A TOOLKIT FOR YOUTH ON CLIMATE CHANGE

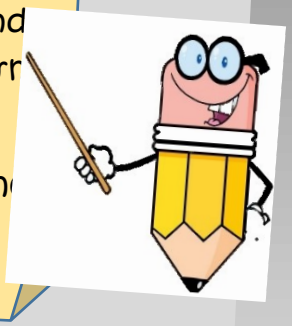
MINISTRY OF SOCIAL SECURITY, NATIONAL SOLIDARITY, AND ENVIRONMENT AND SUSTAINABLE DEVELOPMENT (ENVIRONMENT AND SUSTAINABLE DEVELOPMENT DIVISION)

REPUBLIC OF MAURITIUS

Hi Friends!

Welcome to your new manual on Climate Change and Youth! We are going to learn about Climate Change.

Let us see what's inside the manual.



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What's inside...

Actions to Combat Climate Change

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Acknowledgements

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Foreword

Climate change is one of the most daunting challenges which humanity is facing. It is considerably disrupting national economies, affecting livelihood, and the well-being of people in every corners of the planet. Weather patterns are changing, sea levels are rising, weather events are becoming more extreme and greenhouse gas emissions are now at their highest levels in history. Millions of people around the world have suffered and continue to suffer from extreme weather events. We have never met with a greater sense of urgency. Climate change threatens to affect all aspects of the development agenda, irrespective of countries: from poverty eradication to health care, and from economic growth to disaster risk reduction. It will represent a major impediment towards achieving sustainable development goals.

In the light of the growing concerns linked to climate change, Article 6 of the United Nations Framework Convention on Climate Change sought to promote education and awareness raising as a major pillar to trigger global climate action to ensure that everyone knows both the dangers of climate change and what is required to adapt and mitigate its impacts. Education and training are integral in enabling citizens' contributions to local and global efforts to meet the climate change challenge.

It is noteworthy that Mauritius is also being severely impacted by climate change. We are regularly being quoted among the most vulnerable countries on the planet. For instance, the 2018 World Risk Report ranked Mauritius as the 16th country with the highest disaster risk and 10th as the most exposed to natural hazards. As a matter of fact local climate indicators are all showing signs of serious concerns. Mauritius has experienced an increase in air temperature by up to 1.2 degree Celsius and the sea level is rising at an accelerated rate of 5.6 mm per year. A reduction of 8% over the last 50 years has also been observed in the annual precipitation. The width of our beaches, which is a major pillar of our economy, has been eroded by some 20 metres over the last 10 years.

It is recognized that climate change education and public awareness are vital tools to build resilience against climate change and extreme events. The Government of Mauritius has an ongoing sensitization and public awareness programme in place with the aim to promote climate change literacy. It involves targeting various community groups including youth, women, senior citizens as well as sectors such as education, agriculture, fisheries, infrastructure, water, energy, waste and health, among others.

The approach being used involves developing tailor made sensitization materials such as audio visuals, sensitization toolkits, posters, pamphlets, roller banners, 3D models, interactive digital tools, card games, PowerPoint presentations and mounted exhibitions to hold relevant and effective sensitization activities with various target groups.

This toolkit has been specifically developed to provide the youth community with a detailed insight of climate change including the causes, the consequences, the impacts, the challenges and the opportunities. Increased knowledge will enable the youth to better play their role in climate adaptation and mitigation and make our country climate change resilient and to progress towards a low carbon economy pathway.

List of Abbreviations/Acronyms

AfRP	Africa Regional Platform
BUR	Biennial Update Report
CC	Climate Change
CCIC	Climate Change Information Centre
CDRP	Community Disaster Response Programme
CEB	Central Electricity Board
CGE	CEB Green Energy
CGT	Cycle Gas Turbine
DOWA	Deep Ocean Water Application
EE	Energy Efficiency
EEMO	Energy Efficiency Management Office
EWEAS	Early Warning and Emergency Alert System
GHG	Greenhouse Gases
INDC	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
JICA	Japan International Cooperation Agency
LDRRMC	Local Disaster Risk Reduction and Management Committees
MARENA	Mauritius Renewable Energy Agency
NAMA	Nationally Appropriate Mitigation Actions
NDRRMC	National Disaster Risk Reduction and Management Centre
NEOC	National Emergency Operations Command
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Co-operation and Development
RGSC	Rajiv Gandhi Science Centre
SADC	Southern African Development Community
SCAP	Smoke Control Action Plan
SME	Small and Medium Enterprises
SWH	Solar Water Heater
SWIO	South West Indian Ocean
TNC	Third National Communication

About this Manual

This manual is designed to provide an overall picture of climate change. It introduces aspects of climate change, such as:

- What is climate change?
- Why is climate change happening?
- What are the projected impacts?
- What can be done to better address the challenges?

It lays emphasis on the science of climate change, which is essential for providing a better understanding of the broader picture.

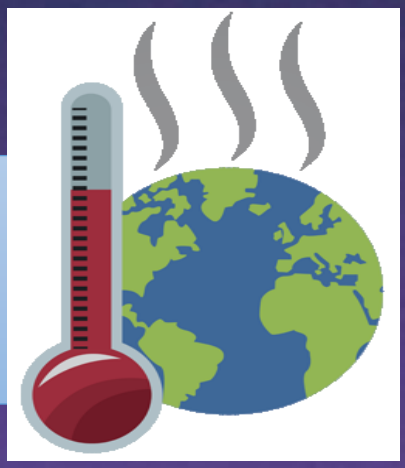
This manual aims to bring climate change closer to the youth by providing concrete examples and guidelines on how to better deal with climate change. Additionally, it explains the observed and projected impacts of climatic change.

This manual supports youth actions towards an eco-friendly future. It provides a variety of options for reducing global warming and climate change. Moreover, the manual shows current youth-led initiatives in Mauritius and around the world with an intent to reduce possible disasters and calamities. This is crucial because the challenge goes beyond raising awareness and inducing behavioral changes.

The aims of this manual are to:

- Increase awareness on the science of climate change, its causes, observed and projected impacts and other related issues;
- Enhance participants' knowledge at addressing climate change;
- Provide youth actions and initiatives to induce behavioral change and
- Promote a sense of responsibility in the youth as climate leaders.

Introduction



Youth and Climate Change

The United Nations recognizes the important role that Youth can play in tackling climate change and therefore works closely with youth-led and youth-focused organisations. This is done through the United Nations Joint Framework Initiative on Children, Youth and Climate Change.

Youth plays a crucial role in combating climate change and they also fit into the climate change and development equation as solution providers.

Preparing (adaptation) for sustainable climate change issues is therefore a major concern for Youth as potential victims and as leaders of tomorrow.

Source: volunteermauritius.org

Need for Youth to have knowledge on Climate Change

Reasons:

- They can contribute to make a better world.
- They are motivated by strong ideals.
- They are willing to take risks.
- They have a lot of energy.
- They are trend-setters for others.
- They are highly communicative.
- They are enthusiastic, impulsive and energetic.
- They can have a high persuasion power.
- They have creative efforts to attract awareness.
- Their involvement must be encouraged by making environment protection an employment opportunity.
- Their enrolment in the active participation in activities is important.

What is Climate Change?

Weather vs Climate

Weather describes the day-to-day conditions in a particular place. Weather is what it's like outside today, tomorrow, next week, next month, etc. For example, the weather can be cloudy, sunny, rainy, windy, hot or cold.

Climate describes the average weather conditions in a place over relatively long periods of time (e.g. 30 years). For example,

Curepipe: Cool and Humid,

Rivière-Noire: Hot and Dry

Climate change is the change in the usual weather found in a country or region. This could be a change in rainfall patterns, or a change in temperature. Climate takes longer time to change.

Examples in Mauritius: Long ago, there was a specific period for flowering of mango trees, nowadays flowering can occur more frequently in some years and less flowering occurs in some other years.

