Annexure-I

Community Development Project

INTRODUCTION TO SUSTAINABILITY

A Project Report

Submitted in partial fulfilment of the requirements for the award of degree of

Bachelor of technology in Computer Science and Engineering

Submitted to

LOVELY PROFESSIONAL UNIVERSITY

PHAGWARA, PUNJAB

From 06/19/20 to 08/14/20

Submitted By

Name of Student: Baggam Sai Karthik

Registration Number: 11906091

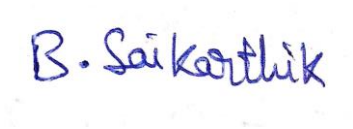
Signature of the student: B. Saikarthik

Annexure-II: Student Declaration

To whom so ever it may concern

I Baggam Sai Karthik, 11906091, hereby declare that the work done by me on "**INTRODUCTION TO SUSTAINABILITY**" from **June, 2020** to **August, 2020,** is a record of original work for the partial fulfilment of the requirements for the award of the degree, **Computer Science and Engineering**.

Baggam Sai Karthik (11906091)



Dated: 1st November 2020

ILLINOIS

COURSE CERTIFICATE

08/14/2020

Baggam Sai Karthik

has successfully completed

Introduction to Sustainability

an online non-credit course authorized by University of Illinois at Urbana-Champaign and offered through Coursera

Dr. Jonathan Tomkin
Associate Director
Research Associate Professor
School of Earth, Society, and Environment
University of Illinois

Verify at coursera.org/verify/BWXTQPF2XRT2

Coursera has confirmed the identity of this individual and their participation in the course.

AKNOWLWDGEMENT

It is not possible to prepare a project report without any encouragement and assistance of other people this one is certainly no exception.

I have taken many efforts in making this project. While doing this project many of my friends helped me in doing this by giving their valuable suggestions to me. I would like to extend my sincere thanks to all of them. I am highly indebted to Coursera and the material that they provide to study is very much valuable and informative. They did a great job in providing good information and video lectures on the topic clearly. I extend my gratitude to my college “Lovely Professional University” for giving me this wonderful opportunity.

I would like to express my gratitude towards my parents for their kind co-operation and encouragement which helped me in the completion of the project.

Thank you!

LIST OF CONTENTS

LIST OF TABLES

LIST OF FIGURES / CHARTS

CHAPTER-1

INTRODUCTION OF THE PROJECT UNDERTAKEN

➢ Objectives of the work undertaken

Here I am mentioning the objectives/goals of the work undertaken in this project.

1.To define the meaning of sustainability and understanding the role of both the natural and human parts of the system.

2.To see how human populations have evolved over time and get a sense of where the next century of change will take us.

3.To look at the issue of climate change and to describe the impacts of global warming on global temperature, climate variability, glaciers, sea level, and ecosystems.

4.To examine energy use today and look at alternatives for the future, to determine if there is a sustainable path available.

5.To explore the connection between water and food and see what will be required to feed the planet over the course of the century.

6.To understand biodiversity and why it is the foundation of sustainable development.

➢ Scope of the project

The scope of this project is to have the good knowledge about the sustainability and how the sustainability affects on the human life and what was the role of the human in the society. The main motive of this project is how to interact with the nature and the way we use the natural resources so that our future generation can also get them. The sustainable development is very much important as it plays a crucial role in our life. It includes the nature and the human interaction. Also all the agricultural components and the environmental components are utilized by the human in a good manner then only the life will be free of burden otherwise it may cause lot of trouble to the people and the animals will become extinct and the plants will die. So this project helps in understanding the meaning of the stable growth in which everything get's balanced.

➢ Importance and Applicability

The economy can be stable with the help of sustainable development. It will not only lead to the development of the present economy but will also lead to its development in the future. It means that development should take place without damaging the environment, and development in the present should not compromise with the needs of the future generations. This concept stresses the role of the environment as capital that, if exhausted, cannot be replaced. It requires preservation of human capital, physical capital and natural capital.

To provide a better life for the future we need to follow the principles of the sustainability so that everything can be balanced and the development will be in stable the stability should be in environmental and it should be in social and it should be in population so the stability should be everywhere so that we can achieve the sustainable country then only our future generation can also the resources that we are enjoying today.

➢ Learning outcomes

1. I have learnt how to save the energy.
2. I have learnt the importance of sustainability and how much it plays in our life
3. I have learnt importance of planting trees.
4. I have learnt the importance of the water cycle and how it effects on our surroundings.
5. I also learnt how the earth is facing the trouble due to the human activities and how the environment is getting spoilt.
6. I have learnt about the conservation of the Bio-diversity.
7. I have learnt about the climatic changes and how it effects on the earth’s atmosphere.
8. I have learnt about the different types of pollution and how it damages the environment.

SUSTAINABILITY AND POPULATION GROWTH

In this chapter we are going to learn about the sustainability and its definition and also about the population growth and the related curves of it. Malthus theory and Catastrophe were also discussed here.

Sustainable development

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs simply it is called as the stable growth. It considers the fundamentals of the human like poverty, environment, equality, democracy, development and peace.

Population growth is one of the factor which is linked with the sustainable development as the population increases then the needs also increases so we have to use the resources properly so that our future generation can also get the resources that we are using today as the current population is 7 billion by 2043 it may reach 9 billion there is a rapid growth so by considering it we have to use the goods properly

Population trends today are characterized by an increasing divergence across countries and regions. Whereas many of the poorer countries continue to be characterized by rapid population growth, others that are more advanced in their demographic transition are experiencing rapid population ageing and even population decline in some cases. Furthermore, the world is witnessing increasingly complex international migration patterns and many countries continue to experience very high rates of urbanization.

Figure 2.1

IPAT Equation:

The mathematical representation of the Impact on the environment which depends on the human population, Affluence and technology.

$$I = P * A * T$$

Here,

I stands for Impact

P denotes Population

A denotes Affluence

T denotes Technology

After few changes that are made in the formula to make it more specified by taking sustainability impact which is the product of the population, consumption per person and impact unit per consumption this is known as the **Sustainability Impact Equation**.

$$SI = P * C/P * I/C$$

Here,

SI denotes the Sustainability Impact

P denotes Population

C/P denotes Consumption per person

I/C denotes Impact per consumption

This formula is further derived as the population is doubled then the impact will also be doubled. If the consumption is doubled then the impact is also doubled as they are directly proportional to each other.

$$2SI = 2P * C/P * I/C$$

$$2SI = P * 2C/P * I/C$$

If we half the Sustainable Impact then the impact per consumption will be doubled as both of them are inversely proportional to each other

$$1/2SI = P * C/P * 2I/C$$

Population Growth

The term population growth is nothing but the increasing of the population. As the population is increasing yearly it was growing in exponential form if the population increases then the needs also increases. The over growth of the population causes the unsustainability. So the sustainable development will be damaged. In 1750 the population was below 1 billion but now the population was nearly 7 billion.

