

Enhancing Energy Efficiency in East African Municipalities

MODULE 3

AGENDA

Objective: share insights on the importance energy efficiency (EE) in buildings, potential actions for commercial buildings, building envelope, as well as energy management and audits for buildings

#	Minutes	Title	Speaker
3.1	20 min	The status quo and energy efficiency potential actions for commercial buildings	Clara Camarasa
3.2	20 min	Energy Efficiency - Building Envelope	Clara Camarasa
3.3	20 min	Energy Management and Audit for buildings	Rahul Raju
3.4	10 min	Q&A Session	Clara Camarasa, Rahul Raju

Session 3.1. The status quo and energy efficiency potential actions for commercial buildings

Clara Camarasa, PhD

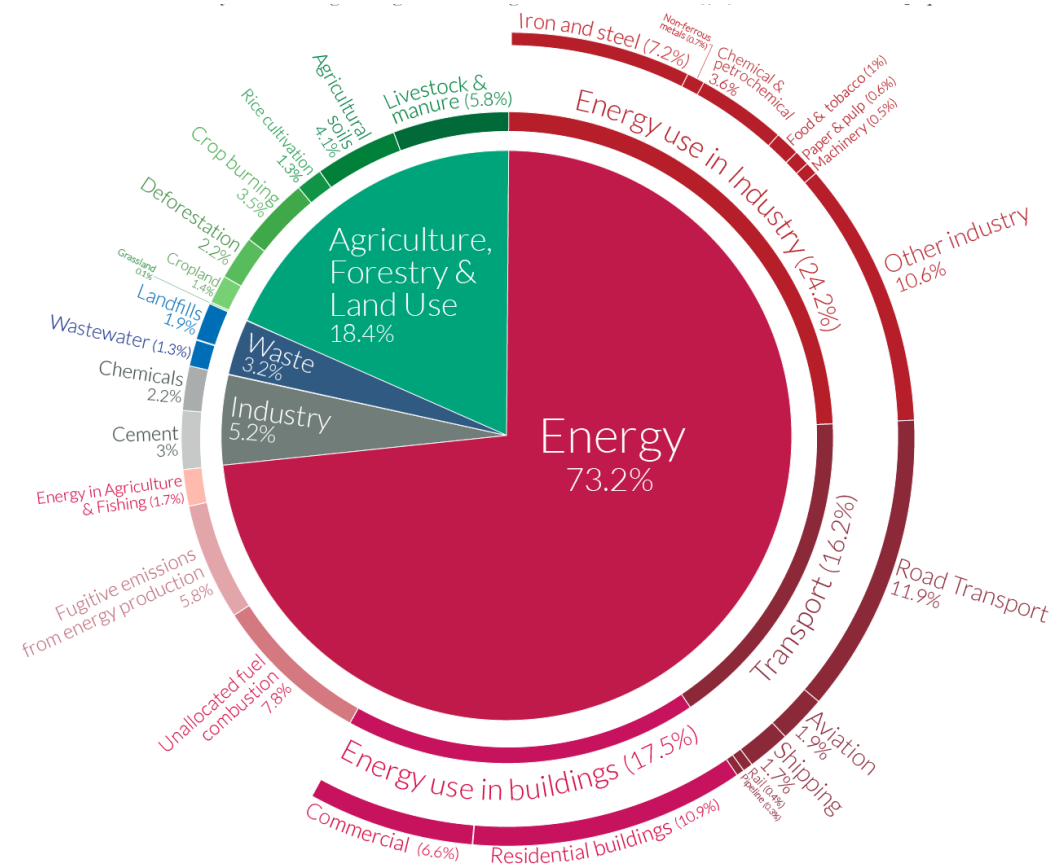
