defrosting, place the unit near ventilation and away from heat sources, clean the area at the rear at least twice a year, and avoid placing hot food inside.
- ***Disconnect water coolers,*** and soft-drink- or snack-vending machines over the holidays.
- ***Turn off printers and computers*** when not in use. Activate the energy-saving function on monitors so that they turn off after a given period of inactivity.
- ***Activate the standby feature on photocopiers*** to switch the device off after a given period of inactivity.
- ***Make sure that video projectors are shut down*** and disconnected immediately after use. If equipped with a presenter-activated pause mechanism, set it on standby.
- ***Prepare only the amount of coffee needed.*** Switch the coffee maker off and disconnect immediately after serving.
- *T**urn off televisions*** when nobody is watching. Unplug when not in use, along with the voltage regulator, if equipped with one.
- ***When buying a new appliance, make sure it has been designed to consume the least amount of energy possible.*** In some countries, there are seals or certificates that help identify this.

Recommendations for:
Gas for cooking and heating water

- ***Keep stove burners clean*** and avoid leaving knobs in the "on" position.
- ***Use pots and pans with completely flat bottoms*** *and those that distribute heat quickly and evenly.*
- ***Use pots or containers of the same size as the burner.***
- ***Use pressure cookers to prepare food requiring long cooking times.***
- ***When using the gas oven, preheat it only when indicated*** and only for the time required to reach the right temperature. Use the oven wisely by baking several foods at once, open the oven door as little as possible, and avoid baking small portions. Turn off the oven a few minutes before baking is complete to make the most of residual heat.
- ***Check the water heater at least once a year and*** keep it off when not in use.
- ***Keep your water heater set to an intermediate temperature*** (never less than 140°F to prevent the spread of certain bacteria pathogenic that affect the respiratory system).
- ***Lay down rules for the use of bathrooms*** that include taking short showers (5 minutes) with lukewarm water.

Recommendations for:
Transportation

- ***Promote the use of public transportation*** among the entire school community, or organize a system of school transportation agreed upon by parents.
- In highly populated urban schools, ***identify and disseminate alternatives*** to avoid bottlenecks during student arrival and departure times. To do this, arrival and departure areas could be built, road support committees formed, and so on.
- ***Promote carpooling or walking*** among those who live nearby. For example, each day a different parent or guardian can pick-up—on foot, by bike, or by car—a small group of children to take them to or from school. Check if this is something possible to implement in your community.
- In the case of urban schools requiring frequent contact with offices, businesses, or people located at a distance, ***encourage use of electronic media for communication*** among the respective staff in charge and establish a weekly activities plan to minimize trips made.
- Despite considerable additional planning and organization, it may be worthwhile to ***explore sharing means of transportation*** with other schools.