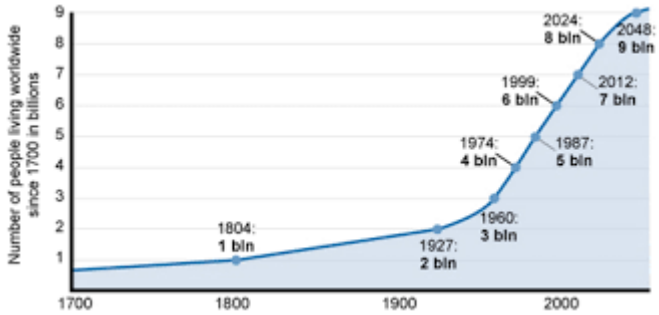


Figure-2.2

Population Growth Curves

The growth of the population is based on the specific environment they generate two different curves they are

1.J-shaped curve or exponential growth graph

2. S-shaped curve or Logistic growth graph

J-shaped curve

In a J-shaped growth curve the population density of the organism increases rapidly due to the change in new environment but it falls abruptly due to some environmental resistance as it becomes effective. It was in exponential growth In this the population at first will be less and then it will increase with respect to time This type of population growth is termed as density-independent

It is represented mathematically as: **dN/dt = rN**

where,

N denotes number of individuals in population

t denotes time

r is the constant which represents the intrinsic rate

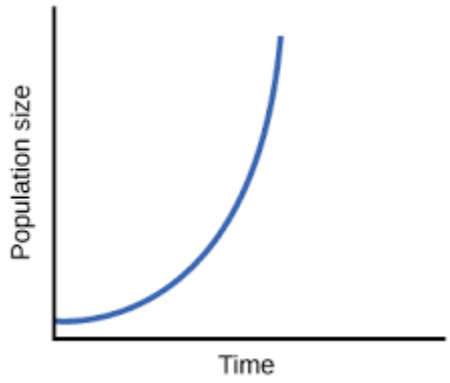


Figure 2.3

S – Shaped Curve

S-shaped pattern of growth curve represents that on introduction to a new area, the population grows slowly in the beginning followed by a sharp exponential increase in growth rate. This sharp increase is followed by a stationary growth phase where the population is maintained at an approximately constant level. This is density dependent graph.

It is represented as

$$\frac{\Delta N}{\Delta t} = rN\left(\frac{K-N}{K}\right).$$

Here K represents capacity carrier

Here N represents the density

Here r represents the rate

Here t represents the time

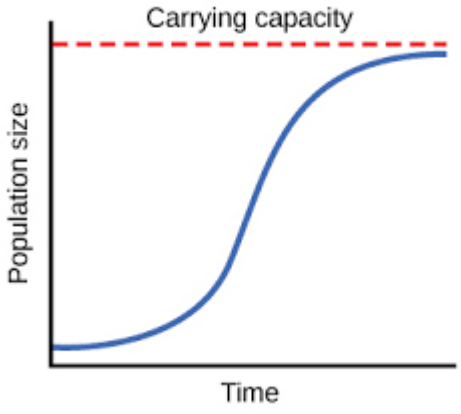


Figure 2.4

In the above figure 2.4 the population is increasing up to the carrying capacity and then it joined with the carrying capacity line.

By using these S-curve and J-curve we can derive some of the following terms from them they are

1.Exceeding carrying capacity

2.Crash

3.Population

4.J-type crash or Population Crash

Exceeding carrying capacity

The carrying capacity of an environment is the maximum population size of a biological species that can be sustained in that specific environment. It includes the shelter, food, water and mate. If these are present then the carrying capacity will be fine if anyone of these are lacking then the Exceeding carrying capacity take place as the capacity of the organism consumed is lacking so the Exceeding carrying capacity takes place here.

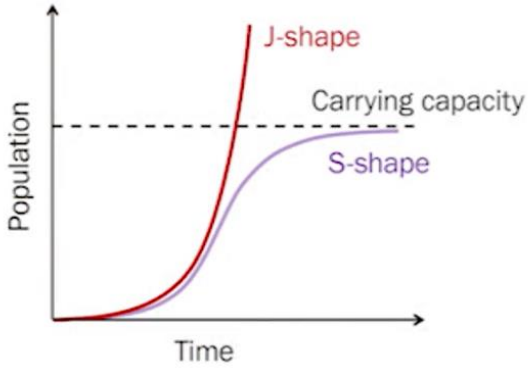


Figure 2.5

Crash

Due to the exceeding carrying capacity the Crash occurs in the graph and the J graph decreases abruptly. So the population growth decreases suddenly as it exceeded the carrying capacity so if the growth of the population increases the carrying capacity then the crash occurs.

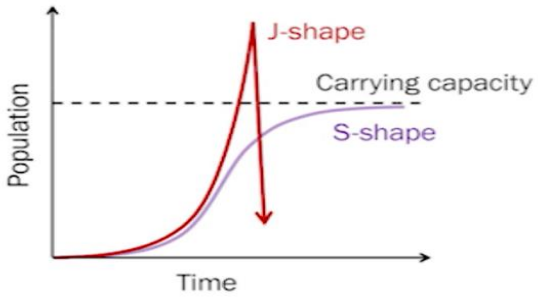


Figure 2.6

Population

The human population is in between the J-curve and the S-curve. As the j-curve got the crash and it is considered as unsustainable growth but the S-shape curve did not exceeded the carrying capacity so it is in stable growth of the population.

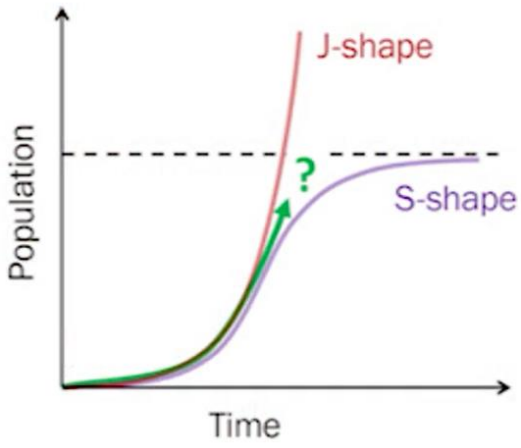


Figure-2.7

J-Type Crash

Here in this we can see that the population is decreased for little bit in future, it will be like this crash will occur on population growth. It shows the estimated population curve up to this year. But now the population is more than expected population. The future in terms of, an inevitable collapse will occur.

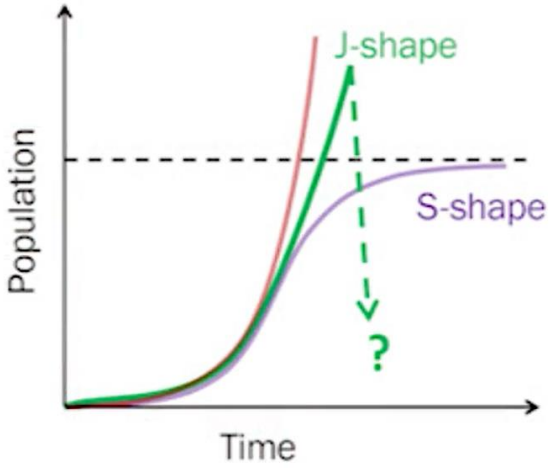


Figure-2.8

So by the above graphs we can conclude that the population growth of the human is becoming like J-curve which is unsustainable . In future the population will be more but the essential needs will be less and they are not sufficient to the people so the crash occurs in them.

Malthus Theory

According to the malthus the population is increasing in exponential form and the production of the food for the people is increasing in arithmetic growth. Where the population increases rapidly and the food for these population will not be increased in that much faster so at one point the population exceeds the food that point is called the point of crisis and it is also called Malthusian

Catastrophe.

