Let’s save our planet!

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P. 6 Why is there a water problem? មូលនិធិអវវីក៏រោនបញ្ ហា ទឹក?
P. 8 Treating dirty water ការសរោអា តទឹកកខវក់

P. 9 Is it getting hotter? តាមើយផ្ដ ផៅៗ ផយើយដមនផទ?
P. 10 Renewable energies ថាមពលផកើតផើងវិញ

P. 11 Our water ទឹែរបស់យើង

P. 18 Fantastic plastic? បាលា ស្ិកែ៏អស្្ រ្យ?
P. 20 Chemicals on our plates? ស្រធាតចុគវីមវីក្នចុងចាចិយើង?
P. 22 Organic farming ការដាំែចុះសរវីរាង្គ

P. 12 Our land ដធីរបស់យើង

P. 26 Ecosystems ស្ ថា ន្បព័ន្ធ

P. 13 Our biodiversity ជធីវៈចត្ុុះរបស់យើង

P. 29 Endangered species of Cambodia បែគូបណ្តវជិត្ចុតពូជផយើង

P. 14 Our responsibility ទំនួលខុសតតរូវរបស់យើង

P. 24 Chemicals on our plates? ស្រធាតចុគវីមវីក្នចុងចាចិយើង?
P. 26 Renewable energies ថាមពលផកើតផើងវិញ

P. 28 Is it getting hotter? តាមើយផ្ដ ផៅៗ ផយើយដមនផទ?
P. 30 Our responsibility ទំនួលខុសតតរូវរបស់យើង
Water is where life on Earth began and all living things need water to survive. Our own bodies are made mostly of water and we couldn’t live longer than a few days without drinking any! We need water to grow fruit and vegetables and raise animals for our food consumption, we need it to clean ourselves and therefore stay healthy, and we even need it to make everyday products and things, such as machines, paper, houses.... But while many of us can just get water by turning the tap on, it is not a resource to take for granted. Experts around the world are warning that water, especially clean drinkable water, could become so scarce in the coming decades that we could soon run into a major humanitarian crisis, causing wars and a lot of suffering.

They used to call me the blue planet!
**Why is there a water problem?**

**Did you know that no new water is ever made?**

The water in your drinking bottle is the same water that dinosaurs were drinking million of years ago! The same water keeps being used, cleaned and treated, over and over again.

**Now we use and discard so much dirty water, that it is not naturally filtrated anymore. The water becomes polluted. Chemicals or substances that contaminate water are discharged into bodies of water. Water pollution affects drinking water, rivers, lakes and oceans all over the world. In many developing countries, such as our own, it is usually a leading cause of death. Approximately 4 million people out of the total population in Cambodia lack access to safe water.**

**Before** the world population grew so much, mother nature used to treat all the water through the natural water cycle.
When you flush your toilet, wash your hands or clean the dishes, you produce sewage water. Currently, in Cambodia, the sewage passes from the pipes in your house to the drainage system (if your house is connected to one) over or under the ground, and then flows directly into lakes, rivers or the sea. Also, many industries and farmers work with chemicals that end up directly in the water (see p.20). This means that there is no wastewater treatment.

However, this is hopefully going to start to change. In 2016, the first wastewater treatment plants were built in the Phnom Penh and Siem Reap airports. What a relief for the environment!

Treating dirty water

Even though it is not drinkable, the water is now clean and can be poured into the local water network without polluting it, or it can even be re-used in the fields to water our vegetables!

How does a sewage treatment plant work?

The first stage is like a big prahok drainer. It filters large objects that should not be in the water: bottles, diapers, sanitary wipes, etc.

The water then goes into a large tank to get rid of any grease: oil is lighter than water, so it floats to the top, while grit and sand are heavier and sink to the bottom.

