LA LIBERTÉ

NATURE Mag JUNIOR

FEBRUARY 2022

VOL.1 | N°1

# MY PLANET:

## I CARE ABOUT IT, I CARE FOR IT!

LA LIBERTÉ NATURE Mag JUNIOR

## OUR TEAM

**DIRECTOR AND EDITOR-IN-CHIEF**
Sophie Gaulin

**SCIENTIFIC DIRECTOR**
Prof. Ibrahima Diallo

**PROJECT LEADER**
Lysiane Romain

**PRODUCTION MANAGER AND GRAPHIC DESIGNER**
Abdelhamid Souissi

**GRAPHIC DESIGNER**
Amine Tasmany

**COORDINATOR**
Fanny Demeusy

**PROOFREADING**
Camille Harper
Maxence Jaillet
Lysiane Romain

**TRANSLATOR**
Daniel Bahuaud

**EDITORS**
Fanny Demeusy
Prof. Ibrahima Diallo
Jean-Baptiste Gauthier
Sonia Roussault
Jonathan Semah

**ILLUSTRATOR**
Chantal Piché

**Thank you** to the scientists who participated in the creation of this issue by sharing their knowledge and their passion for safeguarding the environment (see page 49)

***La Liberté Nature Mag Junior*** was made possible through the Community Media Strategic Support Fund offered jointly by the Consortium of Official Language Minority Community Media and the Government of Canada.

Canada

## OUR PARTNERS

Médias ténois

CDEM

Division scolaire franco-manitobaine

Division scolaire Louis Riel School Division

réseau . presse médias professionnels de l'info locale

QCNA AJRQ

Éco-Ouest Eco-West

## OUR MEDIA PARTNERS

AGRICOM

l'aurore boréale

Le Voyageur journal

Le Courrier de la Nouvelle-Écosse

L'EAU VIVE

Le Nunavoix

Le Goût de vivre

Le Franco

Le Saint-Jeannois

Tribune

l-express.ca

acadie nouvelle

La Voix acadienne

L'aquilon

LA LIBERTÉ

Editorial address:
123 Marion Street – Unit 201
Winnipeg (Manitoba) R2H 0T3
Tel. : 204-237-4823
sgaulin@la-liberte.mb.ca

Magazine unit price:
4,50 $ + Taxes
Annual subscription to La Liberté: $65.90 $
(GST and provincial tax included)
**la-liberte.ca**

ISSN 0845-0455



POSTAL CONVENTION-PUBLICATIONS N° 40012102 | REGISTRATION 7996
*La Liberté* and its *Nature Mag Junior* are products of the publishing company Presse-Ouest Ltée.

# MESSAGE FROM THE EDITORIAL TEAM

**SOPHIE GAULIN**
EXECUTIVE DIRECTOR AND EDITOR-IN-CHIEF OF *LA LIBERTÉ*

Global warming is at the heart of many of the concerns we currently have as a society. And while there is a lot of information out there, it is scattered all over the place.

So, with its first ***Nature Mag Junior, My Planet: I Care About It, I Care For It, La Liberté*** wanted to gather, present and popularize basic concepts about the environment to enable children ages 8 to 14 to have an overall picture of this issue. Pollution, energy management, waste, climate change, pesticides, etc. are all covered in a playful format and with a vocabulary adapted for better understanding.

In addition to my creative and hyper-talented team, I would like to thank all the scientists and researchers (featured on page 49), and most especially our scientific director, Professor Ibrahima Diallo, who helped us navigate through a broad variety of accessible information, and helped us deliver reliable content.

Thanks to our partner Médias ténois, the magazine is available digitally across the country and elsewhere, as well as in SFI-certified *hard copy to subscribers of ***La Liberté*** in Manitoba and to readers of ***L'aquilon*** in the Northwest Territories. The magazine also comes with five original podcasts which will teach you even more about the subject and hopefully encourage readers and listeners to adopt the eco-responsible behaviors so essential to preserving our environment today.

**PROF. IBRAHIMA DIALLO**
SCIENTIFIC DIRECTOR OF THE MAGAZINE

This magazine aims to raise awareness of complex concepts related to the major challenges associated with climate disruption. The ecological disasters that we experience almost daily (torrential rains, floods, forest fires, global warming or cooling, pollution etc.) concern us all.

Climate change, attributed mainly to human activity, is a cause for reflection, as well as individual and collective action, and greater solidarity as we strive for a healthy environment.

I have always been interested in the environment and also in scientific popularization. I am therefore very honored to have participated in the production of this magazine.

In 1854, a great Sioux chief, Seattle, said these words of wisdom, "The Earth does not belong to us, we belong to the Earth. What we do to the Earth, we do to ourselves." There is still time to pull ourselves together and do what needs to be done!

**LYSIANE ROMAIN**
PROJECT LEADER

**FANNY DEMEUSY**
COORDINATOR AND EDITOR

**ABDELHAMID SOUISSI**
PRODUCTION MANAGER AND GRAPHIC DESIGNER

**CHANTAL PICHÉ**
ILLUSTRATOR

**JEAN-BAPTISTE GAUTHIER**
EDITOR

**SONIA ROUSSAULT**
EDITOR

**JONATHAN SEMAH**
EDITOR

SUSTAINABLE FORESTRY INITIATIVE *SFI : Paper from responsible forestry sources.

# The winners!

ALEX
Inuvik

AVA
Ottawa

Today is the big day.

Alex has a meeting with his friends from the APPRENTICE ECOLOGICAL JOURNALISTS contest. These five young people won a Canadian nation-wide contest to share their reports on global warming with the public.

They travelled all across the country to meet animals so that they could learn more about environmental problems and their impact on different regions of the country.

Let's hear from Ava, Elliot, Alex, Marley, and Kateri!

ELLIOT
Montréal

KATERI
Vancouver

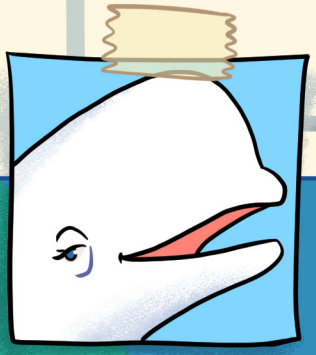
MARLEY
Winnipeg

# ANIMALS INTERVIEWED BY THE APPRENTICE JOURNALISTS

Pacific salmon

Polar bear

Arctic fox



Beluga whale

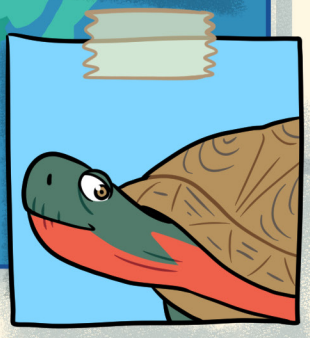
Canada Goose

Honey Bee

Caribou

Tree frog

Wood turtle



The apprentice journalists share their discoveries of the last few weeks...

- ALEX: Hey gang! So how did those animal interviews go?

- KATERI: Well, I got to talk to a goose, a Pacific salmon and a honey bee about pollution!

- ELLIOT: I talked to a caribou about renewable energy.

- MARLEY: Hmm... Interesting! And I got an interview with a tree frog about the impact of humans on nature.

- AVA: A wood turtle talked to me about the disappearance of animals and plants.

- ALEX: That's awesome, guys! Well, I met a polar bear, an arctic fox and a beluga whale. We talked about global warming. If you want, I'll start!

Welcome to Alex's vlog! Today I'm taking you to meet a polar bear in Inuvik, Northwest Territories.

It's the largest community north of the Canadian Arctic Circle.

- ALEX: Hello Mr. Bear, I'm an apprentice journalist and I'm very interested in the environment. I'm here to ask you about global warming.

- BEAR: Well, put simply, global warming is the rise in temperature that is partly responsible for climate change.

But it's actually much more complicated than that... and there are many other factors involved, such as pollution and deforestation.

Global warming is caused in large part by the accumulation of greenhouse gases in the Earth's atmosphere.

And its impact can be found in different forms in all the climate zones of the Earth. So with global warming, you can get for example more hurricanes or tornadoes, but also more droughts.

That's what we call climate change.

- ALEX: You say that global warming is caused mainly by the buildup of greenhouse gases, but what exactly are those?

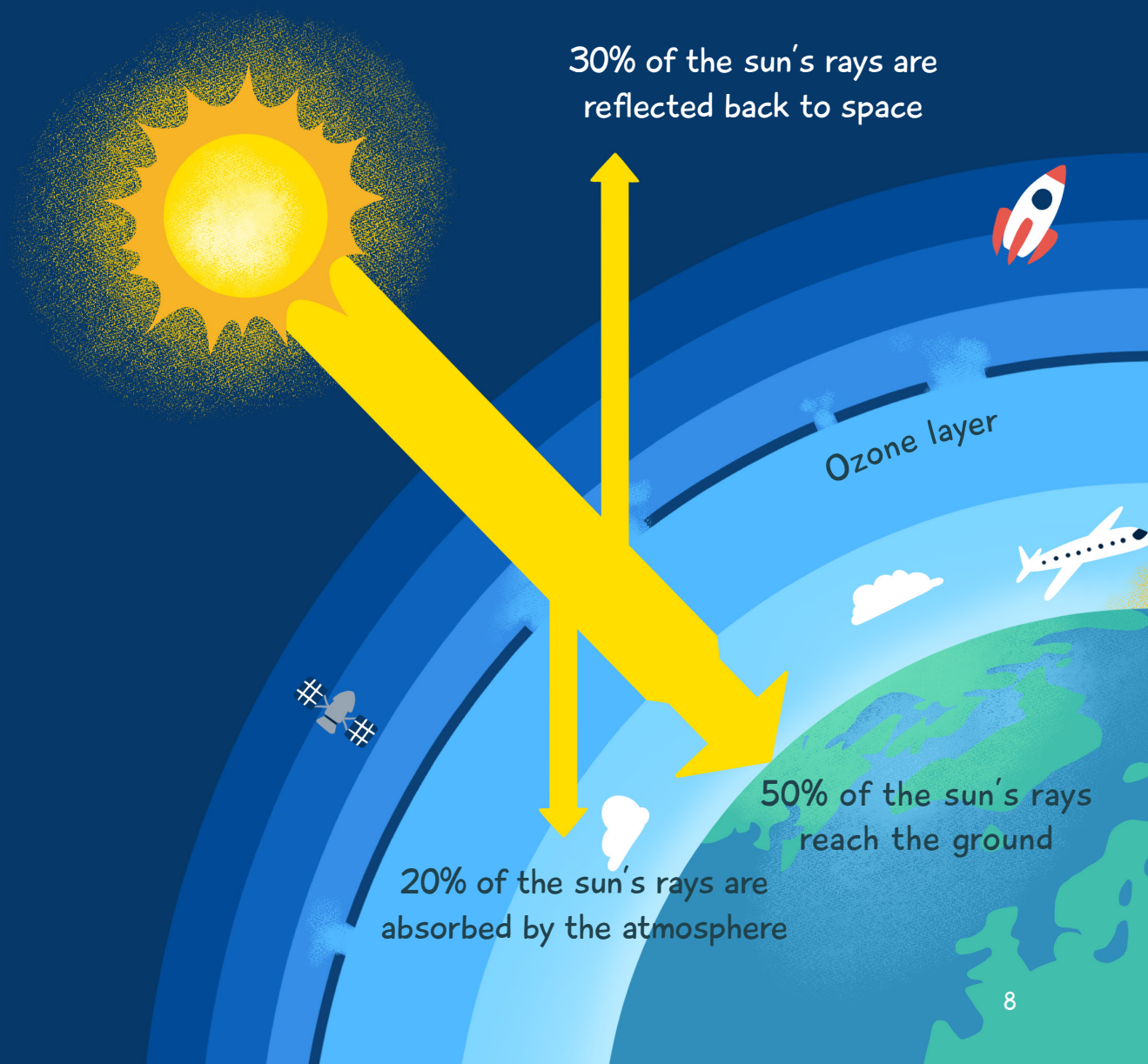
- BEAR: Greenhouse gases, or GHGs, trap heat around the Earth.

What they do is retain some of the energy and heat sent by the sun.

Without them, life on Earth would be impossible because the average temperature would be -18°C instead of the current 15°C!

To better understand why we talk about greenhouse gas accumulation and climate disruption, let me give you an example.
In winter when it is cold, you dress up to go out. In order to resist the cold of space, our planet also covers itself, with GHGs.

But if you add too many layers of clothing, you will be too hot and your body will go out of control: you won't feel well. It's the same thing for the Earth. GHGs are important for heat regulation, but if there are too many of them, it creates the climatic disturbances that I just explained to you.



- ALEX: It's kind of like the ozone layer, right?

- BEAR: Not quite, Alex. Although ozone occurs naturally in the atmosphere, like GHGs, its main role is not to trap heat.

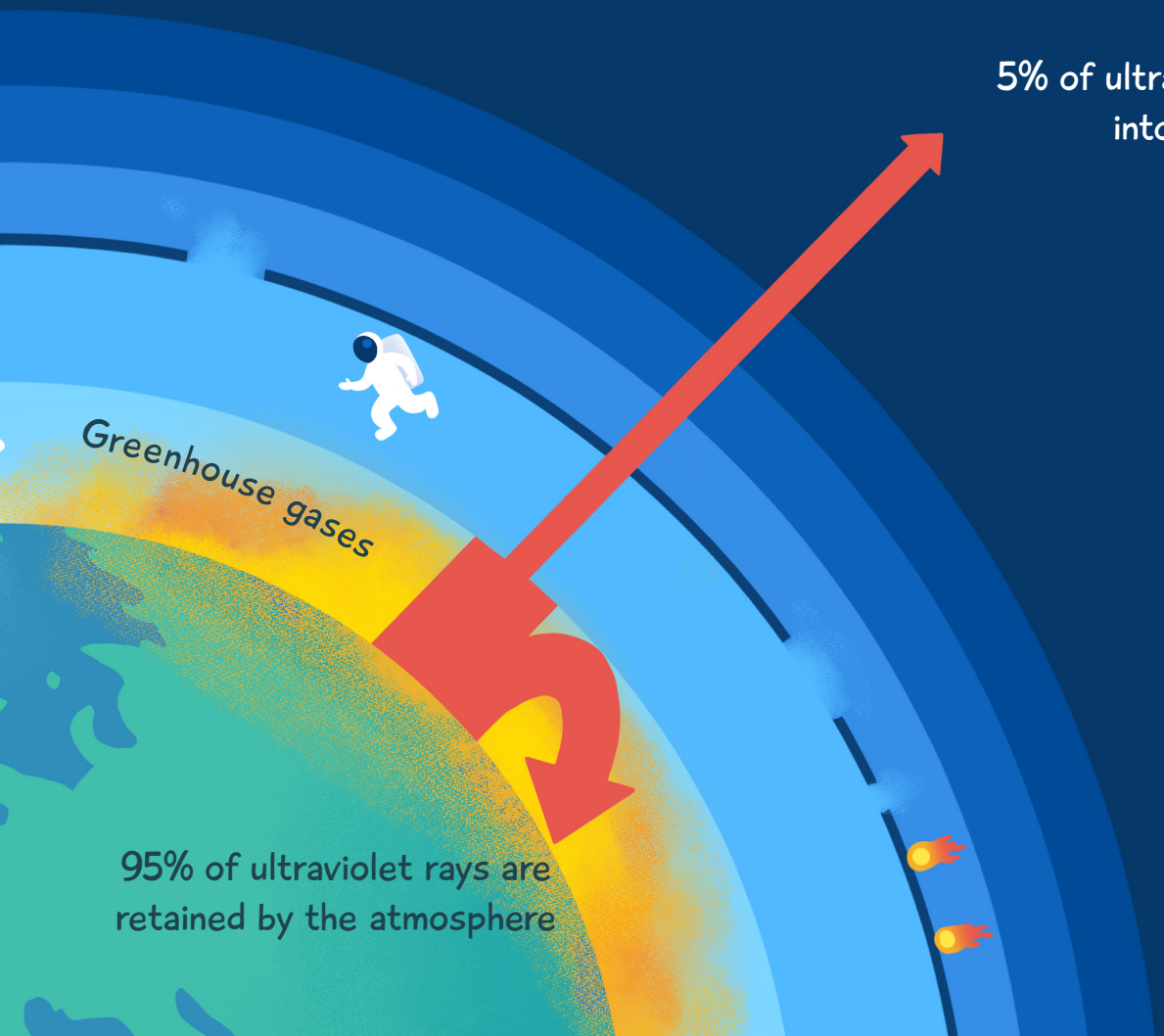
At very high altitudes, ozone can form a protective layer, which absorbs the sun's ultraviolet (UV) rays which are very harmful to humans and other organisms living on Earth. So it protects us!

