

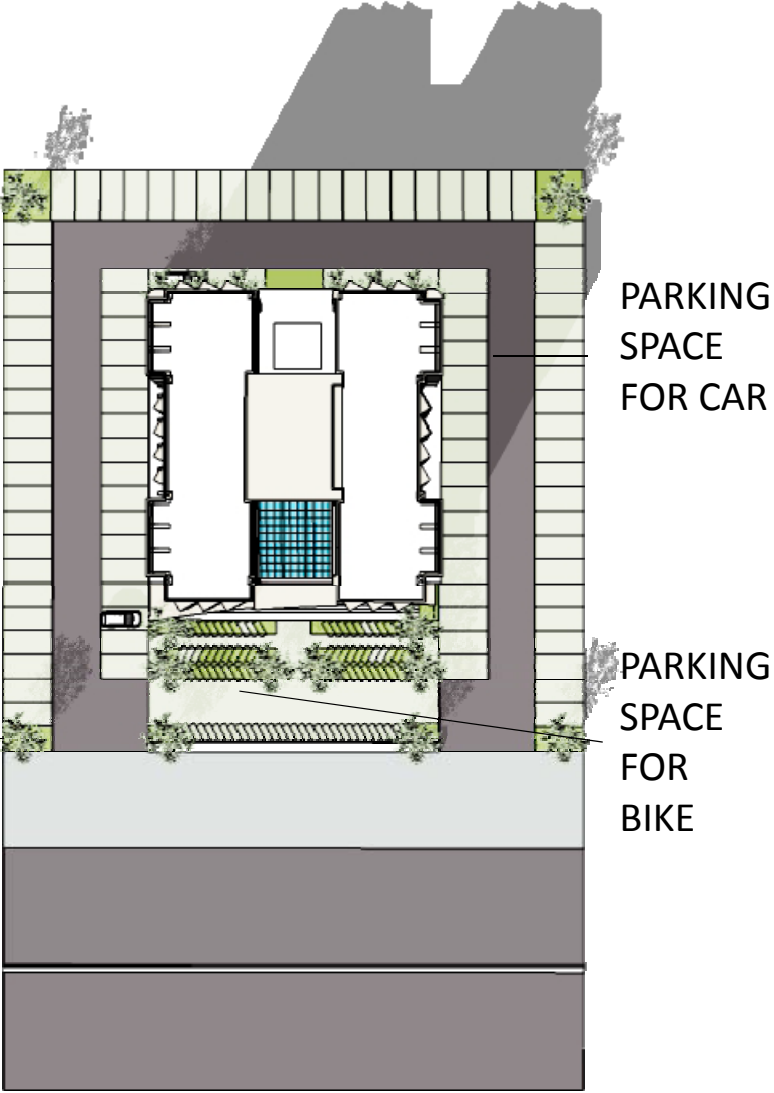
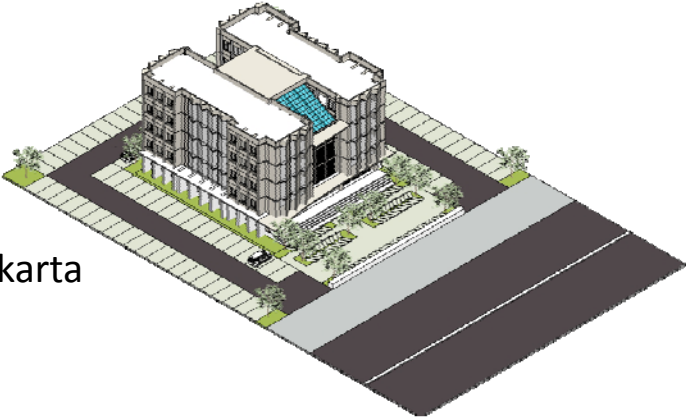


