

# Mustafa Centre

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CREA8 SUSTAINABILITY COMPETITION

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Raffles Girls' School (Secondary)



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# A G E N D A

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Background on Mustafa Centre

Improvements to the building:

1. Energy Efficiency
2. Waste Management
3. Eco Friendliness

## BUILDING: MUSTAFA CENTRE (SHOPPING MALL)

Located on Syed Alwi Road in the cultural district of Little India, Mustafa Centre spans over 40,000 sq ft. It holds a significant place in the retail scene, attracting many shoppers with the wide range of products and services offered. It is also famously known for its 24/7 operating hours.



# ENERGY EFFICIENCY Heat Rejection and Cold Retention

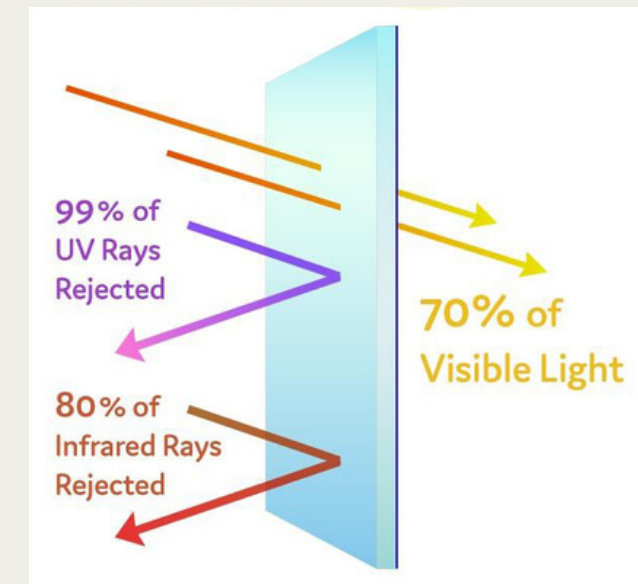
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## Infrared rejection films

- Minimises heat gain
- Reduces infrared insolation >95%

### Feasibility :

- Easily applied to the inner surface of windows to reject heat.
- Prices have dropped 90% to only \$2.00 per sq ft today



## Air curtains

- Reduces loss of cool air
- Minimise infiltration of hot air
- Uses a stream of air to keep cold air in and hot air out.

### Feasibility :

- Cost a few hundred dollars to install
- Save significantly more cooling energy than the energy they require to operate.





# ENERGY EFFICIENCY Air Conditioning

## Double-Effect Absorption Chiller

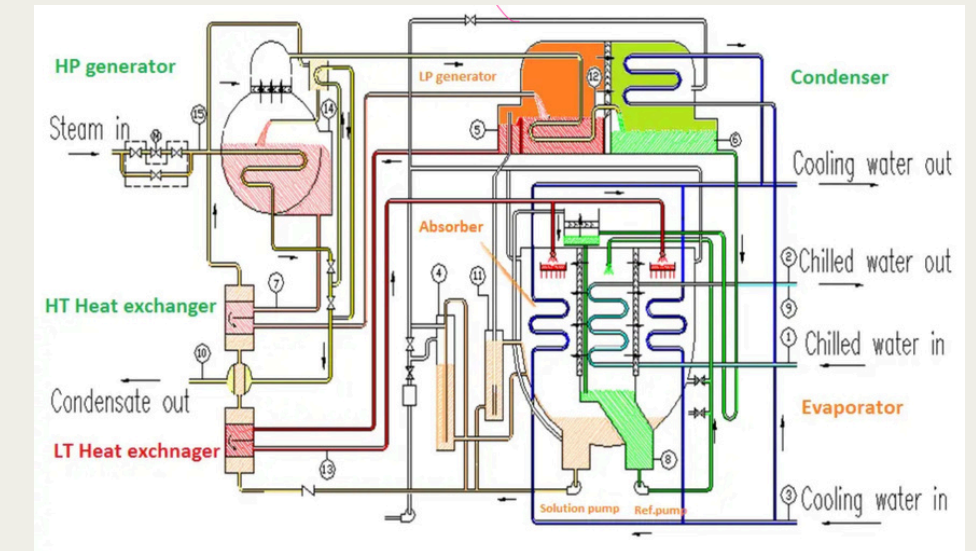
- Most Efficient way to cool large buildings
- Makes chilled water through evaporation, absorption, generation, and condensation of water
- does not use refrigerants which are known to cause serious damage to the environment