Over time, the ozone layer has deteriorated, especially at the South Pole, in Antarctica, particularly because of chlorofluorocarbons (CFCs), which are refrigerant gases. If there's a hole in the ozone layer, it's because these gases have escaped from our refrigerators, our air conditioners and our aerosols. When the ozone layer is depleted, humans are no longer protected from UV rays, and this can lead to eye diseases and skin cancer.

But, some countries are trying to put in place ways to fix the situation, like the Paris Climate Agreement.

Signed in 2016, it's the first universal agreement on global warming, and it calls for the reduction of these harmful greenhouse gases.

If these climate commitments are met, the ozone layer may be able to return to its original state, which is essential for all human and animal life!



- ALEX: How much has the Earth warmed?

- BEAR: Over the past 200 years, scientists have found that on average, the planet has already warmed up by more than one degree Celsius.

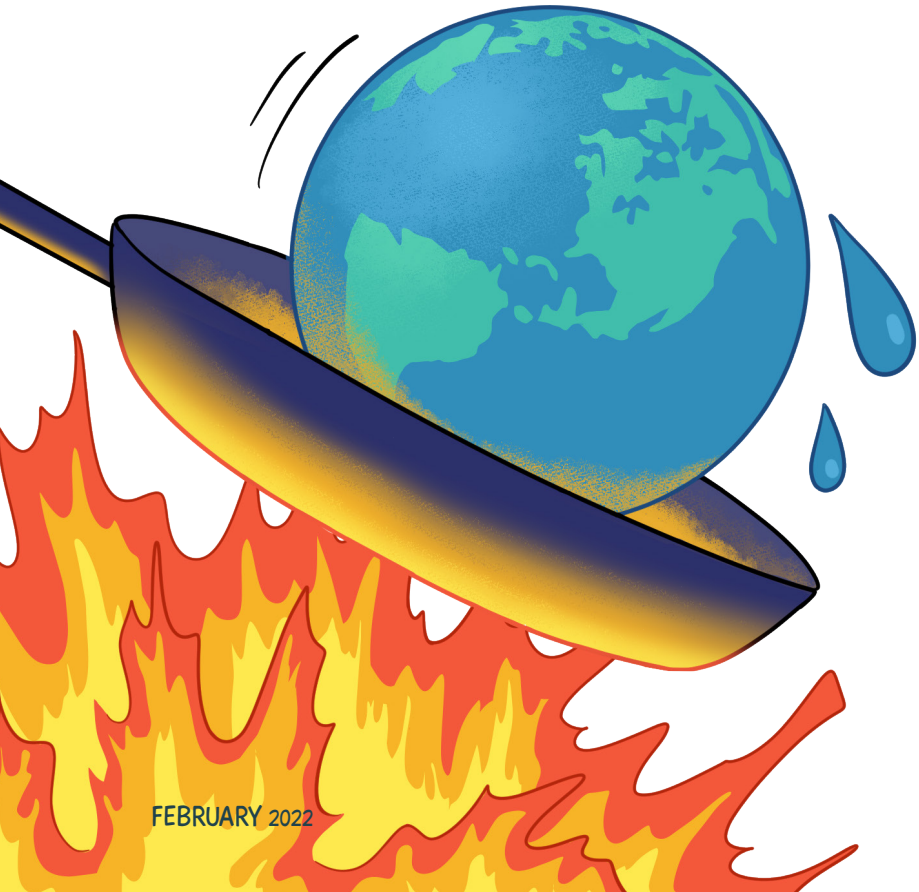
If we don't reduce greenhouse gas emissions soon, this will continue and the planet will warm by 2 to 5°C by the year 2100.

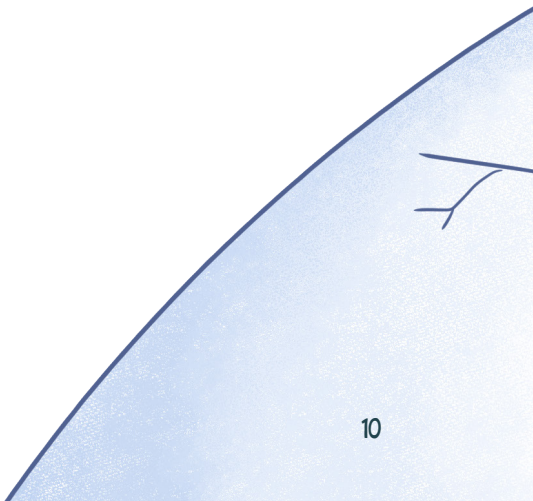
- ALEX: But what are a few more degrees going to do?

- BEAR: It doesn't sound like much, but a temperature increase of one or two degrees will have disastrous consequences for our ecosystems and our activities. It's thought that the disruption caused by rising temperatures will lead to one of the largest mass extinctions of living species ever.

At the rate things are going, many species won't be able to adapt quickly to these new conditions, so they might not survive.

Polar bears like me will become extinct.





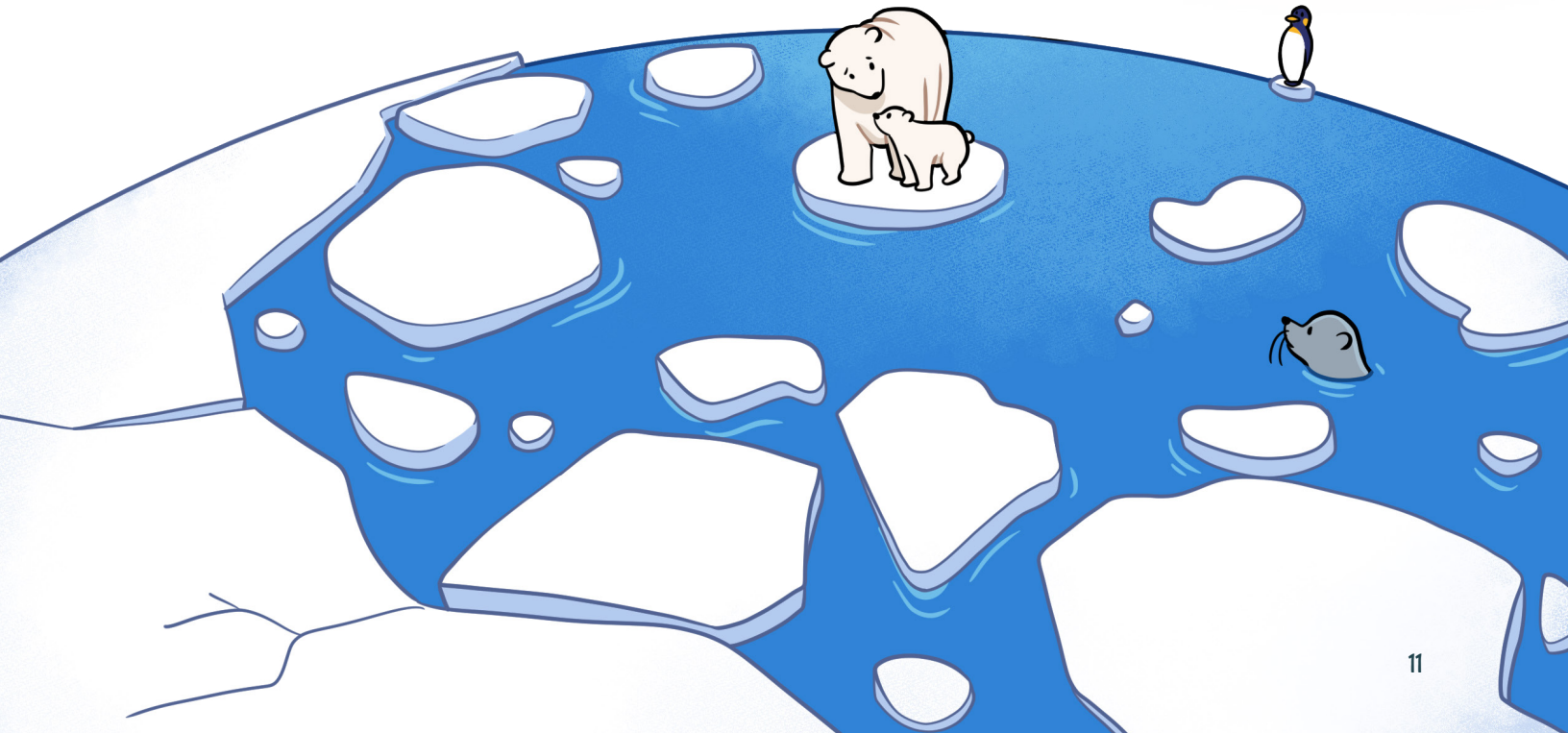
- ALEX: But that's terrible! How can that be?

- BEAR: Global warming is happening twice as fast here in the Arctic as it is in the rest of the world. That's really bad because the ice and snow are melting and taking longer to form again.

The loss of snow and ice also has an impact on the rest of the world. Without the large expanses of snow and ice that cover the Arctic Ocean, also known as pack ice, the planet will reflect less sunlight. The sun's rays will then penetrate the soil and water more easily. And this will further increase the warming and worsen the consequences of climate change.

And I haven't even mentioned that the melting of all that ice will cause the general level of water to rise. Water will take up more space and reduce the space available for terrestrial animals.

In fact, the volume of melted ice will be added to the oceans' water volume, so the sea level will rise. Coastal areas are thus faced with more flooding and increased erosion. Entire cities are likely to disappear!



- ALEX: But how are you going to get out of this mess?

- BEAR: Those few extra degrees are going to push animal species to migrate in search of food to different habitats, where other species are already living. And that's going to have an impact on the ecosystem.

I need the pack ice to move over the ocean to access my favorite food, seals.

In summer, when the ice pack has melted, I don't have access to seals, but I am able to go without food for several months!

On the other hand, if winter is late in coming and because of the heat, the ice doesn't form again, I won't be able to find food. I'll have to move away from my territory to survive.

I'll have to venture into the nearest villages to find food, but humans are often afraid of me... And those bears that can't find food will starve to death.

- ALEX: Thank you for your account of the situation. I really hope that we will find solutions so that this doesn't happen.

Now let's go meet the arctic fox. I think she'll have a lot to share too.

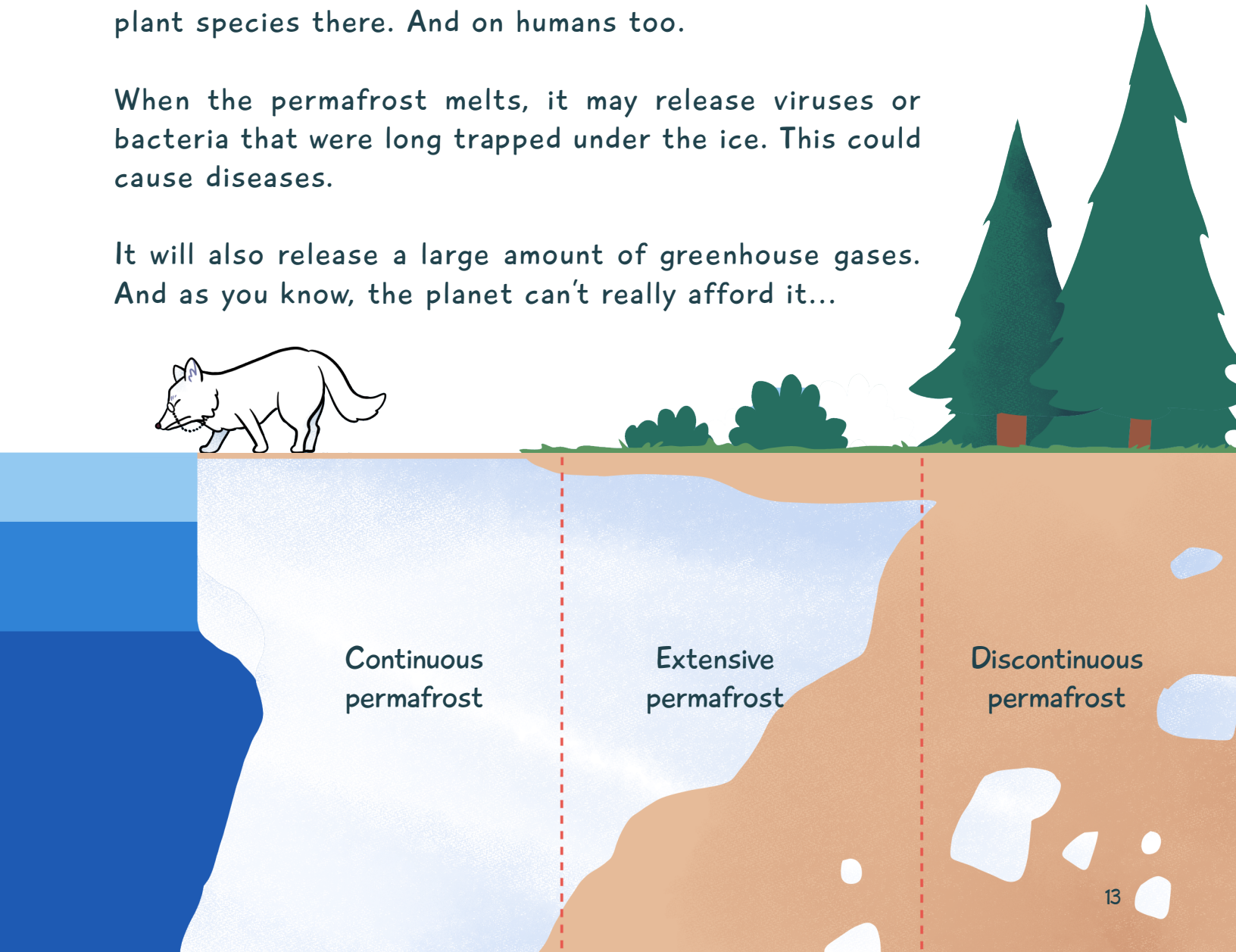
- ALEX: Well, hello there, Arctic Fox! Tell me, what's your habitat like now?

- ARCTIC FOX: Hi! I live in the tundra, in Canada's Far North. It's a land permanently covered with ice, called permafrost. The average rise in temperature is having an impact on the tundra because it causes the permafrost to melt. According to several researchers, it is estimated that almost half of the permafrost will melt by 2050 and almost 90% by the year 2100.

This is a huge catastrophe for the planet! As with the ice pack and polar bears, the changes that will affect the tundra will have an enormous impact on the animal and plant species there. And on humans too.

When the permafrost melts, it may release viruses or bacteria that were long trapped under the ice. This could cause diseases.

It will also release a large amount of greenhouse gases. And as you know, the planet can't really afford it...

