IMPROVEMENTS TO

CHANGI VILLAGE HAWKER CENTRE

S0021 RAFFLES GIRLS SCHOOL (SECONDARY)

Introduction

Why this building?

Changi Village Hawker Centre's (CVHC) operations may contribute to **waste generation** and **energy consumption**, negatively impacting **ecosystems**.

Waste mismanagement can lead to pollution of the nearby sea, threatening marine life and ecosystems. Inefficient energy usage may contribute to carbon emissions, worsening climate change impacts. We need to address issues CVHC faces to mitigate environmental harm and promote sustainability in a sensitive coastal environment.

Location of Building

WASTE MANAGEMENT

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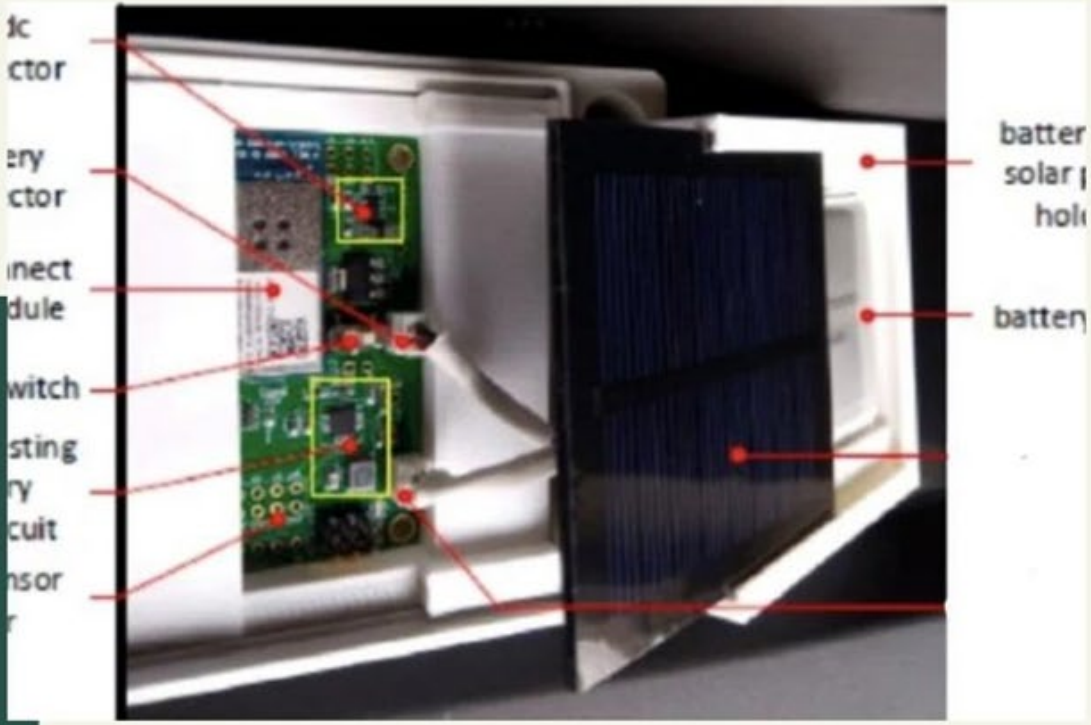
ISSUES

Waste Management

- Overflowing trash bins
- Food waste in bins potentially attracting pests
- High levels of food waste

Implementation of

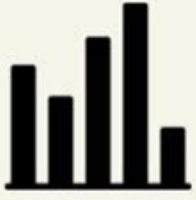
Internet of Things (IoT) System



Internet of Things (IoT) System

IoT sensors in bins to **monitor waste levels**

Provide data on the amount of trash collected



Schedule **waste collection**

Auto lock prevents bins from opening when full

Designated Food Waste Bins

Waste sensors installed in the bins & connected to screens

- Monitor the **food waste levels** of CVHC
- Data of the total amount of food waste collected in the hawker centre each month and compare over the months.

- Display a reminder on the screen to alert the consumer to **waste less food** next time.

- Customers would be **aware** of the hawker centre's efforts to reduce food waste

ARCHITECTURE METHOD

Install the IoT sensors on the underside of the lids of the food waste bins. Secure the sensors using a strong silicone adhesive.

