Code Logic Implementation – Smart Waste Management System

1. Wi-Fi & ThingSpeak Connectivity

The Pico W connects to Wi-Fi using the WLAN interface. Once connected, it uploads data to ThingSpeak every 20 seconds using an HTTP GET request, respecting the minimum 15-second update interval.

2. Ultrasonic Distance Measurement

The HC-SR04 sensor is triggered with a 10 µs pulse. The echo duration is read to calculate distance in centimeters using:

distance = duration_us / 58.

This gives the empty space remaining in the bin.

3. LED & Buzzer Logic

The status indicators work as follows:

• Green LED: Distance > 10 cm → Bin has enough space.

• Yellow LED: Distance ≤ 10 cm → Bin half full.

• Red LED + Buzzer: Distance ≤ 5 cm → Bin nearly full (critical).

4. Sending Data to Thingspeak

The device uploads two values:

• field1 = filled percentage

• field2 = distance in cm

This enables cloud monitoring and graphing.

5. Main Loop Process

The loop performs:

• Read sensor distance

• Compute fill percentage

• Update LEDs/buzzer

• Upload data every 20 seconds

• Delay 2 seconds before next cycle

This ensures continuous bin monitoring and real-time status updates.