At this stage, there is a muddy substance called sludge which settles at the bottom of the tank. It is drained out and dried out so that farmers can use it to fertilize their crops!
Air is another resource we take for granted and yet we couldn’t live without it. In fact when we came out of our mother’s womb, where we were surrounded by water, the first thing we did was take a deep breath in and let out a big healthy scream! What we call air is a mixture of gasses that are within our atmosphere, a sort of gaseous shield which surrounds and protects our planet. Among the mixture there is mostly nitrogen, but also oxygen, which allows animals to breath, and carbon dioxide, which allows plants to grow. But human activities are damaging the careful balance of these gases, which affects not only our health but also threatens the well being of our planet. Scientists are warning us that the changes in the composition of the air are causing the temperatures to rise, which is starting to have disastrous consequences on our environment.

Air is getting hot in here!
Scientists have observed that the average temperature on Earth has risen a lot over the last 100 years. This observation, and the consequences it has for our planet, is called global warming. A warmer Earth can cause changes in rainfall patterns, a rise in the sea level and a wide range of impacts on plants, wildlife and humans. There is a lot of evidence that humans are contributing to global warming because our way of life causes a “greenhouse effect.”

The Earth is protected from the sun's harmful ultraviolet radiation by an envelope of gases called the atmosphere. These gases make sure that the heat from the sun stays around us. Without it, our planet would be too cold for life to be sustained. However, if there is too much of these gases, especially Carbon Dioxide and Methane, the atmosphere traps more heat than usual.

The electricity we use in our homes and factories comes mostly from burning fossil fuels (coal, oil, etc.) which produce Carbon Dioxide.

Trees naturally filter Carbon Dioxide from the atmosphere. But, when we cut them down, we lose an important air filter.

People have started to consume a lot of meat, which means breeding more cattle. But, did you know that a single cow releases on average 70 to 120 kg of methane per year... when it farts or burps! Methane is a lot more harmful than Carbon Dioxide. Around the world there are approximately 1.5 billion cows, each emitting that much methane.

Deforested area

Homes and factories
As we’ve seen, burning fossil fuels, such as coal and petrol, are the main causes of the greenhouse effect. Also, these sources of energy will run out if they continue to be used so much. One of the solutions to reverse this trend is to rely more on other sources of energy, which do not pollute the air and which are always available naturally. These are called renewable energies. Cambodia has a lot of hydro power, but solar, wind and biomass only represent a tiny percentage of the total sources providing electricity in Cambodia.

Renewable energies សុខភាពក្នុងប្រសើរ

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Hydropower ហ្វូដ្ឋានសុទ្ធតុ nationally

Moving water has kinetic energy. Flowing water can turn turbines, which can then convert the kinetic energy into electricity. In Cambodia there are two types of hydropower plants: run-of-river plants, which don’t block the river; and conventional plants, which dam the river through reservoirs to retain water. Potential energy in the retained water is transferred into kinetic energy when the reservoir’s gates open and water flows through the pipes at high speed.

Solar energy ហ្វូដ្ឋានសុទ្ធតុ nationally

The sun is by far the most powerful source of energy. One way to convert energy from sunlight into electricity is through a technology called photovoltaic or PV cells. Sunlight is made up of tiny packets of energy called photons. When these photons enter the PV cells, they set off electrons, which are like little balls with an electric charge. This produces an electrical current. Solar energy has a huge potential in Cambodia, as it is a hot and sunny place!

Biomass ង្ហួសសុទ្ធតុ nationally

Plants absorb the energy of the sun and store it in the form of chemical energy, which is trapped inside them when they die. Burning plants releases the trapped chemical energy, in the form of heat. A lot of Cambodian households burn wood for cooking. But even some industries, such as the sugar processing plants, use biomass: waste from sugar cane is burnt to heat water, and the steam from the heated water turns shafts to produce power.

