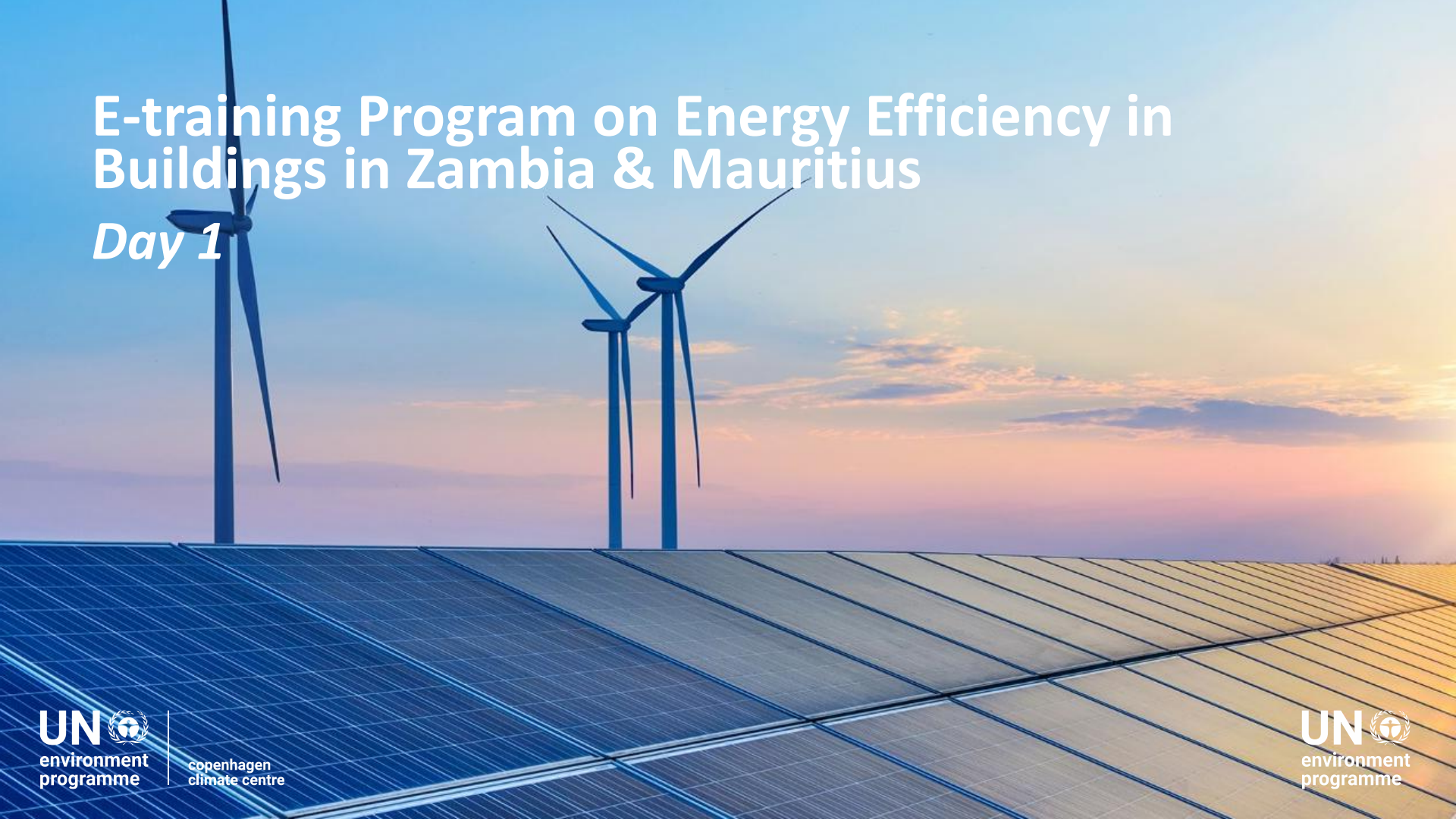
E-training Program on Energy Efficiency in Buildings in Zambia & Mauritius