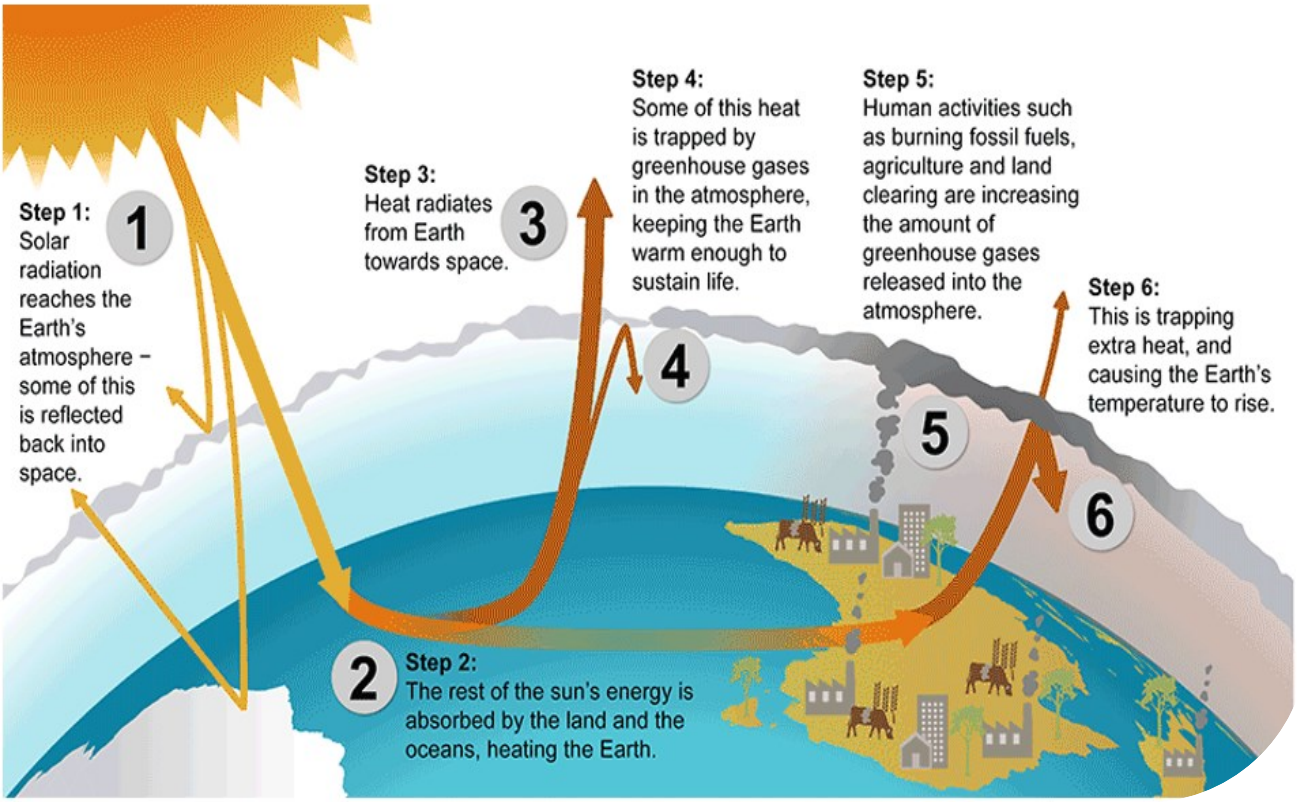
Examples in other countries: Decreasing amount of snow falls affect the water supplies that are used for farming and the timing of the winter snow season is shifting.

The Greenhouse Effect

When solar radiation hits the Earth's surface, some of this energy is absorbed and warms both the ground and the oceans, while rest escapes back into space. However, some of it is trapped in the atmosphere, which further warms the Earth. This is called the ***greenhouse effect*** because Earth's atmosphere acts like the glass panes around a greenhouse and thus warming the inside.

The Earth's atmosphere contains gases such as water vapour, carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) known as ***greenhouse gases***, and are the primary gases that retain the thermal energy reflected from the Earth's surface. The greenhouse effect is what normally keeps our planet at a comfortable temperature. Unfortunately, human activities are increasing the amount of greenhouse gases in the atmosphere, which traps extra heat and further raises the surface temperature of the Earth.

Climate change mechanism – The greenhouse effect



Global Warming

Global warming refers to the rise in the temperatures of Earth's oceans and atmosphere. This is mainly due to the increasing concentration of greenhouse gases in the atmosphere as a result of human activities.

Is the hole in the Ozone layer responsible for Climate Change?

No! Ozone is a very useful gas high up in the Earth's atmosphere that absorbs harmful ultraviolet radiation from the sun. When scientists realized that man-made gases used in fridges and aerosols were making a hole in the ozone layer, the international community set about phasing them out. An agreement called the Montreal Protocol was drawn up to phase out Chlorofluorocarbons (CFCs) in 2010 and Hydrofluorocarbons (HFCs) in 2030.

Efforts have been so successful that the ozone layer is on track to recover by the middle of the 21st century. Unfortunately, fluorinated gases, known as F-gases, eventually replaced the CFCs and their successor substances. These have no effect on the ozone layer but are powerful greenhouse gases. Once again, the world took action: in October 2016, under the Kigali Amendment, the 195 countries that signed the Montreal Protocol agreed to gradually reduce the imports of these gases – the Hydrochlorofluorocarbons (HCFCs) as from 2024 for developing countries like Mauritius.

International Initiatives on Climate Change

There are several international initiatives that work on climate change issues.

United Nations Framework Convention on Climate Change and the Kyoto Protocol

The United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol are the foundation of the international climate change governance. The Kyoto Protocol committed industrialized countries to achieving a specific level of greenhouse gas (GHG) emissions reductions.

Text of the UNFCCC, which entered into force on 21 March 1994, established an international framework for governments, working together, to develop a policy proposal to reduce the effects of climate change and adapt to its threats.

The Kyoto Protocol was negotiated in Kyoto, Japan, in December 1997 which was ratified by many countries, committed to reducing their emissions of carbon dioxide and five other greenhouse gases. The Kyoto Protocol of the UNFCCC is an amendment to the international treaty on climate change that obliges signatory nations to reduce emissions. It entered into force on 16 February 2005.

The objective of the protocol is the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent disruption of the climate system.

Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change (IPCC) organisation was formed by thousands of scientists from many countries. Members of the IPCC, coordinated through the United Nations, have been collaborating since 1988 to interpret data relating to climate change. In 2007 the IPCC, along with Al Gore, was awarded the Nobel Peace Prize for their efforts in studying climate change.

The Republic of Mauritius (RoM) is among the first countries to ratify the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and one among the first 15 countries to sign and ratify the Paris Agreement on 22 April 2016. This demonstrates its willingness as a responsible member of the global community to seek and achieve global solutions on climate change matters.

International Initiatives

The UN Environment provides a list of international initiatives on climate change:

- Absorb, Anticipate, Reshape (A2R)
- Africa Renewable Energy Initiative
- Climate and Clean Air Coalition
- Climate Initiatives Platform
- Climate Technology Centre and Network
- Global Centre of Excellence on Climate Adaptation
- Global Environment Facility
- Green Climate Fund
- GRID-Arendal
- International Environmental Technology Centre
- Partnership with the Technical University of Denmark (DTU)
- Portfolio Decarbonization Coalition
- Programme for Action on the Green Economy
- The Adaptation Fund
- UN Framework Convention on Climate Change
- UN Environment Finance Initiative
- UN Environment International Ecosystem Management Partnership
- World Conservation Monitoring Centre

Source: UN Environment[1]:

National (local) Initiatives

CC and related Conventions signed by the Republic of Mauritius

- UNFCCC
- Kyoto Protocol under the UNFCCC
- Vienna Convention for the Protection of the Ozone Layer
- Montreal Protocol under the Vienna Convention
- More conventions can be found at the website of the Ministry[2]

[1] *https://www.unenvironment.org/explore-topics/climate-change/about-climate-change/climate-change-initiatives-and-partnerships*

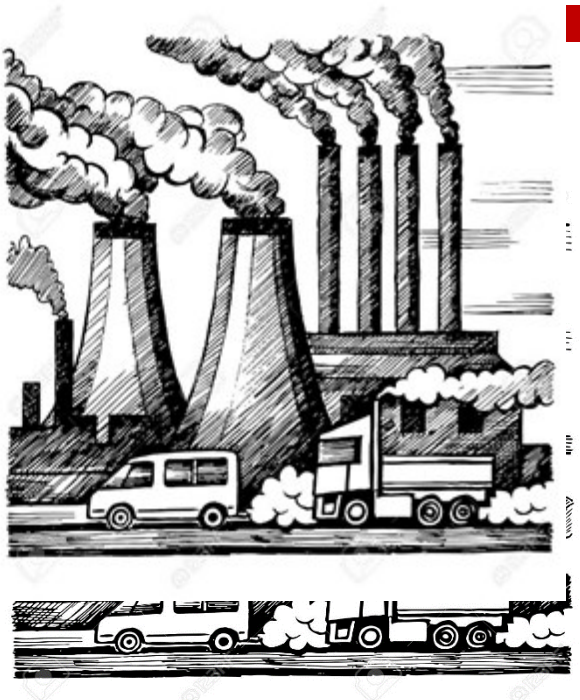
[2] http://environment.govmu.org/English/Pages/Conventions/Conventions.aspx, and http://environment.govmu.org/English/Pages/Conventions/International-Conventions.aspx

Activity 1

THINK ABOUT IT

Discuss with your grandparents, parents and friends on the climatic changes observed in your locality during the past years. For example, is summer as warm as long time ago? Is winter as cold as long time ago? Are flowering periods for particular fruit trees the same?