## TVP Solar Thermal Panels

- Heat is readily available
- Extremely efficient
  - Incorporates vacuum insulation
  - Heats fluids to  $>200^{\circ}\text{C}$
  - Can drive a double effect absorption chillers
- Provides roof cover, reduces heat gain during the day

## Feasibility :

- Will not impose added weight compared to existing cooling system
- Powered by Solar thermal panels.



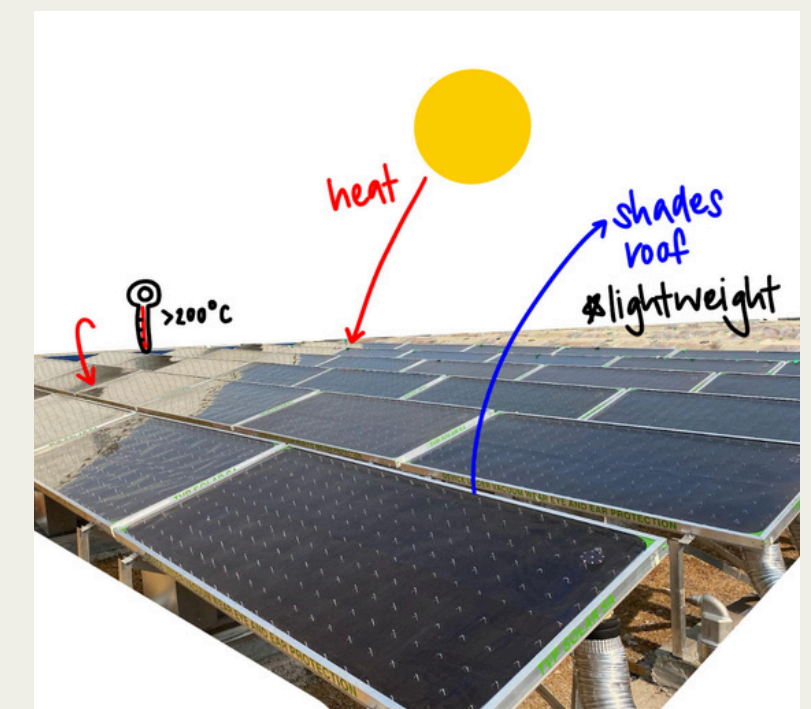
## Feasibility :

- Lightweight Structure
- Lifespan  $>20$  years

If a panel costs \$1k and generated 5kWh per day (\$1.63), it would:

- break even in 613 days
- save over \$10,000 over its lifespan

(Could be scaled to 100+ panels)



# ENERGY EFFICIENCY Refrigeration

## Sliding Glass Doors/Plastic Curtains on Open fridges

- cost-effective improvement
- reduces workload on the compressor (allows easier maintenance of set temperature)
- less work for compressor -> less heat generated -> less load on cooling system

## Solid-State Cooling

- much more efficient than traditional compressor/refrigerant cooling
- no moving parts making it extremely reliable.
- does not use refrigerants which are known to cause serious damage to the environment

### Feasibility :

- Easy installation
- No major modifications to existing units needed
- Low cost with long-term accumulation of savings

