



The Sustainable Diner: A Key Ingredient for Sustainable Tourism

# The Climate Plate

An Environmental Teaching Manual



**The Sustainable Diner: A key Ingredient for Sustainable Tourism**

# **The Climate Plate**

An Environmental Teaching Manual

Published in the Philippines in 2020 by the World Wide Fund for Nature (WWF) Philippines.

Any use, translation, adaptation, and copying of this publication must use proper acknowledgments and citations.

Copyright © 2020 WWF  
All rights reserved.

**The Climate Plate Technical Working Group:** Alfred Johann Lee, Melody Melo-Rijk, Lorayne Therese Roque, Liezl Stuart del Rosario, Alexa Jeanne Lasch, Pamela Bianca Luber, Jonna Elaine Jordan, Kristan Gabriel Villalon

This publication of The Sustainable Diner project is under the World Wide Fund for Nature (WWF) Philippines' Sustainable Consumption and Production. This was made possible through the support of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

WWF-Philippines has been working as a national organization of the WWF network since 1997. As the 26th national organization in the network, WWF-Philippines has successfully been implementing various conservation projects to help protect some of the most biologically-significant ecosystems in Asia.

WWF-Philippines works to improve Filipino lives by crafting solutions to climate change, providing sustainable livelihood programs, and conserving the country's richest marine and land habitats.

**Correct Citation:**

Lee, A., Melo-Rijk, M., Roque, L., Stuart del Rosario, L., Lasch, J., Luber, P., Jordan, J., Villalon, G. 2020. WWF-Philippines. The Sustainable Diner: A Key Ingredient for Sustainable Tourism. The Climate Plate, An Environmental Teaching Manual.

For further information, please contact:  
World Wide Fund for Nature (WWF) Philippines  
4th floor, JBD Building  
65 Mindanao Avenue, Bagong Pag-asa  
Quezon City 1105, Philippines  
kkp@wwf.org.ph  
www.wwf.org.ph



# Foreword

The Sustainable Diner: A Key Ingredient of Sustainable Tourism project implemented by World Wide Fund for Nature (WWF) - Philippines with the support of German Environmental Ministry through their International Climate Initiative, aimed to reduce carbon emissions and food waste in the food service sector of three partner cities in Cebu City, Quezon City and Tagaytay City. This can be achieved through sustainable consumption and production (SCP) which is one of the 17 Sustainable Development Goals adopted by the United Nations Member States from the 2030 Agenda for Sustainable Development.

Based on the project's initial assessment and market research study conducted in 2018 by The Nielsen Company, there were identified knowledge gaps about SCP technical terminologies, related concepts, and practices. The main takeaway from the study was to introduce environmental concepts and lessons early on in the lives of Filipino children to ensure long-term retention and practice of environmentally conscious habits. This paved the way to create a tool to help communicate environmental responsibility and stewardship.

Therefore, the development of a teaching manual is an excellent way to support teachers with the integration of environmental sustainability concepts to their existing lesson plans and modules. With the support and cooperation of various Regional Department of Education (DepEd) representatives, teachers and students, this manual went through a long process of pilot testing, focus group discussions, and peer reviews to further improve and finalize the content. These manuals will support teachers in training current and future generations to be environmentally conscious.

It is my hope, that through this concerted effort to transform the current environmental situation through education, this manual will empower our Filipino teachers in nourishing the young minds of Filipinos on the importance of environmental awareness and conservation by integrating sustainable practices in their everyday lives. We cannot do this alone, but as we say in WWF – together, possible.

Jose Angelito M. Palma  
Executive Director  
WWF - Philippines



# Message

Integrating environmental sustainability and sustainable concepts within the existing lessons is a work of love towards adopting a sustainable lifestyle as part of the goals of the International Climate Initiative.

My heartfelt gratitude to the environmental advocates of World Wide Fund for Nature (WWF) Philippines for choosing our division as one of the beneficiaries of your noble cause in saving the environment. Cebu City has been one of the key tourism destination cities in the country that greatly contributed to the economic growth and development of the city. However, it may adversely affect to the deterioration of our environment. Thus, education plays a vital role in strengthening initiatives in protecting the environment for both the people and nature.

This 4-year project entitled, “The Sustainable Diner: A Key Ingredient of Sustainable Tourism” shall transform the mindset of the teachers and students on the significant contribution of the food service sector into a low carbon industry through the awareness and adoption of sustainable approaches.

The integration of these sustainability concepts that are made available through the teaching manuals can remedy the existing knowledge gap on food and dining sustainability in the Philippines.

As a science enthusiast, I always advocate the love of the environment and supports programs that will save our planet from further distraction. According to Leo Tolstoy, “One of the first conditions of happiness is that the link between man and nature shall not be broken”.

Let this partnership strengthen our connection with Mother Earth and promote a livable city today and for the next generation.



Dr. Rhea Mar Angtud  
Schools Division Superintendent  
Department of Education Division Office of Cebu City

# Table of Contents

<b>Grade 1</b>	1.0 Vocabulary Words	1
	1.1 Taking Care of Our Environment	3
	1.2 Vegetables are Yummy	5
<b>Grade 2</b>	2.0 Vocabulary Words	7
	2.1 Dealing with Leftovers	9
	2.2 Saving Power and Water	11
	2.3 Using Less Plastics	14
<b>Grade 3</b>	3.0 Vocabulary Words	18
	3.1 The Oxygen Cycle	20
	3.2 Climate Change (Basic)	22
	3.3 Eating Out With No Food Waste	25
<b>Grade 4</b>	4.0 Vocabulary Words	28
	4.1 Why We Avoid Plastics	29
	4.2 Conserving the Resources We Use	32
<b>Grade 5</b>	5.0 Vocabulary Words	35
	5.1 Climate Change (Intermediate)	36
	5.2 What Goes On Our Plate	39
	5.3 The Mindset of Sustainability	42
<b>Grade 6</b>	6.0 Vocabulary Words	45
	6.1 Understanding Your Carbon Footprint	46
	6.2 Finding Alternatives to Plastics	49
	6.3 Introduction to Sustainable Dining	52

<b>Grade 7</b>	7.0 Vocabulary Words	58
	7.1 State of the Environment	60
	7.2 Environmentally Responsible Eating Habits	64
<b>Grade 8</b>	8.0 Vocabulary Words	67
	8.1 Calculating Your Carbon Footprint	68
	8.2 Environmentally Sound Business Practices	72
<b>Grade 9</b>	9.0 Vocabulary Words	75
	9.1 Climate Change (Advanced)	77
	9.2 Supporting Local Food Products	82
<b>Grade 10</b>	10.0 Vocabulary Words	84
	10.1 Defining Sustainability	85
	10.2 Environmental Projections	88
<b>Grade 11</b>	11.0 Vocabulary Words	90
	11.1 Environmentally Responsible Home Cooking	91
	11.2 Real Sustainability Instead of Eco-Noveltty	93
	11.3 The Importance of Biodiversity	96
<b>Grade 12</b>	12.0 Vocabulary Words	99
	12.1 The Zero-Waste Ideology	100
	12.2 Climate Change: Climate Crisis	103
	12.3 Know Your Environmental Influence	106

# Lesson: **Vocabulary Words**

## **1.0**

### **Solid**

Solid objects have shape and will hold their shape unless they are subjected to force (clay will hold its shape until it is played with).

### **Liquid**

Liquids, like water, will flow and take the shape of their container. If the liquid has no container and is put on a surface, it will form pools or puddles (on generally flat surfaces) or flow downwards (if the surface is not even).

### **Gas**

Gases have no shape or form. They take up the shape of their container. Outside of a container, gas will spread out freely and disperse into the air. Wind is the movement of gas that we feel.

### **Matter**

Matter is anything that is present in our world that can be classified as either solid, liquid, or gas.

### **Earth**

The Earth is our planet. It is the third planet from the sun and it is the only planet in our solar system where plants can grow and animals can live. We need to take care of it.

# Nature

Anything we find on Earth that is not made by humans is part of nature. Houses, buildings, roads, and other man-made objects are not part of nature.

# Waste / Trash

Items that are to be thrown away or will no longer be used are considered waste or trash. We need to be responsible with throwing away trash or else it will damage our natural surroundings. If properly disposed of, some forms of trash will be broken down and returned to nature in a way that keeps our planet healthy.

# Plastics

Plastics are solid objects that we use to create a lot of items like bags, pipes, clothes, and more. It is a very useful material, but it is also hard for nature to break down. We need to try and use less of it so that nature will not be affected by plastic waste. Examples of plastics that we need less of are straws, plastic utensils, plastic bags, and others.

# Recycling

Items that can be normally considered trash can be used for other purposes. When we do this, it is called recycling. An example of this is using a shoe box as a container for smaller items. Instead of throwing the box as trash, it becomes a useful object.

# Pollution

When waste or trash affects nature, it is called pollution. We need to create less waste in order to lessen the pollution of the Earth.

Lesson:

1.1



# Taking Care of Our Environment

## Lesson Goals

To give students a simplified degree of understanding regarding their responsibility to take care of planet Earth by learning the basic concept of "Earth as our home" and also the importance of our natural environment, with emphasis on how negatively pollution affects it.

## Topic

The Earth is our home. It is our only home and our only planet. Unlike rooms, houses, or buildings, we cannot make a new planet or repair it if it gets broken. There are no replacement planets. If the Earth is no longer fit to live in, we will not have anywhere else to go. This is the reason why we need to take good care of it.

Taking care of the Earth means keeping it clean. The air should be easy to breathe, the water safe to drink, and the land should be able to grow crops that we can eat.

Pollution can destroy all of that. Anything bad for the environment that we carelessly throw away is considered pollution. Waste can turn into pollution, and we need to know how to deal with the waste we create in order to prevent that. Two of the best ways of dealing with trash is by recycling (avoiding the creating of trash) or by proper disposal (if trash cannot be avoided, at least ensure it gets put in the right place).

## Reminders

Always remind students to observe proper hygiene by washing their hands after they touch trash or other dirty objects (like items that have dropped on the floor).



## Expected Outcomes

At the end of the lesson, students will be able to:

- recognize and cherish the Earth as their home and our "only planet"
- identify waste/trash from what can be recycled or reused
- know how to properly dispose of trash
- actively make an effort to properly deal with trash
- name materials that they can avoid using in order to reduce trash

## Discussion Points

- 1 Focus the discussion on how good it is to have a clean environment. Having a clean classroom means having a good place to learn and play. Having a clean bedroom means having a good place to sleep. More importantly, it is also up to them to keep it clean.
- 2 Explain that while there are adult people assigned to clean at home and at school, children should also do their part in keeping the environment clean by the simple task of throwing trash in its proper place.
- 3 Show examples of items that might be considered as trash but are better off recycled. Look for objects made out of glass, plastic, metal, and paper as these are some of the most common recyclable materials. They can either be reused, or made into new items.

*If applicable: Explain that trash should not just be thrown into bins randomly, it should be segregated. This ensures that different kinds of trash get sent to the right facilities so that they don't end up polluting the environment. This is why there are trash receptacles for different kinds of waste.*

## Reminders

Warn students that for anything other than simple, lightweight, solid, and easily identified trash (like liquid and food spills, broken glass, etc), they should call for the help of an adult in order to clean it up and they should not attempt to clean it themselves.

## Exercises

- Have students look inside their bags and school desks and look at the items they have. Ask them to separate the items they use and the items that have been used up and are no longer needed. Empty containers of consumables (like candy wrappers), used sheets of paper, and other forms of trash should be separated and disposed of properly.
- Have the students look around their immediate area and identify if there is trash present. If not, commend the students for actively making their classroom neat. If they find trash, encourage them to dispose of it properly. This can further be reinforced by having students do this at the end of each subject period.
- Make using the trash can fun. As long as there's no danger of accidentally hitting other people or things, there is no harm in tossing small balls of discarded paper into a trashcan. Turning chores into a playing activity is a healthy approach. Three additional pointers that can help: first, tell the students that there is a time and place for playing. Second, if the paper ball misses, make sure to shoot it in properly. Lastly, only do this with paper balls, anything else could be dangerous.
- Bring out various objects and discuss what happens to them once they are "used up". Should they be thrown away? Can they be reused or recycle? Focus heavily on emphasizing the need to find ways to reduce turning objects into trash and finding new uses for them instead.

Lesson:

1.2



# Vegetables are Yummy

## Lesson Goals

To encourage students to make better dietary choices that are both nutritious and eco-friendly.

## Topic

Vegetables are excellent sources of nutrients. Aside from their high nutritional value, vegetables are also more eco-friendly to produce compared to meat products. Of course, a healthy balance of both is recommended for daily meals.

Unfortunately, children are more inclined to eat meat instead of vegetables. This outlook must slowly be influenced in order for them to develop a better mindset regarding the value of vegetables in their diet.

## Expected Outcomes

At the end of the lesson, students are expected to:

- gain a healthy curiosity about the flavors of vegetables
- actively seek out which dishes with vegetables suit their palate
- introduce or increase vegetables in their daily diet

## Discussion Points

**1** Be it better eyesight, faster growth, stronger muscles, better mental development, and more; many children consider their physical capabilities as very important for their most valued activity: playing. Eating vegetables is the ticket to boosting these attributes. Teaching them about these benefits are a great incentive to getting them started on eating vegetables.

**2** It is true that many arguments can be made about how nutritious or eco-friendly vegetables are. But the strongest appeal of food has always been the taste. When talking about vegetables, try to focus on how delicious it is in order to encourage the natural curiosity that children have about tasting various flavors. Many vegetables also have varying textures. Children enjoy variations of crispiness, chewiness, mushiness, and other textures that can be found in vegetables.

## Exercises

- Promoting vegetables to children is a difficult task for any adult. Make this easier by having the students promote vegetables among themselves. Start by asking about their favorite vegetables and allow them to discuss and compare their answers with one another. They are more likely to keep an open mind when listening to their classmates' preferences and opinions. Encourage them to tell their parents or guardians about the different kinds of dishes they are curious about.

## Integration Point

During English/Filipino: When discussing the names of different plants that are used in cooking, talk about which fruits and vegetables students enjoy eating and the different tastes they provide.

Lesson:  
**2.0**

# Vocabulary Words

## Weather

Weather is the condition of the air and sky in the local area for a short amount of time. This usually lasts a few hours at a time to about the length of a day. Weather concerns how sunny, rainy, or cloudy it is. It also covers how dry or damp and hot or cold the air is, and how strong the winds are and what direction they are blowing.

## Environment

The word environment refers to the state of nature around us. It is both the natural features of the planet and the state of it being affected by man-made actions. Having a good environment to live in is very important so we should do our best to take care of it.

## Temperature

Temperature is the measurement of how hot or cold something is. It can be measured accurately using instruments like thermometers, but we normally use our sense of touch to have an idea of what the temperature of an object is like.

# Climate

Climate is how we describe the general pattern of weather in an area for a long period of time. It is possible to have a few occurrences like slightly varying weather that is different from the current climate (like a few days of rain during a warm and dry climate).

The Philippines has five different climate types, these are dependent on the location and time of the year.

The five different climate types found in the Philippines is tropical rainforest or equatorial climate (almost no dry season, plenty of rainfall, found in southern Mindanao and most of the eastern side of the country), tropical savanna (dry, but not hot, found mostly in northern Luzon), tropical monsoon (plenty of rainfall, but very dry during dry seasons, mostly found across the western side of the country), humid subtropical (summer season is very hot and humid, and winters are very mild, found only in the highest altitudes of northern Luzon), and lastly, oceanic (cool with mild winters and also found in the areas with the highest altitudes).

Lesson:

21



# Dealing with Leftovers

## Lesson Goals

To reduce the amount of food waste created by leftovers.

## Topic

Portions of meals or snacks that are not eaten are considered as leftovers, and these can turn into waste if they are not eaten or stored properly.

The simplest way to not leave waste is to eat all the food that is on the plate or in the lunchbox, but there are also other ways to deal with leftovers.

## Integration Point

During English/Filipino: when defining words such as "waste" or "leftovers" or even "food", remind students that if they have food, they should not waste it. They should aim to eat the food that is given or prepared for them fully so that nothing will be wasted.

## Expected Outcomes

At the end of the lesson, students will learn to:

- consume all or most of their food servings
- consider options for dealing with leftover food instead of throwing it away

## Discussion Points

# Drinks

Encourage the students to drink as much from their water jugs as they can. Leftover drinking water in jugs are often discarded. While flavored drinks or juices in cartons/cans are often fully consumed before getting disposed of, it is still worth reminding students to do so.

*During Parent Orientation: Remind parents to observe the eating habits and preferences of their children so that they can prepare the proper volume of food that the students bring. The idea is to have enough to satisfy the appetite without leaving leftovers.*

# Meals

Some students are given plenty of snacks or food to bring to school. As long as their appetite allows them to consume the volume, no food would be wasted. However, there are also instances where a child simply has too much food to eat. Here are two suggestions on what can be done with the excess.

**1** If the food is contained in sealed packages (like chips, wafers, biscuits, etc), open only what can be eaten so that the rest can be saved for a later time.

**2** For excess food prepared in lunchboxes or sandwich bags, students can be encouraged to share them with their friends. This not only helps in eliminating waste, but also teaches social skills.