School transportation

Photo: Asden Awards ▸

Adjustments to the entrance into the facilities to ease transit

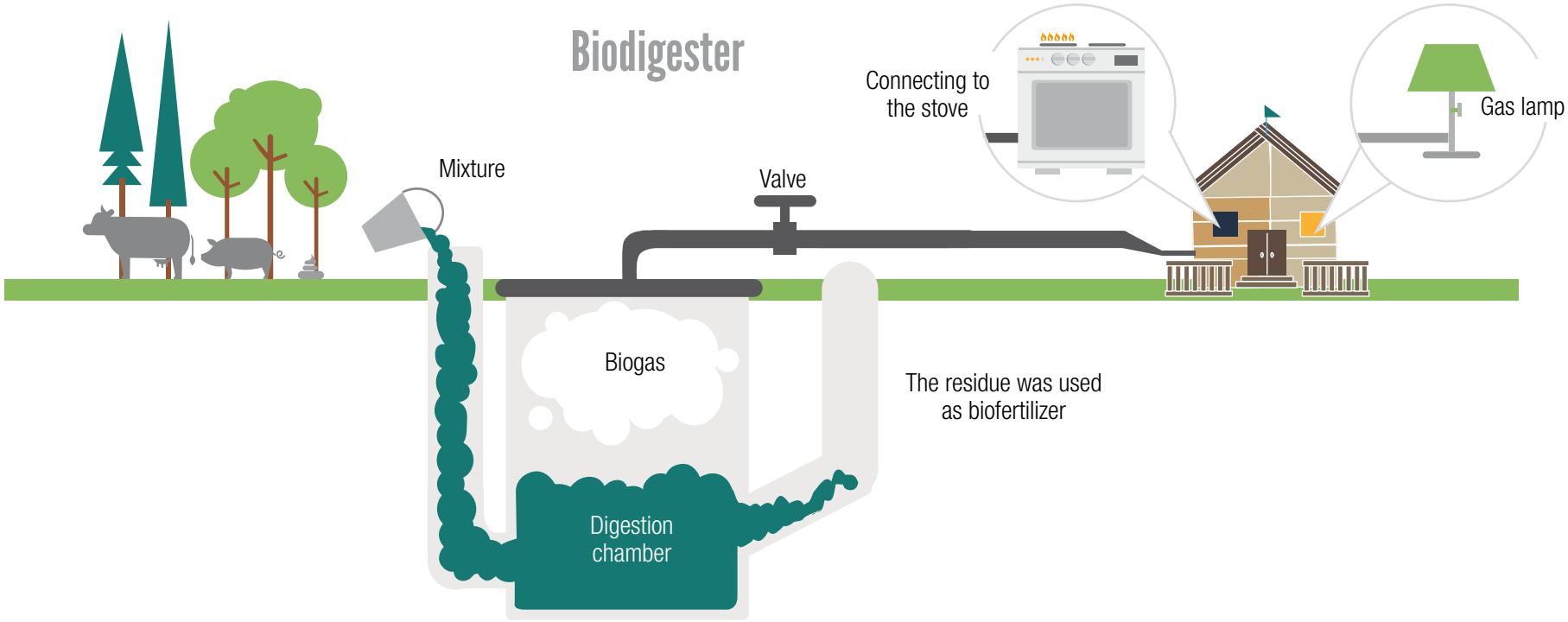
Agglomeration of cars in a school interrupting normal traffic

Use alternative technologies

Alternative technologies are those that do not depend on fossil fuels such as oil, gas, or coal and therefore do not emit GHGs. These include solar energy, wind energy, biomass, biogas derived from the decomposition of organic waste matter, hydroelectric energy produced in small power plants, geothermal energy from sources of heat in the subsoil, and tidal energy from waves.

Though thoroughly tested and proven to be environmentally advantageous, these alternative technologies are still underused—a fact that affects their availability and servicing in some areas. Therefore, before choosing a new technology, seek advice from a group of experts or specialists on the many alternatives available on the market that are functional in your region. Discuss with them the characteristics of the alternative technology of interest, mode of operation, advantages and disadvantages for the school, and installation and maintenance requirements.