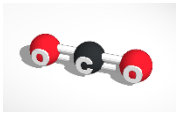
Causes and impacts of Climate change

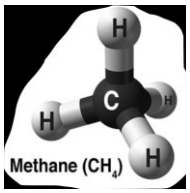


Causes of Global Warming and Climate Change

Greenhouse Gases (GHGs)

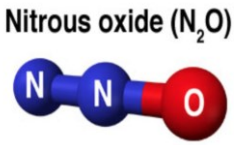
Carbon dioxide (CO_2) is the primary greenhouse gas (GHG) emitted into the atmosphere through human activities. Humans are also influencing the ability of natural sinks, like forests, to remove (absorb) CO_2 from the atmosphere.





Methane (CH_4) is emitted during the production, use and transportation of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.

Nitrous oxide (N_2O) is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.



Fluorinated gases: Hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, and nitrogen trifluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes.

These gases are typically emitted in smaller quantities, but because they are powerful greenhouse gases, they are sometimes referred to as High Global Warming Potential gases ("High GWP gases")

- CO_2 in the atmosphere highest in 650,000 years
- Arctic summer ice shrank to lowest in 2012 years
- China emitted around 9839 billion tonnes of CO_2 in 2017.

Factors Leading to Climate Change

Natural Factors

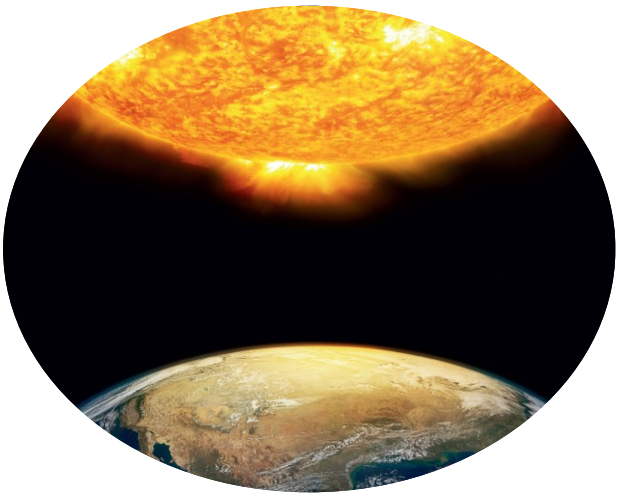
Volcanic Eruptions

Volcanic eruptions emit carbon dioxide (CO_2), which causes global warming and volcanic ash or dust and sulfur dioxide that can block a percentage of sunlight causing a cooling effect.

Source: Daily Express

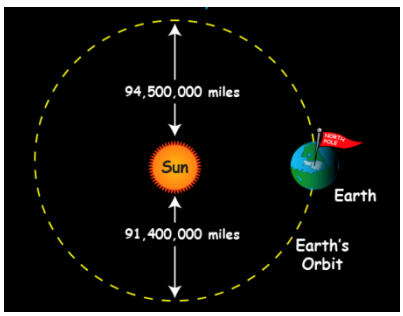
Variations in Solar Radiation

The sun's radiation drives the world's biological and physical processes. Changes in solar activities impact upon our climate as the rate of solar heating of the Earth and cloud forming processes are altered.



Source: Phys.org

Orbital Changes



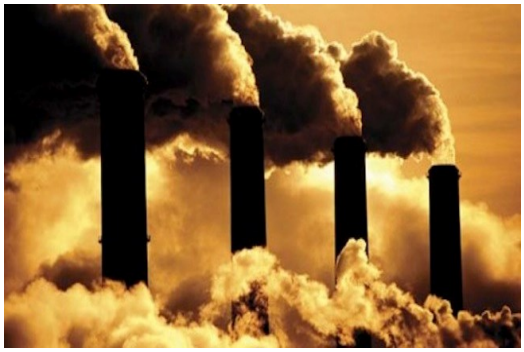
Source: Pinterest

The amount of radiation that Earth receives varies with distance from the Sun. Earth's orbital changes are one of the natural causes of climate change.

Human Induced Factors

The world's leading climate experts confirm that human activities are the main cause of the warming observed since the Industrial Revolution (IPCC). Greenhouse gases are considered the main driver of warming the planet. Some human activities that increase the global temperature resulting in climate change are illustrated as follows.

Burning of fossil fuel



Source: econews.com.au

Burning coal, oil and gas produce carbon dioxide and nitrous oxide.

Cutting down rainforest

Source: Smithsonian Magazine

Trees help to regulate the climate by absorbing CO_2 from the atmosphere. Cutting them down will increase CO_2 in the atmosphere.

Increased livestock farming

Source: Livestock farming blog

Ruminants produce large amounts of methane when they digest their food.

Use of fertilizers

Source: Free Press Journal

Fertilizers, that contain nitrogen, increase nitrous oxide emission which is one of the greenhouse gases.

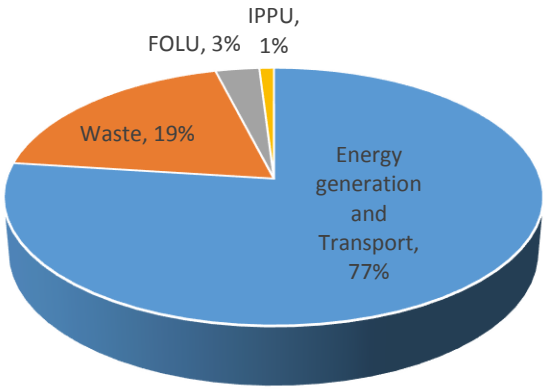
Major GHG Sources in Mauritius

The GHGs are increasing mainly because of uncontrolled human activities such as:

- producing and using energy,
- transportation,
- deforestation, and
- waste generations.

In **Mauritius**, around 77% of the GHG emissions are from the energy sector, which includes electricity generation and transport. Wastes release around 19% of the emissions. Industrial processes and product use *(IPPU)* emit around 1% of GHGs, while Agriculture, Forestry and other land use *(AFOLU)* accounted for around 3% of emissions.

(source: TNC 2016).



DID YOU KNOW...?

Global warming 'solved' a land dispute between India and Bangladesh because…

…the disputed island simply **disappeared**.

Activity 2

Identify the main activities at home that are sources of GHGs

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Impacts of Climate Change Globally

Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate. (IPCC Special Report on Global Warming of 1.5°C)

Stronger and more recurrent cyclones and extreme weather.

Source: Stirile ProTV

Life and livelihood are threatened (scarcity of food, decrease in harvest/ fishing, etc.)

Source: Dailymotion

Increase in number and intensity of flash floods.

Source: The Indian Express

Potential Impacts of Climate Change

More prolonged droughts.

Source: Wikipedia

Intense heat and fire.

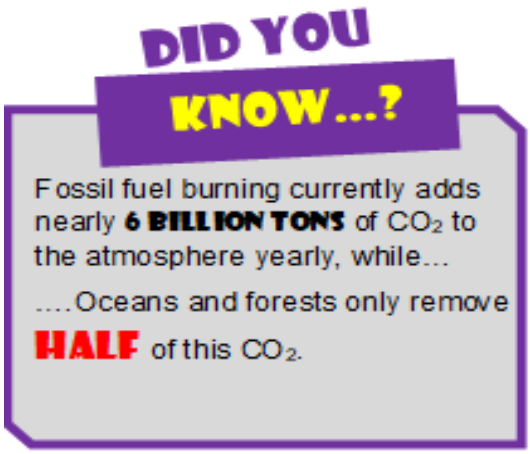
Source: ABC News

Melting of Glaciers.

