



COPENHAGEN CENTRE  
ON ENERGY EFFICIENCY  
SEforALL EE HUB



ELECTRICIDADE  
DE MOÇAMBIQUE, E.P.

# The *status quo* and EE potential actions for existing commercial buildings

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Copenhagen Centre on Energy Efficiency (C2E2)

19 November 2020 | Copenhagen

# AGENDA

**Objective:** share insights on the importance energy efficiency (EE) potential actions for existing commercial buildings

#	Minutes	Title	Speaker
1	20 min	<i>Status quo</i> and energy efficiency (EE) potential actions for existing public service and commercial buildings	Clara Camarasa
2	10 min	Q&A Session	Clara Camarasa

Block #1

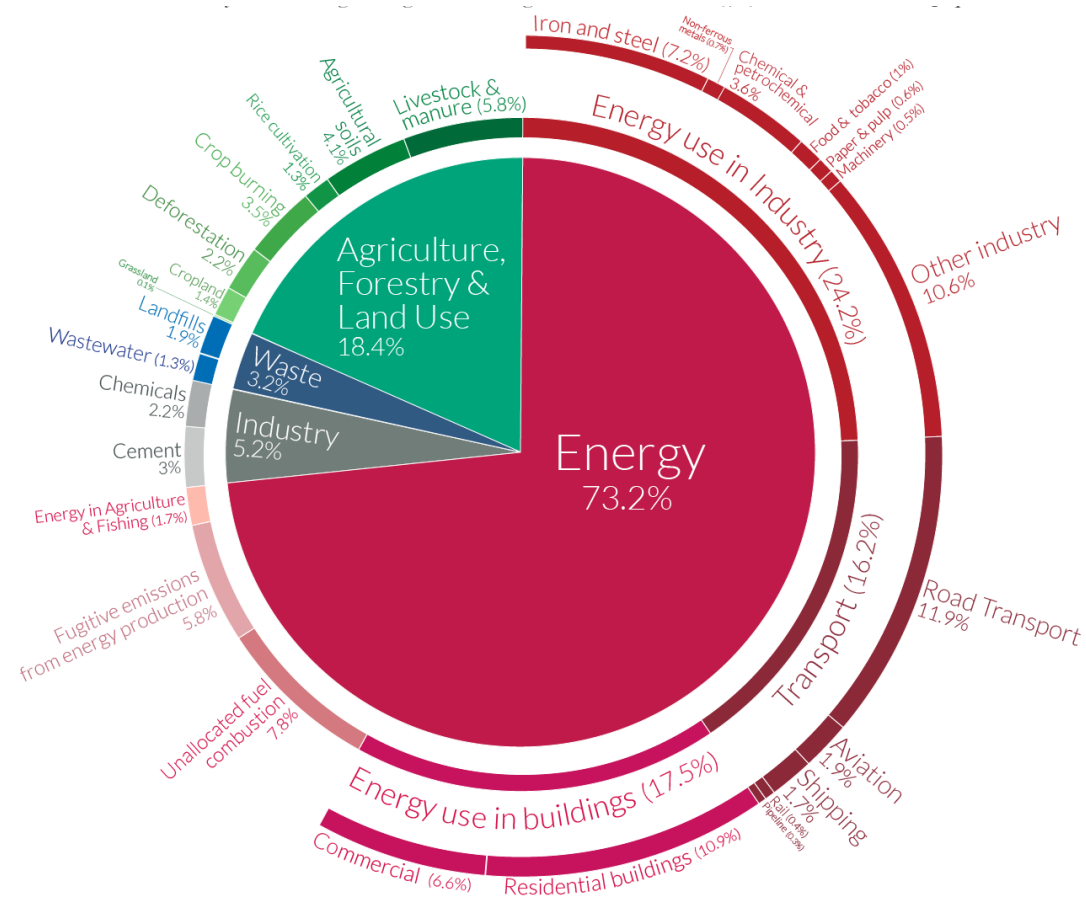
# *Status quo* and EE potential actions for existing commercial buildings

