Climate Change 101

1.0 Climate Change defined

Climate Change refers to a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Source: United Nations Framework Convention on Climate Change

2.0 What Causes Climate Change

What Is Global Warming?

There are many signs that point to humans as the major cause of the increase in temperature during the past one hundred years by releasing gases that trap heat in the course of powering our modern lifestyles. These heat-trapping gases are called greenhouse gases (GHG) and it has been shown to have higher levels now than in the last 650,000 years. The most potent of these GHGs are Methane, Carbon Dioxide and Chlorofluorocarbons (CFCs). This has resulted to what is called global warming.

Global warming is causing a set of changes to the Earth's climate, or on long-term weather patterns. When the earth spins on its axis, the heat in the atmosphere moves with it picking up moisture from the oceans and redistributing it causing the heat budget if the earth to be in balance. However, excessive heating of the oceans have caused disruptions in the rhythms of climate impacting on all living things. Manifestations of these include the melting of glaciers, rising of sea levels, drying up of cloud forests, and wildlife being drive from their habitats.

The question now that one should as is, "what will we do to slow this warming? How will we cope with the changes we've already set into motion? While we struggle to figure it all out, the face of the Earth as we know it—coasts, forests, farms and snow-capped mountains—hangs in the balance.

Source: http://environment.nationalgeographic.com/environment/global-warming/gw-overview/. Retrieved 20 April 2016.

How does Greenhouse Effect happen?

When certain gases in the Earth's atmosphere trap heat, it causes warming that is known as the "greenhouse effect". Like the walls if a greenhouse, these gases allows light to enter the atmosphere but keep the heat from escaping.

This is how it works:

1) When sunlight hits the Earth's surface, it is absorbed and then radiates back into the atmosphere as heat.

2) Some of those radiated back to the atmosphere are trapped by "greenhouse" gases while the rest escapes into space. The more greenhouse gases are in the atmosphere, the more heat gets trapped.

As early as 1824, the greenhouse effect has been known by scientists when Joseph Fourier calculated that the Earth would be much colder if it had no atmosphere. Actually, this greenhouse effect is what keeps the Earth's climate livable and without it, the Earth's surface would be an average of about 60 degrees Fahrenheit cooler. Later in 1895, the Swedish chemist Svante Arrhenius discovered that humans could enhance the greenhouse effect by making carbon dioxide, a greenhouse gas. This was the onset of 100 years of climate research that has given us a sophisticated understanding of global warming.

Over the Earth's history, the levels of greenhouse gases (GHGs) have gone up and down but they have been fairly constant for the past few thousand years. It has also been observed that global average temperatures have stayed fairly constant over that time as well, until recently. Humans are enhancing the greenhouse effect and subsequently warming the earth mainly because of burning of fossil fuels and other GHG emissions.

This phenomenon is referred to by scientists as "climate change" instead of global warming. This is because as the Earth's average temperature increases, winds and ocean currents move heat around the globe in ways that can cool some areas, warm others, and change the amount of rain and snow falling. Thus, climate changes differently in different areas.

Temperature changes and Carbon Dioxide in the atmosphere

The Earth's position relative to the sun varies, and this has impacted on the average global temperature and concentrations of carbon dioxide (one of the major GHG) in the atmosphere. The average global temperature and carbon dioxide concentration has fluctuated on a cycle of hundreds of thousands of years, and a result ice ages have come and gone. But these emissions have been balanced out for thousands of years now because GHGs that are naturally absorbed. This resulted to GHG concentrations and temperatures that have been fairly stable. This is the condition that has allowed human civilization to develop within a climate that is consistent.

Global temperatures are occasionally influenced by other factors albeit briefly. Volcanic eruptions like that of Mt. Pinatubo for example, emit particles that temporarily cool the Earth's surface. But these have no lasting effect beyond a few years which is also true of El Niño that work on fairly short and predictable cycles.

It is said that humans have increased the amount of carbon dioxide in the atmosphere by more than a third since the industrial revolution. What is alarming is that changes this large have historically taken thousands of years, but are now happening in the course of decades.

So why should people be concerned about CC?

The rapid increase in GHGs is alarming because it is changing the climate faster than some living things may be able to adapt. Moreover, a new and more unpredictable climate poses unique challenges to all life on the planet.

Throughout history, the Earth's climate has been known to regularly shift back and forth between temperatures like those we experience today and temperatures cold enough for North America and Europe to be covered with large sheets of ice. It is said that the average global temperatures today and during those ice ages is only about 5 degrees Celsius (9 degrees Fahrenheit). Additionally, these temperature swings happen slowly, over hundreds of thousands of years.

Today, with concentrations of greenhouse gases rising, Earth's remaining ice sheets (such as Greenland and Antarctica) are starting to melt, with the extra water potentially raising sea levels significantly.

As temperature increases, climate can change in unexpected ways. Aside from sea levels rising, weather can become more extreme. This translates to more intense major storms, more rain followed by longer and drier droughts (a challenge for growing crops), changes in the ranges in which plants and animals can live, and loss of water supplies that have historically come from glaciers.

Some of these changes have been occurring more quickly than Scientists have expected. In fact, according to the Intergovernmental Panel on Climate Change, eleven of the twelve hottest years since thermometer readings became available occurred between 1995 and 2006. However, according to NASA and the National Oceanic and Atmospheric Administration, the first six months of 2016 has been the world's hottest on record. So far, this year has been 2 degrees warmer than the 20th century. (http://www.rawstory.com/2016/07/2016-the-hottest-year-so-far/)

How can we help address climate change?

Some tips that ordinary people can do to help address CC:

- Change a light – replacing a regular light bulb with a compact fluorescent light bulb will save 300pounds of carbon dioxide a year.
- Drive less – walk, bike, carpool or take mass transit more often. One pound of carbon dioxide is saved for every mile that you don't drive.
- Recycle more - You can save 2,400 pounds of carbon dioxide a year by recycling just half of your household waste
- Check your tires – keeping your tires inflated properly can improve gas mileage by more than 3%. Every gallon of gasoline saved keeps 20 pounds of carbon dioxide out of the atmosphere.
- Use less hot water – it takes a lot of energy to heat water. Use less hot water by installing a low-flow showerhead (350 pounds of CO2 saved per year) and washing your clothes in cold or warm water (500 pounds saved per year)
- Avoid products with a lot of packaging – you can save 1,200 pounds of caron dioxide if you cut down your garbage by 10%.
- Adjust your airconditioning – an adjustment of just 2 degrees higher in your thermostat could save about 2,000 pounds of carbon dioxide a year.
- Plant a tree – one tree absorbs one ton of carbon dioxide in its lifetime
- Turn off electrical devices when not using them – saves thousands of pounds of carbon dioxide per year
- Try skipping meat one day per week – this saves 35,000 gallons of water. Getting into an entirely meatless diet help save 5,000 pounds of carbon emission per year.
- Unplug – hair dryers, phone chargers, toaster overn and power cords should be unplugged when not in use to save up to 20% on home energy use.

Adapted from www.climatecrisis.net and
http://earthethicsinstitute.org/facultycurriculum_pdf/Fundora_EAP_ClimateChangeHandout.pdf