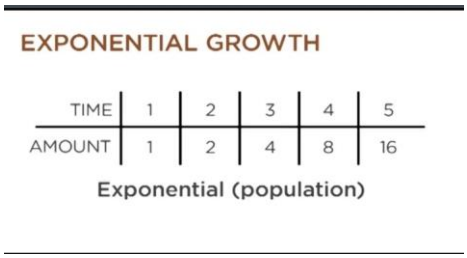


Figure-2.9

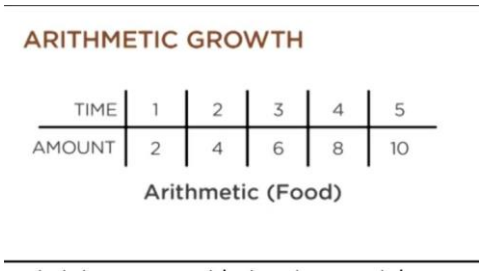


Figure-2.10

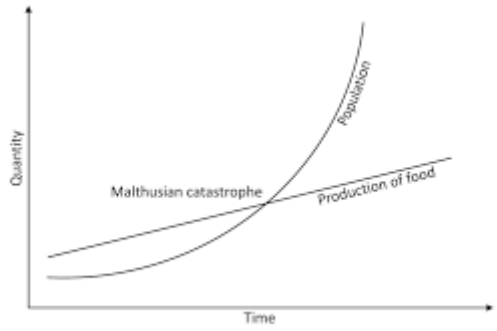


Figure-2.11

In the figure 2.11 you have seen the malthusian catastrophe occurred at the intersecting point of the population and the production of the food. In figure 2.9 you have seen that the population growth of the world is like exponential according to the time but the food growth in the figure 2.10 you have

seen it was growing in arithmatic progression growth so it grows very slowly after a certain period of time they both collide and the catastrophe occurs at that time.

Transitions

The sustainable transition is nothing but the Transformation into the sustainability society. It depends on some of the following factors, as a response to a number of persistent problems confronting contemporary modern societies.

There are many types of the sustainability transitions

1. Global Median Age

2.World Fertility Rate

3.World Population Growth Rate

Global Median Age

The Global Median Age is nothing but the average age of the countries in the world. In which one age is taken as a reference and from that age we are comparing whether the person is older or younger. The Global Median Age is 29.6 as of 2015. The highest Global Median Age is in japan which is 46.3 and the least age is in Niger which is 19.4.India has Global median age is between 25-30 years

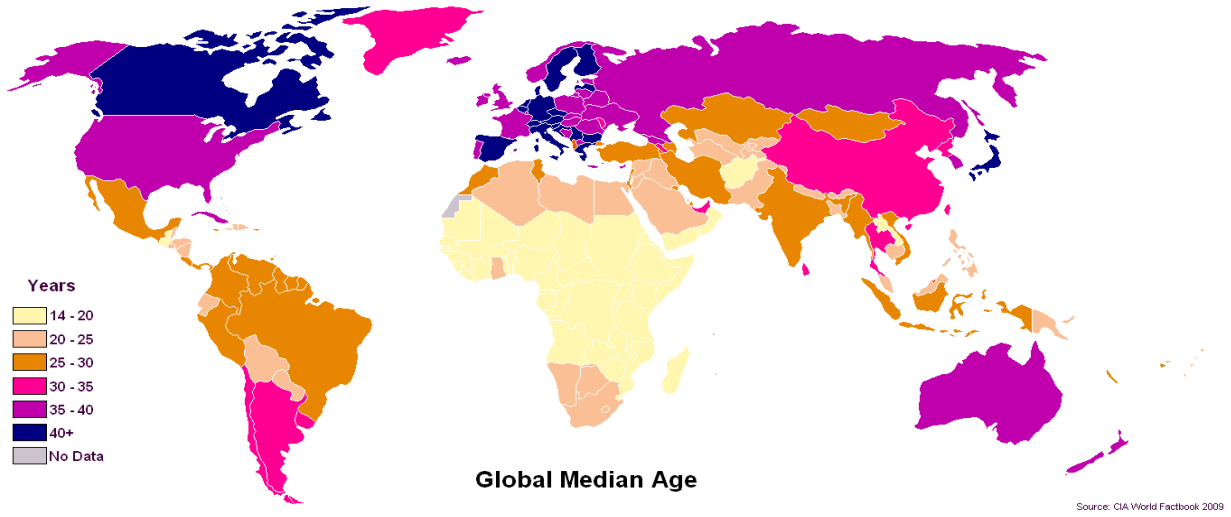


Figure-2.12

From the figure 3.1 we can say most of the african countries has the least Global median age european and all the american countries were in good position as their age was in good position sweden in the europe has the age greater than 40 and also the canada from the North america has the 40 above age

World Fertility

The world fertility is defined as the number of births per women.As we see from the past The fertility rate was decreased now compared with the past as the the urbanization was increasing the people who are in cities has the less fertility rate compared to the people in the villages.

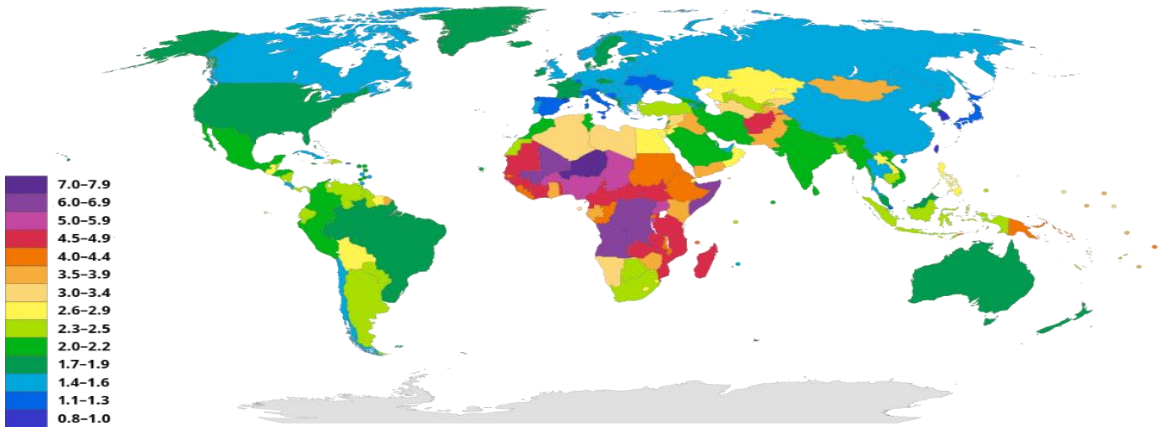


Figure-2.13

From the figure-3.2 we can tell that the African countries has the highest fertility rate and they are not the developed countries the Niger has the highest fertility rate. which has low median age. Singapore has the least fertility rate which is 0.83.

World Population Growth Rate

The World Population Growth is nothing but the growth of the individuals in a country as our global population at present is 7 billion.The world population growth is calculated every year.