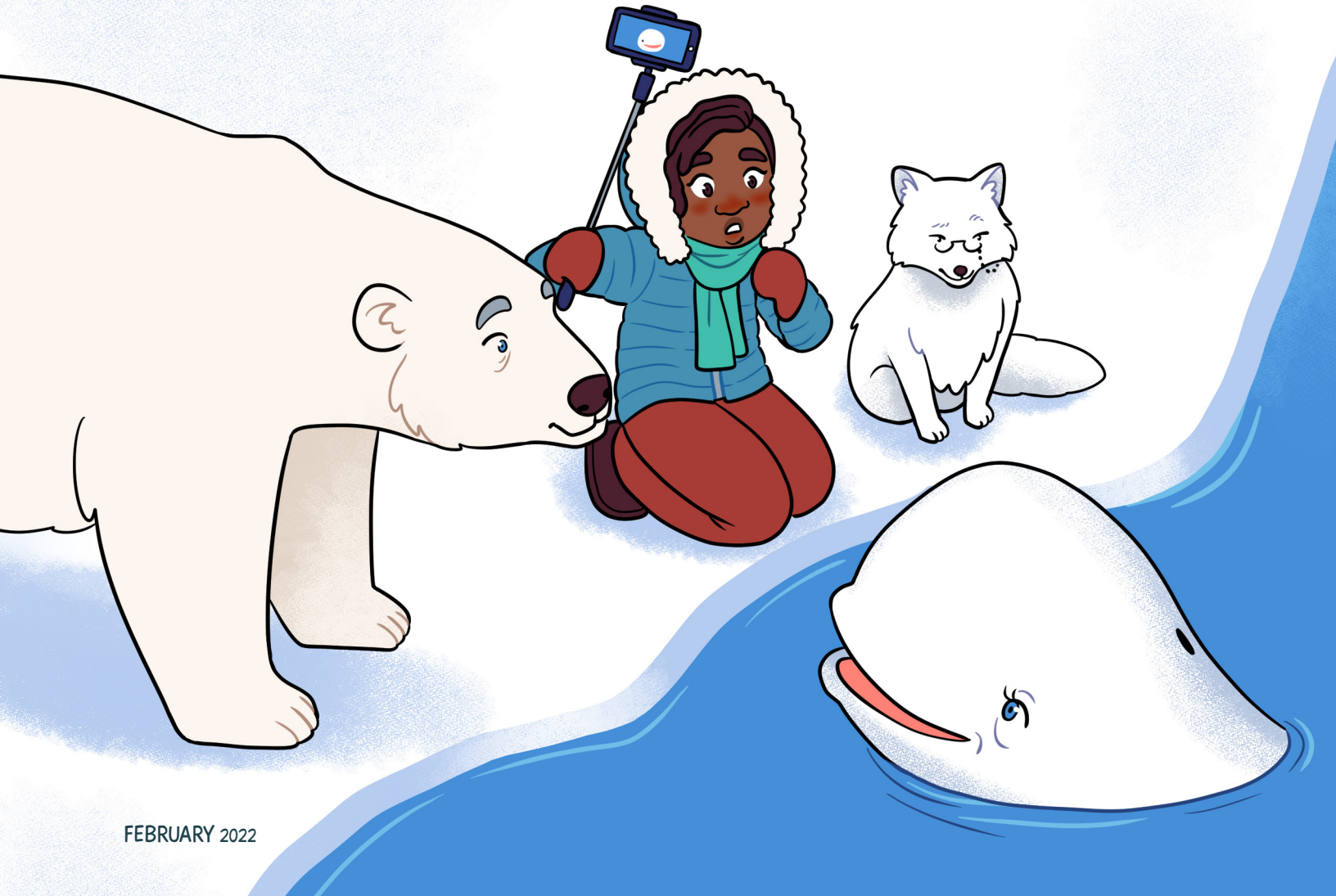


- ALEX: But if your home is destroyed, what are you going to do? Where will you go?

- ARCTIC FOX: My many Arctic animal friends and I (the wildlife), and the plants in our areas, will have to adapt or migrate elsewhere to find a suitable habitat, and find food to survive.

With global warming, the Arctic may green up. The frozen ground will give way to more surface water (lakes, swamps, ponds). Warmer waters also mean that the food chain will be affected.

Look, here comes my friend, the Beluga whale. Let's talk with him about his life in the Arctic Ocean.



- ARCTIC FOX: It's so sad that because of pollution, the quality of the Arctic Ocean's water is becoming increasingly degraded.

And as more time goes on, microplastics are having a greater impact on the lives of these marine species.

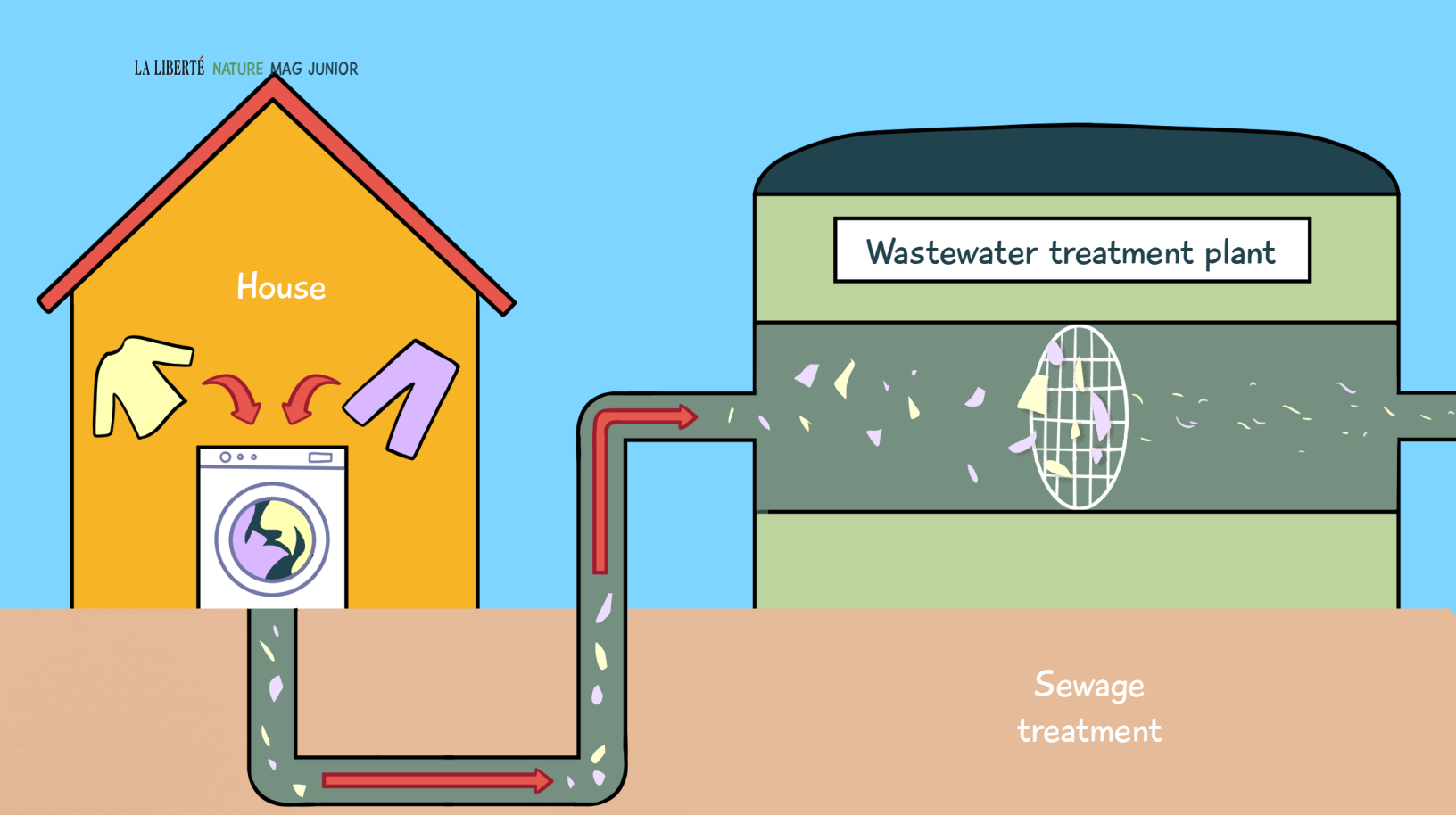
- ALEX: Hi Beluga, I don't know the term that the Arctic Fox just used, micro... what?

- BELUGA: Microplastics. Let me explain. Even though you can't see them, microplastics are in the water. They're tiny particles of plastic that are almost invisible to the naked eye. They measure less than 5 millimeters!

## DID YOU KNOW?

Belugas are one of the marine mammals most affected by microplastics. They can swallow up to 145,000 microplastic particles per year. Microplastics are found in textiles and some clothing, among other things. They make up 78% of all particles found in the stomachs of fish.

- Source Simon Fraser University




- ALEX: But where do these microplastics come from?

- BELUGA: Humans use a lot of plastic every day, in all kinds of forms. Think of bottles, toys, car tires....

With wear and tear, these pieces of plastic break down into tiny pieces that end up in the environment.

You may not know it, but microplastics are also used in products such as non-organic toothpaste, shampoo and even in clothing!

In Arctic waters, 92% of microplastic particles come from synthetic fibers that come from textiles, like polyester, synthetic silks, and spandex, for example.

- ALEX: And how do these microplastic particles get all the way here?

- BELUGA: I'll give you an example. When humans do their laundry, the water is filtered and then released into the environment through wastewater treatment plants. This water then flows out into the sea.

Even if the water has been cleaned and purified, there are still microplastics that pass through the filters because of their small size.

- BELUGA: Microplastics are everywhere... on beaches, in surface waters and also deep in the oceans.

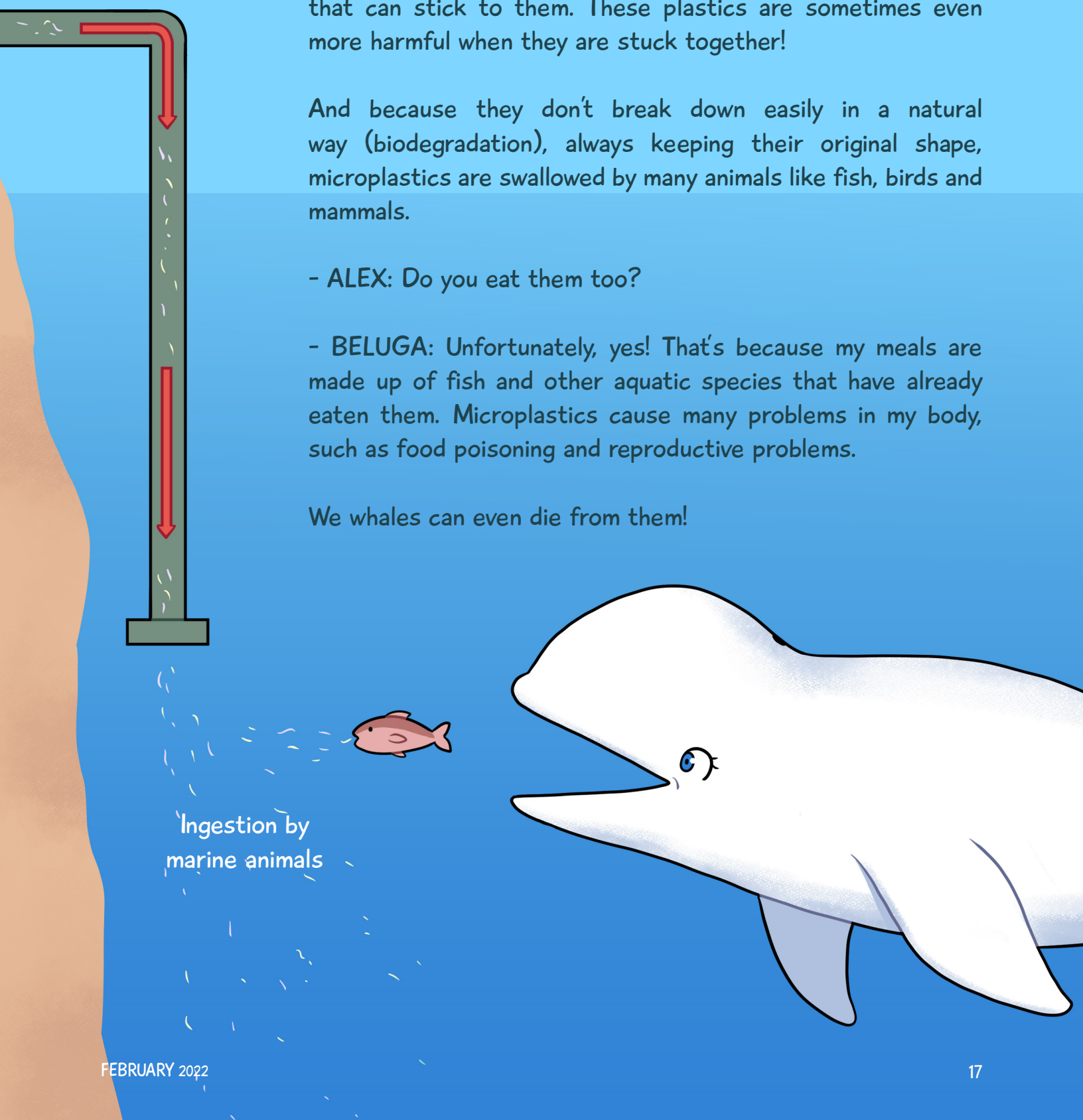
Microplastics also tend to attract other pollutants in the water that can stick to them. These plastics are sometimes even more harmful when they are stuck together!

And because they don't break down easily in a natural way (biodegradation), always keeping their original shape, microplastics are swallowed by many animals like fish, birds and mammals.

- ALEX: Do you eat them too?

- BELUGA: Unfortunately, yes! That's because my meals are made up of fish and other aquatic species that have already eaten them. Microplastics cause many problems in my body, such as food poisoning and reproductive problems.

We whales can even die from them!



- ELLIOT: Wow, that's pretty chilling, and I'm not talking about the temperature from where you're reporting.

- ALEX: I've been worried about the animals since that interview...

- AVA: Yeah, I really hope that things will change and that there will be less plastic and pollution in the future!

- KATERI: Well, as it happens, my topic is about pollution. So let me tell you about it!

## DID YOU KNOW?

The amount of plastic waste dumped into the oceans each year is expected to triple by 2040, to 29 million tons. And 80% of this waste comes from land!

It is directly responsible for the death of approximately 100,000 marine mammals per year.

Sources :
Sources: National Geographic – August, 2020
TV5Monde – December, 2021
La Presse – December, 2018

This is Kateri, live from the Fraser River in British Columbia, where I'm talking about pollution with a Pacific salmon.

- KATERI: Hey Salmon, you're always in the water. So do you see much pollution around you?

- PACIFIC SALMON: Yes, a lot, and this pollution comes from different sources: plastic waste, domestic sewage, pesticides and oil.