Source: Wonkette

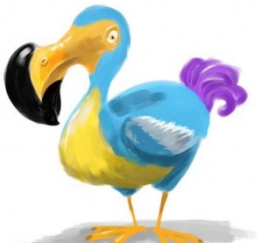
Climate Change Projected Temperature Increase Scenarios at Global Level

The world is getting warmer and the average global temperature on Earth has increased by 0.85°C since the 1880s and two-thirds of the warming has occurred since 1975 at a rate of around 0.15 to 0.2 °C per decade (NASA). The Paris climate agreement firmly affirms that humanity must not pass a rise of 2°C in global temperature from pre-industrial levels since the global impacts of Climate Change will be more than an alarming situation.



Observed and Projected Impacts of Climate Change in Mauritius

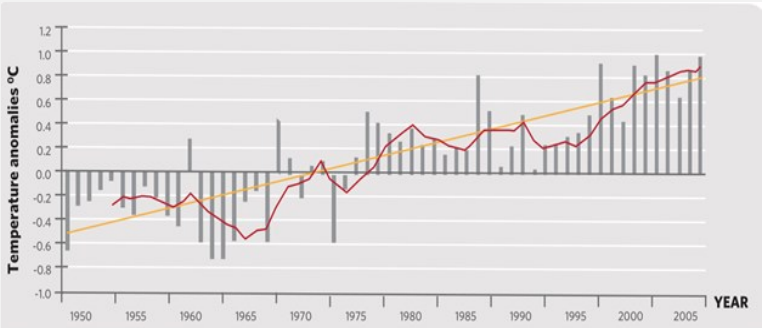
Our contribution to GHGs & our exposure to risks!



- Even if Mauritius contributes only 0.015% of global greenhouse gas emissions, it is one of the most vulnerable countries.
- The 2018 World Risk Report has ranked Mauritius as the 16th country with the highest disaster risk and 10th as the most exposed to natural hazards.

Temperature Trends for Mauritius

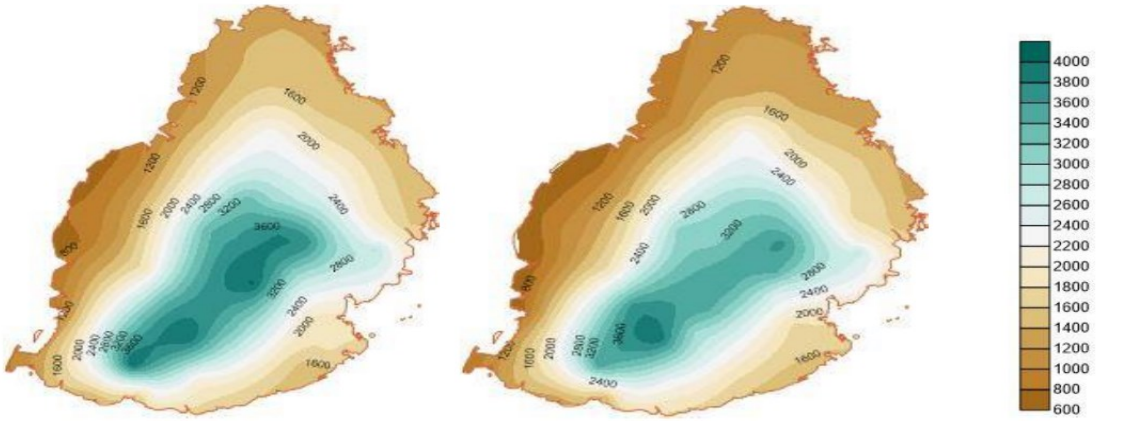
- There is a definite warming trend.
- Average temperature for Mauritius is increasing at the rate of 0.15 °C per decade.
- Climate records over the period 1951-2014 show a significant warming trend of about 1.2°C.



The average temperatures have increased by 0.74°C at Vacoas (high grounds) and by 1.1°C at Plaisance (coastal areas), when compared to the 1961 - 1990 long term mean.

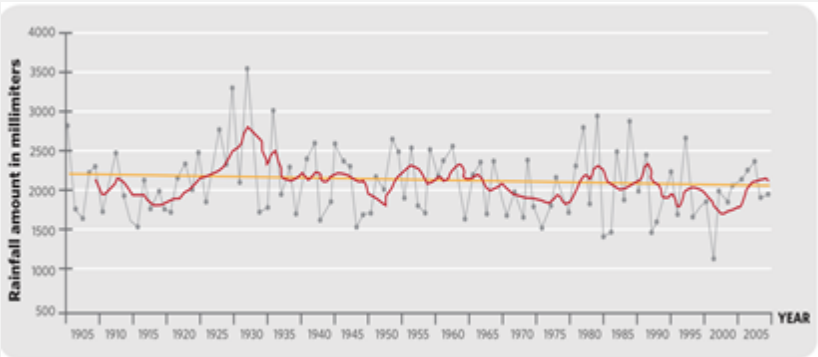
Rainfall Patterns for Mauritius

Changes in rainfall pattern between time period 1951 -1980 and 1981-2010



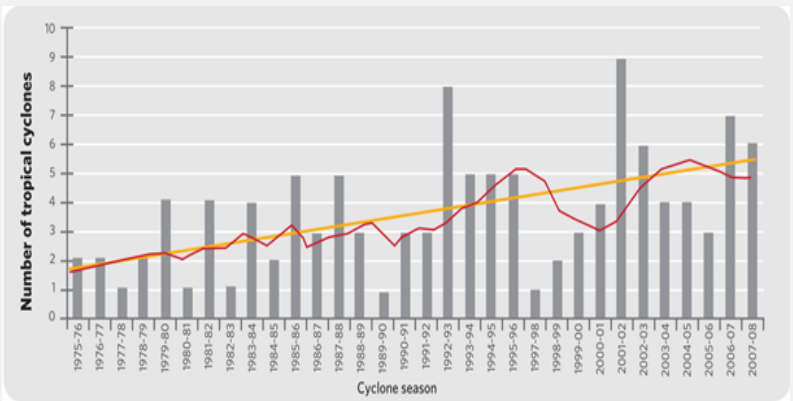
Source: Mauritius Meteorological Services

(a) 1951-1980 (b) 1981-2010 Rainfall scale in mm



There has been a decreasing trend in annual rainfall of 8% over Mauritius since the 1950s.

Trends in Extreme Events



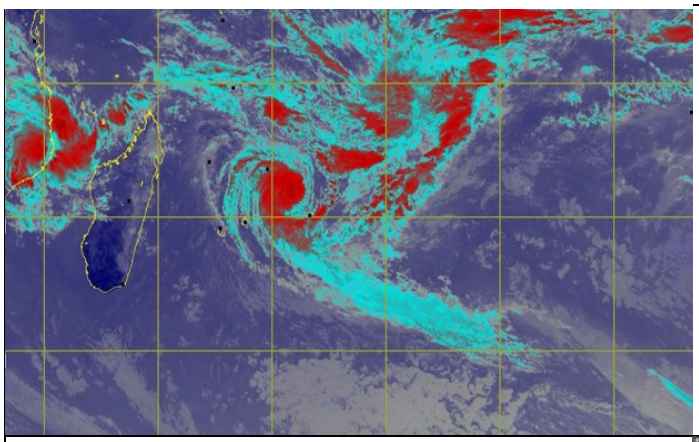
Since 1975, an increasing trend in the number of intense cyclones (with gusts above 165 km/hr) has been noted. Since the last decade, there has been rapid intensification of tropical storms in the South West Indian Ocean (SWIO).

An example is cyclone Fantala in 2016 with gusts in the order of 345 km/hr. In 2019, 10 cyclones have formed, some have been devastating including for Rodrigues.

Sea Level Rise

Sea level rise has been observed to be accelerating in the last decade at an average rate of 5.6 mm/yr compared to the global value of 3.2 mm/yr. (Third National Communication (TNC), 2016).