**Clara Camarasa, C2E2**

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# THE ROLE OF BUILDINGS IN GLOBAL GHG EMISSIONS

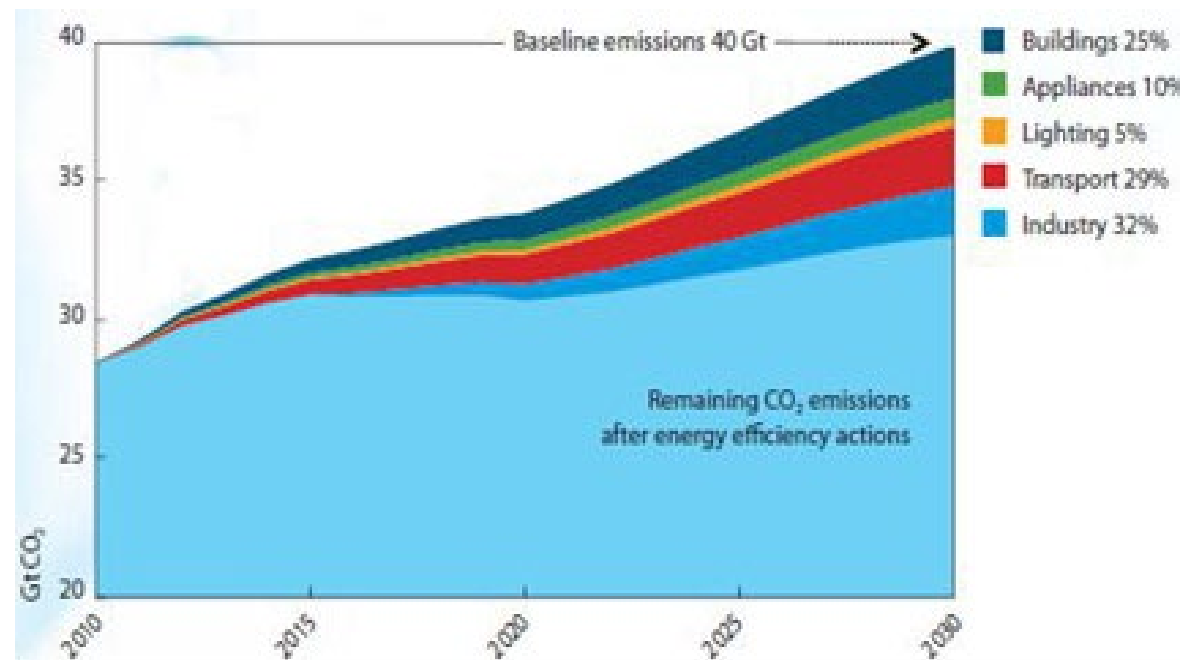
## Global GHG emissions by Sector



Source: Climate Watch (WRI, 2020)

# CO2 SAVING POTENTIAL FROM EE MEASURES

## CO<sub>2</sub> savings potential from EE recommendations per sector



**Source:** Green growth and energy efficiency (IEA, 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



## 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

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



# EE MEASURES IN NEW AND EXISTING BUILDINGS



**New construction**  
Picture: BuildUp EU



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

# EE MEASURES IN EXISTING BUILDINGS

## Generic improvements

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

## Passive systems

- Efficient skin
- Minimize 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

### Key Idea

#### Buildings as a system

- Buildings and their components work as a system, especially in terms of energy consumption
- A single element (e.g. windows) should not be approached without taking the rest of the building's elements into account  
Through the energy audit