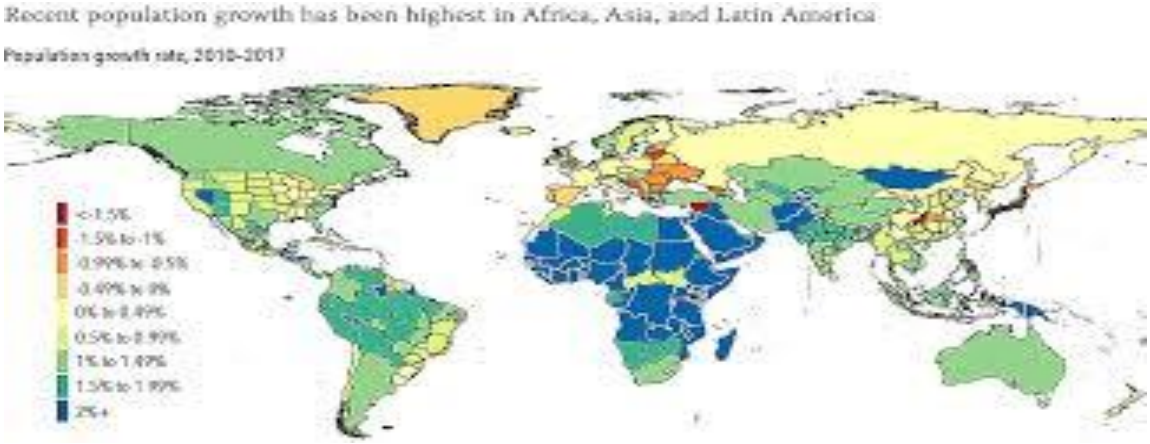


Figure-2.14

From the figure 2.3 we can tell that the world population rate is higher in the African countries as China has the highest population followed by India. Vatican city has the least population

Demographic Transitions

The Demographic Transitions are the Transitions that occurred in which the population change was occurred. It depends on birth rate and death rates of the total population. It consists of four stages.

Stage-1: In the first stage which was the pre industrial age the population was roughly high and the birth rate and the death rates both of them are equal. As the food was very less in this stage

Stage-2: This stage is known as the developing country phase. In this step the food facility was increased and the birth rates were constant and the death rates were decreased as the diseases were reduced in this period.

Stage-3: In this stage the birth rates were fallen due to the urbanization and the education to the women so the birth rate was fallen along with the death rate in this stage

Stage-4: In this stage the birth rate was fallen completely and the both death rate and the birth rates became equal in this stage

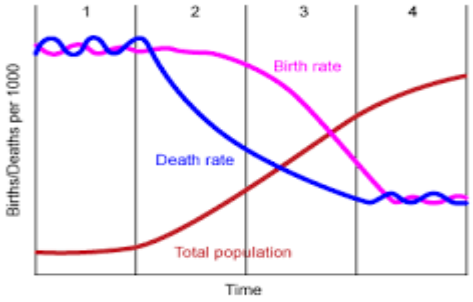


Figure-2.15

Global population

The Global population in the present and the past are completely different and in the developed countries which are well urbanized has the low population increase where as the developing countries are increasing their population from the past few years as we observe the India which is a developing country it has the world's second highest population but the country like America which is a developed country has the less population .

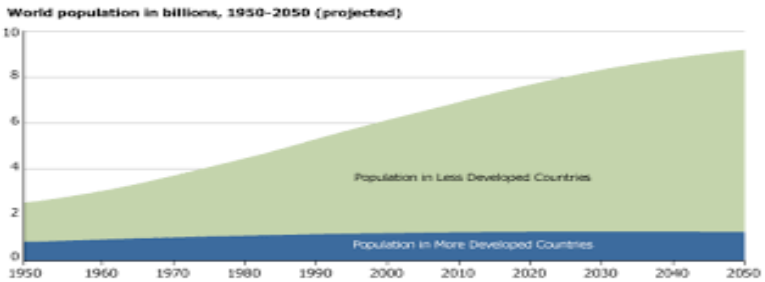


Figure-2.16

Future Population

The population in the future is going to increase. As there was a growth from the past to present if it continues then the population in the future will be more due to this the future population will be more and the resources which are needed for the survival of the people will not be sufficient so the sustainable growth will not takes placeThe current world population of 7.6 billion is expected to reach 8.6 billion in 2030, 9.8 billion in 2050 and 11.2 billion in 2100, according to a new United Nations report being launched today.

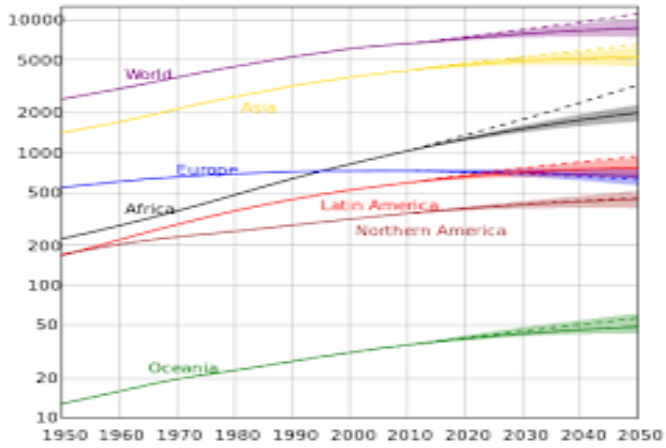


Figure-2.17

From the figure-3.6 we can see that the population growth of the developed countries is less compared with the developing countries. As due to well urbanized they know the problems that they are going to face in their future. The european countries and the American countries has the less growth from 1950 onwards but the population growth of the african countries where the population of it was increasing as most of it countries are under the development

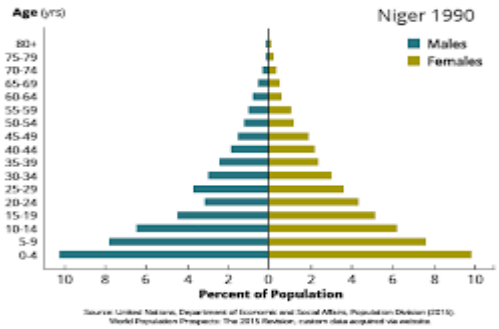


Figure-2.18

The figure-2.18 is about the expansive pyramid of country niger where the base was more but coming to the top it was less this is all due to lack of awareness between the people so this country was in unsustainable position as age 0-4 was more but reaching to top it was very less.

ECOSYSTEM AND CLIMATE CHANGE

In this chapter we are going to discuss about the climate change in our surroundings and about the ecosystem. Mainly regarding the tragedy of common.

What is Ecosystem?

It is a biological community in which the organisms interacting with their physical environment. Ecosystem is the combination of both biotic and abiotic components. biotic components include the plants, animals and other organisms but the abiotic components are land, water, air, humidity and minerals as the biotic components has the life but the abiotic components don't have the life.

Extinct

The species which does not exist on earth at present but they are present at past it was due to some natural change in the environment.
Examples are Dodo, Mammoth, African black rhino etc.

Endangered

The species that are going to extinct are called endangered species now a days there is high range of risk of extinct.
Examples are mountain gorillas, Tigers, Asian elephants etc.

Tragedy of Common

The earth is facing many environmental pressures those are by the human exploitation of natural resources as we find in many places on the earth the natural resources are declining due to vigorous extracting of it.

The **Tragedy of common** is a situation in which the shared resource is used by an individual user independently according to his own interest which damages the environment and fast degradation of the resource takes place in it.

Here in figure 4.1 it tells us about the tragedy of common as that place for grazing has the capability of only 4 cows if we increase the number of cows then food consumed by each cow will be reduced due to tragedy of common.