Energy from decomposition of biomass

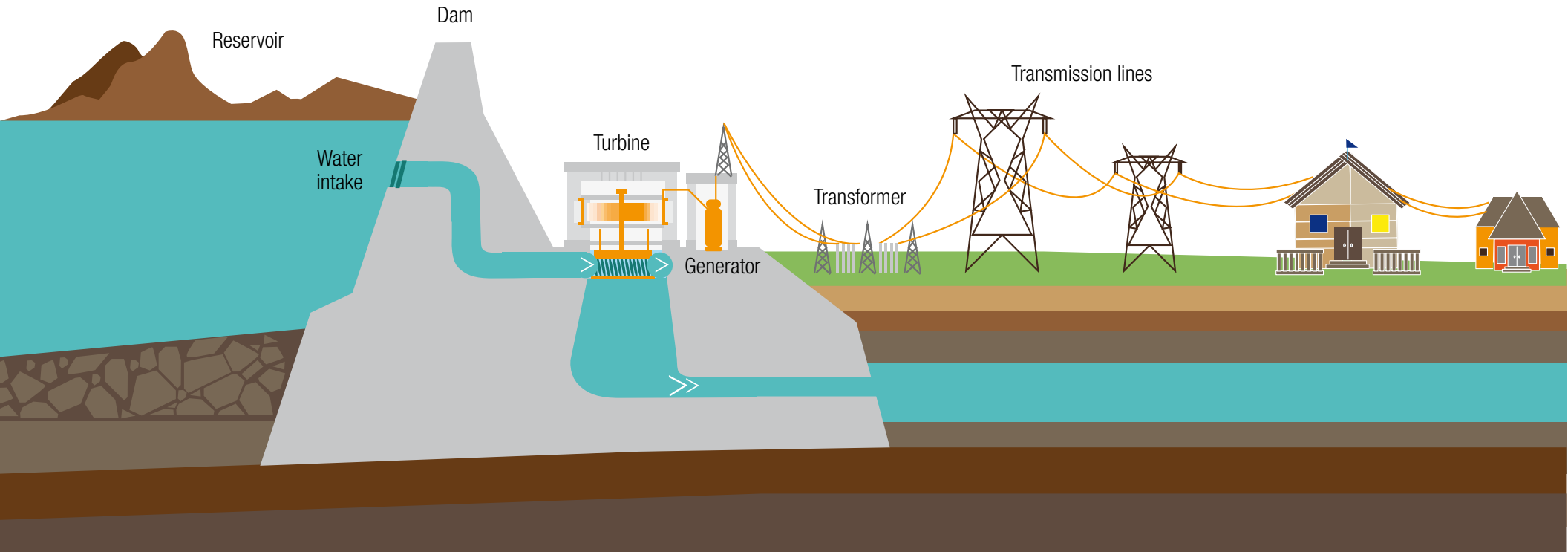


Some questions that an adviser can help you answer are:

- What alternative technologies are recommended for your region?
- Are there support alternatives or subsidies to install these technologies in the schools of the region?
- What is the school's energy consumption and how much of it can be covered by renewable energy?
- How long is the technology life cycle?
- What kind of maintenance is required?
- Is there qualified service available in the area for proper installation, maintenance, and immediate attention if needed?
- Can it operate simultaneously with other technologies already installed in the school?
- How long will it take to recoup the investment?
- What will happen to waste at the end of its life cycle?
- Are there any regulatory limitations to its use in the region?

Once these questions are answered and you have made the analysis of the needs revealed by the diagnosis, you will be ready to plan the

