CLIMATE CHANGE MITIGATION AND ADAPTATION

FOR

SECONDARY STUDENTS

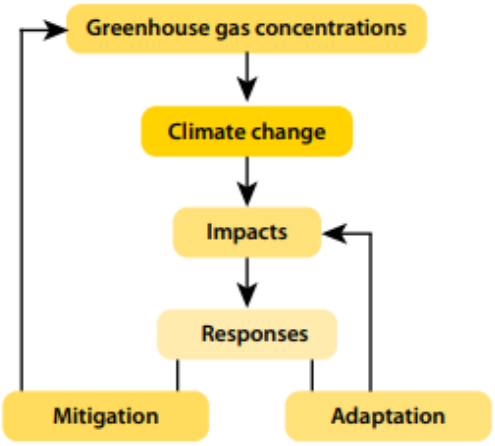
VOL. 4

ADAPTATION AND MITIGATION FOR SECONDARY STUDENTS

Can we avoid Climate Change? No!
Can we reduce and adapt to climate change? Yes!

Climate change is a threat to the future of our planet, but there is still time for us to adapt to it and mitigate its effects. Climate change is one of the most complex issues facing us today. It involves many dimensions – science, economics, society, politics, and moral and ethical questions – and is a global problem, felt on local scales, that will be around for decades and centuries to come. Carbon dioxide, the heat-trapping greenhouse gas that has driven recent global warming, lingers in the atmosphere for hundreds of years, and the planet (especially the oceans) takes a while to respond to warming. So even if we stopped emitting all greenhouse gases today, global warming and climate change will continue to affect future generations. In this way, humanity is "committed" to some level of climate change.

Responding to climate change involves two possible approaches: reducing and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere **("mitigation")** and/or adapting to the climate change already in the pipeline **("adaptation")**.



Difference between Adaption and Mitigation

Mitigation

Mitigation – reducing climate change – involves reducing the flow of heat-trapping greenhouse gases into the atmosphere, either by reducing sources of these gases (See volume 3) or enhancing the "sinks" that accumulate and store these gases.

Adaptation

Adaptation – adapting to life in a changing climate – involves adjusting to actual or expected future climate. The goal is to reduce our vulnerability to the harmful effects of climate change (like sea-level encroachment, more intense extreme weather events, or food insecurity). It also encompasses making the most of any potential beneficial opportunities associated with climate change (for example, longer growing seasons or increased yields in some regions).

Adaptation is different from Resilience

Resilience is the ability of a system to absorb, withstand and bounce back after an adverse event.

As noted above adaptation and mitigation present some notable differences, particularly in their objectives. Mitigation addresses the causes of climate change (accumulation of greenhouse gases in the atmosphere), whereas adaptation addresses the impacts of climate change. Both approaches are needed. On the one hand, even with strong mitigation efforts, the climate would continue changing in the next decades and adaptation to these changes is necessary. On the other hand, adaptation will not be able to eliminate all negative impacts and mitigation is crucial to limit changes in the climate system.

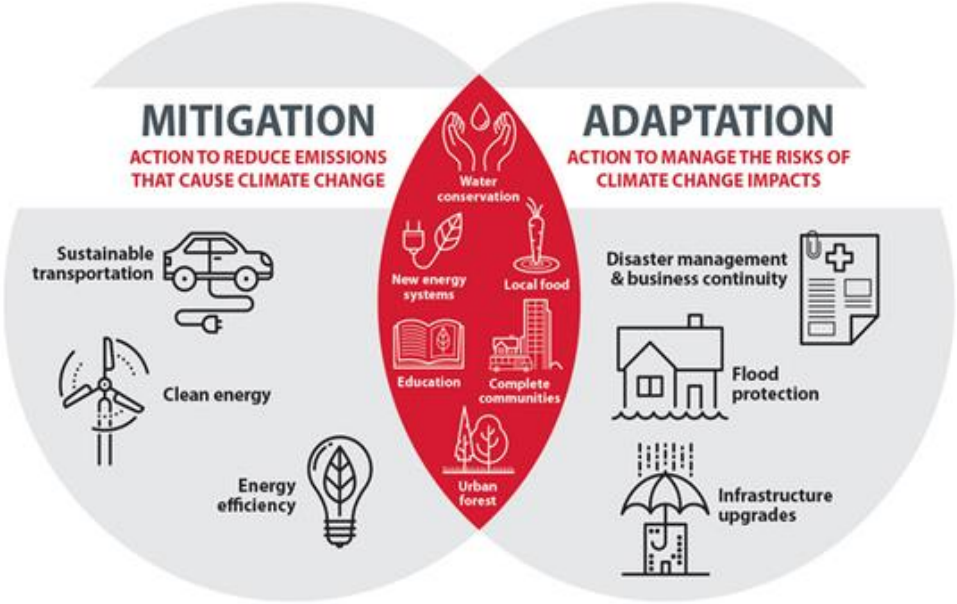
Adaptation and mitigation differ in terms of spatial scales: even though climate change is an international issue, adaptation benefits are local and mitigation benefits are global. Adaptation and mitigation also differ in terms of temporal scales and concerning economic sectors.