Day 1



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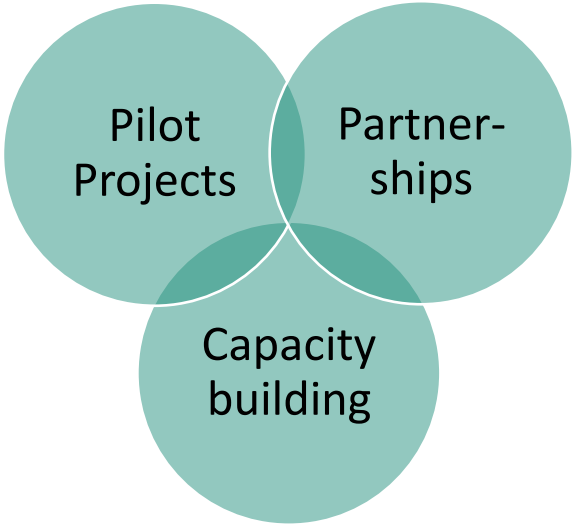
Global Platform for Urban Climate Neutrality (GPUC) Project

- GPUC serves as a central hub offering cities in emerging economies access to information, technical solutions, capacity building, and support for energy efficiency and climate neutrality efforts.
- The ultimate goal is to accelerate energy efficiency interventions in cities towards long-term carbon neutrality targets.
- Supported by the Ministry of Foreign Affairs of Denmark (DANIDA), the German Energy Agency (DENA) and implemented by UNEP Copenhagen Climate Centre (UNEP-CCC).



Agenda (Day 1)

Session 1: Overview of Building Energy Efficiency & Global Trends (30 min)	
- Need for building energy efficiency interventions in cities & global trends - Importance of energy efficiency in Zambia & Mauritius' context	UNEP CCC EEMO, MIHUD
Session 2: Key Energy Efficiency Strategies for Buildings (40 min)	
- Passive design principles - Integration of nature-based solutions to support energy efficiency strategies in buildings - Active strategies to improve building energy efficiency	UNEP CCC
Session 3: Application of EDGE tool in Africa (20 min)	
- Overview of energy-efficient & green building projects in Africa certified by EDGE.	IFC
Session 4: Interactive Discussion (20 min)	
- Challenges and opportunities in Zambia & Mauritius' building energy efficiency sector.	All speakers
Short Quiz	

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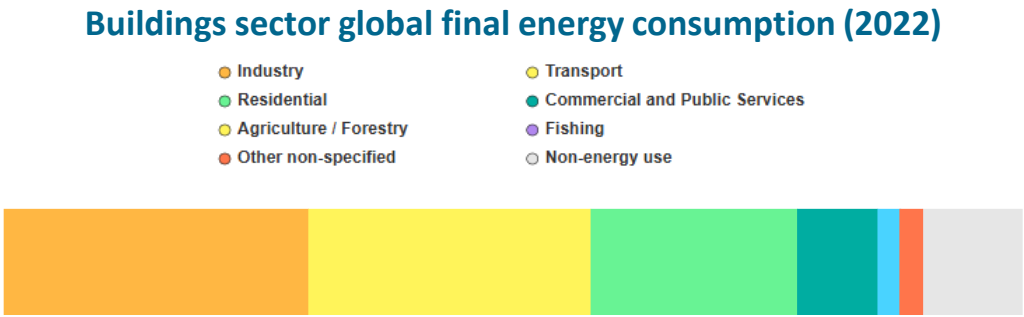
Session 1: Overview of Building Energy Efficiency & Global Trends

