Weather Station Education Program
Year 5 and 6 Digital Technologies

Background contextual knowledge

It is estimated that by 2050 more than 70% of people will live in large cities. It is vital that councils and city stakeholders work together to make our home more comfortable and sustainable to live in, especially as the world is continuing to experience climate change.

Townsville City Council, in partnership with JCU, is working to develop a high-resolution, real-time temperature map of Townsville. This temperature map will be produced using low-cost temperature, air pressure and humidity sensors positioned across the landscape. The goal is to eventually have five thousand weather stations across Townsville's landscape. This program not only provides students in Townsville an opportunity to learn and solve a real-life problem, but also assists us in reaching this goal.

A temperature map of Townsville will assist organisations such as Townsville City Council and James Cook University to plan and design for warmer climates. The temperature map will become a Smart City Infrastructure System that is built by the community for the community.

The temperature map will enable the continued development in understanding of our own city and our own environment. The data collected will greatly influence our city's design as we prepare for the future. Environmental monitoring, using the temperature map, will assist us to monitor the natural environment and the effects temperature changes have on native flora and fauna, define and understand patterns of a particular environment, identify trends for preventative measures, and predict or forewarn any threats to the natural environment.

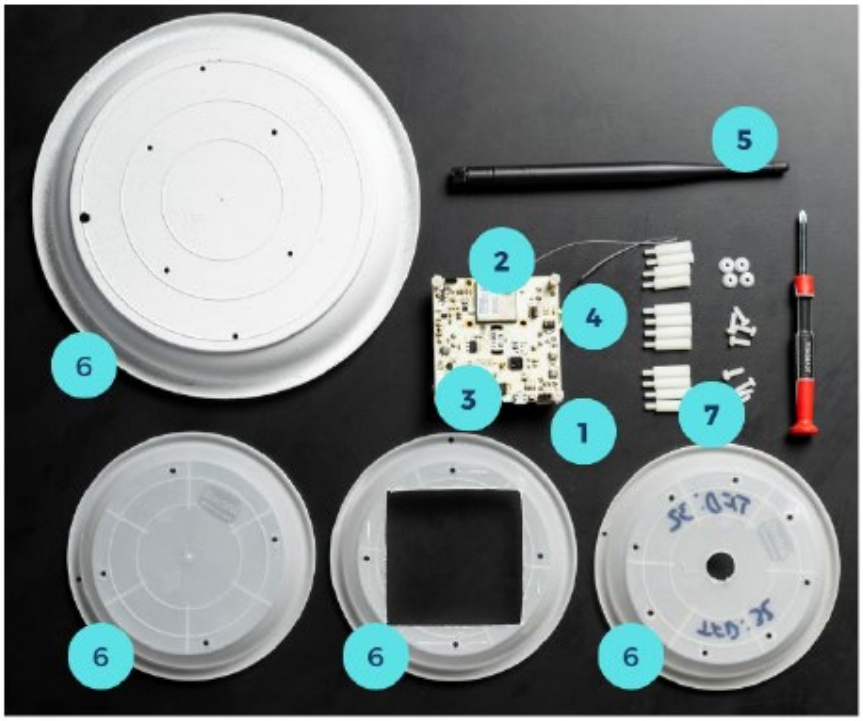
The weather stations:

The weather stations to be used in this program are the V1 Micro Weather Stations. They are designed and developed by local JCU TropResearch. The weather station is a stacked board design, that has a printed circuit board (that contains the environmental sensors) and stacked plastic louvers creating a Stevenson's screen effect. The stacked design enables adequate airflow while also protecting the sensor technology from any environmental conditions such as precipitation and heat radiation. The weather station is made up of seven main components, a printed circuit board, temperature sensor, communication chip, antenna, Stevenson's screen, and nylon screws.

The LoRaWAN Network:

This network is used to connect the weather stations to the internet, which enables the visualisation of data. This network utilises low power long range radio technology to transmit the data from remote locations with low power consumption. The weather station is the device that collects data. This data is received by a gateway (antennas) that can talk back to and control the weather station. The network server sends the messages received by the gateway to the visualisation dashboard (application server). The application server is a piece of software we can access using computers and the internet to visualise the data collected on a dashboard.

The Weather Station



1. The **Printed Circuit Board** or PCB is used to physically connect the mechanical and electronic components in a circuit. This PCB connects the environmental sensors, communication chip, and batteries.

2. The **Environmental Sensors** in this weather station include temperature and humidity sensors.

3. The **Communication Chip** connects the weather station to the LoRaWAN Network.

4. The **Batteries** are stored here, and power the weather station for approximately 3 months.

5. The **Antenna** is used to transmit data and signal to the LoRaWAN Network.

6. The **Stevenson's Screen** design allows for airflow past the environmental sensors, while also protecting the technology from rain and heat.

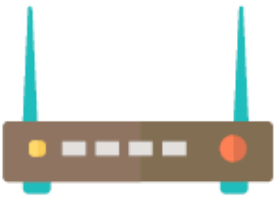
7. **Nylon Screws** are used as they do not conduct elecricity or heat. The durable material is often used in the construction of technology devices.

The LoRaWAN Network

STEP 01

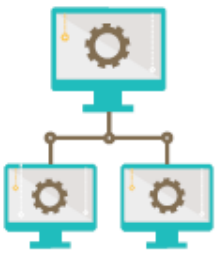
Weather Station
The device used to collect data.

STEP 02



Gateway
Antennas that receive the data and talk back to and control the weather station.

STEP 03



Network Server
Sends the messages to the application server.

STEP 04

Application Server or Dashboard
The software we can access using computers and the internet to visualise the data collected.