Cyclonic Weather

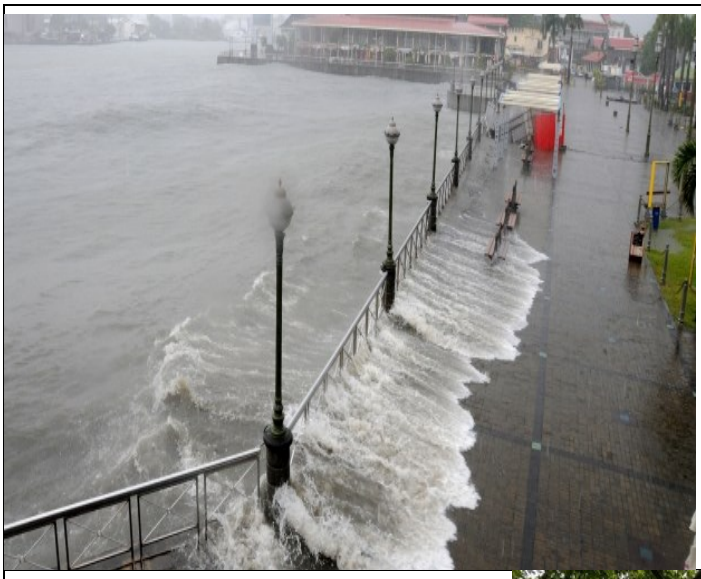


Our exposure to cyclones is increasing. The impacts and intensity of the cyclones keep on increasing with time.

Due to the gusts and rainfall from cyclone Fakir on 24 Apr 2018, at Bois-des-Amourettes, many electrical poles and trees fell down.

Picture Source: l'Express

The hoardings and signboards at Bagatelle and other places also fell down due to the violent winds of cyclone Fakir in 2018.



Storm surge at Caudan due to cyclone Bejisa on 16 Jan 2014.

Many coastal regions, routes and beaches were inundated due to Berguitta cyclone on 16 Jan 2018 especially at Côteau-Raffin.

Picture Sources: l'Express

Activity 3

1. **Tick all the factors below which are likely to <u>cause</u> climate change**
   - ☐ **Planting trees**
   - ☐ **Using more fertilisers**
   - ☐ **Reducing wastes**
   - ☐ **Driving a petrol driven car**
2. **State what could happen to our coral reefs if there is 1.5 °C rise in global average temperature**

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3. **The intensity of cyclones is increasing with the advent of climate change**
   - ☐ **True**
   - ☐ **False**

Observed Impacts

Water Shortages and Related Impacts

Due to the overall warming of the earth, Mauritius is having warmer summers. Water scarcity is becoming more frequent.

In November 2011, the Mare-aux-Vacoas reservoir was only 29.2% filled which lead to a disruption in the water supplies to different parts of the country.

Beach Erosion

Accentuated beach erosion has shrunk the width of beaches around certain coastal areas in Mauritius by up to 10 meters over the past eight years.

Damage to Infrastructure

The Terre Rouge-Verdun road was damaged due to landslide after a heavy downpour.

Damage to Buildings

Regions such as Chitrakoot and Quatre Soeurs have recurrently been affected by landslide events such that residential buildings are prone to cracks and damages.

Picture Source: l'Express& Le Mauricien & hacklog

There has been an increase in the frequency of extreme weather events and more frequent torrential rains, the latter causing 11 deaths in March 2013. During the heavy rainfall in January 2015, around 250 sites were flooded in Mauritius.

The flash flood of May 2017 affected around 74 household in the Flacq region namely, Central Flacq and Poste de Flacq (Cite Hibiscus, Camp Poorun and Cite Debarcadere).

The flooding at Cottage and surrounding regions on 17 December 2018, have resulted into severe damage to personal properties and public infrastructure. Government is implementing an Emergency Flood Rehabilitation Programme which would focus, inter alia, on the construction of new drains and detention basins.

Moreover, on 09 April 2019, flooding has caused major damage to material loss at Fond du Sac. To this effect, some 110 households were compensated.

Impacts on Agriculture

A rise in temperature is resulting in an increased incidence of pests and diseases. It has been observed that bugs (small insects) are increasing in numbers and are a direct threat to some vegetation.

The decreasing trend in annual rainfall of 8% over Mauritius since the 1950s, and an increase in evapotranspiration due to global warming may lead to a decline in agricultural yield by as much as 15-25% in the long run (TNC 2016).

Coral Bleaching

Healthy Coral Reef

After an algal bloom (dead corals)

Totally bleached corals

Warmer seas and ocean acidification causing coral bleaching due to CO_2 absorption.

DID YOU KNOW...?

Corals are **ALIVE**! They are very fragile animals which have existed for over

400 million years.

However, many of the species of corals are listed as

Endangered or Critically Endangered.

- Corals are affected when the sea water temperature increases (e.g. beyond 28°C).
- The coral is also affected when the sea water become more acidic and this is known as ocean acidification which can be caused by CO_2 being absorbed by the ocean.
- Coral Bleaching means that the corals are affected and damaged by the acidic seawater.

Projected Impacts of Climate Change in Mauritius

- A temperature rise of up to 2°C is projected by 2061 - 2070.
- There will be a further reduction in amount of water by 13% by 2050.
- Sea level rise is projected to be of the order of 49 cm by 2100.
- It is likely to have an increase in the frequency of extreme weather events such as frequent torrential rain, resulting in consequences such as flash floods.
- According to the UN report 'SIDS in Numbers 2017' Mauritius is projected to become a water stressed country by 2025 and its agricultural production may decline by as much as 30%.

Important emergency numbers

SAMU: 114

Fire Services: 115

Coastguards: 212 2747

Police: 112/999

CEB (Electricity): 130

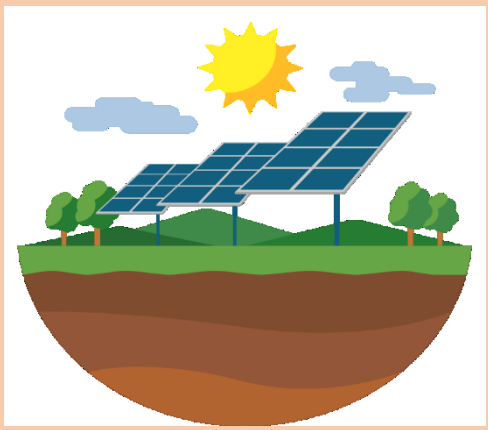
CWA (Water): 170

Telephone directory: 150

Important dates to remember

- World Environment Day - WED (June 5)
- World Wetlands Day (February 2)
- International Day of Forests (March 21)
- World Water Day (March 22)
- Earth Day (April 22)
- International Migratory Bird Day (May 3)
- International Day for Biological (May 22)
- World Oceans Day (June 8)
- World Day to Combat Desertification and Drought (June 17)
- International Day for the Preservation of the Ozone Layer (September 16)
- Clean Up the World (third week-end in September)
- Zero Emissions Day (September 21)
- International Day for Natural Disaster Reduction (second Wednesday in October)
- International Day of Climate Action (October 24)

Actions to Combat Climate Change



WAYS TO COMBAT CLIMATE CHANGE

These are the two fundamental ways to combat climate change:

- Mitigation
- Adaptation

Adaptation
- Change in land use, relocation
- Emergency and business continuity planning
- Upgrades or hardening of building and infrastructure
- Awareness raising campaign
- Health programs

- Seal Buildings
- Green Infrastructure
- Water and Energy Conservation
- Smart Growth

Mitigation
- Energy conservation and efficiency
- Renewable energy
- Sustainable transportation, improved fuel efficiency
- Capture and use of landfill and digester gas
- Increase carbon sinks

What is Mitigation & Adaptation?

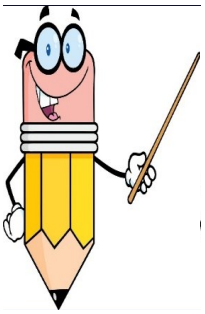
Mitigation

Mitigation refers to the actions that are taken to reduce and curb greenhouse gas emissions in an attempt to slow the process of climate change.

Adaptation

Adaptation refers to the measures that are based on reducing vulnerability to the effects of climate change.

What is Climate Change Vulnerability?



- Vulnerability is the susceptibility of exposed elements or assets to suffer damage and loss.
- Each type of exposed element can be affected by the hazard (i.e. climate change) in different ways.
- For example, a certain wind speed affects a wooden house and a concrete building differently.

Vulnerability depends on three things:

1. Exposure
2. Sensitivity
3. Adaptive Capacity

Is everyone vulnerable to the same extent?

Not everyone has same vulnerability. It depends on many factors such as health, wealth, location around the globe, etc. For example:

- Poor people are more vulnerable as they have fewer facilities in terms of infrastructure and shelter.
- Vulnerability also depends on age; for example, children and old people tend to be more vulnerable.