The Role of Building Energy Efficiency

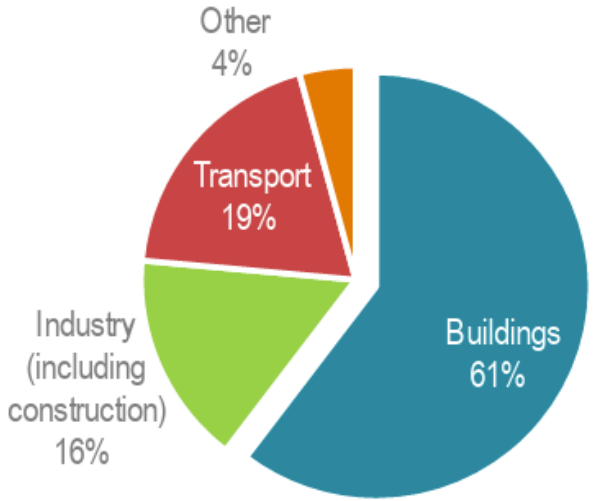


Source: IEA

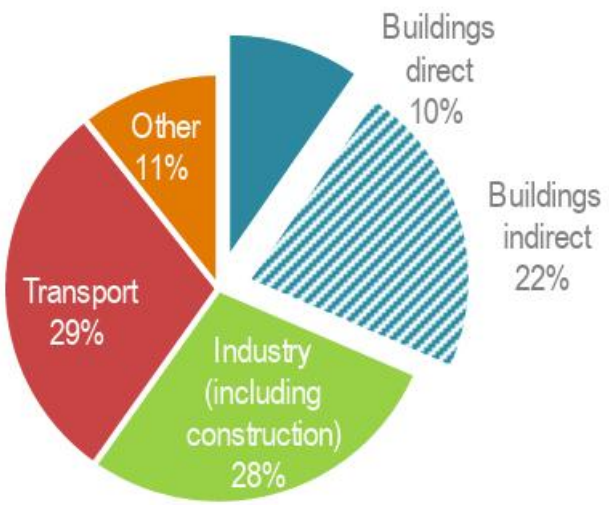
- **Global floor area is expanding rapidly**, particularly across African countries. This growth, combined with ongoing **market development and urbanization**, is expected to drive a construction surge, with **over 80% of this expansion occurring in cities**.

Buildings Energy Consumption in Africa

Buildings' share of total final energy consumption Africa, 2018



Buildings' share of total CO2 emissions in Africa, 2018



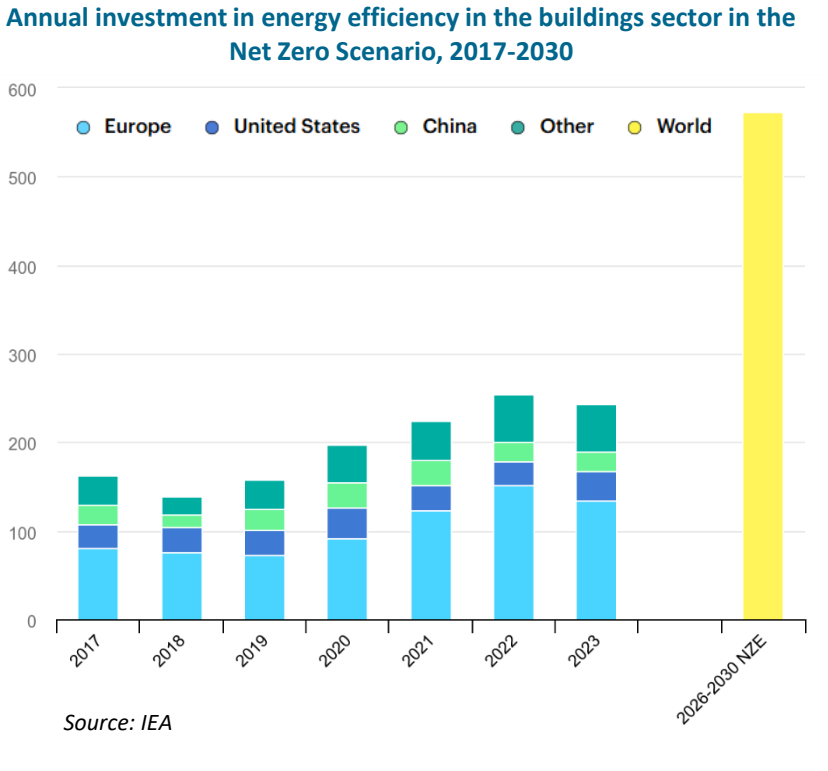
Source: Global ABC

Benefits of Energy Efficient Buildings

- **Energy security**: Energy efficiency can reduce the reliance on energy imports and reduce the risks of supply interruptions.
- **Emissions savings**: Energy efficiency reduces GHG emissions, both direct emissions from fossil fuel, and indirect emissions from electricity generation.
- **Public budgets**: Energy efficiency delivers financial benefit to public budgets through decreased expenses.
- **Energy prices**: Energy efficiency can lower energy prices by reducing the need to add new power generation or transmission capacity and by reducing pressure on energy resources.
- **Household savings**: Energy efficiency can enable higher disposable income by lowering energy bills and other households costs
- **Asset values**: Energy efficiency can increase asset values for homeowners, businesses and utilities.
- **Heath and wellbeing**: Energy efficiency supports physical and mental health with healthy temperatures, humidity, noise, and air quality.

