

## Lesson One – Background Contextual Knowledge

**Climate change:** Changes to global and regional climate patterns that have been accelerated due to increased levels of greenhouse gas emissions produced by human activity.

**Greenhouse gases:** Gases in the earth's atmosphere that trap heat. The primary role is to absorb radiation produced by sunlight to keep our planet at a liveable (warmer) temperature. The greenhouse gas effect is a natural process. The main greenhouse gases are:

- Water vapor
- Carbon dioxide
- Methane
- Ozone
- Nitrous oxide
- Chlorofluorocarbons

**Enhanced greenhouse gas effect:** is the added impact on the climate (and the Earth's natural processes) from the additional heat absorbed by increased amounts of greenhouse gas. The increased amounts of greenhouse gas have been released by human activity since the industrial revolution. As a result, the Earth's average surface temperatures are rising.

**Climate vs weather:** Weather is the conditions of the atmosphere of a specific place, over a short period of time. Weather is only temporary. Climate is weather patterns and data gathered about an entire region over a long period of time, typically 30 years or more.

**Environmental monitoring:** Processes, testing and activities that are used to determine and monitor the quality and health of the environment. Typically, environmental scientists monitor air and water quality, biodiversity, temperature, and waste procedures. Different environmental monitoring techniques are used to collect data, monitor trends, and control environmental risks.

**Types of environmental monitoring:** The following are examples of different sensors and monitoring techniques used here in Townsville, and across the world.

- **Temperature and humidity sensors:** Temperature and humidity sensors are used to accurately monitor the physical temperature and humidity of a particular environment. The real-time data can then be visualised digitally. The data collected by the sensors can be compared to historical data to monitor the effects of climate change and temperature rise in specific regions.
- **Animal monitoring:** Environmental scientists are monitoring the effects climate change is having on the health, reproductive behaviours, and habitats of many different animals. Scientists collect data about an animal's vulnerability in the impacts of climate change and use this data to determine management strategies. These management strategies are developed to assist our most vulnerable animals to adapt for the future.
- **Greenhouse gas emission sensors:** Greenhouse gas emissions are monitored using carbon dioxide, methane, and nitrous oxide sensors. The sensors detect changes in greenhouse gas concentrations in the air. Since industrialisation (in the 18th Century) carbon dioxide

concentrations have increased by 47%, methane concentrations have increased by 160%, and nitrous oxide has increased by 22%.

- **Sea level rise sensors:** Sea level sensors not only determine sea level rise associated with climate change, but also help with tide prediction, and ensuring the safety and clearance of vessels. Understanding changes in sea level can aid in emergency response planning during weather events such as flooding, storms, and king tides. Sea level rise data is used by scientists, engineers, and city planners to develop a greater understanding of the short-term and long-term risks associated with continued sea level rise.
- **Ocean acidification sensors:** Ocean acidification is occurring due to the ocean's absorption of carbon dioxide produced by human activity. Increased levels of carbon dioxide in the ocean causes the pH balance to be disturbed. Currently, the ocean is increasing in its level of acidity. Ocean acidification sensors can monitor changes to the pH of oceans. This data helps environmental scientists to predict and respond to changes that will affect marine life and ocean health.
- **Water quality monitoring:** Water quality monitoring is how environmental scientists can determine the health of an aquatic ecosystem. Water quality sensors are used to determine the levels of sediment, nutrients, and pesticides impacting the health of freshwaters. Typically, the health of a freshwater system is affected by land management practices, erosion, and environmental conditions (such as changes in temperature).

More information for this lesson can be found in the google classroom documents.