Types of Adaptation

- **Anticipatory:** Taking action in preparation of climate change.
- **Reactive:** Taking action when climate change effects are experienced.

Various approaches to climate change adaptation exist. Approaches can range from modifying threats (building a dam for flood control) to preventing effects and impacts (introducing drought-resistant crops) to accepting the loss (when an adaptation measure is too costly). Examples of anticipatory adaptation include establishing building codes to better protect human settlements. Reactive adaptation examples include changes in farm practices such as additional irrigation measures in case of dry spells.

Synergies with Climate Change Adaptation and Climate Change Mitigation



Often adaptation and mitigation are separated in international and national policies and actions. Many adaptation and mitigation options can help address climate change, but no single option is sufficient by itself. Adaptation and mitigation responses are underpinned by common enabling factors. These include effective institutions and governance, innovation and investments in environmentally sound technologies and infrastructure, sustainable livelihoods, and behavioral and lifestyle choices.

Climate change adaptation and mitigation are both equally important and time-sensitive and we need to do both. Mitigation activities can benefit or hinder adaptation, and vice versa; promoting activities that contribute to both objectives can increase efficiency. Several adaptation practices may positively reinforce mitigation potentials under specific conditions. For Example, restoring land by controlled grazing – can lead to soil carbon sequestration and have positive impacts on livestock productivity. Other examples of actions with co-benefits include (i) improved energy efficiency and cleaner energy sources, (ii) reduced energy and water consumption in urban areas through greening cities and recycling water; (iii) sustainable agriculture and forestry.

It is important to note some mitigation responses may not be conducive to adaptation. Additionally, adopting certain agricultural mitigation practices may reduce production within implementing regions, leading to increased production and emissions outside the project region. This is referred to as unclear leakages.

Understanding Key Terms

Climate 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. There are three dimensions of vulnerability to climate change: **exposure, sensitivity,** and **adaptive capacity**.

Exposure

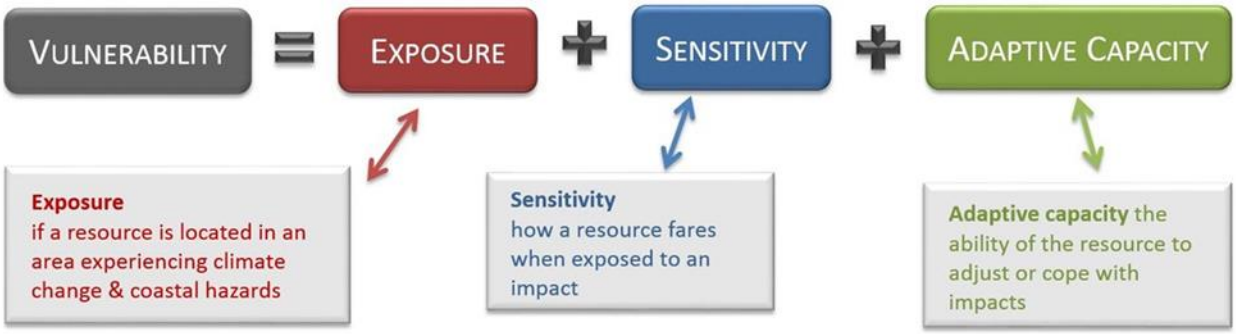
The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.

Sensitivity

The degree to which a system or species is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g. a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g. damages caused by an increase in the frequency of coastal flooding due to sea level rise).

Adaptive Capacity

The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.



Question: Given the effects of climate change, what do you think you can do to adjust to the impacts of climate change?

Adaptation Measures

Guyana's Coasts

Guyana is particularly vulnerable to the effects of climate change since approximately 90% of Guyana's population and 75% of the country's economic activities are found on the Low Coastal Plain which lies approximately 0.5 to 1 meter below mean sea level. The Coastal Plain is threatened by sea-level rise, increase in storm surges and changes in rainfall patterns. Any impact here will have serious consequences for the country's economy, particularly for the agriculture and fishery sectors, which are highly sensitive to changes in climate.

