11

SENIOR HIGH SCHOOL

DEPARTMENT OF EDUCATION
SCHOOLS DIVISION OF NEGROS ORIENTAL
REGION VII
Kagawasan Ave., Daro, Dumaguete City, Negros Oriental

Trends, Networks, and Critical Thinking in the 21st Century

Quarter 3- Module 6a:

PLANETARY NETWORKS:

The Effects of Consumption and Production Patterns to Climate Change

ALTERNATIVE DELIVERY MODE
ADM

Trends, Networks, and Critical Thinking in the 21st Century– Grade 11
Alternative Delivery Mode
Quarter 3 – Module 6a: PLANETARY NETWORKS: The Effects of Consumption and Production Patterns to Climate Change
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INTRODUCTORY MESSAGE

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

Why is there a need to study Trends, Networks, and Critical Thinking in the 21st Century? Perhaps, you, along with other Senior High School learners, ask this question upon learning the K to 12 SHS Curriculum.

The course provides opportunities for students to discover patterns and extract meanings from emerging trends. It aids in developing their critical and creative thinking skills—essential tools for decision making and understanding "ethics of care". Global trends in the 21st century is examined and are either accepted or rejected on a sound set of criteria.

Students will be asked to create and analyze scenarios that will challenge them to (1) formulate their stances on issues or concerns; (2) propose interventions and (3) formulate alternative futures. The students will realize the interconnections between their neural connections and social realities.

What I Know

Directions: True or False: Write ***True*** if the statement is correct. Otherwise, write ***False***. Write your answers in your activity notebook.

___1. Production patterns refer to how people generate and manufacture the products they need to use, sell, or consume.

___2. Other causes of climate change can be traced from the production patterns and the consumption patterns of humans.

___3. Consumption patterns involve the use of economic or consumer goods and resources.

___4. Another major cause of climate change which can be associated with production and consumption is the carbon footprint.

___5. The carbon footprint of a person, an organization, or a nation can be measured through GHG assessment or calculation known as carbon accounting.

___6. Carbon offsetting is the reduction of carbon footprint by using other options such as fossil fuel.

___7. A person can help shrink the size of carbon footprint through common method such as the 4Rs.

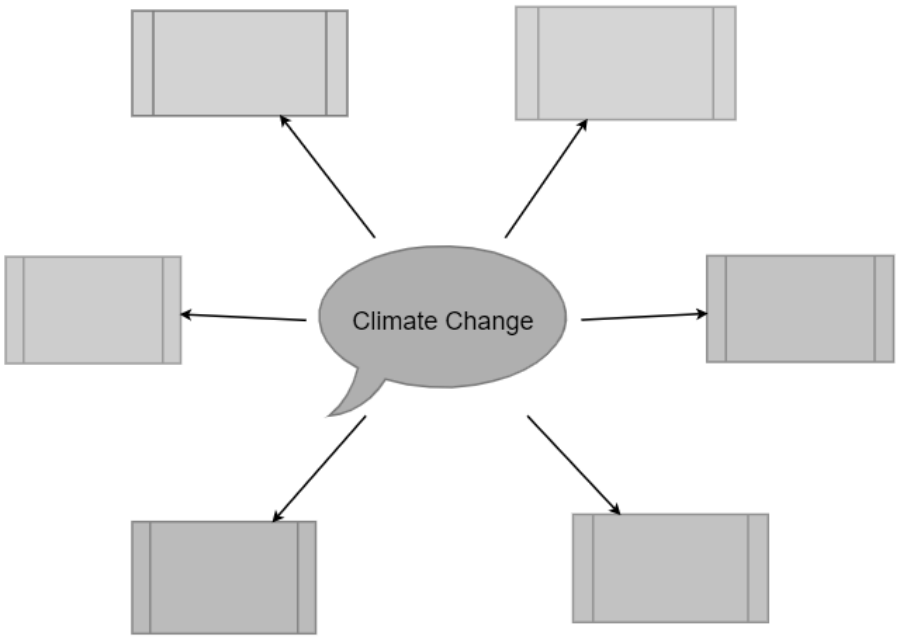
___8. The Kyoto Protocol operationalizes the United Nations Framework Convention on Climate Change by committing industrialized countries and economies in transition to limit and reduce greenhouse gases (GHG) emissions in accordance with agreed individual targets.

What's In

Directions. Read and understand the questions carefully. Write the answer in your notebook.

Task 1

1. Using a Concept Map, what is climate change?



Illustrated by Paul O. Pascobello

2. In your home or community, how do you care for the environment?

_____

_____

_____

What's New

Directions: Read and understand the statements below. Copy the table and write the answers in your notebook.

Task 2 - Green Lifestyle Checklist:

Here are some statements that may help you and your family identify your actions in relation to the environment. For each statement, put a check under the column which best describes the frequency of the action stated.

Questions	Never	Rarely	Sometimes	Often	Always
My family uses paper bags when shopping.					
I use a filter and reuse bottles for water instead of buying bottled water.					
My family uses energy efficient light bulbs.					
I use public transport to get to school.					
I regularly throw food away because it is expired.					
We reuse and recycle things like paper, newspapers, cartons, tin cans, etc.					
We use products that are packaged in Styrofoam or plastic.					