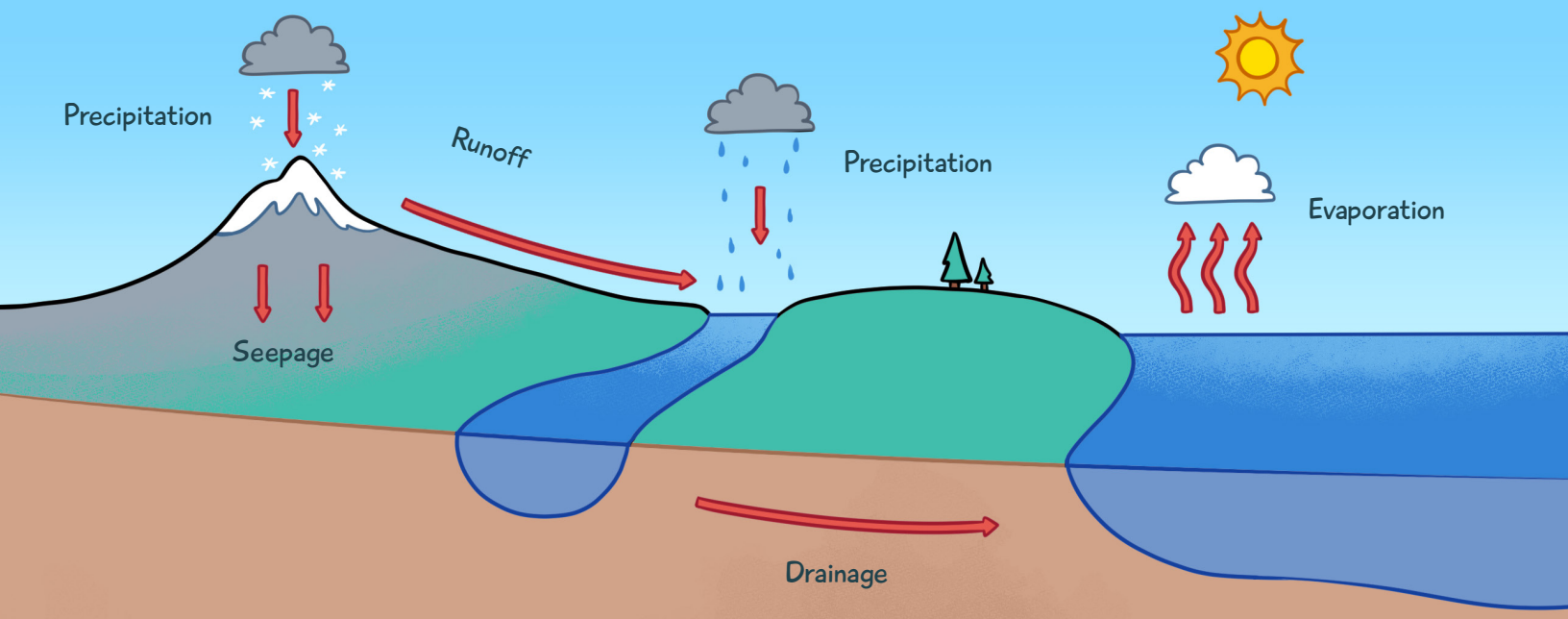
- KATERI: Oil? In the water?

- SALMON: That's right. You may have heard about oil spills, which are big ecological disasters caused by accidents on oil platforms or in factories on the seaside, or from ships transporting oil. The oil slicks created by the spills cause a lot of damage to the marine fauna and flora, including the destruction of their habitat, among other things.

- KATERI: Those oil slicks are very dangerous! Is this the biggest threat to you?

- SALMON: Yes, and it's a serious threat indeed! But the biggest source of water pollution comes from what scientists call "runoff".

Runoff happens when water, rain or melted snow flow over the ground, carrying nutrients, pesticides and other chemicals that do terrible harm to aquatic and terrestrial ecosystems. The waste ends up in waterways, like streams, rivers, lakes, seas... and then the oceans.




- KATERI: Like microplastics, for instance! My friend Alex talked about this with the Beluga in his report.

- SALMON: You're right. Those little plastic particles are also carried by runoff. Just like the invisible waste found in soils, like pesticides.

- KATERI: Would it be possible to filter these wastes and pesticides to make the water cleaner?

- SALMON: Yes, in fact humans treat their water before its consumption. The water you drink has been treated in wastewater treatment facilities. But they can still allow microparticles to pass through.

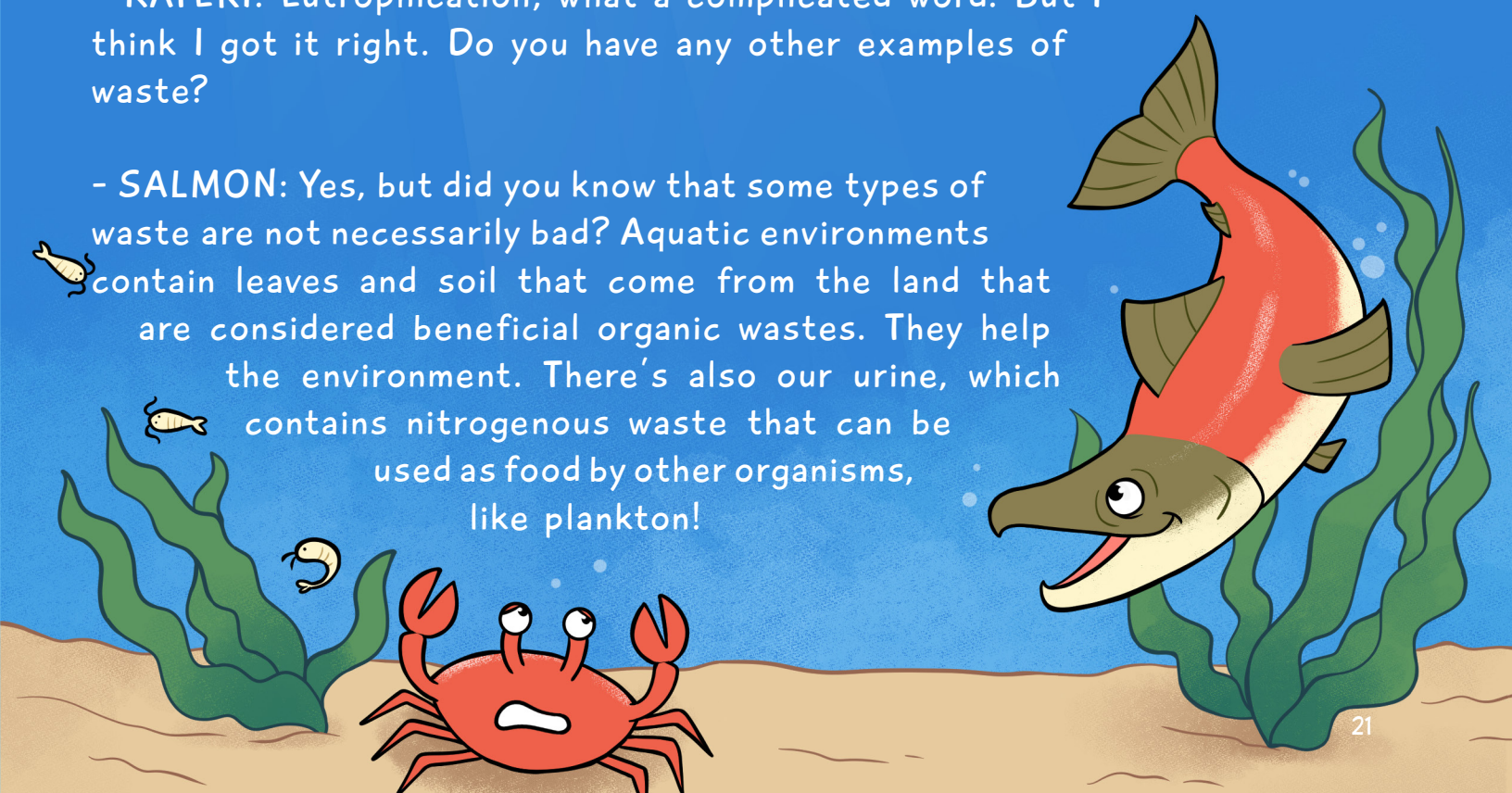
- KATERI: You're talking about human waste, but isn't there also waste produced by nature?

- Salmon: Yes, but nature has the ability to adapt, and the impact of natural pollution takes much more time to be felt, as opposed to human pollution. And if the natural balance isn't respected, it can create all sorts of disturbances. For instance, you may have seen lakes or ponds covered with what's often called "blue-green" algae. Those are cyanobacteria and aquatic plants that float on the surface like a green carpet. They're caused by an excess of nutrients, such as phosphorus and nitrogen, which promote their growth at a rapid rate. That's what's called eutrophication.

This surface cover blocks light and prevents plants and other organisms at the bottom from photosynthesizing. So they die and rot at the bottom of the lake, which is then considerably depleted of oxygen. The fish and many organisms that need oxygen to breathe eventually die, which reduces biodiversity. Some "blue-green" algae produce toxins that can cause irritation on contact with the skin or even kill aquatic animals.

- KATERI: Eutrophication, what a complicated word! But I think I got it right. Do you have any other examples of waste?

- SALMON: Yes, but did you know that some types of waste are not necessarily bad? Aquatic environments contain leaves and soil that come from the land that are considered beneficial organic wastes. They help the environment. There's also our urine, which contains nitrogenous waste that can be used as food by other organisms, like plankton!



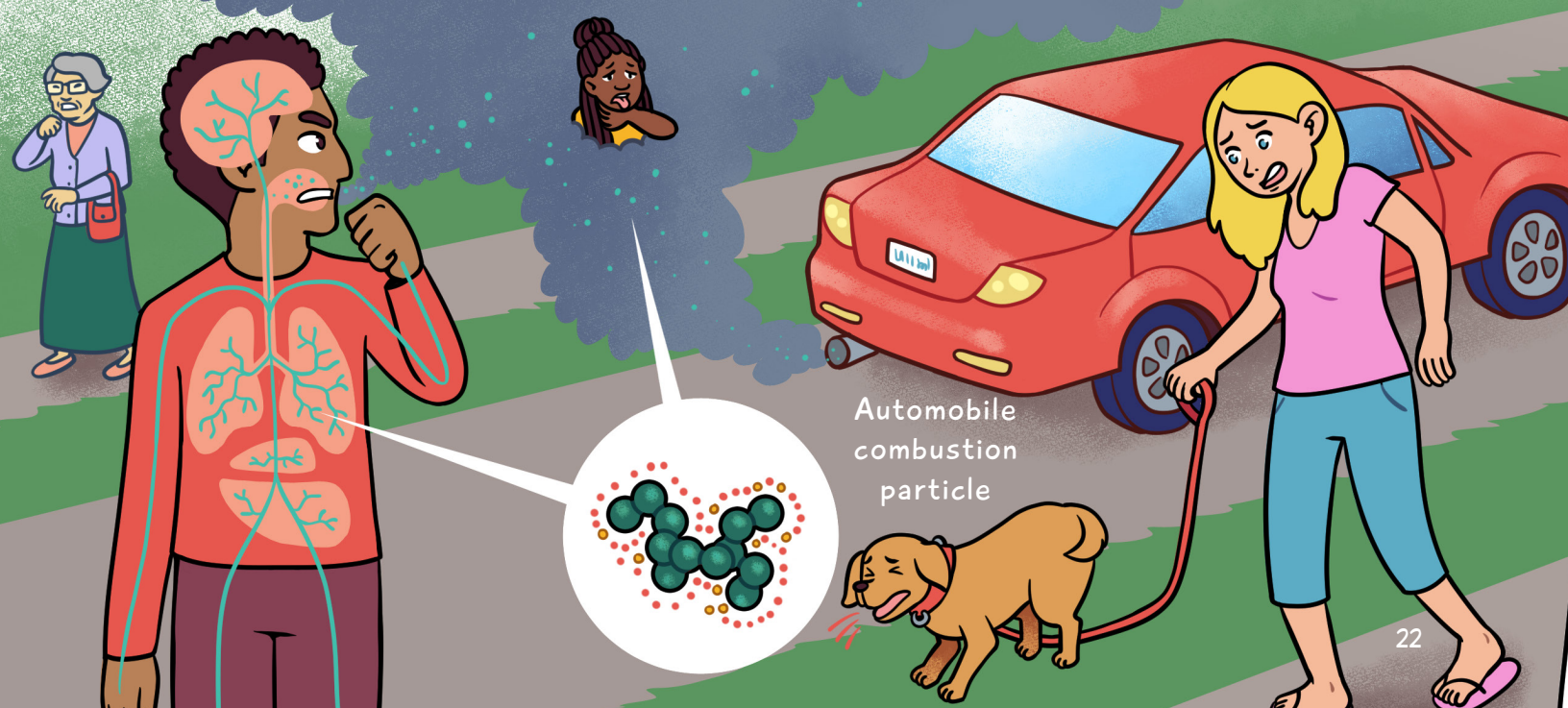
- KATERI: After marine pollution, I now turn to the Canada goose to talk about air pollution. So what is the main cause of air pollution?

- CANADA GOOSE: Human activity is the primary cause, including emissions from industry and agriculture (smoke and dust), as well as combustion heating and transportation.

Especially if these activities use fossil fuels! Fossil energy is produced from fossil fuels that are rich in carbon, such as oil, natural gas or coal. When used, these fuels produce fine particles that are invisible, because they measure between 0.1 µm and 5 µm (micrometers).

To give you an idea, the thickness of a human hair is about 50 µm! So they're in the air and can enter the lungs when breathed in.

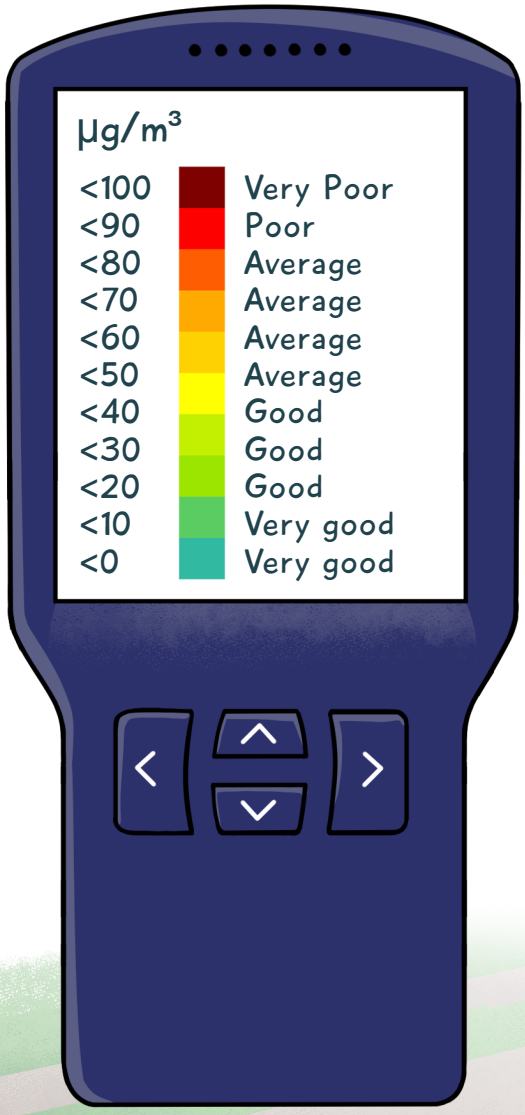
Depending on their size, the particles will create different diseases in humans and affect the heart, the lungs or the brain. And in animals, it is the same.



- KATERI: But how can I know if I'm breathing in particles that are dangerous to me?

- CANADA GOOSE: Humans measure air quality every day to see how much pollution is in the air. When the levels exceed allowable thresholds, it is called peak pollution. Pollution levels are measured in parts per million (PPM), which tells us how many pollutant molecules are found in one million molecules of air.

The air quality index is calculated by measuring the presence of the following five pollutants in the air: fine particles, ozone ($O_3$), nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$) and carbon monoxide (CO).




## DID YOU KNOW?

According to the World Health Organization, 92% of the world's population breathes air that is too polluted by fine particles. One of the most polluted cities in the world is Delhi, India, with a PMP of 84.1 µg/m$^3$. Gitanyow (17.9 µg/m$^3$) and Clearwater (15.5 µg/m$^3$), British Columbia, are ranked among the most polluted cities in Canada.

These figures are based on particulate matter counts of PM 2.5

- KATERI: Are humans the only ones responsible for particulate pollution? There were a lot of forest fires in my home province of British Columbia, and it we were advised not to go outside because of the poor air quality...

- CANADA GOOSE: No, humans are not the only cause. It's just as you said. There are natural phenomena like volcanic eruptions or forest fires that can produce these particles.

- KATERI: And how do we know if these particles are bad for us?

- CANADA GOOSE: In Canada, we use the Air Quality Health Index (AQHI). It links air quality to human health. The particles liable to cause the greatest harm are often visible to the naked eye, because they all fit together.

- KATERI: Oh yeah, there was a kind of gray veil covering the sky after the forest fire!

- CANADA GOOSE: That's called smog. The term smog comes from the contraction of the words "Smoke" and "Fog". Smog is sometimes caused by natural phenomena, but when it appears, it's more often than not because of the excessive use of fossil fuels.