Types of Drought

Meteorological drought

The degree of dryness, in comparison to a normal or average amount, and the duration of the dry period.

Agricultural drought

Focuses on precipitation shortages, differences between actual and potential evapotranspiration, soil-water deficits, reduced ground water or reservoir levels, and so on.

Hydrological drought

A persistently low discharge and/or volume of water in streams and reservoirs, lasting months or years.

Socio-economic drought

The supply and demand of some economic good with elements of meteorological, hydrological, and agricultural drought.

Guyana's Hinterland

Guyana's hinterland accounts for 92.5% of the land area and 10% of the population. Some of these areas are not easily accessible and tend to be flood-prone during the rainy seasons and exposed to drought conditions during the dry season. The hinterland communities (particularly in Regions 8 and 9) have been faced with drought conditions that impact climate-dependent sectors such as agriculture and water. Extreme events particularly floods and droughts, cause detrimental impacts to mining operations and riverine landforms with the consequence that livelihoods and health of rural communities in the hinterland is detrimentally impacted.

The key vulnerabilities in Guyana are:

- Flooding
- Droughts

How to Adapt?

Guyana's Hinterland

Guyana's Coast

Some Adaptation Measures

- Use of Minimum tillage to increase water availability to plants - Climate change is causing hotter weather conditions with less rain. Not tilling (turning up) the land can reduce the moisture lost and increase the amount of water going into the soil. (Will be further elaborated in Volume 8 – Climate Change and Agriculture)
- Design livestock mound to alleviate the effects of floods
- Plant shade trees to reduce heat stress on livestock
- Technological and engineering options such as increased sea defenses
- Research and development on possible catastrophes
- Preventive and precautionary measures (evacuation plans, health issues, etc).
- Protecting our mangroves
- Building higher houses and pens
- Managing our water supply through water harvesting, etc.
- Investing in risk insurance for farmers and households to cover losses
- Planting of new varieties of crops that are salt tolerant, drought-resistant, shorter growing periods, etc.

Key Messages

- Barriers to implementation of adaptation include limited funding, policy and legal impediments, and difficulty in anticipating climate-related changes at local scales.

- There is no "one-size fits all" adaptation, but there are similarities in approaches across regions and sectors. Sharing best practices, learning by doing, and iterative and collaborative processes including stakeholder involvement, can help support progress.

- Climate change adaptation actions often fulfill other societal goals, such as sustainable development, disaster risk reduction, or improvements in quality of life, and can, therefore, be incorporated into existing decision-making processes.

Mitigation Responses

You can help protect the planet by educating yourself and others about the dangers of climate change and how to act against.

How to Reduce your Carbon Footprint

Energy Measures

Unplug Unused Chargers

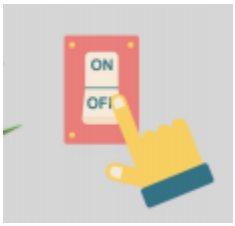
Plugged in chargers consume energy, even when they are not charging a device

Switch to LED lights

LED Bulbs are just as bright, last longer and can reduce energy consumption by 75%

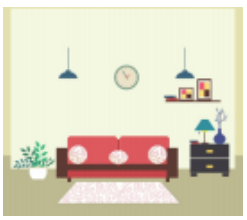
Turn off Taps

Turning off the tap when you are brushing your teeth reduces the amount of energy required to pump water.



Use smart Lighting

Occupancy sensors automatically. Turn off your lights when they are not needed and saves money



Take it Light

Light-colored paint reflects more light, brightening your room and reducing the need to consume energy

Keep it Cool

Refrigerators consume more energy the longer they are kept open. Enter and exit your refrigerator quickly.

Switch it Up

Switch to renewable energy to reduce the amount of fossil fuels burnt (efficient technology).

Shop Smart

Encourage your parents to look for the energy star logo when buying appliances and save your energy cost

Transport

With more vehicles on the road, the amount of CO2 emitted steadily increases.