OFFICE BUILDING  
JAKARTA

# BUILDING SHAPE

## Building shape data

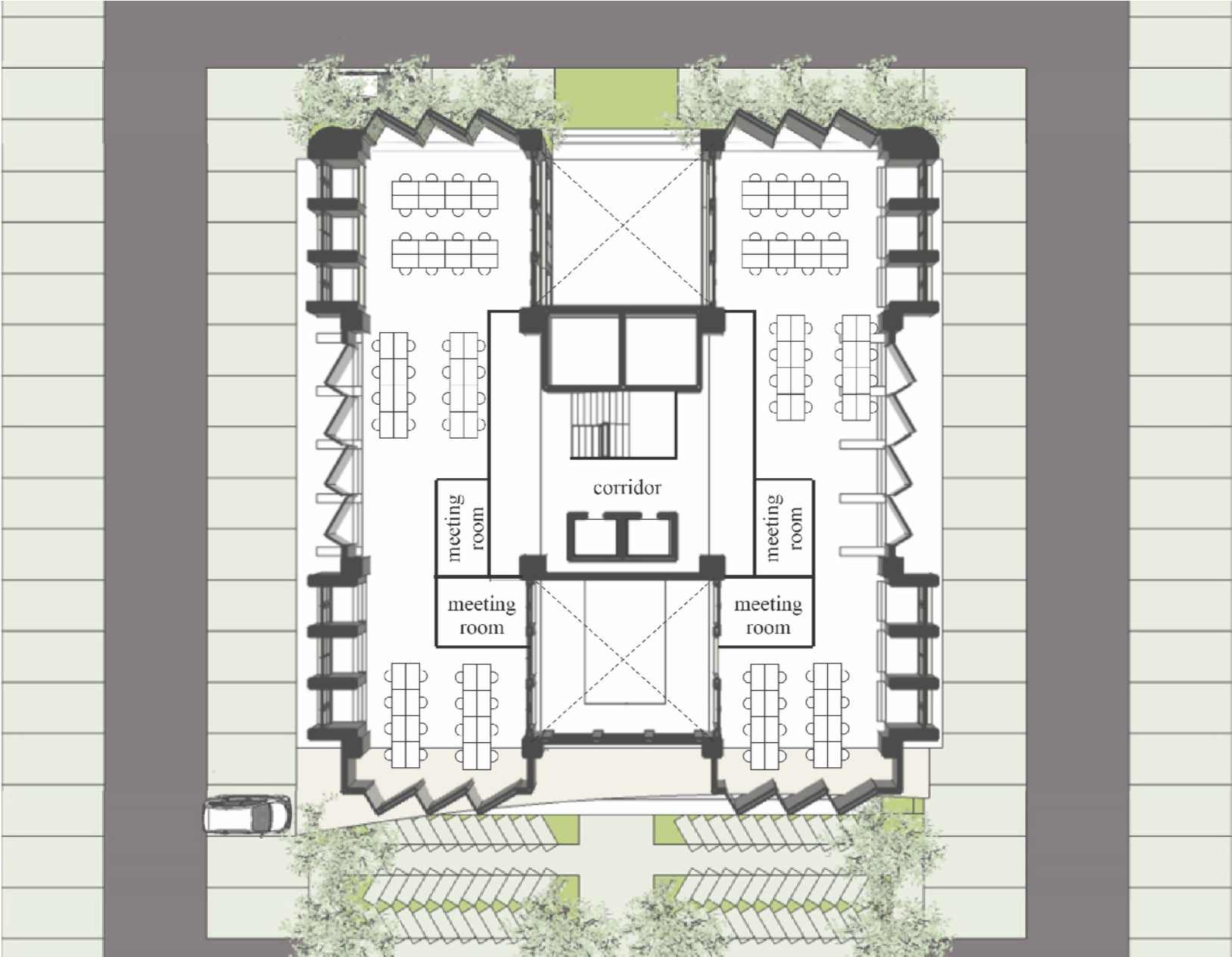
- Main orientation : South
- Plan shape : H
- Site location : Central Jakarta
- Climate : Tropic