## Integration Point

During Sibika at Kultura: when teaching about good Filipino traits and values, sharing and generosity are often cited. Students can opt to share their meals with others. These will not only help them increase their social skills, but also help with ensuring that whatever food they do not consume does not go to waste.

Lesson:  
**2.2**



# Saving Power and Water

## Lesson Goals

To teach students the importance of good home discipline with regards to being aware of wasteful habits starting with the very basic practice of minding how much water and electricity they consume.

*Most schools already have a water and energy conservation program in place - often accompanied by visible signs telling students to turn off lights or faucets when not needed. When bringing up this point in orientation, students should also be encouraged to practice the same at home.*

## Topic

Water may seem very plentiful. After all, a large part of planet Earth is mainly composed of water. However, water that is safe to drink is not plentiful at all. Like any other necessity that is limited, water must be conserved so that there is enough for everyone to use. In the Philippines, while faucet water is certainly not potable, it is at least clean enough for our basic sanitary needs - bathing, brushing teeth, cooking, washing dishes, and others. More importantly, it can be filtered and processed in order to become safe for drinking. For these reasons, we must conserve water.

Electricity allows us to use many wonderful technologies. Because of this, we consume plenty of it. However, to create electricity, our country consumes a lot of oil fuel. Oil is even more limited than water, and like it, must also be conserved.

## Integration Point

During Sibika at Kultura: When discussing Filipino traits, this topic may be included in thriftiness (conservation does not strictly apply to money, but to other resources as well). It also applies when discussing the strength of community spirit ("bayanihan"), where the saving of water and electricity helps not only one's own family, but the community as well.



## Expected Outcomes

At the end of the lesson, students will be able to:

- recognize the activities that use water or electricity in their homes
- be able to ask the adults in the household to unplug electrical devices when not in use
- remember to turn faucets on and off properly in order to conserve the use of water

## Discussion Points

### The Need to Save Electricity and Water

Explain that electricity and water are limited resources, that if wasted, will eventually run out. Electricity is limited because oil is limited (once we dig up all the oil, there will not be any left). Fresh water that is good enough to be cleaned and processed by facilities is also limited (salt water is difficult to process, and using polluted water is not possible) .

Fortunately, the average Filipino household understands the value of limiting the consumption of water and electricity, though mostly for cost-related concerns as opposed to environmental impacts. In order to strengthen the importance of environmental stewardship, focus on the need to conserve limited resources instead of promoting the practice simply for the sake of saving money.

Visualizing the limitation of electricity is made easier by explaining that electricity is being processed and generated from power plants. This concept is much easier to explain here in the Philippines where most areas still employ the use the visible power lines that connect to each house (unlike in other countries where electric cables are completely underground).

### How is Electricity and Water Wasted?

Illustrating the waste of water is straightforward: too much playing with water sources such as faucets and hoses (especially during times when a child is tasked with a chore such as watering the plants or helping clean dishes). A little fun should not completely be discouraged; however, it is recommended to remind students to play in ways that water is not being wasted.

Electricity, being intangible, is not as direct. Start by explaining how electricity is used up when we turn on electric devices. Like water, using electricity is not a bad thing. Wasting and consuming too much is considered bad in maintaining our supply. Electricity is wasted when devices that use them are left on or plugged in despite not being needed (be sure to point out that some devices, such as refrigerators, emergency lights, etc, are meant to be always plugged in and turned on).

## Exercises

- Have the students go around the classroom and identify objects that run on electricity, and which ones need to be turned on and which ones can be turned off.
- Demonstrate the effect of having lights on when the light from the windows is already sufficient.
- Have students list down gadgets and appliances they use that are powered by electricity. Even at grade 2, children tend to have access not only to television, but also other entertainment appliances such as computers, gaming consoles, and handheld devices. Remind them that devices can be turned off when not in use, and in the case of handheld portable devices (like smartphones which have rechargeable batteries), these should be unplugged from the charger as soon as the battery is full.
- Practice washing hands; have students practice washing their hands before and after eating as well as brushing their teeth after meals. Point out that when they are scrubbing their hands with soap, and also while brushing their teeth, it is important to turn off the faucet until they need to rinse. A similar exercise can also be done during MAPE - Art class when rinsing the water color palettes.

## Reminders

- Be sure to tell students to ask for the help of a grown up when it comes to unplugging devices from electric outlets. Most devices can be turned off by simply using the power switch, but it is still recommended to fully unplug devices (some appliances still passively consume electricity as long as they are plugged in).

Lesson:  
**2.3**



# Using Less Single-Use Plastics

## Lesson Goals

To teach students to refuse the use of single-use plastics they normally encounter and discover eco-friendly alternatives they can use.

## Topic

Plastic is not biodegradable, it breaks down into smaller plastic pieces called microplastics. Microplastics are harmful in the environment. However, simply stopping the use of plastics would be difficult, as there are many technologies and innovations that make use of it. There is one classification of plastic items that we can all use less of: single-use plastics. These one-use disposable items are a waste of plastic's key feature: it lasts long. Even worse is the massive environmental impact caused by the large volume of waste that they create.

Recognizing what single-use plastics are is an important first step to knowing what we can refuse to use or purchase. While the immediate goal is to curb the amount of plastic waste that is being generated, this also serves as a good step towards steering social practices towards less reliance on plastic products.

**Discussion  
Points**

## How plastics are harmful

Saying that plastics are not biodegradable often paints a picture of plastic being ever present in its complete state. However, this is not entirely true. Plastic can break down, and it will turn into smaller plastic pieces called micro-plastics. These can be harmful to our bodies and nature in general as they cannot be processed organically. In the ocean, plastic waste is a major source of microplastics that can be found in fish and other seafood (or even our drinking water) that eventually makes its way to our bodies.

## What are single-use plastics?

Alternatively called disposable plastics, these are any plastic-based items that are meant to be only used once before they are thrown away or discarded. The current immediate answer to dealing with plastic disposables is to segregate them into recyclables. However, recycling alone is not the answer. Also, some types of plastics are petroleum based, making them very difficult to recycle.

## Examples of single-use plastics

A lot of the most common single-use plastics are food and dining-related. Examples are plastic dining utensils or implements (spoons, forks, knives, stirrers, straws, condiment packets, plastic cups, plastic bottles, styrofoam food trays, plastic lids, and others), and food packaging (six-pack plastic rings, air-tight plastic wrap, plastic and styrofoam containers, and more). Aside from these, there are plenty of other single use plastics we encounter in our daily lives such as plastic bags, the clear plastics used for wrapping retail products, styrofoam used as transport buffer, bubble wrap, disposable plastic e-cards (for loading credit to mobile or digital accounts), plastic based adhesive tape (as opposed to paper based tape), latex-based balloons and others.

## Expected Outcomes

At the end of the lesson, students will be able to:

- identify examples of single-use plastics
- be able to say no to single-use plastics
- be able to explain why we should say no to single-use plastics
- have a positive outlook towards using alternatives to single use plastics

## Identifying reusable plastics

Sometimes, plastic products are marked with an icon indicating their compatibility for recycling. This icon has a number from 1 to 7 with the triple-arrow triangle for recycling surrounding it. Plastics with numbers 1, 2, and 5 can be recycled. On the other hand, plastics numbered 3, 4, 6, and 7 should be disposed of properly so that the proper facilities can reprocess them safely.

## Refusing single use plastics

We must say no to single use plastics. If we are offered a plastic bag, or a plastic spoon and fork set, we should politely refuse the items.

However, unlike other bad practices that are to be refused outright, saying no to plastics requires preparation. Plastic items serve a purpose, so before you can say no to them, you need to have eco-friendly alternatives available. Opting for reusable straws (often made of metal or paper) allows you to refuse plastic straws, bringing your own storage bag is a good substitute for plastic bags, and having your own spoon and fork means being able to not rely on disposables (some school canteens offer the use of washable non-plastic utensils as well).

In the case of the items listed in the “Examples of Single-Use plastics”, most of the dining related plastics can be replaced by original items they are based on (like water jugs instead of disposable plastic bottles). To lessen

reliance on condiment packs, make use of the condiments if they are readily available (for example, using a bottle of ketchup instead of taking a small ketchup packet). Stores often have condiment bottles available in-store or one can use the condiments at home (stores often offer the packets for take-out orders).

Other plastics can be substituted with a lot of common eco-friendly items. Styrofoam and bubble wrap used in protecting items for transport can be replaced with cloth, paper, or cardboard. Adhesive tape used for temporary posts can be replaced with paper tape, pins, or reusable adhesive tack. In the case of prepaid cards, having credits directly sent to a mobile account (in the case of mobile carrier credit) or having a PIN sent to an e-mail (for other online digital services) helps avoid the need for plastic cards.

**Discussion  
Points**

## More than saying no

There are also some plastic products that are not exactly considered as single-use plastics (as they are meant to be used more than once), but if not used carefully, end up becoming just as disposable as single-use plastics. Pen caps tend to go missing, plastic rulers break, plastic book wrapping can get torn, etc. We also need to be careful and conscientious about the items we use on a day to day basis. Since we need these items, they are quickly replaced if they go missing or are damaged. Always remember that the items that went missing or got broken do not just magically disappear. They are left for the environment to deal with.

## Take pride and joy with alternatives

At first, it may seem like a burden to bring one's own drinking straw, or to have to clean up one's own reusable spoon and fork, or an additional weight to carry a personal shopping bag. But it is important to look at these in a more positive light. Encourage students to choose items with designs and prints that appeal to their aesthetics and personality.

**Exercises**

- Gather various school items, dining implements, and other objects and have the students determine if they are single-use plastics or not.
- Create a list of single-use plastics along with the students, ask them to come up with as many as they can. Go over the list and for each item, determine what options and alternatives are available for refusing these single-use plastics.
- Have students bring in plain eco-bags along with various craft supplies such as textile paint, garment adhesive, and other materials. Have them design the eco bags according to their tastes and preferences.

## Carbon Dioxide & Oxygen

Oxygen is the air that we breathe in (inhale) and carbon dioxide is the air that we breathe out (exhale). Aside from humans, animals also breathe oxygen. Plants, on the other hand, absorb carbon dioxide and release oxygen. Oxygen and carbon dioxide use is one of the many ways that plants and animals help each other, and we call it the "Oxygen and Carbon Dioxide Cycle". Both oxygen and carbon dioxide are sometimes referred to by their chemical formulas,  $O_2$  for oxygen and  $CO_2$  for carbon dioxide.

## Decomposition

Decomposition happens when organic substances slowly break down, it can happen naturally (with the help of bacteria, fungi, or other natural elements) or with human influence. Biodegradation is what we call decomposition that occurs when bacteria break down organic matter. When chemicals or other elements help with decomposition, we call it an "abiotic decomposition" (while biotic decomposition is an accepted term, biodegradation is more commonly used).

As long as a plant or an animal is alive and healthy, it will not decompose. Parts that have been removed or cut off however, will naturally decompose. This is how fur, cocoons, fallen leaves and branches, claw sheddings, and others are absorbed back into nature. However, the rates of decomposition vary. A leaf can decompose very quickly (it may even be eaten by insects), but a large tree trunk will last for over a hundred years since the natural resin in wood acts as a powerful preservative.

## Fossil Fuel

This is the general term used for the natural fuels that we use. It comes in all three forms of matter, solid coal, liquid oil, and natural gas. Fossil is the term used because all three come from very ancient organic sources. Decomposed plants and animals were processed by nature with heat and pressure for millions of years to transform them into fossil fuels. Since it takes a very long time to create fossil fuels, it is not easy to make more. In addition, using up fossil fuels increases the amount of carbon dioxide in the air.

## Polar Ice Caps

The northernmost and southernmost parts of earth are very cold and very icy places. They have plenty of water and more importantly, really large amounts of ice. We call these the polar ice caps, and Antarctica in the south has significantly more ice than the Arctic in the north.

## Sea Level

The sea level is the basis for measuring the height of natural and man-made features on our planet. We base this from the surface of the sea, so the sea level is also an indication of how "high" the sea is. The sea level is not constant as it can be affected by various factors.

One of the more observable changes in sea level in the Philippines is changing number of "islands" during high or low tides (since the higher sea levels will "sink" some islands). On a technical note, the official count of islands accepted by international law is the count during high tides (the official count, as of the year 2017, is 7,641).

Tides are not the only thing that affect sea levels. The amount of ice melting from the polar ice caps due to climate change is slowly rising sea levels all over the world.



Lesson:

# 3.1



## The Oxygen Cycle

### Lesson Goals

To teach students how oxygen and carbon dioxide naturally occur in the environment and how pollution affects the cycles.

### Topic

Climate change is currently the biggest environmental problem that our planet is facing. In order to talk about climate change, we must first learn about the oxygen and carbon dioxide cycle as well as how pollution affects it.

The oxygen cycle describes how the amount of oxygen and carbon dioxide in the atmosphere is kept balanced as it is consumed and processed by living things.

### Expected Outcomes

At the end of the lesson, students will be able to:

- have a basic idea of how oxygen is used and turned into carbon dioxide by humans and animals, and how plants are able to turn carbon dioxide into oxygen
- have a basic grasp of the concept of the atmosphere needing a stable ratio of oxygen and carbon dioxide, and know that an increase in the volume of carbon dioxide is bad for the environment

### Integration Point

During Science: When discussing the different states of matter and focusing on the topic of gas. This can also be integrated when discussing the basic respiratory functions of the body.

Discussion  
Points

## Earth's Atmosphere

The air within the Earth's atmosphere is composed primarily of nitrogen (78%) and oxygen (21%). The 1% remainder is composed of carbon dioxide, argon, and other gases. Humans and animals are able to breathe because of this vast amount of oxygen. When we inhale, we take in air into our lungs and there, oxygen molecules are absorbed by our body and it is used to keep our cells energized. The by-product of this process is carbon dioxide, which we release when we exhale. All non-plant life on Earth breathe in oxygen and exhale carbon dioxide.

Plants, on the other hand, process carbon dioxide in order to enact photosynthesis. Energy from sunlight is used to process the molecules of carbon dioxide and water in order to create carbohydrates that a plant needs. Commonly, this process is explained in a simplified manner that describes the plants as "inhaling carbon dioxide and exhaling oxygen", a description that often proves effective in completing the cycle part of the Oxygen Cycle.

However, this over-simplification does not take into account that plants also breathe (referred to as respiration). This is done through the stomata in leaves. In this process, plants also absorb oxygen and release carbon dioxide. It is simply that the process of photosynthesis processes so much carbon dioxide (releasing even more oxygen) that respiration is hardly taken into account when it comes to the role of plants in the oxygen cycle.

Oxygen is written as  $O_2$  and Carbon Dioxide is written as  $CO_2$ .

## An imbalanced cycle

Human innovation and technology have increased the sources of carbon dioxide. The common and widespread use of fossil fuels for generating energy has led to an increase in carbon dioxide levels that would have been impossible to reach naturally. The increased volume of carbon dioxide in the atmosphere has caused environmental problems.

Lesson:  
**3.2**



# Climate Change (Basic)

## Lesson Goals

To inform students about the current state of the planet and to give them a general idea on the importance of reducing carbon emissions.

## Topic

The constantly increasing use of fossil fuels has had a massively negative effect on the environment. Earth's atmosphere now has more carbon dioxide than it ever had in millions of years and it is causing temperatures to increase. Due to humanity's reliance on the use of fossil fuels as a source of energy, this problem cannot be easily solved.

The first step in dealing with Climate Change is learning about Climate Change. Here we learn about what the term means, how it is affecting the planet, and what is causing it.

## Expected Outcomes

At the end of the lesson, students are expected to:

- form the logical foundations for having an environmentally-inclined mindset when it comes to making lifestyle decisions later in life
- be able to define what Climate Change means in a clear and accurate manner

**Discussion  
Points**

## The Term

The use of the term "Climate Change" has evolved over the recent years. Originally, climate change refers to any long-term, major changes in climate patterns (like the Ice Age). But in modern usage, Climate Change refers to one specific change in Earth's climate pattern: global warming brought about by the massive increase of carbon dioxide and other greenhouse gases in the atmosphere.

To avoid confusion, we use this modern definition of the term as it is currently more widely accepted. Also, since the effects of global warming are not entirely literal, it is preferable to use climate change instead.

## Where does all the Carbon Dioxide come from?

For many years now, the largest source of carbon dioxide has not been the respiratory systems of animals and humans. Instead, it is from the byproduct of using fossil fuels, most commonly, crude oil. Crude oil can be turned into liquid petroleum gas, kerosene, diesel, and a variety of other forms of fuel. As humanity's energy needs increase, so does the consumption of oil and the volume of carbon dioxide we produce.

## How Climate Change affects us:

Earth's atmosphere has too much carbon dioxide, and this is affecting temperature zones across the planet.

In the simplest context, high volumes of carbon dioxide in a small space will increase the temperature, hence the term "greenhouse effect". The higher volumes of carbon dioxide in greenhouses allow certain plants to flourish in artificially heated environments despite the natural climate being much colder.

Our planet, however, should not be turned into a gigantic greenhouse. Too much carbon dioxide is causing the buildup of heat in all the wrong places. Other gases, such as methane, also contribute to this effect, but it is the massive increase in carbon dioxide production that is causing problems for the environment like global warming.