- KATERI: To complete my report, let's talk about soil pollution with the honey bee. She's going to tell us about soil pollution and its causes.

- HONEY BEE: One of its causes, besides the fossil fuel industry, is agriculture.

For example, because of intensive agriculture (i.e. when we cultivate so often that the soil doesn't have time to rest), soil doesn't have as much biodiversity and is now considered more as a medium that helps roots grow, instead of being a diversified and living micro ecosystem.

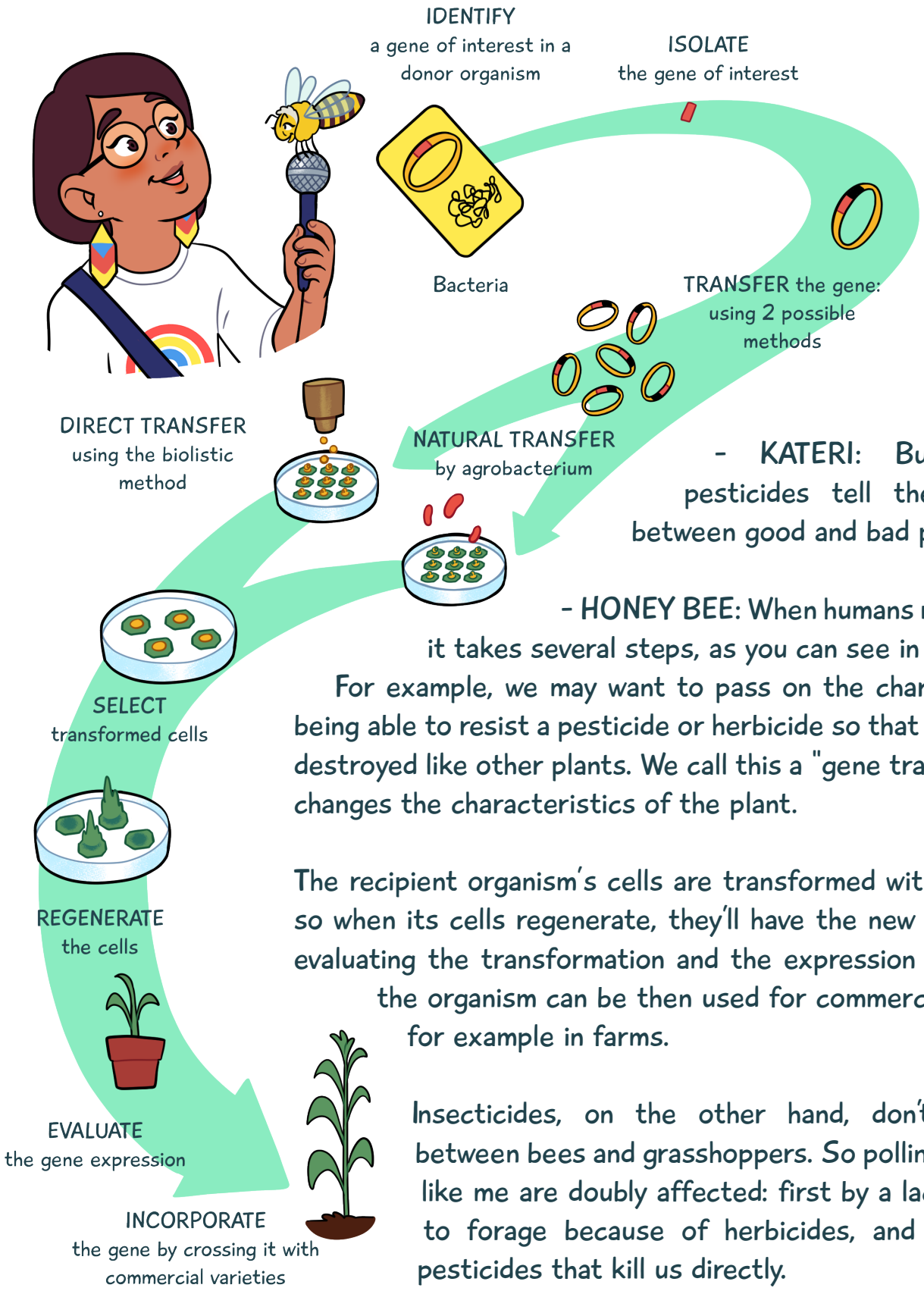
The soil may even become unfit for crops. And then there are pesticides, which were created to protect plants.

There are 3 types of pesticides:
- Insecticides, to fight against insects.
- Herbicides, to fight against certain plants (what we call "weeds").
- Fungicides, to eliminate molds and fungi that become parasites on the plants.

Pesticides are most often used in agriculture, but there are also used at home, in our gardens. And while they do protect crops and gardens, they are highly polluting and dangerous for the soil.

- KATERI: What effect do these pesticides have on the soil?

- HONEY BEE: Well, herbicide is very damaging because it contains a chemical that kills ALL vegetation, unless that vegetation is a genetically modified organism (GMO) or a specific plant .




- KATERI: But how do pesticides tell the difference between good and bad plants?

- HONEY BEE: When humans make a GMO, it takes several steps, as you can see in this diagram. For example, we may want to pass on the characteristic of being able to resist a pesticide or herbicide so that a plant is not destroyed like other plants. We call this a "gene transfer", which changes the characteristics of the plant.

The recipient organism's cells are transformed with new genes, so when its cells regenerate, they'll have the new genes. After evaluating the transformation and the expression of the gene, the organism can be then used for commercial purposes, for example in farms.

Insecticides, on the other hand, don't distinguish between bees and grasshoppers. So pollinating insects like me are doubly affected: first by a lack of flowers to forage because of herbicides, and also by the pesticides that kill us directly.

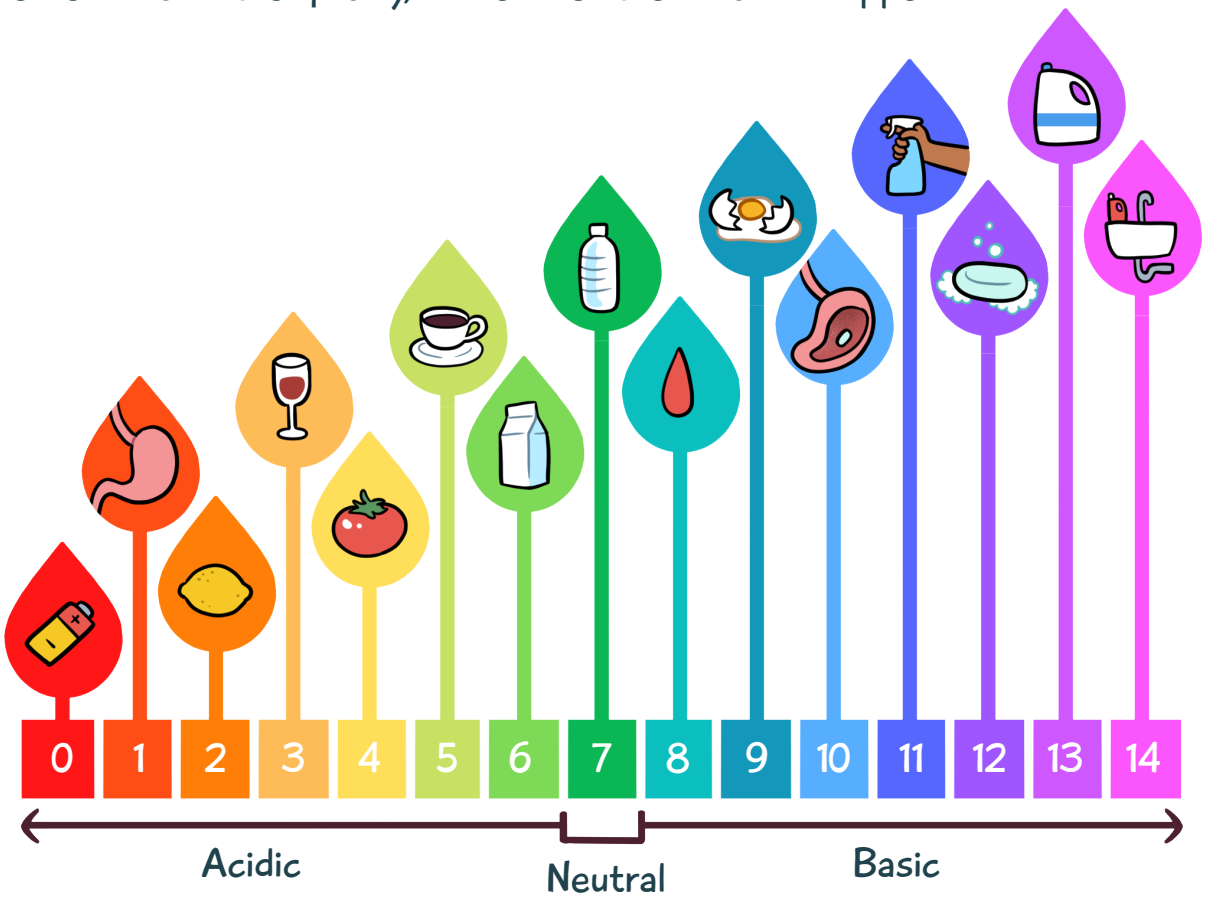
- KATERI: Besides pesticides, what other pollutants are in the soil?

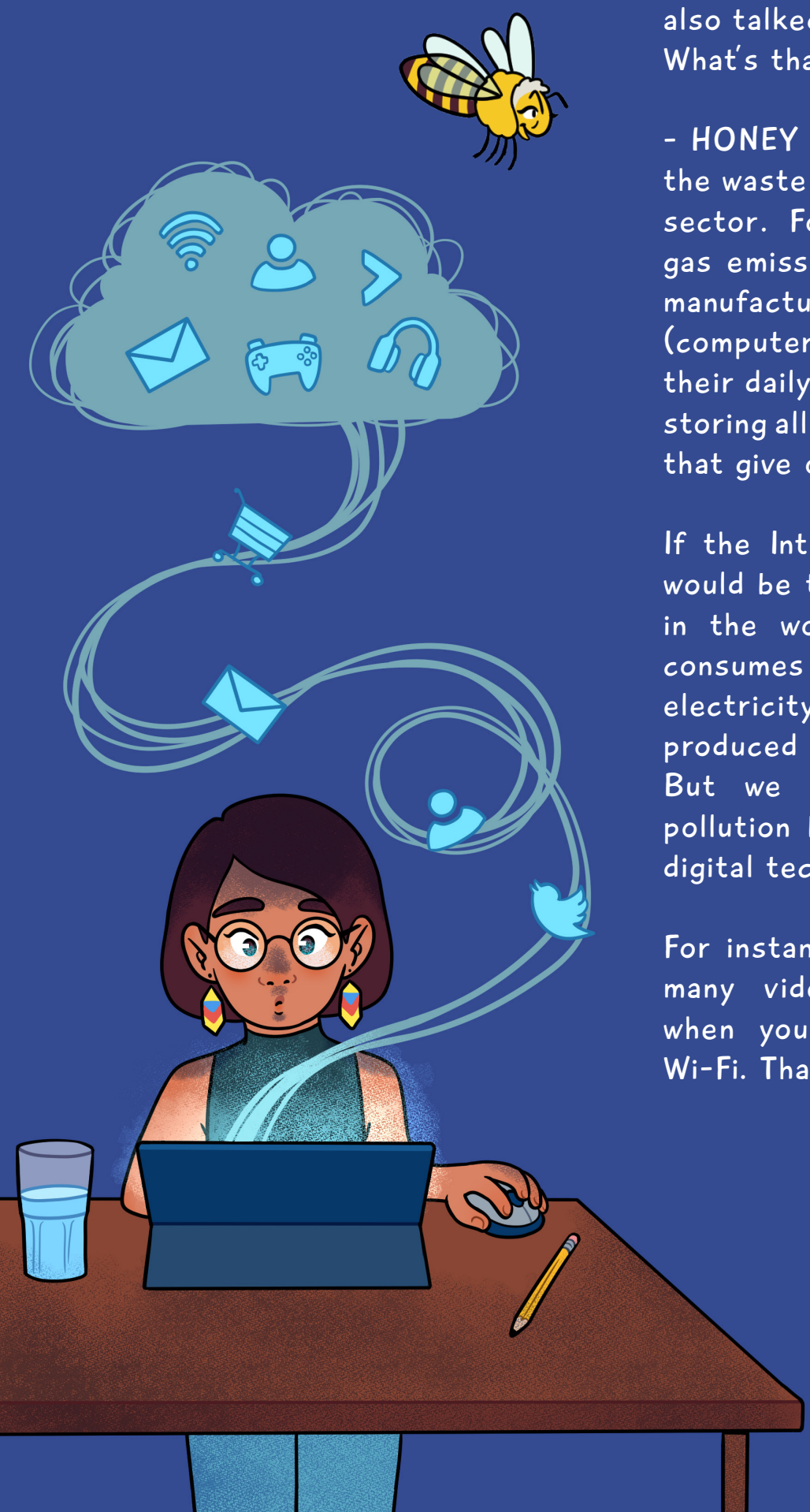
- HONEY BEE: There are many! Many human activities have unfortunately depleted the soil, or transformed it and polluted it. There's deforestation, fires, construction or waste dumping. Some of these even cause acid rain!

- KATERI: Acid rain? But isn't rain usually just water?

- HONEY BEE: Not always. For instance, when fossil fuels like coal or gasoline are burned, they release residues that are captured by the atmosphere and fall back to earth with the rainwater. The runoff flows into streams, rivers and lakes, which increases their acidity. Acidity is measured with the hydrogen potential or pH. A pH of 7 is considered neutral.

Our entire ecosystem is affected by acid rain. Trees affected by acidic water lose their leaves much more quickly, and entire forests can disappear.





- KATERI: The other day, my dad also talked about digital pollution. What's that?

- HONEY BEE: Digital pollution is the waste generated by the digital sector. For instance greenhouse gas emissions. It comes from the manufacturing of digital equipment (computers, tablets, servers, ...), their daily use and most especially storing all the data on large servers that give off a lot of heat.

If the Internet was a country, it would be the 6th biggest polluter in the world! Digital technology consumes 10 to 15% of the world's electricity, the same amount produced by 100 nuclear reactors. But we can all reduce digital pollution by the way we consume digital technology.

For instance by not watching too many videos or playing games when you don't have access to Wi-Fi. That can help.

- KATERI : So you see, soil pollution has a global impact. It affects the food we eat, the water we drink, and even the air we breathe. Our health, like the health of animals, depends on the quality of the soil.

- ALEX: Wow, I didn't know there was so much pollution in the water, air and soil. You've taught me a lot!

- ELLIOT: Yes, this discussion has shown me just how much, and I'm going to tell my parents. We all have to work at it!

- AVA: Since my chat with the wood turtle, I've been talking to my uncle who has a farm, and I've been able to tell him how dangerous the use of certain products is for animals and plants. Would you like to hear what the turtle told me?

Hello everyone, this is Ava, here on the grounds of the SOS shelter in Ontario, where I'm talking with the Wood Turtle.

- AVA: If I understand correctly, you live both in the water and a little on land, so you must come across many different species! Have you noticed the effect pollution has on you and your friends?