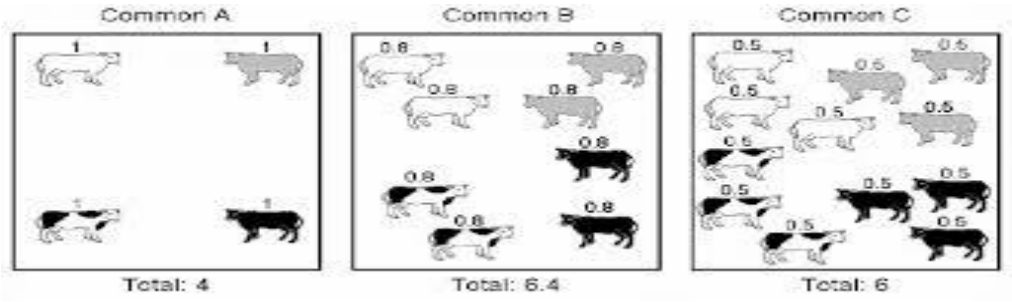


Figure-3.1

Here some examples of Tragedy of common

1.Grand Bank Fisheries

The Grand Banks are the fishing grounds in Newfoundland for the centuries the explorers said that it was the home of cod fish where endless fishes were supplied here but after few years as some of the industries were established the fish declining took place and by 1990's completely it was collapsed Now there was no fish in this bank due to vigorous fishing.

Here in figure-4.1 it shows the fishing of the fishes in the grand bank of Newfoundland by the fisher man.

Figure-3.2

2.Earth's atmosphere

Earth's atmosphere is another resource which was declining as the pollution was increasing due to releasing of the carbon dioxide and some harmful gasses into the atmosphere by vehicles and factories as it increases the global temperature and the ozone gets spoiled due to this so we have to take care of it as it was also a tragedy of common.

Figure 4.3 represents the Earth's atmosphere which was filled with the gasses some harmful gas is released by the industries.

Figure-3.3

3.Groundwater in Los Angeles

Landowners of the Los Angeles has rights to use the water pumped up from the wells on their ground so each landowner started pulling the water from the same pool after few years the population increased the use of the water was also increased the individuals of the town started extracting the water from the pool after 40 years it was completely declined due to the rapid use of the ground water.instead of that the farmers in the Los Angeles can use the soak pits which helps in the restoring of the water so the water problem that they are facing can be reduced.

Figure 3.4

The solution for the tragedy of common is done by **Garret Hardin** he proposed two ways to avoid the tragedy in the society by some methods in the year of 1968.

(1) By assigning the ownership of the resource

(2) Divide the resource into Parcels these are the two ways in which we can overcome the tragedy of common

Climate vs Weather

Weather is the condition of the atmosphere at a particular place over a short period of time, whereas climate refers to the weather pattern, using statistical data, of a place over a long enough period to yield meaningful averages.so both of these terms are different.

In the picture 4.7 it tells the average climate of the Illinois in the year of 2018 it was the example of the climate as it was taken over a long period of time as entire year the higher temperature indicates summer and less temperature indicates the winter in the year.

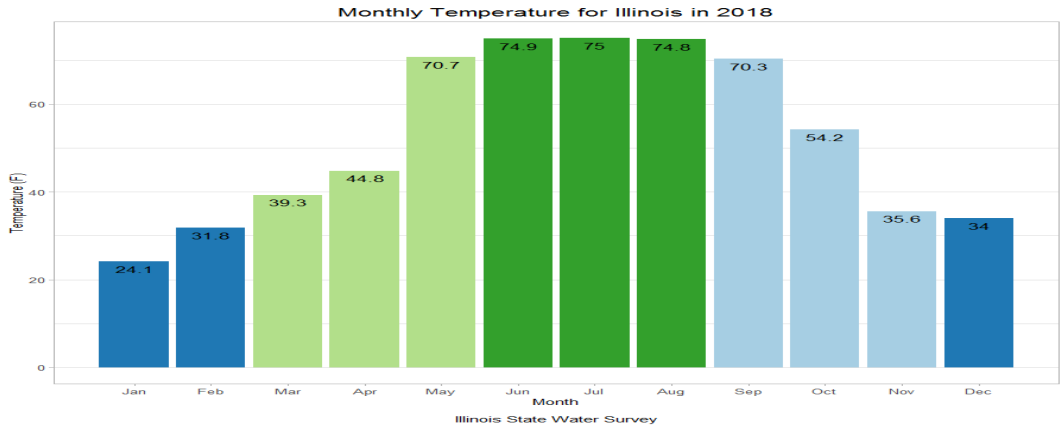


Figure-3.5

Climate change in past

The evidence that climate has changed over the past century includes temperature observations over land and sea, as well as measurements of rainfall, sea levels, and ocean acidity and salinity. There was a great change in the temperature the earth's climate has been warmed up now there was the ice age in the past where the temperature was very cold like the antarctica but after several years due to some natural changes. Now the earth was in this condition

Modern climate change

The modern climate change is completely dependent on the human activities. Human induced changes in the atmospheric composition anthropogenic climate change is most likely continue from the past few centuries as the rapid increase of the vehicles and factories made the increase of the carbon dioxide and it makes a lot of difference in the temperature in past these were less but now it was more so there is a lot of increase in temperature.

The given picture 4.8 tells about the temperature change in the modern and past as the carbon dioxide was increased from 1860 to 2000 from -0.6 to 0.55 due to increase in the carbon dioxide.

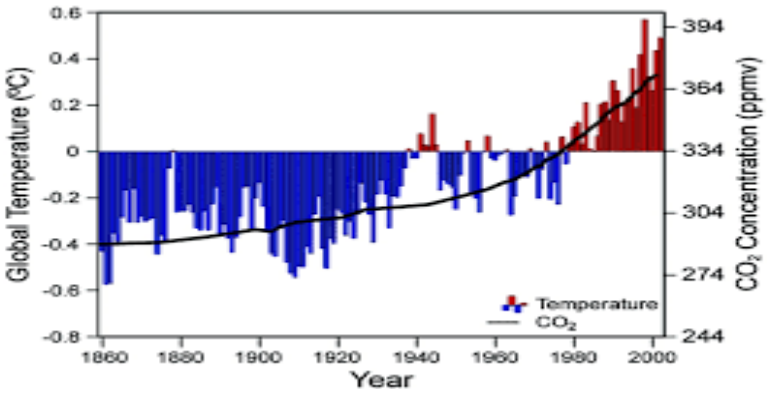


Figure-3.6

Greenhouse Gasses

Greenhouse gasses are the gasses that has the ability to absorbing infrared radiation from the Earth's surface and it reradiates it back to the Earth's surface, thus it causes the **Greenhouse Effect.** Which increases the earth's temperature and the melting of the pole region takes place due to this. Some of the greenhouse gasses are Carbon dioxide, methane, water vapour, nitrous oxide etc.

The figure 4.9 tells us about the occurance of the greenhouse effect by the greenhouse gasses as they are absorbed and then reflected back on the earth as they are reradiated.

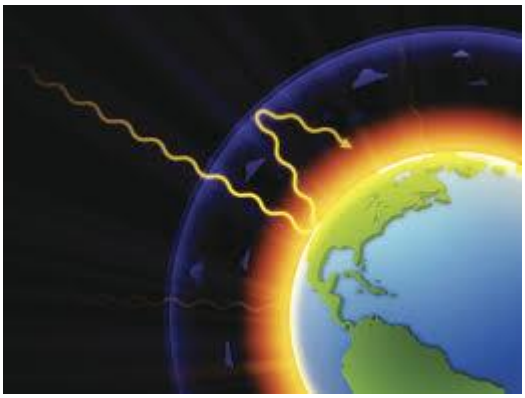


Figure-3.7

Some disadvantages of the greenhouse effect are

1.As the amount of carbon dioxide increases the temperature increases and global warming occurs.