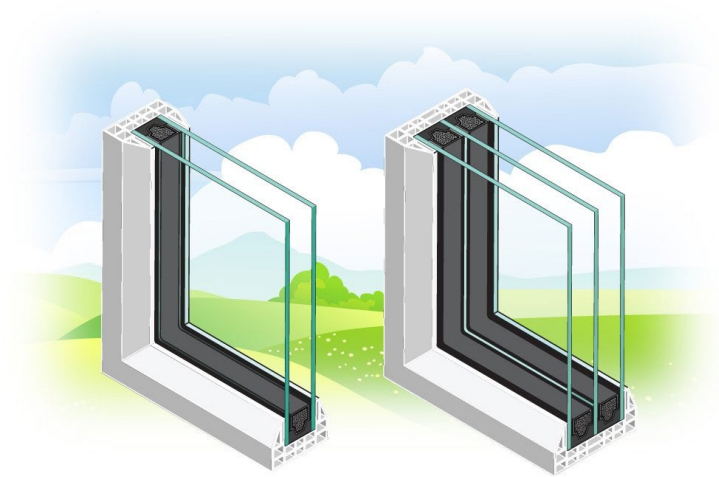
# EE MEASURES PER BUILDING COMPONENTS

## Building envelope

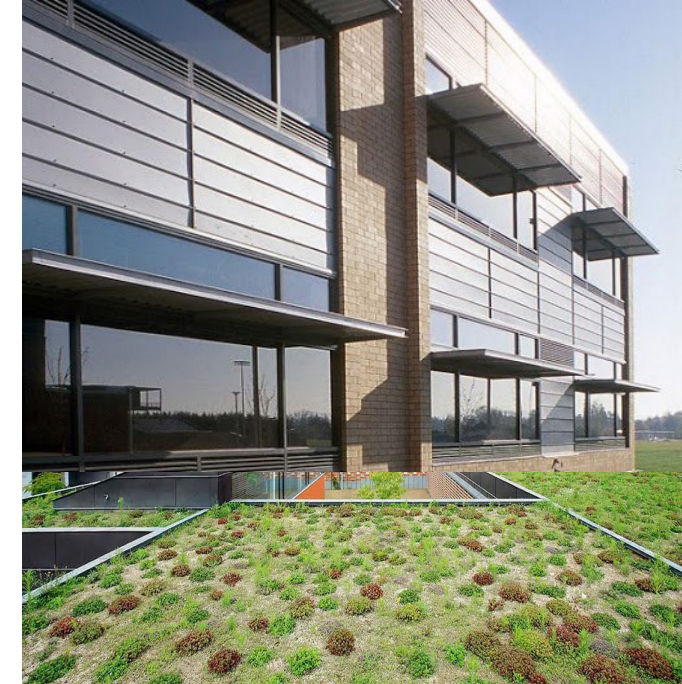
- ✓ Efficient skin:
  - ✓ Include/improve insulation
  - ✓ Replacement of window frames and glass
- ✓ Green roof and/or facade
- ✓ Parasols and/or canopies
- ✓ Capitalizing on daylight
- ✓ Solar shelves
- ✓ Reduction of infiltration through doors and windows
- ✓ Install air curtains on exterior doors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

*Further described in*

*session 2.2: EE - Building Envelope*



Architect: Agence Pierre Tourre



# 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
- ✓ Install biomass boiler
- ✓ Insulation of the air conditioning distribution circuit
- ✓ Replacement of diesel and fuel oil with natural gas
- ✓ Boiler maintenance
- ✓ Replacement electric radiators or air heaters with heat pumps
- ✓ Covering exterior chiller and heat pump condensers
- ✓ Install geothermal energy for air conditioning
- ✓ Radiant systems (floor/ceiling cooling)
- ✓ Circuit heat recovery systems
- ✓ Install solar thermal panels
- ✓ District Heating and Cooling Systems
- ✓ Install "pearlizers" on taps
- ✓ ...

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

*Further described in session 2.5 and 2.6:  
EE – HVAC systems - Part 1 and Part 2*





# EE MEASURES PER BUILDING COMPONENTS

## Lighting

- ✓ Replacement of electromagnetic ballasts by electronic ballasts in luminaires
- ✓ 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 session 2.4: EE – Lighting systems*

## Equipment / appliances

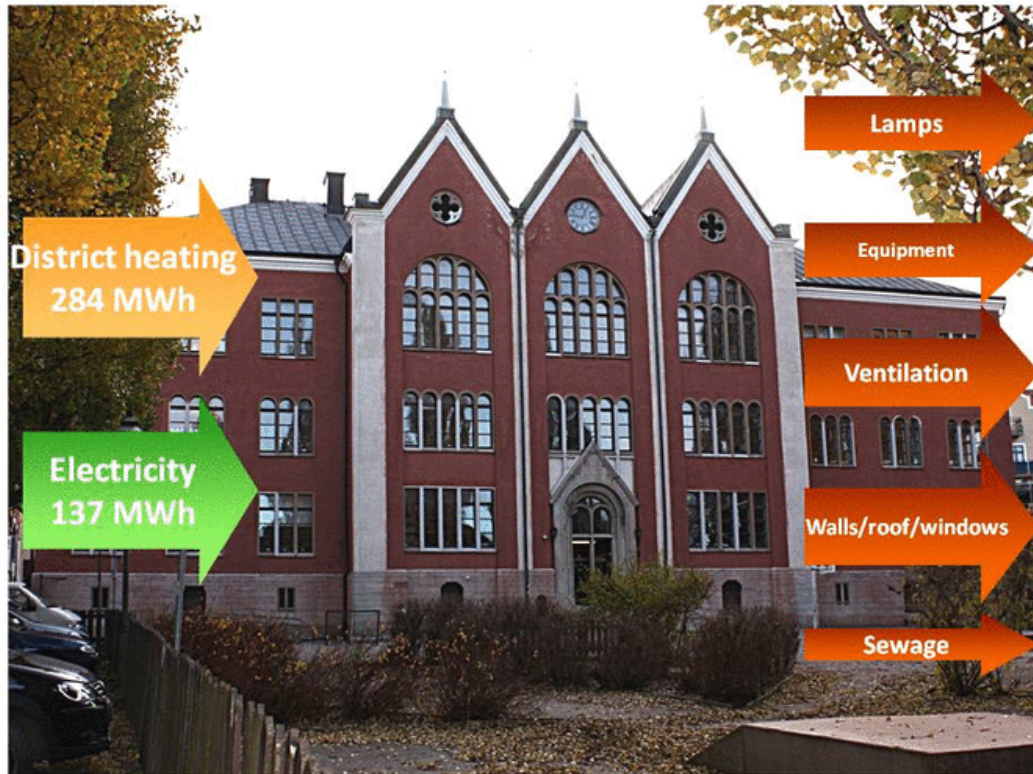
- ✓ Use of multiple strips with programmable switch or plug
- ✓ Variable speed drives in motors
- ✓ High efficiency engines
- ✓ More efficient elevators
- ✓ More efficient electrical appliances
- ✓ ...