18 March 2021 | Copenhagen



**COPENHAGEN CENTRE
ON ENERGY EFFICIENCY**
SEforALL EE HUB

THE ROLE OF BUILDINGS IN GLOBAL GHG EMISSIONS

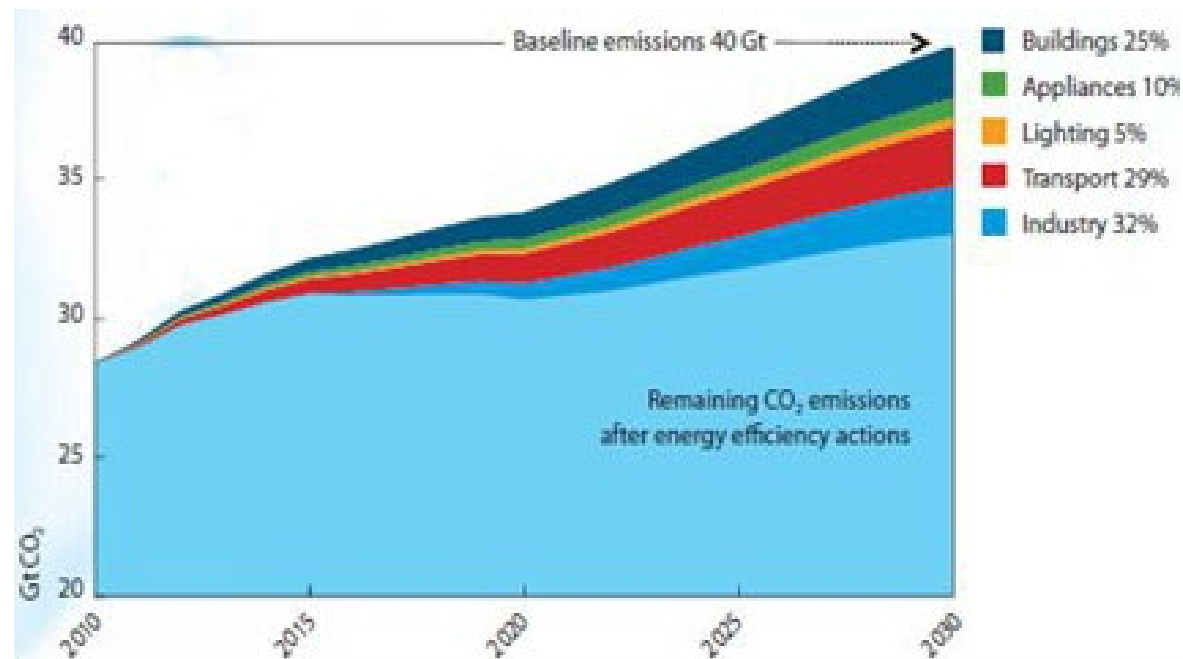
Global GHG emissions by Sector



Source: Climate Watch (WRI, 2020)

CO2 SAVING POTENTIAL FROM EE MEASURES

CO₂ savings potential from EE recommendations per sector



Source: Green growth and energy efficiency (OECD, 2019)

CHARACTERIZING COMMERCIAL BUILDINGS

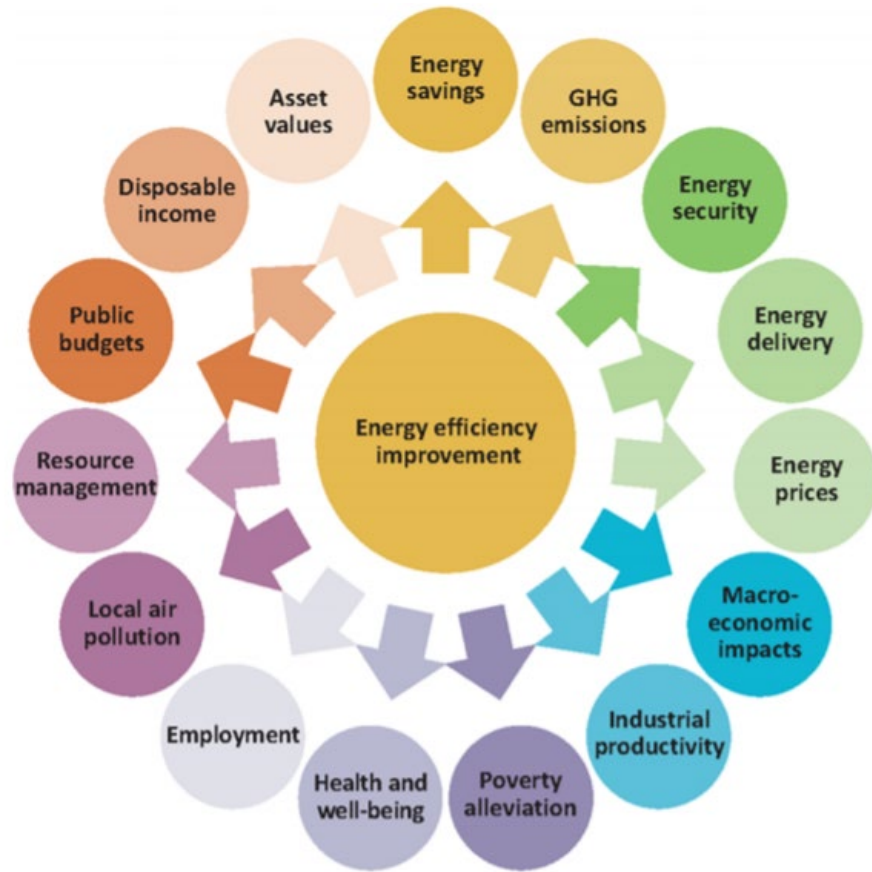
'...Commercial property serves a vast array of purposes supporting public and private sector business and services, such as government, service industries, education, healthcare, manufacturing, telecommunications and other civil infrastructure.