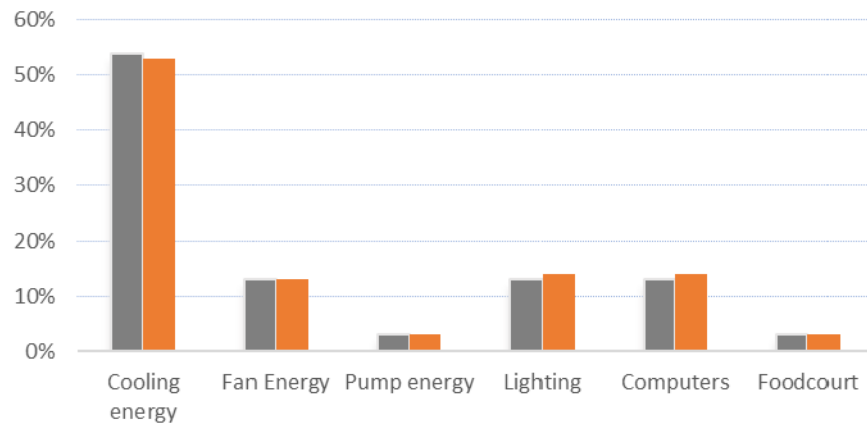




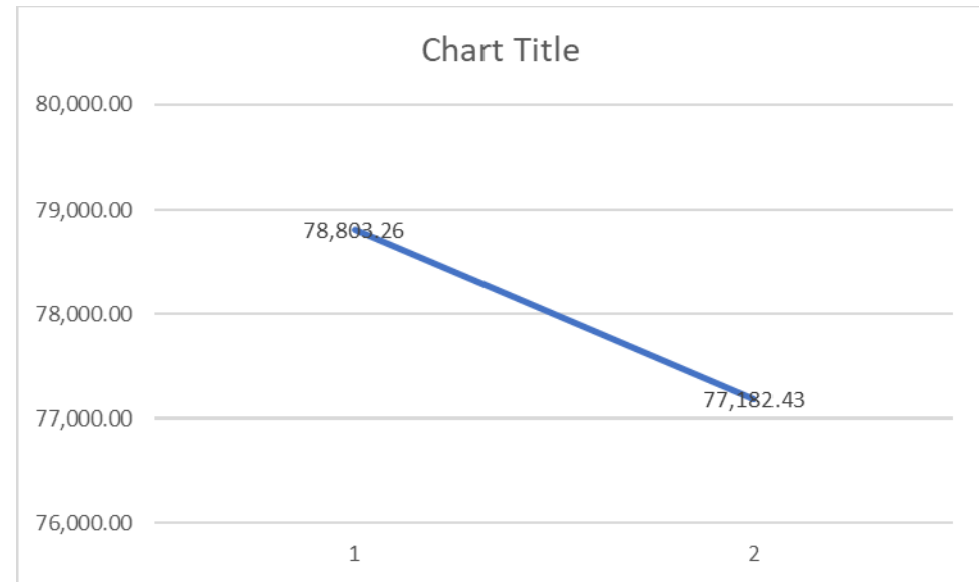




# BUILDING SHAPE & ORIENTATION



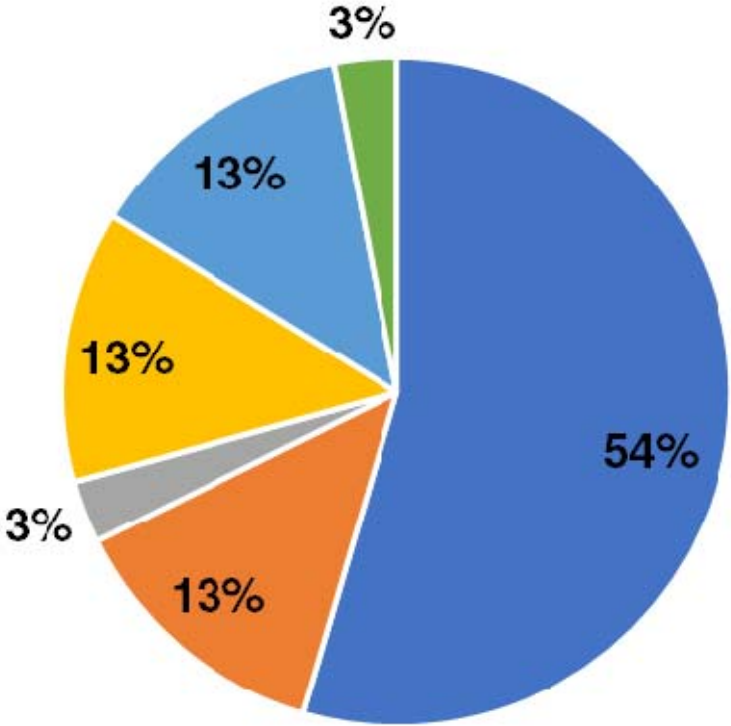
- Energy demand for cooling decreases for 2%, with total energy reduction accounted for 2.1%.



# ENERGY

## Energy Consumption in Office Building

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- More than half of the energy is consumed for achieving thermal comfort (cooling), accounted for 54%.
- Energy demand for fan, lighting, and computers is roughly equal (13%).



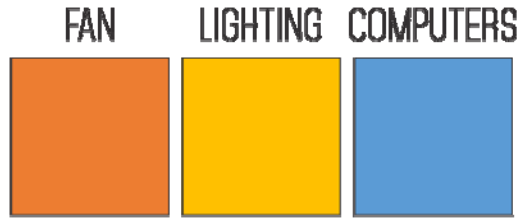


# STRATEGY



**COOLING**  
REDUCED HEAT GAIN

- REDUCED WINDOW TO WALL RATIO
- REFLECTIVE PAINT FOR EXTERNAL WALL
- CEILING FANS FOR OFFICE SPACES
- NATURAL VENTILATION WITH OPERABLE WINDOW
- ROOF INSULATION
- EXTERNAL WALL INSULATION



**ELECTRICITY**  
REDUCED POWER USAGE

- ENERGY SAVING LIGHT BULBS
- OCCUPANCY SENSORS IN BATHROOMS, CONFERENCE ROOMS, AND CLOSED CABIN
- OCCUPANCY SENSORS IN OPEN OFFICE
- SOLAR PHOTOVOLTAICS

