PROGRAMA DE APOYO DIDÁCTICO

FEBRERO-JULIO 2019

BACHILLERATO TECNOLÓGICO

ECOLOGY

Secretaría de Educación
Nuevo León
GOBIERNO DEL ESTADO

Nuevo León

NUESTROS VALORES

- ✓ RESPONSABILIDAD
- ✓ RESPETO
- ✓ COLABORACIÓN
- ✓ COMPROMISO
- ✓ LIDERAZGO
- ✓ SUSTENTABILIDAD
- ✓ HONRADEZ

Colegio de Estudios Científicos y Tecnológicos
CECyTE Nuevo León
1993-2018
25 ANIVERSARIO

ECOLOGY

Student´s name : _____

Enrollment: _____ ***Semester:*** ___ ***Group:*** _____

Institution´s name: _____

Teacher´s name : _____

DIRECTORY

C.P. José Cárdenas Cavazos
General Director

M.A.E. Ángel A. Alameda Pedraza
Responsible of the Academic Office

C.P. Elsa Amparo Martínez Rojas
Responsible of the Administrative Office

Mtro. Domingo Castillo Moncada
Responsible of the Link-up department

Planning and Evaluation Direction

Semestre: Febrero – Julio 2019

Colegio de Estudios Científicos y Tecnológicos del Estado de Nuevo León, Andes Nº 2722, Colonia Jardín Obispado, CP 64050, Monterrey, N.L., México. Teléfono 0181-81517600.

Collaborating Teachers
Alicia Nava Medina, Rosa Elvira López Fernández, Ludivina Flores García, María Elena Cavazos Rodríguez, Isaac E. Mireles Arguello, Ma. De Jesús Vázquez Serna, Mario Dena Silva, Andrea M. Cedillo González, Sergio Rodríguez Tijerina, Alejandro Vega Márquez, Norma Leticia Quiroga Alvarado

Collaborating Teachers in the Edition 2017:
Rosa Elvira López Fernández, Alejandro Vega Márquez y Alicia Nava Medina.

Collaborating Teachers in the Edition 2018:
Gerardo Rodríguez Urbina, María de Jesús Vázquez Serna y Sofía Rebeca Hernández Alvarado.

Third edition
Monterrey, N.L., México
October 2018

BASIC DISCIPLINARY COMPETENCES OF THE EXPERIMENTAL SCIENCES FIELD

The basic disciplinary competences of experimental sciences are aimed at students knowing and applying the methods and procedures of these sciences for solving everyday problems and for rational understanding of their environment.

They have a practical approach refer to structures of thought and processes applicable to different contexts, which will be useful for students throughout life, without for that reason being subject to the methodological rigor imposed by the disciplines that comprise them. Its development favors responsible and founded actions by students towards the environment and towards themselves.

Competences:

1. Establish the interrelation between science, technology, society and the environment in specific historical and social contexts.

2. Base opinions on the impacts of science and technology in their daily lives, assuming ethical considerations.

3. Identify problems, formulate questions of a scientific nature and propose the necessary hypotheses to answer them.

4 Get, record and systematize the information to answer scientific questions, consulting relevant sources and performing relevant experiments.

5. Contrast the results obtained in a research or experiment with previous hypotheses and communicate their conclusions.

6. Value personal or common preconceptions about various natural phenomena based on scientific evidence.

7. Make explicit the scientific notions that sustain the processes for the solution of everyday problems.

8. Explain the operation of machines commonly used from scientific notions.

9. Design models or prototypes to solve problems, satisfy needs or demonstrate scientific principles.

10. Relate the symbolic expressions of a phenomenon of nature and the observable features to the naked eye or through scientific instruments or models.

11. Analyze the general laws that govern the functioning of the physical environment and assess human actions of environmental impact.

12. Decide on the care of your health from the knowledge of your body, your life processes and the environment to which it belongs.

13. Relate the levels of chemical, biological, physical and ecological organization of living systems.

14. Apply safety standards in the handling of substances, instruments and equipment in carrying out activities of their daily lives.

EXTENDED DISCIPLINARY COMPETENCES OF THE EXPERIMENTAL SCIENCES FIELD

Extended disciplinary competences imply desirable levels of complexity for those who opt for a specific academic trajectory and, consequently, have a propaedeutic function to the extent that they will prepare EMS students for admission and permanence in higher education.

1.Assess in a critical and responsible way the benefits and risks that the development of science and the application of technology bring in a historical-social context, in order to solve problems.

2. Evaluate the implications of the use of science and technology, as well as the phenomena related to the origin, continuity and transformation of nature to establish actions in order to preserve it in all its manifestations.

3. Apply the scientific and technological advances in the improvement of the conditions of their social environment.

4. Evaluate the factors and elements of physical, chemical and biological risk present in nature that alter the quality of life of a population to propose preventive measures.

5. Apply the appropriate methodology in the elaboration of interdisciplinary projects addressing problems related to experimental sciences.

6. Use specialized tools and equipment in the search, selection, analysis and synthesis for the dissemination of scientific information that contributes to their academic training.

7. Design prototypes or models to solve problems, satisfy needs or demonstrate scientific principles, facts or phenomena related to experimental sciences.

8. Confront preconceived ideas about natural phenomena with scientific knowledge to explain and acquire new knowledge.

9. Value the fundamental role of the human being as an agent modifier of their natural environment proposing alternatives that respond to the needs of man and society, taking care of the environment.

10. Solve established or real problems of their environment, using the experimental sciences for understanding and improving it.

11. Propose and execute community actions towards the protection of the environment and biodiversity for the preservation of the ecological balance.

12. Propose strategies of solution, preventive and corrective, to problems related to health, on a personal and social level, to favor the development of your community

13. Value the implications in their life project by assertively asserting the exercise of their sexuality, promoting gender equality and respect for diversity.

14. Analyze and apply knowledge about the function of nutrients in the metabolic processes that are performed in living beings to improve their quality of life.

15. Analyze the composition, changes and interdependence between matter and energy in natural phenomena, for the rational use of the resources of their environment.

16. Apply security measures to prevent accidents in your environment and / or to face natural disasters that affect your daily life.

17. Apply safety standards to reduce risks and harm to oneself and nature, in the use and handling of substances, instruments and equipment in any context.

PURPOSE OF THE SUBJECT OF ECOLOGY

Ecology is part of the field of experimental sciences within of the common curricular framework, and therefore has the general purpose of fostering in the student an interest in the study of science, through strategies focused on learning, which will allow awakening their scientific curiosity, creativity and ingenuity, to strengthen the development of basic disciplinary competences and generic competences oriented to know and apply methods and procedures to strengthen the development of categorial and complex thinking when solving problematic situations of real life. The objectives of the ecology course are:

That the student understands the basic concepts of Ecology; that knows the components of an ecosystem, biotope and biocenosis, that compose the diverse ecosystems of the planet.

That the student understands the main characteristics of the Biomes of the world, with emphasis on those located in Mexico.

That the student understands the characteristics of natural resources, the effects of overexploitation of these resources, as well as the pollution caused by human activities.

The Ecology course is organized into three units: 1) Ecology and Ecosystems. 2) Biomes and Pollution and 3) Natural Resources.

This approach aims to provide the teacher and students with the teaching resources that guarantee best practices in teaching and the sensitive elevation of academic achievement.

CONTENT

UNIT I

UNIT I

Ecosystems and Human Activity

Didactic Sequence 1 **Introduction to Ecology**		
Axis: Explains the behavior and interaction in chemical, biological, physical and ecological systems..		
COMPETENCES TO DEVELOP:		
Disciplinary:	CD1 Establish the interrelation between science, technology, society and the environment in historical and social contexts. CD3 Identify problems formulate scientific questions and propose the necessary hypotheses to answer them.	
Generic:	CG4 Listen, interpret and issue relevant messages in different contexts through the use of appropriate means, codes and tools. CG6 Sustain a personal position on topics of interest and general relevance, considering other points of view in a critical and reflective manner.	
Central Content	**Specific content**	**Expected Learning**
Ecology, sustainability and sustainable development.	• What is Ecology, sustainability and sustainable development? • · What can I do to conserve the environment and preserve natural resources?	• Analyze how interactions of environmental factors are determinant for the presence of a species in the ecosystem.

Opening

Activity 1. Answer briefly:

What is your definition of Ecology?

_____

_____

_____

Mention some environmental groups that you know

_____

_____

_____

_____

_____

What are the main tasks that ecologists do?

_____

_____

How important is caring for the environment?

How do you contribute to society for the preservation of ecology?

Development: Read carefully the following text and highlight the main ideas: **What is**

ecology, sustainability and sustainable development?

Activity 2: Make the following readings, highlighting the most important of them and identify the key concepts. When finished, prepare a glossary

What is ecology?

Ecology is the science that is dedicated to the study of living beings in general, the relationship of these with the environment in which they live, the abundance and distribution that exists in a given area or region. In this way, the interaction of living beings with the environment in which they find themselves plays a fundamental role in their study.

The term ecology derives from the Greek **Oikos** which means house or place where one lives; the term was coined by the German biologist Ernst Haeckel in 1869. It includes the study of the relationships of organisms with the environment. It is a science that studies living beings and their relationship with the environment (shaped by the physical and biological factors of their environment). Currently, Ecology has taken a decisive role in making environmental, social and economic decisions worldwide. However, we have a vague idea of what this term means. At the same time, the terms of sustainability and sustainable development and the relationship they have with our environment.

Ecology studies the relationship of living beings with the physical environment they inhabit and the interactions between different species. Within the environment that inhabits a species are abiotic or physical factors such as humidity, temperature, sunlight, soil, etc. and the biological factors that are the relationship with other species that inhabit the same environment. One of the main objectives of ecology is to understand the distribution and abundance of living beings in the physical environment. For example: in your garden or in the park, probably they present a set of different plants, animals and fungi; These patterns in nature are based on the interactions between organisms of the same species, between different species and the physical environment where they live.

Ecology is revealing itself as a fundamental science to try to predict the changes that are taking place in ecosystems as a response to human alterations, therefore knowing what ecology is and what it studies, is very important to disseminate its contributions and preserve the biodiversity of species and the environment. For example you can study the specific case of a species like the red panda, knowing its habitat, the environmental conditions for its development and the factors that impact on it, both natural and human activities, we can protect the species.

So today we know that red pandas are distant relatives of raccoons and are only found in the eastern Himalayas. They spend most of their time in the trees and consume a mainly vegetarian diet. In recent years, the population of red pandas has declined significantly, which has caused conservation groups to classify it as a vulnerable or endangered species.

What are the main factors behind this change in abundance? Ecologists found that biotic factors, such as cutting down trees and introducing diseases transmitted by domestic dogs, played a key role in reducing red panda populations. The abiotic factors have been less important so far, but the change in temperatures can produce a greater loss of their habitat in the future.

Understanding the main factors responsible for the decrease in the number of red pandas helps ecologists create conservation plans to protect the species.

Definition of sustainability

Sustainability is a process that aims to find the balance between the environment and the use of natural resources. Human beings in our passage through the planet have degraded natural resources in such a way that nowadays it is necessary to conscientiously seek and plan the consumption of them to guarantee the consumption of them to guarantee their existence for future generations.

This concept arises in 1987 from the report Our common future, which is focused on the idea of sustainable or sustainable development. Sustainable development not only focuses on the environment, but also on three main areas: economic, social and environmental. Sustainable development began to be formulated in the seventies under the term "eco-development" and was perfected over the next two decades, sustainable development was based on demonstrating that in nature nothing grows indefinitely, if no, that when reaching maximum thresholds, collapse occurs.

In the ecological context, **sustainability** points to ecological systems that maintain their diversity and productivity over time; in the economic and social context is defined as the ability of current generations to meet their needs without harming future generations.

One of the main challenges that Mexico faces in terms of sustainability is to incorporate the environment as one of the elements of competitiveness.

Among the key elements of sustainability is the growth of the population, the energy issue, climate change, lack of resources and waste management. Sustainability is the ability to achieve sustained economic prosperity over time by protecting the natural systems of the planet and providing a high quality of life for people.

Definition of sustainable development

It is known as **sustainable development,** it is about development that can be maintained for a long time without harming the environment or extinguishing resources. This means that development can be sustained
or sustain by itself without affecting the environment or third parties; It allows to satisfy current needs without jeopardizing the satisfaction of future needs.

Sustainable development has as main goals the reconciliation of the social, economic and environmental aspects of our activities and the definition of projects that are viable, so that we can take advantage of nature's resources to satisfy our needs without causing irreparable damage to the environment. ambient. Within this concept there are three fundamental principles that we should take into account: economic sustainability, social sustainability and environmental sustainability.

Economic sustainability refers to all activities that are considered profitable and possible from the financial point of view, and that point to a growth of the economy of an individual, a community or a company.
Social sustainability is based on maintaining social cohesion in the pursuit of common objectives. These are efforts to reduce the negative social impact that the activity may cause, while at the same time enhancing its positive impact. It is also linked to the benefits that local communities can receive to improve their living conditions.
Environmental sustainability revolves around making the activity and the care of ecosystems and biodiversity compatible, in order to prevent them from being destroyed and stop offering us the necessary resources. Reaching this balance between the three principles is not easy, it requires a profound change in our activities taking into account our lifestyles and our needs.

What can I do to conserve the environment and preserve natural resources?
Read the following information and highlight the main ideas and write a short essay about the activities you do as a family to preserve natural resources. Share your information with your classmates.

Contribution to sustainable development
To achieve a balance among economic, social and environmental sustainability, it is necessary to achieve economic well-being, social equity and the proper use of natural resources. So it is necessary to analyze the current lifestyle and redefine it to a new model based on respect for nature and humanity. The relationship between sustainability, protection of the environment and international trade is very close. This is because the conservation of ecology and scientific advances have become of great importance to the international community. This can be seen in two fundamental issues, the first one is that not all environmental measures establish non-tariff barriers or technical barriers to trade because they do not seek a reduction in the marketing of certain products but to improve the lives of people. The second issue, as a clear reaction to the reduction of tariffs and the liberation of a large part of world trade, countries will seek authentic objectives among them, the issue of environmental protection and sustainable development, to inhibit foreign trade with other regions and protect the local industry.
Against this background the World Trade Organization seeks to maintain a fair attitude towards the search for a commercial opening. While it is true that the organization has as its fundamental objective the exchange of goods and services, it also seeks commitments so that respect for the conditions for a healthy environment is not broken.
Environmentally friendly technologies
Currently when we hear the word technology, many associate it with products and services related to information and communication, we lose ourselves every day in the midst of concepts such as networks, mobile telephony, online banking, etc. The technology or the technological tools are those innovations capable of changing the life of the human being, to make it more comfortable.
Recently the concern in our society has grown due to the undesirable effects generated by the products that this technology has given us. We know the severe damage caused by plastic, the disposal of used batteries from many electrical appliances; every time we become aware of the damage we cause by the improper use of these products, so we are increasingly looking for new ways to optimize resources, recycle, minimize emissions, even reuse waste. Achieve through these actions a better quality of life, for example: collection systems, filtration and storage of rainwater, use of energy saving bulbs, reusable diapers, biodegradable packaging, hybrid cars, organic agriculture, green roofs (it is the roof of a building that is partially or totally covered with vegetation), hydroponics (growing plants in aqueous solutions, usually with some support of sand, gravel, etc.), compost, biodigesters (hermetic containers where organic matter is deposited and fermented and produces biogas used as an energy source).
The conservation of natural resources is fundamental to maintain the productive base of the country and the essential ecological processes that guarantee life. The conservation of agricultural land, water, trees and the flora and fauna of the planet is a priority. Conservation occurs for several reasons:

· **Economic:** the degradation or exploitation without measure of the resources leads to economic losses for the country.
· **Scientific:** the conservation of natural areas preserves the genetic material for the future.
· **Cultural:** each town has certain criteria for the conservation of natural resources according to its tradition.
· **Ethical:** man has no right to destroy his environment. Natural resources are the heritage of the nation and the State is responsible for conserving the common good with the participation of citizens.
· **Social:** the looting of natural resources, pollution and the deterioration of the environment affect human societies in the form of diseases and social upheavals, generate poverty and economic crisis.

Glossary

Activity 3: Reflect and answer in your notebook. What are your contributions to sustainable development that you carry out in your home, at school and with society?

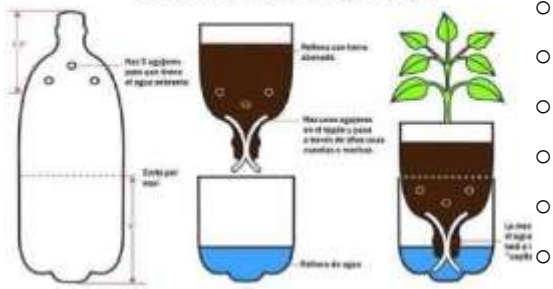
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Clousure

Activity 4 Elaborate the following practice.

Laboratory practice "Vegetable garden in plastic bottles"

Material:



- Plastic bottle of 2 liters
- cutter or scissors
- Soil for plants
- Bottle cap punctured
- Piece of cotton cloth
- Water
- Alfalfa seeds or your choice or any seasonal seed.

Objective: To recycle plastic containers, converting them into ecological pots for planting plants**.**

Introduction

The ecological pots solve the problem of pollution caused by the disposal of plastic flower pots used in the decorative field, another direct problem that solves the fires since we reduce their incidence because in Mexico per year thousands of hectares are consumed by this cause.

Procedure:

1. Cut the bottle with a knife or cutter in half, with a cut as straight as possible.
2. Remove the lid and open holes and replace it.
3. Pour soil or substrate of your choice into the container, on the side of the lid.
4. The underside of the bottle will serve as support.
5. For the irrigation system, there are two options: pour water on the bottom until it makes contact with the lid or put a piece of cotton cloth in the lid and, in turn, put the cloth in the water. In both cases, the earth will absorb water as it needs it. Auto irrigation is optional. The orchards in plastic bottles with auto irrigation are more ecological if they consume little amount of water, they can even be supplied with rainwater.
6. Take care of your ecological pot for 15 days.

Results: Table of results with sizes and photographs.
Analysis and conclusion: Answer the following as an essay in your notebook.
1. Did environmental factors determine the development of your crops?
2. Recycling plastic containers, converting them into ecological pots for planting plants. Do you think this idea is positive for the world?
3. Present your work to the group.

Analyze how the interactions of environmental factors are determinant for the presence of a species in the ecosystem

Lab Practice **Check list**			
	yes	no	grade
Did you comply with the material required to carry out the practice?			
Does it show skills to perform the practice procedure?			
Did you present your project by presenting it to the group?			

Activity 5: Match the columns

1. Science that is dedicated to the study of living beings and their relationship with the environment where they live.	( )	Oikos
2. It means house or place where one lives	( )	Sustainable development
3. It aims to find the balance between the environment and the use of natural resources.	( )	Ecology
4. Development that can be maintained for a long time without harming the environment or extinguishing resources.	( )	World Organization of Commerce
5. Are all activities that are considered profitable and possible from the financial point of view.	( )	Sustainability
6. It is about reducing the negative social impact that the activity developed can cause.	( )	Social Sustainability
7. It revolves around making the activity and the care of the ecosystems compatible.	( )	Environmental Sustainability
8. It seeks to maintain a fair attitude towards the search for a commercial opening.	( )	Economic Sustainability
9. Are those innovations capable of changing the life of the human being to make it more comfortable.	( )	Biodigestors
10. Hermetic containers where organic matter is deposited that is fermented and produces biogas used as an energy source.	( )	Technologies

Didactic sequence 1 Introduction to Ecology				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**Points**	**Points gained**
Opening	**Act. 1:** Questionnaire	Aut		
Development	**Act. 2** Glossary Know the concepts and usual vocabulary used in ecology	COE		
	Act. 3 Reflection Determine your position before the development sustainable in its context.	HE		
Closure	**Act. 4** Laboratory practice. Analyze how the interactions of environmental factors are determinant for the presence of a species in the ecosystem Analyze its position in the sustainable development of ecosystems.	HE		
	Act. 5 Match the columns			
Made the activity of HSE	**Optional**			
Total **Value: 25%**				
Feedback:				

Didactic sequence 2 **Sustainable development**		
Axis: Explain the behavior and interaction in chemical, biological, physical and ecological systems.		
COMPETENCES TO DEVELOP:		
Disciplinary:	CD 6 Assess personal or common preconceptions about various natural phenomena based on scientific evidence.	
Generic:	CG6 Sustain a personal position on topics of interest and general relevance, considering other points of view in a critical and reflective manner. CG9 Participate with a civic and ethical conscience in the life of their community, region, Mexico and the world.	
Central Content	**Specific content**	**Expected Learning**
• · Ecology, sustainability and sustainable development.	• Which sustainable development goals can I support individually and which ones require institutional participation? • The three areas of sustainability (ecological, economic and social) • The declaration of Rio. • The investigation experimental, by sampling.	• · Recognizes the basic principles of sustainable development. • · Distinguish alternative sources of use and management of resources. • · Proposes alternative solutions to an environmental problem in their environment.

Opening :

After months of maintaining the suspense, the president of the United States, Donald Trump, fulfilled his electoral promise.

This Thursday, the president announced that the US will withdraw from the Paris Agreement on climate change approved by 195 countries in December 2015.

"To fulfill my solemn duty to protect the US and its citizens, the United States will withdraw from the Paris climate agreement," Trump said from the White House grounds.

In this way, the United States joins Nicaragua and Syria as the only countries of the United Nations Framework Convention on Climate Change that do not support the environmental treaty.

The Paris Agreement is considered by many to be the most important environmental achievement in history because of its global reach and long-term goals. The decision of the US president was received as a jug of cold water by the international community, with the majority of world leaders showing their disappointment with the president. Trump said his country will ask to renegotiate the treaty "in fair terms for the United States" as a condition to return to it.

"I will work to ensure that the United States remains the world leader in environmental issues, but under a framework that is fair," Trump said.
Trump said that abandoning the Paris Agreement will help the oil and coal industries in his country and generate jobs.
"We do not want other countries to laugh at us, they will not, I was elected to represent the citizens of Pittsburgh, not Paris," the president said.
Trump added that "it's time to put Youngstown, Ohio, Detroit, Michigan, Pittsburgh, Pennsylvania before Paris.After China, the US is the largest emitter of greenhouse gases in the world." Information taken from: https: //www.bbc.com/mundo/noticias-internacional-40124921
Activity 1. From the previous text, answer the following:

1. Do you consider certain statements by President Trump to get out of the Paris Agreement?

2. What could happen in the future if the measures established in that agreement were not met?

Development:

Activity 2: Read the text "Sustainable Development" and develop a mental map.

Sustainable Development

The depletion of resources, the excessive consumption of energy, the extinction of species, the increasing generation of waste and environmental pollution are actions that demonstrate the failures of humanity in the proper management of natural resources.

The species of the diverse ecosystems have been exploited to the extent that they no longer allow their recovery easily. Biotic resources can not be renewable if the equilibrium between the speed of their production and that of their consumption can not be established.

To analyze the damage to the environment, the United Nations Organization created the world commission on environment and development, which published in 1987 the result of its analysis in a document Our common future or Brundtland Report, in this document defines sustainable development as "development that meets the needs of the present, without compromising the ability of future generations to meet their own needs".

The sustainable term is replaced by the term sustainable, which means capable of being sustained or supported, related to the method of agricultural production that uses a source such that it is not depleted or permanently damaged. This concept involves a long-term development in the economic, social and ecological dimensions; in which not only seeks to raise the levels of welfare in current human society, but prevails the concern to inherit future generations a planet with adequate levels of environmental health.

Which sustainable development objectives can I support individually and which ones require institutional participation?