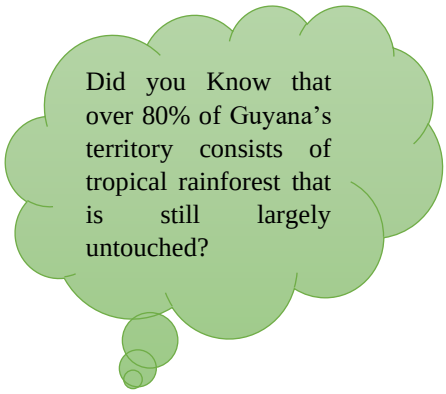
- Make your Commute Green by carpooling or walk or ride short distances. Riding your bike is incredibly helpful to the environment and is a great method to get exercise.
- Improve energy efficiency vehicles
- Use of greener vehicles such as electric cars

Agriculture

- Develop new management techniques to reduce tillage's, recycling of crop residues, mixed cropping and avoid monoculture
- improving the nutrition of ruminants and reduce methane generation
- Manage fertilizer use to reduce nitrous oxide production
- Reduce Biomass Burning

Forestry

Forests are central to tackling climate change. Forests contribute to mitigation because of their capacity to remove carbon from the atmosphere and to store it.



Policy Options

Effective adaptation and mitigation responses will depend on policies and measures across multiple scales such as:

- The United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement focus on addressing climate change, at the international level.
- National and sub-national policies on climate change mitigation and adaptation to increase co-benefits and reduce adverse effects

Glossary

Adaptive capacity: The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.

Alternative Energy: Energy derived from nontraditional sources (e.g., compressed natural gas, solar, hydroelectric, wind)

Carbon Footprint: The total amount of greenhouse gases that are emitted into the atmosphere each year by a person, family, building, organization, or company. A person's carbon footprint includes greenhouse gas emissions from fuel that an individual burns directly, such as by heating a home or riding in a car. It also includes greenhouse gases that come from producing the goods or services that the individual uses, including emissions from power plants that make electricity, factories that make products, and landfills where trash gets sent.

Co-benefits: The positive effects of a policy or measure that are implemented for various reasons at the same time. Co-benefits are also referred to as ancillary benefits

Community-based adaptation: Focuses attention on empowering and promoting the adaptive capacity of communities. It is an approach that takes context culture, knowledge, agency, and preferences of communities as strengths

Decarbonization: The process by which countries, individuals, or other entities aim to achieve zero fossil carbon existence. Typically refers to a reduction of the carbon emissions associated with electricity, industry and transport.

Disaster: Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic or environmental effects that require an immediate emergency response to satisfy critical human needs and that may require external support for recovery

Early warning system: The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare to act promptly and appropriately to reduce the possibility of harm or loss

Energy Efficiency: Using less energy to provide the same service.

Energy security: The goal of a given country, or the global community as a whole, to maintain an adequate, stable and predictable energy supply. Measures encompass safeguarding the sufficiency of energy resources to meet national energy demand at competitive and stable prices and the resilience of the energy supply; enabling development and deployment of technologies; building sufficient infrastructure to generate, store and transmit energy supplies; and ensuring enforceable contracts of delivery.

Exposure: The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.

Hazard: The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources. In this report, the term hazard usually refers to climate-related physical events or trends or their physical impacts.

Impacts (Consequences, Outcomes): Effects on natural and human systems. The term impacts are used primarily to refer to the effects on natural and human systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure

Leakage: Phenomena whereby the reduction in emissions in a jurisdiction/sector associated with the implementation of mitigation policy is offset to some degree by an increase outside the jurisdiction/sector through induced changes in consumption, production, prices, land use and/or trade across the jurisdictions/sectors. Leakage can occur at several levels, be it a project, state, province, nation, or world region.

Mitigation Potential: In the context of climate change mitigation, the mitigation potential is the amount of mitigation that could be – but is not yet – realized over time.

Negative emissions: Removal of greenhouse gases (GHGs) from the atmosphere by deliberate human activities, i.e., in addition to the removal that would occur via natural carbon cycle processes.

Paris Agreement: The Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) was adopted on December 2015 in Paris, France. One of the goals of the Paris Agreement is 'Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels', recognising that this would significantly reduce the risks and impacts of climate change. Additionally, the Agreement aims to strengthen the ability of countries to deal with the impacts of climate change.

Resilience: The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation. 1

Risk: The potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. 15 Risk is often represented as a probability of occurrence of hazardous events or trends multiplied by the impacts of these events or trends occur. Risk results from the interaction of vulnerability, exposure, and hazard. In this report, the term risk is used primarily to refer to the risks of climate-change impacts

Sensitivity: is the degree to which a system is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea-level rise).

United Nations Framework Convention on Climate Change (UNFCCC): The UNFCCC was adopted in May 1992 and opened for signature at the 1992 Earth Summit in Rio de Janeiro. It entered into force in March 1994 and as of May 2018 had 197 Parties. The Convention's ultimate objective is the 'stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate

Vulnerability: the degree to which a system is susceptible to and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

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