**WWR** REDUCED 35.38%  
NORTH 43%  
SOUTH 43%  
EAST 30%  
WEST 0.2%

**REFLECTIVE  
PAINT  
FOR  
EXTERNAL  
WALL** ALBEDO 0.83  
WATERPROOF PAINT

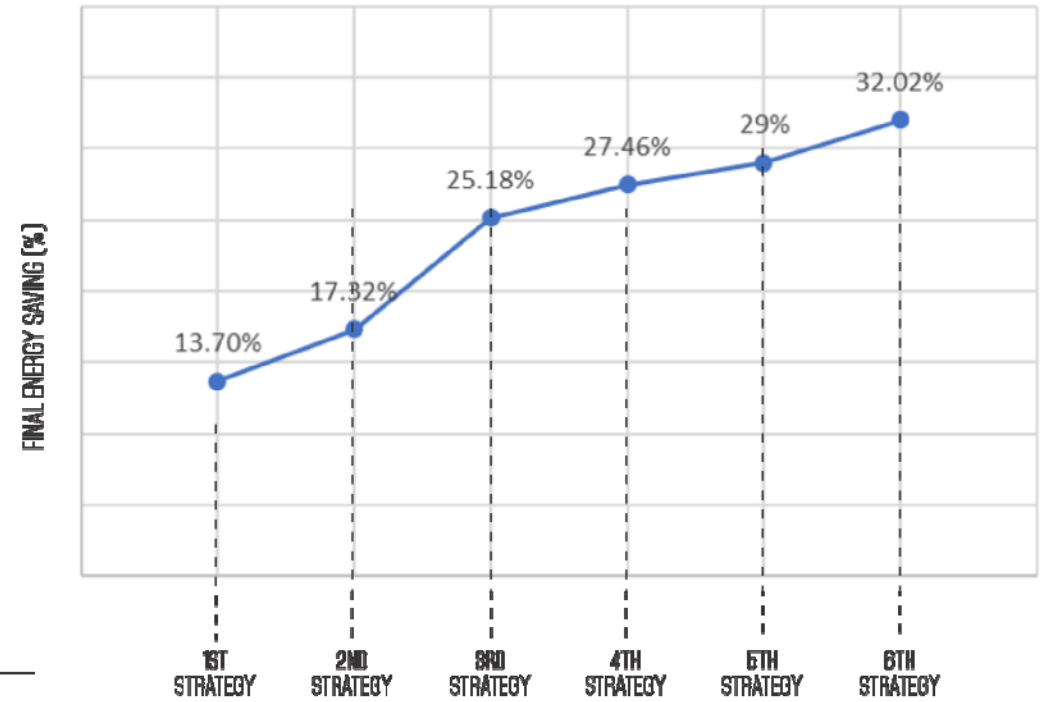
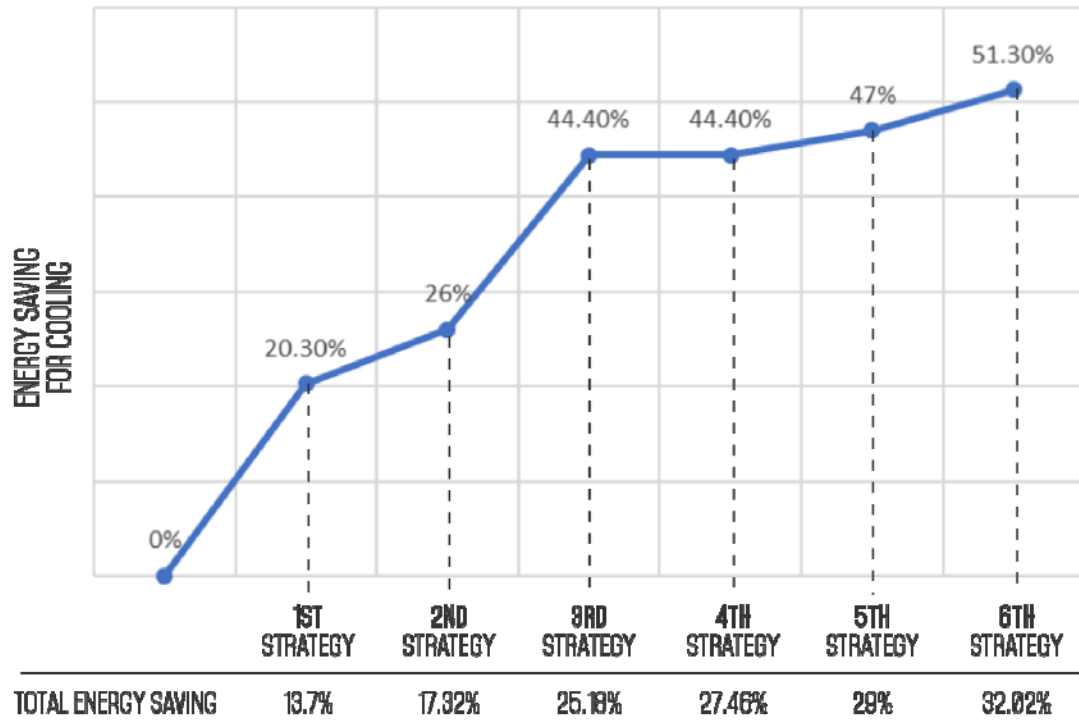
**ROOF  
INSULATION** 0.64 W/m2.K  
1. IN SITU REINFORCED CONCRETE  
2. INSULATION POLYSTYRENE  
3. PLASTER GYPSUM