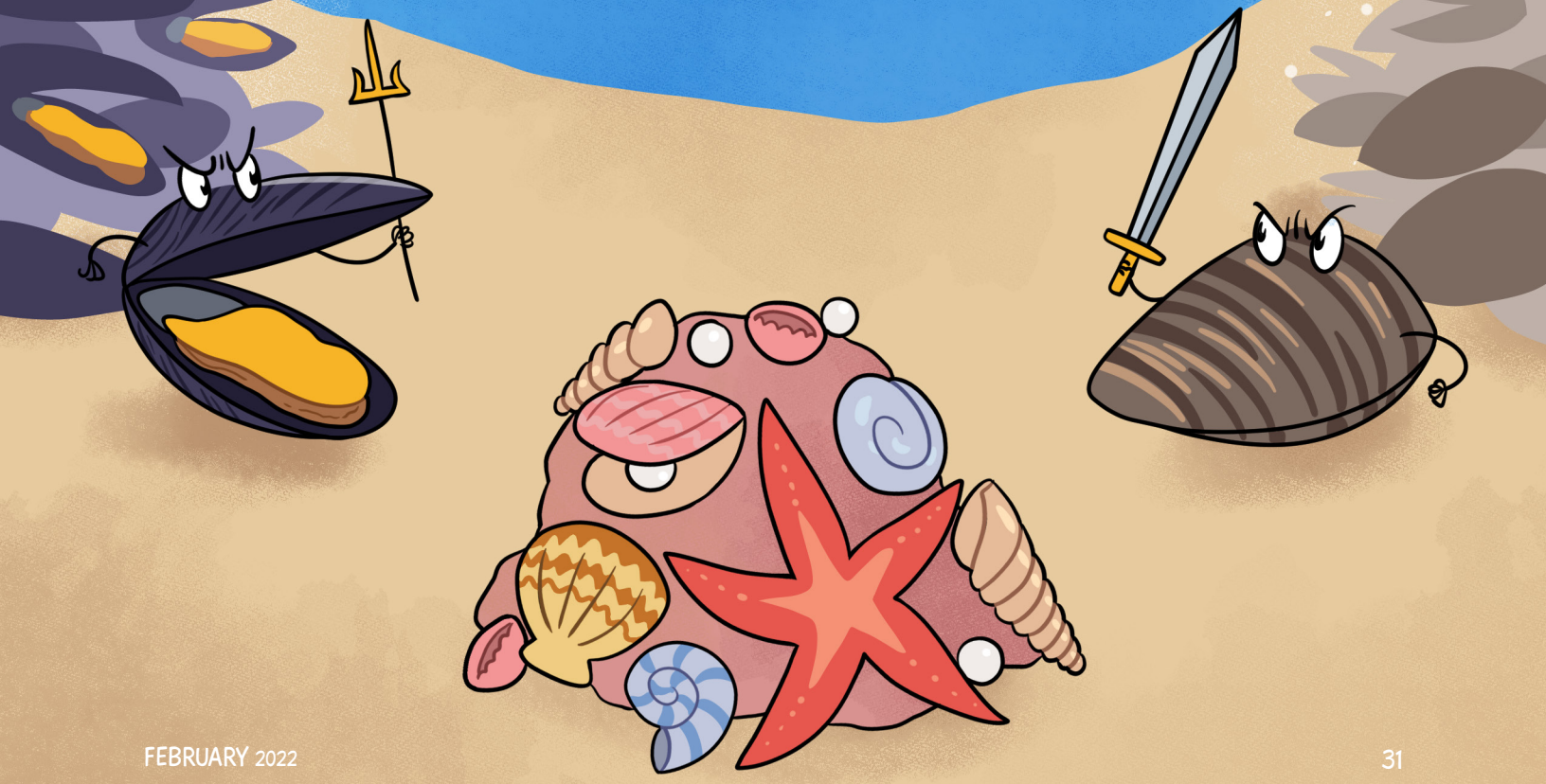
- WOOD TURTLE: Pollution has a huge impact on how we live, feed or reproduce, especially on aquatic species like me. We're very concerned about it, because the wetlands we live in act as sponges that absorb and accumulate pollutants from the water, soil and air. The situation is changing and getting worse because of rising temperatures and acidity levels in the water.

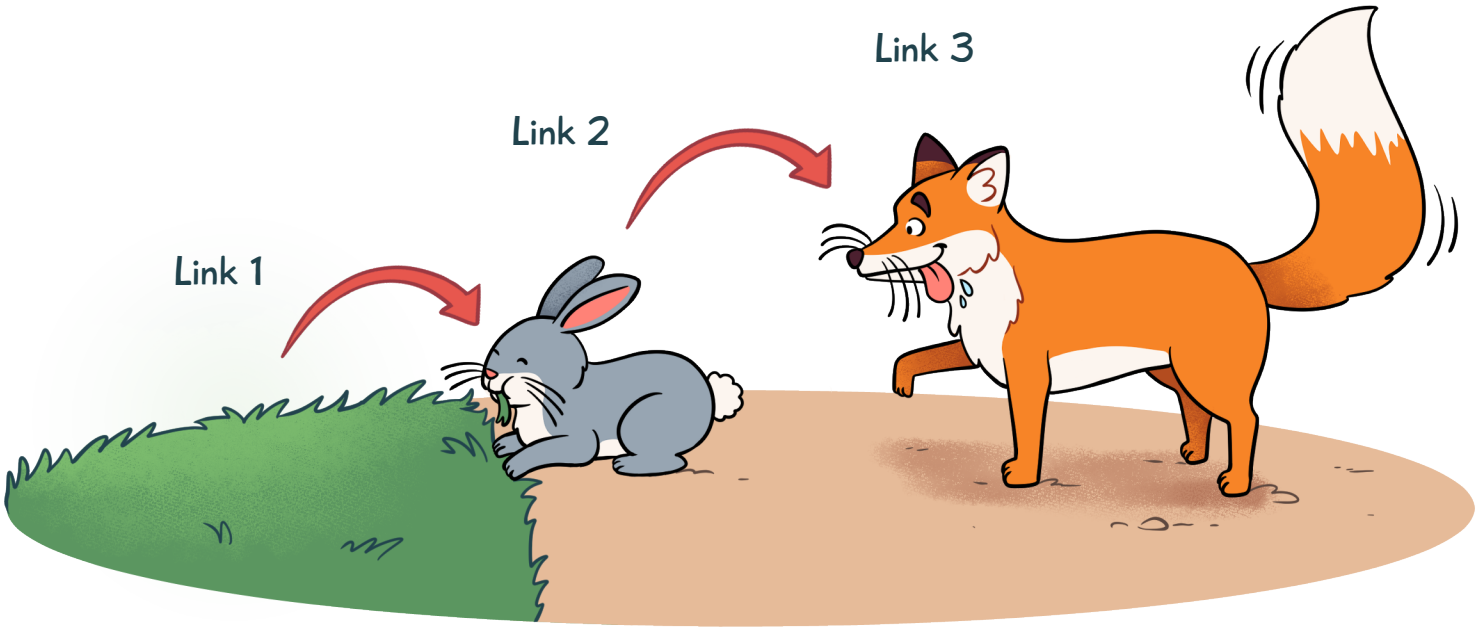
- AVA: How have you been adapting to these changes?

- WOOD TURTLE: Animal and plant species have different ways of adapting to changes in their habitat. With plants, it's the exotic species that are the most successful at it, because they're not native. They've been introduced to the habitat by humans. So they take a bigger piece of "the pie" of the natural resources that are out there.

As for native species, they have evolved very slowly over the millennia in a very specific environment. They're not accustomed to change, so they don't adapt well to environmental disturbances and they become vulnerable, because of competition for natural resources in their habitat.

The least adapted species become more fragile and eventually give way to those that are better able to survive in the environment.






- AVA: And how do all these species interact with each other?

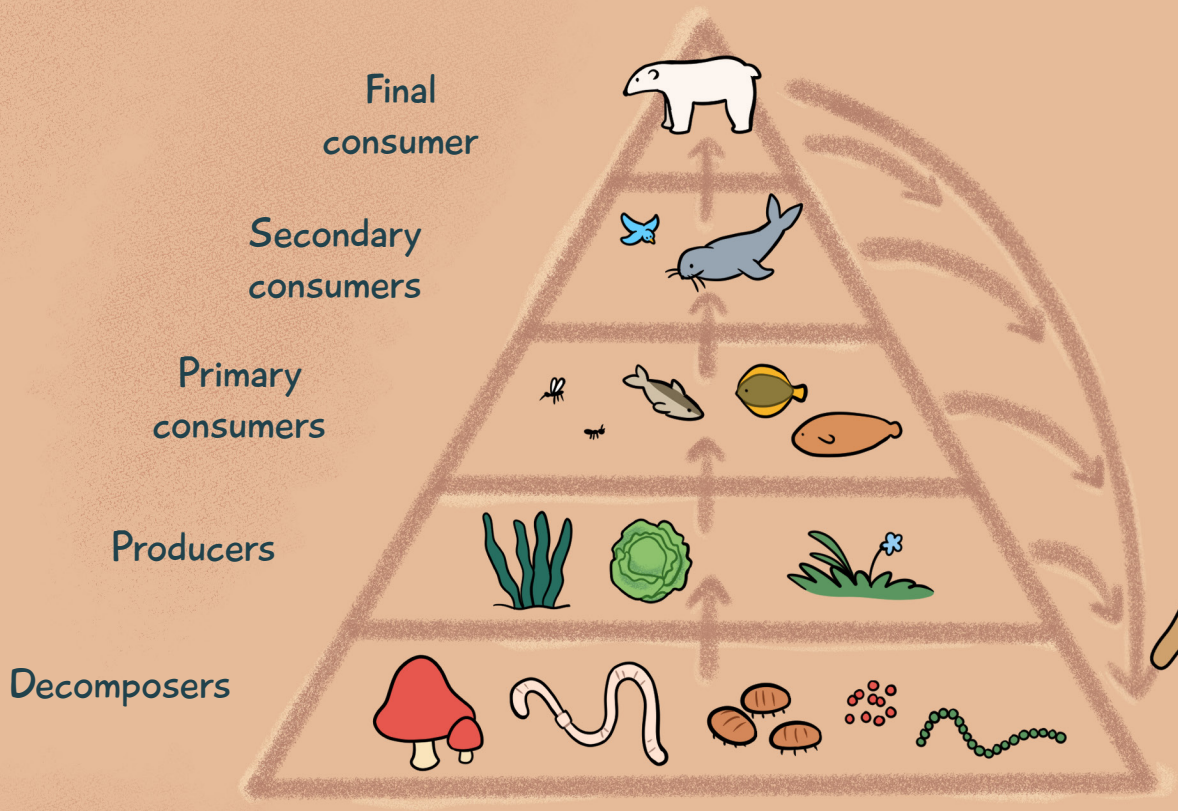
- WOOD TURTLE: Each species in a trophic level depends on other species for food and to limit competition.

Take the fox. The fox eats the rabbit, which means that it depends on the rabbit for its survival.

The rabbit, on the other hand, eats on grass and therefore depends on this plant food. So, indirectly, the fox depends on the grass that the rabbit eats. Everything is connected! That's what we call a food chain.

- AVA: Can you tell me more about this food chain?

- WOOD TURTLE: The food chain is a way to simplify the interactions between living things in an environment. Let's use a pyramid to explain it clearly. Here's a pyramid describing the polar bear's food chain. It's one example, but there are many others!




At the base of the pyramid, we find the decomposers. These are most notably bacteria or fungi. They decompose all the dead organisms of the food chain, which can then be used for instance as fertilizer for plants. Then we find the primary producers. They produce their own food by photosynthesis. This is what plants do.

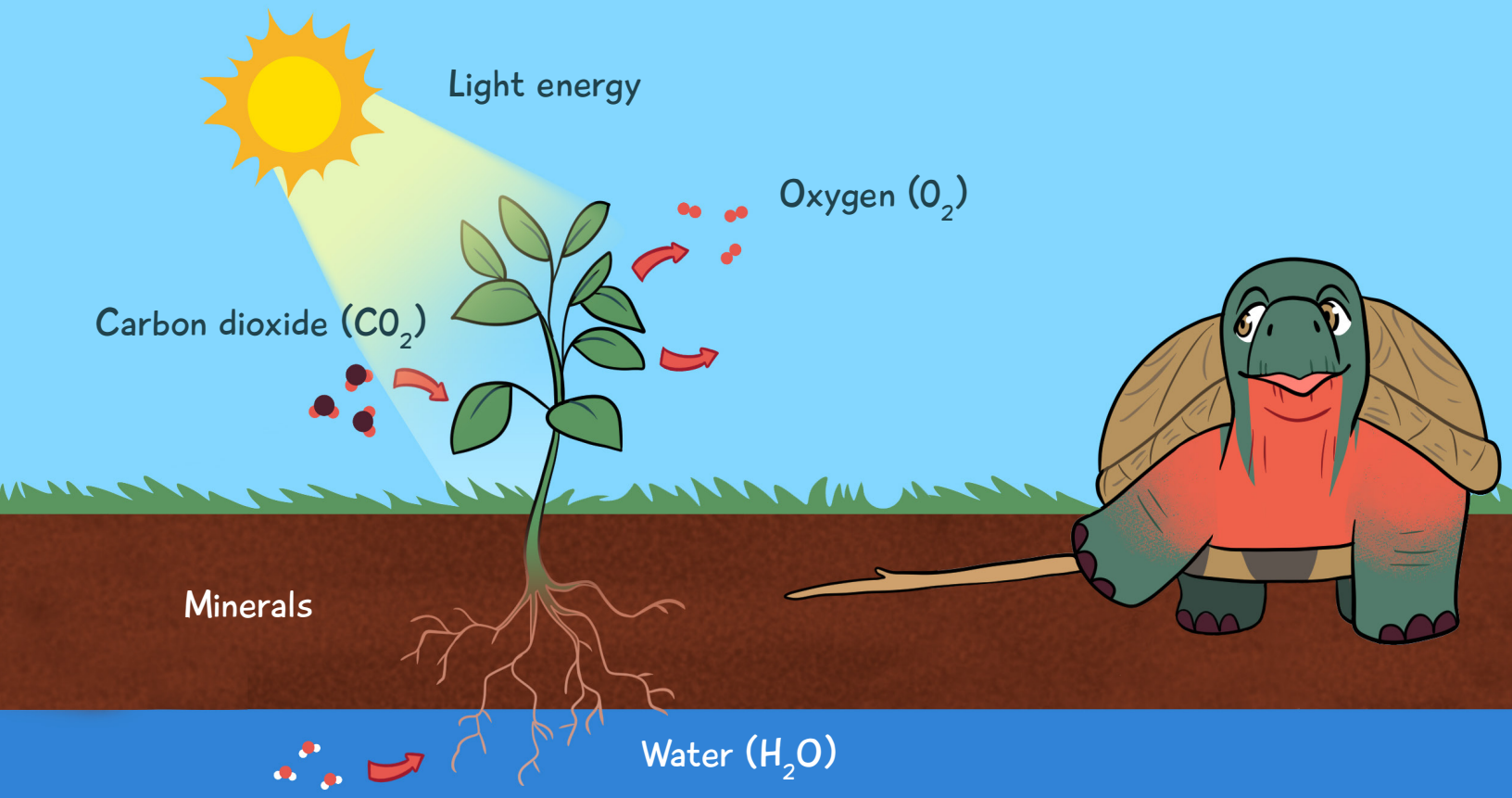
Consumers, on the other hand, eat the producers or other consumers, which makes it possible to distinguish between primary and secondary consumers, etc.

Finally, at the top of the pyramid, we find the final consumers such as the polar bear, the shark, the lion, etc. who eat the other groups. Humans fall into this category as well, since they have no predator.

And finally, we come back to the decomposers and the cycle starts all over again.

- WOOD TURTLE: Let's take a closer look at how primary producers work.

These are mainly plants, algae, and blue and green bacteria which produce organic matter thanks to light, carbon dioxide ($CO_2$), minerals and water. This is what's called photosynthesis.




- AVA: Is the order in this pyramid always respected?

- WOOD TURTLE: No, and it's good you pointed that out. In reality, we're talking about a food web. It's a bit more like a spider's web... But we use the image of the pyramid to make things clearer.

By the way, it's also very important to note that there is no link between these different levels and the diets of each species in the different levels! There are herbivores, who eat plants, carnivores, who eat animals, and also omnivores who eat both animals and plants.

- AVA: Thank you so much Wood Turtle for these explanations, but just out of curiosity, why are you in the shelter and not in the forest?