One such place that is affected by global warming are the polar ice caps. In the Arctic, both sea ice (frozen ocean water) and permafrost (frozen soil, which contains carbon within) are in danger of melting away completely. The melting of sea ice is bad news since it contains huge volumes of water,

enough to raise the sea level globally if it melts. When this happens, many inland areas will be subjected to flooding. Also, alongside the change of sea level, the flow of cold water into warmer areas will also severely affect weather patterns. An example of this is the more frequent emergence of super typhoons, as well as the trend of increasingly warmer climates in the country.

The effects and dangers of melting permafrost is a little more complex. Aside from the ice melting into water, the frozen soil also has many pockets of carbon dioxide and methane trapped within. The release of this will worsen the current volume of greenhouse gases in the atmosphere. Along with these gases are ancient bacteria from microorganisms originally frozen, exposing us to new and old diseases.

Melting the ice caps, is not the only impact of climate change on our environment. Droughts and heat waves (often causing forest fires), stronger typhoons, and many other disastrous effects are being brought about by climate change.

Lesson:  
**3.3**



# Eating Out with No Food Waste

## Lesson Goals

To teach students the virtue of observing restraint when consuming food (to the limit of what they can actually consume), and how to avoid waste by ensuring that excess food can be eaten at a later time.

## Topic

The food industry makes meals very easy to get. Be it ordering from a fast food counter, calling in a food delivery, or telling the waiter which menu items you like, eating out is easy. However, just because these are not home cooked meals it does not mean that we are powerless to make decisions about the food that will be served to us. We can decide on the portion control, what condiments are given, the water served, as well as what to do with leftovers, and these are very important to remember in order to eliminate food waste.

## Expected Outcomes

At the end of the lesson, students will be able to:

- determine how much food they need for their current appetite
- verbally communicate how much food they want and be able to request for leftovers to be packed to take home
- be able to declare how much single-use consumables they need in order to lessen waste

## Hunger sells

One of the easiest ways to end overspending and over-ordering is to forget one's state of hunger. When a person is hungry, appetite will increase, and so does the willingness to buy more food. As long as a person's appetite is able to deal with the volume healthily, this would be okay, but there are many occasions when hunger makes an individual end up biting more than he or she can chew (in this case, sometimes quite literally).

One suggestion to deal with strong hunger is to order small items (such as fries) first. Alternatively, get a normal sized meal.

Either way, the simple process of getting even the smallest amount of food down the stomach is often enough for a person to assess how hungry he or she really is and how much more food he or she still needs. If you have finished the meal and are still craving for more, then do not hesitate to follow your appetite's needs. On the other hand, if you already get full from this initial amount, then you would have saved yourself from spending more unnecessarily and wasting food.

## Dealing with single-use packets

For many take-out and delivered meals, condiments are often given in the form of small, single-use packets. These contain various condiments such as salt, sugar, ketchup, soy sauce, and others. Naturally some meals are more appetizing and fun to eat when they have condiments, so how does one get to enjoy good tasting food while minimizing food waste?

First off, determine where you will be eating. If you are going to eat at home, then chances are, your kitchen will already have bottles of ketchup, mayonnaise, and other condiments. It should also be mentioned that a lot of Filipino families tend to stockpile condiment packets in order to avoid wasting food. So be sure to make use of these items as well as informing the store (when making the order) to not send condiments. Alternatively, when receiving the food from the delivery personnel, you can opt to return any packets you will not be using.

Obviously, there are occasions when the use of packets cannot be avoided (like eating in a car, or out on a picnic). In this case, ask only for the amount of condiments you think you will use - there is no need to get two sachets of sugar when you only need one.

**Discussion  
Points**

## Take leftovers home

Being able to completely finish meals is sometimes not possible. Appetite may be hard to determine, some stores can have unpredictably large serving sizes, or there may even be an urgent matter that will require you to leave the table earlier than planned. Regardless of the reason, there will always be a possibility that you are finished eating but there would still be a portion of the food you ordered left on the table. The easiest way to deal with this is to ask the store crew to pack the remaining food for takeout. This will allow you to bring the food with you so that you can eat it at a later time.

**Exercises**

- Have the students do a role play being in a fast food store or even the canteen, have them explore and practice polite dialogue in order for them to make requests from the serving staff
- Have the students list down their favorite foods and which condiments go well with their choices. Then have the students analyze if their eating practices help them conserve and avoid food waste depending on their condiment usage.



## Microplastics

Any piece of plastic smaller than 5mm in length that contributes to the pollution of our environment is considered as a microplastic. Microplastics are divided into two categories. The first is Primary microplastic, which is for plastic items that are originally 5mm or smaller upon production. Secondary microplastics refer to when larger pieces of plastic break down into small pieces. While there are no final figures on how long it actually takes for plastics and microplastics to break down in the natural environment, it is certain that degradation does not happen fast enough to prevent plastics from being harmful.

## Environmental Conservation

This refers to the ethical usage of environmental resources (either for direct consumption or allocation for later use), as well as the continued upkeep and protection of resources. Resources include local flora and fauna, water, fuel sources, and others. In recent years, there has been a greater focus on the conservation of the resources whose finite limits are about to be reached.

Lesson:  
**4.1**



# Why We Avoid Single-Use Plastics

## Lesson Goals

To teach students about the harmful impact of plastic products on the environment

## Topic

Single-use plastics are frequently used on a common and day to day basis. They generate a large volume of non-biodegradable trash which contributes to the pollution in our environment. Plastic waste can end up in various places, such as landfills, waterways, and even in our oceans. Since plastics are not biodegradable, the microplastics they produce when broken down can be harmful.

By understanding the actual effects of microplastics on our environment, we can emphasize the importance of avoiding its use.

## Expected Outcomes

At the end of the lesson, students will be able to:

- identify the various harmful effects of plastics
- advocate, on a basic level, the need to avoid plastics
- re-evaluate their perception on the proper use and disposal of plastics

## Identifying Single-Use Plastics

The simplest way to know if a plastic is considered as "single-use" is this: it can only be used once.

This applies to plastic objects that are too specialized in make and application that they cannot be repurposed. A good example of these are the form fitting packaging like the plastic wrapping used for straws on the back of boxed juices, or the thick plastic clamshell used for retail products. Both of these, despite being quite different in size and form, need to be torn or broken when in use. There are many other examples of these such as plastic condiment packets (except the fish-shaped soy sauce mini-bottles, these are not broken in order to be used), plastic wraps for disposable chopsticks, disposable plastic drinking cups with covers, and others.

## Not All Plastics are Single Use Plastics

Some plastics end up being only good for a single use, though they are not necessarily single-use plastics. Take plastic bags for instance. Sando bags and plastic zipper bags are often designed with a bit of durability in order to serve the purpose of being containers for items. However, depending on the item placed in them, they may or may not be reusable. Using one for storing perishables, toxic items, and liquids makes them unusable afterwards (it would be unhygienic or even dangerous to do so), but for storing dry, non-perishable, non-toxic items, it would be easy to use them again.

Large black plastic trash bags, if used as a storage option, often makes them reusable. If they are used for their intended purpose, for containing trash, then they become single-use. It has to be noted that these are items that are not easily replaceable for the purposes that they serve (it would be grossly uneconomical to use cloth bags to storing and throwing trash). Thus, when dealing with these kinds of plastics, it is best to do so prudently - like making sure that the trash bags are filled optimally before disposing of them responsibly.

### Exercises

- Have the students create a diagram showing the "life cycle" of plastic items when they are thrown away improperly. Show how plastics can be harmful at each stage. For example: when still whole, plastic bags can block drainages and six-pack rings can strangle small animals. When broken down a little further, small pieces can prove to be choking hazards when swallowed. At the microplastics stage, they can be ingested and enter the bloodstream (through waterways affecting sources of drinking water) causing health problems.
- Have the students discuss their favorite wild animals and write about how microplastics can affect them. Emphasize how the simple act of managing the amount of plastic waste produced can make an impact on the protection and preservation of many species in the wild.

## Understanding Microplastics

Plastics, being non-biodegradable, can cause major problems in the environment. When plastic breaks down, it turns into microplastics. These are extremely small pieces of plastic that can easily spread and accumulate -causing harm to both man and nature.

Microplastics vary in size, shape, and form. The general rule of thumb is that any piece of plastic material smaller than 5.0mm is considered as microplastic. That size may be very visible to the naked eye, but microplastics often manifest much smaller, less discernible, yet equally (or even more) dangerous sizes. The smallest microplastics are 10 nanometers (which are a hundred millionth of a meter), making them microscopic.

We classify microplastics into two general types. Primary Microplastics are directly manufactured microplastics. They are designed and made to be small. Most of these are in the form of microbeads. These tiny plastic beads are often used in hygienic products such as facial scrubs and toothpaste.

The second type of microplastics are Secondary Microplastics. These are tiny bits of plastic that come from the wear & tear and the breaking down of much larger plastic items. Single-use plastic products are a major source of these secondary microplastics

## How Microplastics Affect Us and Our Planet

Since they are small, it is easy for microplastics to find its way into waterways, contaminating the soil, rivers, lakes, and even making its way to our seas and oceans. There are many reports of microplastics in marine environment. When they are ingested, these non-biodegradable particles reside in the bodies of marine life, such as fishes, turtles, mussels, and others. These cause sicknesses not only to the fish, but also to the humans that eventually eat them. It goes without saying that drinking water can also be contaminated by microplastics.

Soil can also have plenty of microplastics because of pollution. Earthworms have been found having ingested microplastic particles. Studies have shown that microplastics in the soil affects the consistency and density of the soil. The ability of soil to absorb water, resist degradation/erosion (soil aggregate stability), and viability for growing bacteria (which are necessary for the eco-system) are all weakened by the presence of microplastics. In the long-term, this affects agriculture and the natural growth of plant life -it can even be said that some of the effects can be felt now.

Being microscopic in size, microplastics are also present in the air. They are health hazards, and can cause minor to severe health problems if inhaled by humans or animals. Aside from the more obvious respiratory issues aerial microplastics can cause, they are also associated with causing cancer and other abnormalities.

Lesson:  
**4.2**



# Conserving the Resources We Use

## Lesson Goals

To give students a deeper understanding of when and how resources such as energy, food, water, and other resources are used.

## Topic

We need resources in order to live— energy for our homes, food and water for our bodies, and plenty of raw materials for the belongings that we own and use. Resources are finite, but not using resources is not an option. Therefore, the most responsible thing to do is to make very wise decisions with regards to how we use the limited resources that are available to us.

By learning different methods of conservative consumption, we can make better lifestyle choices that are environmentally responsible.

## Expected Outcomes

At the end of the lesson, students will be able to:

- identify what resources are used in various daily activities
- appreciate the importance of limiting the consumption of resources

**Discussion  
Points**

## Observing

There is a need to look at the different actions we take each day and identify the resources we use for each activity. Even an action as simple as reading a book will have a variety of factors that may or may not use resources: do we turn on a fan or an air-conditioner in order to cool the area where we read? This is especially true in locations where opening a window is not a good option. Do we make use of a reading light or is there sufficient natural light available? While sunlight is certainly an environmentally viable light source, there should be a good amount of it as reading with insufficient light is bad for the eyes.

By being aware of the different things around us that make use of energy, food, and other resources, we can make educated decisions on how we go about our daily lives.

## Adapting Individualized Practices

We all live very different lives. Each of us goes about our daily routines with practices that have been shaped and influenced by our personal preferences. Some people are more content with eating two servings of rice while others would only need a single serving. Some find mental or emotional relaxation with very long showers while others would prefer to bathe hastily. To suggest that everyone should only eat one serving of rice to conserve food or bathe faster to conserve water would be morally wrong.

What may work for others may not work for us, and what may work for us may not necessarily be good for others. This is why we must adapt according to our individual situations. A long shower may be indispensable for an individual, but make sure that water consumption for other activities, such as brushing teeth and cleaning dishes, is done conservatively. Having two servings of rice is fine as long as one does not leave leftovers.

By determining the difference between how much we need and how much we consume, we can create our own personalized action plans.

## Understanding Impact

A small cloth bag for carrying dry purchased goods may seem like a troublesome thing to carry around, especially for students who are already carrying a lot of items to school, but this little sacrifice makes a big difference.

We already know that plastic products are bad for the environment. Many stores in the Philippines have adopted a "no plastic bags" policy, opting to use the biodegradable alternative of brown paper bags. However, a lot of trees are cut down to produce paper bags. Most importantly, these brown paper bags are definitely single-use items, often getting too torn to be used more than once.

At the end of the day, be it a plastic bag or brown paper bag, these are items that can only be used for a short time. When we dispose of them, we add to the increasing volume of trash and indirectly discard the resources and energy used to produce those bags. In light of this, the minor inconvenience of carrying a cloth bag comes into perspective. Many other conservation practices require doing things that may seem inconvenient and troublesome, but they can have a tremendous impact for the good of the environment.

By making an effort to carry a small bag of one's own, the negative effect of consuming disposable items is prevented. This in itself is a great argument for bringing a personal reusable bag, but more importantly, it is a great example of how one seemingly minor inconvenient practice can actually be a great help to the environment. When it comes to helping our planet, no action is ever too small.

### Exercises

- Make a guessing game by citing common day-to-day activities and have the students guess what kinds of resources these activities use up. This will encourage students to change their outlook on what being environmentally responsible really means. Give bonus points for those able to cite examples that other students cannot easily think of.
- Have an interactive forum on individual solutions, have students discuss activities that they want to make more environmentally sound but cannot do so with conventional approaches (for example: opening a window is a good way to make a room cooler, but if the outside air is subject to smoke from passing vehicles, an asthmatic student cannot make use of this solution). This will allow students to learn about the differences of lifestyles and how each person can have a unique approach on being environmentally responsible.

# Lesson: **Vocabulary Words**

## **5.0**

### **El Niño**

El Niño refers to a weather phenomenon that occurs in the Pacific Ocean. Warm ocean currents affect the air pressure in the region and directly cause the rise of average temperatures of the area, the lessening of rainfall, as well as influencing the formation of tropical cyclones. The Philippines is directly affected by these occurrences. For other parts of the world, such as the region around the Atlantic Ocean, Antarctica, etc, the effects are less dramatic or sometimes even unnoticeable. The term itself comes from the Spanish phrase "El Niño de Natividad".

### **Sustainability**

According to the Bruntland Report for the World Commission on Environment and development of 1992, Sustainability is the "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs". It is an ideal and a philosophy that aims towards achieving a balance between society's need to consume resources and its ability to protect and cultivate it.



## Lesson: 5.1



# Climate Change (Intermediate)

### Lesson Goals

To reinforce the importance of reducing carbon emissions by providing them with a more in-depth knowledge about climate change and its relation to how greenhouse gases are changing the planet.

### Topic

For the past few years, discussions on environmental issues have been focusing more and more on Climate Change and Global Warming. But what does Climate Change really mean for the Philippines?

Simply knowing what climate change is on an academic level is not enough. There is a need for emphasis and knowing how it affects us locally. Learning about the effects of climate change on localized and specialized scales will allow us to better understand the gravity of the situation.

### Expected Outcomes

At the end of the lesson, students will be able to:

- see the different effects in their own lives that have been brought about by Climate Change
- empathize with how their local communities are affected by Climate Change
- develop and cultivate, on an individual level, the desire to deal with Climate Change and other environmental issues

**Discussion  
Points**

## Global Warming

The increase of temperature on a global scale does not necessarily mean that all parts of the world will grow warmer. In fact, some areas will actually see a drop in temperature. This is one of the ironies of the effects of Global Warming and is one of the reasons why a lot of people misunderstand it. However, the Philippines has a tropical climate, and thus, an increase in global temperature directly affects us with an increase in local temperature.

Statistically speaking, the years 2015, 2016, 2017, and 2018 have had the four hottest average global temperatures ever recorded. 2016 is the highest (affected by El Niño) and 2018 being the lowest of the four.

## Super Storms

The Philippines is no stranger to storms. Being in the tropics, it is no surprise that the country gets a few over the course of a year (on average, the Philippines can have up to 20 storms each year). Super storms (or super typhoons) however, are a completely different thing. These aberrant and deadly weather formations are statistically uncommon, and yet for some reason, five of the top ten strongest typhoons to affect the country since the 1880's have all occurred in the years 2006 onwards. It goes without saying that a single superstorm can cause a massive degree of destruction to both human life and in terms of property damage.

Since the country is an archipelago, there are plenty of locations that can become hard to reach during times of catastrophe. Many of the local islands are already isolated even in optimum conditions. In a crisis situation, evacuating people and providing aid are faced with major obstacles that other single-land mass countries don't encounter. This means that for every super storm that hits the country, we suffer from the loss of infrastructure, finances, and human life.

## The Change Affects Us Early

According to the Global Climate Risk Index of 2019, the Philippines is currently the fifth most affected country by Climate Change in the years of 1998 to 2017 (in 2015, the country was at the number 1 spot for the yearly rankings). This is due to the geographical position of the country. Our position in the tropics, as well as the surrounding warm waters of the western Pacific all contribute to the rising temperatures of the country.