**WALL  
INSULATION** 0.93 W/m2.K  
1. CEMENT PLASTER  
2. AUTOCLAVED AERATED CONCRETE  
3. INSULATION POLYSTYRENE

**WALL  
INSULATION** 0.93 W/m2.K  
1. CEMENT PLASTER  
2. AUTOCLAVED AERATED CONCRETE  
3. INSULATION POLYSTYRENE

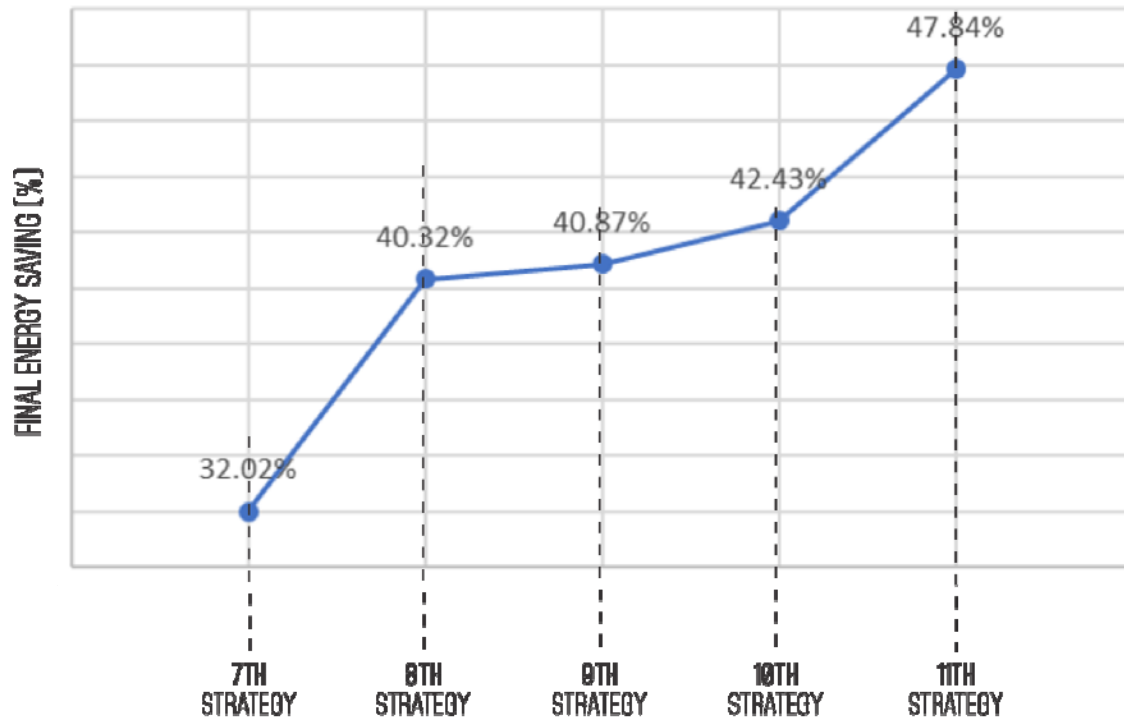
**SOLAR  
PV** ANNUAL ELECTRICITY USE: 20%  
41.4 KWP  
AVAILABLE ROOF AREA: 506 SQM

# ENERGY SAVING



- REDUCED WINDOW TO WALL RATIO 1.
- REFLECTIVE PAINT FOR EXTERNAL WALL 2.
- CEILING FANS FOR OFFICE SPACES 3.

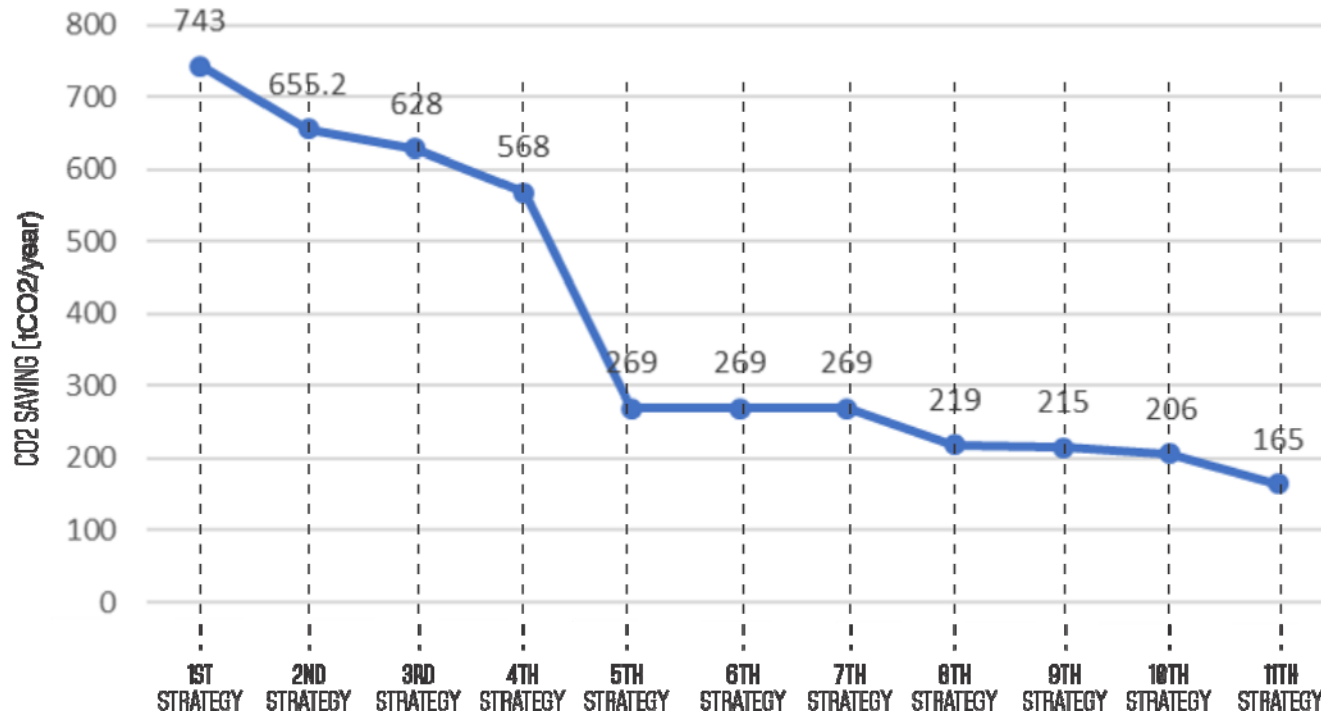
- NATURAL VENTILATION WITH OPERABLE WINDOW 4.
- ROOF INSULATION 5.
- EXTERNAL WALL INSULATION 6.