Connect the sensors to a wireless network for real-time data transmission, and implement software for data analysis.

Set the sensors to lock the bins that are completely filled.

ADDITIONAL INITIATIVES

Dish Portion Sizes

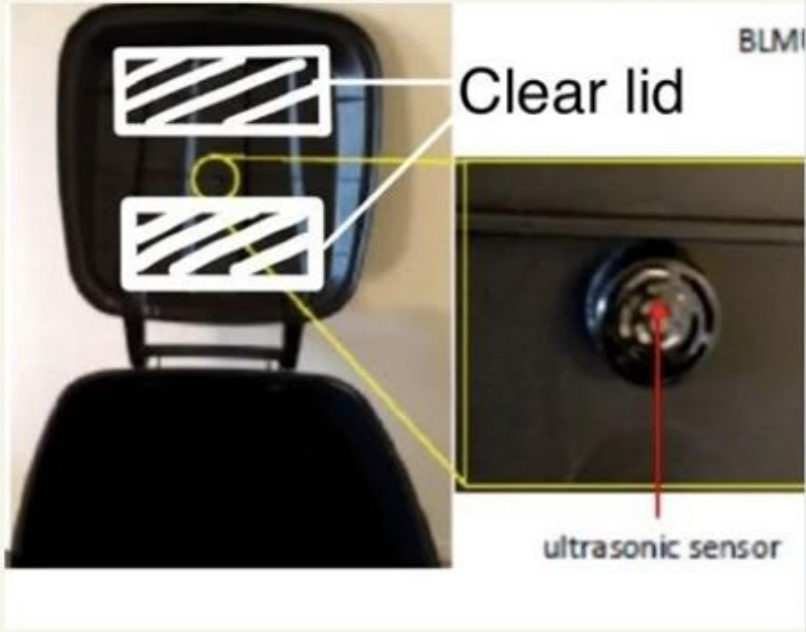
- Small, Medium, Large portions
- To prevent customers from over-ordering, reducing food waste. Hawkers to follow these guidelines.

Partially Clear Bins

- Lids of food waste bins partially made of clear plastic for consumers to observe food waste they disposed of, increasing awareness of food waste issue

Posters

- Reminders with ways consumers can reduce food waste placed on tables.
- Catchy slogans & in multiple languages



ECO-FRIENDLINESS

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ISSUES

Eco-Friendliness

- Poor air quality due to cooking fumes exhaust from nearby bus interchange
- Heavy reliance on fans to maintain comfortable temperatures
- Heavy usage of plastics

Green Roof

Improving Air Quality

- **Natural air filters**
- **Absorbs pollutants** from cooking fumes & exhaust from buses
- Soil traps **airborne particles**

Cooling Surroundings

- Mitigates urban heat island effect
- Decreases surrounding temperature by providing **natural, evaporative cooling**
- Absorbs **solar radiation**

Additional Initiative

Plastic Container/ Cutlery Vending Machine

- To discourage the use of plastic among stall owners and customers
- To promote the usage of reusable containers to pack their food

Hawkers can stop supplying plastic containers and cutlery when preparing take-away food.