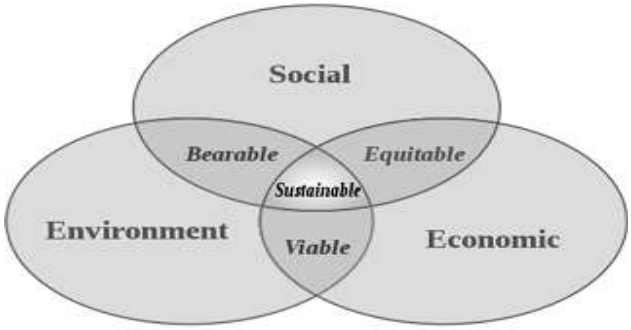
The Sustainable Development Goals (SDGs), also known as the Global Objectives, are a universal call for action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. These 17 objectives are based on the achievements of the Millennium Development Goals:

1. End of poverty
2. Zero hunger
3. Health and well-being
4. Quality education
5. Gender equality
6. Clean water and sanitation
7. Affordable and sustainable energy
8. Decent work and economic growth
9. Industry, innovation, infrastructure
10. Reduce inequities
11. Sustainable cities and communities
12. Responsible consumption and production
13. Climate action
14. Marine life
15. Life on Earth
16. Peace, justice and strong institutions
17. Partnerships for the objectives

The SDGs entail a spirit of collaboration and pragmatism to choose the best options in order to improve life, in a sustainable manner, for future generations. They provide clear guidelines and targets for adoption by all countries in accordance with their own priorities and the environmental challenges of the world at large. We can all contribute to these goals being met, because our actions, however small, can achieve an important change: what we do can become an example for our family or school, our friends and have a beneficial impact on society. For example, in the objective of clean water and sanitation, although this process is carried out by some companies and the government, we can do our bit by not wasting the vital liquid when we bathe or in other household chores, also reuse it when possible and also verify that there are no leaks in the pipes. The SDGs are an inclusive agenda. They address the root causes of poverty and unite us to achieve positive change for the benefit of people and the planet.

The three areas of sustainability (ecological, economic and social)

"**Sustainable development** is to meet the needs of current generations without compromising the possibilities of meeting the needs of future generations." 1987 Report of the Commission created by the United Nations on environment and development.



Environmental sustainability: Compatibility between human activities and the preservation of biodiversity and ecosystems. The levels of exploitation of natural resources are maintained without reaching their limit or carrying capacity (the maximum number of individuals

that an area can sustain) and without there being a decrease of the resource in its essence. It is intended to avoid the depletion of non-renewable, difficult or slowly renewable resources; besides avoiding the generation of waste and polluting emissions.

Social sustainability: it is based on the maintenance of the social and cultural network, on the ability to maintain common interests through democratic and non-exclusive ways. This through the change of attitudes and collective personal practices where people care more about others and value social justice, education, health, peace and tranquility, improving and maintaining the quality of human life through the generations.

Economic sustainability: generate wealth in a local, regional and global framework that stimulates financially possible and profitable development, maintaining the base of natural resources and their conservation.

Activity 3: Browse the following website and answer the following questions**:**

http // www.yb.org / sustentabledevelopment / es / Development-de-Development-sostenible /

1. What are the goals of the Sustainable Development objectives?

_____
_____
_____
_____
_____

2. In what way will it benefit humanity to achieve these goals?

_____
_____
_____
_____
_____

The Rio Declaration (experimental research)

The "Cumbre de la Tierra", organized by the ONU, held in Rio de Janeiro in 1992; the conference was the opportunity to adopt a program of action for the 21st century, called program 21. It takes into account issues related to health, housing, air pollution, management of the seas, forests and mountains, desertification, water resources management and sanitation, agriculture management, waste management.

With the aim of establishing a global alliance by creating new levels of cooperation between states, key sectors of societies and people. 27 principles are proclaimed that allow to reach international agreements in which the interests of all are respected and the integrity of the environmental and global development system is protected, recognizing the integral and interdependent nature of the Earth. It tries to promote a new form of collaboration between the States, the sectors and the people. In its 27 principles includes the following ideas: the uncertainty in the scientific field should not delay the adoption of measures to protect the environment: States have the right to use their resources, but they must not cause damage to the environment of others State; the elimination of poverty and the reduction of disparities in living standards throughout the world are indispensable for sustainable development, and the full participation of women is essential to achieve sustainable development.

Article taken from the Report of the United Nations Conference on the Human Environment, Stockholm, 5-16 June 1972 (United Nations publication, Sales No. E.73.II.A.14 and corrigendum), chap. 1.

http://www.un.org/spanish/esa/sustdev/documents/declaracionrio.htm

Activity 4. Taking into account the previous reading, correctly answer the following questionnaire:

1. Why are international environmental agreements created?

2. Do you consider the Rio agreements important?

3. How are the three areas of sustainability related?

4. Do you think these agreements help to take care of the environment?

5. Do you think the world can produce large quantities of food for the population?

Closure.

Experimental research: sampling and the use of mathematical models in Ecology.

In statistics, the technique of selecting a sample from a population is known as sampling. When choosing a sample, its properties are expected to be extrapolated to the population. This process saves resources by obtaining similar results if the entire population is studied.

Related subjects: Ecology, Physics and Mathematics

Activity 5: Make the following laboratory practice

Lab practice

SAMPLING OF POPULATIONS

Objetive: Through fieldwork, describe the characteristics of a community, applying a sampling method.

Questioning:
What environmental factors determine the distribution of living beings? From the questioning, elaborate your hypothesis:

_____
_____
_____
_____
_____

Material:
1. Four 30 cm-stakes of broomstick
2. Measuring Tape
3. Garden shovel
4. Plastic bags.
5. 4 m cord.

Procedure

- Select the study area.
- The quadrant sampling technique will be used.
- Describe the abiotic factors of the study area and record them in your notebook.
- Quadrant sampling technique
- Build a square with stakes of 1 x 1 m.
- Place the cord linearly, forming the square meter.
- Look carefully at the area and count everything that exists including live organisms and garbage, registering in the results table. Take samples of the soil, plants and insects that are found in your study area.

Results table

Soil characteristics	Temperature	Description of flora	Description of fauna

Conclusion

Questionnaire

What is the relationship between the type of soil and the presence of sampled organisms?

Do you think that depending on the type of soil the flora and fauna will depend on? Explain why

Mention what is the most dominant organism in your sample and explain what characteristics it presents

Lab practice

	yes	no	grade
Did you comply with the material required to carry out the practice?			
Does he/she show skills to perform the practice procedure?			
Did you present your project exposing in front of the group?			

Activity 6. Match the columns

1.	It meets the needs of the present without compromising the ability for future generations to meet their own needs.	( )	Sustainable development objectives
2.	"That is capable of being sustained or	( )	Social sustainability
3.	They are a call for action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.	( )	Economic sustainability
4.	Compatibility between human activities and the preservation of biodiversity and ecosystems.	( )	Sustainable development
5.	It is based on the maintenance of the social and cultural network.	( )	Rio Declaration
6.	It refers to generating wealth in a local, regional and global framework that stimulates financially possible development, maintaining the base of natural resources and their conservation	( )	Environmental sustainability
7.	Formed by 27 principles that allow reaching international agreements in which the interests of all are respected and the integrity of the environmental system is protected.	( )	Sampling
8.	Technique for selecting a sample from a population.	( )	Sustainable

Didactic sequence 2 Sustainable development				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**points**	**Points obtained**
Opening	**Act. 1:** Questionnaire	Aut		
Development	**Act. 2** Mind map Recognize the basic principles of development sustainable	COE		
	Act. 3 Questionnaire	HE		
	Act. 4 Questionnaire			
Closure	**Act. 5** Laboratory practice. Analyze how the interactions of environmental factors are determinant for the presence of a species in the ecosystem Analyze its position in the sustainable development of ecosystems.	HE		
	Act. 6 Match the columns.	COE		
He/she made the activity of HSE	**Optional**			
Total **Value: 25%**			**100**	
Feeedback:				

Didactic sequence 3: Abiotic and biotic factors.		
Axis: Explain the structure and organization of the natural components of the planet.		
COMPETENCES TO DEVELOP:		
Disciplinary:	CD2 Base opinions on the impacts of science and technology in its daily life, assuming ethical considerations. CD6 Apprais personal or common preconceptions about various natural phenomena based on scientific evidence.	
Generic:	CG5 Sustain a personal position on topics of interest and general relevance, considering other points of view in a critical and reflective manner. CG9 Participates with a civic and ethical conscience in the life of their community, region, Mexico and the world.	
Central Content	Specific Content	Expected leaarning
The environmental factors of the ecosystem where I live.	• · Biotic and abiotic factors. • · The most limiting limiting factor (Law of the Liebeg minimum) • · Effect of lack or excess of a limiting factor (Shelford's Law of Tolerance)	• · Explain how environmental factors limit the distribution and abundance of organisms. • · Identify the environmental factors that determine the economic activity of their region, proposing strategies to promote the sustainable use of their natural resources.

Opening

Activity 1. Make a visit to a green area within your campus and indicate the biotic and abiotic factors with which you found and write down your observations

What do you think would be the limiting factors of biotic factors?

Biotic Factors	Abiotic Factors

Development: Read carefully the following text and highlight the main ideas.

Biotic and abiotic factors

Biotic factors directly affect the performance, abundance, distribution and diversity of living beings, so they are classified as producers, consumers and disintegrators in the food chain. A food pyramid represents the food relationships of an ecosystem, in the way that the first level covers the largest area of the pyramid, while the last one is the smallest.

- The producers are the first link in the trophic chain. In the terrestrial surface the plants are considered the main producers, whereas in the aquatic medium the plankton constitutes this link. Consumers are organisms that are unable to synthesize their own foods from inorganic matter. Consumers obtain energy from pre-existing organic matter and are classified in:

· Primary consumers
· Secondary consumers
· Tertiary consumers

- Parasites are considered consumers because they obtain their food from another organism, although they do not necessarily kill immediately.
- The disintegrators or decomposers use the dead organic matter to transform it into what will be used again by the producers. They can be classified as:

· Scavengers or ghouls
· Saprophage
· Coprophages

The biotic factors correspond to all those living organisms. This term also has to do with the interaction that occurs between these living beings, their interrelations and coexistence implications.
According to the way in which they absorb nutrients, biotic factors are classified into three major types: producers, consumers and decomposers.

Producers. Biotic producing beings are those that are characterized because they are capable of generating their organic matter based on inorganic material found in the environment.

Organisms that have this ability to form their own organic matter are called autotrophs. There are basically two sources through which organisms can generate their own organic matter: through solar energy (photosynthetic processes) or through the energy generated from chemical compounds (chemosynthetic processes).

Consumers. Unlike producing organisms, consumers necessarily require other living beings to be able to synthesize their own food. They are also known as heterotrophic organisms. Heterotrophs are classified into 5 groups:

- · Herbivores, which feed only on plants and herbs
- · Carnivores, which focus their consumption on other organisms, both carnivores and herbivores
- · The omnivores, which feed on plants and herbs as well as other animal organisms
- · Scavengers, who eat dead animals
- Detritivores, which feed on decomposing matter.

Decomposers: They are responsible for decomposing matter corresponding to dead organisms. Through this decomposition process, decomposer organisms generate inorganic matter, which is exploited by the biotic factors that produce them.

Activity 2: Elaborate a terrestrial and marine trophic chain indicating all the biotic factors that intervene

Biotic interactions

The biotic factors interact all the time within their habitats or environments, according to the type of interaction they carry out they are classified into:

- **Competition:** occurs when two or more species damage each other by competing with the same scarce resource in the environment.

- **Predation:** in this type of interaction there is a beneficiary (predator) and a victim (prey). Where the predator is a free-living organism that feeds on other living organisms of other species and the prey is an organism that is devoured by the predator. Both the predator and the prey have developed throughout their evolutionary history a series of characteristics that have allowed them to survive their environment. For example, mimicry is a skill that certain living beings possess to resemble other organisms and their own environment to gain some advantage.

- **Symbiosis:** is an interspecific relationship in which two species live together in an association that involves some transfer of energy or some benefit of adaptation. There are three types:
  - **Commensalism:** occurs when one of the species benefits from the association but without the other species being significantly affected.
  - **Mutualism:** the two species benefit within the relationship.
  - **Parasitism:** the parasite is benefited and the other guest is injured, the parasite that lives outside the host is called ectoparasite and the one that lives inside the host is called endoparasite.

Activity 3: Make a collage where you capture the possible biotic interactions between different organisms .

Collage

Activity 4 Read the following text and elaborate a conceptual map on abiotic factors, at the end it includes a conclusion

Abiotic factors

The abiotic factors are all those that have no life and do not need interaction with other living beings to exist. On the contrary, these factors are what allow living beings to develop and develop correctly.
These factors can be physical or chemical, depending on their composition and behavior. They are vital for the beings that inhabit the planet, they constitute the necessary space in which organisms are capable of subsisting and reproducing themselves.
Abiotic factors basically include 4 major elements: water, sun, soil and air.

Water is a fundamental chemical compound for all living beings. It has the characteristic of being part of the physical composition of most beings and is capable of dissolving a large part of the elements that exist in nature.

Soils are full of minerals that allow the generation of life. This abiotic factor is considered one of the most important due to the high impact it has on all living organisms on the planet.

Air has basic components such as oxygen and carbon dioxide. These gases are generated by the different living organisms that exist on the planet, and they play a primordial role in the breathing processes of beings, as well as in the photosynthesis carried out by plants.

Sunlight is responsible for providing energy for terrestrial organisms to survive. Sunlight creates the right conditions for species to develop in one habitat or another, and is also fundamental during the process of photosynthesis.

Physical factors

Physical factors are a sub-classification of abiotic factors, because they are elements that do not have life. Within this category three fundamental elements can be highlighted: temperature, atmospheric pressure and rain.

Temperature: The level of temperature in a given environment will determine which species will develop there. There are organisms that need very high temperatures to survive, while there are others that can only develop optimally when they are at temperatures below zero. The temperature changes that occur throughout the year as a result of the different seasons, directly affect the behavior of plants, the hibernation of some animals and the moments of mating and reproduction of organisms.

Atmospheric pressure: This element has an important influence on the amount of oxygen in the water; In addition, the level of atmospheric pressure that exists in a space will determine the execution of a series of internal processes in organisms, which are generated so that they can adapt to existing conditions.

Rain: Precipitation affects living beings in different ways. For example, when falling on soils, the rains favor the processes of erosion of the rocks, which allows the incorporation of minerals in the soils.

Chemical factors

Being non-living elements, chemical factors are also considered part of the abiotic factors. In this opportunity, two of the main chemical factors will be highlighted: the salinity of water and minerals.

***Water salinity*:** The concentration of salt in the water also influences the organisms that can be found in a certain place. There are beings that work perfectly under high salt levels, such as halophilic Archaebacteria; while there are others that can only survive in scenarios with low levels of salinity**.**

Minerals: Minerals are a fundamental part of soils, because they serve as nutrients to plants. They are also part of the constitution of living beings and fulfill important functions within organisms, such as the strengthening of bones and participation in metabolic processes, which are fundamental for the proper development of organisms.

The scarcest limiting factor or Liebig`s Law of the mínimum

For their maintenance, development and reproduction, organisms require the necessary material that the physical environment provides them.

Justus von Liebig chemist and German physiologist, in 1840, proposed the law of the minimum to verify that the growth of plants is limited by some element that requires minimum quantities and that the medium also offers in a small proportion, but totally essential for the vegetable. This concept was originally applied to the growth of plants and crops, where it was found that increasing the amount of nutrients more abundant did not increase the growth of the plants. Only by increasing the amount of the nutrient limiting (the scarcest) could the growth of a plant or crop be improved.

Effect of lack or excess of a limiting factor (Shelford's Law of Tolerance)

A limiting factor also known as tolerance limit, is a resource, variable, element or condition of a system that due to its scarce character with respect to the rest of factors determines and limits the development and evolution of a process. It is a term widely used in chemistry, biology, agriculture and economics. Some species have a wide tolerance to some environmental factors. Also, species growth and reproduction are often regulated by only one or a few scarce conditions or resources.

Closure

Activity 5. Match the columns

1. Represents the food relationships of an ecosystem	( )	Herbivores
2. Organisms unable to synthesize their own food from inorganic matter.	( )	Producers
3. They are able to generate their organic matter based on inorganic material found in the environment.	( )	Shelford's Law of Tolerance
4. Organisms that only eat plants and herbs.	( )	Competence
5. Their diet is based on both plants and herbs as well as other animal organisms.	( )	Predator
6. It occurs when two or more species damage each other by competing with the same scarce resource in the environment	( )	Trophic pyramid
7. Free-living organism that feeds on other living organisms of other species	( )	Liebig`s law of minimum
8. Interspecific relationship in which two species live together in an association that involves some transfer of energy.	( )	Water
9. It occurs when a species benefits from the association without the other species being affected.	( )	Symbiosis
10. Chemical compound fundamental for life, is part of the physical composition of most living things.	( )	Consumers
11. For their maintenance, development and reproduction, organisms require the necessary material that the physical environment provides them.	( )	Omnivores
12. Resource, variable, element or condition of a system that by its scarce character to the rest of factors determines and limits the development and evolution of a process.	( )	Commensalism

Didactic sequence 3 Environmental Factors				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**Points**	**Points obtained**
Opening	**Act. 1:** Abiotic biotic factors table		A u	
Development	**Act. 2** Trophic chains		C O	
	Act. 3 Biotic interactions Collage		H	
	Act. 4 Conceptual Map		H	
Closure	**Act. 5** Match the columns		C O	
He/She made the activity of HSE	**Optional**			
Total **Value: 25%**				
Feedback:				

Didactic sequence 4 **Environmental factors**		
Axis: Explain the structure and organization of the natural components of the planet.		
COMPETENCES TO BE DEVELOPED::		
Disciplinary:	CD1 Establish the interrelation between science, technology, society and environment in specific historical and social contexts. CD9 Analyze the general laws that govern the functioning of the physical environment and assesses human actions of environmental impact.	
Generic:	CG4 Listen, interpret and issue pertinent messages in different contexts through the use of appropriate means, codes and tools. CG9 Participates with a civic and ethical conscience in the life of its community, region, Mexico and the world.	
Central Content	Specific content	Expected Learning
Environmental factors of the ecosystem where I live.	• In what regions of the country can coffee be grown? • What are the environmental factors that favor its growth? • Why can not I grow coffee in the north of the country? • · How can I investigate the influence of temperature or humidity on an organism?	• Explain how environmental factors limit the distribution and abundance of organisms. • Identify the factors environmental factors that determine the economic activity of their region, proposing strategies to promote the sustainable use of their resources.

Opening

Activity 1. Answer the following in your notebook and discuss your ideas with your classmates.

1. How does environmental factors influence health?

2. ¿ What is the relationship between environmental factors and climate change?

3. How can one know what to grow in each region?

Development: Read the following text carefully, and highlight the main ideas.

The environmental factors

There are two major environmental factors: **the biotic factors**, which are all those living beings and their interactions among themselves; and the **abiotic factors**, which are the elements that do not have life but are fundamental for living organisms to develop.

Within the abiotic factors, two elements of vital importance stand out: the physical and the chemical. Each one of them fulfills different functions, framed always in generating the conditions that will determine which organism will inhabit in a certain place and which are the characteristics that it must have to be able to subsist in said scenario.

In what regions of the country can coffee be grown? What are the environmental factors that favor its growth?

The coffee production of our country has a considerable economic and social importance that has its foundations at the end of the 18th century, when the first grain exports from Córdova had already been registered. Due to the war of independence, the crop was abandoned, retaking until 1817. During the Porfiriato, the main producing state was Veracruz, following him Colima, Chiapas, Guerrero, Michoacán, Morelos, Oaxaca and Tabasco. At the same time the crop was extended to the states of Jalisco, Tamaulipas, Durango, México, Nayarit, Sinaloa and Coahuila.

Currently coffee is grown in twelve states of the Mexican Republic: Chiapas, Veracruz, Oaxaca, Puebla, Guerrero, Hidalgo, San Luis Potosi, Nayarit, Jalisco, Tabasco, Colima and Queretaro. The area with coffee trees in the country represents 3.2% of the land planted.

The coffee regions are concentrated in four zones: the slopes of the Gulf of Mexico and the Pacific Ocean, the Central-North zone and the Soconusco in Chiapas, in the Mexican southeast, which together comprise 398 municipalities in the 12 producing states.

The species of the coffee tree bush that are cultivated in the country are two:

1. Arabica, Arab or Arabica and
2. The robust or canephora.

Approximately 98% of the coffee trees are Arabica varieties such as Borubón, Caturra, Maragogype, Mundo Novo, Garnica and Typica; the latter being the one that predominated in Mexico until recently; however, it is currently being replaced by varieties of low size and higher production such as Catimor and Catuai. Each variety has differences in quality, volume produced, yield, resistance to pests and diseases, aroma, acidity, etc.

Why can not I grow coffee in the north of the country?

Let us investigate the favorable climatic conditions for the cultivation of coffee, taking as a reference all the abiotic factors that determine the development of living beings in the different ecosystems. Among them the temperature, precipitation, humidity, winds, Climate and soil for coffee

Climate components

- **Temperature:**

The optimum zone for the cultivation of Arabica coffee is between 19 and 21.5 degrees Celsius.

In cold climates, where the average temperature is less than 19 degrees Celsius, coffee varieties develop less, their production is lower and the crop is distributed throughout the year.

In hot climates, where the average temperature is higher than 21.5 ° C, the productive life of the coffee tree is shorter, the harvest earlier and concentrated. The attack of the rust is more severe and pests such as the broca and the miner increase.

- **Rain**

It is considered appropriate for the crop a quantity of rain between 1,800 and 2,800 millimeters per year, with a good distribution in the different months of the year. At least 120 mm per month are required.

Periods of a lot of rain favor the presence of diseases such as pink and leaky disease.

The excess of rains can also affect the flowering of the coffee plantation, diminishing it or damaging it.

If excessive droughts occur, the leaves of the coffee tree may fall due to lack of water and the attack of pests such as the red spider mite, the miner and the broca may increase.

- **Air humidity or relative humidity**

This component of the climate presents high variations between day and night. In coffee areas the air is usually humid.

- **Wind**

They are responsible for transporting water vapor and clouds, varying some components of the climate such as rainfall, temperature and solar brightness.

In general, the most suitable areas for coffee cultivation are characterized by low strength winds.

- **Sun shine and cloudiness**

The main source of energy for the plants is the radiation of the sun, which reaches the plants depending on the presence or absence of clouds and the orientation of the slopes in relation to the sunrise. The solar brightness is expressed as the number of hours in which the sun shines in a given period.

The solar brightness in the coffee zone is between 1,600 and 2,000 hours of sunshine per year.

- **The soil for growing**

The soil is the top layer of the earth where the roots of the plants develop.

Soil is essential for coffee because it facilitates anchoring and provides the water and nutrients necessary for its growth, development and production.

It has its origin in the disintegration and slow decomposition of rocks, caused mainly by the action of water, temperature and winds. In some regions these processes are accompanied by ash from volcanoes. With the passage of time the particles formed are mixed with the residues of animals and plants in decomposition, giving rise to the soil or plant layer.

The soil is composed of solid substances (organic and inorganic), water and air.

Physical properties of the soil

The main ones are color, texture, structure, porosity, permeability, effective depth.

- **Colour:** In general terms, the black color of the soils indicates a good content of organic matter. The dark floors are the best for coffee and crops in general.

- **Texture**, is related to the size of the grains or particles of the soil: clays, sands and silts. Depending on the grains or particles that are in greatest number in the soil, one can speak of soils with a sandy, clayey or silty texture. When the particles are in equal proportions, the texture is loamy. The best soils to grow coffee are the so-called loamy.
- **Effective depth:** It is so called at a distance to where the roots of the plant can easily penetrate in search of water and food. The greater the effective depth of the soil, the better the radical development of the coffee will be. A soil to grow coffee is deep if it allows the penetration of the roots up to 80 cm.

In summary, the best soils for coffee cultivation are francs, of good effective depth, with granular structure, good aeration and moderate permeability.

Chemical properties of the soil

The most important are pH or acidity, fertility, organic matter. They are determined in the laboratory through the chemical analysis of soils.

- **Degree of acidity or pH**

This measure varies between 1 and 14. Soils good for coffee should have an acidity between 5 and 5.5.

- **Fertility**

This property is related to the amount of nutrients available to the plants.
The nutritious elements for the coffee tree require in greater quantity are: Zinc, Manganese, Boron - Copper.
The lack of some of these nutrients affects the normal growth and development of the coffee plantation as well as its potential production, both in quality and quantity of coffee.