Energy from hydroelectric plants

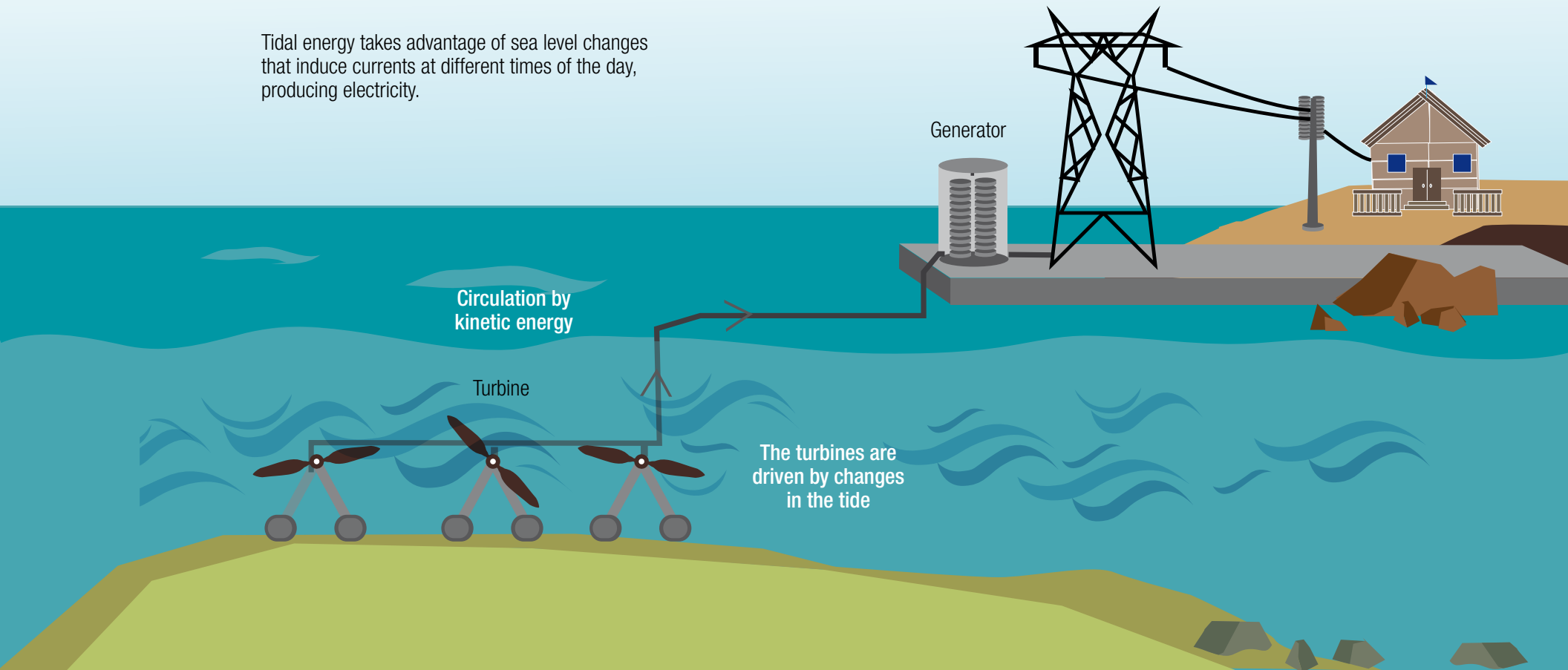


gradual transformation of the school's energy generation technologies. Necessary considerations include the financial resources available, and the possibility that certain public or private institutions may lend support to your installation of alternative technologies.

The initial investment involved will be recovered in energy savings over the medium term. Meanwhile, these alternatives improve the working and learning conditions of rural schools with no access to electrical systems. For these particular circumstances, more types of support are increasingly becoming available.

Tidal energy

Tidal energy takes advantage of sea level changes that induce currents at different times of the day, producing electricity.