Task 3 - Self-Inventory Consumption:

What is your daily consumption based on the given scheme below? Put a check mark on the column which best describes the frequency of the action stated.

Commodities	Never	Rarely	Sometimes	Often	Always
Perfume					
Toothpaste					
Shampoo					
Hairspray					
Detergent/ fabric conditioner					
Gadgets					
Appliances					
Use of Styrofoam/ plastic					
Transportation					

Processing questions:

1. Based on your answer in the checklist, how can you describe yourself as a consumer?
   _____
   _____

_____
_____
_____
_____
_____
_____

2. How does your patterns of consumption affect the environment?
_____
_____
_____
_____

What is It

Consumption and Production Patterns Affecting Climate Change

According to the new study, greenhouse gases began warming the world's oceans in the early 1800s, decades earlier than previously thought. Aside from the burning of fossil fuels, other causes of climate change can be traced from the production patterns and the consumption patterns of humans.

Production patterns refer to how people generate and manufacture the products they need to use, sell, or consume. Paper comes from a tree pulp or grass fiber; rubber shoes come from the sap of the rubber tree; machineries are produced from mine minerals; bread is made from wheat, cassava, or rice flour; and textile is woven from plants such as cotton, abaca, and ramie and from animals such as silk, wool, and cashmere.

Food system activities, including producing food, transporting it, and storing wasted food in landfills, produce greenhouse gas (GHG) emissions that contribute to climate change. Of these sources, livestock production is the largest, accounting for an estimated 14.5 percent of global GHG emissions from human activities. Meat from ruminant animals, such as cattle and goats, are particularly emissions intensive.

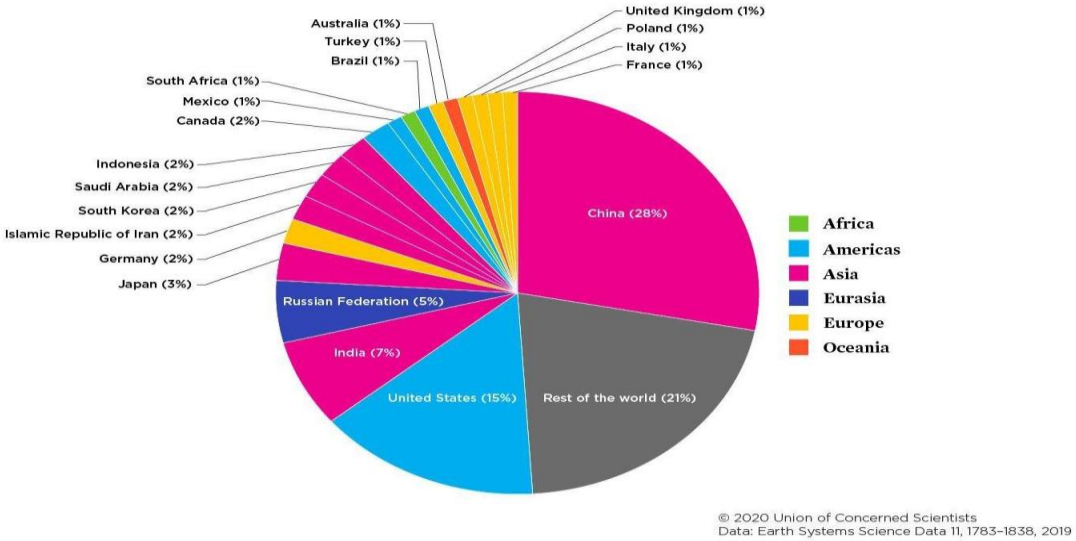
How long does it take to melt iron bars and how much is required to turn it into a car engine? How many trees should be felled to become timber used in construction? Almost everything comes from natural resources which are depleted every time they are used. Thus, there is a need to regulate the extraction and to replenish what was used. Are the goods produced with minimal use of energy? What kind of energy was used for production? How many barrels of petroleum per day are utilized to manufacture one car? Have you resorted to alternative sources of energy and related facilities like wind turbines?

If the production pattern is characterized by heavy dependence on coal, the problem of climate change will be even more aggravating. For instance, China has large coal mines and relies on them for its energy requirements. This makes China one of the most polluted countries on Earth due to its high carbon dioxide emissions. China is currently the most polluting country in the world, with a 28 percent share of global CO2 emissions in 2018. Dependence on petroleum in the manufacture and production of goods makes U.S. produce 15 percent greenhouse gas emissions in 2018, while India produce 7 percent and Russian Federation produce 5 percent of carbon emissions.

(philstar 2019)

The Malampaya Gas Field located offshore northwest of the island of Palawan, Philippines, which delivers 20% of the country's electricity requirements.

Undeniably, these countries contribute much to the depletion of the ozone layer and, consequently, the worsening of global warming and climate change.



(Data 2008)

Each Country's Share of CO2 Emissions

Consumption patterns involve the use of economic or consumer goods and resources. Consumption patterns can be categorized as individual, family, company, and government consumption. These categories have similarities in the items consumed such as food, clothing, footwear, education, house and furnishings, lighting, fuel, transportation, communication, recreation, entertainment, health care and medicine, tobacco and narcotics, as well as insurance.