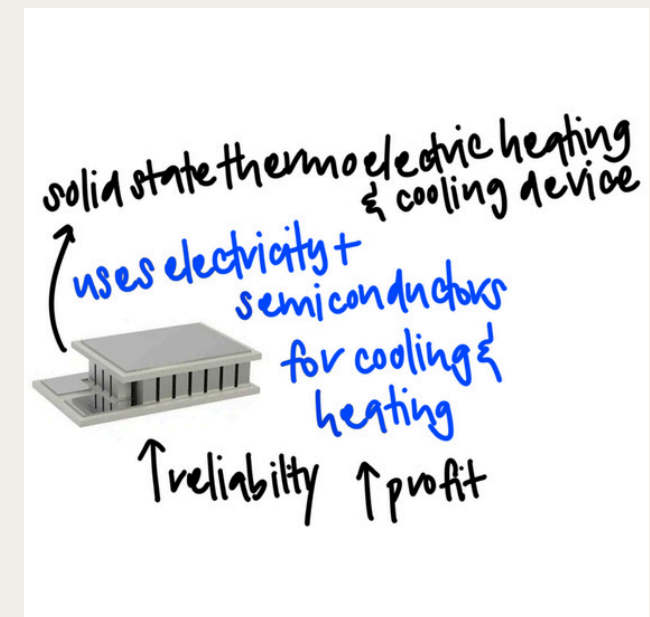


### Feasibility :

- long-term energy savings
- lower running cost
- reliability

will eventually produce a positive return on investment

- Installation is straightforward when replacing end of life units.





# ENERGY EFFICIENCY Automatic Escalators (infrared motion sensors)

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Escalators equipped with infrared motion sensors trigger the escalator only when someone approaches.

- reliable and easy to install
- detects the presence of people by sensing the heat emitted by their bodies,
- escalator only starts moving when someone approaches

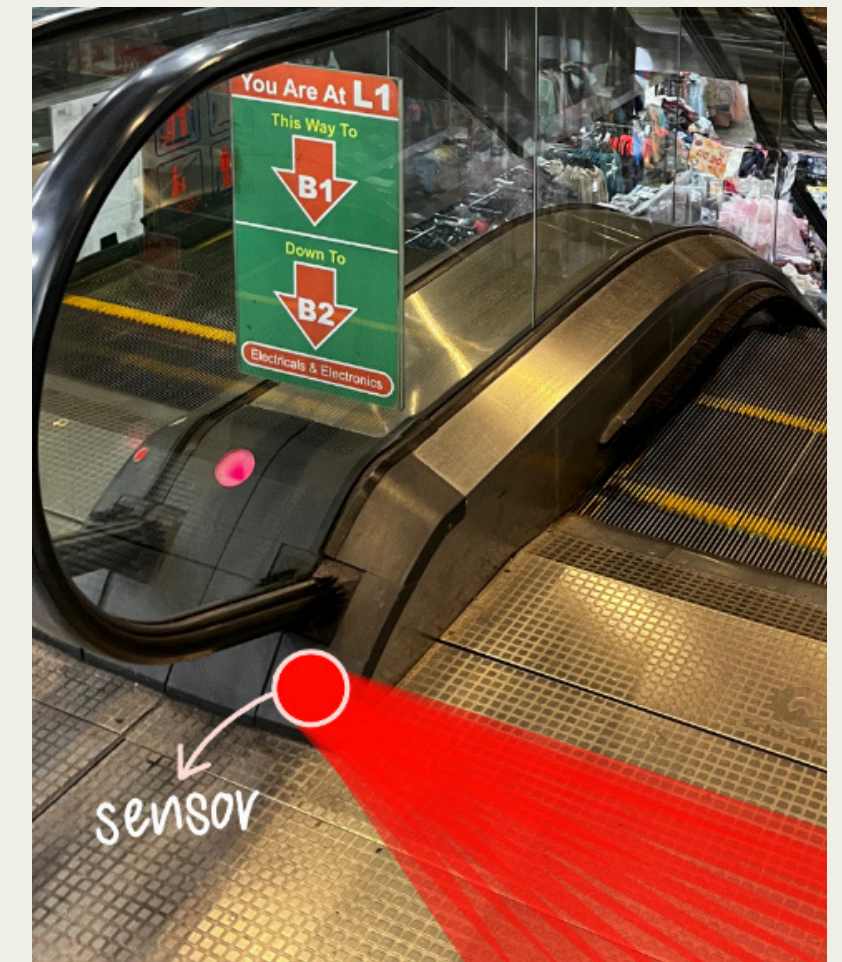
Feasibility :