The increase of temperature in the country and waters around it are linked to the formation of the storms mentioned above. The increase of heat in both the air and the seas means that storms will be stronger and more frequent - a trend that we have seen over the past few years. Countries further away from the equatorial line are less affected by Climate Change.

### Exercises

- Before starting the discussion on Climate Change, ask the students to talk about what they know about the topic through written or oral form. Then, proceed with the discussion of the topic. Afterwards, have the students compare what they think they know about Climate Change before and after the discussion.

## Lesson: 5.2



# What Goes On Our Plate

### Lesson Goals

To make students aware of the environmental impacts of the various processes required in producing the food on their plates and teach them to identify the types of foods that are environmentally sound as well as healthy.

### Topic

What does it take for the food to get on our plate? Going back through each step, there's cooking, food preparation, purchasing ingredients, selling meat and vegetables, transporting food products, and lastly, growing or raising what becomes our meals.

In each and every single one of these steps, there are plenty of things that happen. The value of food goes far beyond the nutritional benefits and gastronomic pleasure that we get from it. By learning about all the energy and effort that goes into the food that we eat, we can appreciate its importance better.

### Expected Outcomes

At the end of the lesson, students will be able to:

- give more value to the food that they have
- understand what makes food accessible in our current society

## Focus on Appreciation

While this is about learning the value of food through the various production processes that it goes through, the whole point is to emphasize that wasting food is truly bad for the environment.

Imagine wasting half a cup of steamed rice. That, for others, may seem like a small amount of food, insignificant enough for some to think that it would not be a waste. But, in order to cook a half cup of steamed rice, one needs both water and heat (be it a gas range or, more commonly in the Philippines, an electric rice cooker). That already uses fuel and clean water.

Before we even cook the rice, we need to buy it. Stores that sell rice use electricity, among many

other resources. Then comes the gas used for transporting the rice from the granaries to the suppliers and to the stores of the sellers. In the Philippines, granaries is where rice is stored, but it also has mills where the husk from the rice grains are removed. Like the stores that sell rice, these facilities consume electricity to run.

Lastly, there's the farms that grow the rice. Soil needs to be tilled and irrigated, and the wheat has to be grown and harvested. Depending on the farm, this usually means there is energy spent by farmers and farming animals or fuel used by farming machinery.

## What We can Do

As individuals, there is a limit to how much one can do when it comes to the food industry. We cannot directly affect or change how farmers cultivate or how stores sell food. But what we can control is our eating practices in order to create a more sustainable lifestyle.

With food preparation, it is important to observe that we minimize the amount of resources we waste. By cooking food evenly and properly, we ensure that no parts are discarded from under or overcooking. By learning how to properly chop vegetables, we ensure that no useful parts are thrown away. This is why learning some basic food preparation skills are very important.

**Discussion  
Points**

## Seasonal Produce

One of the most common tips for better food acquisition is to buy "in season" vegetables and fruits. However, for many local crops such as kangkong, they tend to grow almost all year round. With the Philippines having all four tropical climate patterns spread across different regions, many seasonal produce in other countries become easily available locally.

Take **cabbage** for example:

From January to March, it can be sourced from Catanduanes, Sorsogon, eastern Quezon, eastern Leyte, eastern Mindanao (among others).

From April to June, it is grown in western Cagayan, southern Quezon, Nueva Vizcaya, etc.

On the months of June to September, we can get cabbage from northeastern Luzon, Camarines Sur, Southern Mindanao, etc.

Lastly, from October to December, cabbage can be sourced from western Luzon, Mindoro, Palawan, and Negros.

In the Philippines, many agricultural products are available at a relatively steady price all year-round (whereas in other countries, seasonal products are more expensive during off-season). Though there are a few crops that are not available at certain months, the focus is more on choosing a responsible and environmentally conscious retailer.

## Balance Your Meals

Eating vegetables is more than just good for your health, it also helps the environment. Meat production processes are lengthy and resource-consuming, which means that it leaves a larger carbon footprint than vegetables or fruits.

In the Philippines, the most common sources of meat are beef, pork, chicken, and fish. Aside from fish, three of these are raised as livestock, and produces a significant volume of waste material. Farm animals produce methane, a more potent greenhouse gas than carbon dioxide. Also, they require plenty of heat, food, water, and other resources in order to be grown. Once harvested, meat needs to be stored in sanitized refrigeration units to prevent it from spoiling. These cold storage solutions also require plenty of energy to run. While the freshness of vegetables also needs to be preserved, the amount of energy used for non-meat products is much less.

Of course, it is a terrible and unhealthy idea to completely remove meat products from human diet. Instead, is it wiser to choose a more balanced diet that combines meat, grains, and vegetables instead of choosing to prioritize the consumption of only grains and meat (which is sadly, a common trend in the country).

Lesson:  
**5.3**



# The Mindset of Sustainability

## Lesson Goals

To give students the proper information on what sustainability is (as compared to other environmental movements) and know-how for practicing sustainability in their daily lives.

## Topic

Sustainability is an environmental philosophy that covers both developmental sustainability and an end goal of having a truly sustainable system. It means being progressive without destroying the natural environment around us. On paper, it sounds really good and idealistic, but in practice, it is something that we need to constantly work hard for to achieve. It is, however, worth it. Sustainability as the end goal is a win-win for all parties involved: society, the economy, technological progress, and of course, the environment.

As amazing as sustainable goals and beliefs sound, what does it mean for students?

## Expected Outcomes

At the end of the lesson, students will be able to:

- define the meaning of sustainability as framed from an environmental viewpoint
- expand their perspective on how they live life

**Discussion  
Points**

## Defining Sustainability

The literal meaning of the word sustainable is "something that can be maintained to remain in its current state". Meanwhile, "environmental sustainability" means creating a balance between our need for resources and minimizing our environmental impact at the same time. Ironically, most of human society's progress has been literally fueled by practices that have high environmental impact. That is why there is a strong emphasis on the need for developmental sustainability.

More than the abstract definition of the word, what is more important about sustainability is how we observe it in our lives. The application of sustainability comes in the form of environmentally conscious decision making when it comes to basic choices on what we consume. Awareness of product sources and production methods goes a long way in helping change the environment for the better. That, combined with lifestyle choices that focus on the reduction of waste, and the more efficient consumption of resources, helps us create a "sustainable" way of living.

## Do Your Research

One of the most important innovations in the recent decade is the accessibility of online services for everyone. In 2019, the Philippines has been rated as having the highest rate of online social media usage in terms of hours spend on social networking daily (the local daily average of the year being 10 hours and 2 minutes, with second ranking Brazil at 9 hours and a half). The prevalence of online services means that one very important resource is now available to many Filipinos all over the country: information.

Filipinos now have access to information about their favorite brands and companies (as most companies, from large corporations to small independent ones, tend to have a presence online). Learning which brands and products are produced with environmentally-safe methods, by environmentally-responsible manufacturers is no longer a matter of educated guesswork. There are plenty of online resources, ranging from official company profiles all the way to consumer reviews, which will give you a clear idea of what companies are worth your support.



## Going Local

The trend of liking and supporting local products has always been labeled as nationalistic and patriotic. That makes sense because doing so helps the local Philippine economy. This, however, is not the only benefit we get. Supporting local artisans and brands is also environmentally friendly. Many production processes in the Philippines make use of locally sourced natural materials, and traditional methods for processing. From food to clothing to furniture, there are plenty of local brands that are environmentally-conscious.

## Influence Your World

Access to social media also means being able to make your voice heard. Be it to just ten friends or a hundred thousand followers. Every individual's sustainable practices make a significant difference for the betterment of our environment, and the more people see you doing it, the more they are encouraged to do the same.

### Exercises

- Have the students create a table with three columns. In the center, have them jot down various innovations in technology and society. In the right column write down the positive effects gained from the item in the center column. Lastly, on the left column, write down the resources that were used in order to develop the item in center column. Talk about their ideas for achieving more center-column goals without creating a heavy price in the left column.

# Lesson: **Vocabulary Words**

## **6.0**

## **Carbon Footprint**

The carbon footprint is a measure of how much carbon emission a person, group, or object has created in the course of their life or existence. The numerical value is measured in Carbon Dioxide Equivalent (CDE) and is used by various commercial and public institutions as a rating system for how "green" their practices are. The term is inspired by the concept of the Ecological Footprint, but instead of measuring all environmental impacts, the CDE focuses only on carbon emissions.

Lesson:  
**6.1**



# Understanding Your Carbon Footprint

## Lesson Goals

To teach students what goes into the calculation of carbon footprint in order to impress upon them the value of their individual effort in contributing to solving environmental issues.

## Topic

A carbon footprint is a measure of how much carbon emissions we create in our life. Knowing this information provides a clear-cut value on how we are affecting the environment. What's more, knowing what adds to a person's carbon footprint can clearly identify which actions and activities create carbon emissions.

## Expected Outcomes

At the end of the lesson, students will be able to:

- increase their aptitude for identifying activities that create carbon emissions
- increase their self-awareness with regards to the environmental impact of their activities

**Discussion  
Points**

## What Creates a Carbon Footprint?

Creating a carbon footprint means creating carbon emissions. Take riding a car to the mall for example: the car's engine uses fuel and creates a by-product in the form of carbon emissions. This is why sharing a ride with friends, taking public transportation, or even just walking/biking can help reduce your carbon footprint. It is impossible to have zero carbon footprint, but it is possible to reduce it. All it takes is being aware of the actions we take every day.

## Things We Take for Granted

One of the most common and largest contributors to individual carbon footprint is energy usage (the single largest contributor would be jet fuel usage, which only happens when riding an airplane). Using electricity is a nearly indispensable part of our daily lives, but that doesn't mean we are out of options for cutting down. One such example is the use of smart phones. Many of these devices comes with built-in power saving settings, allowing users to lower screen brightness, slow down processing speeds, and disable many unneeded background applications - all of which contribute to a greater usage of the phone's battery power. As this battery power tends to come from fuel-run electricity sources, cutting down on usage will make a big difference.

Another major household necessity is the use of cooling appliances. Refrigerators keep food fresh and air-conditioning is important for the generally hot local weather. One thing to remember about these devices is that their cooling power is limited: they can cool only a small amount of space efficiently. For the refrigerator, never leave the door open for a long time. A similar approach applies to air-conditioning: keep the doors and windows of the air-conditioned room closed. Forcing devices to overwork means that they will need to consume more electricity.

Take a moment to think about how different appliances and fixtures make use of electricity and find ways to minimize the amount of energy they will need to consume.

## Revisiting "Reuse, Reduce, Recycle, and Refuse"

Sometimes, the basics are still the most important. The process of reducing the amount of waste that one creates makes a significant reduction on a person's carbon footprint.

**Recycling** and **reusing** waste items means that nothing goes to waste: old shopping bags, scratch paper, carton boxes, and many other objects can have a second life. Many simple arts and crafts projects could make good use of aluminum cans, plastic bottles, and other assorted scraps. Of course, this will require the help of some creative re-imagining on our part.

**Refuse** means saying no to single use plastics and other disposables. Having our own drinking cups/bottles vastly reduces the number of disposable cups that we use, the same applies to bringing our own straws, spoons, and forks.

Lastly **reduce**, which is decreasing both our consumption of resources as well as cutting down the actual volume of waste we produce. When printing on paper, it is often a good idea to switch the printer's ink-consumption mode to low or economy settings. Also, try to fit in as much content on every sheet of paper used in order to decrease the volume of paper that is needed. Wasting an entire sheet of paper to print one or two errant lines is a big no-no.

Lesson:  
**6.2**



# Finding Alternatives to Plastics

## Lesson Goals

To provide students with a wider perspective on their options and possible alternatives when it comes to living a plastic-free life.

## Topic

Disposable plastics are bad for the environment, but they are also very prevalent in our society. There are a large variety of retail products used for daily necessities that include plastics in various shapes and form. Some are very easy to identify, but there are also plastic waste from not commonly thought-of sources. While it is impossible to list down all things that can add to the volume of plastic waste, learning about a few certainly helps us get an idea of what else to look out for.

## Expected Outcomes

At the end of the lesson, students will be able to:

- advance their knowledge on sources of plastic waste
- develop a plastic-aware consciousness when choosing what items to use

## Keep Up With the Basics

We have all heard it many times now: use your own cloth bags, have reusable straws and cutlery, bring a thermos or drinking cup when going to cafes. These measures should not be considered as stop-gaps or temporary arrangements. We have to remember that the effort to stay environmentally responsible is a lifelong commitment.

## Take Care of Your Gadgets

Our society has a lot of gadgets: smart phones, laptops, bluetooth accessories, and more. The volume of waste (plastic and otherwise) produced by gadgets in an indirect manner however, is huge. Take pre-paid mobile accounts for example: the volume of plastic used to produce pre-paid "load" cards is quite significant. So instead of using pre-paid cards to top up the credits, we can opt use a direct transfer of funds instead.

While the expensive price of phones and the personal value of the digital data stored within makes users want to take care of them better, the same is not to be said of the accessories. Earphones, chargers, protective shells/covers/cases, and others are often subject to major wear and tear. If we take better

care of these things, then we will see less of them in the trash. And this matters as the global average of e-waste is approximately 44 pounds per person each year. That's about 255.4 metric tons of waste just for Metro Manila alone.

On a final note: repair is always better than replace. Unless you really need to upgrade to a new device, it is always better to try repairing. Some retail establishments may give the oft-used phrase of "repair costs will be as expensive as getting a new one", but this is not always applicable. Do be sure to canvas with other establishments and consult with technicians to get a second, third, or even fourth opinion before making a decision.

Discussion  
Points

## Go for Canned or Cardboard

As much as we can advocate the importance of bringing a reusable drinking container, life is not always as convenient as we would like it to be.

Since it is never a good idea to allow ourselves to be dehydrated, consider getting drinks that are stored in biodegradable or recyclable packaging such as canned drinks or those in cardboard boxes (in the case of drinks in cardboard boxes, let us try to at least have a reusable straw on hand). At the end of the day, don't forget that having your own reusable is still the better and responsible thing to do.

## Pizza Plastics

A recent trend in the packaging of pizza is the inclusion of a small, hard plastic object that stands in the middle of the slices. This plastic thing is called a package saver and is designed to prevent the pizza from smearing onto the top lid of the box. While this implement is indispensable for take-outs and deliveries as they keep the pizza in good edible condition during transport, they are completely pointless when dining in. So be sure to tell the counter not to include them for your dine-in orders.

## Read the Labels on Hygienic Products

Be it plain soap or facial wash, there is always the slight possibility that your daily skin and body care regiment may have plastic microbeads that are very bad for our environment. Always keep an eye out for the word "polyethylene" in the product labeling (it is usually listed under ingredients).



Lesson:

# 6.3



## Introduction to Sustainable Dining

### Lesson Goals

To teach students how sustainable dining practices at home reflect the practices of a commercial sustainable diner.

### Topic

From the kitchen to the dining room, how we handle our food can vastly affect our environment. Minimizing food waste should always be a priority, and this way of thinking applies not only to the domestic scale of a home kitchen, but also to the larger commercial food industry.

In the Philippines, the food service, food processing, and commercial dining industry are among the strongest and constantly-growing sectors of the economy. And as with any rapidly developing industry, the food sector has its fair share of business practices and processes that produces waste products. Annually, it is estimated that over 300 thousand tons of rice is wasted across the nation. That is just rice alone. It does not even count other forms of food waste as well as other byproducts of the industry. To deal with all of that, Sustainable Dining is the answer.

### Expected Outcomes

At the end of the lesson, students will be able to:

- recognize how their dining practices help shape the industry around them
- identify establishments that employ sustainable dining practices

**Discussion  
Points**

## The Power of a Consumer

As a consumer, you can directly influence an industry through your purchasing decisions. This is why it is important to support businesses that follow Sustainable Dining practices. The first step in doing this is in knowing what sustainable dining practices are.

## More than What We See

Aside from things that we can observe as a consumer, there are plenty of other Sustainable Dining practices that restaurants can follow. This includes kitchen-specific processes like maximizing the use of their ingredients to minimize wasted portions (parts that are removed or cut then thrown away), or by using cookware that is able to distribute heat evenly and efficiently (which lowers the fuel cost of cooking).

Key decisions such as partnering with sustainable suppliers, using organic produce, and disposing or processing waste properly (both organic and inorganic), can help the local environment. Sometimes, the only way to learn about this is to read about their company profile (some put it in their menus, advertise it through in-store prints, or on their online pages) or by asking their staff directly.

That brings us to the most important part: learning to ask. By communicating with the staff that you care about these practices, commercial institutions learn what practices matter to their paying customers. After all, nothing makes a business practice more sustainable than having clients that support it.