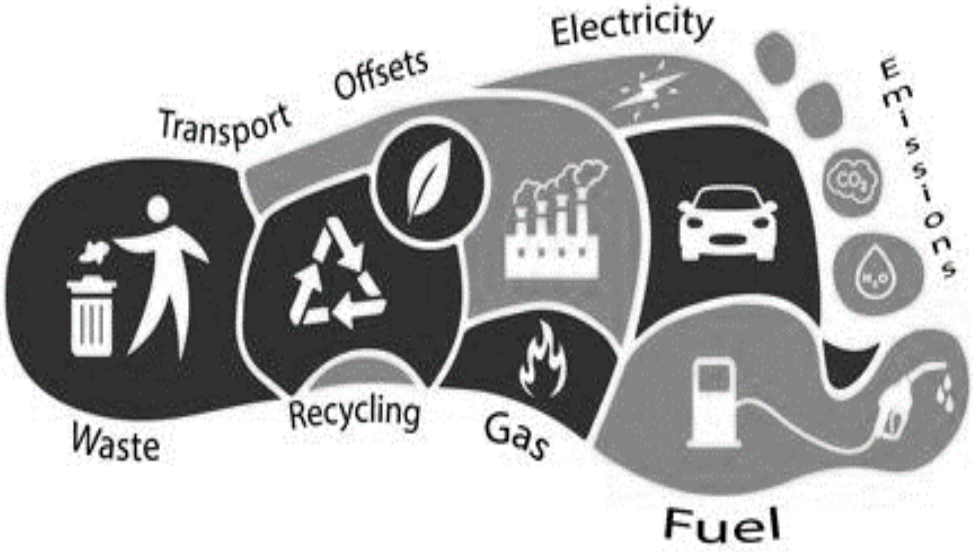
Consumption patterns are considered as the key driver for the use of resources. Ecosystems and landscapes are influenced by consumption patterns. Ecosystem resiliency, the ability of the ecosystem to regenerate, sustain, and adjust what is lost, destroyed, or added into the environment, are affected by the way the lad is utilized. Overexploitation and depletion of land resources can diminish the resiliency of the ecosystem.

The quality of the landscape or the natural scenery of the land reflects how the demand for resources is being addressed. Is forest depletion due to the excessive felling of trees? Are the mountains leveled for quarrying or for giving way to subdivisions? Are the rivers poisoned and wildlife displaced due to gold extraction?

Spatial planning (the methods or approaches used in the distribution of, among, others, people, and activities in spaces of various scales) are the central to the management of landscape and ecosystem resiliency. Zoning or dividing the town or city into sections for various purposes (such as commercial, residential, educational, government, recreational, and botanical and zoological) is salient to spatial planning. This can be initiated by the government in cooperation with private firms. Thus, spatial planning plays a significant role in enhancing climate change adaptation, especially within urban areas by improving their resilience.

A consumerist attitude contributes to the depletion and exhaustion of natural resources, which thus creates a chain—the more consumption, the more demand; the more demand, the more production; the more production, the more extraction of natural resources; The more extraction of natural resources without replenishment, the faster the degradation and exhaustion of the resources. Running parallel is a chain of consumption—the more consumption, the more demand; the more consumer demand, the more production; the more production, the more use of coal or petroleum being the most abundant and cheapest; the more use of coal or petroleum, the more GHG emission; the more GHG emission, the worse the global warming will be.

Another major cause of climate change which can be associated with production and consumption patterns is *carbon footprint*, “a measure of the total amount of carbon dioxide and methane emissions of a defined population, system, or activity within the spatial and temporary boundary of the population, system or activity of interest” (Wright, Kemp, and Williams, 2011). Greenhouse gases are usually expressed in terms of the amount of carbon dioxide discharged. The concept of carbon footprint originated from the ecological footprint discussions in the 1900s. It is one of the three footprint indicators, the two others being land footprint and water footprint.



(Green 2019)

One’s carbon footprint is summarized in this graphic

Most carbon footprint for the average households come from indirect sources such as purchasing a product that has gone through several processes from extraction of raw materials, to its manufacture, transportation, and shortage in stores. All these processes have contributed to GHG emissions. The farther a product has gone through before reaching the final consumer, the larger carbon footprint it will emit.

Emissions from burning fuel in a stove or a car are referred to as direct sources of carbon footprint. The main factors that affect and aggravate carbon footprint include economic output, energy, population, and the economy's carbon concentration. These same factors constitute the main targets for reducing the footprint.

What are the 10 Causes of Global Warming?

1. Power Plants

Forty percent of U.S. carbon dioxide emissions stem from electricity production. Ninety-three percent of the electric industry emissions result from burning coal. According to the EPA coal-fired power plants, municipal and medical waste incineration account for two-thirds of U.S. mercury emissions.

2. Transportation

Environmental Protection Agency (EPA) reports state that thirty-three percent of U.S. emissions come from the transportation of people and goods.

3. Farming

Industrial farming and ranching releases huge levels of methane and carbon dioxide into the atmosphere. Farming contributes forty percent of the methane and twenty percent of the carbon dioxide to worldwide emissions.