2.Ozone layer gets damage due to Greenhouse effect.

4.If the ozone layer gets damage then the harmful rays from the sun directly falls on us which causes some skin diseases

3.Ice present in the polar region increases.

ENERGY

In this module we are going to learn about he energy and it's extraction and also about the different types of energy that we use now a days. As we are completely dependent on the resources for our survival so these energy resources are very much important to us.

What is Energy?

According to physics the definition of energy is the capacity to do work. There are different types of energy. Like kinetic energy, potential energy, thermal energy, nuclear energy, geo thermal energy etc. But most of the energy that we use comes from the fossil fuel i.e over 80%. total global energy consumption is increasing day by day as the population is increasing so the consumption of the energy is also increasing day by day.

But in our current situation we are not using the energy resources equally as it is becoming unsustainable. As the amount of the coal, petrol, oil and uranium are present in a less quantity but we are using them heavily so there is a decline of it. It may not be available for the future generation as they are **Non-renewable resource**. But the solar energy and wind energy are the **Renewable resource** which are sufficient and can be produced over and over.

There are two types of energy

1.Non-Renewable Energy

2.Renewable Energy

Non-Renewable Energy

Non-Renewable Energy is a source of energy which cannot be replenished in a short period of time. We get most of our energy from these resource like coal, fossil fuels, oil, nuclear energy etc……. as 80% of the U.S primary energy uses the fossil fuels and 10% of primary energy use comes from nuclear fuels. In the last 50 decades the big oil producers are from the Middle East countries like Saudi Arabia, Iraq, Iran, Russia and U.S.

The main disadvantage of the use of the fossil fuel is it causes the damage to the environment by the releasing of the harmful gasses like carbon dioxide and other gasses which damages the environment. Air pollution takes place and it damages the environment and the ozone layer gets damage due to it.

There are 4 types of Non-Renewable resources which produce energy they are

1.Coal

2.Fossil fuel

3.Natural gas

4.Nuclear energy

In the figure 5.1 we see the four non renewable resources which produce the Non renewable energy. As most of them we see in our day to day life

Figure-4.1

Fossil Fuel

Fossil fuel is a type of fuel which is made up of the dead plants and animals.It is present on the earth for many years ago.it was formed due to earth crust. They are fossilized. U.s produces highest amount of fossil fuel which is about 20% of world contribution. These fossil fuels were non renewable as they cannot be replenished so we cannot use them again and again.

Some of the fossil fuels are

1.Oil

2.Coal

3.Natural gas

4.petrol

Peak oil

As we know the oil is a non renewable resource if we consume a lot amount of oil then in future we may not get it as these resources cannot be replenished. The point at which the global production of the oil reaches its maximum rate it is known as the Peak oil. Many countries depend on the oil for

their survival it is the most important resource. The peak oil was first occurred in 1971 in united states after that they took some initiation steps to overcome the peak oil problem.

The given figure 5.3 is the world's biggest oil production company it was in Saudi Arabia it was named as **Saudi Armco** it reserves approximately 270 billion barrels of oil

Figure-4.2

Coal & Gas

The coal is hard rock which is used as a solid fuel it is rich of carbon and it also contains sulpher, hydrogen, oxygen, nitrogen it is sedimentary rock of peat. Natural gas is a non-renewable energy which is used for the heating, cooking and electricity generation these are used in many places the trains and factories run by the coal. The coal is produced largely by China in the world and the natural gas is largely produced by USA in the world.

Figure-4.3

Renewable resource

Renewable energy is the energy that was produced by the renewable resources which can be replenished as they can occur again if it is completed. They are wind, solar, tidal, geo thermal heat, etc most of these resources do not harm to the energy it maintains the sustainability as our future generation also can enjoy it. It is also most secured damage to the environment will be less by using it.

There are few disadvantages of it. To meet our current needs the renewable resources are not sufficient and they are present only in less amount its energy density was low compared to the nonrenewable resource. Now a days the prices of it was also more it was higher than the conventional alternatives

Some examples of renewable energy are

1.Solar energy

2.Wind energy

3.Hydroelectric energy

4.Tidal energy

Solar energy

The energy that was produced by the sunlight is known as the solar energy. As the light from the sun falls on the solar panel and it absorbs the heat from the sun and it generates the energy The solar energy is used more now a days. It was used in the factories, Home appliances, Banks and offices everywhere. It used in both domestic and industrial purpose.

Solar energy is generated through the principle of the photovoltaic effect.Where the photovoltaic cells from the sun is captured in the solar panel and the DC current is generated and it supplied through the solar panels. But the current that was produced is directly depend on the incident light from the sun directly as it follows the light dependent principle

Figure-4.4

Hydroelectric energy

The electric energy that is generated by the harness of water. As the water moves fast in the water fall or in a dam as the motion of it is used to generate the electricity. As we see our earth is covered with water of 71% so it was present a lot amount So we can generate a lot amount of energy by using it there are many dams built across some rivers which is used to store water and also o generate the electricity those dams are called multipurpose dams. The hydroelectricity generally relies on the

water cycle. In many of the countries industries were built near to river as they can get the enough energy which is sufficient to generate the hydroelectricity that helps in the making of the goods but the waste from the industry is again releases into the river which causes the water pollution. In this way the water is used and it is not only used to generate the electricity but also the steam produced by the water is used to run the locomotives in the past.

Figure-4.5

Wind energy

It is nothing but the use of wind to provide the mechanical energy to the wind turbine to generate the electricity it was a renewable resource. It was like pumping and milling. Wind power is a sustainable and renewable source that has a much smaller impact on the environment compared to burning of fossil fuels.

Tidal energy

It is a renewable energy that is produced due to the natural raise in the ocean tides it includes the turbines and paddles. It depends on the tides of the oceanThe tidal energy is mostly used in the countries which are near to the seashore as they generate the electricity by the turbines and paddles in the ocean.

Conservation of Energy

The conservation of energy is nothing but the storing of the energy and using it properly as the energy which is non renewable we have to use it properly and we should not waste the energy as the process of generating of the electricity takes a lot of time to we have to conserve it properly if you are not using a room then you have to switch off the lights and fans in that room unnecessarily we should not use the electricity Energy can be conserved by reducing wastage and losses, improving efficiency through technological upgrades and improved operation and maintenance. On a global level energy use can also be reduced by the stabilization of population So we have to save the energy to our future generations and also the environment is dependent on the Energy. If we save the energy then the environment will be protected.

WATER & AGRICULTURE

In this chapter we are going to learn about the use of water and the agriculture as the earth is a world full of water as 3/4th part of our earth is covered by water and 1/4th part of it is covered by land. The fresh water is used for the domestic purpose, industrial purpose and especially for the agricultural purpose.

Limits of water

Most part of the earth is covered by water but only some amount of it is used for drinking for us. only fresh water is used for drinking but the salt water which is almost 98% is not compatable for drinking so we have to use this less amount of fresh water carefully if we use it unnecessarily then in future we may face problems.