## Things to Observe

When eating out, there are plenty of little details that can tell you if the dining establishment is being run with environmental practices in mind. Here are a few things that you might want to look out for:

- 1** Water is not wasted: in restaurants, does a waiter ask if you want water? This may not seem like a big deal, but drinking water is an important resource that should not be wasted. It is a good sign if the diner ensures that they only serve water when it is asked for.
- 2** Condiment containers: is the salt available in shakers or in disposable packets? Same goes for ketchup, soy sauce, hot sauce, and others. When dining in, there should be a lot fewer disposable items and more reusable containers.
- 3** Proper lighting: when eating in daytime and other hours with substantial daylight, is the diner able to make use of this resource in order to cut down on artificial lighting? Less electricity use is always a favorable thing.
- 4** Eco-minded Reminders: does the cafe have notices or memos reminding its clientele to keep the door closed (for air-conditioned establishments)? Are you encouraged to unplug from the public outlets when your devices are properly charged? Is there a sign in the bathroom about conserving water usage? A commercial establishment that encourages its customers to be environmentally friendly is likely to be environmentally-minded themselves.
- 5** Scheduled menu changes: ever notice that some eateries make use of dynamic menus that changes its offerings based on the day of the week and/or time of day? This is because they will limit the types of food they will prepare to accommodate the consumer demand for that period in time (some would even close completely during off-peak hours). This ensures that they do not waste precious ingredients preparing dishes that are less likely to be ordered.

Lesson:  
**7.0**

# Vocabulary Words

## Coal Fired Power Plant

A coal fired power plant is a facility that generates electricity by burning coal. The heat of the burning coal is used to boil highly pressurized water to generate steam that turns and spins the giant turbines of a generator. The generator outputs electricity through a transformer and from there, transmission lines, like the ones you see along the street, allow the energy to be transported into homes and businesses.

1,000 megawatts of electricity can power over 1,000,000 homes, or a small city. In order to generate this much power, a total of 9,000 tons of coal, which is equivalent to about 360 dump trucks, needs to be mined and burned. This means that generating this much power using coal releases a huge amount of carbon dioxide and methane in our atmosphere which worsens global warming, and further pollutes the air we breathe. Lastly, this process also requires plenty of water which is used to produce the steam and wash the coal to remove impurities. The water coming from these power plants are incredibly polluted, and highly unsafe for humans.

# Megawatt

The megawatt is a unit of measuring energy used and generated by power plants. There are two types of megawatts: MWe and MWt. For most people, the more common usage of megawatt they hear about is MWe or Megawatt electric. This is the amount of energy produced by a power plant and is then consumed by private homes and other establishments that require electricity. More often than not, when people say MW, they are actually referring to MWe.

The other megawatt is MWt or Megawatt thermal. This is a rating system that is used for coal-fired, geothermal, nuclear, and other types of power plants that make use of heat. MW thermal refers to how much heat (from coal) that a power plant needs to generate the amount of electricity it delivers. For example, let's say that a power plant is rated at 2,000 MWe and 6,000 MWt. This means that the power plant is capable of producing 2,000 MWe for consumers to use, and in order to create that much electricity, the power plant will have to generate 6,000 MWt of heat.

As one can see, the conversion of heat to electricity is not very efficient. While the numbers in the above example are inaccurate approximations, it is true that it takes a lot of heat to generate a small amount of electricity. This means that there is a lot of excess heat generated by these kinds of power plants. Other types of power plants, such as hydroelectric, wind turbine, etc., also have an MWe rating (the amount of electricity they produce) but they have no MWt rating as they do not use heat to generate electricity.

Lesson:  
**7.1**



# Rising Above the Climate Crisis

## Lesson Goals

To stress upon the students the urgency and importance of environmental movements by teaching them about the current state of the society with regards to pollution on a global scale as well as understanding the urgency and danger of Climate Change.

## Topic

There is an environmental cost to human development. Our industries are changing the very planet we live in. Because of this, our future is uncertain. Knowing some of the basic factors that has led to this situation is important for understanding the very nature of our global environmental problem.

## Expected Outcomes

At the end of the lesson, students will be able to:

- understand that environmental care is an urgent concern
- take initiative in finding ways to help the environment

## The Climate Crisis

Each year for the past few years, the human population produces about 35 billion tons of carbon dioxide. About 55% of this is absorbed by the land, oceans, plants, etc. The remaining 45% stays in the atmosphere. Of the 35 billion tons of carbon dioxide, more than half is produced by power plants that use fossil fuels to generate electricity, and a third comes from gas powered vehicles.

We say "about" 35 billion tons because each year, that number grows, and that means a continuous increase in the volume of carbon dioxide in the atmosphere. Considering that the ideal ratio of greenhouse gases should only be less than 1% of the air, the result is that our power generation, transportation practices, and other lifestyle choices are constantly making Climate Change worse.

Globally, a lot of time and energy is being spent on political debates about the existence of Climate Change instead of discussions on how to mitigate it. For as long as humanity does not stop and focus on these issues, this crisis will continue despite all the best efforts of many environmental groups and agencies.

## The Power of People

Filipinos are both consumers of commercial goods and citizens of this country. This gives us the power to make a change. As Filipino citizens, we possess the ability to influence legislation through various democratic channels and most importantly, the ability to vote upon reaching voting age. If the citizens unite for environmental causes, then legislation will have to address that concern.

As consumers, we can use our buying and spending influence to affect industry trends. While it could be said that producers of consumer goods can influence the public, the road goes both ways. By supporting businesses and practices that veer towards greener solutions, we generate greater demand for it. And as the rules of the economy goes, where there is demand, the economy will follow.

Discussion  
Points

## Maximum Effort

The basic reason why it is hard to stop using fossil fuels is that so much of our existing infrastructure and technologies rely on it. Fuel-based electricity generation and transportation are the top two primary sources of carbon emissions; they are also fundamental for our economy. This means that ending Climate Change will require a tremendous amount of effort for everyone in the world.

In the Philippines, our coal-fired power plants provides less than half of our total energy usage, but produces a lot of carbon emissions. However, we cannot simply shut them down unless there are additional sources of energy that are already in place.

There is a need to build more electricity generating facilities that makes use of renewable resources, like solar, geothermal energy, wind energy, biomass energy, and hydroelectric energy. The Philippines already has many of these facilities in place; in fact, our country

generates around 49% of our energy needs from renewable sources. That means, we need to build more renewable energy power plants to cover the remaining 51% (the combination of coal-based plants at 43%, and oil-based plants at 8%).

The transportation issues face an equally long and hard road as well, since majority of private vehicle owners won't be able to easily afford replacing their gas-fueled vehicles with electric ones. There is also the logistical issue of being able to provide an environmentally sound solution for the disposal of all the vehicles if everyone does adapt, electric vehicles. Lastly, there should also be recharging stations available throughout all road-routes in the place of gas stations.



## 2 Minutes Left on the Doomsday Clock

The Doomsday Clock is an abstract concept created by scientists following the use of atomic weapons in Hiroshima and Nagasaki. The clock serves as a countdown timer showing how close humanity has to ending itself through war, unchecked scientific advancements, and other man-made dangers. The time is depicted in measures of "minutes to midnight", with midnight equating to a point-of-no-return doomsday scenario and the minutes showing how close we are to it.

The clock is updated annually, and it is not a literal clock that moves in a single direction. Depending on advancements and changes made by humanity, the minute may move closer or further to midnight. As of 2018, members of the Bulletin of Atomic Scientists have set the clock to 2 minutes to midnight. This count is the closest we have come to ending the world since 1953, when the United States and the Soviet were at the foothold of a dangerous nuclear exchange.

### Exercises

- Have students come up with their own Doomsday Clock. Start by having them create the basic clock design in class. Then allow them time to research about what each minute on their clock means. Have them present their works in class. This can be done in groups or individually.

Lesson:  
**7.2**



# Environmentally Responsible Eating Habits

## Lesson Goals

To give students additional green dining practices to help them re-evaluate their eating habits and preferences in order to further improve their awareness and habits with regards to making environmentally responsible food choices.

## Topic

Sustainable Dining is more than just a philosophy or mindset, it is also something we practice in daily life. It is about knowing the value of everything that goes into the food that we eat, and the importance of good dining habits on us and on the environment. The food system uses most of our resources, like 69% of all the world's fresh water and 34% of land. It has caused 75% of deforestation, contributes at least 24% of greenhouse gas emissions, and has caused 70% of biodiversity loss. Even though we use so much resources to produce food, we still waste around 1/3 of all food produced globally. Sustainable dining is important in order to mitigate these negative effects, and to maximize the amount of food we produce.

## Expected Outcomes

At the end of the lesson, students will be able to:

- increase their knowledge of sustainable dining practices
- be able promote sustainable dining practices to the people around them

## Low Carbon Dining Means a Little More Flexing

Not to be confused with a low-carb (carbohydrate) diet, low carbon dining means eating food that makes as little carbon emissions to prepare. Preparing a dish with a low carbon footprint will have a few basic elements: faster cooking/prep time, less ingredients that are grown close to home (or the store you bought them from), and as much greens over meat as you can have.

Usually, this needs a bit more effort on our part, as it means avoiding a lot of processed food – meaning we will have to do more preparation work. The extra effort is worth it, as the end result will not only be more eco-friendly, but usually a tastier and healthier meal (not to mention improving our cooking skills too).

Going to the wet market for fresh produce and meat is also better than purchasing pre-packed or even preserved ingredients. For those with

home gardens, being able to grow fresh vegetables, calamansi, chili peppers, and other similar plants is a great alternative.

It also helps to learn a few basic cooking skills, and one of the easiest things to learn is also the most eco-friendly: re-cooking leftovers. Steamed rice can be turned into fried rice, little chunks of meat can be put together into an omelet, and cooked chicken meat can be shredded and turned into a spread with some mayonnaise. The possibilities are endless as long as you are willing to try innovating recipes.

The important thing to remember here is that all these requires a little more time and effort. Convenience is a price we should be willing to pay for a better world.

## Local Sensibilities

The internet is full of information, both accurate and inaccurate. While it is certainly encouraged for students to have the drive and initiative to seek out various methods for "going green", always remember that what we read on the internet is not always correct -or at the very least, not always applicable in our country.

Some tips, such as drinking tap water instead of bottled water, or eating raw produce, certainly cuts down on carbon footprint, but are also unhealthy suggestions locally. Tap water in the Philippines is certainly not potable, and raw produce will still need cleaning before it is safe to eat (it is recommended to clean all raw produce regardless of where you are). Since there are very few online references that actually provide tips that come from a Filipino perspective, always remember to cross check any research and always follow local safety practices.

**Discussion  
Points**

## Help with the Groceries

While a high school student is less likely to be paying for their own groceries, it is not unlikely for them to help with the act of buying the groceries (in fact, it should be encouraged). A trip to the grocery, or for the more adventurous, the wet market, can be quite the learning experience.

Reading the food labeling tells us a lot about how green the food is. With meat and eggs, the term "free range" means that the animals were fed by allowing them to graze on pastures and open areas, as opposed to giving them formulated feed. This has a smaller environmental impact as feeds require processing while pastures do not. The second best thing would be eggs and meat from ranches that create their own organic feeds (smaller ranches may not have open pastures).

"Organic" is a much sought-after label, often meaning that the grains, produce, and other foodstuffs have been grown or made without the use of chemicals (pesticides is the most common example) or other artificial additives. This implies that the item in question has been made with minimum carbon emissions. However, remember despite a lot of products using the organic label, not all are truly organic. Fortunately, the Department of Agriculture has released an official Organic label by the DA-BAFS (Bureau of Agriculture and Fisheries Standards). Products with this organic mark have met the standards set by a regulatory board.

Lesson:  
**8.0**

# Vocabulary Words

## Carbon Footprint

This is the volume of carbon emissions of a specific subject for a given amount of time. It is measured in weight of Carbon Dioxide emissions (CDE), the lower the value, the lesser the environmental impact. As everything in the world leaves a carbon footprint, being able to measure it allows us to assess what is making Climate Change worsen and what does not (there is a natural acceptable volume of carbon dioxide in the atmosphere). All carbon footprint calculations are approximations and/or projections, but the general idea of how much CDE is created serves enough of a purpose.

## Clean and Renewable Energy

Clean energy is power that is generated without creating a lot of carbon emissions or other harmful byproducts. Renewable energy comes from resources that do not deplete easily or can never be depleted. Electricity from natural sources such as wind, flowing water, sunlight, geothermal heat, and others, are considered clean and renewable energy.

Lesson:  
**8.1**



# Calculating Your Carbon Footprint

## Lesson Goals

To teach students a simple method of calculating carbon footprint.

## Topic

The carbon footprint is the measure of how much carbon emissions we make. This can be measured in scales of individuals, households, facilities/businesses/industries, and countries. Knowing the approximation of one's personal carbon footprint is a great exercise in mathematics as well as a good way to objectively assess how much each action we take affects the environment around us.

## Expected Outcomes

At the end of the lesson, students will be able to:

- calculate their own carbon footprint
- re-assess their practices and habits to help the environment

## Discussion Points

### Approximation Only

All carbon footprint calculations are not 100% accurate in terms of figures, and it does not need to be. After all, there are plenty of changes that can happen in a person's lifestyle and immediate environment, so these calculations are more of projections than solid figures. Measurements of carbon footprints are meant to serve as reminders and guideposts on how we can improve our lives and also to appreciate how much of a difference our efforts make.

Also, there are many variations of carbon footprint calculations. This method will measure how many pounds of carbon dioxide emissions an individual in the Philippines can generate in the course of a day when using electricity and commuting. For more in-depth calculations, there are plenty of calculators available online.

### Going Online

Unlike most carbon footprint calculators, this variation includes the emissions cost of various online actions, such as doing a web query or sending an email. While this may seem to have little direct energy use for the end-users (the students), the reality is that every single thing that happens online is done on a multitude of very physical and very energy-consuming servers and processors all over the world. There is a carbon cost to digital content, and it is one that we cannot ignore. While the individual numbers of carbon emissions are low on a per person scale, always remember that there are millions of people using the internet at any given time.

**Exercises**

## Base Values for Calculation

For transportation and electric use, the actual rates will vary depending on the product and model used. For this calculation, the average values for the top local models are used. Students may choose to increase or decrease the amounts if they know the exact energy usage values of the vehicles or products they use.

### CO<sub>2</sub> Emissions

Target value: CO<sub>2</sub> Emissions in kg (kilograms)

Electricity: 1 KWh = 0.512kg of CO<sub>2</sub>

Gas: 1 liter of gasoline = 2.4kg of CO<sub>2</sub>

### Transportation Usage

Motorcycle/Tricycle: 0.014 liter/km

4-Wheel Vehicle: 0.065 liter/km

Walking/Bicycle: 0 liters/km

### Electricity Usage

Television: 0.06 KW/h

Smart Phone: 0.01 KW/h

Laptop: 0.01 KW/h

Desktop Computer: 0.60 KW/h

1HP Air Conditioner: 0.75 KW/h

### Internet Usage

Google Search: 0.007 kg of CO<sub>2</sub>

Sending/Receiving Email (1MB): 0.019 kg of CO<sub>2</sub>

Facebook Comment: 0.001 kg of CO<sub>2</sub>

Youtube (10 minute): 0.001 kg of CO<sub>2</sub>

Twitter Tweet: 0.00002 kg of CO<sub>2</sub>



# Calculating the Footprint

## Transportation

1. Calculate the distance travelled by the student to the school every day in kilometers
2. Multiply this KM with gasoline amount under the corresponding vehicle under transportation usage
3. Multiply the gasoline amount consumed with 2.4kg, results are in kg of CO<sub>2</sub>

## Electricity

1. List all the applicable devices used, and then for each device used, write down the number of hours they are in use per item
2. Multiply hours of use with the corresponding amount in electricity usage for each individual appliance, results are in KWh
3. Add up all the KWh and multiply by 0.512m, results are in kg of CO<sub>2</sub>

## Internet

1. List all the applicable net actions performed, and then for each action used, write down the estimated number of times they are done each day per action.
2. Multiply number of actions with the corresponding amount in internet usage for each individual action, results are in kg of CO<sub>2</sub>

**Final step:** add up all the kg of CO<sub>2</sub> for all three categories. This is how much carbon dioxide the person adds to the atmosphere each day.

If we multiply this value by 7, we get a week, by 30 a month, and by 365 a year. Now consider the combined annual carbon footprint of everyone in the room for a whole year. Sure, not everyone goes to school every day, but there are also plenty of times when people travel to different places in a single day.

The Philippines has a population of 104.9 million people, multiply that with the CO<sub>2</sub> values of the student with the lowest footprint in the room and it will still be a staggering value. This calculation does not track the carbon emissions from food eaten, water usage (drinking, bathing, etc), retail purchases, and other activities. But those values still exist, and we cannot ignore how everything adds up. This is why every individual's actions matter, everything we do will either add or offset the carbon emissions in the atmosphere.

Lesson:  
**8.2**



# Environmentally Sound Business Practices

## Lesson Goals

To provide students with the ability to define an environmentally friendly business, and to remind them about the importance of supporting businesses that share their environmental values.

## Topic

A good business will have three bottom lines: economic or financial gain, social growth for reputation and consumer market share, and environmental balance, which means having a minimum impact on nature and its resources. At first glance, the environmental angle may seem like it does not belong. However, the reality is that striving for ecological sustainability is a good business strategy. For a more obvious example, a furniture maker would run out of raw materials if all the trees used as wood has been cut down. Striking a good balance with nature ensures that resources would always be available and that the environment would also be hospitable to businesses and clients today and for future generations.