Solar energy ហ្វូដ្ឋានសុទ្ធតុ nationally

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The vast majority of our activities as humans, throughout history, occurs in land areas: the solid surface of Earth that is not permanently covered by water. It is land that supports agriculture, habitat, and various natural resources. But in the last two centuries, our actions as humans have started to deteriorate the Earth’s land surfaces. For example, we are producing more waste than we used to. Waste from factories, mining, oil refineries are very polluting, but so is our own domestic waste, in particular the plastic we use and throw out every day. We have also started to cultivate the land more extensively and intensively, using chemicals to make production more efficient. These chemicals end up in the soil and contaminate it.
Fantastic plastic? ម្រូបធាតុអុីដ្ឋាន?

Look around you. There is plastic everywhere! From bottles of water, to toys, to window frames and even your clothes! Plastic is artificial; it doesn’t come from nature. Chemists created it around 100 years ago by joining molecules from petrol to make polymers (which means “many molecules”). By mixing plastic molecules with other chemical substances, scientists have also created many different forms of plastic. One special property of plastic is that it can be moulded into just about any shape, which is useful. But, when plastic gets thrown away, it hurts our environment. If we don’t stop using so much of it and don’t stop disposing of plastic carelessly, this could be a big problem for our planet.

It never disappears completely

Unlike many other things we throw away, such as paper or food scraps, plastic is non-biodegradable. That means that it never disappears from nature completely, even if, over time, it is broken down into smaller pieces in the sunlight. Even that takes a lot of time: it is estimated that a plastic bag takes between 400 to 1,000 years to degrade into small pieces!

Burning it releases pollutants

Burning any type of plastic releases toxic chemicals called dioxins into the air that are inhaled by humans and animals. It contaminates the soil and surface water and therefore it also affects plants, some of which are eaten by humans. Many scientists have shown that dioxins cause cancer in humans.

Turtles, seabirds and other wildlife eat it

Wind and rain sweep litter from land into the ocean where it can remain for decades. Animals can get tangled in it or they sometimes mistake it for food and eat it. Either way, animals often do not survive when that happens. There is actually an “ocean of plastic”. Moving currents carry floating rubbish across the ocean. The debris collects in areas called “garbage patches”. The biggest ones are in the Pacific Ocean.

It blocks drainage systems

Excess plastic ends up in roadside storm ditches and gutters, clogging drainage systems. This is especially problematic in our country, which sees sudden spouts of heavy rain for half of the year: rainwater has nowhere to flow and it ends up accumulating and causing floods. Many Cambodians lose income during the monsoon season when clogged drains cause flooding and prevent them from working.

It’s never too late! Reducing our plastic consumption is the first step toward solving this problem. Let’s start small by using reusable bags at the grocery store, cleaning out the plastic in our house, and avoiding single-use plastic items. Tread lightly and do our best to protect our beautiful planet!
Chemicals in our plates?

For thousands of years, farmers have used natural methods to grow food. However, in the last 100 years, when the human population started growing rapidly, it has been important to find ways to produce a lot more food at a much faster rate to feed everybody. Farmers began using chemicals called pesticides to help keep their crops free of insects and weeds. They also used chemical fertilizers to give plants more essential nutrients. All of these chemicals end up in the food that is being produced, as well as in the soil, which causes harm to other living things or destroys soil or water ecosystems.

Insecticides

Insecticides are a range of chemicals that kill insects that feed on the food being grown and are therefore a threat to crops. However, they can be very harmful for farmers who handle them, for people who live near sprayed crops but also for consumers as insecticides can be absorbed inside the fruit, vegetables and cereals that we eat. In Cambodia, scientists have recently detected dangerous and banned pesticides such as methamidophos and phorate in samples of tomatoes and carrots.

Fertilisers

Like you, plants need food to survive. Plants absorb nutrients from the soil, but once the plants die and decompose, these nutrients are returned to the soil. On farms, the nutrients are often not replaced as crops are harvested, so it is often necessary to replace them with fertilizers. Today, most farmers like to use chemical fertilisers, that is, chemically engineered nutrients, such as nitrogen, phosphorus and potassium. They are easy to use and farmers can be sure that their plants are getting all the nutrients they need. However, since they contain a lot of nutrients, there is also a risk of overuse. Excess nutrients get washed-off by the rain into streams, lakes and oceans. This leads to a lot of algae which spoils the quality of water and causes long-term damage to soil.