Figure 6.1 depicts the amount of water on the earth and it tells how the water was divided as 98% of it was salt water which was from sea and 2% was fresh water. In this 2% again 87% was in ice and 12% was ground water and 1% from lakes and rivers

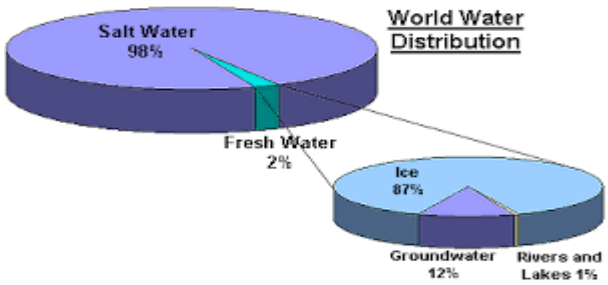


Figure-5.1

Water contamination

The contamination of water is done in several ways. It contains microorganisms like bacteria and parasites that get in the water from human or animal waste. It can contain chemicals from industrial waste or from spraying crops. Nitrates used in fertilizers can enter the water with runoff from the land. It causes the water pollution which spoils the environment.

Figure-5.2

Hydrological cycle

The hydrological cycle is also known as the water cycle. It is nothing but the circulation of the water in the earth's atmosphere it involves. In this water cycle the flows in different forms it flows as gaseous state, liquid state and in solid state. Most part of the water cycle takes place in the oceans where the major amount of the water is present. It involves both the biotic and the abiotic components which makes the water cycle possible.

The water moves from the one place to another place in different forms as it includes few different process. Ice in the polar region melts and it flows down into ocean and the level of water increases and the water in the river, ponds, sea evaporates by the heat produced by the sun these are termed as the process of the water cycle they are mentioned below

1.Evaporation

2.Condensation

3.Precipitation

4.Transportation

5.sublimation

6.Run of

Apart from these process Transpiration and the collection are few process which are also a part of the water cycle but their contribution is less in the water cycle biotic components involve in the transpiration process.

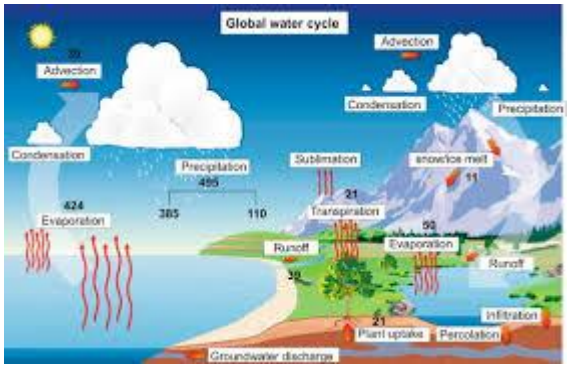


Figure-5.3

Figure 6.2 tells us about the hydrological cycle in which the water is cycled from the ocean to land and again from land to ocean it was done with the help of the few processes.

Some of the process in water cycle

1.Evaportation

This process occurs when the warmth from the sun causes the water present in the sea, lakes ,ponds ,rivers ,ice to melt and turn into water vapour this process is known as the Evaporation in the water cycle Evaporation from the oceans is the primary mechanism supporting the surface-to-atmosphere portion of the water cycle.

2.Condensation

The condensation is the process in which the water vapour in the air is turned into the water this is known as the condensation in the water cycle .so the conversion of the water vapour to the clouds is done by the condensation it was the secondary mechanism which supports the water cycle.

3.Precipitation

The precipitation is the process in the water cycle in which the clouds make the fall of rain or snow to the earth again the process is known as precipitation it was in the form of snow or in the form of rain as the water which went up and formed clouds reaches the earth again with the help of the precipitation.

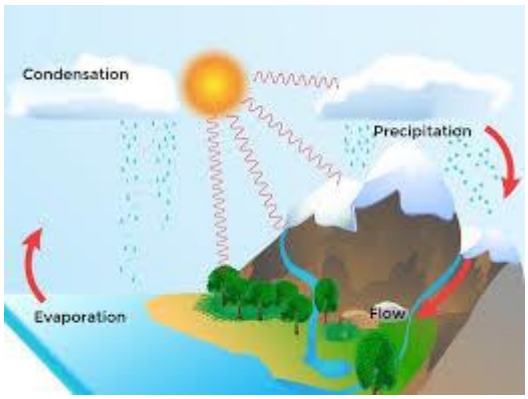


Figure-5.4

4.Transportation

The transportation is nothing but the transport of the water vapor in the atmosphere from one place to another place it moves from ocean to land by the movement of the clouds this process is known as the transportation. Some of the Earth's moisture transport is visible as clouds, which themselves consist of ice crystals and/or tiny water droplets.

5.Run Off

The run off is the process in water cycle in which the water from the hills and the rivers flows down and then it merges into the sea it is simply the flow of water as the snow also melts from the mountains and then it flows as river and then finally it merges into the sea.

Water Pollution

The water pollution takes place when the water gets polluted by the releasing of harmful substances and chemicals into the water bodies like pond, river, streams, aquifiers which damages the environment and the water gets polluted with it degrading water quality and rendering it toxic to humans or the environment. Water is uniquely vulnerable to pollution. As it was called as universal solvent. It easily mix with the waste released by the factories and towns and it causes the water pollution. Now a days due to the negligence of the human the water pollution is increasing day by day.

Figure 6.3 shows the disposal of waste materials into the local river which is water pollution.

Figure 5.5

Agriculture

Agriculture is nothing but the art of cultivation in the soil, growing crops and raising livestock. It includes the preparation of plant and animal products for people to use and their distribution to markets. It is the bond between the farmer and the land.

Everything that we are getting now was extracted from the agriculture the food we eat is from the agriculture and the clothes that you wear the cotton comes from the agriculture so the agriculture is everything to human being life. The methods followed for the growing of the crops and those agricultural methods are different for different countries and it also depends on the place where we cultivate.

Figure 5.6

Use of water in food and agriculture

In the process of the agriculture and the growing of the crops the water is the most essential and the primary component Up to 70 % of the water we take from rivers and groundwater goes into irrigation, about 10% is used in domestic applications and 20% in industry. In the irrigation purpose the water is extracted from the bore wells some depend on the river and some will use the underground water.

For vegetative growth and development plants require water in adequate quantity and at the right time. Crops have very specific water requirements, and these vary depending on local climate conditions. The production of meat requires between six and twenty time more water than for cereals. As the population was increasing so the production of the food should also be increased The main source of food for the population of the world is agriculture. This term also includes livestock husbandry, manages fisheries and forestry.

There are few methods there in the agriculture for the watering of the plants and provide the water for the irrigation purpose like drip irrigation, sprinkler irrigation, manual irrigation, sub irrigation Among these the drip irrigation is most recommended method as the usage of water is done properly and the wastage of the water in this process is less and the water is supplied to the crop properly.

Figure-5.7

In the figure-5.5 you can see the sprinkler irrigation in the farm and the plants and crops are watered with this but in drip irrigation water cannot be wasted in this it will be wasted

Green Revolution

The Green Revolution is nothing but the growing of crops using the fertilizers and pesticides to produce High Yielding Varieties (HYV) by using them. It provided the increase in production needed to make India self-sufficient in food grains, thus improved the agricultural sector in India. In India the Green Revolution was introduced by **MS Swaminathan**. He was also called as the father of green revolution in India.This Green Revolution strategy was developed in late 1960's now it became more popular and present it was using widely and by using this lot kinds of crops were grown.