- easily integrated into existing control system of the escalators
- involves wiring the sensors to the control panel and configuring them to activate the escalator's motor when motion is detected
- initial investment offset by long-term savings due the reduction in:

energy consumption

maintenance costs

wear and tear on the escalator



# WASTE MANAGEMENT

## Organic Waste

### Rearing Tilapia, Hydroponic Plants

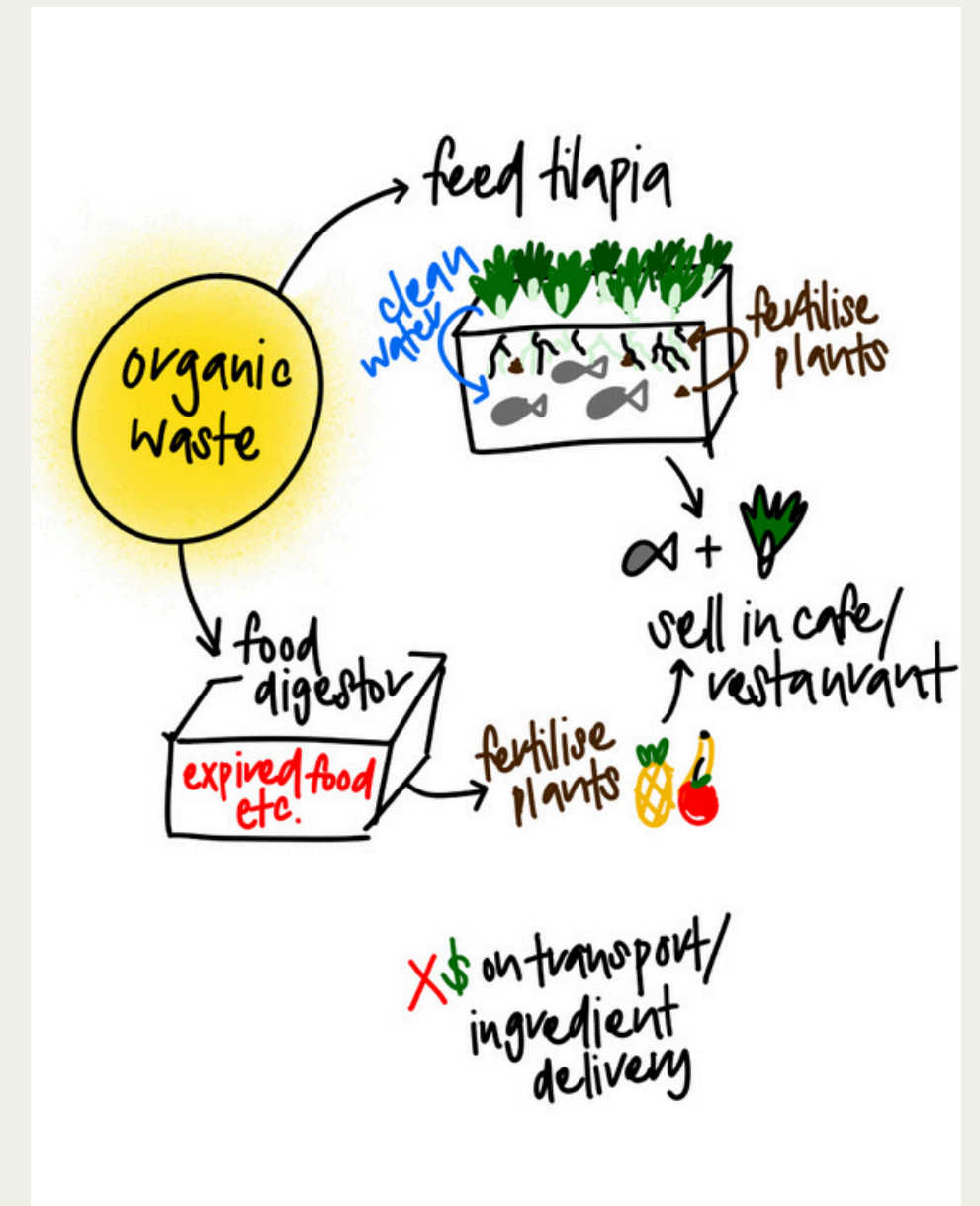
- Appropriate organic waste can help rear tilapia
- Tilapia is able to consume a wide variety of organic material
- Waste products from the fish can grow plants hydroponically
- Plants purify and clarify water for the fish
- Mature tilapia and plants can be sold in Mustafa
- Farm-to-table, self-sustaining, carbon-friendly, saves costs on delivery and transportation.