Source: RSIS


Source: Assam Times


Source: Business Times

Adaptive Measures in Key Sectors

Health

Mosquito Proliferation

Due to an increase in the frequency of extreme weather events – intermittent heat waves varying from 33 to 37°C, cyclones and flash floods – weather factors are conducive to the proliferation of vector-borne diseases by mosquitoes and bacteria leading towards health problems such as malaria and food poisoning.

Mosquito control especially in school premises

Sensitization campaigns

Use of mosquito coils, repellents, sprays, etc.

There is a need to prevent the proliferation of mosquitoes and to consume food that has been freshly prepared.

Disaster Risk Reduction and Management

With the unpredictable changes in weather patterns, the youths are at risk of being victims to flash floods amidst other calamities. Many related NGOs and forces have started to carry out simulation exercises and drills to help the youngsters be better prepared for such natural disasters.

Sensitisation

Climate Change education and related environmental topics are taught as from pre-primary till tertiary levels.

Initiatives like school compost project, rainwater harvesting, school endemic garden and waste segregation projects have been implemented in schools.

Extra-curricular activities related to environment are organised on special events like the Earth Day, Environment Day, Wetlands Day, etc.

Activities like distribution of information materials, essay and drawing competitions, project presentations, debates and Slam are organised on these days.

World wetland day at Goodlands SSS

Slam presented by students of Satya Sai School of Mauritius

Children visiting the 'Bis Lamer' by REEF Conservation

Agriculture and Food Security

In the field of Agriculture and food security, the following adaptation actions are encouraged:

Cultivation of more drought and heat resistant varieties of food crops.

Practice of trash blanketing in sugarcane fields

Shifting towards soilless cultures and sheltered farming

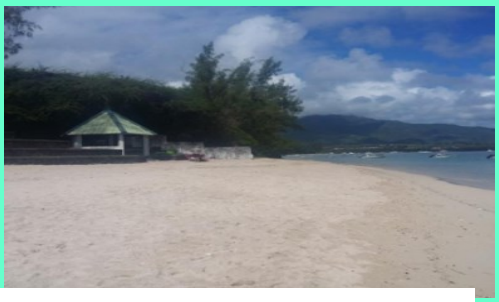
Improved livestock housing and breeding

Reduction in the use of irrigation water and fertilizer, through improved techniques e.g pivot and drip irrigation systems and fertilization technology

Coastal Management and Tourism

In the coastal management and tourism sector, some of the following key measures have been undertaken to combat accentuated beach erosion around certain coastal areas as shown in the examples that follow.

Rock revetment for shoreline protection at Baie-du-Cap



Beach nourishment at La Preneuse

In addition, various adaptation programmes are being implemented; for example, the minimum setback from high water mark has been increased from 15m to 30m for hotels and residential coastal development. An Integrated Coastal Zone Management Framework has been developed and many coastal activities are controlled through the EIA mechanism.

The increased erosion process at Flic en Flac and Rivière des Galets beach required beach protection works to reduce the effects of erosion.

Beach erosion at Flic en Flac public beach

Beach protection works at Flic en Flac public beach

The authorities are also encouraging coral nursery and growth of coral reefs. They intend to incentivise **ecotourism** with the valourisation of natural capital.

Rehabilitation works at Rivière des Galets

Mangrove Plantation

Mangroves are almost five times more effective than land forest in sequestering carbon. They also protect coastal zones from heavy waves and beaches from erosion. In the Technical Needs Assessment Report (GoM, 2012), vegetation restoration was recommended as one of the priorities for the protection of coastal zones. Consequently, an intensive mangrove propagation programme is being promoted to increase mangrove forest following a drastic decline in mangrove cover, which stood at only 45 ha in 1980.

Several NGOs are now engaged in mangrove propagation with funding from the private sector and international agencies.

The benefits of mangrove plantation are far-reaching and have the potential to not only protect but to improve the local ecosystem by restoring equilibrium; mangroves play an important role in balancing the diversity of marine life in the area. An increase in mangroves could result in improvements in local fishing with positive effects on individual livelihoods.

Rainwater Harvesting

A rainwater harvesting system consists of stages like transporting rain water through pipes or drains, filtration and storage in tanks for reuse or recharge such as watering plants, landscape irrigation and washing of premises and cars.

Rose Belle market does rainwater harvesting since March 2017.

Infrastructure/Settlement

- Where practicable, adopt climate sensitive building design that allows cooling through natural ventilation and that consumes low energy through proper building orientation.
- Buildings should be designed taking into consideration future climate change impacts and incorporation of future adaptation.
- Development should be controlled in areas identified to be potentially at risks from flooding and even landslide.
- Provision of proper drainage system should be considered within inhabited vulnerable areas where drains are absent.
- Green walls and roofs: A number of cities are growing plants on walls and roofs to absorb heat and help control the temperature inside buildings when it is hot. They also absorb water and reduce run off during cyclone and heavy rainfall. In some countries, such as France and Denmark, the law requires all new buildings to have green roofs!

Activity 4

What are examples of climate change adaptation?

a. Riding bikes instead of driving cars
b. Raising the level of the land to protect houses from floods
c. Using public transport
d. Planting crops that withstand bad weather
e. Reducing consumption and reusing and recycling resources
f. Installing solar panels
g. Use of drip irrigation

Activity 5

After natural disasters (e.g. flood, drought, cyclone), many properties and other assets are devastated, but some of them recovered quickly. Tick the reasons why some recovered?

a. They make provision for food reserve
b. They have protected and durable infrastructures
c. They used most of their water reserves
d. They have no insurance
e. Their land was vulnerable to natural disasters
f. Their roads were built on the proper ground and well protected with proper drainage
g. Their houses are not robust enough to withstand extreme weather
h. They easily contacted emergency services where they live

Activity 6

1. Tick all the adaptation measures below which can be useful
   - ☐ Rainwater harvesting
   - ☐ Sensitise people about climate change
   - ☐ Use appropriate clothing
2. Drains should be blocked to adapt to climate change
   - ☐ True
   - ☐ False
3. There are less disease due to climate change
   - ☐ True
   - ☐ False

Climate Change Mitigation

Use of Renewable and Cleaner Energies

- **Use of renewable energies**

Wind

Wave

Hydroelectric

Solar

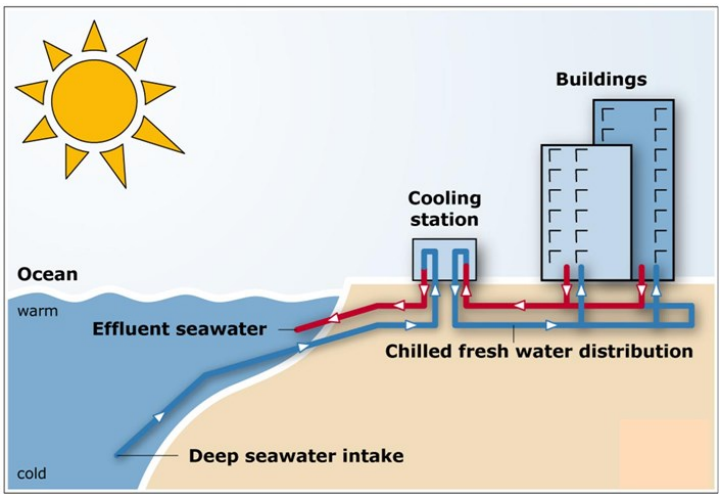
DID YOU KNOW...?

173,000 Terawatts of Solar energy strikes the Earth continuously. That's more than 10,000 times the world's energy use.

Energy.gov

- **Deep Ocean Water Applications (DOWA)**

The principal objective is to promote, design, construct and operate a ground- breaking system that will use thermal energy from the ocean by pumping cold sea water at 5°C from 1000 meters deep to be used for air conditioning.