Global Investments in Energy Efficiency

- Investment in energy efficiency in buildings increased by about 14% to over USD 250 billion in 2022, continuing the rapid growth of the past few years. Maintaining similar progress of at least 11% year-on-year growth could put the sector on track to reach 2030 annual investment levels needed in the NZE Scenario.
- Investment in energy efficiency and clean technologies in the buildings sector has increased, but still falls far short of levels needed in the NZE Scenario



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Global Energy Efficiency Targets

European Union (EU) 

•**Targets**:

- Improve the average energy performance of the national residential building stock by **16% by 2030** (vs. 2020)
- Reach **20–22% improvement by 2035**, based on national trajectories

India 

•**Targets**:

- Industry, Buildings (including appliances), Transport, and Miscellaneous sectors

China 

•**Targets 2025**:

- All **new urban buildings** must comply with **green building standards**
- **50% rooftop PV coverage** required for new public institutions and factories
- Target **8% renewable energy substitution** in urban buildings
- Renovate **200 million m²** of existing buildings for improved energy efficiency
- Reduce heat loss in urban heating networks by **2%**
- Improve energy efficiency of renovated buildings by **30% (residential)** and **20% (public)**

Importance of energy efficiency in Zambia & Mauritius' context

Session 2: Key Energy Efficiency Strategies for Buildings

Building Energy Efficiency Strategies

🟩 Passive Measures

Design-focused solutions that reduce energy demand without relying on mechanical systems.

- **High Performance Windows**
- **Natural Ventilation**
- **Design for Daylighting**
- **Cool Roofs**
- **Nature-based Solutions**

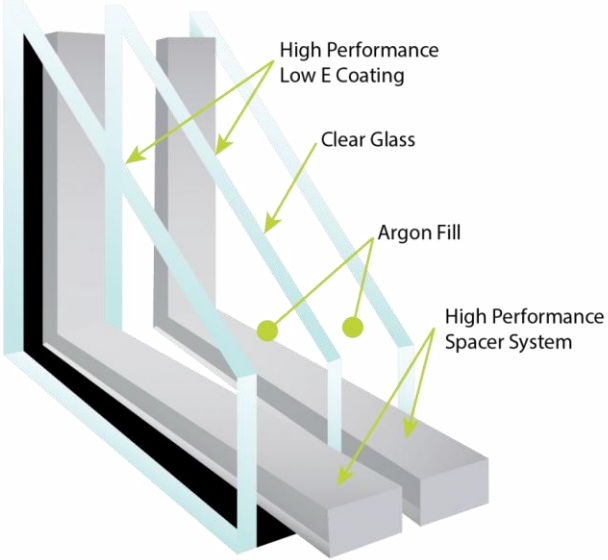
🟦 Active Measures

Technological solutions that use energy-efficient systems and equipment.

- **LED Lighting & Smart Controls**
- **High-Efficiency Appliances**
- **Efficient HVAC Systems**
- **Renewable Energy Integration**
- **Energy Management Systems (EMS)**

High Performance Windows

- High-performance windows block excess solar heat while allowing daylight in hot climates
- Double/triple pane windows with insulating gas between them designed for better insulation
- A low-e coating lowers the U-factor of the window, and some are filtering out 40% to 70% of the heat normally transmitted through insulated window glass while allowing the full daylight
- Internal or external shading devices (e.g. overhangs, blinds, screens, awnings or curtains, and shutters) further reduce solar heat gain.

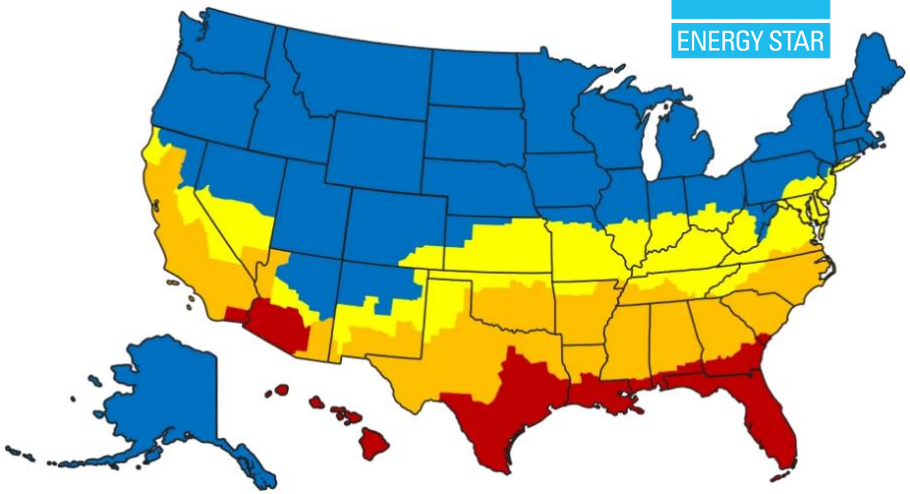


Source: Smarter Windows & Doors

Energy Star Program for Windows

Southern Zone Requirement (mostly cooling)		
U-factor	**Solar Heat Gain Coefficient (SHGC)**	**Visible Transmittance (VT)**
Windows ≤ 0.32 Skylights ≤ 0.50	Windows ≤ 0.23 Skylights≤ 0.25	No requirement

Source: Energy Star, USA



Natural Ventilation

Natural ventilation allows fresh air to flow through operable windows, skylights, and vents, minimizing the reliance on mechanical systems.