### Feasibility :

- Does not require significant space
- Turns waste into a revenue stream. Both the fish and plants can be sold allowing revenue to be generated from organic waste. This would offset any spending.

### Food Digestors

- remaining organic waste can be converted into compost through food digester then used to fertilize plants in the building





# WASTE MANAGEMENT

## Plastic and General Waste

### Reverse Vending Machines and Recycling Bins

- easily accessible “Reverse Vending Machine” (RVM) within the mall, located near entrances or exits
- clear instructions on how to use it
- introduce incentive programs such as rewards or discounts for Mustafa Centre to increase participation
- efficiently transforms used material into resources that manufacturers can use to produce new products, reducing waste.
- Drastically increase recycling rates
- Recycling bins can also be added

#### Feasibility :

- straightforward to install and operate causing minimal disruption when installing
- Could partner with NEA (like how NEA partners with schools) to help achieve a zero-waste nation
- NEA most likely would cover the maintenance and operation costs of the machine.



# WASTE MANAGEMENT

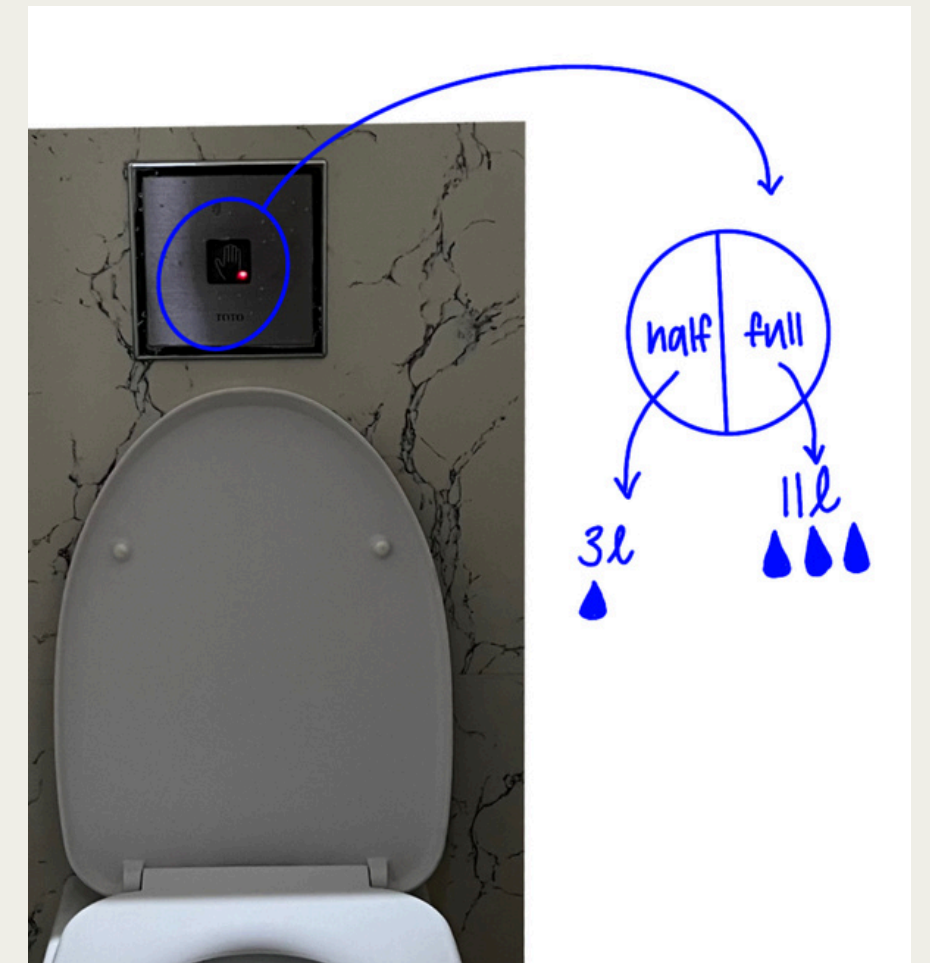
## Water Wastage

### Half Flush Function

- Toilets in Mustafa use approximately 11 liters of water every flush, this is excessive
- Half Flush reduces water consumption by up to 8 liters per flush

### Feasibility :

- readily available
- easily retrofitted to existing plumbing systems
- cost of installation below \$150 per toilet
- With Singapore's water price at \$2.74 per cubic meter, the reduction in water usage could lead to substantial financial savings.
- a half-flush toilet can save around 20,000 liters of water per year (\$55 annually)
- Considering the amount of toilets in Mustafa Centre the cumulative savings would be very significant.