- WOOD TURTLE: Well, unfortunately for me, I swallowed some plastic waste. I thought it was food. It gave me very bad stomach ache. The SOS shelter found me, took me in and treated me. But soon I will be able to go back to the forest and join my family!

- AVA: I'm so glad to hear that you're doing much better and that the shelter is taking good care of you. That reminds me, my friend Elliot is going to do an interview about waste. I hope it will help us understand how dangerous it is, and that we can find solutions!

Get well soon, Turtle!

- ALEX: Poor Turtle, I hope he makes it.

- AVA: Yes, I contacted the shelter again. They've released him back into the wild. He should be with his family now.

- ELLIOT: That's good news! I'm really happy. But when he says he swallowed a piece of plastic waste, I get pretty frustrated! Especially since I did a story about garbage and waste with a tree frog.

ELLIOT : Hello folks! I'm here with the tree frog! She's going to talk to us about garbage. First of all, could you tell us what garbage is?

- TREE FROG: Garbage is a product, material or substance that's been thrown away or abandoned because it's no longer useful. There are different types of waste: domestic, industrial, agricultural, and radioactive, among others. They're often related to human activity.

We can classify this waste into categories:

- household waste, the kind we find in our garbage cans at home,

- inert waste that does not degrade easily, like stone and concrete,

- non-hazardous waste, which isn't necessarily bad for the environment, such as vegetable waste (branches or dead leaves),

- hazardous waste, such as radioactive waste, or even batteries.

Some of these can be recycled, or are biodegradable. Other types of garbage can take thousands of years to decompose.


- ELLIOT: When I go for a walk, I see a lot of garbage... My family and I pick it up. But I keep wondering, how long it takes for different types of garbage to disappear?

- TREE FROG: They don't all disappear at the same speed. And unfortunately, some take thousands of years to be biodegraded completely. That's why it's so important to dispose of them in the right places and not to mix them up!

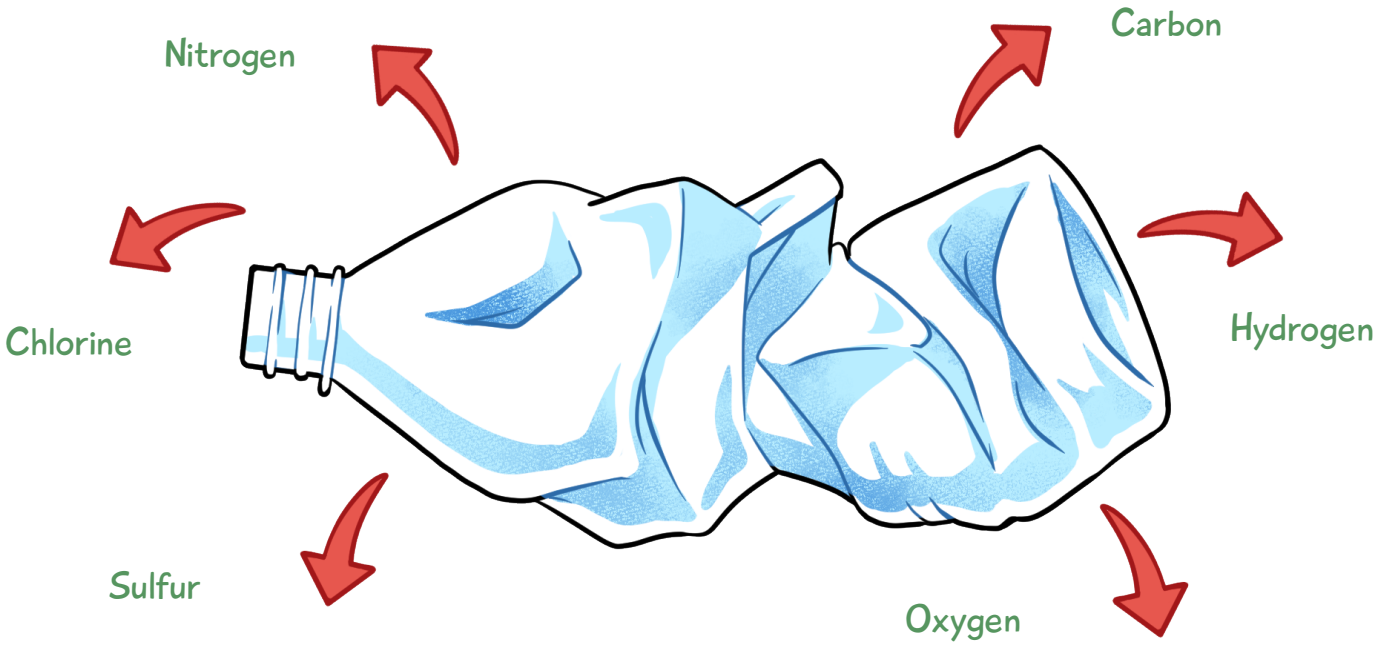
- ELLIOT: Oh, so that's why my mom only chooses biodegradable packaging when she goes grocery shopping and never uses plastic bags.

- TREE FROG: Yes, that's because plastic bags take 400 to 450 years to disappear. Your mom is quite aware of the impact her choices have on the environment!

- ELLIOT: 400 or 450 years for plastic? So what's it made of, and why is it such a problem?

- TREE FROG: Plastic comes from fossil fuels like oil, natural gas and coal. It can release toxic compounds into our environment. And humans produce a lot of plastic for everyday use. You'll find it in packaging, synthetic fabrics like winter coats, shampoo bottles, toothbrushes, makeup...

Everywhere, really! It may be an easy and cheap resource to produce, but it's not yet a truly recyclable resource.




## DID YOU KNOW?

Canadians throw away more than 34 million plastic bags every day, yet the country's population is 38.5 million. This means that each day, each person throws away almost one plastic bag.

Source: Environment and Climate Change Canada (2019)

- ELLIOT: But tell me, Tree Frog, there must be ways to reduce our waste?

- TREE FROG: Yes. There's a good way to reduce both our waste and our pollution. It's called the 6Rs rule: Reuse, Repair, Refuse, Reduce, Recycle and Rethink

1. REUSE: Can you use a product several times? You can't reuse a plastic straw! But you can buy groceries with reusable bags instead of plastic ones.

2. REPAIR: Don't throw away a broken product that can be repaired, like a damaged drawer. Don't throw away the whole piece of furniture, fix the drawer!

3. REFUSE: Avoid buying a product that isn't really useful or that can't be recycled. For instance, at your birthday party, you can refuse the goody bags and ask for just one present.

4. REDUCE: Try to reduce your waste. Instead of using paper towels to clean the table, you could use a dish cloth, for instance.

5. RECYCLE: Recycle glass and plastic bottles, and make your own compost using your food waste!

6. RE-THINK: Think about what you really need before buying something. Ask yourself, do I really need two remote control cars or the latest toy?

- ALEX: Thanks, Elliot. The last part of your discussion with the tree frog made me feel way better!

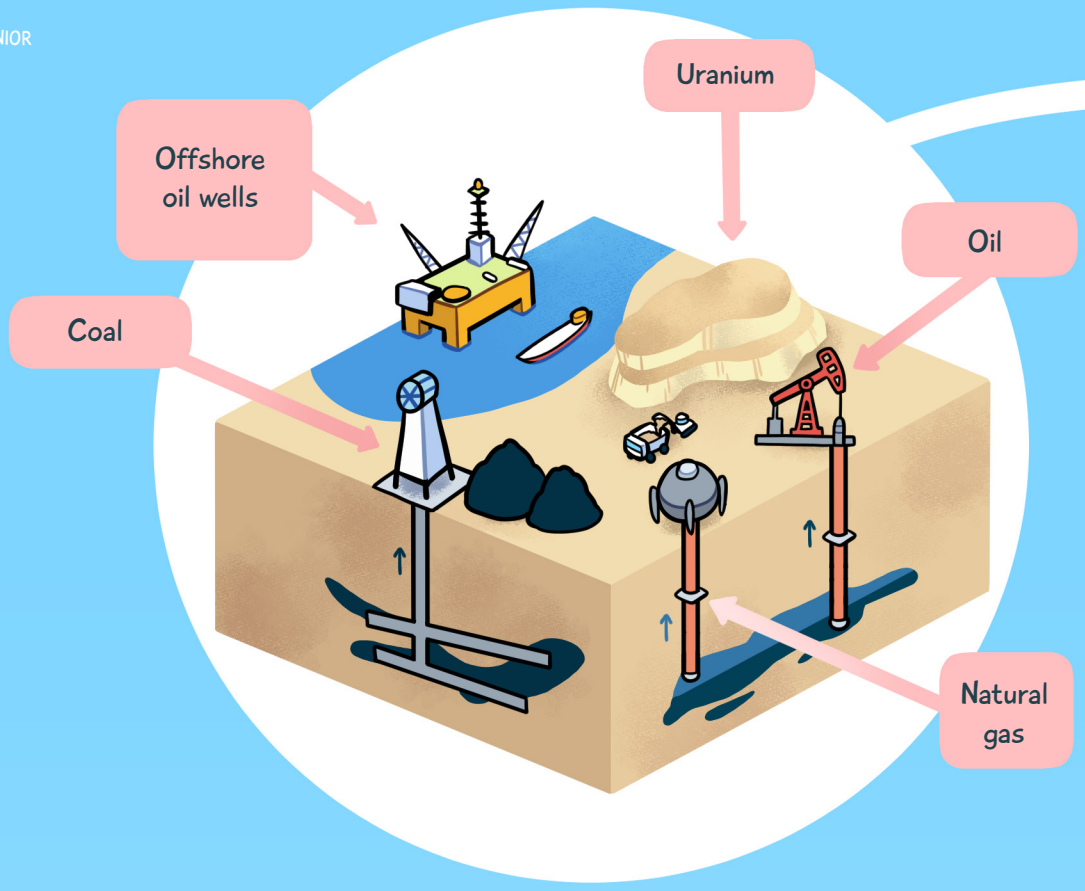
- ELLIOT: Absolutely, it did! With the 6Rs, you too can make important choices for the planet. Even businesses must be asking themselves these kinds of questions these days.

In a circular economy, you have to think about the whole life cycle of a product, from its design, its manufacture and use, all the way to its breakdown and decay. All in a responsible way! The goal is to reduce the impact that a product has on the environment, at every step in the cycle.

- AVA: Everyone should and can make a difference to save the planet!

- KATERI: Which means that if we all make an effort, we can make a difference.

- MARLEY: You know what; I can give you even more reasons to hope, with my topic! It's about renewable energy and I talked about it with a Caribou in Manitoba.



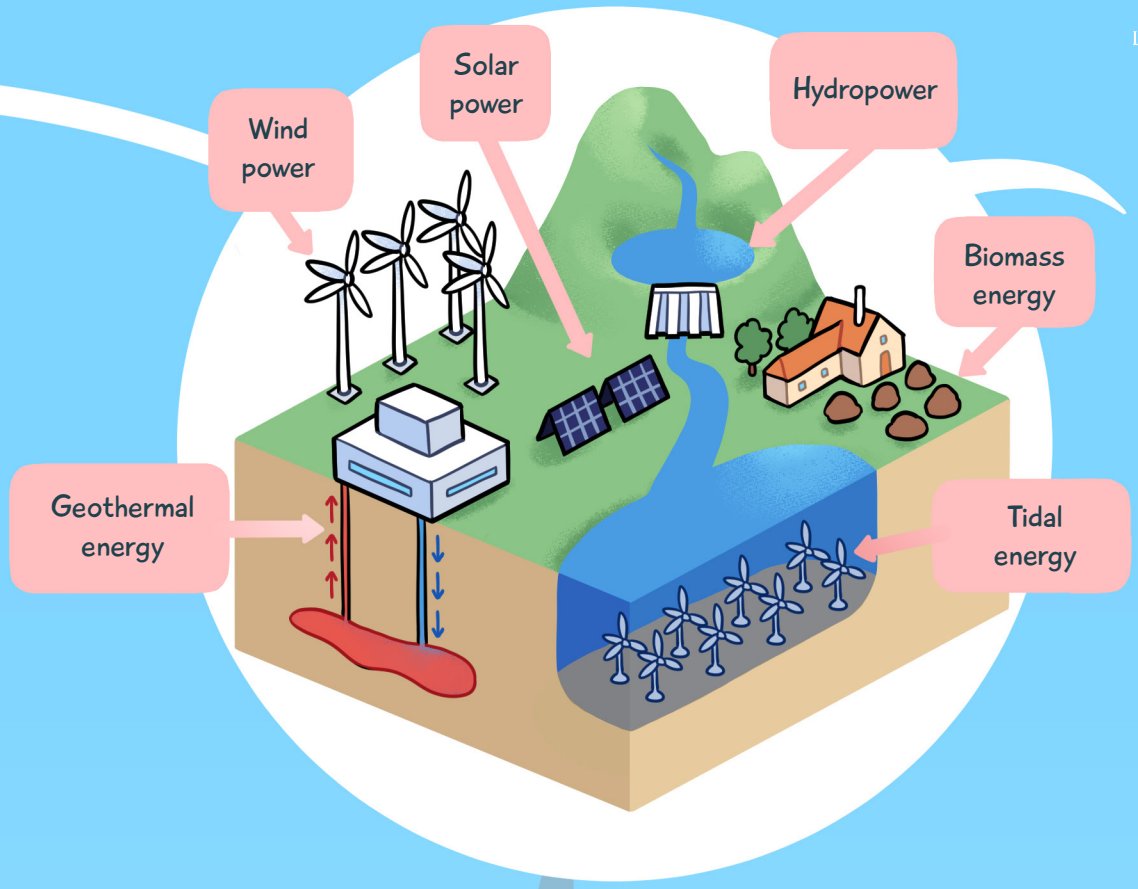

MARLEY : Hello Caribou! You're here with me to talk about energy.

- CARIBOU: Energy? Yes, but all sorts of energy. Because there are many types of energy.

- MARLEY: Yeah, that's right! In fact, it's often been said that fossil fuels like coal, crude oil, and natural gas have transformed our society.

- CARIBOU: Yes, but unfortunately, these sources of energy took millions of years to form up and are available in limited quantities. They are created by the transformation of organic matter and are stored underground. They've provided you with the means to heat and light your homes, to travel and transport your goods, but when they're used, their combustion emits greenhouse gases that are very bad for the planet...

- MARLEY: But do we only produce energy that pollutes?




- CARIBOU: No, there are non-polluting types of energy! Over time, humans have developed renewable forms of energy that create less damage to the environment and are inexhaustible or rapidly recoverable sources of energy.

There are several renewable energy sources: solar, wind, geothermal, tidal, hydro, or energy from biomass. In 2018, 16.3% of Canada's energy came from renewable sources.

## DID YOU KNOW?

Canada is the second largest producer of hydroelectricity in the world. Hydro-electric power is the production of electricity from the flow of water, created for instance by dams. Electricity produced from this source does not create carbon pollution, but building dams can disrupt natural ecosystems, affect territories occupied by animals and human populations that may even have to be relocated.