However, not all businesses strive for these three things. There are those that only focus on financial gain and expanding their market. This is why it is important to know a few basic traits of environmentally responsible businesses. By knowing who to support, we can influence which businesses will grow and which will not.

## Expected Outcomes

At the end of the lesson, students will be able to:

- identify the various business practices that are harmful or helpful to the environment.

## Why Does this Matter?

High school students are an active part of the Philippines' consumer economy. More importantly, their purchasing habits and brand preferences at this stage will help define and shape their market sensibilities as they grow older. Therefore, it's important for them to learn to support environmentally responsible companies early on.

## Going Paperless

Businesses use up a lot of paper. Memos, invoices, letters, official announcements, audits, and reports are just a few of the many records and processes that companies need to put into black and white. The good news is that there is always the option to go digital. Some companies can go "paperless", which means that most of their previously paper-based official communications internally, and with partners and clients will be done through the use of digital documents or soft-copies.

This move cuts down on the need for paper and pulp products, which means a lot less trees are cut down and a lot less processing chemicals are consumed (those that turn wood pulp to paper). Aside from that, cutting down on paper also means cutting down on ink. In terms of environmental efficiency, this is one of the best things that a business can do.

**Discussion  
Points**

## Rewarding Renewables

Many companies are now making use of solar energy panels to help supplement their energy needs, most prominent of these are some of the major malls in the National Capital Region (NCR). Due to the huge amount of energy that local businesses need (as a tropical country, it is almost impossible to do without air conditioning), the electricity usage tends to be very high. By making use of solar energy, a small portion of that consumption is reduced. More importantly, aside from the direct reduction in carbon emissions, this practice gives a public face to the concept of using renewable energy, inspiring other business and even private individuals a push towards doing the same.

## Life Cycle Cost Analysis (LCCA) and Designing for the Environment

LCCA is a method for a business to assess how much a facility or device will cost them. A building, for example, will have an elevator, lights, and air-conditioning. Before buying a building, the cost of running the elevator, as well as keeping the lights and air-conditioning on will also have to be accounted for. This is not just about saving on the cost of the electric bill, but it also shows a consideration for the energy consumption and emissions of the facility.

Some businesses will make use of auto-dimming lights that lower the light intensity in lower-traffic areas of the building when no one is around. Some malls have smart escalators, which slow down to lower energy use when no one is using it.

It is not all about using high technology features though. Some, like the introduction of "lanes" in escalators, not only improve the flow of foot traffic, but also makes the escalators function more efficiently by minimizing crowding and lessening the stress on the machine. This results in lower energy consumption as well

as a longer lifespan of the equipment, both of which lowers the escalator's overall environmental impact.

DFE (designing for the environment) works in the same sense, but focuses mainly on product development. In the case of mobile phone developers, they are constantly striving to improve device performance while finding ways to lower battery consumption. Updates that increase battery life per charge help the end users and the environment by ensuring that each mAh (the unit of measurement for phone battery power) is maximized.

There are now plenty of manufacturing processes that make use of recycled plastics. These take plastics out of the trash bin and back into circulation, preventing them from contaminating the environment.

Many companies that practice this don't usually place that information upfront, so it is recommended to read up on business and company profiles to learn more.

## Power Plant

A facility designed to generate electricity. Large electric generators are able to create electricity by transforming turbine movement into power. Turbines can be moved by a variety of methods, most commonly, by steam. Mechanical methods that directly move turbines, like wind or water, also exist.

## Biomass Power Plants

These power plants generate electricity by using organic waste material as fuel. Using biomass is a very effective way of reducing waste, but the energy plants themselves have low energy ratings. Most of the biomass plants in the Philippines are rated at 10MW, which is less than 10% of what the average geothermal plant can produce. While using organic fuel still has some carbon emissions, the levels are very low and it is offset by the fact that biomass plants grow their own crops.

## Hydroelectric Power Plants

These power plants are usually situated near rivers with strong currents. The water current pushes the turbines that generate electricity. This is a very clean and renewable source of energy. However, during the times wherein the water levels decrease, the amount of energy generated is lessened.

# Geothermal Power Plants

Geothermal plants make use of the natural heat from the earth to create steam. The steam moves through coils that rotate turbines. It works the same way as coal-fired power plants, but since natural heat is used, it has no carbon emissions.

# Wind Power Plants

These make use of wind turbines in order to generate electricity. A single wind turbine does not generate a lot of power, so there are usually a lot of turbines in a single wind farm. Naturally, these facilities are set up in areas where there is steady and strong wind. However, occasional weather changes can affect the output.

Lesson:

# 9.1



## Climate Change (Advanced)

### Lesson Goals

To inspire students to take a stronger resolve in making lifestyle choices that help deal with Climate Change. By learning about the social, commercial, economic, and political practices that make humanity dependent on carbon, they will understand the importance of social will and resolve in order to bring about the needed changes.

### Topic

For the past few thousand years, humanity has been dependent on the use of fossil fuels. To this day, many modern economies and industries rely on fossil fuels as a primary source of energy. It goes without saying that the real fight against Climate Change can only truly begin when humanity finally breaks off from its dependence on fossil fuels. It is not the only step we have to take, but it is certainly the biggest one.

Another major hurdle in dealing with Climate Change is the fact that there is misinformation everywhere. From outright fabrications to well-intended misinterpretations, it has become quite difficult for many people to realize a productive and actionable plan for dealing with Climate Change. The value of individual action can be undermined by a misguided community. Saving the environment is going to take a social effort, and to make that effective, we have to make sure that we are all starting on the same page.

### Expected Outcomes

At the end of the lesson, students will be able to:

- engage in meaningful discussions about Climate Change and what needs to be done about it
- increase their understanding of wrong information and verifiable data

Discussion  
Points

## The Problem with Using Fossil Fuels

Fossil fuels are neither renewable nor clean. Not "renewable" in the sense that if humanity consumes all the coal and oil in the planet, it will be a few million years before new deposits are replenished. Consuming all the fossil fuels is impossible because of two reasons: discovering all coal and oil deposits in the world is a near impossible task, and if we try to use up all the coal and oil we've already dug up, global warming will accelerate so fast that humans will be extinct even before we consume everything.

On the other hand, nuclear energy is considered as "clean" energy. It produces a very minimal amount of carbon emissions. There are arguments that the process of excavating uranium and creating nuclear power plants has its own carbon emissions, but for the most part, nuclear energy does not contribute significantly to global warming. The problem with nuclear energy however, is that it is not renewable. There is a finite amount of uranium deposits in the world, and since it is being used for fuel, uranium in a power plant will not last forever. It is commonly considered that the uranium in a nuclear plant will last for about 80 years. But if the amount of electricity generation is increased to cope with the growing energy needs, those 80 years will be decreased significantly.

This is why wind, solar, geothermal, hydroelectric, and many other forms of clean energy should be the focus of the energy industry. They are clean, produce no byproducts that harm the environment, and more importantly, are renewable sources since they generate power through means that will never run out.



## Our Usage of Coal

Coal was first used in China, 4,000 years ago, as a substitute for fire wood. For centuries, coal served as nothing more than kindling for fires – be it for cooking, for staying warm, smelting ores, and more. From the ancient times, through the dark ages, and until before the steam engine was invented, coal usage was moderate.

The introduction of the steam engine was the day humanity began to consume fossil fuels at an alarming speed that is still increasing to this day. Before steam engines, a single shovelful of coal may have been enough to last a family's basic needs for a day (heating and cooking). But with a steam engine, the same amount is only enough to keep the train running for about 15 seconds. That is why steam engine trains carried tons of coal when being used. More than a hundred years later, coal quickly took over the energy industry.

The first power generators ever made actually used renewable energy. In 1878, a hydroelectric power station was built for the service of a small area in Craggside, England. Due to the fact that the conversion of water force to energy was still low at that time and the fact that electricity only served as a substitute for gas (it was only used for heating and lighting back then), hydroelectric stations were considered less practical than gas providers.

In 1882, Thomas Edison's Edison Electric Light Station in London was built. This coal-fired power plant was able to generate a substantial amount of power provided energy for light and heating, and powered a nearby telegraph office. For the first time, electricity became more important than gas, and it was through the use of coal that this became possible.

Since that time, humanity has chosen to improve power stations by increasing the amount of electricity they can produce each day. But the fuel remained the same: fossil fuels in the form of coal and oil. Renewable energy sources have also seen a lot of improvements over recent years, but their growth pales in comparison to the leaps in development that coal-plants have had over the past century.

On average, a coal fired power plant consumes 0.375 tons of coal per hour to produce 1 megawatt. The Philippines' largest coal-fired power plant, Sual Power Station, is rated at 1,500 megawatts, which means that it uses around 563 tons of coal per hour.

**Discussion  
Points**

## A World in Action

Indeed, climate change is already upon us. Many of the initial signs of global warming has already presented itself. It has not been a single-sided development. For many years now, various organizations, businesses, groups, individuals, and even nations have begun to take action against Climate Change.

The United Nations has long known the threat of Climate Change. Back in 1992, the treaty of the United Nations Framework Convention on Climate Change was ratified by all 197 members of the UN. This would be later reinforced by the Kyoto Protocol (2005) and the Paris Agreement (2015).

In 2009, the Philippine Congress ratified Republic Act No. 9729, known as the Climate Change Act. Many local companies are making a significant effort in cutting down on their carbon footprint, and as a whole, our country and its citizens recognize the need to do something about the environment.

## Clean Energy Challenges

As nice as it would be to wake up one day and see that the energy industry has fully adopted clean and renewable energy sources, the fact is that going green has a lot of challenges. Each type of clean energy source has its own strengths and weaknesses. The first issue is that clean energy is dependent on geography, more specifically, topography. A wind farm in a country with a low average wind speed is a bad idea for obvious reasons. Imagine setting up a solar farm in areas with long periods of night. The Philippines is rather lucky in this regard because of our country's natural qualities. We have sites for geothermal power, hydroelectric plants, wind turbine farms, and biomass power plants.

The second challenge is that the currently available technology of renewable energy cannot compete yet with the output strength of non-renewable energy plants. The Mak-Ban Geothermal power plant generates 480MW of electricity, and this plant has the highest capacity of all our current renewable energy sources. Other renewable energy plants generate anywhere from 10MW to 275MW. Comparing this to Sual Power Station which generates an average of 1294MW,

it's easy to see how far behind renewable sources are in terms of being able to deliver the society's current energy needs.

Meeting these challenges will require action on all fronts. We, the consumers of energy, will have to be more mindful on our energy consumption. We could decrease the amount of electricity we use or switch to technologies that are more energy efficient. The industrial and commercial sectors will need to adjust their business practices and redesign products and equipment to optimize energy usage. The energy sector will have to start investing significantly in the development of better technologies for our renewable resources so we can generate more electricity while minimizing loss, and start finding even more options for clean energy generation.

Lesson:  
**9.2**



# Supporting Local Food Products

## Lesson Goals

To inform students about how supporting local products can help the environment by teaching them the advantages of ordering local and seasonal produce, buying from companies that support local suppliers, and other practices.

## Topic

Filipino food, from dishes to treats, are amazing. They taste great, are good for the health, and best of all – are good for the environment. From local food preparation methods to choices of ingredients it is easy to see why supporting local fare has a very low carbon footprint.

## Expected Outcomes

At the end of the lesson, students will be able to:

- appreciate the value of local food products
- be able to discuss why supporting local goods has a positive effect on the environment

## Local Means Less Fuel Consumed

Imported food products travel a great distance from other countries. This means a huge amount of oil has been used just for its transportation alone. Unless there is a specific need for an imported food product or ingredient, it is always better to make use of local alternatives.

## Natural Methods

On average, Filipino companies use less preservatives, chemicals, and other artificial ingredients on their products (it is still advisable to read the product labels) as compared to food from western countries. Health-wise, it is better to go with the more organic option. For our environment, less artificial content means less processing and less waste generation (which often comes in the form of chemical waste and carbon emissions).

## Truly Local

Get to know the various food suppliers in your area. Ask storeowners and sellers where they source their products. If you show a sincere interest in the food that you buy, sellers are more likely to be open with you. Of course, take everything with a grain of salt as sales talk may tend to have some bits and chunks of fabrication. It also helps to pay attention to the products as well.

## Mind the Packaging

Many local food items are now packed in tiny little plastic containers. While this may seem like a step forward for the sellers, traditional food wrapping is actually more eco-friendly. Take pastillas, for example. These little milk based candies are traditionally wrapped in paper, but some sellers now have them wrapped in plastic, so try to avoid those. You can also choose to buy biscuits in cans instead of in small plastic packs. If you are buying from the local bakeshop, choose to have your items packed in a brown paper bag instead of plastic, or better if you bring your own reusable container.

Lesson: **Vocabulary**  
**10.0 Words**

## Poaching

The act of illegally hunting animals for their parts.

## A Frog in Hot Water

A figure of speech that refers to the dangers of being ignorant or unaware. It is also a reference to humanity's tendency to be complacent. The text literally refers to live frogs being put into lukewarm water. When the water is brought to a boil slowly, the frog remains unaware of the gradual temperature change and will stay in the water. By the time the water is boiling, it is already too late for the frog to escape.

Lesson:  
**10.1**



# Defining Sustainability

## Lesson Goals

To provide students with a new perspective on environmental awareness, and encourage them to make a difference.

## Topic

We often hear the word "sustainable" or "sustainability" as a major buzzword when it comes to almost any topic about preserving the environment, but there is more to it than that. Sustainability is a goal that we must reach for humanity to have a good future. By learning the different concepts and factors that define sustainability, we gain a clearer understanding on what must be done, and what is being done to achieve it.

## Expected Outcomes

At the end of the lesson, students will be able to:

- define and discuss sustainability, as well as abstract concepts of environmental conservation, preservation, production, and consumption

**Discussion  
Points**

## The Foundations of Sustainability

Sustainability is best seen in one of humanity's earliest achievements: farming. A farmer tends to the crops and his animals, and in return, they provide for the farm. While the farmer certainly uses the crops and animal to eat and to earn, he ensures that his farm stays rich and alive. When there is a balance between man and nature, sustainability is achieved.

With progress and development, humanity consumes more resources in order to achieve new heights. However, this should not come at the cost of our environment. In order to maintain a balance, we must learn to observe and follow certain ideals.

### Conservation

Conservation can be defined as any action or plan that helps protect our natural environment. Going deeper into a more definite detail, conservation is a two-stage approach.

The first involves personally minimizing or preventing overuse and depletion of natural resources such as wood, oil, water, and more. While it is inevitable for humanity to make use of the resources we need to live and grow, the amount of resources we use should be regulated.

The other approach is choosing where our money goes – to companies and industries that are good for the environment or those that harm it. The less money we give businesses with harmful environmental practices, the less damage they can do.

### Environmental Consumerism

The Philippines is a developing country. As such, our consumer industry is large and active. Each day, NCR is able to produce around 8,600 tons of trash. Since majority of that trash ends up getting burnt (which directly adds to carbon dioxide emissions), it is easy to see why consumerism is one of the reasons why our climate is in crisis.

While a vast majority of carbon dioxide emissions can be blamed on fossil fuel-based power plants, those facilities only exist to provide energy for consumer demand. A consumer's influence translates directly to purchasing power, and our ability to discern which products and companies deserve our money controls the trends of the industry. By supporting environmentally friendly products and businesses, we are helping shape our future for the better.



## Preservation and Protection

Preservation involves ensuring that as much as humanity progresses and develops, our impact on the environment should either be positive or minimal. However, this is an uphill battle. With the advent of human industrialization and commercialization, many species have become endangered or extinct altogether. The Pyrenean Ibex, African Black Rhinoceros, Passenger Pigeons, and the Caribbean Monk Seal are just a few of the many animals that humans have hunted to extinction.

Preserving wildlife is no easy task, as there is plenty of money to be made from illegal and unsanctioned mining, woodcutting, and poaching. The black market industry is worth

millions in US dollars, and as such, those who are involved in these illegal practices are prepared to fight for it. In South Africa, the active armed conflict between poachers and wildlife rangers is a war for the lives of many endangered animals.

Protecting our environment is challenged not only by deliberate action, but also by human ignorance. Lack of environmental awareness has led to the development of bad practices: over-fishing, use of the harmful chemicals in soil, dumping of toxic waste, and more.

## Production and Manufacturing

The manufacturing industry is responsible for converting what nature has to give into something that we need. It turns wood into furniture, stone into floorings, livestock into meat, and more. There is no denying the fact that in order for us to have the things we need; we have to take it from nature.

Environmentally sound manufacturing processes means lessening the environmental impact in acquiring raw materials. This is done by maximizing these resources, and making use of recycled materials. This ensures that nothing is wasted. Another consideration is the regulation of acquisition. How much is an industry allowed to get from nature and for how long? With renewable organic resources, this means creating a calendar that takes into account the time it takes for the organics to grow. Non-organic materials are non-renewable, acquisition of which must be regulated with consideration for the biodiversity of the local area as well as long-term sustainability.

Manufacturing processes also go under the green treatment. It starts with reducing the amount of energy and water usage required to process raw materials. While it is obvious that machines and other equipment can consume a lot of electricity, not a lot of people are aware how much water is used in industrial processes. From cleaning to cooling, water is used in a lot of industrial processes. Most of the time, water comes out filled with various micro particles, some toxic, others non-biodegradable. It is important to properly filter and purify the water before dumping it back into nearby rivers and lakes.