4. Deforestation

Deforestation to use wood for building materials, paper and fuel increases global warming in two ways—the release of carbon dioxide during the deforestation process and the reduction in the amount of carbon dioxide that forests can capture.

5. Fertilizers

The use of nitrogen-rich fertilizers increases the amount of heat cropland can store. Nitrogen oxides can trap up to 300 times more heat than carbon dioxide. Sixty-two percent of nitrous oxide released comes from agricultural byproducts.

6. Oil Drilling

Burn-off from the oil drilling industry impacts the carbon dioxide released into the atmosphere. Fossil fuel retrieval, processing, and distribution account for roughly 8% of carbon dioxide and 30% of methane pollution.

7. Natural Gas Drilling

Touted as a cleaner fuel source, natural gas drilling causes massive air pollution in states like Wyoming; the hydraulic fracturing technique used to extract natural gas from shale deposits pollutes ground water sources as well.

8. Permafrost

The melting of permafrost releases tons of trapped greenhouse gases, which further speeds up the melting of more permafrost. Scientists calculate that approximately five

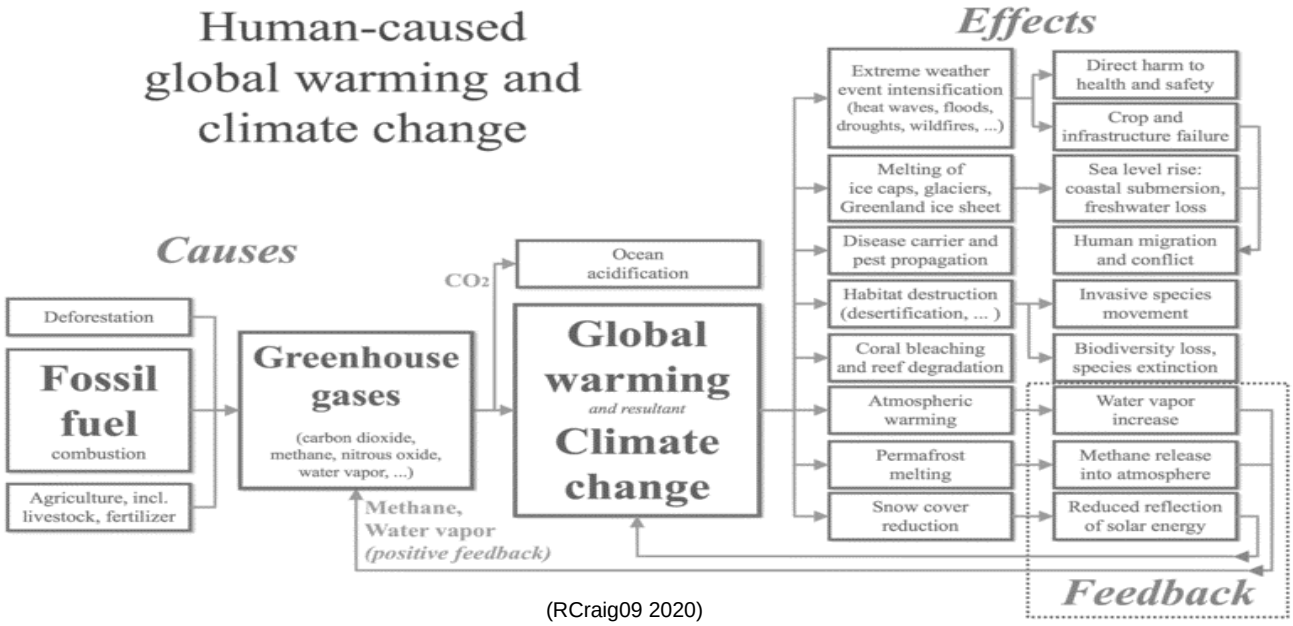
hundred gigatons of carbon is trapped in the Siberian permafrost alone. A single gigaton equals one billion tons.

9. Garbage

As trash breaks down in landfills, it releases methane and nitrous oxide gases. Approximately eighteen percent of methane gas in the atmosphere comes from waste disposal and treatment.

10. Volcanic Eruption

Volcanoes expel large quantities of carbon dioxide when they erupt. Volcanoes have an overall small effect on global warming and an eruption causes a short-term global cooling as ash in the air reflects greater amounts of solar energy.



(RCraig09 2020)

The diagram indicating primary causes and wide-ranging effects, including feedback, of global warming and climate change.

What is the Difference Between Human & Natural Air Pollution?

The major difference between *natural* and *man-made air pollution* is that continuous or temporary natural events cause natural air pollution, but human activities are responsible for man-made pollution. We cannot prevent natural air pollution from sources like volcanoes, but we can reduce man-made pollutants and their consequences: respiratory diseases, acid rain and global warming.