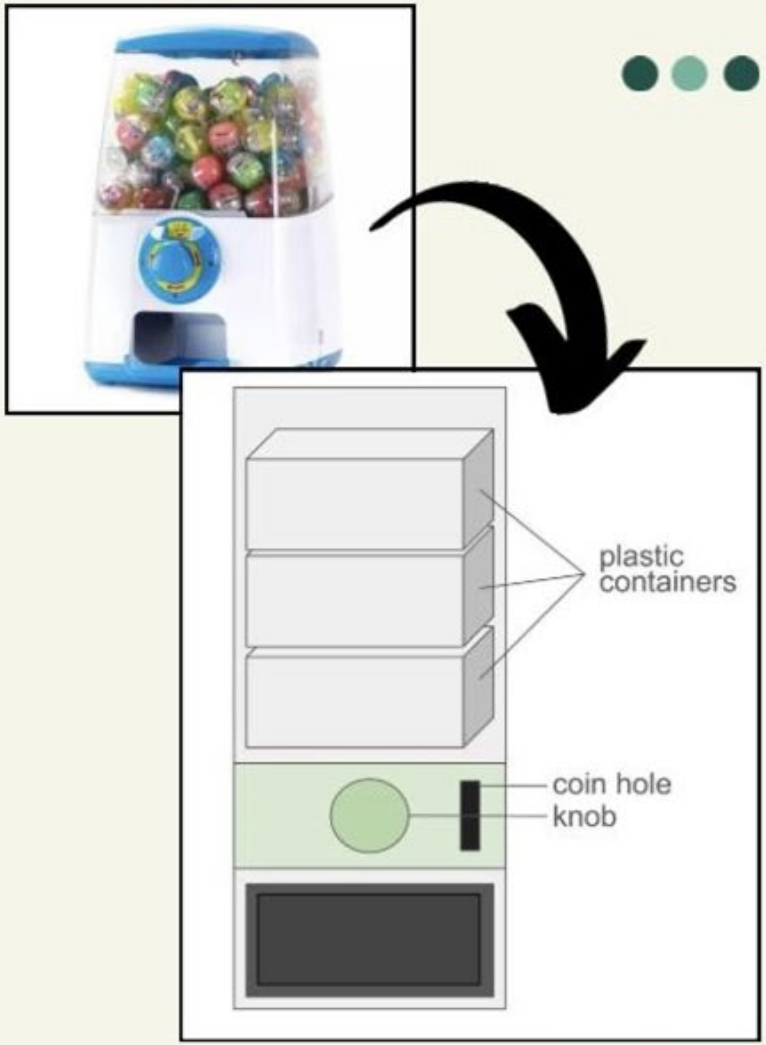
Customers need to undergo the trouble of obtaining and paying for a plastic container/ cutlery from the vending machines, which compels them to bring their own reusable containers and cutlery instead.

Architecture Method

Gravity-powered vending machine to prevent excessive usage of electricity

- Once the coin is inserted and accepted, the user turns a knob or lever, which releases a catch or latch holding the item in place.

- With the latch released, gravity allows the item to fall or slide down to a point where the user can retrieve it.



ENERGY EFFICIENCY

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Proposed hybrid design combining green roof and QD paint

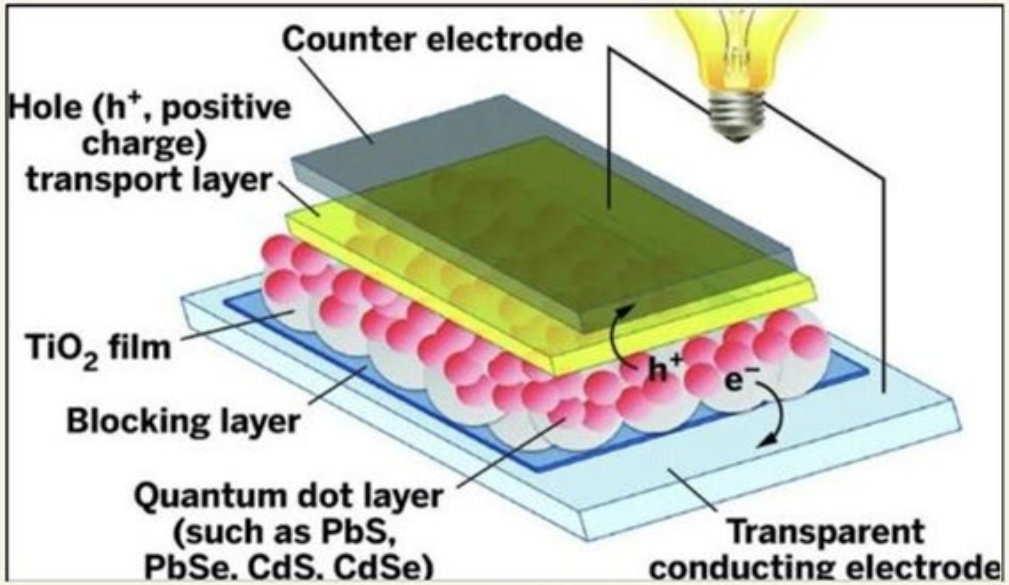
Quantum Dots

Quantum Dots (QD) are semiconductors of electricity.