Facilities that follow good environmental planning find measures to lower harmful byproducts such as carbon emissions and toxic substances, and ensuring that all waste is disposed of responsibly.

Lesson:  
**10.2**



# Environmental Projections

## Lesson Goals

To teach students how population growth and commerce directly affects pollution and the planet's degradation, and the current predicted trends for the immediate future.

## Topic

The future does not bode well for humanity. The planet is in dire crisis due to Climate Change and few understand how urgent the situation is. While urgency is often an effective motivator for people, it is hard to recognize the signs for what they really are. Climate Change is literally a "frog in hot water" scenario, with humanity being either completely oblivious to the situation or worse, are willing to listen to those who say that it is okay to be complacent.

## Expected Outcomes

At the end of the lesson, students will be able to:

- feel a sense of urgency and importance on the need to act

## Local Awareness

The issues affecting our environment are already here, and are affecting the world around us. The early effects of these issues are being shrugged off by most of the global population. By the time the more noticeable and significant signs appear, it might already be too late. In a lot of countries, climate change experts are having a difficult time explaining the situation because people are not feeling the direct effects.

The situation in the Philippines is a little different. Being a tropical country surrounded by large bodies of water, the effects of global warming are significantly more noticeable. This is why our nation's leaders and citizens have been more open and accepting of the concepts of Climate Change. All that said, it is still important for the industrial and commercial sectors of the country to start acting.

## Population Explosion

Back in the 1900s, the Philippine population was at 7 million people. By the year 2000, that amount has increased to 76 million. During 2017, the number has reached to nearly 105 million. Regardless of the cause of the population increase, one fact remains the same: the needs of every single person puts a severe strain on the quickly depleting resources that we have. To survive, we need food, energy (in the form of electricity), and material goods. Just imagine the amount of carbon dioxide emissions there are for every person in the country. Growing populations put a severe strain on the environment. However, our country is not alone. The world has seen a massive boom in population. In the short 50-year span of 1960 to 2010, the world has gone from 3 billion people to over 7 billion, more than double the original figure.

## Rising Waters

The melting ice caps are slowly rising sea levels all over the planet. It is projected that once global warming is in full swing (which is expected to happen within this century), water levels could rise to over a meter – and that is high enough to completely submerge many of our country's smaller islands. All over the world, this will also remove hundreds of miles of coastal shores, effectively shrinking most land masses by a significant amount. The problems do not end there however, the change in sea level will also affect the air pressure across the ocean, leading to even larger and stronger storms. The problem with this is that once all the ice has melted, there is no way to bring it back. Global warming has already melted enough ice for the world's seas to rise by 20cm since the last century.

Lesson:  
**11.0**

# Vocabulary Words

## LPG (Liquefied Petroleum Gas)

Also known as butane or propane, LPG is most commonly known in the Philippines as the fuel for gas stoves. It can be obtained as a byproduct of natural gas processing and oil refining, and is naturally found with other hydrocarbons such as crude oil and natural gas. The carbon emissions from LPG is lower than conventional gasoline oil, but it still a contributor of greenhouse gases.

## Challenger Deep

At 10.9 kilometers deep, Challenger Deep is the deepest known point in the ocean. It is a part of the Mariana Trench southwest of the island of Guam.

This point is so deep that natural sunlight does not reach it. As such, it serves as a home to very unique aquatic species that live in an environment with high pressure and no light. Sadly, despite the isolated nature of the location (humans can only reach it with very specialized deep-water submersibles), explorers have found that some plastic waste has managed to sink all the way down to Challenger Deep.

Lesson:

# 11.1



## Environmentally Responsible Home Cooking

### Lesson Goals

To teach students how to use the kitchen in an environmentally responsible manner.

### Topic

How we prepare meals can have as much of an impact on the environment as to what we are preparing. Across the years, cooking methods and equipment have been improved to make food better. Now, we can learn how to make food in ways that are good for the environment as well.

### Expected Outcomes

At the end of the lesson, students will be able to:

- gain new ideas for preparing food
- be inspired to find their own ways to make their kitchen habits more "green"

**Discussion  
Points**

## Mind the Voltage

There are plenty of useful and helpful kitchen appliances that require electricity to run. Always be sure to check the range of the wattage on the back. Wattage tends to be a range, so the consumption rate will depend on the device's settings. A lot of appliances now have an Energy Star sticker, label, or etching on the back. This little mark allows us to identify appliances which have a need of a much lower average energy than other similar appliances.

## Use an Airpot for Boiling

Modern airpots (electric kettles) for boiling water are very energy efficient and fast. The deciding factor here is the time it takes for the water to boil. By the time water boils on a stove, the amount of energy spent would have been too much. For preparing pasta, and other similar meals, it helps to pre-boil water in an electric kettle. Do remember that this is not an option for recipes that require food to be brought to a boil – you will need to do that in a pot.

## Cooking: Gas Range or Electric Stovetop?

The environmental efficiency of cooking ranges is dependent on location. Aside from people living in locations where LPG tanks are not allowed, like in condominiums, most people have a choice on what kind of stove they can use. Given this, the main consideration for environmental efficiency is the source of electricity. If your area sources electricity from a coal-fired or gas power plant, or any other non-renewable, non-clean energy source, then the gas range is a better option. This is because the electricity consumed will require more fossil fuels to generate than the amount of LPG the gas stove could've used. On the other hand, for those living in areas powered by renewable energy, the electric range will have lower carbon emissions versus gas stoves.

## Microwave Management

If you need to heat pre-cooked food fast, then the microwave is a faster alternative. However, the gas range is still a more environmentally friendly way to reheat food. Do remember that an electric stove consumes more energy than the gas range or microwave.

## Cook Larger Quantities

A great way to save on energy and time is to cook a lot of food at once. When cooking, try to prepare dishes in quantities that can have multiple servings. The preparation and cooking needs for making smaller portions is a lot larger than doing it all once.

Lesson:  
**11.2**



# Real Sustainability Instead of Eco-Novelty

## Lesson Goals

To teach students to support long-term sustainable solutions instead of short-term novelties

## Topic

Being environmentally conscious is the hot new trend in today's society. From social networking to the retail industry, there is a growing trend towards marketing things labeled as eco-friendly. The rise of this trend is a good thing for environmental awareness. However, our environmental responsibility is a long-term concern, and acts of novelty can only go so far. We need to be able to identify the truly sustainable practices that we should continue to support.

## Expected Outcomes

At the end of the lesson, students will be able to:

- be able to distinguish what actually helps the environment and what does not

**Discussion  
Points**

## Practice Responsible Eco-Tourism

In some places of the world, humans have destroyed the natural beauty and balance of some tourist areas. Tourism is a very important livelihood for the communities in tourist areas. Practicing sustainable tourism or sustainable traveling will not only benefit the environment of these areas, but also sustain the livelihood of these families. It is important to regulate the introduction of humans to natural tourism sites in order to control the damage being done and raise money to fund the preservation and rehabilitation of the area. This is effective as long as there are rules and regulations in place that would protect the natural order of the area, and if the tourists behave, follow the rules, and have the initiative to adopt eco-friendly traveling practices. The simple act of holding onto your trash during a hike until you find a trash can is already a big help.

We have all heard enough horror stories about tourists littering and destroying the natural environment. To this day, the main trails to the peak of Mt. Everest is littered with trash, and plastic waste has been found at Challenger Deep, which is the deepest point underwater in the world. The next time you travel, think of ways on how you can have the smallest impact to the natural environment you are excited to visit.



## Be Smart When Buying

Things labeled as "eco-friendly" are not equal in terms of effectiveness. Many do help the environment, but some are more effective than others. Take reusable straws for instance. They help curb the amount of plastic waste, regardless of the type of straw that you use.

Glass and metal straws are manufactured with methods that require energy and water. On the other hand, bamboo straws have a more environmentally sound production process. While bamboo straws have a much lower lifespan, they hardly add to overall waste as they are completely biodegradable. Lastly, most reusable straws come with cleaning brushes. These are normally made with metal wire handles, but the small bristles are made of plastic. If you already have a usable cleaning brush from a previous straw, choose to forgo getting a new brush when you get a new straw.

Another example are businesses claiming that a portion or all of the proceeds from buying one of their items will be donated to an environmental cause. In cases like this, it is wise to double check the authenticity of the claim by checking with the environmental organization identified as the beneficiary.

## Learn About Environmental Organizations

Protecting the environment is an advocacy that a lot of people care about. They care enough to be willing to donate money for such causes. However, not everyone who says that they will plant a tree for every donation is telling the truth. There have been reports about individuals creating false organizations for the purpose of scamming well-meaning people for their money. This is why it is important to research about the organization you are donating to.

Learn about established environmental organizations. Non-Governmental Organizations (NGOs) are non-profit organizations that are registered and fully recognized by the government. Get to know them by researching online, attending their events, talking to their staff, and taking part in activities. Volunteering is a great way to help and to get to know the people in your area who are working on the same programs that interest you.

Lesson:  
**11.3**



# The Importance of Biodiversity

## Lesson Goals

To teach students the value of biodiversity for them to see the importance of protecting the natural flora and fauna around us.

## Topic

The environment we live in plays as a host to various living things. Each one has a role to play in the balance of nature. While plants and animals may go extinct naturally, as goes the cycle of nature for the past millennia, the presence of humanity has caused a significant increase in extinction that causes an imbalance to our environment. Our rapidly expanding society and developing industries have changed the face of the planet we live in. Biodiversity is how our environment creates a balance for life, and we must do what we can to protect it.

## Expected Outcomes

At the end of the lesson, students will be able to:

- understand and appreciate how plants and animals help keep the balance in the environment
- gain a deeper respect for life on Earth

## What is Biodiversity?

There are two standard definitions for the word biodiversity. Primarily, it is the range of species of plants and animals in a given biosphere. Every living creature is counted in the biodiversity of an area. It also accounts for genetic differences across the same species. The more species there are, the more diverse it is.

The other meaning of biodiversity is the balance of nature that is achieved by having many different species in an area. The food cycle is a great example of how biodiversity balances nature: plants are eaten by animals, and when the animal dies, the remains of the dead animals break down, and the nutrients go back into the soil, which is then absorbed by plants. Aside from ensuring that each living thing has enough food, biodiversity also affects shelter (large trees can provide homes for a range of animals), propagation of species (flowers rely on various birds and insects for pollination), and more.

## How Humanity Benefits from Biodiversity

Humanity owes a lot to the diversity of species around us – such as plants breaking down carbon dioxide to provide fresh oxygen, insects keeping the soil fertile so we can harvest fresh produce, worms decomposing corpses and preventing the spread of disease, and so much more.

It is a well-established fact that man has long benefited from nature. Much of what we have today comes from nature. The clothing and textile industry rely heavily on fibers such as cotton, silk, and wool. Paper, other pulp based products, furniture, weaponry, and many more come from wood. The medical industry makes use of a wide range of plant and animal extracts. Domestic animals have long served as both physical and

humans, and some can be trained for specialized work such as seeing-eye dogs for the blind.

Our quality of life would be vastly inferior if we had not had such a rich level of biodiversity in our biosphere.

**Discussion  
Points**

## The Balance that We Give Back

What is humanity's responsibility in biodiversity? Like any system with a cycle, there should be continuous flow of progress. Certainly, we take from nature, but how do we give back? As the most technologically and intellectually advanced race on the planet, we have the capacity to protect nature.

That capacity, however, is only minimally met. The decline of resources due to overpopulation, the increase of greenhouse gases due to overuse of fossil fuels, the extinction of many animal species due to irresponsible hunting, poaching, and destruction of natural habitats, the introduction of new species in areas where they upset the ecological balance – all these and more prove that humanity has not been fulfilling its responsibility. Biodiversity can be lost, and we cannot continue to develop as a species without it.

## Conservation and Preservation Efforts

Not all of humanity is set on destroying the planet. There are many people, groups, and organizations that take a very active role in protecting our environment. From ensuring that trees are not overharvested, to seeking out ways to increase the population of endangered species, there are plenty of programs in place to protect nature.

Conservation means more than just keeping animals alive. It also means protecting the places they live in. After all, a pride of lions will quickly die if their territory has no prey or water. The circle of life is connected, and saving one species in an area often means needing to save them all.

## Echo Chamber

A situation wherein a person is surrounded by people who share a similar mindset or perspective; thus, leaving no room for arguments that provide an alternative or conflicting opinion.

## Confirmation Bias

This is a tendency to be selective in using information that would only support or confirm a pre-existing argument while ignoring any data that would provide a conflicting point of view.

Lesson:  
**12.1**



# The Zero-Waste Ideology

## Lesson Goals

To inspire students to aim for higher environmental milestones like having a zero waste lifestyle.

## Topic

"Zero Waste" is an ideology that takes the "reduce, reuse, recycle" concept to the absolute maximum: by having no waste at all. This may seem impossible at first, but many cities in the world have begun their attempts at trying to create a zero waste society. A small village in Japan, Kamikatsu, started their efforts back in 2003, and now, they produce almost no waste at all. Zero Waste is not an impossibility, it is something we can strive for.

## Expected Outcomes

At the end of the lesson, students will be able to:

- be optimistic about what they can do about and for the environment
- explain the concept of zero waste
- identify zero waste practices and start doing them

## What is Zero-Waste?

Zero waste is achieved when a society is able to turn all trash into something useful. One of the most difficult parts of reusing and recycling is the fact that sometimes, we really can't find any other use for what we're going to throw away. But what if we find someone else who does? This is one major cornerstone of a zero waste community: by knowing what each member of the community can do, the more options there are for reusing materials.

Waste from one household or facility can serve another purpose elsewhere. As communities are composed of different individuals, families, and establishments with different needs, skills, and resources, finding new uses for discarded materials becomes easier. For example, by having residences with gardens or farms, organic waste can be turned into compost. By having people with skills in textiles and garments, old clothing can be reused and reworked into new clothing, upholstery, stuffed toys, and more.

But this alone does not ensure zero waste. Instead, active participation is more important.

## Community Fridge

An environmental program for the community will only work if the community actually takes part in it. A good example of this is the "community fridge". This is a great system for communities that helps reduce food waste and hunger. Fridges are set up in a public location. Anyone can place food in the fridge, and anyone can take food from it. The community fridge is normally overseen by volunteer workers who ensure that the food is safe, the fridges and storage containers are kept clean, and that nobody abuses the system. A system like this will not work if there are no people to donate food or if there are people who take advantage of the free food for profit.

**Discussion  
Points**

## A Change in Lifestyle

The zero waste village of Kamikatsu did not achieve their results overnight. Since they started the project in 2003, they have constantly revamped their systems to cope with the evolving needs of the village. Simply getting everyone to cooperate was already a monumental feat. Village representatives would often express in interviews that the system took a while before it was accepted by all the villagers.

Introducing a massive change to society will always be met with resistance. Regardless if the change is for the better, there are those who simply prefer to do what they have been used to doing for a long time. Now, more than a decade and a half since they started, the entire village works together and their waste production is almost zero.

They sort their trash to over 30 classifications, and are constantly finding new ways to reuse materials that will be beneficial to the community. It is a lot of hard work involving everyone in the area, but the results are definitely worth it. Across the world, cities such as Vancouver in Canada, Bute in Scotland, Flanders in Belgium, San Diego in the USA, Capannori in Italy, and more have also begun their own zero waste programs.

**Exercises**

- When discussing the concept of a community fridge, ask the students to raise their hands if their first thought was about the possibility of other people abusing the system. Then ask what this reflects about our local society and what challenges our community needs to overcome in order to achieve the kind of consistent unity that zero waste needs.



Lesson:  
**12.2**



# Climate Change: Climate Crisis

## Lesson Goals

To ensure that students are armed with the correct knowledge and information about what Climate Change is.

## Topic

Climate Change is the biggest problem that humanity has ever faced. Unless we actively lower carbon emissions, predictive models indicate the possibility of total environmental collapse within the next 100 years. However, one does not deal with an issue like this blindly, not when the global community is full of misinformation and inaccurate data. This is why a full and comprehensive review of information always helps.

## Expected Outcomes

At the end of the lesson, students will be able to:

- provide factual information and logical arguments when discussing climate change

**Discussion  
Points**

## Understanding the Climate Crisis

The world is in danger due to the continuous buildup of greenhouse gases in the atmosphere. For the past 800,000 years, carbon dioxide levels (per million) had stayed within the range of 180 to 300, creating a regular cycle that spanned almost a hundred centuries each. With the advent of industrialization, we passed the 300 mark in the 1950s. Now, the count is at 410 and it is continuing to rise.

At this point, we have already seen news about massive droughts and forest fires in western countries. In our own country, we have been subject to constantly increasing temperatures and catastrophic super typhoons. It is bad, and it will only get worse.

## Climate Change: Effects

Climate Change is the human-caused or natural change in climate. A symptom of this is global warming, which is the rise of global temperatures due to the increase of greenhouse gases from carbon emissions.

This change in temperature has led to slow but dangerous changes in the planet, like polar ice caps melting causing sea levels to rise, affecting the pressure zones across oceans, and forming powerful storms.