In the Air

Air pollutants are gases and particles that harm people or other life, damage materials or reduce visibility. Some air pollution comes from volcanic eruptions, forest fires and hot springs, but most is the result of human activities. Power plants, factories, cars, and trucks emit carbon dioxide, carbon monoxide, hydrocarbons, sulfur dioxide, nitrogen dioxide and particulate matter that consist of fine particles suspended in the air. Burning oil, coal, gasoline, and other fossil fuels are major causes of man-made air pollution. Other man-made sources of air pollution include:

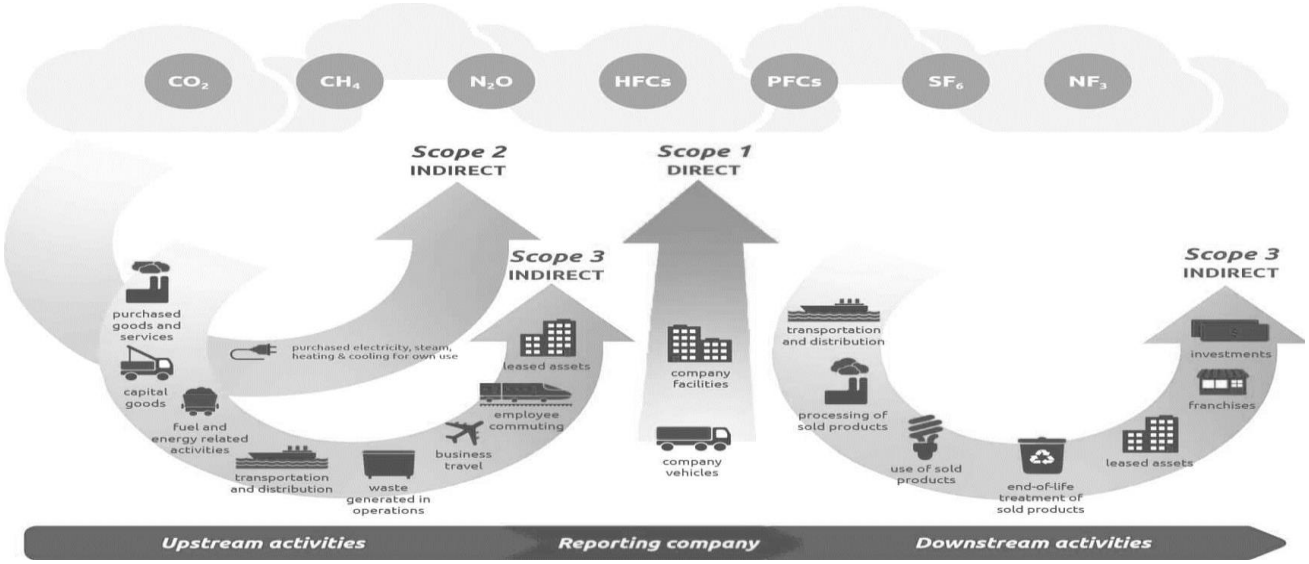
- waste disposal
- dry cleaning
- paints
- chemical manufacture
- wood stoves
- flour mills

Natural Sources of Air Pollution

Natural air pollutants include *radon, fog and mist, ozone, ash, soot, salt spray,* and *volcanic and combustion gases*. Radon is a radioactive gas that seeps from the ground in some areas, and fog and mist are both dense water vapor at ground level that obscures vision. Ozone, a chemical formed naturally by the action of sunlight on oxygen, is a pollutant at ground level but beneficial in the upper atmosphere. A molecule made of three oxygen atoms, *ozone* shields the Earth from harmful ultraviolet rays from the sun, but it damages plants and causes breathing problems in the lower atmosphere. Volcanic eruptions and grass fires launch soot and ash into the atmosphere, which reduces sunlight and lowers temperatures. Eruptions and fires also produce carbon dioxide, carbon monoxide and other polluting gases.

Air Pollution Effects

Natural and man-made air pollution harm humans, other life, and the environment. Particulate matter from burning wood and fossil fuels lodges in the lungs, causing respiratory problems, and settles in a fine film over buildings, trees, and crops. Carbon monoxide interferes with the blood's ability to transport oxygen and causes headaches, heart damage and death. Sulfur dioxide, which is a product of burning coal, irritates eyes, damages lungs, and makes rain acidic. Acid rain damages buildings and forests and kills aquatic life. Another contributor to acid rain is nitrogen dioxide emitted by vehicles, industrial boilers, and other industrial processes. Lead from leaded gasoline, power plants and metal refineries contaminate crops and livestock and causes brain and kidney damage.



(Tae-min 2021)

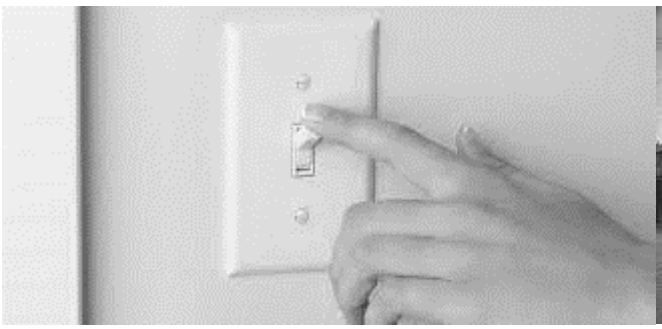
Various activities add up the overall carbon footprint.