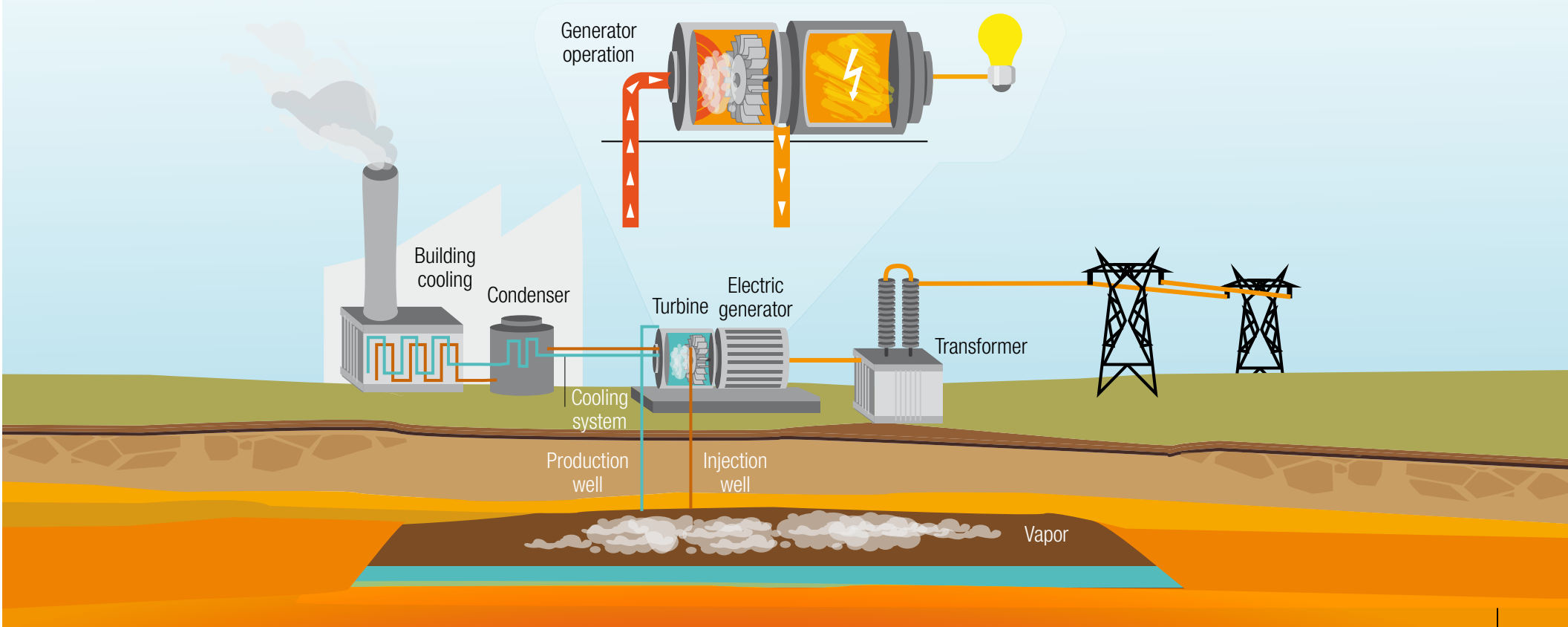
Solar or photovoltaic panels

Solar panels are a series of modules made up of cells designed to produce electricity from sunlight coming into contact with their surface. They are built with a semiconductor that absorbs energy from sunlight and converts it into electrical current.

This technology involves an important initial expenditure, but the investment is recovered over the short term. Solar module prices have declined tremendously in recent years and will be even cheaper in the near future. Devices of varying capacities and prices are available on the market. This solution is recommended for areas that enjoy a good amount of sunshine for most of the year. Rural schools off the nation's electric grid would do well to consider their installation, which may be supported by any one of several international foundations.

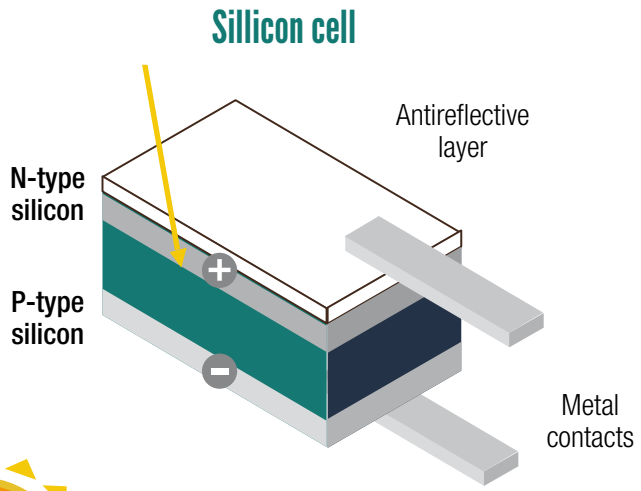
In Latin America there are already many schools that cover their energy needs with solar panels. Many European schools, too, have switched their electrical and heating systems over to alternative technologies.