- **Organic material**

It is represented by the decomposed residues of plants and animals. Decomposed coffee pulp brings organic matter to the soil. Organic matter is very important to obtain a high productivity of the crop. It has a decisive influence on the improvement of soil physical conditions, promotes moisture retention and is the main substrate for the development of small organisms that transform it into a great source of food for coffee. Good soils to grow coffee must have organic matter contents greater than 8%

Activity 2: Make a table in which you list the characteristics of the climate and the environmental factors of coffee crops.

Table: Favorable environmental factors for coffee climate:

Activity 3: Elaborate the practice of environmental factors

Lab practice
Environmental factors

Introduction:

How can I investigate the influence of temperature or humidity on an organism?

The environment influences living beings and these influence the environment and other living beings. The way in which both are influenced or conditioned has come to be called environmental or ecological factors or conditioners. The influence of the environment on living beings is the sum of each and every one of the environmental factors. These factors determine the adaptations, the great variety of species of plants and animals and the distribution of living beings on Earth.

Objetive: Observe the influence exerted by abiotic factors such as temperature, humidity and sunlight on some living beings.

Hypothesis: Where will the seeds grow, in light or darkness? From the questioning elaborates your hypothesis:

_____

_____

_____

_____

_____

Material:

Two clean tetrapack containers of milk.
Three small transparent plastic bags
A pack of cotton.
60 Seeds of beans or seeds of your choice
Colored cellophane paper: red, blue, green, yellow and transparent.
A stapler
A black cardboard (30 x 30 cm.)
Scissors
Masking tape
Four caps of glass jars.

Procedure:

Humidity

In each plastic bag add cotton of the same width and length of the plastic bags.

In the middle of the cotton place 5 seeds in each bag.

In bag 1 water will be put only by moistening the cotton.

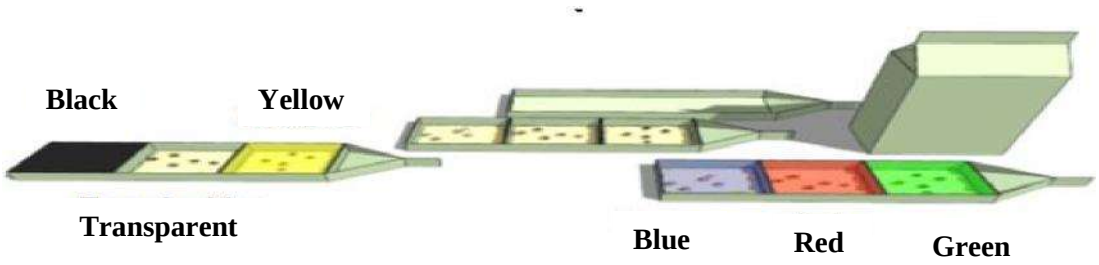
In bag 2 water will be added and the cotton will be squeezed.

In bag 3 cotton will be soaked.

Note: the contents of the water inside the bags should be taken care of during a week and the behavior of the seeds will be registered.

Light.

With the clean tetra - pack, place a container horizontally and carefully cut it with the scissors according to the figure.



Put a strip of cotton all along the package and on top of it, 15 seeds; not very close together

With the cardboard cut from the top face, cut out a dividing wall and place it in the box so that it is separated into three sections.

In each section stick a different cellophane paper, with the following sequence. Green, red and blue in one of the tetra - pack packaging; yellow, transparent and black cardboard in the other tetrapack.

Observe the seedlings at 8 days and fill the results table, noting the growth in millimeters on each observation day.

Temperature:

Take three lids of jars, in each one put 5 seeds that have been germinated 8 days in advance. Put the lid number 1 inside the refrigerator, put the lid number 2 at room temperature; Put the lid number 3 inside the oven in your house or near the stove so that it stays at a temperature of about 30 to 35 ° C. After 8 days observe the results and fill the table of results, noting the growth observed in millimeters, during the days of the experiment

Results table:

Humidity

day	Plastic bag 1	Plastic bag 2	Plastic bag 3

On a sheet of millimeter paper, create a line graph based on the previous table, comparing the three samples in the same graph to establish differences. Attach to your practice notebook.

Light:

Container selection	Comparative description of seedlings
Green	
Red	
Blue	
Yellow	
Transparent	
Black	

On a sheet of millimeter paper, create a line graph based on the previous table, comparing the six samples in the same chart to establish growth differences.

Temperature

Cap number	Description.
1. Refrigerator.	
2. Environment	
3. Stove at 30°C	

On a sheet of millimeter paper make a line graph based on the table, the three samples will be displayed on the same graph, to establish a more illustrative comparison.
Write your Conclusions:

Analysis and conclusions:
Questionnaire:
With respect to figure 1, which seeds started their growth fastest and explains why?

Based on graph 2, with what filter was there no germination and growth?

Can the results obtained in figure 3 be related to the development of vegetation in the tropics zones? Does this explain why this occurs?

Explain briefly what is the importance of abiotic factors in plants :

Closure.

Activity 4. Match the columns

1. They are all living beings	( )	Broca and miner
2. Pests that attack the coffee plant.	( )	Black soils
3. The color of the soil indicates a good content of organic matter.	( )	Effective depth
4. They are the types of soil according to the size of their particles.	( )	Zinc, Manganese, Boron and copper
5. It refers to the distance to where the roots of the plant can easily penetrate in search of water and food	( )	Biotic Factors
6. Nutritious elements required by the coffee tree	( )	Clays, sands and limos

Didactic sequence 4 Environmental factors				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**points**	**Points obtained**
Opening	**Act. 1:** Questionnaire		A u	
Development	**Act. 2** Environmental factors Table		C O	
	Act. 3 Lab Practice		H	
Closure	**Act. 4** Match the columns		C O	
He/She made the activity of HSE	**Optional**			
Total **Value: 25%**				
Feedback:				

UNIT II

UNIT 2

The ecosystem where I live

DIDACTIC SEQUENCE 5 Components of an Ecosystem		
AXIS: Relate environmental services, the impact generated by human activity and mechanisms for the conservation of ecosystems.		
COMPETENCES TO DEVELOP:		
Disciplinary:	CD1 Establish the interrelation between science, technology, society and the environment in historical and social contexts. CD2. Base opinions on the impacts of science and technology in their daily lives, assuming ethical considerations. CD4. Get, records and systematizes the information to answer scientific questions, consulting relevant sources and performing relevant experiments.	
Generic:	CG8 Participate and collaborate in an effective manner in different teams, proposing ways to solve a problem or develop a team project, defining a course of action with specific steps. CG11. Contribute to sustainable development in a critical manner, with responsible actions. 11.1 It assumes an attitude that favors the solution of environmental problems in the Local, National and International areas.	
CENTRAL CONTENT	**SPECIFIC CONTENT**	**EXPECTED LEARNING**
The goods and services that I obtain from ecosystems.	Where do the foods I eat come from? What benefits do I get from nearby ecosystems? What would happen to the quality of the air if all the green areas of my locality and my surroundings? What can I do to preserve the natural ecosystems of the region where I live? Environmental services: support, regulation, provision and cultural	Appraise the environmental services provided by ecosystems and the consequences of their loss or alteration.

Opening.

Currently we are in need of more area to live, by the increase in population and if we add the dishonesty of the authorities in the approval of permits for land use change and also the location of the population in areas of risk; this means that our relationship with the environment that surrounds us is not adequate, all this allows us to implement measures to improve our ecosystem.

Diagnostic activity 1:

1. Do you think that all the alterations that are being made such as construction of houses, roads and destruction of vegetation affect the "Ecology"?

2. What do you understand by alteration of an ecosystem?

3. What is a trophic chain?

DEVELOPMENT

Activity 2: Make the reading and identify the main theme, subtopics and concepts and write them down in your notebook.

Basic concepts of ecology

To understand the object of study of ecology, it is necessary to review the levels of organization studied by Biology, which range from biomolecules to large biomes. Ecology deals with the last levels of organization, this is the systems of populations and communities.

A group of very similar organisms, whose offspring can be fertile, constitutes a **species**. Members of a given species that live in a certain area are considered a **population**. The populations of several species that interact in the same area form a **community**. A community, together with its inanimate environment, which includes land, water and atmosphere, is an **ecosystem.** The next level would be the **biome** that is an ecosystem that occupies a large area of land. The entire surface region of the earth inhabited by living beings (including also inanimate components) is called a **biosphere**. The set of all biomes integrates the biosphere**.**

An ecosystem is any area in which energy is transferred when organisms interact with each other and with the non-living. Ecosystems are the basic units of ecology. The seas, the ponds, Lakes, swamps, forests, fields and cities are ecosystems.

An ecosystem is made up of biotic (living) factors, or biocenosis, and abiotic (non-living) factors, or biotope.

Biotope is understood as an area of uniform environmental conditions that provides vital space for a set of flora (phytocenosis) and fauna (zoocenosis). The biotope (figure 1.2) is almost synonymous with the term habitat with the difference that habitat refers to species or populations while biotope refers to biological communities.

By grouping several populations belonging to a biotope, a community or biocenosis is constituted; In this way, the community is a group of populations of different species that live in the same place or biotope.

An ecosystem can be subdivided into habitats. A habitat is the place where an organism lives. In a forest the habitat of a tree includes the land in which it is planted and the space on the land occupied by the tree, the habitat of certain kinds of ants is in the tree and that of a rodent in the forest floor.
An ecological niche is the function that an organism performs in an ecosystem. The ecological niche is a broad and complex concept that includes the place where an organism lives (its habitat) what it does, how it transforms energy, how it reacts to the environment and how they act on other species. For example, the ecological niche of a rattlesnake is a heterotrophic organism that feeds mainly on rodents, which lives in semi-arid areas and is prey to certain birds.

But why is it important for humans to study ecology? Apart from knowledge for knowledge, the basic science of Ecology is absolutely necessary for human applications. For example, a basic understanding of parasitic-host relationships is necessary to control human epidemics and diseases. Similarly, a knowledge of the basic principles of the organization of communities and the function of ecosystems is essential for the proper management and exploitation of resources. And beyond the anthropocentric arguments, one can argue that other species have the right to exist as well, since they are a product of natural selection that have adapted to their environment over millennia. And with the human population growing without stopping and pressing more and more on the space and resources that surround us, we will need all the biological knowledge that we can obtain for the conservation of the planet.

What are the components of an ecosystem?

A system is the set of interdependent components that interact with each other to form a complete unit. Systems can be closed or open, closed systems do not have an interaction with the environment that surrounds them and tend to be self-sufficient; while the open ones interact with the environment because there is an exchange of matter and energy.

Ecosystems have three fundamental characteristics:
Defined structure: type and number of biotic and abiotic elements that constitute an ecosystem.
Self-regulation: the capacity of the ecosystem to maintain stable the flow of matter and energy.
Self-sufficiency: degree of independence and control of an ecosystem.

In terms of its functioning, ecosystems are made up of two basic components: Biotope and Biocenosis.

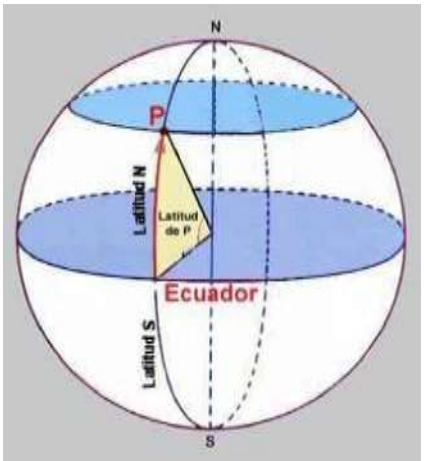
Activity 3.- Read the following topic and create a synoptic chart.

Biotope: Abiotic Factors of Ecosystems
The units of study in Ecology are the ecosystems, which are formed by two types of factors, abiotic, or biotope, and biotic, or biocenosis.
The abiotic factors (a, "without", and bio, "life"), are the inert factors, that is, all the physical and chemical components of an ecosystem are those that do not have life, and then we will review the following factors: abiotic: Climate (sunlight, temperature and water), Latitude, Altitude and Soil.

Climate
One of the main influences in ecosystems is the interaction between the quantity and quality of sunlight, water and temperature; these three abiotic factors determine the climate. Climate is defined as the set of meteorological conditions that characterize the average state of the atmosphere at a point on the earth's surface; It consists of the statistics of a series of measurements that scientists make about different parameters.

a) **Solar light.** It is the main source of energy of the ecosystems, since it is the determining factor for the realization of the process of photosynthesis, a phenomenon by which the flow of energy starts in every ecosystem. Of the total solar radiation that reaches our planet, 30% is returned to space, 20% is absorbed by the gases in the atmosphere, the remaining 50%, which is absorbed by the earth's surface and water, for the most part dissipates in the form of heat.
b) **Temperature.** It depends on the amount of solar radiation on the Earth, and is defined as the intensity of heat measured in degrees. Temperature is a determining factor for the life and distribution of living beings in different ecosystems, and varies according to the medium, altitude and latitude of a given area.

c) **Water.** It represents 78% of the surface of our planet; reaches the atmosphere by evaporation and returns to the land surface by precipitation in the form of rain hail or snow. Water is an essential compound in the life of organisms and constitutes the essential factor for the distinction of the two great environments of the planet: aquatic and terrestrial.



Latitude

Figure 5.1. Latitude, measured in degrees, is the angular distance between a point on the earth and the equator. It can be North or South. The latitude, in combination with the movement of translation and the angle of inclination of the earth, determines the angle at which solar energy reaches our planet, as well as the duration of day and night in the different seasons of the year.

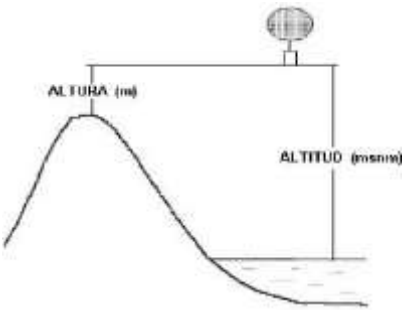
The amount and intensity of sunlight reaching a given portion of the earth's surface has a large effect on the annual average of temperatures. In Ecuador, sunlight reaches the earth's surface almost at right angles, making the climate constantly warm. Further north or southward, the sun's rays strike at a greater angle, which causes the same amount of sunlight to spread over a larger surface and produce lower overall temperatures.

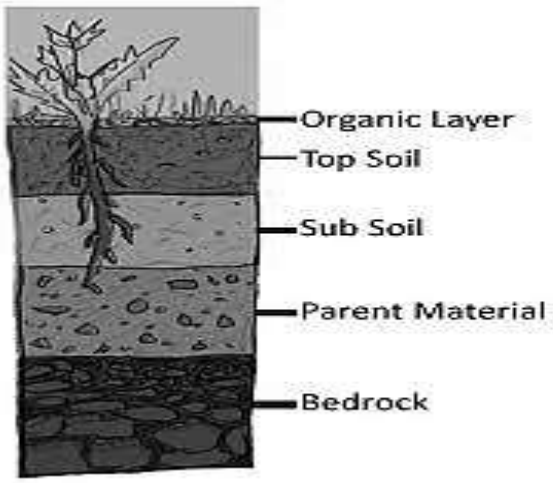
Altitude

Figure 5.2. It is the vertical distance between a point located on the surface of the earth or the atmosphere and the average level of the sea. In indigenous populations living in the highlands, particularly in Bolivia and Ecuador, there seems to be a complex interaction of biological and sociobiological factors that limit fertility.

The global distribution of species diversity depends on these conditions: The latitudinal gradients: at lower latitude, that is, with the proximity to the equatorial line, the number of species increases, while towards the poles (greater latitude) decreases.

Altitude gradients: in terrestrial ecosystems species diversity generally decreases with height. In the Andes this phenomenon is evident from the Amazon towards the Andean heights, where near the line of perpetual snow the number of species is lower.





Soil

Figure 5.3 The soil is the substrate that supports the organisms and influences them by determining the type of vegetation and animals present in the habitat. The substrate is the material that supports the organisms.

In terrestrial media the main substrate is the soil, while in aquatic ecosystems, the substrate can be rocks, sand, mud or water.

The substrate meets the needs for fixation, nutrition, protection, water reserve and other important functions for organisms. In addition to serving as a support for organisms, soil contains the nutrients needed for its development.

Biocenosis: Biotic Factors of Ecosystems

They are all living beings of an ecosystem, such as animals, plants, fungi and microorganisms that constitute a community. Living beings in an ecosystem can be separated into several groups, which are determined by the role they play in the transfer of energy through the ecosystem. All organisms need energy to survive. The sun is the main source of energy for most organisms. The living beings that synthesize their own food are called autotrophs. The main autotrophic beings in the ecosystem obtain their nutrients through a process called photosynthesis.

During photosynthesis plants convert the energy of the sun into chemical energy (organic molecules). In the ecosystem these organisms are called producers. The higher herbaceous and woody plants are generally the producers in the terrestrial ecosystems, while the algae are the main producers of the aquatic ecosystems.

Not all organisms in the ecosystem can synthesize their own food; Some have to consume them already made by others, these organisms are called heterotrophs. To achieve this the heterotrophs feed on other organisms, so they are called consumers. These can be divided, according to the type of organisms they consume, into three groups:

a) Primary consumers. - Are the herbivores (beings that feed on plants) and include from microscopic organisms, such as zooplankton, to large herbivores such as the elephant and the giraffe.

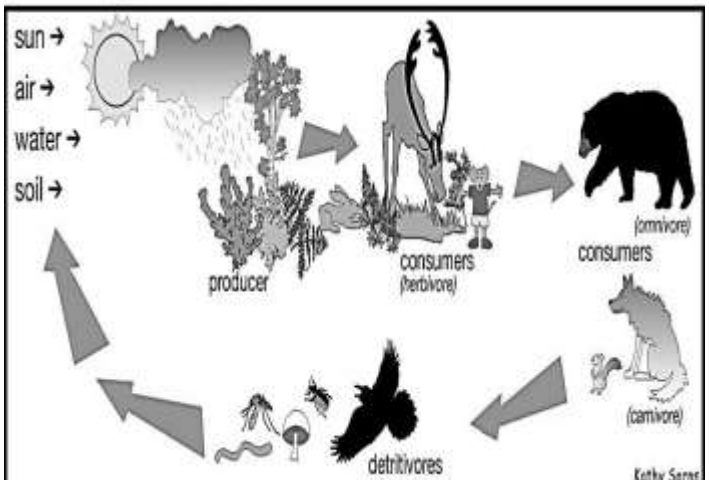
b) Secondary consumers. - They are the carnivores that feed on herbivores, such is the case of spiders, foxes, toads and coyotes.

c) Tertiary consumers. - They are carnivores that feed on other carnivores and / or herbivores. For example, snakes or hyenas.

Insect (Primary C.) Frog ((Secondary C.) Plant (Producer) Snake (Tertiary C.)

d) Omnivores. They eat both animals and plants, their diet is varied. Examples: The man, coyotes, raccoons, foxes and some fish like carp.

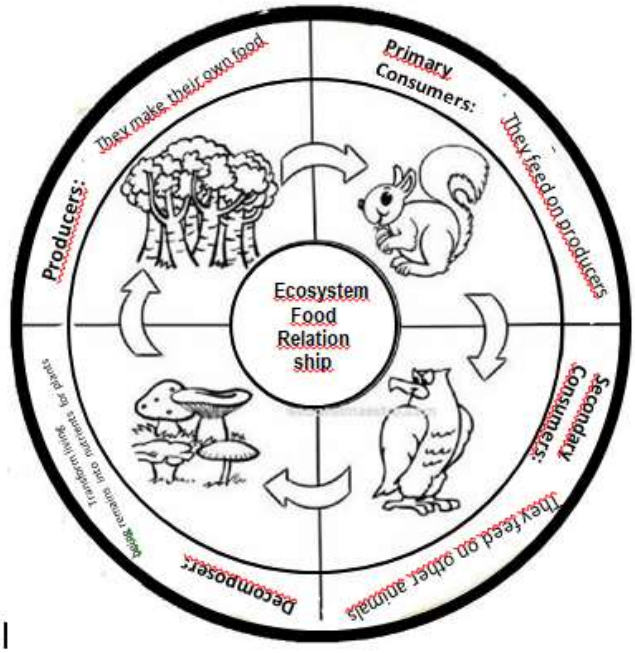
e) Decomposers. This is the third group, apart from the producers and the consumers, in the ecosystems and these organisms degrade the organic matter, that is, the dead bodies of plants, animals and their waste. They are represented mainly by fungi and bacteria, but also belong to this group earthworms, as well as small arthropods. Its role in the ecosystem is to transform organic matter into usable forms for producers and to reintegrate the rest of organic matter into biogeochemical cycles.

f) 

The Detritivores. They are organisms like the earthworm that feeds on particles of detritus, chewing them and grinding them into even smaller pieces, some other examples are many types of mites, snails, shrimp and crabs. The detritivores usually digest the decomposers that are inside and debris particles.

on

Figure 5.5. Biotic elements of ecosystems: producers, consumers and decomposers.



Modification of one or several elements of the ecosystem.

There is an urgency to advance in ecological research, simply because the pressure of humanity is rapidly leading to the extinction of other species, and is destroying entire ecosystems that have not yet been studied or understood in all its extension. Sadly, many will disappear without being adequately described and much less understood. Knowledge of the evolutionary history of a species or ecosystem will disappear with them, and therefore we will lose access to valuable biological information. Indeed, "destroying species and ecosystems is like tearing pages from a book that has not been read, written in a language that humans hardly know how to read." Thanks to Ecology, we are beginning to learn to read this book of life.

The change in land use due to human activities such as agriculture, livestock, urban and rural constructions, and mining cause destruction in the places where it is carried out. Therefore, the loss or modification of natural habitats triggers serious environmental problems in such a way that the ecosystem is sometimes altered in an almost irreversible way, which is not immediately possible to restore or remedy it. On the other hand, it is impressive to see when an ecosystem is recovered by the reintroduction of a species that had already been in that place and how it recovers benefiting each species involved and those that still seemed to have nothing to do with or be related. So it is recommended to do the following activity.

Synoptic chart

Closure.

Activity 4. Watch the video "What happened to the Yellowstone wolves?" And make a summary to deliver and discuss it in class.

DIDACTIC SEQUENCE 5 Components of an Ecosystem				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**Points**	**Points obtained**
Opening	**Act 1:** Diagnostic		A u	
Development	**Act 2:** Make the reading and identify the main topic, subtopics and concepts and write them down in your notebook.		H E	
	Act 3.- Read the topic of biotope and biocenosis with the development of the synoptic chart.		H	
Closure	**Act 4.** Watch the video What happened to the Yellowstone wolves?		H	
He/She made the activity of HSE	**Optional**			
Value: 25%	**Total**			
Feedback:				

DIDACTIC SEQUENCE 6 Differences among natural, urban and rural ecosystem.		
AXIS: Relate environmental services, the impact generated by human activity and mechanisms for the conservation of ecosystems.		
COMPETENCES TO DEVELOP:		
Disciplinary:	CD1 Establish the interrelation between science, technology, society and the environment in historical and social contexts. CD2. Base opinions on the impacts of science and technology in their daily lives, assuming ethical considerations. CD4. Get records and systematizes information to answer scientific questions, consulting relevant sources and conducting relevant experiments.	
Generic:	CG8 Participate and collaborate in an effective manner in different teams, proposing ways to solve a problem or develop a team project, defining a course of action with specific steps. CG11. Contribute to sustainable development in a critical manner, with responsible actions. 11.1 Assume an attitude that favors the solution of environmental problems in the Local, National and International areas.	
CENTRAL CONTENT	**SPECIFIC CONTENT**	**EXPECTED LEARNING**
The goods and services that I obtain from ecosystems.	• Where do the foods I eat come from? • What benefits do I get from nearby ecosystems? • What would happen to the quality of the air if all the green areas of my locality and my surroundings disappear? • What can I do to preserve the natural ecosystems of the region where I live? • Environmental services: support, regulation, provision and cultural	Appraise the environmental services provided by ecosystems and the consequences of their loss or alteration.

Opening

Activity 1.

1.- For you, What is a natural ecosystem?