# ECO-FRIENDLINESS

## Flora and Fauna

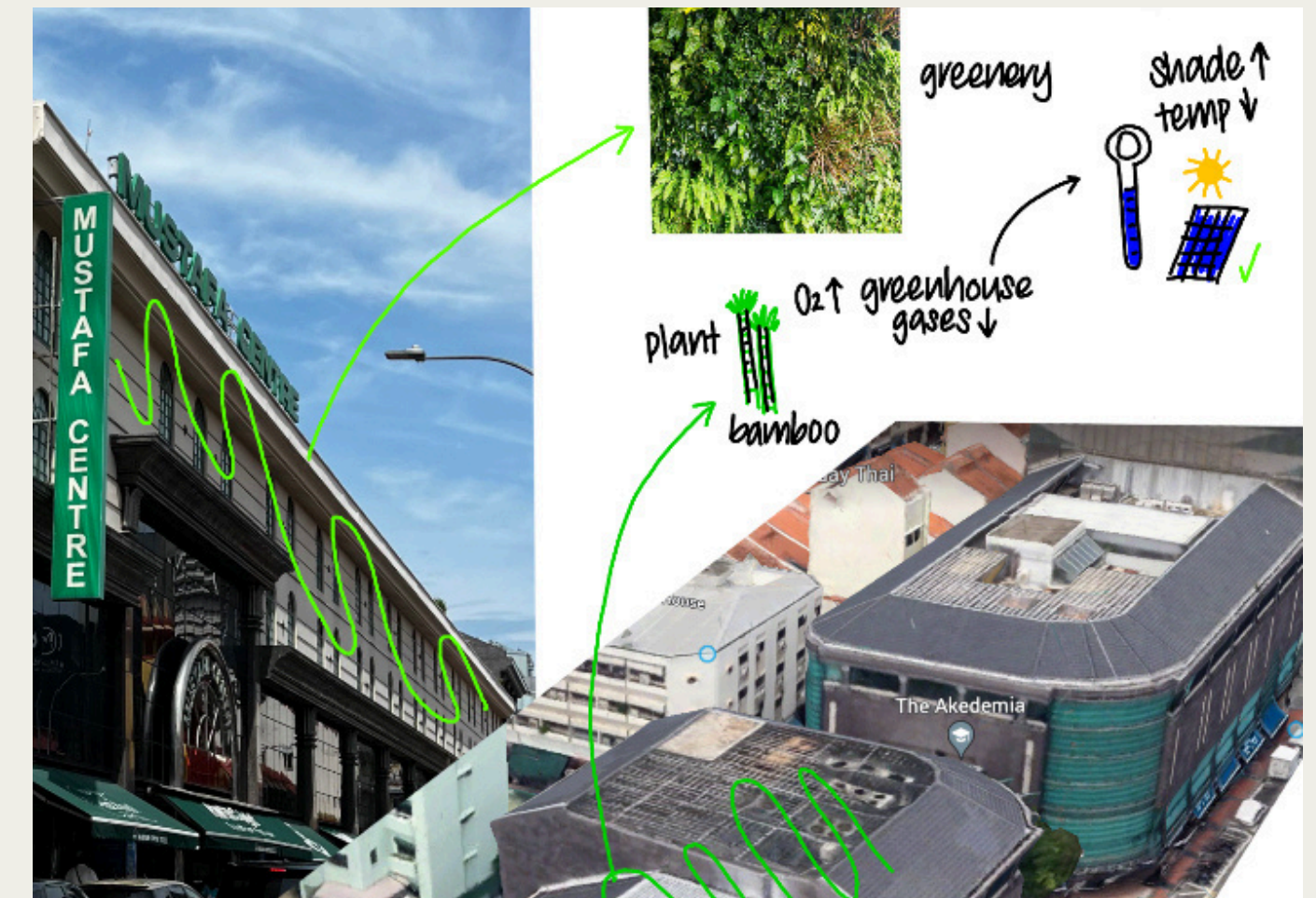
### Green Roof and Wall Plants

- Mustafa Centre lacks greenery
- Flora and Fauna mitigates the urban heat island effect and promotes sustainability
- Plants on the roof and sides of the building will:
  1. Reduce surface temperatures by absorbing sunlight and providing cooling shade
  2. Enhance evapotranspiration mitigating the urban heat island effect,
  3. Reducing energy consumption for cooling
  4. Increase efficiency of solar panels as by lowering ambient temperatures, resistance decreases and energy produced is increased.

Bamboo absorbs around 5 times more greenhouse gasses and produces 35% more oxygen than the equivalent volume of trees