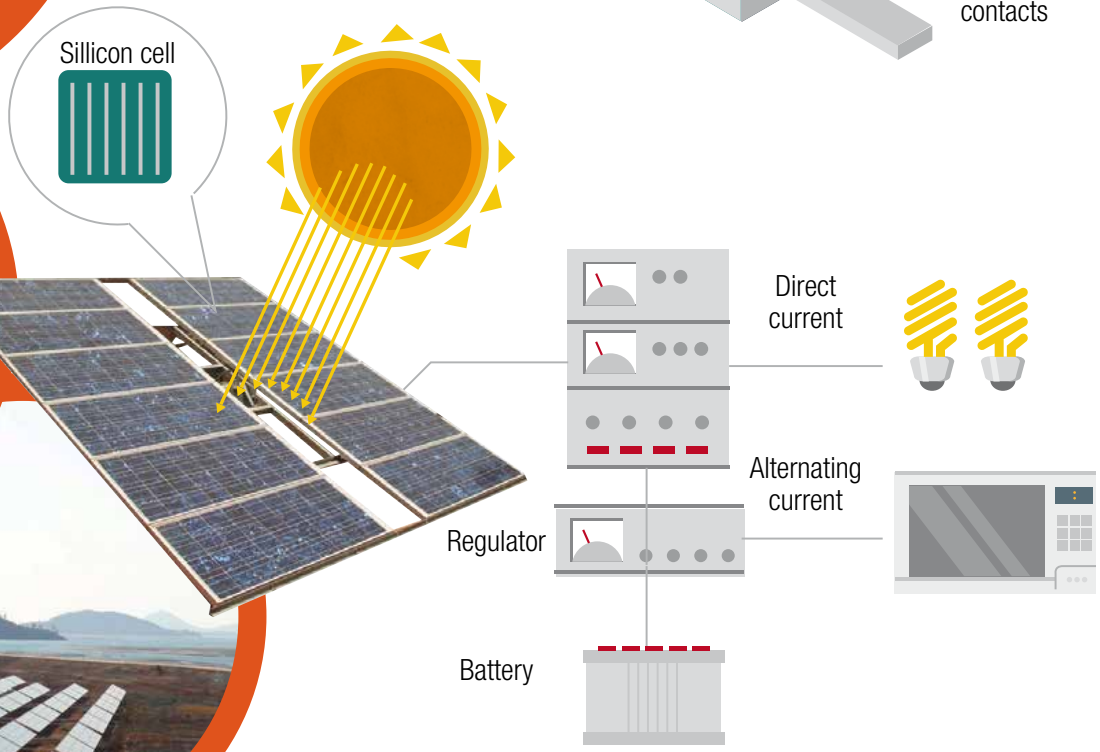
Geothermal energy



Box 3.
Solar panels

Solar panels of various sizes are available. Their ability to generate electricity is commensurate with their surface area. An average panel of 55 watts can keep a fluorescent lamp of 20 watts lit for almost 18 hours.





Source: http://elblogverde.com/paneles-solares-fotovoltaicos/

Solar water heaters

These devices are very economical and efficient, and require a small- to medium-sized investment. With basic training, they can be made locally. They are systems that heat water using the sun's energy, thus minimizing the use of gas or electricity.

Generally, systems are installed over the ceiling with a tilt and orientation designed to capture the maximum sunlight possible. They consist of a system of tubes that absorb heat from exposure to sunlight and an insulated storage tank to keep the water hot.

Their size varies with their heating and storage capacity, and they have a life cycle of 15 to 20 years. When deciding which size is best for your school, consider the number of people using hot water and the volume of water required by them. A small solar panel can heat up to 180 liters of water daily.