The carbon footprint of a person, an organization, or a nation can be measured through GHG assessment or calculation known as *carbon accounting*. Many carbon calculators can be found online. A carbon calculator calculates your carbon footprint after you supply information about your home size, diet, shopping and recreational activities, transportation choices, heavy appliances, electricity usage, and many more.

It is useful to know the size of the carbon footprint of a population and an area so strategies can be designed to trim down its size. Process enhancement, product management, technology development, and carbon offsetting are some applicable strategies.

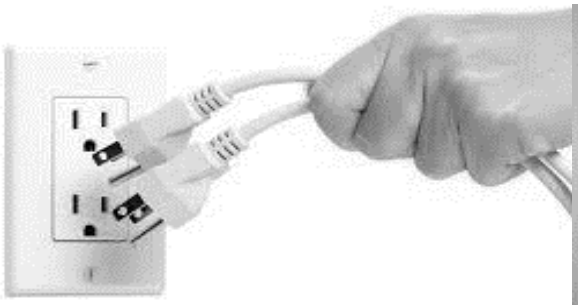
Carbon offsetting is the reduction of carbon footprint by using other options such as wind or solar energy. It is said that the best way to diminish carbon footprint is to either cut down the amount of energy consumed in production or minimize the dependence on carbon-emitting fuels such as coal and petroleum. Among the energy-generating technologies, hydroelectric, wind, and nuclear power produce the least carbon dioxide emission per kilowatt hour.

Individually, you can help shrink the size of carbon footprint. The most commonly used method is the 4Rs—refuse, reduce, reuse, and recycle. This method is promoted by organizations advocating the preservation and protection of the environment. We can opt to use eco-friendly metal straws or long-lasting plastic bags while we can choose to use our own travel mugs which coffee shops are now happy to refill. And of course, say no to plastic bottles. For people with cars, one option is to drive less; another is to walk or bike to nearby destinations. At home, your household can limit the use of heating or cooking appliances, as well as air-conditioning units. Installing wall or ceiling insulation and turning off lights and electric fans not in use significantly help reduce the size of your carbon footprint.



(yourteenmag 2018)

(rei n.d.)



(Hero Kitchen n.d.)

(Parren 2021)

Carbon offsetting can be done in many ways, including the following: (1) switching off the lights, (2) using bikes, (3) unplugging appliances, and (4) using reusable water bottles.

The choice of diet likewise affects your carbon footprint. Rice, red meat, heavily processed foods, and highly perishable products not immediately consumed or transported to a far, distant outlet create a bigger carbon footprint.

A carbon handprint movement has been formed to show the importance of individual carbon offsetting. The movement calls for the reduction of one's carbon footprint and increase his or her "handprint," which is the positive environmental and social impacts one has given to the planet.

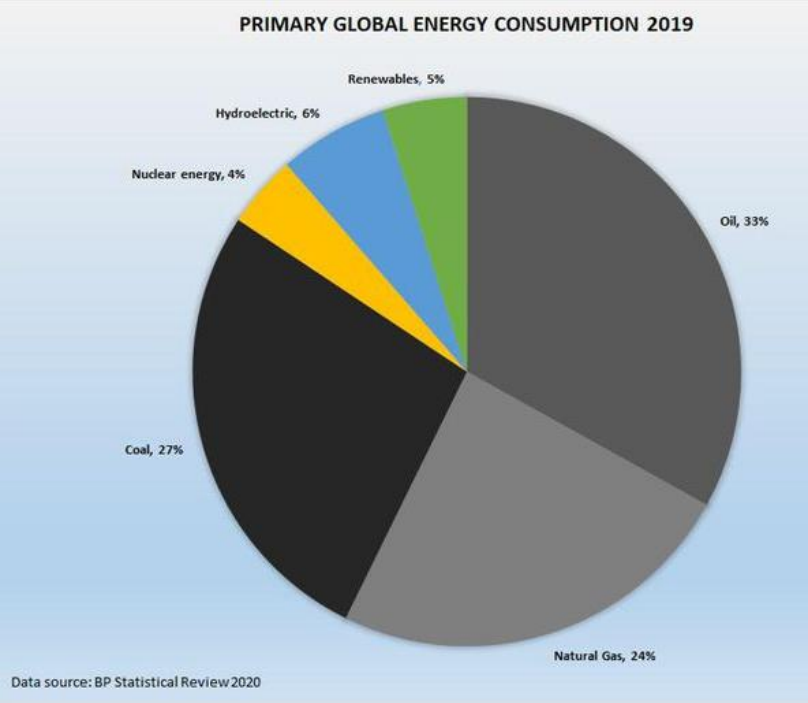
Some forms of carbon offsetting that individuals can do are planting trees in deforested areas, eating fresh fruits and vegetables instead of canned ones, using public transportation instead of driving a private car, buying fresh meat instead of processed meat, and making use of reusable items such as a water container of disposable ones.

At the government level, at least three schemes have been initiated to reduce carbon emissions; (1) the Kyoto Protocol, which was enforced in 2005; (2) the emission certificates: (3) carbon offsetting.