The exception is real estate related to agricultural or residential use.'

Source: Royal Institution of Chartered Surveyors (RICS)



MULTIPLE BENEFITS OF EE ACTIONS



Source: Capturing the Multiple Benefits of Energy Efficiency (IEA, 2015)

Benefits of EE of commercial buildings

- Reduce equipment operation and maintenance costs, extending their useful life
- Adapt equipment and facilities to current regulations
- Air pollution reduction
- Promote of the use of renewable energies
- Local job creation
- Asset value increase
- Indoor air quality
- Municipal buildings - Lead by example:
 - Promote awareness
 - Acquire experience & test the framework conditions

EE MEASURES COMMERCIAL BUILDINGS

Passive systems

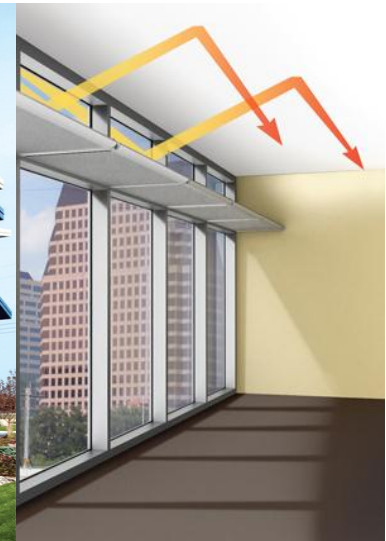
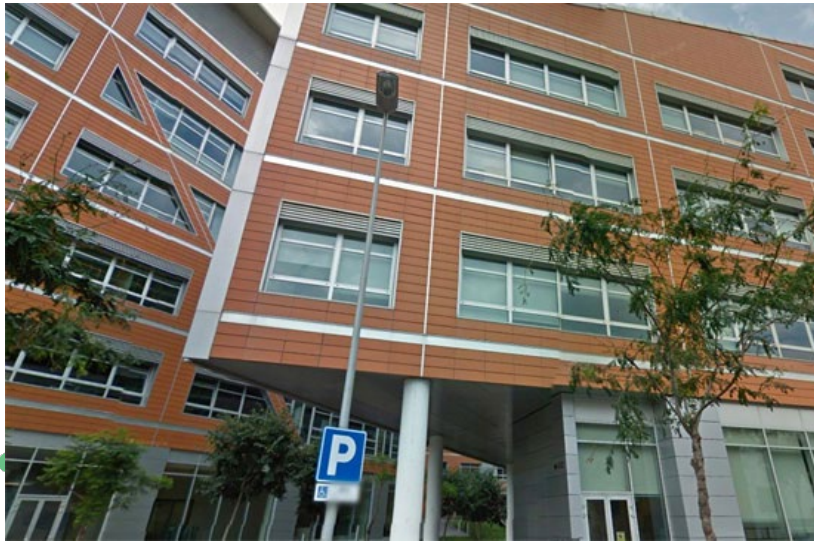
- Efficient skin
- Minimize/maximize solar heat gain
- Capitalize on daylight
- Natural airflows

Active systems

- Efficient lighting
- Efficient air conditioning, heating and ventilation installations (HVAC), appliances
- Active controls; energy management system

Generic improvements

- Good energy consumption practices among employees
- Proper maintenance of facilities
- Electricity bill