1. ENERGY SAVING LIGHT BULBS
2. OCCUPANCY SENSORS IN BATHROOMS, CONFERENCE ROOMS, AND CLOSED CABIN
3. OCCUPANCY SENSORS IN OPEN OFFICE
4. SOLAR PHOTOVOLTAICS

# ZERO NET CARBON

## CO2 SAVING



- BUILDING ORIENTATION 1.
- REDUCED WINDOW TO WALL RATIO 2.
- REFLECTIVE PAINT FOR EXTERNAL WALL 3.
- CEILING FANS FOR OFFICE SPACES 4.
- NATURAL VENTILATION WITH OPERABLE WINDOW 5.
- ROOF INSULATION 6.
- EXTERNAL WALL INSULATION 7.
- ENERGY SAVING LIGHT BULBS 8.
- OCCUPANCY SENSORS IN BATHROOMS, CONFERENCE ROOMS, AND CLOSED CABIN 9.
- OCCUPANCY SENSORS IN OPEN OFFICE 10.
- SOLAR PHOTOVOLTAICS 11.

Final building carbon emission: 165 tCO2/year

## STRATEGY



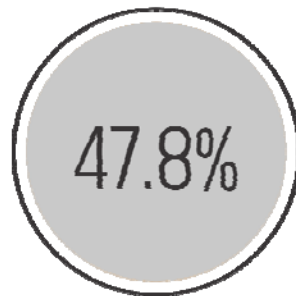
**CARBON OFFSET-100% OF TOTAL CO2**

### **CONSIDERATION:**

- **No available installed renewable energy generator**
- **Site location is adjacent to Muara Karang coal powerplant, hence the power supply may depend greatly on it.**

## RESULT

ENERGY SAVING



CARBON EMISSION

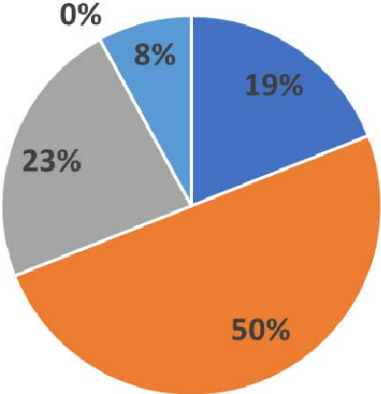
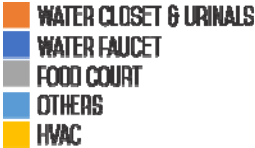


FINAL ENERGY USE 17088.59 KWH/MONTH  
INCREMENTAL COST 27587.83 THOUSAND RP.  
PAYBACK PERIOD 0.18 YEARS

# WATER

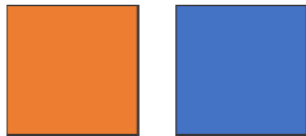
## Water Consumption in Office Building

- Water closet and urinals have the highest proportion of water usage in office building (50%), followed by food court (23%), and water faucet (19%).