Key considerations

- Orientation: Position openings to catch prevailing winds
- Cross Ventilation: Place windows or vents on opposite walls
- Stack Ventilation: Use vertical shafts, clerestory windows, or high vents to release warm air
- Window Types: Use operable windows like casement, louvered, or jalousie for better airflow
- Shading: Combine with shading devices to prevent unwanted heat gain

Traditional wind tower

Source: Unsplash

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Design for Daylighting

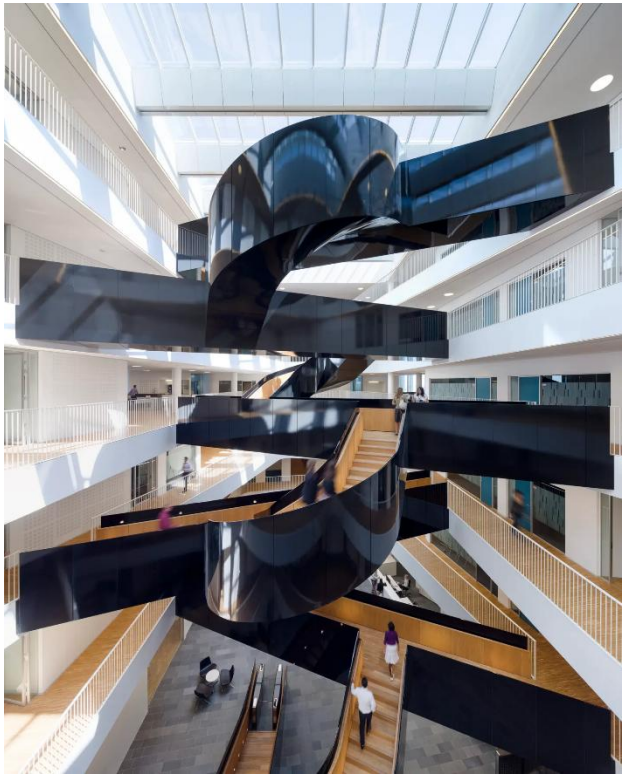
Daylighting is the controlled admission of natural light into a building to reduce electric lighting needs and save energy

External considerations:

- **Building Orientation**
- **Surrounding Structures**
- **Climate and Weather Patterns**
- **Urban and Environmental Context**

Internal considerations:

- **Building Function**
- **Space Layout**
- **Surface Reflectance**
- **Room Depth and Window Placement**



Source: UN City

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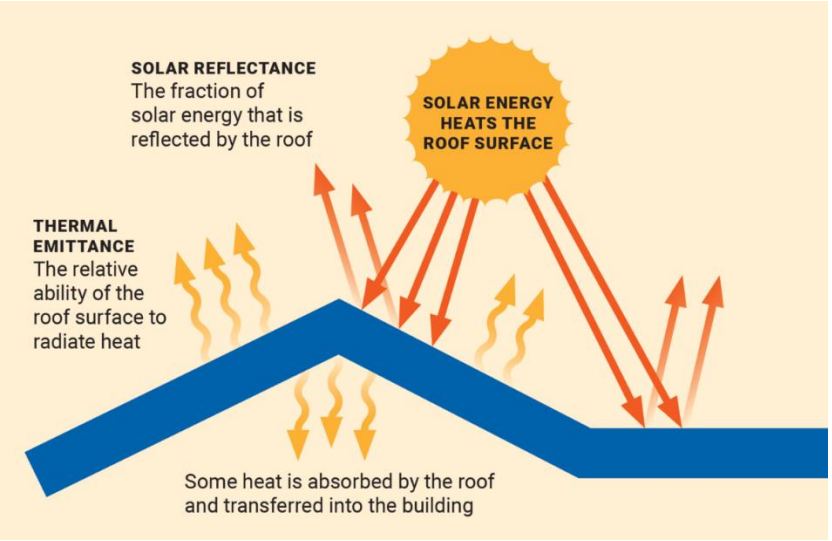
Cool Roofs



Source: Cool Roof Rating Council

Source: Heat Cure

Cool roofs reflect a significant fraction of incoming sunlight and keep the roof surface at a lower temperature than that of regular roofs.