2. Argue the differences between an artificial ecosystem and an urban ecosystem, in case there are differences between them. Or explain why you think they are the same.

2. In your city, can there be an ecosystem? Give your reasons for or against.

Activity 2. On the theme Natural, rural and urban ecosystems. Read the concepts underlining the most important and make a synoptic chart with the information.

The natural, rural and urban ecosystems.

Natural ecosystem: It encompasses the ecosystems of the continents and comprises a series of open interaction systems that include living forms such as animals, plants, seas and microorganisms, as well as their abiotic environment: soil, geological formations and atmospheric constituents, as well as their Activityes, interrelationships, chemical reactions, physical changes and other phenomena.

Rural ecosystem: This is characterized by its high level of purity and a low level of environmental degradation. Rivers provide the source of natural life and are the main environmental agent.

Urban ecosystem: This works based on exchanges of matter, information and energy. A particularity of the urban ecosystem are the horizontal routes of the aquifer, food, electrical and fuel resources, which can exploit other distant ecosystems, which causes territorial imbalances. This ecosystem generates its environmental conditions, light, geomorphological, etc. independently of the environment, since it supposes an important alteration in the environmental conditions of the territory. It is convenient to point out that the urban ecosystem is an environment created by man. Cities and towns are examples of them. Therefore, any ecological system found in a city or urbanized area is within an urban ecosystem and only occupy 2% of the earth's surface of the planet and yet they give home to more than half of the world's population.

Activity 3. By way of drawing or image expresses the differences between the following ecosystems.

Types of natural ecosystems

There are innumerable types of natural ecosystems, from giant biomes such as forests, through regional ecosystems such as mountains and lakes, to natural pools and smaller mud puddles.

Types of artificial ecosystems

Some ecosystems created by man are products of territorial development, such as lakes, ponds, canals, parks and gardens. Others, such as farms, orchards and vegetable gardens, are based on agriculture.

Function. Whether they have been created for recreation, feeding, irrigation or observation, such as an aquarium or an ant farm, artificial ecosystems are always designed to adapt to an alien purpose. The natives are autonomous and exist only to perpetuate their own survival.

Complexity. The ecosystems created by man are much less complex than natural ecosystems; on the contrary, artificial ecosystems have little organic diversity and their food webs are relatively simple.

Maintenance. Natural ecosystems are self-regulated, meaning that they do not need external help to function, but unfortunately, without the intervention of people, artificial ecosystems can decay and die.
Taken from: http://www.ehowenespanol.com/diferencia-ecosistemas-naturales-creados-hombre-hechos 39960/

Components of the ecosystem where I live.

In the urban environment, which is where the majority of the population lives on the planet, electric light, concrete, fuels, bricks, metals, plastics, etc. are used, all of them materials created by man. These materials condition the type of life of its inhabitants, an example of this are the bearing or pavement surfaces, which due to their dark color retain heat during the day and release it at night. By doing this, cities have higher temperatures than rural areas. However, it is curious to see how nature makes its way in the middle of constructions. The vegetation takes advantage of any gap to grow, any gap between the walls, any fissure in a sidewalk, any small space in a traffic ridge, and see how nature regains ground that rightfully corresponded. Pollution is another that affects the air, water and soil, coupled with all the above makes the urban ecosystem difficult to live, except for the more resistant animals such as rats and insects such as cockroaches, which find an ideal habitat for they. Although recently, some cities have been invaded by some species of birds such as parrots that have "adapted" to an environment different from the natural one.

Types of Biogeochemical Cycles

The most important elements of all nutrient cycles are green plants, which organize nutrients into biologically useful components; the decomposers, which return them to the initial simple state; and air and water, which transport nutrients between the abiotic components and the living components of the ecosystem. Without these factors there would be no cyclic flow of nutrients. There are two basic types of biogeochemical cycles: atmospheric and sedimentary.

1. **Atmospheric or gaseous:** nutrients circulate mainly between the atmosphere and living organisms. In most of these cycles the elements are recycled quickly, often hours or days. This type of cycle refers to the fact that the transformation of the substance involved changes its geographical location and that it is fixed from a gaseous raw material. Examples of gaseous cycles are carbon, nitrogen and oxygen.

2. Sedimentary: nutrients circulate mainly in the earth's crust (soil, rocks, sediments, etc.) the hydrosphere and living organisms. The elements in these cycles are generally recycled much more slowly than in the gas cycle, in addition the element is transformed in a chemical way and with biological contribution in the same geographical place. The elements are retained in the sedimentary rocks for a long period of time with frequencies of thousands to millions of years. Mineral salts surface directly on the earth through the wear and tear of the earth's crust. The soluble salts then enter the water cycle. With water, they move through the soil to the water courses and lakes, and finally reach the seas where they remain indefinitely. Other salts return to the earth's crust through sedimentation. They are incorporated in salt beds, silts and sedimentary rocks. After a new process of wear of the earth's crust they will enter the cycle again. Examples of this type of cycle are phosphorus and sulfur.

3.- The hydrological cycle: water circulates between the ocean, the atmosphere, the earth and living organisms, this cycle also distributes solar heat on the surface of the planet.

Activity 4. Read carefully and highlight the main ideas of the topic “Atmospheric Cycles” and write them in your notebook.

Atmospheric Cycles

1. Carbon Cycle

The basic carbon cycle begins when plants, through photosynthesis, make use of carbon dioxide (CO_2) present in the atmosphere or dissolved in water. Part of this carbon becomes part of the vegetable tissues in the form of carbohydrates, fats and proteins; the rest is returned to the atmosphere or water by breathing. Thus, carbon passes to herbivores that eat plants and thus use, rearrange and degrade carbon compounds. Much of this is released in the form of CO_2 by respiration, as a byproduct of metabolism, but part is stored in animal tissues and passes to carnivores, which feed on herbivores. Ultimately, all carbon compounds are degraded by decomposition, and carbon is released as CO_2, which is used again by plants.

The atmospheric CO_2 acts as a shield on the Earth. It is crossed by short-wave radiation from outer space, but blocks the escape of long-wave radiation. Since atmospheric pollution has increased the CO_2 levels of the atmosphere, the shield thickens and retains more heat, which causes global temperatures to rise in a process known as the greenhouse effect.

2. Nitrogen Cycle

Organisms use nitrogen in the synthesis of proteins, nucleic acids (DNA and RNA) and other fundamental molecules of metabolism. Its fundamental reserve is the atmosphere, where it is in the form of N_2, but this molecule can not be used directly by most living beings (except some bacteria). Those bacteria and cyanophyceous algae that can use the N_2 of the air play a very important role in the cycle of this element when making the nitrogen fixation. In this way they convert the N_2 into other chemical forms (nitrates and ammonium) assimilated by plants.

Ammonium (NH_4^+) and nitrate (NO_3^-) can be taken by plants through the roots and used in their metabolism. Animals get their nitrogen by eating plants or other animals. Some bacteria convert ammonia to nitrite and others transform it into nitrate. One of these bacteria (Rhizobium) lodges in nodules of the roots of the legumes (alfalfa, bean, etc.) and for that reason this class of plants are so interesting to make a natural fertilization of the soils. Nitrogen travels the food chain from plants to herbivores, and from these to carnivores. When plants and animals die, nitrogen compounds break down to produce ammonia, a process called ammonia.

Part of the ammonia is recovered by the plants; the rest dissolves in water or stays in the soil, where microorganisms turn it into nitrates or nitrites in a process called nitrification. Nitrates can be stored in decomposing humus or disappear from the soil by leaching, being carried into streams and lakes. Another possibility is to become nitrogen by denitrification and return to the atmosphere.

3. Oxygen Cycle

Oxygen is the most abundant chemical element in living beings. It is part of water and all kinds of organic molecules. As a molecule, in the form of O_2, its presence in the atmosphere is due to the photosynthetic activity of primitive organisms. At first it must have been a toxic substance for life, due to its great oxidizing power. Even now, an atmosphere of pure oxygen causes irreparable damage to cells. But the cellular metabolism adapted to use the oxygen molecule as the oxidizing agent of food, thus opening a new way of obtaining energy much more efficient than anaerobic energy.

The fundamental reserve of oxygen usable by living beings is in the atmosphere. Its cycle is closely linked to that of carbon because the process by which C is assimilated by plants (photosynthesis), also involves the return of oxygen to the atmosphere, while the breathing process causes the opposite effect.

Another part of the natural cycle of oxygen that has a remarkable indirect interest for living beings on the surface of the Earth is its conversion into ozone. O_2 molecules, activated by very short-wave energetic radiation, break into oxygen-free atoms that react with other O_2 molecules, forming O_3 (ozone). This reaction is reversible, so that the ozone absorbing ultraviolet radiation returns to O_2.

Sedimentary Cycles

1. Phosphorus Cycle

Although the proportion of phosphorus in living matter is relatively small, the role it plays is absolutely indispensable. Nucleic acids, substances that store and translate the genetic code, are rich in phosphorus.

Many intermediates substances in photosynthesis and cellular respiration are combined with phosphorus, and the phosphorus atoms provide the basis for the formation of high-energy bonds of ATP, which plays the role of energy exchanger , both in photosynthesis and cellular respiration.

Phosphorus is a rather scarce element of the non-living world. The productivity of most terrestrial ecosystems can be increased by increasing the amount of phosphorus available in the soil. As agricultural yields are also limited by the availability of nitrogen and potassium, fertilization programs include these nutrients.

Phosphorus, like nitrogen and sulfur, participates in an internal cycle, as well as in a global, geological cycle. In the minor cycle, the organic matter that contains phosphorus (for example: vegetable waste, animal excrement) is decomposed and phosphorus is available to be absorbed by the roots of the plant, where it will join organic compounds. After crossing the food chains, it returns again to the decomposers, which closes the cycle.

Phosphorus does not form volatile compounds that allow it to pass from the oceans to the atmosphere and from there return to the mainland. Once at sea, there are only two mechanisms for the recycling of phosphorus from the ocean to terrestrial ecosystems. The first is through seabirds that collect phosphorus that passes through marine food chains and can return it to the mainland in its excrement. The second is the possibility of the slow geological uplift of ocean sediments to form solid ground, a process that undoubtedly takes millions of years.

2. Sulfur Cycle

Sulfur is incorporated in virtually all proteins and thus is an absolutely essential element for all living beings. It moves through the biosphere in two cycles, one internal and one external global, or geological. The inner cycle includes the passage from the ground (or from water in aquatic environments) to plants, to animals, and back again to the ground or water; however, there are gaps in this internal cycle. Some of the sulfur compounds present in the earth (for example, the soil) are taken to the sea by the rivers, this sulfur would be lost and would escape from the earth cycle if it were not for a mechanism that returns it to the earth, such mechanism consists of convert it into gaseous compounds such as hydrogen sulfide (H_2S) and sulfur dioxide (SO_2), these enter the atmosphere and are brought to the mainland, usually washed by the rains, although part of the sulfur dioxide can be directly absorbed by the plants from the atmosphere.

Bacteria play a crucial role in the sulfur cycle. When present in air, the decomposition of sulfur compounds (including the decomposition of proteins) produces sulfate (SO_4 =). Under anaerobic conditions, hydrogen sulphide (rotten egg odor gas) and dimethyl sulfide (CH_3SCH_3) are the main products. When these last two gases reach the atmosphere, they are oxidized and converted into sulfur dioxide. The further oxidation of sulfur dioxide and its dissolution in rainwater produces hydrogen sulfide and sulfates, principal forms under which sulfur returns to terrestrial ecosystems.

Mineral coal and oil also contain sulfur and its combustion by the industrial activity of man is causing excessive emissions of sulfur gases into the atmosphere and causing problems such as acid rain.

3. Water Cycle

As a synthesis regarding the Water cycle, considering that it is part of the Biogeochemical cycles, since this topic is developed more widely within the Didactic sequence number 9. In this way we have to admit that the total amount of Water that exists on Earth, in its three phases: solid, liquid and gaseous, has remained constant since the appearance of Humanity. Earth's water - which constitutes the hydrosphere - is distributed in three main reservoirs: the oceans, the continents and the atmosphere, between which there is a continuous circulation - the

Water cycle or hydrological cycle. The movement of water in the hydrological cycle is maintained by the radiant energy of the sun and by the force of gravity. The hydrological cycle is defined as the sequence of phenomena by means of which water passes from the earth's surface, in the vapor phase, to the atmosphere and returns in its liquid and solid phases.

Closure.

Activity 5. On sheets of flipchart paper elaborate a scheme of some of the biogeochemical cycles that were described, the teacher will indicate to each team which one corresponds to schematize. Make a query in the information sources of your school and / or internet, so that they complement your work. They will have to expose it before the group indicating the effects of the environmental contamination on this cycle.

DIDACTIC SEQUENCE6 Differences among the natural, rural and urban ecosystem.				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**Points**	**Points obtained**
Opening	**Activity 1.** Exploratory questions.			
Development	**Activity 2.** Read the following concepts underlining the most important and make a synoptic table with the information.			
	Activity 3. By way of drawing or image expresses the differences between the following ecosystems.			
	Activity 4. Read carefully and highlight the main ideas of the topic "Atmospheric Cycles"			
Closure	**Activity 5.** On sheets of flipchart paper elaborates an outline			
He/She made the Activity of HSE	**Optional**			
Value: 25%	**Total**			
Feedback:				

DIDACTIC SEQUENCE7 Transfer and Energy Flows.		
AXIS: Relate environmental services, the impact generated by human activity and mechanisms for the conservation of ecosystems.		
COMPETENCES TO DEVELOP:		
Disciplinary:	CD1 Establish the interrelation between science, technology, society and the environment in historical and social contexts. CD2. Base opinions on the impacts of science and technology in their daily lives, assuming ethical considerations. CD4. Get, records and systematizes information to answer scientific questions, consulting relevant sources and conducting relevant experiments.	
Generic:	CG8 Participate and collaborate in an effective manner in different teams, proposing ways to solve a problem or develop a team project, defining a course of action with specific steps. CG11. Contributes to sustainable development in a critical manner, with responsible actions. 11.1 It assumes an attitude that favors the solution of environmental problems in the Local, National and International areas.	
CENTRAL CONTENT	**SPECIFIC CONTENT**	**EXPECTED LEARNING**
The goods and services that I obtain from ecosystems.	• Where do the foods I eat come from? • What benefits do I get from nearby ecosystems? • What would happen to the quality of the air if all the green areas of my locality and my surroundings disappear? • What can I do to preserve the natural ecosystems of the region where I live? • Environmental services: support, regulation, provision and cultural	Appraise the environmental services provided by ecosystems and the consequences of their loss or alteration.

Opening.

Activity 1. Answer the following questions

1.- For you, what does the term succession mean?

_____

_____

_____

_____

2. What is productivity?

3. What is energy transfer?

4. What is a trophic relationship?

5. What does the concept "Energy Flow" tell you?

Development.

Activity 2. Read the topic "Productivity and factors that affect ecosystems" and underline the main concepts and summarize them in your notebook.

Productivity and factors that affect ecosystems.

Primary productivity is considered as the rate or speed at which autotrophic organisms, such as plants, algae and some bacteria, fix matter and energy using solar energy in a certain area and time. These organisms represent 99.9% of the living beings of the biosphere. Primary productivity in an ecosystem tells us the speed at which it can produce natural resources essential to our existence and that of any living being. On the other hand, the low productivity of an ecosystem brings with it an imbalance in it. The primary productivity is expressed in terms of accumulated energy for example calories / ml / day or in calories / ml / hour or in terms of organic matter synthesized, which is the same, grams / m2 / day or kg / hectare / year and the energy that is fixed is used in two processes: Metabolism and Growth.

There are two types of primary production:

Net primary production (PPN). It is the energy fixed through the process of photosynthesis or chemosynthesis reserved only for the growth of autotrophic organisms, less the energy used in the metabolism, that is, gross primary production minus respiration.

Gross primary production (PPB). It is the total energy fixed by photosynthesis or chemosynthesis of autotrophic organisms.

Net primary production is a vital variable, since it represents the speed at which the energy that feeds all heterotrophic organisms, including humans, is produced. And this varies according to the climatic conditions and the latitude of the ecosystems. For example, the net primary production of a rainforest is 2200 g / m^2 / year, in a seasonal tropical forest it is 1600 g / m^2 / year, a perennial forest is 1300 g / m^2 / year, and a desert or polar area is 3 g / m^2 / year,

There are several factors that determine the net primary productivity of ecosystems, both terrestrial and aquatic.

Factors affecting terrestrial ecosystems:

Solar radiation. In this factor, the quantity and quality of solar radiation received by producers or plants is decisive.

Environmental temperature**.** In general, high temperatures stimulate the growth of plants, while low temperatures decrease it. An exception to this is apple production that requires a certain number of cold hours to obtain a good production.

Mineral nutrients It is required that the nutrients are in a certain minimum amount so that the plants can absorb them from the soil for their growth**.**

Water. It is obvious and fundamental that from the process of photosynthesis and maintenance and in a general way, the greater the precipitation, the greater the net primary productivity. Except for cacti and succulents where they can die from rotting due to excess water**.**

Factors that affect aquatic ecosystems:

Depth of water. At greater depth, there is less availability of light required for photosynthesis. Distance to the coast or to the shore. The highest concentration of nutrients is towards the edges of water bodies. Emergence defined as the emergence of cold water masses from the seabed to the surface. So it increases the PPN by the large amount of nutrients.

Availability of nutrients. It is worth mentioning that the greater the amount of nutrients, the greater the PPN will be.

Activity 3. From the topic Trophic Relations and Energy Flows, make a summary where you include the main concepts.

Trophic Relations and Energy Flows

In ecosystems there is constantly energy flow, which is defined as the ability to perform work and its behavior is defined by the laws of thermodynamics. Within them we have:

First law. Energy is not created or lost but only transformed. An example is the solar energy that is transformed by photosynthesis into organic matter.

Second law. There is a loss of energy through heat, each time the energy is transformed into another. An example is within the trophic pyramids, passing from one level to another, there is loss of energy by metabolic processes. Another example is sunlight that only manages to fix 45% of what is received.

On the other hand, it is said to be energy flow because it has a unidirectional or one-way route.

Generally, an ecosystem has more than one food or food chain. Almost all animals get their energy from more than one species.

Others use energy indirectly by consuming other organisms. The series of steps by means of which the energy of the sun is transferred through the organisms of an ecosystem is known as food or trophic chain. The organisms of almost all ecosystems depend on the sun for energy. Organisms that directly use solar energy to synthesize their food are called photosynthesizers. It is for this reason that the food chains in an ecosystem are almost always related to each other. This forms what is called a trophic network, which consists of a group of interrelated food chains in an ecosystem.

Almost all food chains start with the sun. This energy stores the tissues of the producers, such as plants. Consumers are the next steps in food chains and finally these chains end with decomposers. It is important to mention that not all the energy stored in a trophic level goes to the next level, because a part of the energy is lost mainly in heat and movement of the same organisms of the trophic level.

Figure 7.2 shows an energy pyramid that illustrates the loss of energy from one level of the food chain to another. The producers form the base of the pyramid. Consumers form each of the other levels. The size of each trophic level represents the energy that is available in each level. The pyramid shows that there is much less energy in the upper level than in the first level.

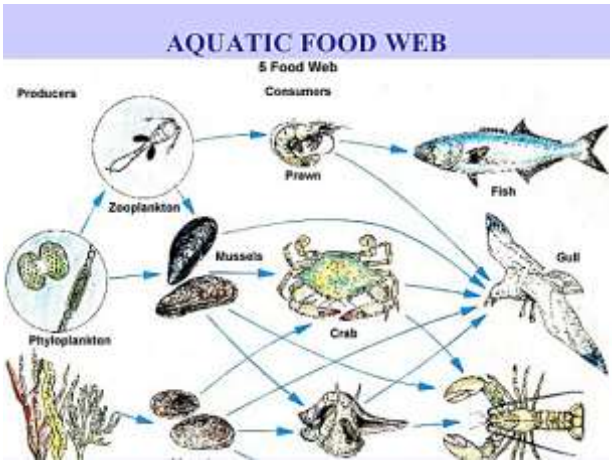


Figure 7.1 Trophic web in an aquatic ecosystem

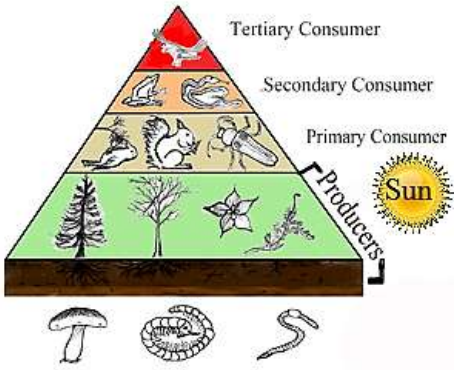


Figure 7.2 Energy Pyramid

Changes in Communities

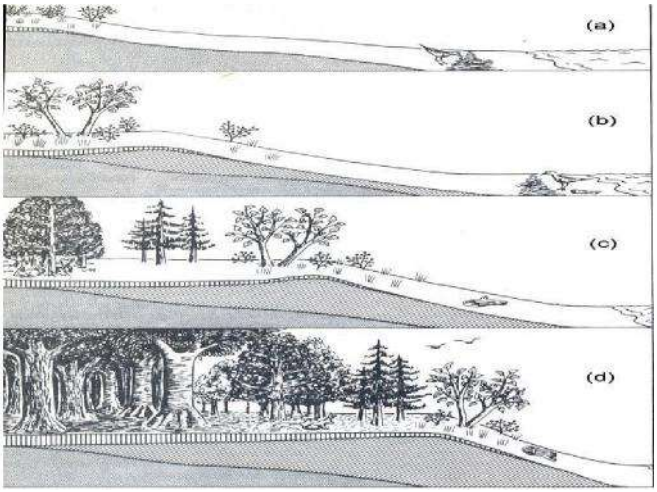
The biocenosis (also called biotic or ecological community) is the set of organisms of all plant species, animals, etc. coexisting in a defined space called a biotope that offers the external conditions necessary for its survival. It can be divided into phytocenosis, which is the grouping of plant species; zoocenosis of animal species and grouping of microorganisms (microbiocenosis).

On a large geographical scale, the main factor that determines the type of communities is climate, while on a smaller scale it is more difficult to find which or which factors explain the groupings of species. One of the first objectives pursued by an ecologist is to know the composition of a community and its structure, understanding this as the set of relationships that exist between different species among themselves and with the environment in which they live. There are several ways to characterize a community, the most appropriate being that which considers both the composition of species and the number of individuals of each one. However, not all species have the same importance within a community; are known as key or dominant species those that if they disappear would cause a profound change in the community, because they are articulated on the whole community.

Sometimes it is difficult to delimit, in nature, a border that separates different communities and in many cases what is observed is a progressive gradation from one community to another. The transition areas that appear between two totally differentiated communities are called ecotones and are especially rich in species. Communities can undergo changes over time called successions; these transformations tend to be slow and lead to changes in the composition or populations of the species. The ecosystems and the communities that constitute them do not remain static, but change over time. Although the climate of a given place remains stable over the years, ecosystems have a tendency to change from simple to complex through a process that consists of a series of population changes that is known as ecological succession. There are two kinds of ecological succession:

Primary Succession

It is the establishment and development of communities in newly formed areas, such as rocky surfaces, sandy areas, chilled lava from a recent volcanic eruption, etc. The first organisms that establish themselves in a new area are called pioneers. Pioneering organisms such as lichens, which grow on rocks, can release weak acids that help break down rocks. Some time later, dust particles begin to accumulate where some plant seeds germinate and more soil continues to form. So other plant species grow and the community changes. This process of population colonization continues through time, changing soil conditions until shrubs or trees are established, where initially there was naked rock.



Symbiotic associations such as lichens, legumes associated with nitrogen-fixing bacteria and plants associated with fungi, seem to have an important role in the development of the first successional communities.

This type of succession also occurs in aquatic ecosystems where accumulations of water of recent formation are gradually invaded by a series of species with changing populations.

Figure 7.3. It shows an ecological succession in dunes. (a) Invasion of herbs. (b) The herbs have given way to the bushes. (c) Some trees have been established. (d) A forest has been formed.

Secondary Succession.