Herbicides

Herbicides are chemical substances that are used to destroy unwanted plants around a crop. They can save farmers' money by preventing crop losses. However, experts believe that chemicals, such as glyphosate, may cause cancer. Also, by killing weeds, herbicides take away many flowers that bees love! Bees and other insects that feed on plants are very important for nature as they allow most plants to reproduce.
Weeding: Instead of using herbicides, organic farmers weed by hand. This is much more environmentally friendly because it is chemical free. It means more labour and time spent which also means more jobs for the community. Because pesticides aren’t used, there are more pollinating insects in the area.

Pest control: Organic farmers do not use chemical insecticides, but instead find natural ways to prevent insects and other pests from destroying their crops. For example, they try to attract insects such as ladybugs, which find destructive insects delicious! They also use physical barriers and traps and sometimes insecticides made from less harmful natural products.

Crop rotation is used to reduce diseases building up in the soil and to strengthen the composition of the soil. Some plants, such as peas and beans, fix nitrogen from the air into the soil, making it very fertile. Organic farmers rotate legumes with other crops.

Manure is used instead of chemical fertilisers. It is made from animal poo mixed with straw! In addition to providing nutrients, it improves the structure of the soil.

Compost is a mixture of decayed plants and organic waste that is used as a fertiliser to improve the soil. An advantage of organic fertilizers is that the nutrients are released slowly, so they are less likely to be supplied faster than plants can use them. For this reason they are considered less damaging to the environment than chemical fertilizers.
Ours is so special and so different from any other planet we know of because of the incredible diversity of living things. This wide variety of animals and plants living among non-living things such as rocks, water and air, is called biodiversity. These may all seem like permanent features, but are actually vulnerable to collapse. Jungles can become deserts, and coral reefs can become lifeless rocks over a few years, just by disturbing the fragile balance of nature. Preserving this biodiversity is crucial for humans. Nature provides us with animals for our food, plants for our clothes or medicines, natural resources such as wood for energy... But as we take over natural spaces to build roads and houses, cut down trees to make space for intensive agriculture, and hunt and fish carelessly, many of the living things cease to exist, changing the face of our planet forever.
T he word ‘ecosystem’ comes from two words: ecology, the science of relationships between living things and their environments, and system. In a system, a set of things work together as part of something larger. In an ecosystem, those “things” are organisms. An organism can be an animal like your dog, a plant like the fried morning glory you eat or even the fungus that grows on rotten food. Ecosystems also include non-living components, like air or water, which the organisms interact with and depend upon. Each living organism has a particular place in which it survives best. We call that its habitat. For example, the natural habitat of a parrotfish is a coral reef. However, it lives there with many other organisms to form an ecosystem. All the organisms in an ecosystem need each other to survive.

Mangroves are called producers because they capture energy from the sun and make food for others to eat. Since plants absorb carbon dioxide and release oxygen, they keep the ecosystem healthy. The mangrove leaves that fall down are eaten by crabs and fish. The way each organism is linked to another as a source of food is called a food chain. Many food chains cross over, forming more complicated food webs. It is a complex but fragile balance. Losing just one organism can affect the whole ecosystem and whole species can disappear!

But how is everything connected?

In an ecosystem, each organism has a role, just like we can see in this marine ecosystem in the Cambodian waters:

Sunlight makes the mangroves and seagrass grow.

Fish, such as the pacific reef-egret, eat other fish like groupers.

When groupers die, their decaying bodies provide nutrients for the seagrass.

Seagrass provides a home for all kinds of fish to live.

The mangrove leaves that fall down are eaten by crabs and fish.

Food chains and food webs are important for maintaining balance in ecosystems. An ecosystem is a community of living things interacting with their environment. As each organism has a role, the whole ecosystem depends on all of them.