- **Integration of nature-based solutions to support energy efficiency in buildings**

Efficient Lighting

Replace Existing Lamps with LEDs

- LED uses up to 75% less energy than incandescent bulbs.
- LEDs have 10–25 times longer lifespan, reducing maintenance and replacement costs.

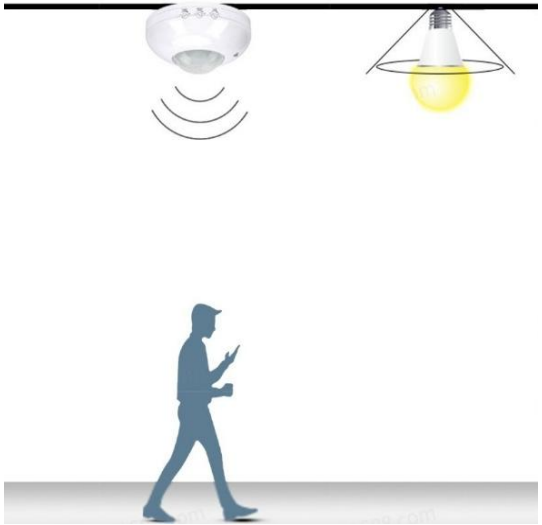
Use Occupancy & Daylight Sensors

- Occupancy sensors automatically turn lights on/off based on movement detection in a room or zone.
- Daylight sensors adjust artificial lighting based on the amount of natural daylight available.

Replace existing lamps with LEDs

Source: Unsplash

Use occupancy & daylight sensors



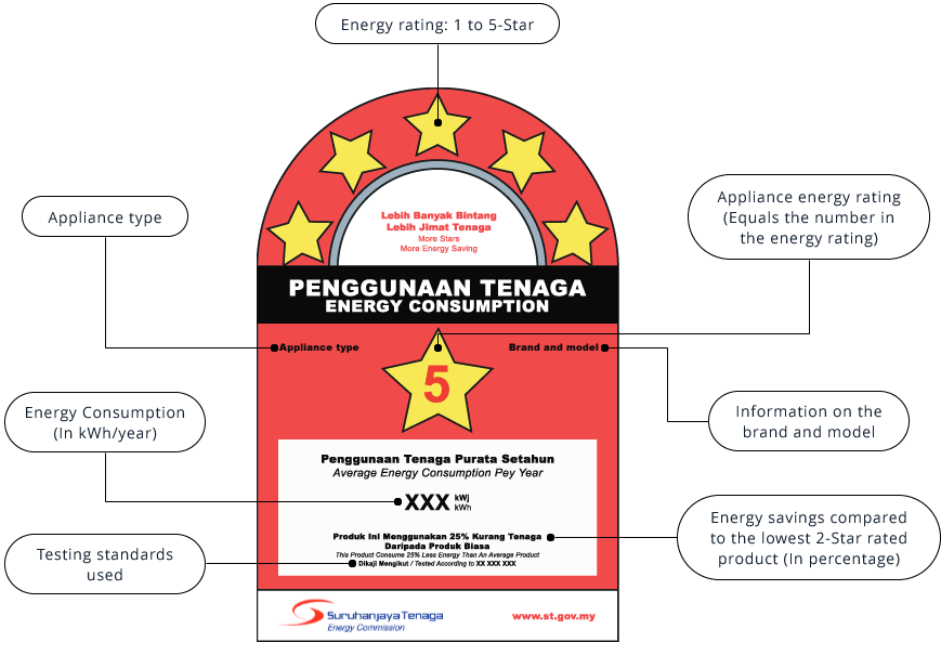
Efficient Equipment

Minimum Energy Performance Standards (MEPS)

- MEPS are regulations that set the minimum acceptable energy efficiency levels for appliances and equipment to reduce energy consumption.

Energy Efficiency Labels

- Efficiency labels provide consumers with information on energy consumption and efficiency rating of appliances.
- Each energy label on an appliance shows how much energy the model would consume under standardized conditions



Efficient Heating, Ventilation & Air Conditioning (HVAC) Systems

Integration of Renewables

Solar PV

Source: Unsplash

Solar Thermal

Source: Solar Power Authority

Building Integrated PV

Source: Inhabitat

Session 3: Application of EDGE Tool Across Africa

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