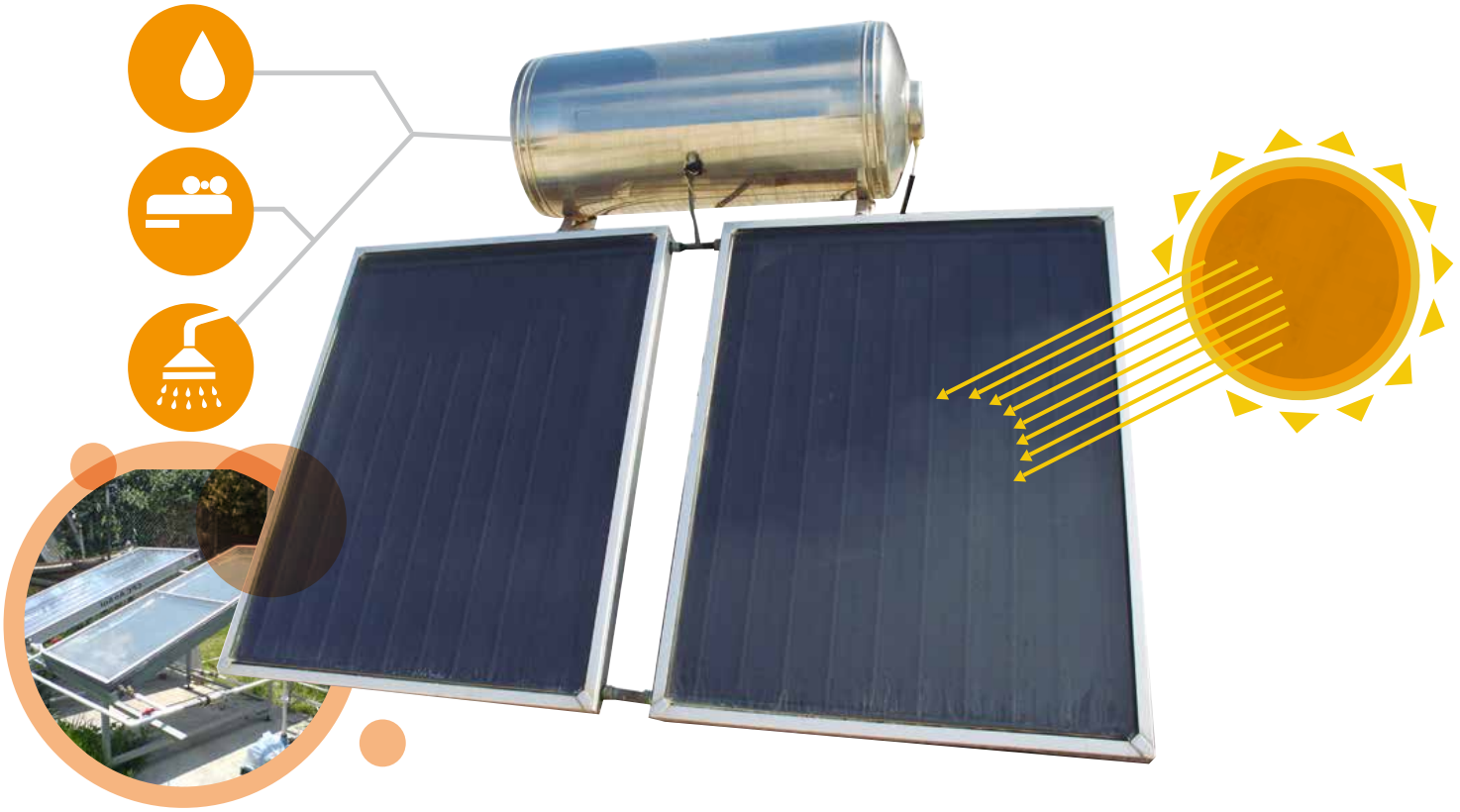


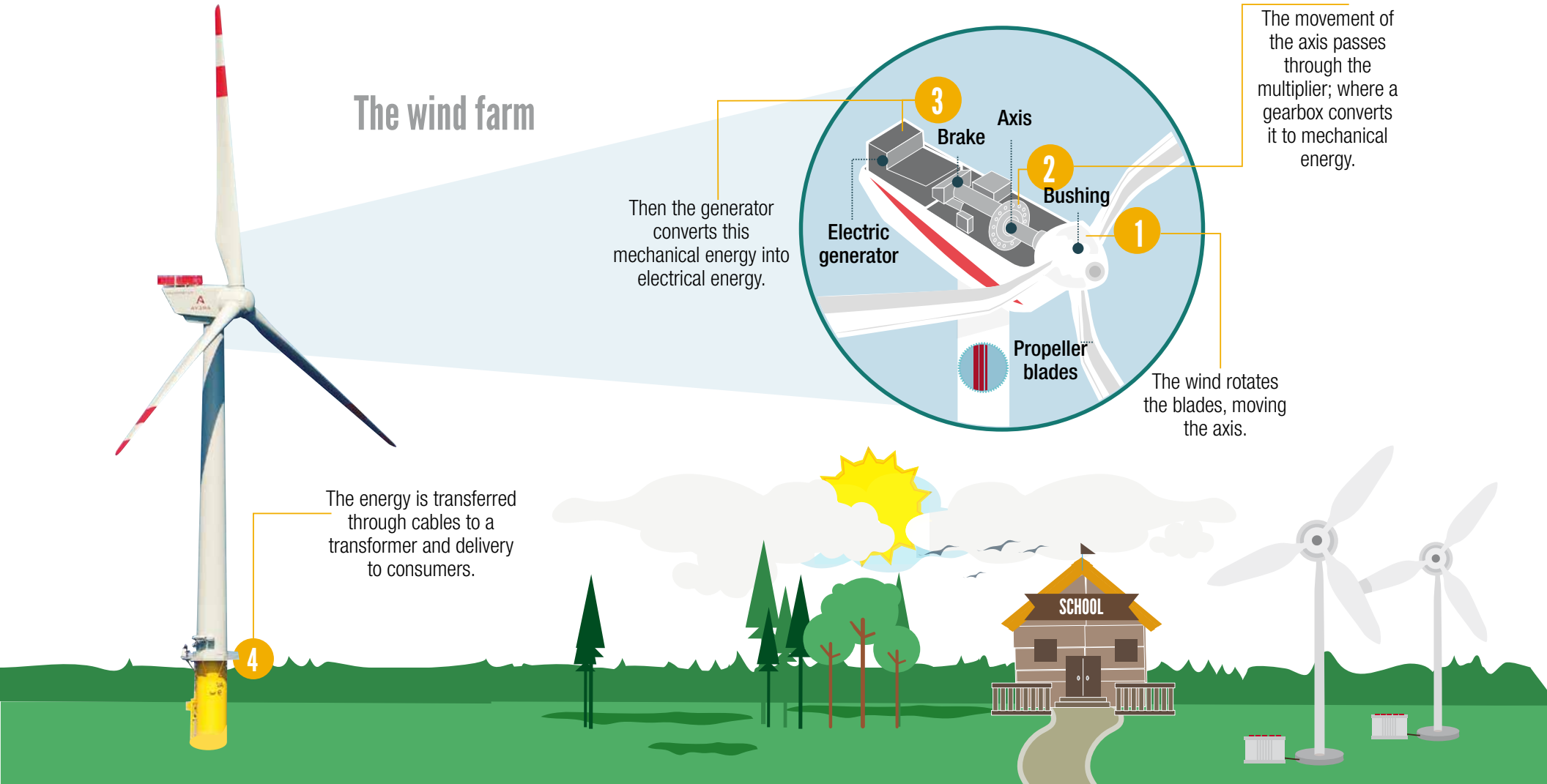
Photo: Stan Zurek

Wind turbines

These devices are also known as windmills. They are recommended for areas with an average wind speed above 7 meters per second.

They are generally placed on roofs or high above open fields, and are easy to install and economical to service. The initial investment is high but, as with solar panels, it is recovered in a very short time and the electricity price produced with wind is already competitive with coal and gas in many countries with good wind resource. Another similarity with photovoltaic energy is that producing electricity with the wind or the sun doesn't involve the use of water, which is important in areas where water is scarce or needed for other activities as agriculture.

Wind turbines are used for rural schools in Latin America and the Caribbean, many of which combine them with solar panels to further ensure their energy supply.



Monitoring and evaluating progress

Environmental

The most common way to record progress is to compare figures for energy, gas, and other fuel bills for the same months in years prior to the energy-saving project. To do this, you must have access to previous bills for these services. If actions are properly carried out, then the changes should be rather obvious. But it is important to take the following factors into account:

- Holding any special event (such as a festival, celebration, teaching additional courses, and so on) may involve higher energy use.
- When comparing with previous years, you must also take into account significant changes undergone by the school during that time, such as variances in the number of students, classrooms, equipment, or services.
- Since energy or gas prices are also subject to change, bills should be compared on the basis of consumption, not cost.

Monitoring may involve organizing periodic group tours of the school—weekly, biweekly, or monthly (at the beginning they may be more frequent)—to check if community members are adhering to agreements made for the project (lights off in off-service hours, electrical appliances off, water heater and stove knobs in the "off" position when not in use, and so on). The information gathered during these tours can then be presented to the community and discussed. It is advisable to seek input on how to best maintain and improve progress, and to implement ideas that promise positive outcomes.

Social