This type of succession occurs in areas that have been disturbed and that initially had established living organisms. An example of this succession occurs after a forest fire; if the fire burned most of the trees and the ground remains bare, later weeds appear that cover the ground and prevent erosion. Later on, various species of shrubs will appear and finally the area will be covered with trees once more. However, this process of recovering the disturbed area until its complete regeneration can take many years.

The successional changes that a community is going through over time become less pronounced and the community becomes stable, that is, they no longer register relevant successional changes. When this happens it is said that a climax community has been established. When a community of this type is established, this means that a balance between the physical and biological components of the ecosystem has occurred and the succession of species in the ecosystem comes to an end.

Closure.

Activity 4. On the topic "Changes in Communities". Do an investigation where you get more knowledge of the subject and get examples of succession. Prepare your writing and do not forget to quote your bibliography in APA format.

DIDACTIC SEQUENCE 7 Transfer and Energy Flows.				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**Points**	**Points obtained**
Opening	**Activity 1.** Diagnostic Questions.	Aut	10	
Development	**Activity 2.** Read the topic productivity and underline the main concepts and summarize them in your notebook.	HE	20	
	Activity 3. From the topic "Trophic Relations and Energy Flows". Make a summary where you include the main concepts.	HE	20	
Closure	**Activity 4.** On the topic "Changes in Communities". Do an investigation where you get more knowledge of the subject and get examples of succession. Prepare your writing and do not forget to quote your bibliography in APA format.	HE	30	
Made the Activity of HSE	**Optional**		10	
Value: 25%	**Total**			
Feedback:				

DIDACTIC SEQUENCE 8 My Ecological Footprint		
AXIS: Explains the behavior and interaction in chemical, biological, physical and ecological **systems.**		
COMPETENCES TO DEVELOP:		
Disciplinary:	CD1 Establish the interrelation between science, technology, society and the environment in historical and social contexts. CD2. Base opinions on the impacts of science and technology in their daily lives, assuming ethical considerations. CD4. Get records and systematizes information to answer scientific questions, consulting relevant sources and conducting relevant experiments.	
Generic:	CG8 Participate and collaborate in an effective manner in different teams, proposing ways to solve a problem or develop a team project, defining a course of action with specific steps. CG11. Contribute to sustainable development in a critical manner, with responsible actions. 11.1 It assumes an attitude that favors the solution of environmental problems in the Local, National and International areas.	
CENTRAL CONTENT	**SPECIFIC CONTENT**	**EXPECTED LEARNING**
My Ecological Footprint.	What are the human activities that contribute the most to the ecological footprint? What is my contribution to climate change? What can I do to reduce my ecological footprint? How has the growth of the human population and industrialization influenced the environmental impact? Environmental impact and its causes: growth of the human population and industrialization. Climate change and its causes, the greenhouse effect. Consequences of climate change: climate change, sea level change, loss of biodiversity. Ecological footprint, biocapacity, ecological deficit and credit.	Calculate the individual ecological footprint. Identify the factors that exponentiate and impact of human activities on the environment. Develop action strategies to reduce the ecological footprint.

Opening:
Diagnostic Activity. 1: With your own words answer the following questions:

1. What do you understand by climate change?

2. What are the consequences of climate change?

3. Do you think acid rain helps companies dedicated to the production of chemical products?

Development.

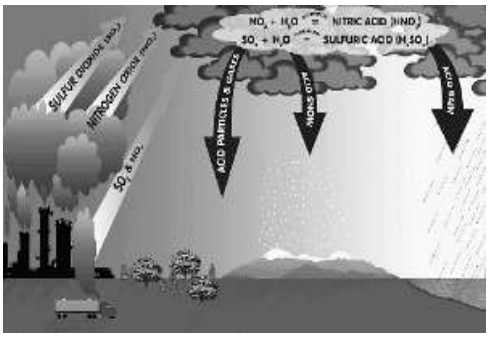
Activity 2. The following topic highlights the main ideas and then makes a synoptic table on Climate Change.

Climate change

Most scientists believe that the most important environmental problem during the 21st century will be climate change. The burning of fossil and natural fuels for energy, as well as the immoderate felling of forests and jungles, are the direct causes of climate change.

Figure 8.1. The consequences begin to be evident, such as the rise in sea level, the melting of polar ice caps, icebergs and icebergs, flooding of coasts and islands, loss of ecosystems, vegetation cover and scarcity of water, among others.

For every ton of coal that is released into the atmosphere, 3.7 tons of CO_2 are produced. The current concentration of this compound is 31% compared to 1750. Methane levels rose by 145% and nitrogen oxide levels by 13.4%. It is estimated that the effect of these increases could last up to 200 years. It is expected that by the end of the 21st century the average annual temperature will rise by more than 2 º C. Climate change is associated with a series of environmental factors and situations, such as:



Acid Rain. This rain has a lower pH than normal or clean rain. It constitutes a serious environmental problem caused mainly by the contamination of fossil hydrocarbons. These pollutants are released when burning coal and oil when they are used as fuel to produce heat, heating or movement (gasoline and diesel).

Figure 8.2. Acid rain is mainly formed by sulfur dioxide (SO_2) and nitrogen oxides (NOx). This usually occurs in high clouds where SO_2 and NOx react with water and oxygen, forming a dilute solution of sulfuric acid and nitric acid. Solar radiation increases the rate of this reaction:

$$SO_3+H_2O \rightarrow H_2SO_4$$

$$2NO_2+H_20 \rightarrow HNO_3 + HNO_2$$

Rain, snow, fog and other forms of precipitation carry these pollutants to the lower parts of the atmosphere, depositing them on the leaves of plants, buildings, monuments and the ground.

Acid rain directly affects the leaves of vegetables, stripping them of their waxy cover and causing small lesions that alter the photosynthetic action. With this, the plants lose leaves and thus, the possibility of feeding properly.

The effects of acid rain on the soil can be increased in forests of high mountain areas, where the fog contributes significant amounts of the pollutants in question.

Greenhouse effect. It is one of the main factors that cause global warming of the Earth, due to the accumulation of greenhouse gases called CO_2, H_2O, O_3, CH_4 and CFC's in the atmosphere. When the infrared radiation hits the molecules of CO_2, H_2O, O_3, CH_4 and CFC's, it is absorbed by them. These molecules that vibrate, move and emit energy in the form of invisible and infrared rays, cause the phenomenon known as the greenhouse effect, which keeps the Earth's atmosphere warm. The radiations bounce between the mixture of molecules that make up the atmosphere until they finally escape into outer space.

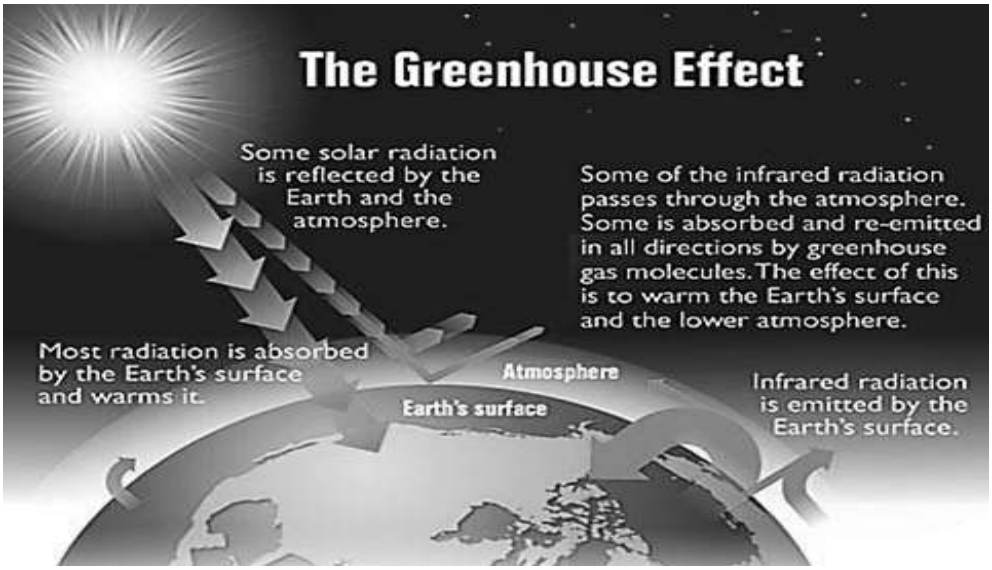


Figure 8.3. Greenhouse effect.

Thermal inversion. It normally occurs on cold mornings over valleys of poor air circulation in all terrestrial ecosystems. The thermal inversion is a dangerous phenomenon for life when there is pollution because when compressing the cold air layer to the pollutants against the ground the concentration of toxic gases can reach up to 14 times more.

Long-term thermal inversion conditions with sulfur dioxide pollutants and soot particles caused the death of thousands of people in London, England in 1952 and in the Ruhr Valley, Germany

in 1962. Generally, the thermal inversion ends (breaks) when the soil is heated and re-emits heat which restores normal circulation in the troposphere, or by the breaking of the smog or contaminants layer itself.

Climate Alterations.

The water expands upon perceiving the intense heat; since it is the oceans that absorb more heat than the mainland. In this way, sea level increases. Thanks to the melting of glaciers and sea ice as a result of excessive heat; sea level is also increased from this perspective. As a consequence of the rise in sea level, floods of all the surrounding populations occur. Sites in which it rains or snows under normal conditions, can get to heat up and with it, dry out completely, as well as lakes and rivers. When decreasing the zones of rain, it is provoking the deforestation and later desertification of the ground. Conditions of strong drought would appear, maintaining the risk of loss for the crops. Water for agriculture; production of food, drink or general use would be limited by atmospheric conditions.

On the other hand, it would also begin the critical extinction of many animal species and vegetation, due to lack of water for their nutrition. Hurricanes, tornadoes, earthquakes and storms caused by the variations in temperature that the planet is exercising drastically and uncontrollably, leading at the same time to the evaporation of water that would take effect much more regularly than normal.

Loss of Biodiversity

Once a specie is extinguished there is no possibility of recovery. The disappearance of natural areas by deforestation, sowing, cattle raising, construction of roads, dams, urban areas and the contamination of oceans and soils cause the loss of biodiversity by eliminating their habitat. Poaching for commercialization of skin, meat or some other derivative, hunting to eliminate species considered "pests", as well as the illegal marketing of ornamental species, have also contributed to the loss of biodiversity.

SEMARNAT reports that at least one in five species has a certain risk of extinction. Of the total of extinct species in the last three centuries, half of them occurred in the last decades. Some of the animals in Mexico that are in danger of extinction are: the harpy eagle, the golden eagle, the gray whale, the pronghorn, the swamp crocodile, the river crocodile, the macaw, the jaguar, the Mexican wolf, the manatee, the spider monkey, the howler monkey, the tapir, the black bear, the anteater, the toucan, seven species of sea turtles, the tigrillo, the white-tailed deer and five species of rattlesnake.

Deforestation

Deforestation is a process fostered by man that began in antiquity with the construction of large population centers. This problem has reached alarming proportions during the 20th and 21st centuries. Agriculture, the immoderate and illegal logging of forests and jungles, livestock, urbanization, the absence of policies of controlled exploitation and conservation, are factors that have contributed to this problem.

Figure 8.4. The loss of vegetation cover causes imbalance of air currents, changes in humidity and in the collection of rain, as well as the adsorption and release of heat. These processes modify the processes that cool the air masses that are in contact with the deforested soil and cause torrential rains that aggravate the problem of soil erosion.

Soil Erosion

Soil degradation affects the entire world, the most serious occurs in America, Asia and Africa as a result of increased pressure for land use, which has caused the regeneration of this resource to be slow or not occur , resulting in desertification.

Lack of Control of Hazardous Waste

The contamination of water, atmosphere and soil is the result of the lack of planning and of global foresight in regard to the disposal of all types of waste. The process of industrialization worldwide has produced an alarming increase in the volumes of waste, being worrisome the lack of information as to what is produced, who produces them, what quantity and what happens with them. Added to this, the toxicity, complexity and chemical heterogeneity of these wastes, as well as the high costs of treatment and final disposal, have caused a negative impact on the environment and human health, creating public awareness worldwide.

The effects of hazardous waste vary considerably with respect to human health, property and the environment. In health there may be temporary effects (nausea, vertigo, headache, etc.) and permanent effects (cancer, disability, death, etc.); the impact depends on the duration and exposure to them.

Figure 8.5. To characterize a hazardous waste it is necessary to know: its toxicity, reactivity, corrosivity and flammability.

From the practical point of view, there are too many compounds and products and combinations of products, for which it is necessary to group them into five categories: 1) Radioactive substances. 2) Chemical Products 3) Biological Waste 4) Flammable Waste 5) Explosives.

With this training you can evaluate the health effects on life in the earth, rivers, seas and the environment in general, which allows determining a better method of handling, storage, treatment and disposal of them.

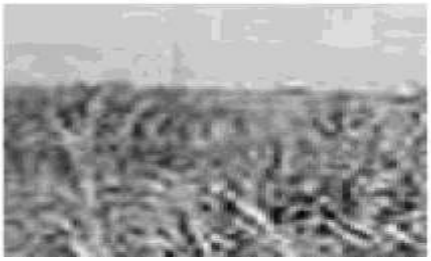


Figure 8.6. The General Law of Ecological Equilibrium and Environmental Protection define as a **hazardous waste** any surplus or residue, in any physical state, which, due to its corrosive, toxic, poisonous, reactive, explosive, flammable, biological, infectious or irritating characteristics, represents a danger to the ecological balance or the environment. According to this definition, practically any substance could be considered dangerous; However, the most important factors for society would be infectious and toxicity.

According to official numbers, the production of hazardous waste in Mexico has been increasing. Thus, in 1986 an annual production of 2,737 million tons was estimated.2 In 1990 it reached 5,657 million tons and for 1995 a generation between 7 and 7.5 million tons per year is calculated.

In Mexico, the problem of hazardous waste is related to the industrial, mining, sanitary and agricultural activity. Residues that, in any physical state, have toxic, poisonous, corrosive, reactive, explosive, flammable, biological, infectious and irritant characteristics that represent a danger to all life forms are considered hazardous. Human activity produces various wastes such as heavy metals, hospital waste, pesticides and many more.

Depletion of the ozone layer

The Mexican scientist Mario Molina and his collaborators received the Nobel Prize in chemistry in 1995. They demonstrated that the ozone layer, which protects living beings from the harmful effects of ultraviolet light, was being affected by chemical compounds such as chlorofluorocarbons, artificial gases, inert, odorless and non-flammable gases, contained in various articles for domestic use.

The destruction of this layer allows ultraviolet radiation of types UV-B and UV-C to reach the Earth's surface, causing from skin burns to cancer of various types and even important genetic changes.

The Shortage or Excess of Water

The main source of water for human consumption comes from groundwater systems located underground. These systems have reduced their burden due mainly to over exploitation and the reduction in their recharge, the latter caused by the effects of deforestation, urbanism and changes in the distribution of rain regimes and amounts of precipitation. To this we can add that in many regions of the world, the dry season is getting longer and longer.

Another important factor that has affected water tables is pollutants, which have been leached from the ground or from surface water bodies. This has caused that a large part of the world's population is consuming non-potable water, whether contaminated by microorganisms, by all kinds of chemical substances or, for both.

Excess water is generated by climate change, precipitation is in a short time and in too much quantity, causing damage mainly in the economically and socially most vulnerable countries, and within these, to the unprotected social classes. It should be added to this that tropical storms and cyclones are more severe.

Figure 3.43. Flood after a rain.

Activity 3. Make a conceptual map according the topic " ecological footprint"

Ecological footprint

The Ecological Footprint is the measure of the impact of human activities on nature, represented by the surface needed to produce the resources and absorb the impacts of said activity. Another definition is the environmental impact indicator that is generated individually, by population or sector, by the consumption of various environmental goods and services. This area referred to is the sum of the productive land (or biocapacity) needed for crops, grazing and urbanized land, fishing areas and the forest area required to absorb the carbon dioxide emissions that the oceans They can not absorb. Both the biocapacity and the Ecological Footprint are expressed in the same unit: global hectares (hag). When the ecological footprint of a region exceeds its biological capacity, this means that it is being used in a sustainable manner.

Biocapacity

It is the capacity of a specific biologically productive area to generate a regular supply of renewable resources and to absorb the waste resulting from its consumption. When the ecological footprint of a region exceeds its biological capacity, it means that it is being used in an unsustainable way.

Ecological deficit

It is the amount of productive land that is missing to meet the needs of a given population and that exceeds the carrying capacity of the area in which they live. Indicates that the community or area is appropriating surfaces outside its territory or is using surfaces of future generations.

Ecological credits

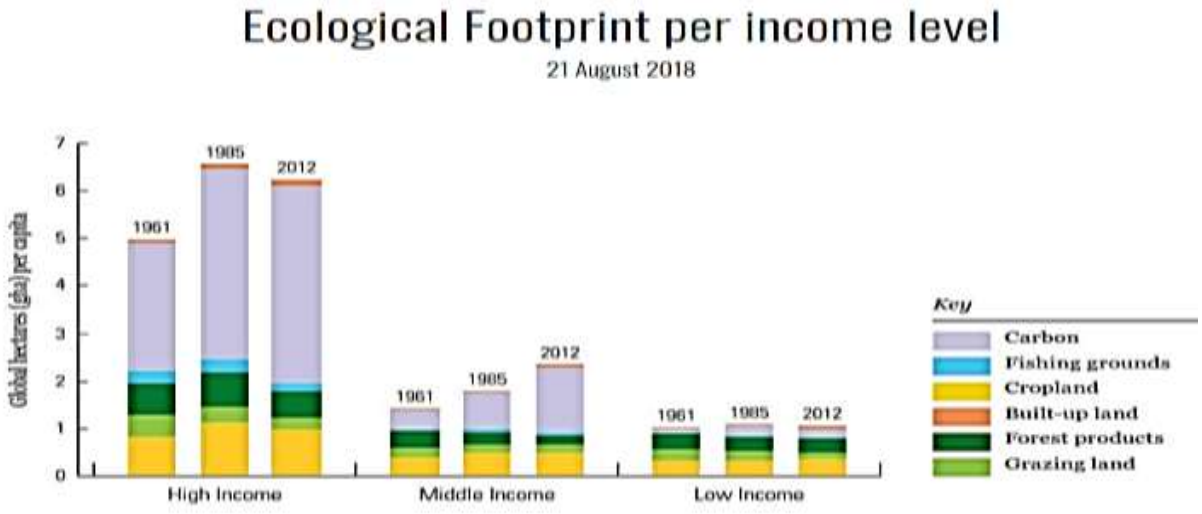
Throughout history, nature's capacity to absorb the impact of human Development has had limits. In the past, pollution and other pressures led, above all, to the deterioration of local environments. But today, in addition, we have forced on a planetary scale the limits of the resilience of nature.

We are eating the planet. This means that our demand for resources needs more than a planet and a half to meet their needs. A study on the subject includes the most up-to-date data of the Footprint revealing that, to satisfy its current needs, humanity is consuming a quantity of natural resources equivalent to 1.6 Planets. If this continues, 2020 will require 1.75 planets and 2.5 planets by 2050. To counteract this trend, we urgently need to improve the way we produce, choose and consume resources, especially in the fields of food and nutrition energy.

The impact of how we produce and how we eat.

The statistical data of the organizations dedicated to the study of the environment show that the current food system is unsustainable. Almost 80% of agricultural land is used for livestock to produce meat and dairy products; However, these animal products supply only 33% of the proteins consumed by humans in the world. Agriculture occupies 34% of the Earth's land area, is responsible for 69% of freshwater withdrawals and, together with the rest of the food system, generates almost a third of greenhouse gas emissions. And the biggest contradiction: while 759 million suffer from malnutrition, the number of overweight people amounted to 1,900 million.

Modern societies base their growth model on fossil fuels. And to think that forty years ago it was said that there was only oil for maximum by 2020 and now we see that they continue to discover new deposits such as those in the Gulf of Mexico.



The graph shows how, regardless of the level of income, countries are following at different rates, a similar development pattern, characterized by the transition from agrarian economies (based on biomass) to industrial economies (based on fuels fossils).

The ecological footprint by countries

According to the study, the countries with the most Total Ecological Footprint are China, USA and India, while those with the highest Ecological Footprint per capita are Luxembourg, Australia and the USA.

The human activities that contribute most to the ecological footprint.

When calculating the ecological footprint, it is possible to know the magnitude with which each Activity contributes to determine its size. We know that at a global level, the area needed for the capture or sequestration of carbon dioxide (CO_2) produced by the burning of fossil fuels, natural gas and coal, is the item that contributes the most to the ecological footprint, demanding little more than 47% of the total area required to cover our needs. This uptake or sequestration of CO_2 is mainly carried out by forests and oceans (even though the contribution of the latter is not accounted for in the ecological footprint), which prevents all this gas from concentrating in the atmosphere and exacerbating the so-called " greenhouse effect". If you want to know more about this effect and climate change, see the Climate change and ozone section. The area required for the sequestration of CO_2 is the component of the ecological footprint that has had the greatest growth in the world: between 1961 and 2003 it grew more than 9 times! Also in Mexico, this item is the most important, contributing with about 46% to the value of our ecological footprint. The capture of CO_2 is followed in its contribution to the ecological footprint, both in Mexico and in the world, the area required by agriculture (which amounts to about 27 and 22%, respectively). Livestock is the third Activity that contributes the most to the national ecological footprint (13%) and is followed by the area we need to extract wood to produce pulp and paper, with about 5%.

The countries with greater industrialization have a greater ecological footprint than the countries in Development, in the same way large cities and with a large number of inhabitants demand more goods and services and therefore will have a greater footprint than rural communities, which have less or very little population and less demand for elementary services.

Within the human activities that increase the ecological footprint in the world are.

1. Burning of fossil fuels, in any of its forms.
2. Fishing, especially for not respecting the closed season.
3. The use of firewood or charcoal (by cutting down trees)
4. Wood as a pulp for the production of paper.
5. Livestock, both intensive and extensive.
6. Agriculture. Above all, by the use of monocultures.
7. Human settlements. That every time they end up with the ecosystem where they settle but also with the surroundings of them.
8. Nuclear energy.

Actions to reduce your ecological footprint

Saving both electricity and gas are necessary to reduce greenhouse gas emissions, it's just a matter of carrying out some simple tasks. Here are some practical tips where we can help protect the environment.

- **Become aware**. Mentalize that every action you do has a consequence.
- **Consider** if you really need what you are going to buy or if there are alternatives.
- **Give maximum life** to your things. Repair things don´t work before you have to throw it away.
- **Walk,** pedal, use public transport. It is not necessary to always use the car.
- **Share your car**. If there is no choice but to drive, share.
- **Reduce waste**. Opt for large containers with few packages. Each of us produces an amount of garbage equal to 10 times our weight each year.

- **Reuse** what you can and recycle. For example, a PET container of purified water can be used more than once.
- **Save energy.** There are low-energy appliances and bulbs that also last longer. Specifically, a low consumption bulb lasts 10 times more than a normal one.
- **Avoid leaving devices on stand-by** or the chargers plugged in, as they continue to waste energy. A device in stand-by is consuming 6.6% of electricity.
- **Save unnecessary water**. A dripping faucet pulls 50 liters of water in a week.

Taken from: http://www.aragonvalley.com/es/10-consejos-para-reducir-tu-huella-ecologica-y-proteger-el-planeta/

The Environmental Impact and its 4 main causes

The **environmental impact** is the adverse effect caused by the industrial development, or infrastructure projects or by the release of substances into the environment. It is the disintegration of the land or the deterioration of the environment through the consumption of its goods, for example, water, air and soil, and the eradication of wildlife. It is characterized as any change or grievance that nature experiences. The ecological effects or degradation caused in the environment has caused a **climate change** and this in turn has generated serious consequences in all living beings.

The **environmental impact** can be seen by long-term ecological effects, some of which can demolish entire environments. An environment is a surrounding where all living and non-living beings are incorporated and related. It is important to know the causes and latent effects in all these changes that have occurred in our environment and what we can do to minimize the damage.

Causes and Effects of the Environmental Impact.