### Feasibility :

- cost ranges from \$100 to \$300/sq meter
- Due to reduced energy consumption for cooling, the cost would be offset by the money saved on cooling costs





# ECO-FRIENDLINESS

## Clean Renewable Energy Sources

### Solar Panels

- building's renewable and eco-friendly source of energy
- effective in generating energy and reliable
- reduces carbon emissions and reliance on non-renewable energy sources, promoting environmental sustainability

### Feasibility :

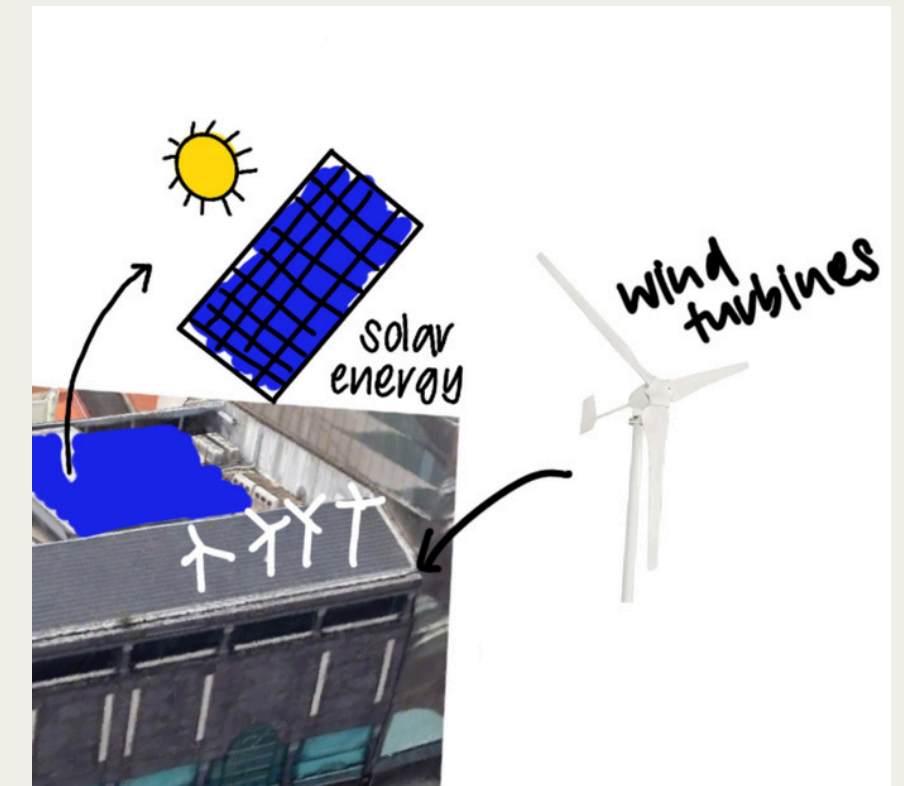
- affordable and feasible for widespread use
- results in substantial long-term savings, (reduces electricity bills)
- require low maintenance.