Source: Government of Canada - June 2020

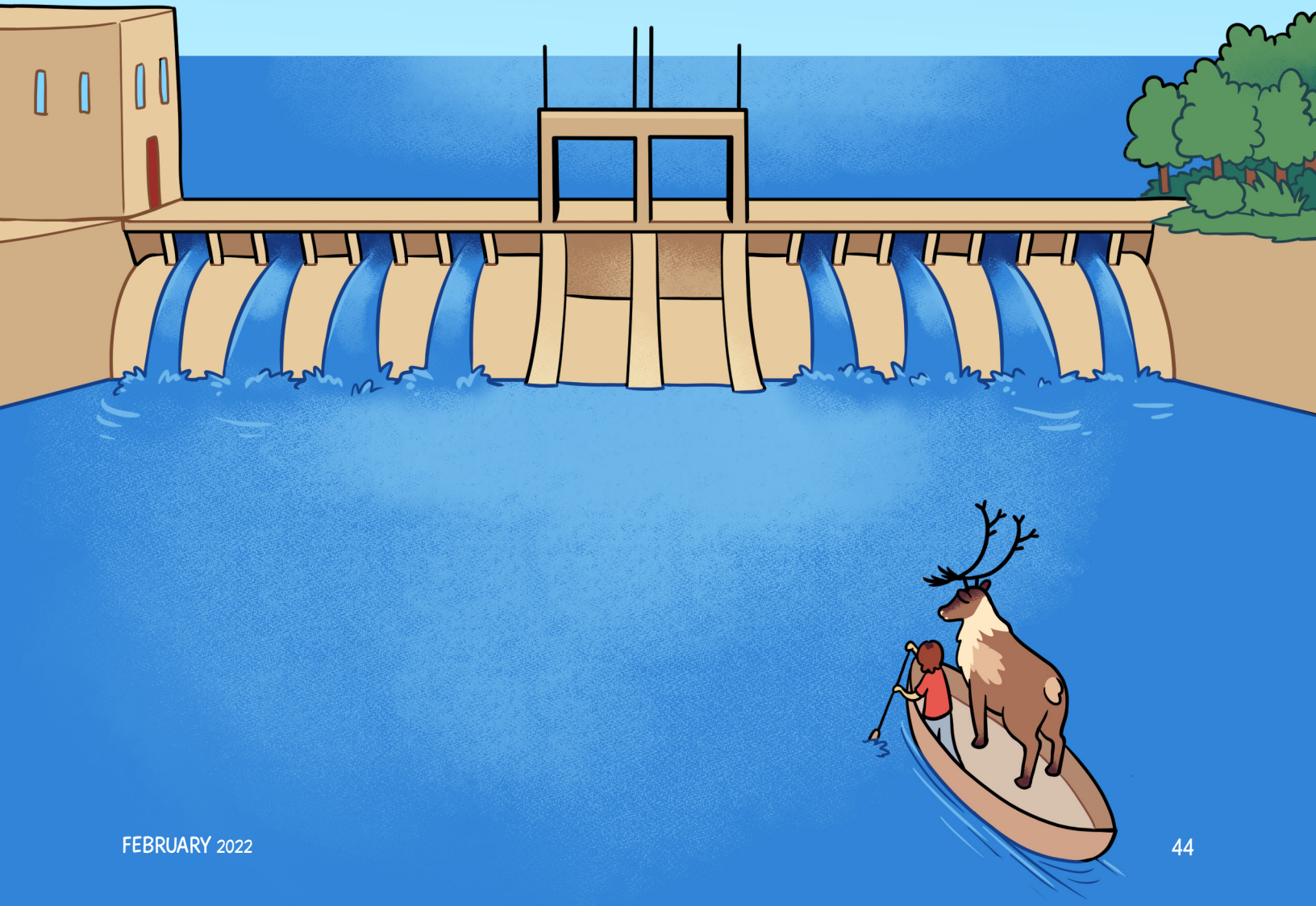
- MARLEY: Since there are so many lakes in Canada, does that mean we could produce only clean energy, with hydropower for example?

- CARIBOU: You absolutely have to limit your dependence on fossil fuels. The idea would be to use as much electricity as possible from a clean energy source, without greenhouse gas emissions.

Almost 80% of Canada's electricity comes from non-greenhouse gas emitting sources and is generated by hydroelectric power, solar power and wind power, which are all growing rapidly. And yet there's still far too much use of fossil fuels, for instance for transportation.

Instead of continuing to manufacture gasoline-powered cars, it would be better to replace them with electric vehicles or to have people take public transportation. Or better yet... encourage cycling!

We would then be able to use the natural resources we already have to produce clean energy in the future.



- MARLEY: Yeah! Where I come from in Winnipeg, there are more and more electric buses!

And Canada hopes to be carbon neutral by 2050. That means there would no longer be emissions that release carbon.

- CARIBOU: Yes, it's urgent we get to that point! We need to put in place new sustainable ways of consuming energy. It's part of the ecological transition that will help the planet get better.

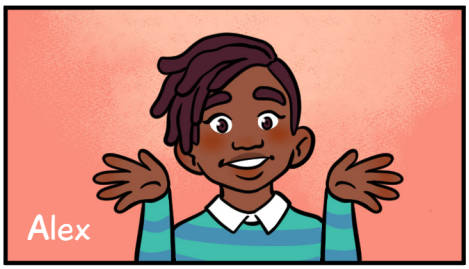
- MARLEY: We absolutely have to rethink the way we produce, work and live together to make our way of life more ecological.

- CARIBOU: I can't wait for things to change!

- MARLEY: And I can help? Sometimes I feel a bit overwhelmed...

- CARIBOU: Of course we can all do our part! Ask your parents to install solar panels or even a geothermal system in your yard.

Above all, we need to inform everyone of what's happening, and change the way we consume and behave.

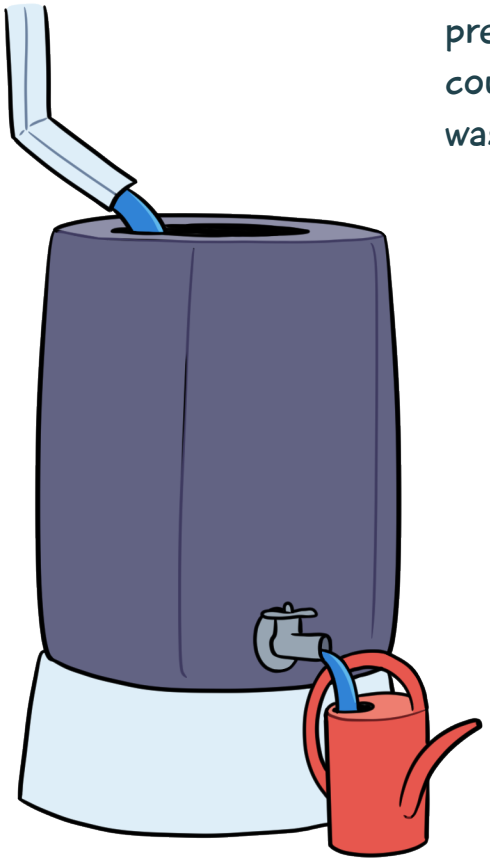


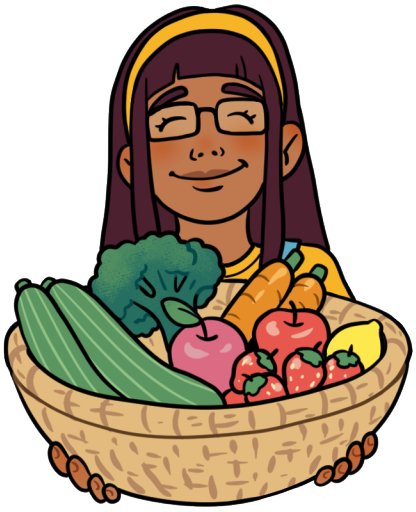

- ALEX: That's true. In fact after seeing all your reports, we've all learned some very important things about our planet.

But with all that we've learned from the animals, what advice would you give and apply?


- KATERI: Thanks to the Pacific salmon, the Canada Goose and the Honey Bee, I understood that we should pollute the water, air and soil much less. I would like to encourage organic farming, and an organic lifestyle.

Or even better: I could make my own garden to preserve the soil, and harvest healthy vegetables. I could collect rainwater to water the plants and avoid wasting drinking water...





- AVA: We could also change our eating habits! We should eat fruits and vegetables in season. Even if they are not always pretty to look at, they taste just as good! And above all, we should avoid buying too much so we don't waste food, which generates a lot of waste!

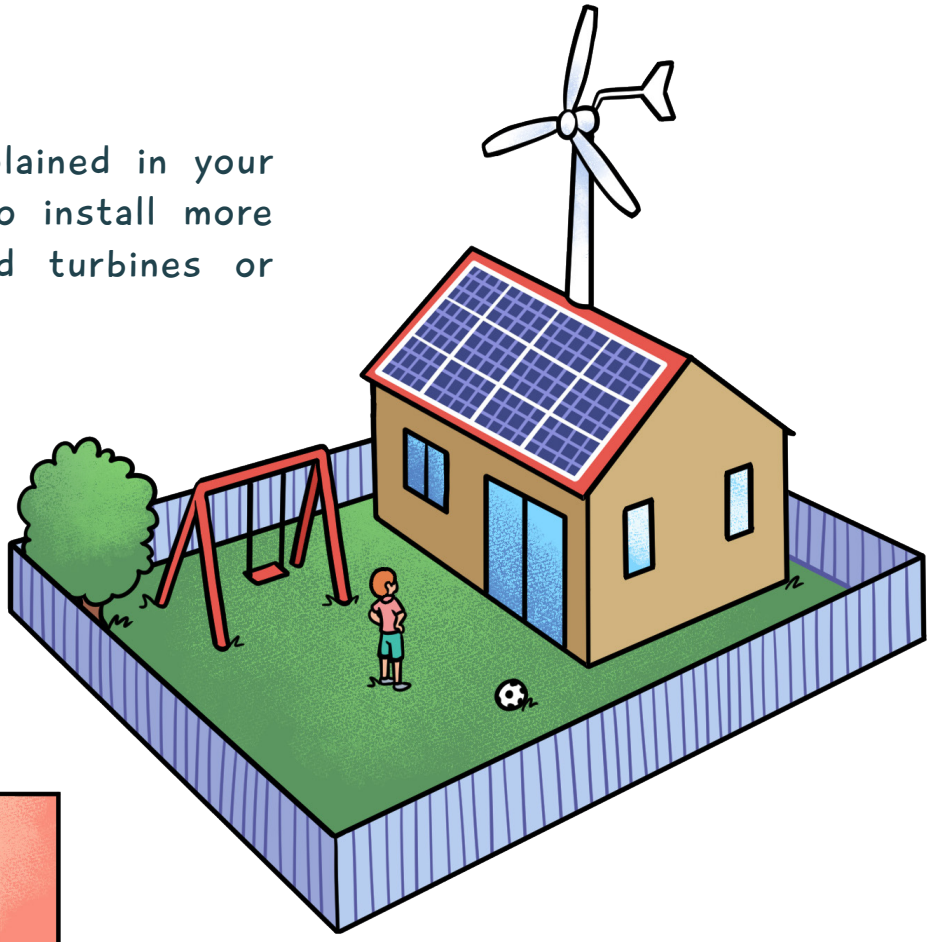
And at home, you need to have several garbage cans to separate food, glass and plastic. It's very important to separate our waste so that it can be better recycled.

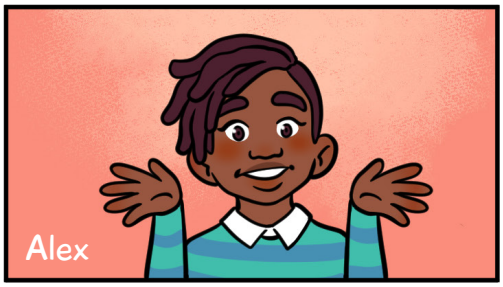
- MARLEY: Let's also remember to rethink how we produce energy. We could sort through our emails a little more often, avoid watching too many videos or playing too many games online, so that computer servers don't overheat and create digital pollution.

We should also encourage and prioritize the purchase of second-hand or reconditioned products. That way, a product has several uses before it's thrown away.

- ELLIOT: And as explained in your report, we should also install more solar panels and wind turbines or geothermal systems!

But at home, we can already think about turning off the lights when we leave a room, to conserve energy.






- ALEX: We also have the 6Rs solution to reduce our waste and pollution. When we buy a product, we must always ask ourselves if we can Reuse it, if we can Recycle it, if we can Repair it and therefore Refuse to buy a new one, in order to save energy and produce less waste with a new purchase. We also have to think about Reducing our consumption, Rethinking our way of doing things to better respect the environment. We've got to change our behavior. With all these solutions, we're ready to help the planet!

Thank you for your collaboration. We really did the APPRENTICE ECOLOGICAL JOURNALISTS contest proud. I even found a 7th R: Responsible! By applying all these tips, we become responsible citizens!

# THANK YOU

We would like to thank the scientists who participated in this issue by sharing their knowledge and passion for the environment.

**PROF. IBRAHIMA DIALLO**

Scientific director of the magazine and full professor (anatomy, physiology and zoology) at the University of St. Boniface, Faculty of Science and Department of Experimental Science.

**GREG FLATO**

Senior Scientist,
Climate Research Division,
Environment and Climate Change Canada

**PAULINE GERRARD**

Assistant Director, IISD-ELA
Experimental Lakes Area

**SCOTT HIGGINS**

Research Scientist, IISD-ELA
Experimental Lakes Area

**MAXENCE JAILLET**

Holder of a Bachelor of Science degree
in marine sciences and
Director of the Tenerife Media

**JEAN-MICHEL MARTIN**

Biologist and biology teacher at the
University of Saint-Boniface

**VINCE PALACE**

Chief Scientist, IISD-ELA
Experimental Lakes Area

**JULIEN NAYET-PELLETIER**

Bilingual guide and interpreter for
Oak Hammock Marsh
and the Manitoba Museum

**MICHAEL RENNIE**

Research Fellow, IISD-ELA
Experimental Lakes Area

**FERNAND SAURETTE**

Biologist

# GAmeS

## Test your knowledge of the environment!

Hint: All the answers are in the magazine.

1. If we do not reduce greenhouse gas emissions, by the year 2100, the Earth will have warmed by:

   a. 2 to 5°C
   b. 8 to 20°C
   c. 10 to 15°C
   d. more than 50°C

2. Find the odd one out: which source of energy is NOT a fossil fuel?

   a. Coal
   b. Oil
   c. Wind power
   d. Natural gas

3. Where does the arctic fox live?

   a. In the desert
   b. In the tundra
   c. In the savannah
   d. In the forest

4. How long does it take a plastic bag to disappear?

   a. 6 weeks
   b. 3-14 years
   c. 200 years
   d. 400-450 years

5. What is the largest source of water pollution?

   a. The waterfall
   b. Runoff
   c. Outflow
   d. Rainfall

6. The fine particles that pollute the air are smaller than... :

   a. A horse
   b. An ant
   c. A hair
   d. A car

## In the grid below are 16 words, It's up to you to find them!

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W | T | U | R | T | L | E | C | A | R | I | B | O | U |
| G | L | P | O | L | A | R | B | E | A | R | G | B | D |
| C | L | R | E | C | Y | C | L | E | P | X | O | W | A |
| O | C | G | O | Q | N | G | A | E | E | J | O | M | R |
| P | G | L | K | R | E | U | S | E | F | O | S | M | C |
| U | N | F | L | R | E | D | U | C | E | B | E | Y | T |
| R | A | R | E | F | U | S | E | R | H | W | J | P | I |
| E | U | D | T | R | E | E | F | R | O | G | U | F | C |
| T | L | E | M | Q | Z | F | R | K | N | F | D | B | F |
| H | I | N | V | X | Q | G | E | R | E | J | A | D | O |
| I | M | U | K | B | S | Y | P | S | Y | Z | C | I | X |
| N | S | Y | Y | K | O | U | A | P | B | Z | Y | U | H |
| K | B | E | L | U | G | A | I | K | E | D | U | L | I |
| O | V | L | N | J | M | T | R | G | E | J | H | N | K |

Goose
Polar bear
Arctic fox
Honey bee
Beluga
Caribou
Tree frog
Recycle
Refuse
Rethink
Reduce
Repaire
Reuse
Turtle

## Will you be able to find the 7 differences between the drawings below?

Answers : 1. a - 2. c - 3. b 4. d - 5. b - 6. c

Find this magazine in French and in English at:

www.lalibertenaturemagjunior.ca

LaLiberteManitoba
LaLiberteMB
laliberte_mb
laliberte_mb

and our podcasts on:

Spotify
Apple Podcasts

as well as on your other favorite listening platforms.