It is important to know the causes and latent effects in all these changes that have occurred in our environment and what we can do to minimize the damage. Below we analyze some causes and effects that have led to a deterioration of our environment**, climate changes** and affecting our quality of life.

Causes of Environmental Impact

The Perturbation of the Earth: One of the most elementary causes in the environmental impact is the damage to the planet earth. Many species of weed plants, for example, garlic mustard, are both strange and intrusive. A break in the environment gives them an opportunity to start growing and expanding. These plants can take over nature, eliminating local vegetation. As a result, a territory is obtained with a solitary plant that predominates and that does not provide a satisfactory food contribution to all environmental life. Complete environments can be finished due to these invasive species, such as, for example, the strangler fig.

Pollution: Pollution can be of various types, air, water, sound, or soil. But no matter what it is, it causes many harmful effects to the environment. If it is about air pollution it infects all the air we breathe, causing severe health damage. In turn, water pollution ends up degrading the quality of it and it is used to drink by the human being. Sound pollution causes irreparable damage to our ears when exposed to loud, loud and continuous sounds. And finally the contamination of the soil, which is usually caused by human activities and ends in the degradation or depletion of the earth's surface. All these types of pollution end causing a **climate change** and greatly affecting the human being.

Overpopulation: Rapid and imminent population growth puts natural resources under stress, and this as a result allows and contributes to the degradation of our environment. Thanks to the best medical facilities, the mortality rate has been greatly reduced and has resulted in an increase in the useful life. However, the fact that the simple population continues to increase means that there is more demand for goods, food, clothing and shelter. So more space is needed to grow food and provide homes for millions of people. Bringing deforestation as a consequence, which is another factor of environmental degradation.

Deforestation: Deforestation is the cutting of trees that is implemented to make way for more homes and industries. This is due to the rapid population growth and urban expansion that are two of the main causes of deforestation. The felling of trees generates the emission of carbon into our atmosphere, thus producing a climate change in our environment. In addition, the use of forest land for agriculture, animal grazing, fuelwood harvesting and logging are some of the other causes of deforestation. Deforestation contributes to global warming since the reduction of forest size returns carbon to the environment.

Effects of the Environmental Impact: the main one is the Impact on human health, followed by Loss of Biodiversity. The depletion of the ozone layer, loss for the tourism industry and also economic impact, for obvious reasons.

Since there are many causes and effects that harm us, we must take serious measures to prevent our planet from being degraded. That's where social responsibility comes in.
Social responsibility is the sensitivity and ethics with which society and companies should behave individually or collectively towards social, economic, cultural and environmental issues; in order to have a positive impact in all the fields mentioned.
We must be very careful because we can contribute to the environmental degradation and climate change that is happening around the world. However, we can take measures to stop it and take care of the world in which we live by providing environmental education and helping people to have **social responsibility**.

Taken from: https://www.geosys.com.pe/impacto-ambiental-4-causas-principales

Closure.

Activity 4. Consult and make your ecological footprint.

DIDACTIC SEQUENCE 8 My Ecological Footprint				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**Points**	**Points obtained**
Opening	**Activity Diagnostic. 1.** Exploratory questions		A u	
Development	**Activity 2**.- From the following topic highlight the main ideas and then make a synoptic chart on Climate Change.		H E	
	Activity 3. Make a conceptual map according the topic of ecological footprint.		H	
Closure	**Activity 4.** Consult and make your ecological footprint.		H E	
Made the Activity of HSE	**Optional**			
Value: 25%	**Total**			
Feedback:				

DIDACTIC SEQUENCE 9 My Water Footprint.		
AXIS: Relates environmental services, the impact generated by human activity and mechanisms for the conservation of ecosystems.		
COMPETENCES TO DEVELOP:		
Disciplinary:	CD1 Establish the interrelation between science, technology, society and the environment in historical and social contexts. CD2. Base opinions on the impacts of science and technology in their daily lives, assuming ethical considerations. CD4. Get, records and systematizes the information to answer scientific questions, consulting relevant sources and performing relevant experiments.	
Generic:	CG8 Participate and collaborate in an effective manner in different teams, proposing ways to solve a problem or develop a team project, defining a course of action with specific steps. CG11. Contribute to sustainable development in a critical manner, with responsible actions. 11.1 It assumes an attitude that favors the solution of environmental problems in the Local, National and International areas.	
CENTRAL CONTENT	**SPECIFIC CONTENT**	**EXPECTED LEARNING**
My Water Footprint	Why is water so important for my life? For what use water in a day? What would happen if there was no water to drink and for domestic use in my community (home, school, work)? How big is my ecological footprint and how can I reduce it? What are the sources of contamination of the different bodies of water (rivers, hydrological basins, aquifers, seas)? Importance of water for life. Uses of water. Overexploitation of fresh water sources. Water contamination. Water treatment. Water for food production. Personal water footprint and by nations. Saving water.	Calculate the individual and nation's water footprint. Identify the water sources that exist in your region, noting the impact they have as a result of human activities. Propose strategies to solve problems that favor the sustainable use of water sources in the region.

Opening.

Diagnostic Activity 1: List daily activities in which water is needed and then write a reflection about the importance of water for living beings and the actions you know for reuse in at least 5 lines. Comment the contributions of the students in plenary.

DEVELOPMENT

Activity 2: Make the reading "the importance of water" and identify the main topic, subtopics and concepts and write them down in your notebook.

Importance of Water in Ecosystems.

For the ecology, water has a double value, on the one hand it is an element of the ecosystem and is consequently a social asset, on the other it is a generator of ecosystems. The ecological function of water has two fundamental aspects: a) Maintenance of the ecosystems that are its own. b) Vehicle transport of nutrients, sediments and life, is a common good whose respect must be reconciled with the sustainable development of human activities on earth.

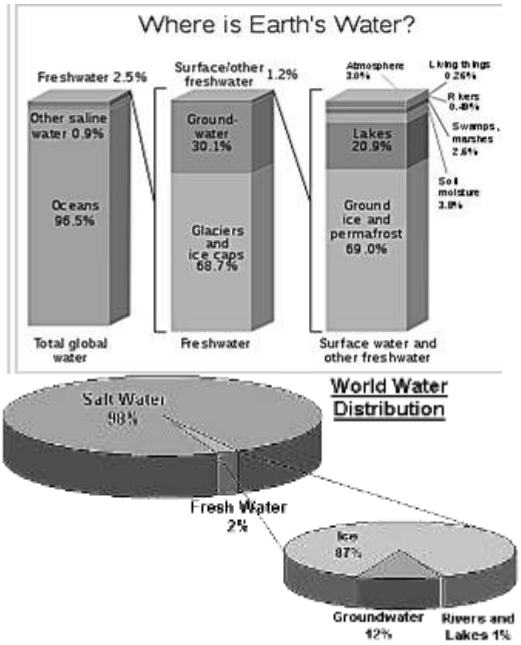


Figure 9.1. Distribution of water in the world.

Although 70% of the surface of our planet is covered by water, only 2.5% of the total of this vital liquid is sweet, the rest (97.5%) is salt water. Now, not all fresh water is available, most of it is frozen in the polar ice caps and in the high parts of the mountains; a significant amount is located at depths that until now have been inaccessible. We only have 0.55% of the total fresh water and 0.01% of the total of the planet to supply the ecosystems and the human population.

The distribution of rainfall varies with the time of year, in few places in the world precipitation is distributed evenly. This causes a dry season during part of the year; in many places this season is prolonged and the amount of precipitation is extremely low, for example, in the deserts.

From the biological and physical-chemical point of view, water is the most important component of the universe, it represents 70% of any organic structure, and therefore it is part of our environmental environment and indispensable element for life in all its orders. In the human organism, water is 70% of our physical component, in children this proportion is accentuated up to 80% and, as we all know, we can not survive many days without the necessary water intake, because, although the organism conserves the water by means of a very sophisticated system in the kidney, in the perspiration and in the breathing, the normal losses caused by the thermal differences are enough for dehydration to occur and even death.

The water is in continuous movement through the hydrological cycle, it evaporates mainly from the oceans, lakes and rivers, to later precipitate on the continents. They receive more water through precipitation than they lose in the form of evaporation, which results in the formation of streams, rivers, recharge of aquifers and contribution to the oceans. The water flow corresponding to the previous runoffs is 40,000 km^3 / year, of which only 14,000 km^3 / year are available for the different 94 uses (urban, agricultural, industrial). This flow gives us a global average value of 2,000 m^3/ year per capita, amount that with a rational and efficient use could be sufficient for all our activities

.

The phenomenon of the hydrological cycle, essential for the subsistence of all beings is alive of the planet. It generates, among others, two great benefits: a) the transport of water from the oceans to the continents and b) the desalination of sea water, transforming it into fresh water. These two processes, not spontaneous in their thermodynamic nature, exist due to the absorption of solar energy in the oceans. Therefore, by means of solar energy, large continental extensions count on the availability of the vital liquid. However, not all territories have the same fate and, due to population growth and the increase in industrial and agricultural activity, the original availability is decreasing in many places. The energy absorbed by water represents the most important factor for its availability in society and ecosystems.

Water consumption

The demand for water has grown too much during the last 100 years, due to the explosive growth of the population. In the last century the demand went from 800 km3 to 4000 km3 per year. As if this were not enough, availability dropped to one third of what was in the 70s. It is estimated that if the problems related to the availability and supply of water are not remedied, in the year 2025 two thirds of the population of the world will live in countries with insufficient water resources. The decrease in the availability of water and its contamination causes health problems in the human population, limits agricultural development and causes irreversible damage to ecosystems.

65% of the world's fresh water is used in agriculture, 10% is domestic and municipal consumption and 25% in industry. It is important to point out that the agricultural use of water, despite being necessary and justified, requires improving efficiency, obsolete irrigation systems cause 55% of the water used to be wasted. Consumption by the industry grows rapidly, it is estimated that it may soon reach 34%, at the expense of volumes for agricultural and domestic use.

In these circumstances many regions of the world have reached the limit of water use, which has led them to overexploit surface and underground water resources, creating a strong impact on the environment.

Figure 9.2. Rolled irrigation is the least efficient of the systems.

Water in my life.

Some of the functions of water in the human body are among others: It allows the circulation of electrolytes. Water is the means for electrolytes to circulate in the body. Electrolytes are minerals such as sodium, potassium, chloride, magnesium, and calcium, which help in the transport of glucose and amino acids in cell walls. Balances the pH of the body. Due to its chemical characteristics, the water is neutral or pH 7.0. The concentration of hydrogen in the body creates an acidic environment in the blood and organs. Water allows free hydrogen ions to move freely in and out of the blood and cells and keep the pH around 7.4. Regulates the temperature. Water has the chemical property that allows it to be able to absorb and release heat to maintain the temperature of the environment in which it is located. The body temperature should be maintained in a very narrow range of 36.1 ° C to 37.2 ° C and the water removes excessive heat from the body through the evaporation of sweat.

Activity 3.- Read the topic My water footprint and create a glossary of the vocabulary mentioned.

My water footprint

The Water Footprint is the volume of fresh water consumed, used and contaminated directly by the daily activities we perform, plus the volume of water used in the production of the goods and services we consume (virtual water footprint).

The Water Footprint is composed of two dimensions: the Direct Water Footprint and the Footprint Indirect Water, and in turn each one includes three types of footprint: Blue, Gray and Green:
* Blue: volume of water that evaporates, enters or is lost from the basin.
* Gray: volume of water necessary to assimilate the pollutant load of the wastewater generated, according to acceptable parameters of local regulations.
* Green: volume of water consumed in agricultural products.

Overexploitation and Water Pollution

Figure 9.3 Water sources, the springs, the basins or streams are in an accelerated path of extinction, there are changes in climate and soil, floods, droughts and desertification. But human action is the most drastic: it exerts delirious deforestation, it ignores traditional knowledge, especially of local indigenous communities, it removes water from rivers in different ways, among others with engineering works, dams and detours.

Faced with a situation of water scarcity, the threat looms over three fundamental aspects of human well-being: food production, health and political and social stability. This is even more complicated if the available resource is shared, without considering the ecological aspect.

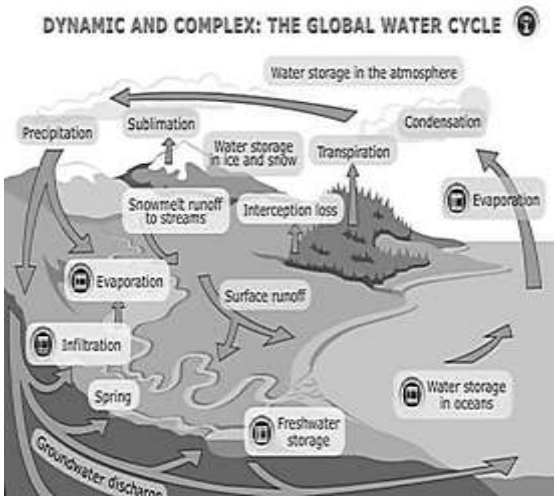


Figure 9.4. The depletion of groundwater is the hidden threat to food safety.
The food supply of many countries in Development depends on the groundwater that is used for irrigation. If that resource is not managed more sustainably, some of the most populated areas of the world may have to face a deep crisis in the future.

In the countries in Development, groundwater has become the main support of agrifood activities. However, this valuable resource is not being used in a sustainable manner. In countries where groundwater is relied on for irrigation, excess water extraction is causing groundwater levels to fall at a very alarming rate.

The three main problems that characterize the use of groundwater: depletion due to excess extraction of this resource; floods and salinization caused by insufficient drainage; and finally, pollution, due to intensive agricultural, industrial and other activities.

In Mexico, 100 of the 617 aquifers are overexploited and many are contaminated by wastewater discharges. The most critical aquifers are the Valley of Mexico, the Lerma Basin and the La Laguna Region. In addition, practically all important surface water bodies in the territory are contaminated, mainly by pesticides, fertilizers, heavy metals and other toxic substances, organic matter and pathogenic bacteria. We must not forget that the oceans receive all the waste that the rivers collect in their journey.

The decrease in water availability per capita and its pollution causes health problems in almost all countries, limit economic and agricultural development and produce irreversible damage to ecosystems.

Figure 9.5. The diversion of river beds due to large infrastructure works has destroyed entire ecosystems, such as mangroves and other coastal wetlands. The alteration of ecosystems

The result of deforestation has a serious impact on water processes. When there is no vegetation the rivers and springs dry up and the erosion of the soil that produces this loss of vegetation leads to the rivers and lakes becoming silty.

Figure 9.6. The current urban lifestyle and the excessive consumption of water in agriculture have led to overexploitation of aquifers formed over millions of years. To make matters worse, a high proportion of the water that is returned to nature is contaminated, mainly because it is used as a means of transporting waste. Therefore, in the world 4 out of 10 people drink and bathe in polluted water.

Proposals to solve the water problem

- There is a lot of work to be done to reduce consumption in all areas, but mainly in those with the highest percentage of expenses. Therefore, national policies on sustainable water management must include some of the following actions:
- · Promote a social culture of water, to assess it and understand its importance and the risks of its inappropriate use.
- · Define clear and long-term policies that guarantee the public interest in the use of water and ensure the conservation of natural ecosystems.
- · Adapt the laws and strengthen the institutions that administer water, guaranteeing the participation of society.
- · Create technologies appropriate to the conditions of each country and region.
- · Change the forms of production to reduce water consumption and eliminate the release of pollutants to water bodies.
- · Caring for the natural processes that allow the replenishment of water resources.

Tips to save water at home:

- **Shower instead of bathing.** A shower means an average saving of 400 liters per day and home.
- **Do not leave the tap open when brushing your teeth or shaving.** With this usual practice, up to 30 liters per person per day are wasted.
- **Do not keep the tap open when washing dishes.** It is better to fill the pile and wash the dishes in it.
- **Reuse water.** Try again to use water that is not dirty for other actions, such as, for example, the water in your children's bathroom can be used to scrub the floor.
- **Rationalize irrigation.** You can do it by taking advantage of rainwater or by establishing drip irrigation systems.
- **Be careful with leaks in the bathroom and kitchen.** It is necessary to check the taps and the urinary elements every so often because with the use they can appear small leaks that generate important losses of water and money after the time.
- **Change your traditional appliances for those with the A +, A ++ or A +++ label. S**pecially, the washing machine and the dishwasher. This type of appliance saves 50% of water consumption thanks to its economic systems and its half load programs.
- **· Install thermostatic or electronic taps in the kitchen and bathroom.** These systems make the use of water rationalized by regulating consumption.

- **Place aerators or flow reducers in the taps.** This will make them spend less when we have to use them.
- **Do not abuse detergents, bleaches or polishes.**
- **Defrost in the refrigerator, not in the water jet.**
- **Recycle used oil** and do not pour medicines or other substances that contaminate the water through the sink or bathroom.
- **Choose plants with sustainable** growth appropriate to the climate in which you live.
- **Install a rainwater tank.**

Water pollution

According to the World Health Organization, water acquires the category of contaminated when it can not be consumed by man or animals, whether or not it is potable. The problem of contamination arises when these substances are excessive and the self-cleaning system is unable to dissolve the different pollutants. In this way, the water is contaminated and can not be apt to develop any human activity.

The 10 most common causes of water pollution

1. **Oil.** Many claim that it is the engine of humanity. Although in decline, oil is still one of the most powerful tools in the manufacture of dozens of products derived from it, as well as being a highly valued natural product. Added to all this, oil is extremely polluting, being one of the most lethal when it is poured into aquatic bodies, killing all the fauna and flora present and generating damage for many years in the affected area.

2. **Wastewater.** Very common, especially in developing or underdeveloped countries, is that all waste coming from wastewater from households and industries is discharged into rivers and lakes without any treatment. This turns the urban and suburban aquatic bodies into huge landfills, that is, sewer channels. The fauna and flora, as well as the entire ecosystem of these hydrographic bodies are eliminated. The sea is also affected since later these rivers and lakes flow into it.

3. **Chemical products.** Most of the factories work with different chemical products, waste from which they are discharged through the different existing mechanisms. One of the most lethal is to dump this waste to different aquatic bodies, because they damage large areas of water and prevent their consumption, poisoning the species that live there. Some of these products can be pesticides, or detergents.

4. **Heat.** It also applies as water pollution the fact of pouring substances into water that are at high temperatures. This generates that the aquatic temperature changes abruptly, being able to generate alterations in the currents and the death of the living beings that live under the water. Generally, these substances, besides the heat, contain different elements and materials that contaminate the water.

5. **Mining waste**. Mining is one of the most lethal activities for the environment in general. Water is not the exception, because in many occasions mining is done on rivers, adding chemical elements that irreparably pollute the waters. For example, sulfuric sulphide is often added to water, which forms sulfuric acid with water and causes copper to emerge. These actions are very frequent in underdeveloped countries where illegal mining is institutionalized.

6. **Noises**. Water pollution is not only understood as a spill of liquid or solid in water. Sonic pollution is a very widespread form of pollution, which is also applied in aquatic spaces. The noise emitted by oil or gas platforms, the construction of ships or other activities that take place on the high seas seriously affect marine fauna, with special emphasis on echolocation animals such as dolphins.

7. **Pathogenic agents**. The marine fauna of each region and zone is its own and native. When, through contamination practices, pathogens are introduced into the water, such as bacteria that can be protozoa, parasites, among others, they can radically attack the existing fauna and flora, besides making it impossible for the affected water to be suitable for human consumption. These bacteria are found in feces, as well as in food processing waste.

8. **Sediments.** When large-scale constructions are carried out, sediments always occur. These, when they are dragged towards the aquatic bodies or intentionally discharged into them, inevitably contaminate the surface, adding remains of debris that are very difficult to dilute, as well as seriously damaging the flora that can be found on the seabed, river or lake.

9. **Plant nutrients** Although they may seem harmless, plant nutrients are also one of the main water pollutants. This is because the nutrients can accelerate the growth of aquatic plants. When the life cycle of the plants is accelerated, the existing oxygen is reduced and the water acquires bad odors and later it can not be used by animals or humans.

10. **Fats and oils.** This is one of the most visible types of aquatic pollution, because it is located on the surface of the same, where fats and oils accumulate. The presence of these elements interferes in the development of the relationship between water and air, decreases the existing oxygen and absorbs the radiation emanating from the sun, affecting aquatic life.

Taken from: https://www.lifeder.com/contaminantes-del-agua/

Activity 4.- Check the water footprint and make yours. Make your report and do not forget to write the source you consulted.

Water treatment and its different methods

The waters that receive treatment can be industrial, urban and even of the same nature, since it can contain chemical compounds not suitable for health.

The waste water that is treated can be used for human consumption, irrigate crops, in the industry as virtual water or simply to reinsert it into water courses without contaminating it, thus having a constant recycling.
The water treatment has different methods that are used depending on the use that you want to give the water. Here are some methods or types of water treatment.

Primary roughing method. Pollution is one of the most common wastewater problems of urban origin and the primary roughing method manages to leave plastics, bottles, papers and others in a container. It is made by means of medium-sized grids, through which the water is passed, eliminating the large elements.

Filtered by membranes. Membrane filtration is a method of water treatment that causes water to pass through filters of different sizes, eliminating undesirable components. Filtration membranes are usually cataloged according to their size.

Inverse osmosis. Also called hyperfiltration, being a type of membrane with open pores with size of 1 to 10 angstroms, the pressure that is exerted on the water causes it to pass through the membrane, retaining the dissolved salts, leaving it free of them.

Nano filtration. Mostly this type of filtration is used in industrial processes, the size of the pores is 10 to 100 angstroms, the water treatment causes the nano filtration to separate organic substances such as dyes from water.

Ultrafiltration The size of the pores is smaller ranging from 0.01 to 0.1 microns, in this type of filtration it is possible to eliminate bacteria and viruses effectively.

Micro filtration The pores range from 0.1 to 1 micron and eliminates the viruses and bacteria that ultrafiltration failed to retain.

In Mexico, biological methods are mainly carried out that involve aerobic or anaerobic processes depending on the characteristics of the treatment plant, being the most common those that carry out purification processes through the technique known as activated sludge. But it will also depend on the dispositions of the region where the treatment plant is located, but in all cases it is possible to achieve a very acceptable level of purification. But above all, it will depend on the purpose for which it is desired to provide this decontaminated water.

Closure

Activity 5. Investigate the different methods that exist for the treatment of wastewater and for human consumption. Make your report and do not forget to write the source that you consulted, in APA format.

DIDACTIC SEQUENCE 9 My Water Footprint				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**points**	**Points obtained**
Opening	**Diagnostic Activity 1:** List Everyday activities		A u	
Development	**Activity 2:** Make the reading the importance of water and identify the main topic, subtopics and concepts and write them down in your notebook.		H E	
	Activity 3.- Read the topic My water footprint and create a glossary of the vocabulary mentioned.		H E	
	Activity 4.- Check the water footprint and make yours. Make your report and do not forget write the source you consulted.		C O	
Closure	**Activity 5.** Investigate the different methods that exist for wastewater treatment and for consumption human. Make your report and do not forget Write the source you consulted, in APA format.		H E	
Made the activity of HSE	**Optional**			
Value: 25%	**Total**			
Feedback:				

UNIT III

UNIT 3

Ecosystems and Human Activity

<table>
<tr><td colspan="3">DIDACTIC SEQUENCE10
Environmental services</td></tr>
<tr><td colspan="3">AXIS: Relate environmental services, the impact generated by human activity and mechanisms for the conservation of ecosystems</td></tr>
<tr><td colspan="3">COMPETENCES TO DEVELOP:</td></tr>
<tr><td>Disciplinary:</td><td colspan="2">CD2. Base opinions on the impacts of science and technology in their daily lives, assuming ethical considerations.
CD4. Get records and systematizes the information to answer scientific questions, consulting relevant sources and performing relevant experiments.</td></tr>
<tr><td>Generic:</td><td colspan="2">CG8 Participate and collaborate in an effective manner in different teams, proposing ways to solve a problem or develop a team project, defining a course of action with specific steps.
CG11. Contribute to sustainable development in a critical manner, with responsible actions.
11.1 Assume an attitude that favors the solution of environmental problems in the Local, National and International areas.</td></tr>
<tr><td>CENTRAL CONTENT</td><td>SPECIFIC CONTENT</td><td>EXPECTED LEARNING</td></tr>
<tr><td>The goods and services that I obtain from ecosystems</td><td>Where do the foods I eat come from?
What benefits do I get from nearby ecosystems?
What are services environmental
What would happen to the quality of the air if all the green areas of my locality and my surroundings disappear?
What can I do to preserve the natural ecosystems of the region where I live?</td><td>Appraise the environmental services provided by ecosystems and the consequences of their loss or alteration.</td></tr>
</table>

Opening:

Mexico is characterized by its gastronomy, being one of the richest in the world. It has its origins in the indigenous and Spanish culture and is characterized by a wide variety of strong flavors, spicy, condiments, cocoa, beans, corn, avocado, cactus, meat as beef, pork, birds, reptiles and insects. Perhaps the best known dish is the taco.