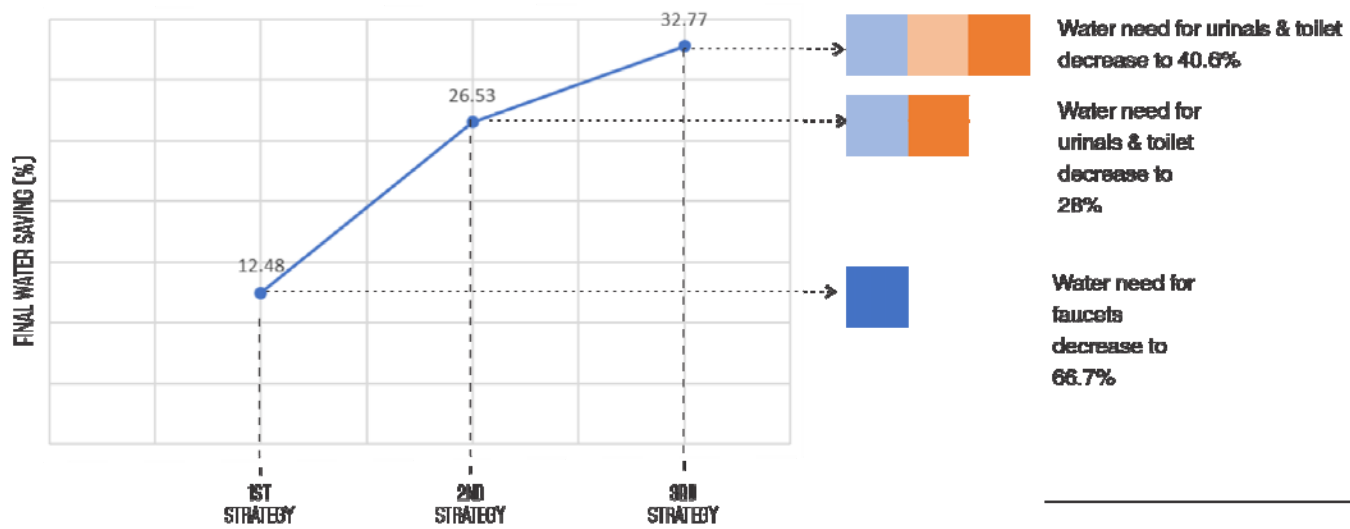
## STRATEGY



## WATER SAVING

EFFECTIVE USE OF WATER

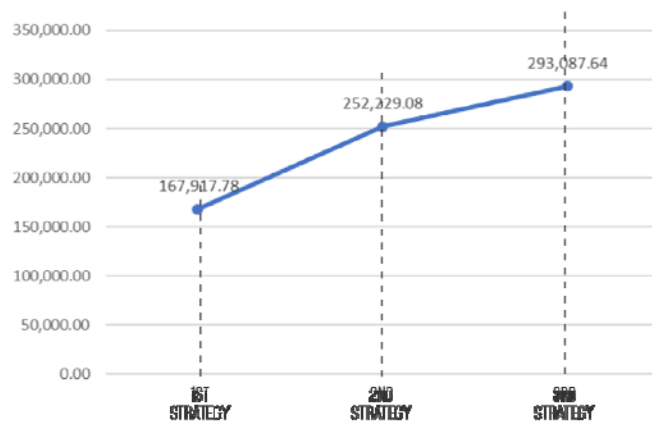
- LOW-FLOW FAUCET IN ALL BATHROOMS ▀
- DUAL FLUSH FOR WATER CLOSETS IN ALL BATHROOMS ▀
- WATER-EFFICIENT URINALS IN ALL BATHROOMS ▀



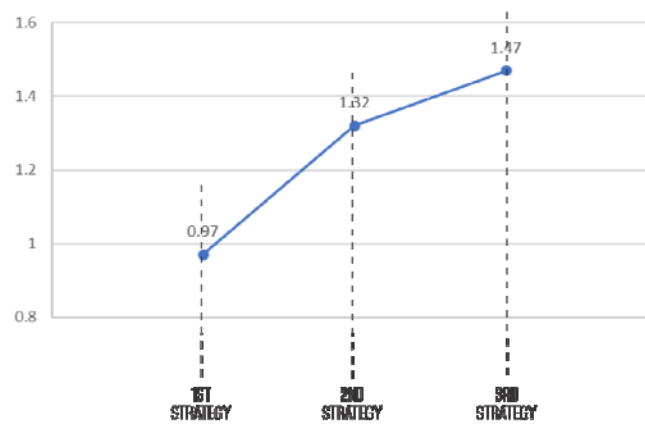
- 
1. LOW-FLOW FAUCET IN ALL BATHROOMS
  2. DUAL FLUSH FOR WATER CLOSETS IN ALL BATHROOMS
  3. WATER-EFFICIENT URINALS IN ALL BATHROOMS

# EFFECT OF WATER SAVING STRATEGY

## INCREMENTAL COST [THOUSAND RP]



## PAYBACK PERIOD [YEARS]



*Increased number of incremental cost, followed by payback periods*

**RESULT  
WATER SAVING**



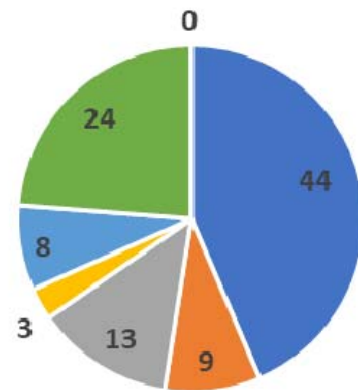
**FINAL ENERGY USE 17069.59 KWH/MONTH  
ENERGY SAVING 47.86%  
FINAL WATER USE 58164 M3/MONTH  
INCREMENTAL COST 293087.64 THOUSAND RP.  
PAYBACK PERIOD 1.47 YEARS**

# MATERIAL

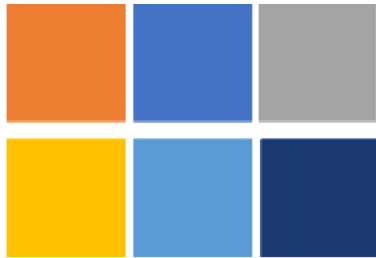
## Embodied Energy in Office Building

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- Floor slab material has the highest percentage of embodied energy among other building parts, accounted for 44%, followed by window (24%) and external walls (13%).