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EE MEASURES IN NEW AND EXISTING BUILDINGS



New construction
Picture: BuildUp EU



Existing building (deep retrofit), Before and After
Pictures: O'Riain, O'Connell

GENERIC MEASURES

Good energy consumption practices among building users

- ✓ Adapting the use schedule to capitalize daylight
- ✓ Turn off office equipment when it is not in use
- ✓ Energy management plan
- ✓ Closing of windows and doors

Proper maintenance of facilities

- ✓ Updated energy management system (EMS)
- ✓ Quantification of savings and investments
- ✓ Regular maintenance of the facilities

Electricity bill

- ✓ Optimization of the contracting of electrical supplies
- ✓ Use of computer tools for monitoring consumption
- ✓ Connecting to District Heating and Cooling Systems (if possible)

Your Electricity Bill **ecotricity**

Ms A Sample
155 Sample Street
Sample Town
XX XXX

Current Balance £127.23 CR

This is your electricity bill for the period from 9th July 2012 to 9th October 2012.

As you pay by a regular monthly amount, there is no need to pay this balance. However if you think you are paying too much or too little or that your bill is wrong, please take a meter reading and give us a call on 0845 555 7 200.

5 9th October 2012
Tariff: Green Electricity
Account number: 4123 4567
Bill number: 70000071231
Supply address
Ms A Sample
155 Sample Street
Sample Town
XX XXX

2 How we calculated your bill

Consumption	Price per unit	No. of units	Amount
Consumption	15.25p	1000	£152.50
Standing Charge			£33.00
Sub Total			£185.50
VAT at 5%			£9.27
Total cost of electricity in this period			£194.77

3 Your account summary

Payment Date	Description	Amount
	Previous balance	£ 88.00 CR
25.07.2012	Direct Debit Payment	£105.00 CR
25.08.2012	Direct Debit Payment	£105.00 CR
25.09.2012	Direct Debit Payment	£105.00 CR
	This bill	£194.77 CR
	Current Balance	£127.23 CR