Activity 1: Reflect in a group on the following questions and write a conclusion in your notebook.

1) What are the typical foods consumed in your region?

2) Where do the items you consume come from?

3) Do you know what the environmental services are? Mention them.

4) Do you know what ecosystem is present in your region? Mention them.

Development:
Activity 2: Read carefully the following text and use a map of the Mexican Republic where you indicate its main ecosystems.

The diversity of ecosystems and biological diversity that occur in Mexico places us among one of the twelve most mega-diverse countries that exist. In its 11 kilometers of coastline can be included so many marine ecosystems, such as terrestrial, For example, coral reefs, lagoons, and estuaries where they conclude fresh water from the rivers and salt from the sea. In the interior of the continent we find deserts, temperate forests, coniferous forests, mixed forests, jungles, bushes, and pastures.
This diversity of ecosystems is a key element that explains the reason for the diversity of species and with it the great gastronomic richness. It is the agricultural and fishing sectors that maintain vegetative diversity and animals for human consumption in life, from where we obtain meat, fruits, cereals and vegetables, the materials from which clothes, furniture, etc. are made. That is, plants and animals give us most of the raw material of the products we need to live as food, fibers, building materials, chemical compounds, medicines, among others.
However, even though we have a great diversity of consumable species that would make us self-sufficient, nowadays food imports are increasing exponentially. Its cost is higher, the profits to our farmers and ranchers is lower, coupled with the large number of kilometers that the product has to travel before we can acquire it, causing the emission of tons of CO2 that contribute to climate change. Hence the importance of consuming local products, and seasonally obtaining products of higher quality, and 100% natural.

Activity 3: Make an illustrated synoptic chart where you indicate the different environmental services.
At the end write a conclusion where you indicate how we can take care of the environmental services provided by your community.

Environmental services:

Water, wood, medicinal substances, objects produced by nature that are used by humans are called environmental goods because they are the result of nature itself. Environmental services are those functions of the ecosystems that generate a benefit and well-being for people and communities.
We know the goods and services that we obtain from our natural environment as Environmental Services, and their proper functioning depends on the flow of energy and movement of matter. These environmental services are classified according to their use as follows:

Support services: They maintain the processes of the ecosystems allowing the provision of the rest of the services such as care of biodiversity, nutrient cycle, polymerization, biological control, etc.

Regulating services: They maintain the processes and natural functions of the ecosystems regulating the conditions of the human environment.
Supply services: Maintains the supply of consumable products by the population such as food, water, oil, etc.
Cultural services: These are purely cultural and recreational benefits that allow socio-cultural and religious development and determine the way in which we interact with our environment and with other people. Among them we find the beauty of the landscape, education and belonging.

Gas regulation	Regulates air quality
Water regulation	Water storage
Water supply	Water treatment
Climate regulation	Record of global, regional and local climatic conditions
Waste treatment	Some ecosystems such as wetlands filter effluents, decompose waste by biological Activity eliminating pathogens
Preventing riots.	Moderation of external events, such as hurricanes, earthquakes, tornadoes, etc.

Read text of air quality and green areas.

Air Quality and Green Areas:

Human activities generate waste that is released to the environment, including those that go to the atmosphere and deteriorate the quality of the air we breathe, other activities cause deforestation or felling of trees destroys green spaces and natural areas causing an increase in temperature and they create a dry climate generating a climate change, the thinning of the ozone layer, acid rain and thermal inversion.

The main causes of air pollution are related to the burning of fossil fuels such as oil, gas, and oxides of carbon, nitrogen and sulfur released mainly by transport, factories and electricity production centers. Throughout history, man has been affected by the production of fumes that are released when burning fuels. As the big cities grow and develop, and the industrial revolution appears, air pollution causes greater havoc in the population. There are some countries that generate more pollutants than others, occupying the first places the great powers such as the United States, China and the European Union. Mexico currently occupies (2018) the number 14 in the emission of greenhouse gases.

The progress and development of the cities, as well as the population growth, and the lack of awareness of the citizens in the care of the environment bring environmental pollution and the loss of green spaces independent of the area that is inhabited, either rural or urban, The loss of a certain species can cause an imbalance in the ecosystem causing an impact to each of the different elements of that ecosystem altering the living conditions of society.

Air pollution negatively affects the health of individuals especially at the respiratory or pulmonary level, and cardiovascular. Among these diseases we can mention respiratory diseases such as bronchitis and asthma pneumonia, viral diseases such as yellow fever and hepatitis, as well as lung cancer, among others.

To know if the air quality is good there is an atmospheric monitoring network present in the country. The concentration of the contaminants in the air is obtained by taking the sample from it that is analyzed and processed and expressed in units of IMECA (Metropolitan Index of Air Quality). Their values establish the limits of air quality to protect the health of the population, indicating as:

- Good from 0 to 50 IMECAS
- Regular from 51 to 100 IMECAS
- Bad from 101 to 150 IMECAS
- Very bad from 151 onwards

It is of vital importance to preserve the green areas to such an extent that it is affirmed that the future of humanity depends on the number of trees we plant today. The green areas contribute to the assimilation of atmospheric pollutants, prevent the erosion of soils, facilitate the infiltration of water, muffle noise, improve the landscape, provide oxygen.

The challenge we face today is to manage a sustainable environment that reduces pollution and conserves the ecological balance. For this, it is required:

1) Reduce energy consumption
2) Reduce the use of transport, thereby avoiding high fuel consumption.
3) Choose the consumption of local products
4) Reduce the use of non-returnable packaging, recycling and minimizing the use of plastic bags and containers.
5) Use the really necessary water.

Activity. 4: Make an essay after researching and reflecting on

1. What are the environmental services that you commonly use?

2. What would happen to the quality of the air if all the green areas of my locality and my surroundings disappear?

3. What can I do to preserve the natural ecosystems of the region where I live? Write your conclusions in the notebook

Closure

Activity. 5: In the following table, mark with a cross who are bines and who are environmental services

	ENVIRONMENTAL GOODS	ENVIRONMENTAL SERVICES
Water for domestic use		
Food of animal origin		
Scenic beauty		
Water catchment		
Disease Control.		
Pest control		
Flood control		
Culture		
Atmospheric carbon fixation		
Firewood and coal		
Freedom of belief		
Wood		
Water supply and quality		
Landscaping		
Medicinal plants		

Plants and fruits		
Production of biodiversity		
Soil protection with nutrient fixation		
Climate regulation		
Forest seeds		

Conclude the theme indicating what are the environmental services that you use every day and what is important in the Social Development.

DIDACTIC SEQUENCE10 **Environmental services**				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**points**	**Points obtained**
Opening	**Act. 1:** Questionnaire		A U	
Development	**Act. 2** Map of the Mexican Republic. Recognize the ecosystems of your locality and country where you live.	HE		
	Act. 3 Illustrated synoptic picture Describe environmental services and how you can take care of them	HE		
	Act. 4: Essay Recognize the importance of conserving green areas and the consequences of their loss.	HE		
Closure	**Act. 5** Table of environmental goods and services Recognize the difference of environmental goods and services and their importance in social development.	COE		
Made the activity of HSE	**Optional**			
Total **Value: 25%**				
Feedback:				

DIDACTIC SEQUENCE11 **Deforestation and its causes**		
AXIS: Relate environmental services, the impact generated by human activity and mechanisms for the conservation of ecosystems		
COMPETENCES TO DEVELOP:		
Disciplinary:	CD2. Base opinions on the impacts of science and technology in their daily lives, assuming ethical considerations. CD4. Get records and systematizes the information to answer scientific questions, consulting relevant sources and performing relevant experiments.	
Generic:	CG8 Participate and collaborate in an effective manner in different teams, proposing ways to solve a problem or develop a team project, defining a course of action with specific steps. CG11. Contributes to sustainable development in a critical manner, with responsible actions. 11.1 It assumes an attitude that favors the solution of environmental problems in the Local, National and International areas.	
CENTRAL CONTENT	**SPECIFIC CONTENT**	**EXPECTED LEARNING**
The goods and services that I obtain from an ecosystem	Deforestation and its causes: agriculture, livestock and urban planning Situation of the main Deforested ecosystems: temperate forests, mangroves and tropical forests Desertification and its causes: felling, agricultural overexploitation and overgrazing	Identify natural areas protected from their region, state and nation and the resources that contribute to their conservation

Opening:

Did you know that the tallest tree in the world lives in Canada and is called Hyperion which means "the one that looks from above" as it reaches 115.55 meters in height and is about 700 to 800 years old, while the tree with the largest diameter in its trunk is the Tule reaching 14 meters and under its shadow could fit approximately 500 people.

Native trees of Nuevo Leon have very special characteristics since they are long-lived, resist adverse weather conditions, resist pests and support wildlife. Among them we find: Encino evergreen, Oak Encino, Sycamore Poplar, Ash Tree, Nogales, Sabino, Anacahuita, Huizache, Mesquite among others.

Activity 1: Locate in your community any of these trees and describe their characteristics such as shape of the leaf, height, diameter of the trunk, whether or not it has flowers, such as its seed, etc. Share your observations with the group's colleagues and submit an illustrated report of the investigation.

Development:

Activity 2: Read carefully the topic of deforestation and answer the guiding questions.

Deforestation:

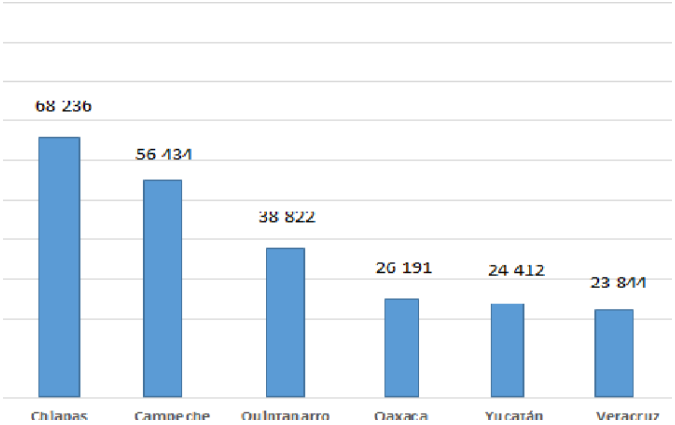
Deforestation is the loss of tree vegetation caused mainly by human activities. Its main causes according to the order of importance are:

1. Generation of larger tracts of land for agriculture and livestock.
2. Immoderate felling of trees for commercial purposes.
3. Forest fires
4. Construction of more urban and rural spaces
5. Pests and diseases of trees.

There are five countries that comprise more than half of the total forest area: Russia, Brazil, Canada, the United States and China.

Worldwide, it is considered that 13 million hectares of forests have been lost per year due to natural causes between the period of 2000 to 2010 and 16 million hectares per year due to human activity.

According to a report in the newspaper Excelsior, deforestation in Mexico in 2017 resulted in losses of 274 thousand 183 hectares of forest, due to the advance of the cattle and agricultural frontier, showing the states of the country with the greatest loss of forest cover in the following chart.



Agriculture, livestock and urbanism are the main causes of deforestation of forests, the land has been forced to comply with commercial crops activities where there are no climatic conditions or the contribution of useful nutrients for the development of crop by what cause the impoverishment of minerals and nutrients of the earth. In the same way, cattle ranching occupies large areas of forested areas for grazing, so they have cut and deforested. Finally, urbanism absorbs natural green areas, rural areas and cultivation areas for the construction of houses and roads.

The main consequences of deforestation are:
1. Soil erosion
2. Climatic disorders
3. Reduction of biodiversity
4. Global warming
5. Loss of goods and services

Some ecosystems have been mostly affected by deforestation, among them we find temperate forests, mangroves and tropical forests.

Temperate Forests:
They are characterized for being the most populated areas since they have a pleasant climate of summers with warm temperatures and very cold winters and precipitations all the year. Coniferous trees and deciduous shrubs predominate, that is, they show leaf fall during the dry seasons. The fauna is made up of quail, owls, eagles, reptiles and mammals such as white-tailed deer rabbits, hares, foxes, etc.
The soils of temperate forests are deep and rich in organic matter, their soils are the basis of raw material production, so they have been subjected to intense degradation due to urbanism, because due to their climatic conditions and productivity they are the most attractive ecosystems so that the population can live and enjoy their goods and services more comfortably, however, such urbanism, agricultural and livestock production, cause destruction and reduction of fertility and little by little we are destroying this ecosystem.

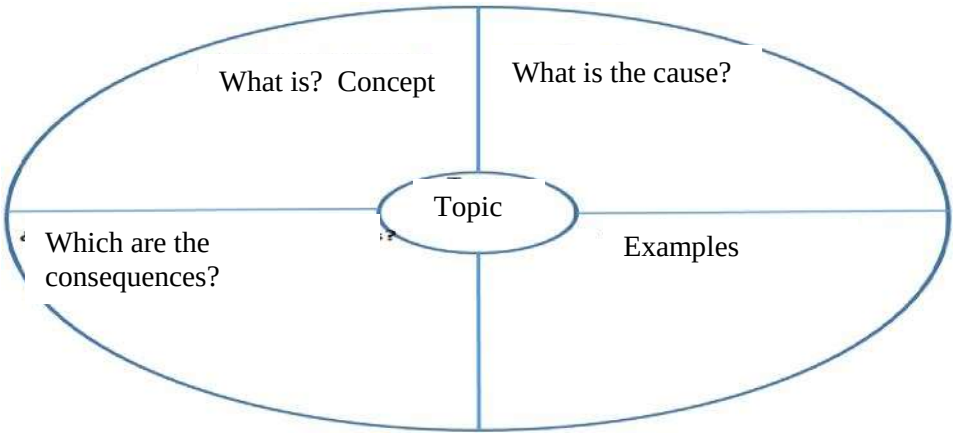
Mangroves:
The word mangrove comes from the Guarani Indians, and means "twisted tree". Mangroves are areas that develop in lagoons, banks and tropical coasts that are in contact with waters of marine and sweet origin at the mouths of rivers. Its climate is tropical, with a high production of organic matter, its flora is adapted to tolerate high levels of salinity, so the trees have aerial roots in the form of stilts which allows them to anchor in the soil, their seeds are floating and They have specialized structures that allow the exchange of gases in anaerobic soils. Its fauna includes species of fish, mammals, molluscs, crustaceans and birds. It has a great ecological importance because they provide great environmental services such as:

a) Food and medicine supply service
b) Support service with coastal protection and nutrient cycling.
c) Cultural services with transport in estuary networks, are visited by tourists and generate economic resources.
d) Climate regulation services because it captures greenhouse gases, while absorbing, storing and releasing carbon. Stabilizes the climatic conditions of precipitation and temperature. Its preservation is vital to mitigate the negative effects of global warming.

Rain forest:

The rainforest is characterized by a warm, humid climate with rainfall almost all year round. This biome is located between the tropics and the equator. Its flora and fauna is very dense, and corresponds to 60 and 80 species of plants and animals known worldwide. There are abundant tree species such as rubber, wild bananas and cacao, which coexist with thousands of species of plants with flowers, plants epiphytes (plants that grow on others) stranglers and climbers. Its fauna hosts thousands of bird species, amphibians, reptiles with a wide variety of snakes and mammals among which we can find bats, monkeys, sloths, leopards, etc. As well as a wide variety of insects.

The deforestation and devastation of the forest is caused mainly by the increase in population density and human activities. In Mexico, around 90% of its forests are lost, although this biome remains an important reservoir of biodiversity and its restoration and care is sought in Veracruz, Tabasco, Campeche, Chiapas, Yucatan, Quintana Roo, and parts From Oaxaca.



Analyze the graph of the entities with the greatest deforestation and mention

What is the state of greatest deforestation in Mexico?

Reflect: How can the conservation of ecosystems in your community bring benefits to the population?

Desertification and its causes:

Desertification is the process of degradation of the soil until it partially or totally loses its capacity for agricultural production or cultivation, turning it little by little into something similar to the desert. This is due to intense soil erosion, excessive grazing or a prolonged drought due to climate variations.
This phenomenon is increased by human activities when wanting to adapt sectors of land in cultivation areas, not being these agricultural lands. As a result of these actions we observe the extermination of the flora and fauna of the area, the alteration of the hydrological cycle, decrease in the food capacity and the environment becomes more vulnerable to flooding.
This can be avoided by reforesting the area forming vegetative curtains that prevent soil erosion, applying soil improvement techniques using organic material that encourages the formation of new nutrients or soil material.

Activity. 3 Watch the video "Desertification: half of Mexico is eroded by deforestation" in the next link: **https://www.youtube.com/watch?v=pHcHjpcM-48**.
At the end, answer the questions that are asked. Define desertification

What are the causes of desertification?

What benefits can we obtain with the conservation of ecosystems?

Propose some measure to conserve the ecosystems present in your environment

Protected areas:

The protected areas are terrestrial or marine spaces of the national territory of great importance since they preserve the diversity of biological species, the beauty of the landscape, and the natural processes that provide us with environmental services and at the same time preserve the natural and cultural heritage. of a region. These areas are regulated and managed to achieve their preservation and are established by the General Law of Ecological Equilibrium and Environmental Protection (LEGEEPA). Protected areas are classified into the following categories:

1) Biosphere reserves
2) National parks
3) Natural monuments
4) Areas of protection of natural resources
5) Protected land and marine landscape
6) Area of protection of managed resources
7) Sanctuaries

Closure:

Activity. 5 List of protected natural areas of the Mexican Republic

DIDACTIC SEQUENCE 11 Deforestation and its causes				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**Points**	**Points obtained**
Opening	**Act. 1:** Illustrated report on forest resources. Recognize the forest assets of your community..	Aut		
Development	**Act. 2** Answer guiding questions. Identify the causes and consequences of Deforestation	COE		
	Act. 3 Desertification Questionnaire. Know the concept and causes of desertification proposing ecosystem conservation measures	COE		
Closure	**Act. 4** List of protected natural areas. Learn about the options of protected natural areas present in your country	HE		
He made the HSE Activity	**Optional**			
Total Value: 25%				
Feedback:				

DIDACTIC SEQUENCE12 **Environmental impact**		
AXIS: Relate environmental services, the impact generated by human activity and mechanisms for the conservation of ecosystems		
COMPETENCES TO DEVELOP:		
Disciplinary:	CD2. Base opinions on the impacts of science and technology in their daily lives, assuming ethical considerations. CD4. Get, records and systematizes the information to answer scientific questions, consulting relevant sources and performing relevant experiments.	
Generic:	CG8 Participate and collaborate in an effective manner in different teams, proposing ways to solve a problem or develop a team project, defining a course of action with specific steps. CG11. Contribute to sustainable development in a critical manner, with responsible actions. 11.1 Assume an attitude that favors the solution of environmental problems in the Local, National and International areas.	
CENTRAL CONTENT	**SPECIFIC CONTENT**	**EXPECTED LEARNING**
Rational use of energy sources in everyday activities	Environmental impact of fossil fuels Alternate sources of energy What advantages and disadvantages Do you have renewable energy? What percentage of homes of Mexico have energy electric? Which countries do not have access to electric power? What renewable energy technologies could you implement in your home?	Explain the impacts environmental factors that generate energy production processes Recognize the advantages and disadvantages of the energies renewable Identify the activities in which you could use renewable energy. Design and argue the implementation of renewable energy in the home

Opening:

Natural resources are all those goods and services that are products of the natural processes of the earth, and that in some way satisfy the needs of living beings. These resources can be classified as renewable and non-renewable. Renewable resources are virtually inexhaustible, since they are replaced by cyclical processes developed in nature, among them solar energy, wind, tides, water, etc.

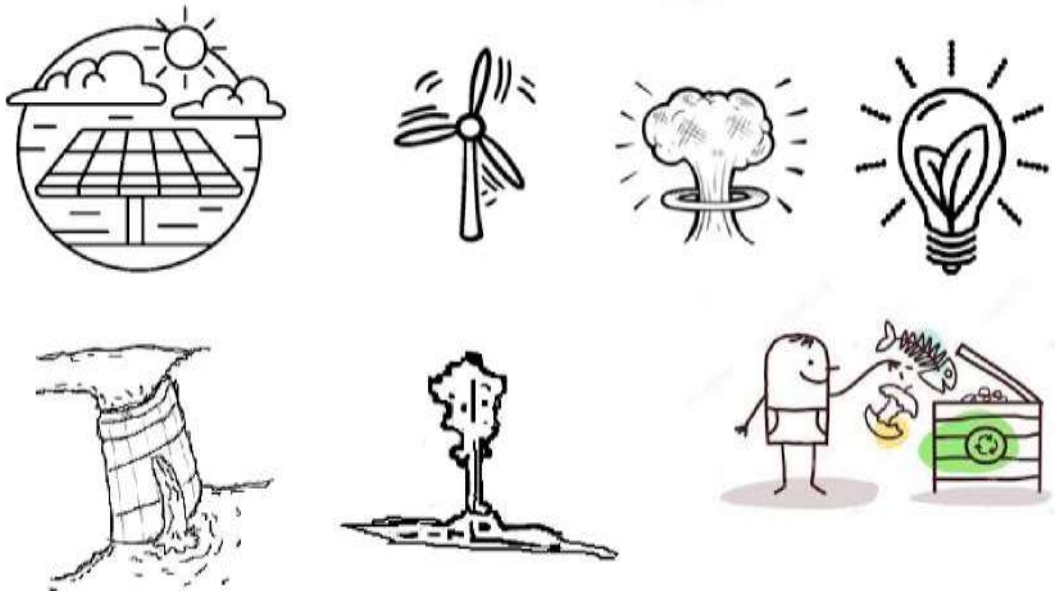
The non-renewable resources are those that can not be replaced in a moderate time less than their exhaustion takes, they are not renewed naturally but through geological, physical or chemical processes such as fossil fuels such as oil, gas, coal or the minerals.

Natural resources often represent the economic solvency of the different countries or those who exploit them, so that the development of the countries depends on the conservation of their natural resources, involving in the ecological aspects government, industry and education.

The main concern of the last decades has been the issue of the effects of the use of fossil energy that impacts the environment with a climate change looking for other options that help the sustainable development of the planet.

Activity 1:

Identify the different types of energy presented below



Development:

Activity. 2 Analyze the text *Environmental impact of fossil fuels* and answer the questions that are formulated at the end of the topic.

Environmental impact of fossil fuels

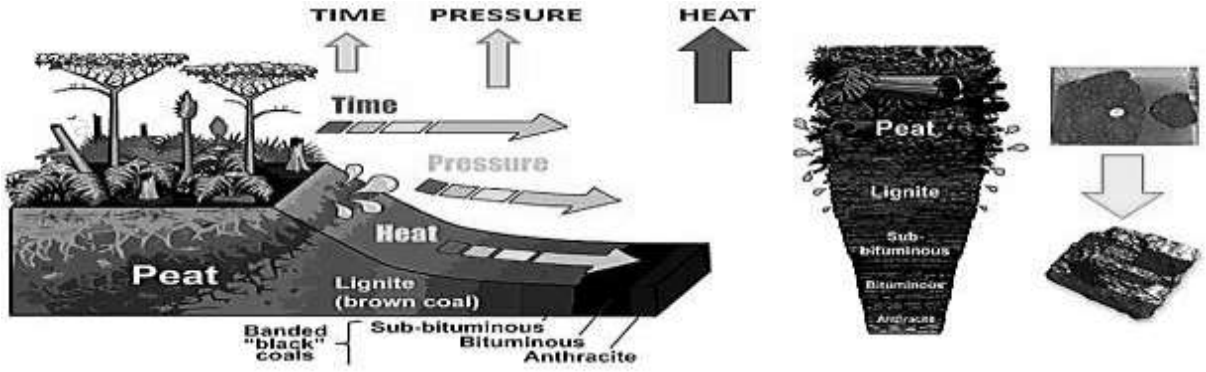
Energy is one of the main indicators of social progress and environmental sustainability, which is why it has become a topic of scientific, political, economic and social interest. Energy is necessary for industrial, agricultural, commercial development and even for the same functioning of the physiological processes of living beings.