While fuel bills may provide a quantitative indicator of progress, it is also very important to gather some qualitative evidence. We suggest reflecting on the progress being made, and planning adjustments when new information and input come to light. Every fact has value:

- If there is a person or a group of people responsible for certain tasks, it indicates that there is still interest in the project.
- If any diagnosis was made with the participation of the entire school or multiple groups within the school, this indicates the strength of the community's organizational capacity.
- If after a reasonable period of time no progress is evident or the planned schedule has not been met, a few of the following may be happening: enough time is not being invested, not enough interest has been generated, the timetable did not take all variables into consideration, or the program simply needed more time to become stronger and for the achievements to be evident.
- If very few people are participating in the program, it may be necessary to do more to raise awareness and motivate the school community.

Identifying these issues and discovering their significance involves communicating with participants. Throughout the project, community members should be asked for feedback and suggestions for improvement. This could be done at a general meeting (if the school community is not very large) or in groups assigned by teachers.

Economic

One expected outcome of efficient energy management is a lower energy bill. Even when this is not the main goal, it is an indicator of success. Any savings should be communicated to the school community and celebrated.

Savings can be used to improve other conditions at the school or to transform other areas of high environmental impact. These indicators may be useful in seeking out funding sources to support future projects. Transforming your school into an environmentally friendly space is a continual process.

Tips for finding financial support

Responding to the growing interest in energy self-sufficiency and the risks of climate change, many organizations now lend support to projects reducing emissions through energy conservation and optimizing efficiency. Several, for example, support programs aimed at replacing incandescent bulbs with energy-saving lighting, adapting electrical installations, or modernizing equipment to maximize efficiency.

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Module 4

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Rise Up Against Climate Change!

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