4 Your meter reading

Meter ID	Previous	Current	Units used
MF0240000	40789 Customer	47470 Customer	661

6 Historical electricity usage

7 Total consumption for last 12 months: 3790 kWh

8 Predicted Cost for next 12 months: £1036 based on previous 12 months consumption at current rates.

9 Power Cut? Call: 0800 328 1111

Meter Point Number: 155 Sample Street, Sample Town, XX XXX

Source: <http://www.drivenfm.com.au/>



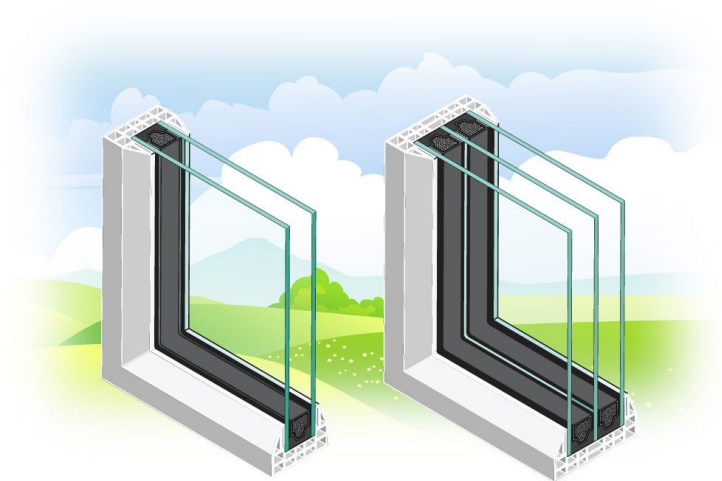
Source: <http://www.drivenfm.com.au/>

EE MEASURES PER BUILDING COMPONENTS

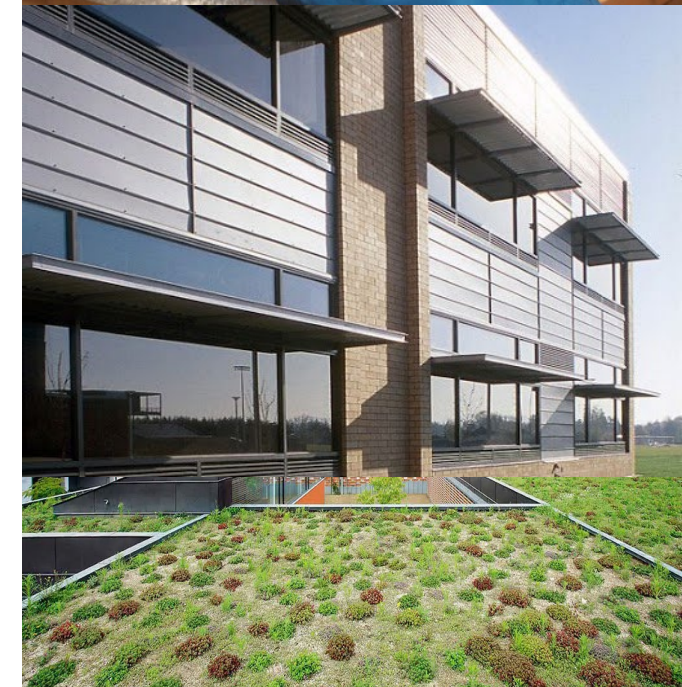
Building envelope

- ✓ Efficient skin:
 - ✓ Insulation
 - ✓ Window frames and glass
- ✓ Green roof and/or facade
- ✓ Parasols and/or canopies
- ✓ Capitalizing on daylight
- ✓ Solar shelves
- ✓ Reduction of infiltration through doors and windows
- ✓ Install air curtains on exterior doors
- ✓ ...

Further described in the next session



Architect: Agence Pierre Toure



EE MEASURES PER BUILDING COMPONENTS

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) SYSTEMS

- ✓ Install thermostatic valves in radiators
- ✓ Regulation of the air conditioning temperature
- ✓ Boiler replacement by a more efficient one
- ✓ Insulation of the air conditioning distribution circuit
- ✓ Boiler maintenance
- ✓ Covering exterior chiller and heat pump condensers
- ✓ Install geothermal energy for air conditioning
- ✓ Radiant systems (floor/ceiling)
- ✓ Circuit heat recovery systems
- ✓ Install solar thermal panels
- ✓ District Heating and Cooling Systems

<http://www.asiagreenbuildings.com/6350/energy-efficient-hvac-systems/>



Further described in the upcoming session “EE – HVAC systems - Part 1 and Part 2

EE MEASURES PER BUILDING COMPONENTS

Lighting

- ✓ Install presence detectors in areas of sporadic use
- ✓ Use of natural light by means of light sensors
- ✓ Lighting zoning
- ✓ Lighting with LED lamps
- ✓ Replacement of mercury/sodium vapour lamps in outdoor lighting with LEDs
- ✓ ...

*Further described in upcoming session
"EE – Lighting systems"*

Equipment / appliances

- ✓ Use of multiple strips with programmable switch or plug
- ✓ Variable speed drives in motors
- ✓ High efficiency engines
- ✓ More efficient elevators
- ✓ More efficient electrical appliances
- ✓ ...



Source: EnergyStar

THE BUILDING AS A UNIQUE LONG-LASTING SYSTEM



Key Ideas

- 1. Buildings as a system:** Buildings and their components work as a system, like the human body
- 2. Case-sensitive:** There is no right set of EE measures to be implemented, the optimal measures will depend on the local weather conditions, the use of the building as well as construction practices
- 3. Long Lifetime:** Buildings have long lifetime. Thus, (1) implement EE in a timely manner and (2) avoid “lock in” effects



LETS RECAP – KEY IDEAS

- ✓ Energy efficiency actions can considerably reduce energy costs through the increase of energy savings
- ✓ Beyond the energy savings, EE in commercial buildings can be a means to support the local economic and social development while attaining environmental goals
- ✓ Multiple options available that can help with energy cost savings; from LED lighting to low-cost energy efficiency strategies such as utilizing natural light. These can be broadly classified into generic, passive and active EE measures.
- ✓ EE measures can be cost-effective with short payback times
- ✓ To implement EE measures on the Building envelope:
 - ✓ All building elements of the system need to be taken into consideration – building as a system
 - ✓ There is no one recipe that can suit all buildings – weather conditions, use of the building, available resources (incl. budget) affect its selection



Thank you for your attention

<https://c2e2.unepdtu.org/>

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