At the level of social progress, most of the energy used today comes from fossil fuels, which are oil, natural gas and coal, which is a mixture of gases composed mainly of methane gas and has been obtained from geological formations. These fossil fuels are non-renewable energies.

Oil is a mixture of hydrocarbons in a liquid state, extracted from the subsoil. It is known as fossil fuel since the main organic matter that gives rise to it comes from the remains of mainly marine animals that lived many years ago and were deposited in geological funds. Oil is one of the most used energy sources but also one of the most polluting.

Natural gas: just as oil is a fossil resource extracted from the subsoil by drilling. It is less polluting so it begins to be increasingly used in developed countries. It is used for cooking, or as fuel for cars and is cheaper than electricity or gasoline.

Coal: It is a fossil fuel formed by deposits of organic matter of vegetal origin accumulated in marshy areas during the Carboniferous period about 260 to 300 million years ago. These vegetation deposits were subjected to high pressures and temperatures transforming it into peat, coal lignite and finally anthracite, which is the best quality coal.



Currently most of the industrial technologies depend on natural fossil resources, including radioactive materials such as uranium and thorium which, although used in the production of electricity, ship propulsion, manufacture of high-powered weapons, are also used in the synthesis of radioisotopes for medical images, radiotherapy and industry.

Although it is increasingly difficult and expensive to extract oil, this is still the basis of our energy fuel, without forgetting the great environmental impact we generate with its use.

The environmental impact is defined as the consequences that the environment suffers due to natural alterations such as the action of hurricanes, volcanic eruptions, fires and those caused by human activity such as deforestation or the burning of fuel in large quantities. These changes are manifested by a climate change in both the intensity and distribution of rainfall throughout the year and changes in temperature. Its main effects are described below:

Greenhouse Effect: This phenomenon is due to the accumulation of gases such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone, which retain more solar radiation reflected by the Earth's surface by raising the temperature global of the surface of the earth.

Acid Rain: It occurs when the aforementioned air pollutants combine with the humidity of the atmosphere. Thus the emissions of oxides of nitrogen, sulfur and carbon are mixed with water transforming into sulfuric acid, sulfurous acid, nitrous acid, carbonic acid. Damage to nature occurs due to the acidification of soils, lakes and seas affecting flora and fauna, as well as producing corrosion effects on metals present in buildings, bridges or structures, destruction of limestone in historic buildings, sculptures, statues etc.

Thinning of the ozone layer: The ozone layer (O_3) is present in the stratosphere of 15 35 km above the earth's surface, it absorbs the greatest amount of ultraviolet radiation from the sun, preventing it from reaching the Earth's surface and cause damage to living organisms, however the accumulation of chlorofluorocarbon gases (CFCs) that are used in aerosols, solvents and refrigerators in contact with UV radiation break and release chlorine which combines with ozone oxygen, causing its thinning allowing a greater passage of uv radiations to the terrestrial surface generating alterations in flora and fauna.

Social Development can be measured in relation to energy consumption because it provides welfare of a society. The concept of "energy crisis" appears when energy sources are depleted.

An economic model like the current one, whose operation depends on continuous growth, also demands an increasing demand for energy. Since the sources of fossil and nuclear energy are finite, it is inevitable that at a certain moment the demand can not be supplied and the whole system collapses, unless other alternative energies are discovered and developed to obtain said energy.

Analyze:
Why if natural gas is cheaper and less polluting than electricity or gasoline, do we still use gasoline as an automobile fuel?

How can oil extraction impact the environment?

Perform a review at home and make a list of electrical appliances they have. How many of them are connected? How many of them do you use every day? How many of them do you disconnect while you are not using them?

Act. 3 Work as a team and create an infographic on "Environmental Impact" where you mention the effects and consequences of it.

Act. 4 Read carefully the text on alternative sources of energy, as well as the advantages and disadvantages of using them and elaborate an illustrated synoptic chart.

Alternate sources of energy

Alternate energy sources are also known as renewable energy, they provide us with a higher quality service than conventional ones without high repercussion to the environment. They are obtained from nature, generating little or no environmental impact. Among them we have the following:

- **The wind energy** that is the kinetic energy or movement that contains the wind, and that is captured by means of wind turbines or windmills. It is also used to extract water from the subsoil. Its construction is relatively simple They are located in Oaxaca, Guerrero and Hidalgo
- **Hydraulic energy,** consisting of the capture of the potential energy of the waterfalls, taking advantage of the movement to become kinetic energy and that is carried out in hydroelectric power stations which are far from rural and urban areas, in Mexico 22% of Energy is obtained from hydroelectric plants.
- **Oceanic or tidal energy,** which is obtained either from the tides (analogous to hydroelectric), or through the movement of the waves and aided by a generator to transform it into electrical energy, however the impact must be analyzed that can have marine species. .
- **Solar energy,** directly collected in the form of high temperature heat in solar power plants of different types, or at low temperature by domestic thermal panels, or in the form of electricity through the photoelectric effect through photovoltaic panels.

- **Nuclear energy** obtained by radioactive minerals such as uranium.
- **Geothermal energy** produced by taking advantage of the heat of the subsoil in areas where this is possible, such as geysers and hot springs as in the Mexicali Plant. It is used mainly in heating, production costs are not very high but the gases they emit are polluting and damage the ecosystem - in Mexico 3.1% is used in Baja California and Michoacán.
- **Biomass** by decomposition of organic waste, or by direct burning as fuel. It obtains fuel such as alcohol and methane gas that can produce electrical energy through transformers, however it has a high cost of production and lower energy efficiency. Its use is restricted because some believe that it threatens food production.

Advantages and disadvantages of the use of alternative energies:

The use of alternative energies has the advantage that they are safe and free of contaminants, they are inexhaustible, they are considered autochthonous, since they are produced and used in the same region where they are developed, which can boost industrial development and generate employment.

Its disadvantages can be:
In the case of wind energy, wind turbines produce noise pollution that harms the orientation of the birds or they may collide with the propellers.
The abuse of biofuels can divert valuable food resources to generate gasolines and with it the emission of CO_2
The construction of dams cuts with the natural flow of rivers and harms the natural ecosystem
It produces less energy than fossil fuel
The cost of storage is higher
Its disposition may not be constant because it will depend on the geographical conditions

Read the next text:
Electric power in Mexico and the world:

All countries have access to electricity, The world's energy consumption has increased by 70% in 30 years and according to reports of the United Nations (UN) will continue to increase at a rate of 2% each year in both next decades. However, it recognizes that close to one billion people do not have access to any commercial energy source, most of them live in rural areas and look for alternate sources of energy with which they operate their homes, such as the use of coal, wood, biomass, manure, wax, etc.

In Mexico, it is reported that between 95 and 98% of all inhabitants have electricity service.

In some West African countries, for example, in rural areas only 6 out of every 100 households have electricity. The least developed countries are economically lagging behind in obtaining energy for households and businesses. At present, 48 least developed countries (LDCs) are recognized, 34 in Africa, 9 in Asia, 4 in the Pacific, 1 in the Caribbean.

Ecotechnology:
Ecotechnology is a series of techniques and practices that through the knowledge of ecology seeks to solve everyday problems aimed at improving environmental conditions. An example of them is the application and use of solar panels and the use of geothermal energy
The technology for the self-sufficiency and use of water that involves systems of capture, filtration and storage of water in tanks of ferrocement, systems of irrigation by dripping, and restoration of streams among others.

Technologies that promote food self-sufficiency: such as biointensive crops, organic agriculture, urban agriculture, green roofs.
There are several options to apply renewable energy in homes, including:

- Choose the use of economizing showers that allow the use of 7 to 10 liters compared with non-savers that occupy between 10 and 23 liters.
- Likewise you can choose two different volume of water discharge in the WC
- Use of aerators that are accessories for the sink that inject air bubbles and decrease the flow of water up to 50% as well as the use of saving keys.
- Water purifier or filters. Reduce the cost in this service to the third party.
- Use of refrigerators manufactured after 1993 reduce the cost of energy to 50%
- Solar heaters which capture solar radiation and transform it into thermal energy transferable to water that is stored in a thermal reservoir.
- Use of fluorescent bulbs instead of incandescents consume four times less energy and have greater durability.
- Technologies to reduce the generation of waste; what is achieved by producing more with less compost, sewage treatment, use of biodigesters, separation and recycling of inorganic materials such as plastics, pet, cans, etc.
- The permaculture that is the design and construction of living spaces transforming it into a sustainable space.
- Use of green roofs, creating aesthetic spaces, which serves as a refuge for birds and small fauna and a family garden is obtained.

Activity 5 Work as a team and develop a model where you design and argue the implementation of renewable energy in the home

Closure

Activity. 6 Create a double entry box where you record a list of the renewable and non-renewable resources you consume daily as well as the consequences of their shortage

DIDACTIC SEQUENCE12 Environmental impact				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**Points**	**Points obtained**
Opening	**Act. 1:** Identify the different types of energy. Recognize the presence of different types of energy	Aut		
Development	**Act. 2** Questionnaire Identify environmental impact produced by the use of fossil fuels.	COE		
	Act. 3 Infographics Explains the environmental impacts generated by energy production processes	HE		
	Act. 4 Illustrated synoptic chart Recognize the advantages and disadvantages of renewable energies	HE		
	Act. 5. Sustainable House model Design and argue the implementation of renewable energy in the home	HE		
Closure	**Act. 6** Double entry box. Identify the daily activities in which you could use renewable energy.	COE		
Made the HSE activity	**Optional**			
Total **Value: 25%**				
Feedback:				

DIDACTIC SEQUENCE13
Sustainable communities

AXIS: Relate environmental services, the impact generated by human activity and mechanisms for the conservation of ecosystems

COMPETENCES TO DEVELOP:

Disciplinary:	CD2. Base opinions on the impacts of science and technology in their daily lives, assuming ethical considerations. CD4. Obtain, record and systematize the information to answer scientific questions, consulting relevant sources and carrying out relevant experiments.
Generic:	CG8 Participate and collaborate in an effective manner in different teams, proposing ways to solve a problem or develop a team project, defining a course of action with specific steps. CG11. Contribute to sustainable development in a critical manner, with responsible actions. 11.1 To assume an attitude that favors the solution of environmental problems in the Local, National and International areas.

CENTRAL CONTENT	SPECIFIC CONTENT	EXPECTED LEARNING
Sustainable communities	Why has the population concentrated in the cities of the country? What characteristics does a sustainable rural community have? What characteristics do sustainable cities have? Development of communities based on available environmental services. Characteristics of a sustainable city: mobility and transport; areas, roofs and green walls; design of sustainable houses and buildings; use of alternative energy and ecotechnologies. What is the alternative for an equitable world in access to services and food, in peace and without contamination?	Design and argue the implementation of renewable energy in a rural community or city Identify the problems Common environmental factors that populous cities have Distinguish the characteristics of a sustainable community or city and the factors that strengthen them. Propose alternatives to promote the sustainable development of your community based on your local resources.

Opening:

The demographic explosion and the unequal distribution of the population, the lack of economic decentralization and the lack of sensitivity of the people, have caused more severe environmental deterioration and the environmental goods and services have been distributed in the same way in an unequal way, as such way that its cost and benefit is not valued.

Activity 1: Analyze the following image, and discuss in the group what it expresses in relation to the evolution of rural and urban society, the goods and services obtained and the consequences that are generated. Write the conclusions in your notebook.

Development:

Development of communities based on available environmental services.

The development of a country and the welfare of its inhabitants is determined by the ease of access to the goods and services that it can grant, however, its distribution is unequal, since these are centralized in certain areas of political interest, where most of the goods and services are supplied, the economy grows and becomes a more attractive sector for the population. Thus the inhabitants of a population are distributed in rural and urban areas.

According to the INEGI, a rural population has less than 2 500 inhabitants, while the urban population is one where more than 2,500 people live.

A **rural area** is one that has as an economic base the Development of agriculture, livestock, and forestry that is the cultivation, care and exploitation of forests and mountains. It produces the raw material, the basis of the economy of a country. In these areas there are difficulties in obtaining all services such as electricity, water, drainage, roads, means of transport and communication, health and entertainment services.

An **urban area** is one that enjoys most of the goods and services, which is why it is characterized by its high population density, extension and infrastructure, highlighting different productive sectors that make the place attractive to the population in search of better employment opportunities and economy.

The population is unevenly distributed, concentrating in urban areas, which results in a greater environmental deterioration, since its demand for goods and services is greater. These goods and services are often unknown to the population, which becomes insensitive towards them, neglecting and modifying the ecosystem.

Sustainable Rural Community:

Rural Development is the process of substantive improvement of the welfare conditions of the rural population. The main needs of Sustainable Development in a rural community are:

- Improve the welfare of the population by reducing the urban-rural gap and eradicating poverty
- Protect and conserve natural resources, landscaping and culture
- Ensure access to education, to food

The perception of climate change has also been observed in the countryside with deforestation and the degradation of their soils, reducing the capacity of forests and forests to absorb carbon dioxide from the atmosphere and obtain greater agricultural productivity. Faced with this problem, the sustainable use of forest resources is promoted through an integrated management of the territory to achieve a sustainable rural Development. At the local level, ejidos and rural and indigenous communities must be concerned about maintaining their livelihoods, through agroecology and local autonomy.

To achieve this it is important that the population becomes aware and seeks to consume local products, eliminating intermediaries and paying a "fair" price to producers. Yes, it also requires the promotion of forestry with good management of its natural resources, which allows its forestry producers to position themselves in the national and international markets.

Sustainable cities:

A sustainable city is one that offers quality of life to its inhabitants without putting their resources at risk and seeking social justice. To achieve this, it requires:

- Access to basic public resources: They guarantee a quality education, health services, adequate transportation and communication, garbage collection and good air quality.
- Access to urban renewal: restoration of public services such as streets, squares, parks, cultural and recreational spaces.
- Favor fair trade: Encourages the consumption of local products.
- Recycling: manages environmental education based on reducing, reusing and recycling with responsible consumption.
- Areas, roofs and green walls: Transforms gray spaces into living and harmonious.
- Design of sustainable houses and buildings: It raises the efficiency in the use of water, and the use of renewables, conservation of materials and resources.
- Use of alternative energies: How are solar panels
- Ecotechnology That allow you to use less energy, water and natural resources and create less waste, is healthier for people to live in it.

Alternative for an equitable world

Today environmental and pollution conditions are critical, the deterioration of soil, water and marine resources endanger food production, to this is added the loss of biodiversity, damage to the ozone layer and climate change , coupled with the increase in population, which leads us to seek a new vision of social welfare and to foresee a sustainable future.

Environmental education is an alternative to seek equity and access to services and food, in peace and without contamination. Environmental education is a training process that helps us to become aware of the importance of caring for our environment and the bines and services we obtain from it, promotes in the citizens the Development of values and new attitudes that contribute to the rational use of natural resources and the solution of environmental problems. Its main objectives are:

- Promote the care and protection of the environment.
- Raise awareness of the damages that lead to neglect and overexploitation of resources.
- Design and develop programs to solve the problems arising from the environmental impact we live every day.

Activity. 2 Analyze and answer the following questionnaire

1. . Why has the population concentrated in the cities of the country?

2. What characteristics does a sustainable rural community have?

3. What characteristics do sustainable cities have?

4. Determine what are the consequences of overpopulation in cities?

5. Investigate which are the most polluted cities in the Mexican Republic?

Activity.3 Work as a team and create a poster where you design and argue the implementation of renewable energy in a rural community or city, expose your ideas in plenary to the whole group.

Ecotourism:

Ecotourism or ecotourism is the tourist activity that develops without altering the balance of the environment and avoiding the damage to nature. This Activity is linked to an ethical sense that the World Sustainable Tourism Conference was held in 1995, which establishes the participation of local communities throughout the planning process, so that tourism can enjoy free natural and cultural spaces pollution and bustle that allow you to relax and rest and in turn the population is benefited by the commercialization of agricultural and artisanal products.

Activity. 4 Investigate and prepare a list of the places where ecotourism is practiced in Mexico, reflecting on its importance in the economic development of the population.

Closure

Activity. 5. Look at the place where you live and compare it with some places you have visited, in rural and urban areas.
Make a table with the characteristics of each of them in your notebook.
Propose alternatives to promote the sustainable development of your community based on your local resources.

Example:

	Where I live	urban	rural
Water			
Light			
Sewer system			
Pavement			
Phone			
Internet			
Schools			
Shops			
Movie theater			

DIDACTIC SEQUENCE13 Sustainable communities				
CRITERIA OF EVALUATION (INDICATORS)		**Type of evaluation**	**Points**	**Points obtained**
Opening	**Act. 1: I**mage analysis	Aut		
Development	**Act. 2** Questionnaire Distinguish the characteristics of a sustainable community or city and the factors that strengthen them.	COE		
	Act. 3 Poster Design and argue the implementation of renewable energy in a rural community or city	HE		
	Act. 4 Identification of ecotourism sites	HE		
Closure	**Act. 5** Comparative Table Rural and Urban. Propose alternatives to promote the sustainable development of your community based on your local resources.	HE		
S/He made the Activity of HSE	**Optional**			
Total **Value: 25%**			**100**	
Feedback:				

Bibliography

Auderisk, T, ., Auderisk, G. y Byers, B. R. (2003). “Biología 3. Evolución y Ecología”. 6a edición. Pearson Prentice Hall. México.

Cervantes, Marta; y Hernández, Margarita.(2001). “Biología General”.

Díaz-Barriga F. 1996. Los residuos peligrosos en México. Evaluación del riesgo para la salud. Salud Pública Mex. 38:280-291. http://www.cepis.org.pe/bvsarp/e/fulltext/mexico/mexico.pdf Fondo de cultura económica. (2004). Biología. Colección DGETI.

Escobar, A y Flores A. (2010) Ecología y Medio Ambiente. Edt. MacGraw Hill. México. P 87-101.

Hacia una estrategia nacional y plan de acción de educación ambiental. Colección DGETI.

Heres Pulido, M. E. 2006. Seminario de Educación Ambiental. Publicaciones Culturales. 247 pp. México: Publicaciones Cultural. 7° Reimpresiones

Miller, K y Joseph Levine. Biología 1 Ecología y sustentabilidad. UANL. Segunda Edición 2018. Ed. Pearson. México.

Miller, Kenneth; Joseph Levine: “Biología III”, Editorial PEARSON EDUCACIÓN, México, 2007, pp. 2723116.

Peter Alexander. (1992). “Biología”. Editorial Pretice Hall. EUA.

Romano García, Mariana. (2018). Ecología. Ed. Anglo Digital. México.

Secretaria de medio ambiente, Recursos Naturales y Pescas. (1995).

SEMARNAT (2007) ¿Y el Medio Ambiente? Problemas en México y el Mundo. Pag. 192

Solomon, E.P, Berg, L.R., Martin, D. W y Ville C. (1998). « Biología de Ville”. 4ª edición. McGraw-Hill Interamericana Editores, S. A. de C. V. México.

Sutton, David B. y Harmon, N. Paul. (2002). “Fundamentos de Ecología”. México: Editorial Limusa. UANL, Dirección de Estudio del Nivel Medio Superior. (2004). Biología 3°. México. 4° Edición.

Valdivia, B. Granillo, P. Villarreal, M. (2009) “Biológica: La vida y sus procesos”. México: Publicaciones Cultural. 7° Reimpresión.

Valverde, T., Cano-Santana, Z., Meave, J. y Carabias J. S/A. Ecología y Medio Ambiente. Pearson Prentice Hall. 230 pp. Vázquez, Rosalino. (2002). “Ecología recursos naturales y conservación”. México: Publicaciones Cultural. 5° Reimpresión

Vázquez, C.R (2012). Ecología y Medio Ambiente. Edt. Patria. México p 87-130

Wallace R. B. 2009. El Carbón en México. Economía Informa. No 359. Pág. 138-160.

Young, Marco Antonio y Young, J. Eduardo. (1993). “Ecología” Editorial Nueva Imagen. 1° Edición.

Páginas Web consultadas

https://www.lifeder.com/contaminantes-del-agua/ https://www.geosys.com.pe/impacto-ambiental-4-causas-principales http://www.aragonvalley.com/es/10-consejos-para-reducir-tu-huella-ecologica-y-proteger-el-planeta/ http://www.ehowenespanol.com/diferencia-ecosistemas-naturales-creados-hombre-hechos_39960/ http://cuentame.inegi.gob.mx/economia/petroleo/comosetransforma.aspx?tema=E
http://genesis.uag.mx/edmedia/material/eyma/Diversidad.htm
http://redexperimental.gob.mx/doctos/exp_biologia.pdf
http://weblogs.madrimasd.org/universo/archive/2008/02/27/85503.aspx http://www.ambiente-ecologico.com/cgi-local/AT-ambienbuscarsearch.cgi
http://www.aulatelematica.com.mx/_layouts/images/hdt/scorm/66/ODA_CI1_B1_1.4.2.swf
http://www.bajacalifornia.gob.mx/portal/nuestro_estado/recursos/flora.jsp
http://www.cideiber.com/infopaises/mexico/Mexico-04-05.html
http://www.clusterorganicodom.org.do/publicaciones/Manejo_Ecologico_del_Suelo.pdf
http://www.cobachbcs.edu.mx/cn/ecologia.pdf
http://www.elmundo.es/elmundo/2005/05/18/ciencia/1116411506.html
http://www.interciencia.org/v20_05/art05/ http://www.jmarcano.com/nociones/bioma/desierto.html
http://www.marietta.edu/~biol/biomes/tundra.htm http://www.memo.com.co/ecologia/humedal.html
http://www.mexicodesconocido.com.mx/notas/89526-Tundra-alpina-mexicana
http://www.microsiervos.com/archivo/mundoreal/2000-pruebas-nucleares.html
http://www.miliarium.com/Proyectos/SuelosContaminados/Manuales/Problemasusosuelo.asp
http://www.monografias.com/trabajos14/problemadelagua/problemadelagua.shtml
http://www.monografias.com/trabajos6/elsu/elsu.shtml#top http://www.pep.pemex.com/RepAnu2006/
http://www.sagan-gea.org/hojared_AGUA/paginas/14agua.html
http://www.slideshare.net/ivraga/prcticas-de-laboratorio-presentation
http://www.unicamp.br/fea/ortega/eco/esp/esp-10a.htm
http://www2.ine.gob.mx/publicaciones/libros/459/cap2.html www.actuaconenergia.org/node/620
www.mineriaenlinea.com/reportajes/hist_rep.php?id_repo=313 www.sagan-gea.org/hojared/portada1.htm

Activity 4. Solve the following problems individually, at the end, exchange the present exercise with a partner to coevaluate.

1.- Two coins are thrown. What is the probability that at least one sun falls?

2.- In the CECyTE of Nuevo León, 35% of students failed math, 20% failed chemistry, and 10% both subjects.

3.- If a student is selected at random, what is the probability that he or she has failed any of the two?

CLOSURE:

Activity 5. In binas solves the following problems by applying axioms and probability theorems.

b) 1) Recent studies show that in a certain population of Mexico, the probability that an inhabitant is over 40 years old or has baldness is 0.40. The probability of being over 40 is 0.20 and the probability of having baldness is 0.30. Calculate the probability that an individual: a) Is 40 years old or younger.

c) b) Be older than 40 years without baldness.

d) c) Be older than 40 years with baldness.

2) Of 150 students, 80 play soccer, 70 play basketball and 50 play soccer and basketball. If a student is selected at random, find the probability that it is:

a) A student playing soccer or basketball

b) Do not play soccer or basketball


Colegio de Estudios Científicos y Tecnológicos
CECyTE
Nuevo León
1993-2018
25
ANIVERSARIO