The Kyoto Protocol is an international agreement that aimed to manage and reduce carbon dioxide emissions and greenhouse gases. The Protocol was adopted at a conference in Kyoto, Japan, in 1997 and became international law on February 16, 2005. The Protocol operationalized the United Nations Framework Convention on Climate Change (UNFCCC). 192 nations committed to reducing their emissions by an average of 5.2% by 2012, which would represent about 29% of the world's total emissions.

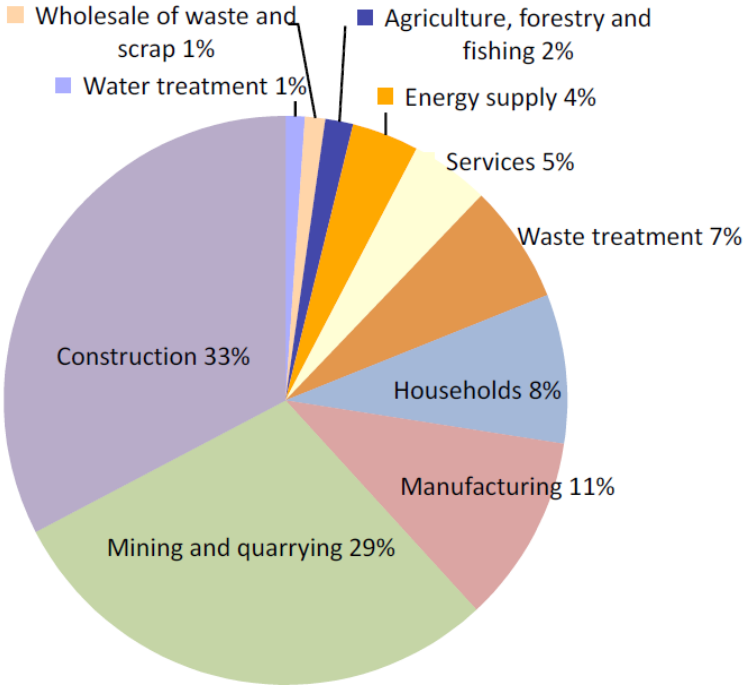
What's More

INSTRUCTIONS: Analyze the graphical forms showing the patterns of consumption and its effect to the environment and answer the questions below. Write the answers in your notebook.



(Rapier 2020)

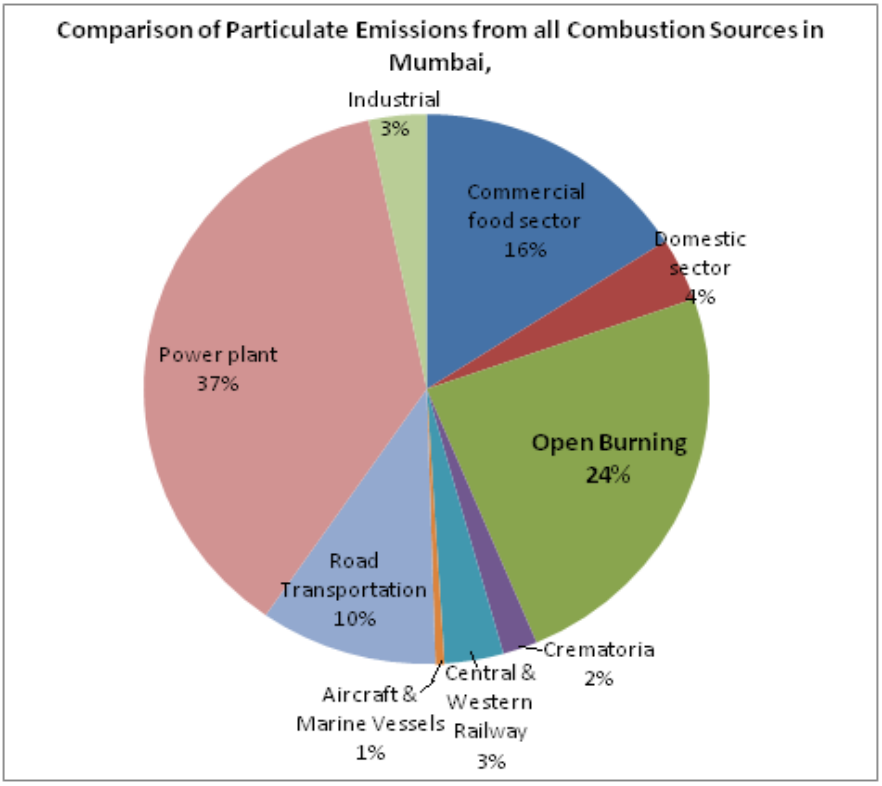
Figure 2 – Waste generation in EU-28 by sector (2012)



Data source: Eurostat (env_wasgen), 2016.

(Admin 2016)

(Conservancy n.d.)



(Ranjith 2012)

Processing Questions:

1. What is the main content of the graphs?

_____
_____
_____
_____

2. What activities, goods and services cause the largest impact when it comes to the destruction of the environment?

_____
_____
_____
_____

What I Have Learned

DIRECTIONS: Make a journal to manifest your understanding about the topic. You can have it in your activity notebook.

I have learned that _____.

I have realized that _____.

I will apply _____.

What I Can Do

DIRECTIONS: Read and understand the questions below. Write the answers in your notebook.