- **Use of Bagasse and Biomass**

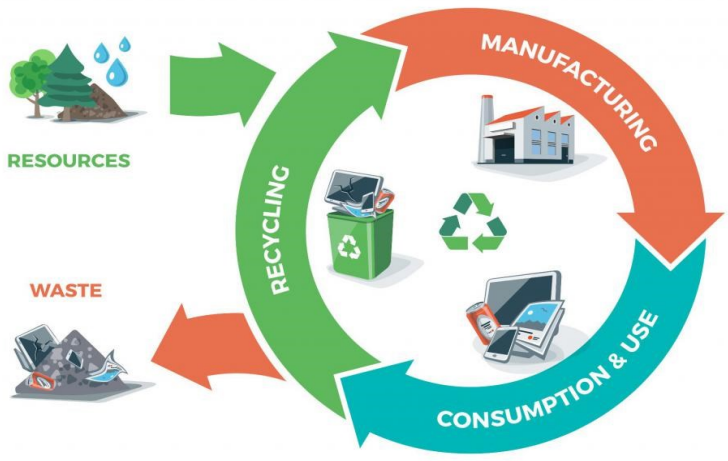
Other energy alternatives:

- Biofuel
- Tidal
- Nuclear

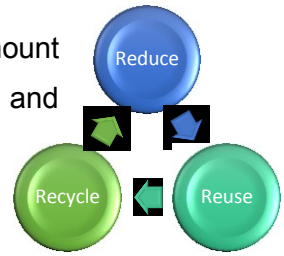
- **Shift towards the use of cleaner energy technologies, such as Liquefied Natural Gas (LNG), among others.**

As compared to diesel and gasoline, LNG significantly reduces the GHG emissions.

- **Sustainable Consumption and Production**



Applying the 3 R's



The three R's – reduce, reuse and recycle – all help to cut down on the amount of waste we throw away. They conserve natural resources, landfill space and energy.

Reduce – means to reduce the amount of waste produced in everyday activities by limiting the number of purchases. For example,

a. Take your own bag when going shopping instead of buying biodegradable plastic or paper grocery bags.
b. If possible, repair electronic devices instead of buying new one. This will reduce the amount of waste produced.
c. Buy products with minimum packaging wherever possible.

Reuse – means looking for ways to reuse some of the materials we use for our everyday life, including paper, toys, electronics and any other tools. If we reuse, then we do not have to buy a new item. Consequently, we save energy and reduce the overall pollution.

Recycle - Recycling is changing old products into new ones that can be resold. For example, recycled bottles and cans wind up becoming a wide variety of new products such as new aluminum cans, rain gutters, window frames, steel beams, recycled bicycles, new jars and bottles.

BEST PRACTICES FOR WASTE MINIMISATION

- Buy good quality products that will last long
- Buy in bulk to save on packaging, energy-consuming shopping trips, and money
- Avoid over packaged goods
- Buy recycled/ recyclable products
- Buy environmentally-friendly goods that won't create havoc on our rivers and marine life
- Use durable shopping bags and avoid plastic bags completely
- Buy organic and locally grown produce thereby encouraging and supporting farming that is pesticide and chemical fertilizer free

BEST PRACTICES FOR REUSING ITEMS CONSIDERED AS WASTE

- Use of PET bottles to make mini greenhouses for raising seeds and to make plastic funnels

- Collect and knit unwanted scraps of wool into blanket squares and sew them together to make a rug or blanket

- Make soil enricher from leaves collected by stacking them in a wire mesh frame or rubbish bag.

- Punch small holes along the length of an old discarded to make a water saving sprinkler.

Enhancing Carbon Sinks

Tree Planting Programmes

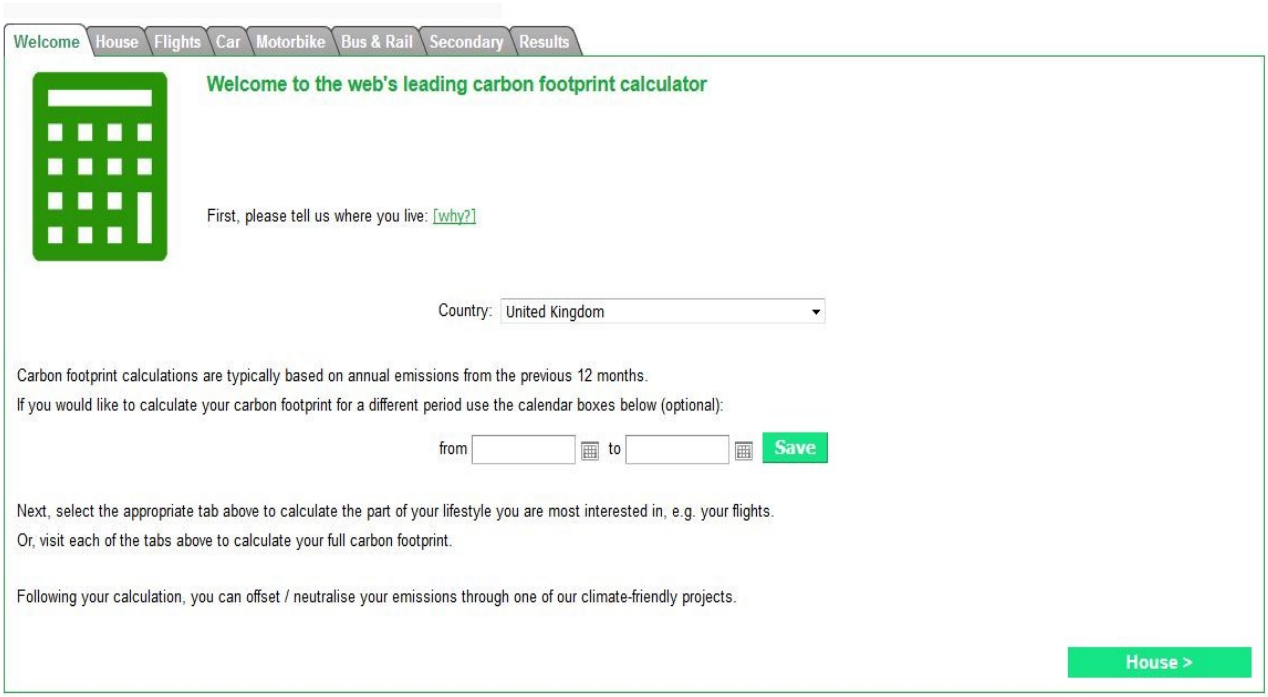
Forests are the lungs of our country. With the ongoing drastic decrease in the number of trees, the future generations will have lesser clean air and balanced atmosphere. Many measures are being taken at the grassroots level to tackle this problem.

Carbon Footprint

The Carbon Footprint is the impact people cause by releasing GHGs out of daily activities, such as driving a car, producing wastes, using electricity, or consuming food, etc.

Activity 7

1. **Tick all the mitigation measures below which can be useful**
   - ☐ **Use solar water heater**
   - ☐ **Cut down trees**
   - ☐ **Use of air conditioning**
2. **Using plastic bags is a way to mitigate climate change**
   - ☐ **True**
   - ☐ **False**
3. **There is no need to promote recycling of waste**
   - ☐ **True**
   - ☐ **False**



Activity 8

Which of the following contributes the least to your carbon footprint?

a. Riding a bike to college
b. Driving a car to the shops
c. Taking a plane

Activity 9

You may wish to calculate your carbon footprint by accessing the following link:

https://www.carbonfootprint.com/calculator.aspx

Activity 10

THINK ABOUT IT	Discuss with your friends and identify ways through which you can contribute to combat climate change in your daily activities

SUCCESS STORIES/CASE STUDIES IN FIGHT Against Climate Change

1. Conference of Youth by SYAH Mauritius

Aim: Push Youth not only to assist conferences, talks and seminar but also to equip them with tools and get them on the field for concrete action.

"The event may not have been mediatised to a large extent, we might not have reached as many people as we would hope but our action prompt people to think of waste and its disposal, the blooming recycling industry and over consumption of plastic in day to day life."

-Syah Mauritius

SYAH Mauritius events and activities

2015: Post COP21: Multi Stakeholder Dialogue

2015: Launch of Tap Water Revolution

2016: Conference of Youth 12 (COY12)

2017: Climate March

2017: Conference of Youth 13 (COY 13)

2018: Sustainability Tour with SYAH (Seychelles)

2018:Clean up with SYAH (Seychelles)

2018: Beach Clean up Flic en Flac

Other projects:

- Waste Management System
- Environmental Education Newsletter
- Multi Stakeholder Dialogue (MSD)
- Conference of Youth 14 (COY 14)
- Others

HONORING THE OCEANS On June 9, 2018

(Supporting the March for the Ocean community - M4O)

- *Site of Clean Up and waste auditing*
- *Mainly grass and white sand, had some kiosks and trees Surface area: approximately 100 metres square Duration: 1 hour*
- *No. of Persons: 12*
- *Waste Audit – Data Collected: Weight of waste: 2.625 Kg Quantity of cigarette butts: ~ 1597*

2. Volunteer Mauritius aims to create opportunities for youth to engage in volunteering activities at regional and national levels.