### Building Integrated Turbines

- still efficient at low wind speeds
- recent reduction of capital costs
- Lightweight and aerodynamic designs make them highly sensitive to small air movements.

### Feasibility :

- Some wind turbines a lower capital cost
- easy to install on the roof and can be done without professional help.



# ECO-FRIENDLINESS

## Self-sustainability

### Rainwater Harvester

- installed on the rooftop
- additional supply of water used to flush toilets and irrigate plants

#### Feasibility :

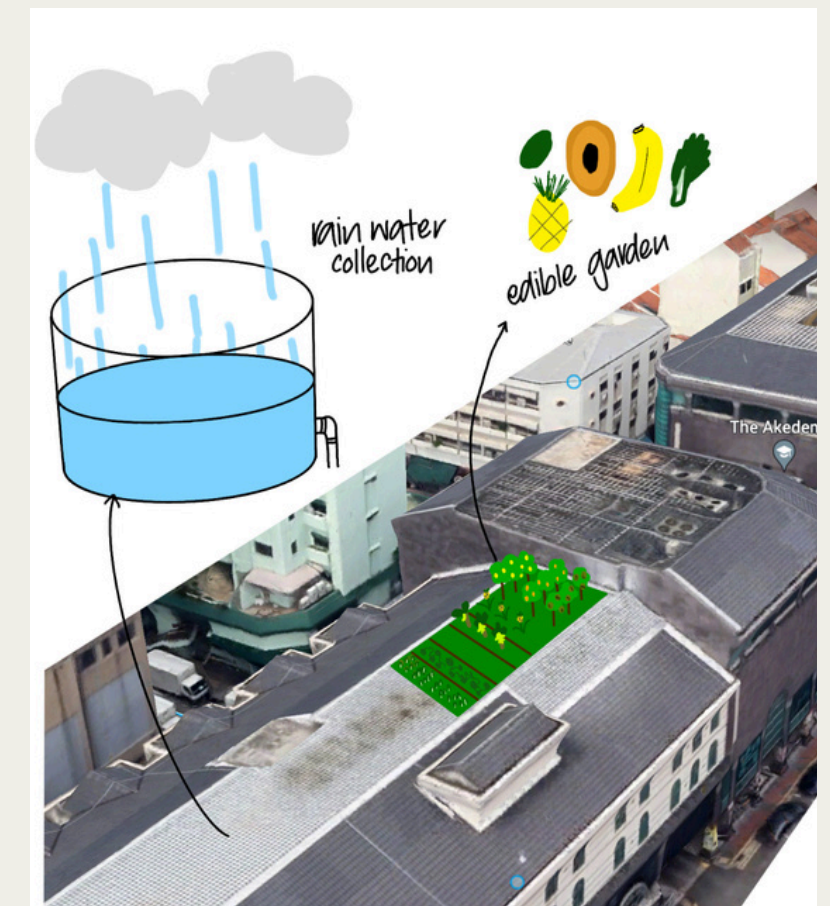
- heavy rainfall in Singapore provides system with a consistent water source
- space-efficient, cost-effective, and has low maintenance costs
- initial installation cost is offset by the savings on water bills over time.

### Edible Garden

- integrates vertical farming tech
- maximises space and yield
- adds greenery, improves air quality
- reduces the urban heat island effect
- supports a self-sustaining ecosystem.
- Vegetables and fruits grown can be fertilized with compost from the food digester

#### Feasibility :

- Costs minimized as harvested rainwater and organic waste compost are utilized
- eco-friendly and economical



# Thank you!!

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