The main features of the Green Revolution are

- High Yielding Varieties seeds promised to produce much greater amounts of grain on a single plant.
- Use of advanced technology, chemical fertilisers, pesticides and well-developed system of irrigation.
- These steps solved food crisis in India and made India self-sufficient in food grains.
- This led to higher income growth and reduced poverty.
- This led to commercialisation of agriculture. In many areas, Green Revolution is associated with loss of soil fertility due to increased use of chemical fertilisers. Also, continuous use of groundwater for tube-well irrigation has reduced the water level below the ground.

Figure 5.5

Sometimes the usage of the fertilizers and the chemicals on the field also spoils the fertility of the soil and the yielding place gets spoiled. It reduces the quality of soil as it was mixed with the chemicals so that in future no crops can be grown in the place so the farmer has to keep this in the consideration and use them accordingly otherwise it may affect him economically. It also creates the health impacts as the food grown by using those fertilizers if we eat them we may fall sick or sometimes we may lose our life.

CHAPTER-6

Biodiversity and It's Conservation

In this chapter we are going to discuss about the Biodiversity and how to conserve it by following some strategies.

Biodiversity

The word Biodiversity is nothing but the variety and variability of life on earth. The Biodiversity conservation is very important it is nothing but the protection and management of the biodiversity which helps in the sustainable development. As it plays the crucial role in it.

Biodiversity conservation has three main objectives:

- Preservation of the different species.
- Sustainable utilization of species and ecosystem.
- To maintain life-supporting systems and essential ecological processes.

Figure 6.1

Biodiversity Conservation

The conservation of different species is known as the Biodiversity conservation. Now a days many species are vanishing due to some natural changes and some Human violation so some of the species are becoming extinct so to overcome these problems there are few methods in the conservation of it.

1.In-situ conservation

2.Ex-situ conservation

In-situ conservation

In-situ conservation is the conservation of the ecosystem according to the natural habitat. Without disturbing them. In this conservation the natural ecosystem is protected. There are few advantages in the In-situ conservation they are

1. They are cost effective

2.Large number of organisms can be conserved at same place

3. It is the convenient method for the conserving of species

4. This method also helps in the evolution of them into new species

Some in-situ conservations are wildlife sanctuaries , biosphere reserves and national parks.

National park

These are maintained by the government and the animals were kept here they are conserved here and there will be no human activities like rearing of cattle, habitat, hunting as these are strictly prohibited here. The animals which are present here are adjusted with that environment so they can be preserved here. In our country there are few national parks like Khanna national park, Kaziranga National park

Figure-6.2

Wildlife Sanctuaries

These are the regions where only wild animals are found. Human activities such as timber harvesting, cultivation, collection of woods and other forest products are allowed here as long as they do not interfere with the conservation project. Also, tourists visit these places for recreation.

Figure-6.3

Biosphere Reserves

Biosphere reserves are multi-purpose protected areas where the wildlife, traditional lifestyle of the inhabitants and domesticated plants and animals are protected. Tourist and research activities are permitted here.

Ex-situ Conservation

Ex-situ conservation of biodiversity involves the breeding and maintenance of endangered species in artificial ecosystems such as zoos, nurseries, botanical gardens, gene banks, etc. There is less competition for food, water and space among the organisms.

Ex-situ conservation has the following advantages:

1.Animals were provided for a longer time in one place.

2.These species bred in one place and the capacity increases.

3.Gentic methods were used to create new species.

Figure-6.4

Strategies for Biodiversity Conservation

These are the strategies Followed to conserve the Bio-diversity:

1. There are many varieties of the food, timber, Agricultural animals.
2. All the economically important organisms should be identified and conserved.
3. The ecosystem should be preserved.
4. The utilization of the resources should be preserved.
5. Hunting of animals must be stopped.
6. The reserves and protected areas should be developed carefully.
7. Pollution should be reduced in the environment.
8. Deforestation should be strictly prohibited.

9. Environmental laws should be followed strictly.
10. The useful and endangered species of plants and animals should be conserved in their nature as well as artificial habitats.

Why should we conserve biodiversity?

It is believed that an area with higher species abundance has a more stable environment compared to an area with lower species abundance. We can further claim the necessity of biodiversity by considering our degree of dependency on the environment. We depend directly on various species of plant for our various needs. Similarly, we depend on various species of animals and microbes for different reasons.

Biodiversity is being lost due to the loss of habitat, over-exploitation of resources, climatic changes, pollution, invasive exotic species, diseases, hunting, etc. Since it provides us with several economic and ethical benefits and adds aesthetic value, it is very important to conserve biodiversity.

Figure-6.5

As we are seeing some animals which became extinct in the museum if this continues then in our next generation they also have to see every thing in the museum so we have to conserve the biodiversity some of the animals which are endangered species those are going to become extinct in the future so to stop this we have to stop hunting of the animals and also due to the use of mobiles the radiation from the mobile is effecting the birds health and they are dieing due to the radiation and from the industrial waste from the industries is passed into the river this causes the death of the water species so we have to stop all these human actions

CHAPTER-7

CONCLUSION

Sustainable Development is a global concern. In which everyone wants to bring change in it if it is not stable then everything gets collapsed. So sustainable development is needed to run the life in a successful way. It is nothing but the stable growth in which the present generation is using the things by meeting the needs of the future generation.

After doing this course everyone will fall in dilemma that really at present they are in sustainable world or not. But after realising that they are not in the sustainable world then they will find the way To attain the sustainability every living creature on this earth to maintain a stable life then it should meet the sustainability as the food, shelter, water are the primary needs these should be required for each and everything living on this earth if it lacks it then the unsustainability occurs due to this many of the animals became extinct as the humans are the main reason for the extinction of the animals as their dangerous acts made them vanish away. Like hunting, cutting of trees, building factories in forest areas, leaving the waste water into the rivers and ponds.

So, are we in a sustainable path? Yes, we are moving on right path but at slow pace. The best approach is to educate the consumers, and the industry, to leave behind an either/or approach to development and conservation and to take on a balanced ratio approach that seeks the best of both worlds. This is very hard to do as it requires an element of sacrifice be adopted by the present society. We need both of the sides to come together creating regulations, incentive programs and tax credits that promote sustainable development while defining priorities for conservation in different areas that will also feedback into the local communities. The task is difficult but we are changing slowly and gradually.

I believe that in future the people are going to realise that the importance of the sustainability and they will follow the required steps and paths to attain it as the sustainability is very much important in the present generation and awareness programs must be conducted to wake them up. Conducting the events related to the environment is going on now a days so it will definitely make a change in the future and the stable growth takes place in the human life.

REFERENCES

Books that I referenced from:

1. Anubha Kaushik, C.P. Kaushik in Perspectives in Environmental Studies (Edition-2), New Age International Publishers, 2004, pg. 65-120
2. Joseph H. Hulse, Sustainable Development at Risk: Ignoring the Past(Edition-1), International development of research centers,2007,pg. 10-17
3. D. Dave and D. D. Katewa in Text Book of Environmental Studies (Edition-2), Cengage Learning India, 2012, pg. 10-31

Sites from which I took help:

1. https://www.environmentalscience.org (Accessed on 1st Nov 2020).
2. https://www.quora.com (Accessed on 1st Nov 2020).
3. https://medium.com (Accessed on 2nd Nov 2020).
4. https://www.sciencedirect.com (Accessed on 2nd Nov 2020).
5. https://unfoundation.org (Accessed on 4th Nov 2020).
6. https://www.resilience.org (Accessed on 5th Nov 2020).
7. https://sonomasun.com (Accessed on 5th Nov 2020).
8. https://www.nature.com (Accessed on 6th Nov 2020).