Overview of **Green Module**

Designed for beginners to gardening, the green module offers the basics of how to create a garden in your space while emphasizing on organic gardening and sustainable farming. The knowledge and consolidated field experience gathered through the green module is expected to provide each participant with the required skills to operate in a sustainable context and support community's contribution to address food security challenges.

The green modules are 3 hours in length for a total of 27 hours.

A total of 33 hours of volunteering time need to be logged in to complete and validate the green module.



September 2017

More info on facebook:
https://www.facebook.com/pg/VolunteerMauritiusMYS/photos/?ref=page_internal

3. YUVA

Sunday 20 November 2016, YUVANs have distributed and planted 200 young trees in the village of Lallmatie.

Caring for trees and the environment is the social responsibility of every individual. The *iPlant-A-Tree Programme* is a platform for every Mauritian to actively participate in greening his/her yard by planting trees.

4. The Duke of Edinburgh's International Award - Mauritius

Almost 50,000 young people have been introduced to the Award in Mauritius. The government offers free participation to all young people through the Ministry of Youth & Sports.

A holistic programme which encourages participants towards personal discovery, emotional growth and overall development: Goodlands Boys SSS - Duke of Edinburgh International Award Mauritius

5. African Network for Policy Research & Advocacy for Sustainability

ANPRAS is a Mauritius based NGO, committed to driving change and community-based actions for sustainable development at grassroots. Founded in 2008, the initial aim of ANPRAS was to establish a cross-sectoral platform for policy and research on issues related to sustainable development. Incrementally, ANPRAS has extended its sphere of influence and further grown into a pro action-based entity.

ANPRAS is an elected member of the 2nd Permanent General Assembly (Dec 2014) of the Economic, Social and Cultural Council (ECOSOCC) of the African Union. ANPRAS further shares privileged partnership with a plethora of international organisations, namely AYICC, Common Ground Publishers, Earth Hour Global, Earth Day Network, Global Alliance for Climate Smart Agriculture, Organisation of African Youth, Let's Do It Foundation, NAYD and USTKIP among others. It prides itself to have spearheaded the Green Africa Awards in 2010 and further championed the Earth-Hour, Candle-Night and Earth Day in Mauritius.

https://www.anpras.org/home

6. African Youth Initiative on Climate Change (AYICC)

AYICC members and their friends from ANPRAS took part in this clean up in Mahebourg in the build up to COP21. Over consumption and un-sustainable production methods are contributing to pollution, and we need serious education on this.

ENVIRONNEMENT

À l'occasion de la COP21, nous invitons nos lecteurs à une réflexion sur la préservation de notre environnement et sur les actions que nous pouvons entreprendre.

À MAHÉBOURG

Ecoguards et Mauritius Round Table 1 s'associent pour nettoyer nos mangroves

1,97 tonne de déchets en 3 heures. Le dimanche 29 novembre, la Mauritius Round Table One et le Kolektif Ecoguards, avec l'aide de Belle-Verte, se sont mobilisés pour le nettoyage des mangroves à Mahébourg. Diane Desmarais, militante écologique, explique : « Nos mangroves sont constamment polluées. Les déchets proviennent surtout des rivières et de la mer, surtout après les grosses pluies et les grosses marées. Sans compter les gens qui y jettent leurs ordures. »

En 2013, Lagon Bleu, avec qui Ecoguards collabore régulièrement, avait organisé deux matinées de nettoyage : une tonne et demie de déchets avaient été collectées. Dimanche dernier, 40 volontaires ont participé à l'activité de nettoyage. Bilan de l'opération : des bouteilles de verre, des cannettes, du polystyrène, des contenants plastiques de toutes sortes, un matelas, un frigo, des cadavres de chiens morts (dans des sacs), des coquillages, des produits textiles (vêtements, chiffons), des filets, des seringues et des fioles de sirop, de vieux téléviseurs, des vitres et carreaux céramiques, du ciment et même une banderole politique ! À l'évidence, ces détritus sont là depuis longtemps. « Si certains déchets sont recyclables (textiles, plastiques, carton), la majorité s'avère inutilisable, puisque souillés par la boue et l'eau de mer. Sachez que laver un déchet sale est moins écologique que de le recycler, à cause de la consommation d'eau et d'énergie. Cela démontre l'importance du tri des déchets en amont pour les valoriser et les recycler », ajoute Diane Desmarais.

Enfin, les mangroves sont primordiales pour l'écosystème marin. Elles abritent des larves, des crabes, des poissons, et préservent nos côtes de l'érosion. Elles sont protégées dans de nombreux pays, et celles de Pointe-Jérome sont classées sous le site RAMSAR. Il est donc essentiel de sensibiliser la population sur une meilleure gestion des déchets.

https://www.facebook.com/ayicc.mauritius/photos/pb.1039737652711604.-2207520000.1533391714./1076121732406529/?type=3&theater
https://m.me/ayicc.mauritius

7. Lets Do It Mauritius

Let's clean up Ebene **in June 2017 gathered several youths to be engaged in cleaning, greening, and sensitising people.**

http://www.letsdoitmauritius.org/

https://iphone.facebook.com/letsdoitmauritius/albums/1452429774848882/?__tn__=%2Cg

There are a number of interactive websites on climate change, specially designed for the youth.

Connect yourself to these websites. Some suggestions are:

- Climate change kids site: http://www.epa.gov/climatestudents/
- NASA's Climate Kids: http://climatekids.nasa.gov/
- Young Voices for the Planet: http://youngvoicesonclimatechange.com/
- A student's guide to Global Climate Change: http://www.epa.gov/climatechange/kids/index.html
- Climate connections video: http://www.npr.org/news/specials/climate/video/
- Ecokids: http://www.ecokids.ca/pub/kids_home.cfm
- Global warming kids: http://globalwarmingkids.net/
- One World: http://tiki.oneworld.net/global_warming/climate9.html

1. What is the most common greenhouse gas emitted from human activities?

   - A. Oxygen
   - B. Carbon Dioxide
   - C. Methane
   - D. Carbon Monoxide

2. Greenhouse gases are always bad for humans and the environment

   - A. True
   - B. False

3. In which of the following ways do people increase the concentration of greenhouse gases in the atmosphere?

   - A. Cutting down trees
   - B. Driving gasoline-powered cars
   - C. Burning coal to produce electricity
   - D. All of the above

4. Greenhouse gases cause global warming by absorbing and reradiating heat from _____ rays? (infrared, sun, ultraviolet)

5. Having more rain than usual in winter is a sign that climate change may be slowing down.

   - A. True
   - B. False

What is weather?

Weather describes the atmospheric conditions at a place over a short duration of time.

What is climate?

Climate is the statistics of weather over long periods of time. It is measured by assessing the patterns of variation in temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count and other meteorological variables in a given region over long periods of time.

What is climate change?

Climate change is a change in the pattern of weather, and related changes in oceans, land surfaces and ice sheets, occurring over time scales of decades or longer.

What is the International Panel on Climate change (IPCC)?

The IPCC is the International body for assessing the science related to climate change. It provides policymakers with regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation.

What are greenhouse gases (GHGs)?

Greenhouse gases are any gaseous compound in the atmosphere that are capable of absorbing infrared radiation. They trap and hold heat in the atmosphere.

What is the aim of the Paris climate agreement?

The aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.

What is adaptation?

Adaptation means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause. Early adaptation action saves money and lives later.

What is mitigation?

Climate change mitigation consists of actions to limit the magnitude or rate of long-term climate change. Climate change mitigation generally involves reductions in human (anthropogenic) emissions of greenhouse gases (GHGs).

What is climate change vulnerability?

Vulnerability refers to the degree to which people, or the things they value are susceptible to, or are unable to cope with the adverse impacts of climate change. Vulnerability determines how severe the impacts of climate change might be.

Answers to Activities and Quiz

Activity 2

Example answers

Driving a petrol driven car.

Garbage produces methane when they decompose and decay.

Using electricity that has been produced from fossil fuels.

Activity 3

1. Using more fertilisers, driving a petrol driven car.
2. Coral reef damage/bleaching, etc.
3. True

Activity 4

b, d, g

Activity 5

a, b, f, h

Activity 6

1. All correct: Rainwater harvesting, Sensitise people about climate change, Use appropriate clothing
2. False
3. False

Activity 7

1. Use solar water heater
2. False
3. False

Activity 8

a

Activity 9

Hint: Calculate your carbon footprint by providing the information required.

Quiz

1 B

2 B

3 D

4 Infrared

5 B

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