When integrated into paint, QDs can absorb sunlight and generate electricity through the **photovoltaic effect.**

How do Quantum Dots Work?

1. QD in the paint absorb sunlight, exciting electrons and generating charges (electron-hole pairs)



2. Charges are separated and collected to form a direct current (DC).

3. DC electricity is fed into a power conditioning unit, which converts DC to alternating current (AC), suitable for most electrical appliances.

4. AC electricity is distributed through wiring to power electrical appliances.

Why QD Technology?

Reliable source of energy; during periods of low sunlight, it can automatically switch to stored energy generated by the QD

Shown to be 11% more efficient than traditional solar panels

Application of QD

Hybrid Roof Design

Heightening of Roof

Hot air rises, hence heightening the ceiling of the building by two metres allows hot air in the building to rise higher and further from the customers. This cools the air and improves customers' comfort.

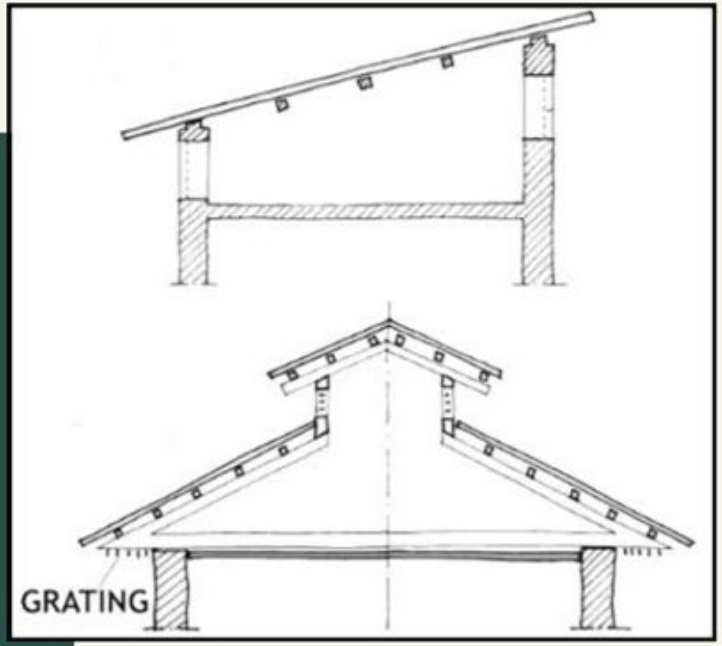
Construction of Chimney

A-shaped roof with a straight gap in the middle

- Hot air accumulated near the top of the interior can escape to the surrounding air, like a chimney. This cools the air, improving customers' comfort.

Another A-shaped roof constructed above the roof with the gap

- For rainwater to flow off the roof smoothly.



Additional Initiatives

Rainwater Harvesting

Collection, storage & usage of rainwater that falls on the hawker centre's rooftop.

Rainwater can be stored for use during drier periods for the irrigation of the green roof and general cleaning purposes (e.g. in restrooms). This reduces demand on freshwater sources.

Subsidies

Subsidies for energy efficient appliances

To reduce the hawker centre's greenhouse gas emissions, the government could give such subsidies for hawkers spend on energy efficient appliances that consume less electricity.

Summary of Improvements

WASTE MANAGEMENT

IoT System
Sensors in bins for waste tracking & prevent overfilling

Designated Food Waste Bins
Monitoring food waste levels

Portion Sizes, Partially Clear Bins & Posters
- Consumer awareness
- Reduces food waste

ECO-FRIENDLINESS

Green Roof
Reduces reliance on fans

Vending Machines for Disposable Plastics
- Reduce plastic usage
- Encourage bringing of reusable lunchboxes and utensils instead

ENERGY EFFICIENCY

Quantum Dots Paint
- Electricity from sunlight
- Renewable energy source

High Roof & Chimney
- Cooler interior
- Reduces use of fans

Rainwater Harvesting
- Conserves water

THANK YOU

FOR LISTENING TO OUR PRESENTATION

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