1. As a responsible student/citizen, how can you be of help in solving the problem of climate change?

_____
_____
_____

2. If we cannot do away with using materials that are harmful to the environment, what can we do as ordinary individuals to help lessen these negative effects?

_____
_____
_____

Assessment

Directions: Read and understand the statements or questions carefully and choose the letter of the most appropriate answer. Write the answer in your notebook.

1. It involves the use of economic or consumer goods and resources.
   A. Spatial planning C. Carbon offsetting
   B. Consumption patterns D. Production patterns

2. The total amount of carbon dioxide and methane emissions of a defined population, system or activity within the spatial and temporary boundary of the population, system or activity of interest.
   A. Spatial planning C. Carbon footprint
   B. Consumption patterns D. Carbon offsetting

3. As an individual, how can you help shrink the size of carbon footprint?
   A. 4Rs C. using reusable water bottles
   B. using bikes D. All of the above

4. The reduction of carbon footprint by using other options such as wind or solar energy.
   A. Spatial planning C. Carbon offsetting
   B. Consumption patterns D. Production patterns

5. The carbon footprint of a person, an organization, or a nation can be measured through GHG assessment is known as _____.
   A. Spatial planning C. Kyoto Protocol
   B. Consumption patterns D. Carbon accounting

6. It is an international agreement that aimed to manage and reduce carbon dioxide emissions and greenhouse gases.
   A. Kyoto Protocol C. UNFCCC
   B. Climate Change Agreement D. Carbon accounting

7. The following are the schemes that have been initiated to reduce carbon emissions EXCEPT
   A. Spatial planning C. Carbon offsetting
   B. The Kyoto Protocol D. Emission certificates

8. Which of the following is NOT a man-made pollutant?
   A. Volcanic eruption C. Natural gas drilling
   B. Deforestation D. Power plants

9. Which of the following is a natural source of air pollution?
   A. salt spray C. fog and mist
   B. radon D. All of the above

10. What is the difference between human and natural air pollution?
    A. Natural air pollution are those that result from naturally occurring phenomena such as volcanic ash, while man-made pollution is a result of human reliance on fossil fuels.
    B. Natural air pollution is caused by power plants, while man-made pollution is caused by garbage, deforestation, etc.
    C. Natural air pollution is caused by waste disposal, flour mills, paints, etc., while man-made pollution is caused by factories and cars.
    D. Natural air pollution is caused by the accumulation of waste and modern agriculture, while man-made pollution is caused by sulfur dioxide released from biological decay and forest fires.

Answer Key

WHAT I KNOW

1. True
2. True
3. True
4. True
5. True
6. False
7. True
8. True

WHAT'S IN

1. Using a Concept Map, what is climate change? *(Answer may vary)*
- rising sea levels, more heat-related illnesses, more animal extinction, rising temperature, more and worst storms, crop and infrastructure failure, biodiversity loss

2. In your home or community, how do you care for the environment?
(Answer may vary) use reusable bags, recycle, save electricity, start a garden or plant a few trees, use bike instead of private vehicle

ASSESSMENT

1. B
2. C
3. D
4. C
5. D
6. A
7. A
8. A
9. D
10. A

WHAT I CAN DO

1. As a responsible student/citizen, how can you be of help in solving the problem of climate change? (*Answer may vary)*

2. If we cannot do away with using materials that are harmful to the environment, what can we do as ordinary individuals to help lessen these negative effects?
(Answer may vary)

WHAT'S NEW

1. Task 2 - Green Lifestyle Checklist *(Answer may vary)*
2. Task 3 - Self-Inventory Consumption *(Answer may vary)*

Processing questions:

Based on your answer in the checklist, how can you describe yourself as a consumer? *(Answer may vary)*

How does your patterns of consumption affect the environment? *(Answer may vary)*

WHAT'S MORE

Processing Questions:

1. How will you interpret the graphs? *(Answer may vary)*
2. What activities, goods and services cause the largest impacts in the destruction of the environment? *(Answer may vary)*

References

BOOK:

Elizabeth T. Urgel (2017). Trends, Networks, and Critical Thinking in the 21st Century Culture. Published by DIWA Learning Systems Inc. pp.96-102. ISBN 978-971-46-1095-8.

TEACHERS GUIDE:

Most Essential Learning Competencies

WEBSITES:

https://www.carbonbrief.org/scientists-clarify-starting-point-for-human-caused-climate-change
http://www.foodsystemprimer.org/food-production/food-and-climate-change/
https://www.statista.com/statistics/183943/us-carbon-dioxide-emissions-from-1999/
https://www.ucsusa.org/resources/each-countrys-share-co2-emissions
https://sciencing.com/the-top-10-causes-of-global-warming-12512484.html
https://www.ecomatcher.com/the-basics-of-a-carbon-footprint/
https://www.sundried.com/blogs/news/benefits-of-using-a-reusable-water-bottle
https://save.lovetoknow.com/ways-save-money/does-unplugging-electronics-save-energy
https://www.rei.com/learn/expert-advice/bike-errands.html
https://yourteenmag.com/family-life/communication/turn-off-the-lights
https://earth.org/the-kyoto-protocol/
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