Fish are eaten by seabirds, like the Pacific reef-egret, or by bigger fish, like groupers.

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The mangrove leaves that fall down are eaten by crabs and fish.
Sometimes, people cut down trees and plants to make room for a building or a road, to sell the wood or to farm the land. As a result, the organisms that used the forest as their habitat may not survive. Climate change, which increases extreme weather, also affects habitats. Some people catch animals illegally, which is called poaching, or fish using dynamite or poison. When the survival of plants and animals are threatened, we say they are endangered.

If all of a species die, they have become extinct, which means gone forever. Climate change, which affects habitats. Some people catch animals illegally, which is called poaching, or fish using dynamite or poison. When the survival of plants and animals are threatened, we say they are endangered. If all of a species die, they have become extinct, which means gone forever.

There are dozens of endangered species in Cambodia. Here are some of them:

**Hawksbill turtles** were thought to be extinct, but it was recently found that a few still remain. The main threat to hawksbill turtles is the collection of their eggs but they are also killed for their meat and their beautiful shells, which are used for making jewellery. They also often get caught in fishing nets.

**The Sunda Pangolin’s** population in Southeast Asia has dropped by 50% recently because they are the most illegally-hunted animal in Cambodia. Poachers sell them to people who make traditional medicine from their scales. Pangolins are still illegally-hunted animal in Cambodia. Poachers take them away.

**The Siamese crocodile** is probably the most endangered reptile in the country. Most of those that remain are in Cambodia’s Cardamom Mountains. They are threatened by hunting, habitat loss, and human disturbance, such as noise from people, boats or dogs, which scares them away.

**The Giant Ibis** is Cambodia’s national bird! Only a very small population remains in Preah Vihear and Mondulkiri province. Their numbers are declining fast because of habitat loss, hunting, and human disturbance. The “traps” forest pools, where they feed and nest, are crowded by people and livestock, so the birds get scared away.

**The Mekong Dolphin** is part of Cambodia’s national heritage. However, the population of this rare species of dolphins has been declining because they get caught in fishing nets and suffer because of pollution. Now only about 80 dolphins still swim in the Mekong and it is unlikely that they will survive after the construction of the dam in Laos.
Protecting our planet by caring for our environment is something that everyone needs to get involved in. Not just governments and local councils, but also you, your friends and your family! Learning about the issue (like you are doing right now by reading this book) is the most important step to take. Here are a few more:

**Save energy!**
At home, always turn off appliances, like your TV or lamps, when they are not in use. This saves a lot of energy! For short distances, don’t ride a moto or a car, which uses fossil fuel. Instead, ride your bike or take public transport. Solar panels on your roof will also reduce reliance on polluting and non-renewable energy sources.

**Reduce waste!**
One of the easiest ways to save the Earth’s resources is by consuming less and therefore producing less waste. Do you really need that many clothes or toys? Think before you buy, especially, non-durable items made of plastic. Could you buy second hand? Take a reusable fabric bag wherever you go! That way you don’t waste plastic bags that will be used for a few hours at most, but will remain in a landfill for centuries!

**Buy organic!**
Tell your parents to shop in places where vegetables, fruits and meat are produced in an organic way.

**Pick-up your rubbish!**
Make your surroundings beautiful and save the land and water by making sure all your rubbish goes in a bin. If you can’t see one, take it with you until you find one. Better still: don’t bring your food or items in disposable bags or containers!

**our responsibility**
The fact that life has somehow managed to appear on our beautiful planet, sometimes seems to be a miracle, considering that, as far as we know, none of the other thousands of planets we have studied in the universe bear any form of life... Yet, this miracle should not be taken for granted. Our water, our air, our land and our biodiversity will only continue to exist and support us if each of us acts responsibly and cares for the environment. A lot of damage has already be done, but it is not too late for each one of us to act. Read on to be part of the solution!