As the effects worsen, food sources will be affected as higher temperatures cause problems with crops and water supply. Physical and mental health will become bigger problems due to heat waves and polluted air. Warmer climates will encourage the growth of contagious diseases while the changes in the environment will cause both direct and indirect emotional changes in people. The economic sector will have to adjust with a drop-in supplies and a less productive but more demanding market and workforce.

## The Reason Why

The primary source for most of the carbon dioxide emissions (CDE) in the atmosphere is the energy sector. Power plants all over the world consume fossil fuels and contribute to over half the greenhouse gases. About 21.3 gigatons of CDE each year is produced from the consumption of fossil fuels, and Earth is only able to absorb or breakdown about 10 gigatons of carbon dioxide, this means that more than half will stay in the atmosphere, and this level continues to rise with each passing year. The other major contributor to CDEs is the transportation sector. The remainder of greenhouse gases come from other production processes. On a per-country basis, China and United States produce the most greenhouse gases. Combined, their total CDE is almost equal to the rest of the world.

## What We Should Do

Lower our individual carbon footprints. Encourage and support industries that minimize waste and carbon emissions. Vote for lawmakers who will protect the environment. Devote time and energy into promoting environmentally responsible lifestyle changes. If everyone in the world observed a more environmentally responsible lifestyle, then companies that damage the environment will not thrive, laws that protect nature will be enforced, and practices that are geared towards a cleaner and greener future will become the standard.

Lesson:  
**12.3**



# Know Your Environmental Influence

## Lesson Goals

To teach students that to deal with the climate crisis, they need to understand the difference between the effectiveness of their online actions and their real-world actions.

## Topic

One of the most powerful and influential forces in today's hyper-connected world is the presence of the internet, and with it, social networking. Various social networking platforms provide a voice to individuals, groups, organizations, and more. It allows us to be heard by almost any person, at any place, at any time. The result of this industry is the emergence of new business and advertising trends, particularly one that focuses on using emerging trends to reach more audiences.

In the recent years, attention towards the existence, effects, and issues surrounding global warming has been increasing. On the surface, humanity wants to protect the environment, but a lot of it is nothing more than lip service. In terms of real action that makes a difference, few are actually willing. Unless we see some real change, the environment will continue to suffer.

## Expected Outcomes

At the end of the lesson, students will be able to:

- be aware that not everything they read online is real or accurate
- understand the value of social networking platforms in their lives
- be inspired to do things that actually matter for the environment

## The Internet is Malleable

Much of the current framework of the online world is based on the concept of "Internet 2.0", which basically means that content is provided by the users and not the site itself. Resource sites such as wikipedia, databases, and more, rely heavily on user input. Many websites employ content creators, non-specialized writers who will fill the site with content that are often not well-researched. Therefore, a lot of the information found online may or may not have been written by people who are truly credible.

However, online reputation is rarely built on credibility. Instead, it is based on how "viral" a person can be. Being viral is a measure of how contagious something is online – unlike the real world, word-of-mouth in the digital age is one of the fastest ways to get information around. Communities tend to form around influencers, forming echo chambers that breed misinformation and a near fanatic following based on online confirmation bias.

## The Power of Your Online Presence

Before the age of the internet, a single person's voice can only be heard by a limited number of people. Unless someone was a public figure, like a politician, social leader, or a media personality, there was no way for a single person to reach a large audience.

The internet has changed all that. The average Facebook user has around 155 friends. That means being able to share what you had for breakfast with over a hundred people instantly. When we create an online post on any social network, we are able to make our voice heard by a lot of people. That in itself is a powerful thing. As pop-culture has taught us: with great power comes with great responsibility.

Can social networking help save the environment? Yes, by sharing factual information, correcting misleading facts, discouraging others from spreading inaccurate data, and promoting positive and environmentally responsible actions, we can create a culture of educated active awareness.

**Discussion  
Points**

## Misinformation is Bad for the Environment

The influence of public support can move and change industry standards. However, if the public is not properly informed, then the influence they can exert will be misguided. One such example is the inability of industries to switch from petroleum to biofuel.

Jet fuel can be mixed with biofuel. In 2010, a super-sonic F-18 Super Hornet was flown using fuel that was a 50-50 mix of jetfuel and biofuel. In 2012, a Lufthansa 747 commercial airliner made history for being the first biofuel powered plane to make a transatlantic commercial flight. In 2014, it was an Airbus A330 that flew on biofuel power.

Despite all of that however, many online articles will often mention that biofuel is not a good substitute for petroleum, when in reality, there is just simply not enough support for it.

Often, it is due to public misconceptions that a lot of important information regarding the environment is disregarded. Sadly, there are also confirmed reports about misinformation being deliberately spread in order to prevent certain changes and innovations from coming forward.

The discussion on Climate Change is an even better example of this. Online, the term Climate Change only became an important buzzword in 2006, but many scientists all over the world have already been studying a theoretical framework related to this as early as 1938 (Guy Callendar's "Callendar Effect").

Admittedly, carbon emissions in the 1930's were so low that this was barely an issue worth thinking about. Two World Wars and a global industrialization later, carbon dioxide emissions (CDE) has gotten big enough to be a serious concern. By 1988, a NASA researcher was already presenting facts and predictions to the United State Senate. It took a decade of promotion and a self-made movie by former Vice President Al Gore to bring Climate Change to public attention. However, until now, the internet is still full of misleading facts about the topic.





## References

- Cambridge English Corpus [Online Dictionary](2019)  
Retrieved: 2019 from <https://dictionary.cambridge.org/>
- Kintanar, R. L. (1984). Climate of the Philippines. PAGASA.  
Retrieved: 2019 from  
<http://bagong.pagasa.dost.gov.ph/information/climate-philippines>
- Coronas, José (1920). The Climate and Weather of the Philippines, 1903 – 1918. Manila Observatory: Bureau of Philippines.
- Flores, J. F.; Balagot, V. F. Arakawa, Hidetoshi (ed.). (1969) World Survey of Climatology. Vol. 8: Climates of Northern and Eastern Asia. Elsevier.
- C. Blair Crawford, B. Quinn (2016) Microplastic Pollutants (1st ed.). Elsevier Science.
- C. Giacobelli (2018). SINGLE-USE PLASTICS: A Roadmap for Sustainability [website]. UN Environment Programme.  
Retrieved: 2019 from  
<https://www.unenvironment.org/resources/report/single-use-plastics-roadmap-sustainability>
- G. Seaman (2012) Plastics by the Numbers.  
Retrieved: 2019 from  
<https://learn.eartheasy.com/articles/plastics-by-the-numbers/>
- R. Pachauri (2014) Climate Change Synthesis Report [PDF]. THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE. Retrieved: 2019 from  
[https://epic.awi.de/id/eprint/37530/1/IPCC\\_AR5\\_SYR\\_Final.pdf](https://epic.awi.de/id/eprint/37530/1/IPCC_AR5_SYR_Final.pdf)
- Climate Change in the Philippines (n.d.) PAGASA. Retrieved: 2019 from  
<http://bagong.pagasa.dost.gov.ph/information/climate-change-in-the-philippines>
- Working Towards a "Zero Waste" Society (2018) Zero Waste Academy. Kamikatsu. Retrieved: 2019 from <http://zwa.jp/en/>
- Zero Waste Kamikatsu PDF (2018) Zero Waste Academy. Kamikatsu. Retrieved: 2019 from <http://zwa.jp/en/>
- P.R. Shukla, J. Skea, R. Slade, R. van Diemen, E. Haughey, J. Malley, M. Pathak, J. Portugal Pereira (eds.) (2019) Technical Summary, 2019. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. [PDF] Retrieved: 2019 from  
<https://www.ipcc.ch/srccl/>
- D. Eckstein, M. Hufils, M. Wings (2018) Global Climate Risk Index of 2019. [PDF] Germany  
Retrieved: 2019 from <https://en.climate-data.org/>
- F. Lasay (2018) Planting Calendar for the Philippines [Web Article] Bohol. Duck Duck Bro. Retrieved: 2019 from  
<https://duckduckbro.com/2018/07/planting-calendar-for-the-philippines/>
- Sargento, J.J.R., Brena, S.R., Malabanan, N.B., Bermudez, R.V., Baltazar, M.A.M., Castaneda, A.C. (2005) Rice Planting Calendar in the Philippines. Philippine Rice Research Inst. Nueva Ecija.
- C. Halls, S. Humphrey (ed), J. Loh (ed), S. Goldfinger (ed), (2008) Living Planet Report [PDF] WWF. Gland. Retrieved: 2019 from  
[https://assets.panda.org/downloads/living\\_planet\\_report\\_2008.pdf](https://assets.panda.org/downloads/living_planet_report_2008.pdf)
- J. Easterlyn (2016) "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." U.S. Energy Information Administration (EIA)
- Carbon Footprinting Software (2019)  
The Carbon Trust Retrieved: 2019 from  
<https://www.carbontrust.com/resources/tools/carbon-footprinting-software/>
- Sustainable Consumption and Production (2017) The Sustainable Diner. Quezon City. Retrieved: 2019 from  
<https://wwf.org.ph/what-we-do/food/thesustainablediner/>
- White Paper on the Conservation and Sustainable Use of South America's Biological Diversity. (1997) Government Gazette. Department of Environmental Affairs and Tourism.  
Retrieved: 2019 from  
[https://www.environment.gov.za/sites/default/files/legislations/biodiversity\\_whitepaper\\_18163\\_gen1095\\_0.pdf](https://www.environment.gov.za/sites/default/files/legislations/biodiversity_whitepaper_18163_gen1095_0.pdf)



List of Existing Power Plants (2019) Department of Energy. Retrieved: 2019 from <https://www.doe.gov.ph/list-existing-power-plants>.

Power Plant Profiles (n.d.) National Power Corporation. Retrieved: 2019 from <http://www.napocor.gov.ph/generations/MYWEB/Body/PowerPlantsProfiles.htm>

P. Przyborski, R. Levy (2011) The Carbon Cycle. EOS Project Science Office. Retrieved: 2019 from <https://earthobservatory.nasa.gov/features/CarbonCycle/page5.php>

"Full Fuel Cycle Assessment: Well-To-Wheels Energy Inputs, Emissions, and Water Impacts". (2007) California Energy Commission. Retrieved: 2019 from [http://s3.amazonaws.com/zanran\\_storage/www.energy.ca.gov/ContentPages/3032520.pdf](http://s3.amazonaws.com/zanran_storage/www.energy.ca.gov/ContentPages/3032520.pdf)

B. Rich, J. Gines, E. Carraher, J. Galarze (eds.) Future-Proof Building Materials: A Life Cycle Analysis. Intersections and Adjacencies. Proceedings of the 2015 Building Educators' Society Conference. Salt Lake City, University of Utah.

E. Thomson (2003) The Chinese Coal Industry: An Economic History. London

C. Lira (2001) Brief History of the Steam Engine. Retrieved: 2019 from <https://www.egr.msu.edu/~lira/supp/steam/>

A Brief History of Hydropower (n.d.) International Hydropower Association. London. Retrieved: 2019 from <https://www.hydropower.org/a-brief-history-of-hydropower>

C. Sulzberger (2011) Thomas Edison's 1882 Pearl Street Generating Station [PDF]. Engineering and Technology Wiki. Retrieved: 2019 from [https://ethw.org/w/images/a/ae/Edison\\_and\\_Pearl\\_Street%2C\\_Text%2C\\_031410.pdf](https://ethw.org/w/images/a/ae/Edison_and_Pearl_Street%2C_Text%2C_031410.pdf)

B. Zauderer (2004) Final Technical Report: Development & Testing of Industrial Scale Coal Fired Combustion System, Phase 3 [PDF]. Pittsburgh Energy Technology Center. Retrieved: 2019 from <https://www.osti.gov/servlets/purl/923036>

800,000 Years of Carbon Dioxide (2019) Climate Central. Retrieved: 2019 from <https://www.climatecentral.org/gallery/graphics/800000-years-of-carbon-dioxide>

K. Inoue (2008) Mak-Ban Geothermal Power Plant Complex Rehabilitation Project. OPMAC Corporation Retrieved: 2019 from [https://www2.jica.go.jp/en/evaluation/pdf/2008\\_PH-P140\\_4.pdf](https://www2.jica.go.jp/en/evaluation/pdf/2008_PH-P140_4.pdf)

Z. Cruz-Ducut (2013) Application for Approval of the Energy Supply Contract Between Quezon Electric Cooperative Incorporated and San Miguel Energy Corporation, with Prayer for Provisional Authority. ERC Case No. 2012-125 RC. Energy Regulatory Commission. Retrieved: 2019 from <http://liaerc.node1347.speedyrails.net/documents/412>

Meinshausen, M., Meinshausen, N., Hare, W. et al. (2009) Greenhouse-gas emission targets for limiting global warming to 2 °C. Nature 458, 1158–1162. doi:10.1038/nature08017

S. Blackman, (2011) Uranium: A Finite Resource? Mining Technology. Retrieved: 2019 from <https://www.mining-technology.com/features/feature110624/>

Natural Health Products (2019) Department of Trade and Industry. Retrieved: 2019 from <http://industry.gov.ph/industry/natural-health-products/>

PHILIPPINE DEVELOPMENT PLAN 2011-2016 (2011) National Economic and Development Authority. Retrieved: 2019 from <http://www.neda.gov.ph/wp-content/uploads/2013/09/CHAPT-ER-10.pdf>

Extinct Species, Explained (2019) National Geographic Retrieved: 2019 from <https://www.nationalgeographic.com/animals/reference/extinct-species/>

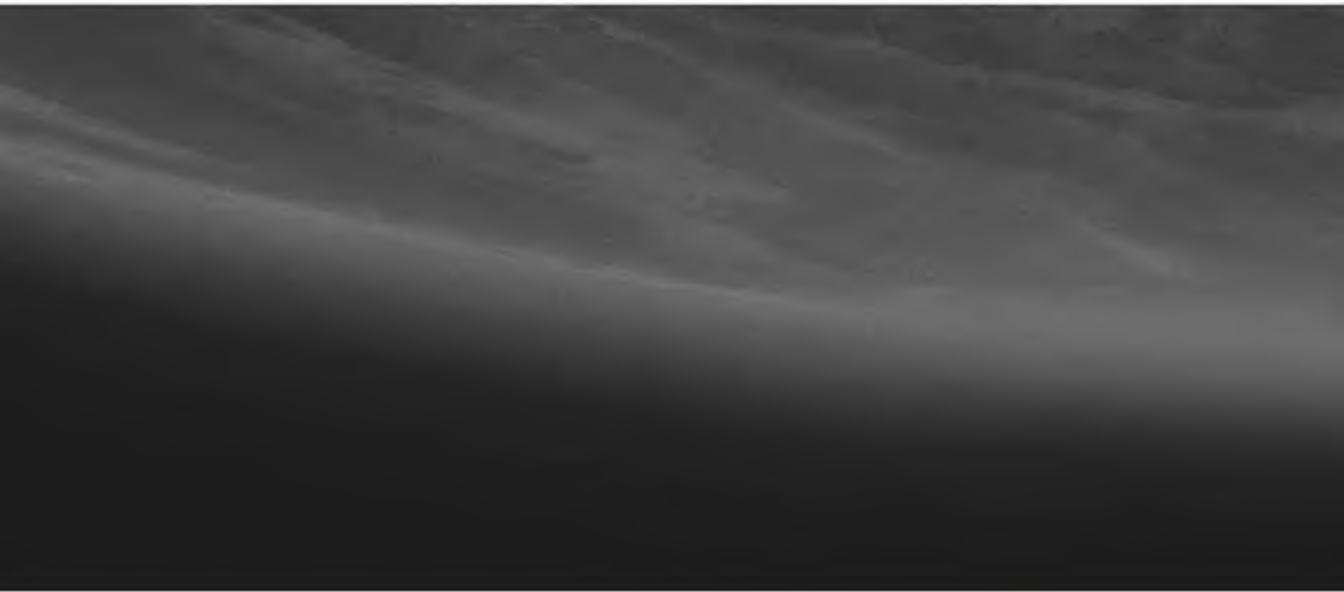
C. Dell'amore (2014) Species Extinction Happening 1,000 Times Faster Because of Humans? National Geographic. Retrieved: 2019 from <https://www.nationalgeographic.com/news/2014/5/140529-conservation-science-animals-species-endangered-extinction/>

K. Alave (n.d.) Metro Manila Produces a Fourth of Philippine Garbage. Philippine Daily Inquirer. Retrieved: 2019 from <https://newsinfo.inquirer.net/42317/metro-manila-produces-a-fourth-of-philippine-garbage>

Land and Biodiversity at a Time of Climate Change (2008) Environmental Defenders Office, Victoria. Retrieved: 2019 from <https://trove.nla.gov.au/work/27643674>







Supported by:



Federal Ministry  
for the Environment, Nature Conservation  
and Nuclear Safety

based on a decision of the German Bundestag

*'This project is part of the International Climate Initiative (IKI).  
The Federal Ministry for the Environment, Nature Conservation  
and Nuclear Safety (BMU) supports this initiative on the  
basis of a decision adopted by the German Bundestag.'*



**One planet**  
handle with care