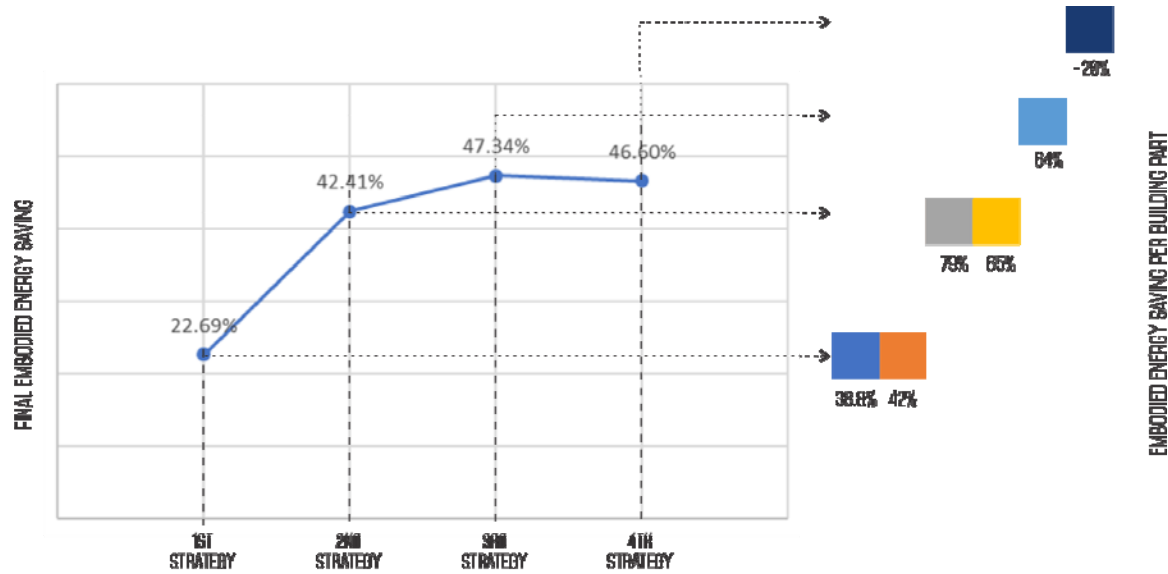
## STRATEGY



## EMBODIED ENERGY SAVING

- IN SITU REINFORCED CONCRETE FOR FLOOR SLAB AND ROOF
- AUTOCLAVED AERATED CONCRETE BLOCK FOR EXTERNAL AND INTERNAL WALLS
- FINISHED CONCRETE FLOOR
- POLYSTYRENE INSULATION FOR ROOF AND WALL

- FLOOR SLAB
- ROOF CONSTRUCTION
- EXTERNAL WALLS
- INTERNAL WALLS
- FLOORING
- WINDOWS
- INSULATION

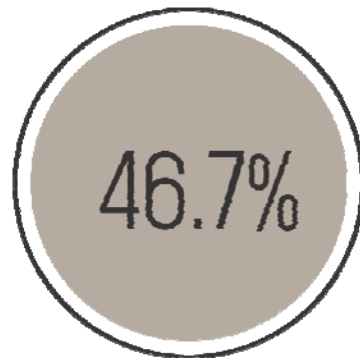


**MATERIAL LIST**

FLOOR SLAB	120THK	IN SITU REINFORCED CONCRETE
ROOF	100THK	IN SITU REINFORCED CONCRETE
EXTERNAL WALL	150THK	AAC BLOCK
INTERNAL WALL	160THK	AAC BLOCK
FLOORING	-	FINISHED CONCRETE FLOOR
WALL INSULATION	20 THK	POLYSTYRENE
ROOF INSULATION	20 THK	POLYSTYRENE

1. IN SITU REINFORCED CONCRETE FOR FLOOR SLAB AND ROOF
2. AUTOCLAVED AERATED CONCRETE BLOCK FOR EXTERNAL AND INTERNAL WALLS
3. FINISHED CONCRETE FLOOR
4. POLYSTYRENE INSULATION FOR ROOF AND WALL

**RESULT**  
**EMBODIED ENERGY SAVING**



**FINAL ENERGY USE 17069.59 KWH/MONTH**  
**ENERGY SAVING 47.86%**

**FINAL WATER USE 58164 M3/MONTH**  
**WATER SAVING 32.8%**

**INCREMENTAL COST 293087.64 THOUSAND RP.**  
**PAYBACK PERIOD 1.47 YEARS**