Source: EnergyStar

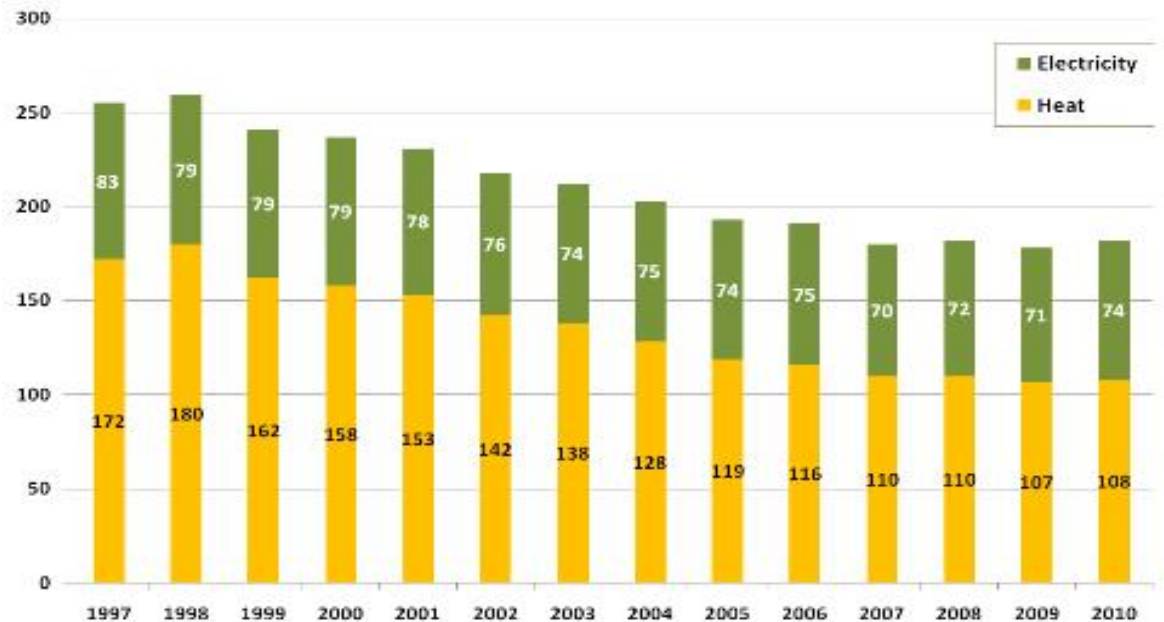
# CASE STUDY #1: Municipal buildings in Gotland (Sweden)

## Analysis



In year 1997 the annual energy use in the municipality of Gotland's buildings was 172 kWh/m<sup>2</sup> heat and 83 kWh/m<sup>2</sup> electricity.

Until year 2010 the energy use has decreased to 108 kWh/m<sup>2</sup> heat and 74 kWh electricity/ m<sup>2</sup>.



Source: [www.gotland.se/59078](http://www.gotland.se/59078)



# CASE STUDY #2:

## Energy efficiency in Public Administration building in Catalonia, Spain



### Source:

[http://circuitor.es/docs/CE\\_ICAEN\\_EN.pdf](http://circuitor.es/docs/CE_ICAEN_EN.pdf) (left)

<https://www.eseficiencia.es/2015/12/02/ahorro-energetico-en-un-edificio-de-la-administracion-publica> (right)

### Public administration buildings

#### PROJECT

Improve energy efficiency in a public administration building

#### SECTOR

Public administration

#### CLIENTE

Catalan Energy Institute (ICAEN)

#### Information of interest

Energy ratio

#### Most significant results

##### SAVINGS

€34 552 a year  
(22.5% of the electricity bill)



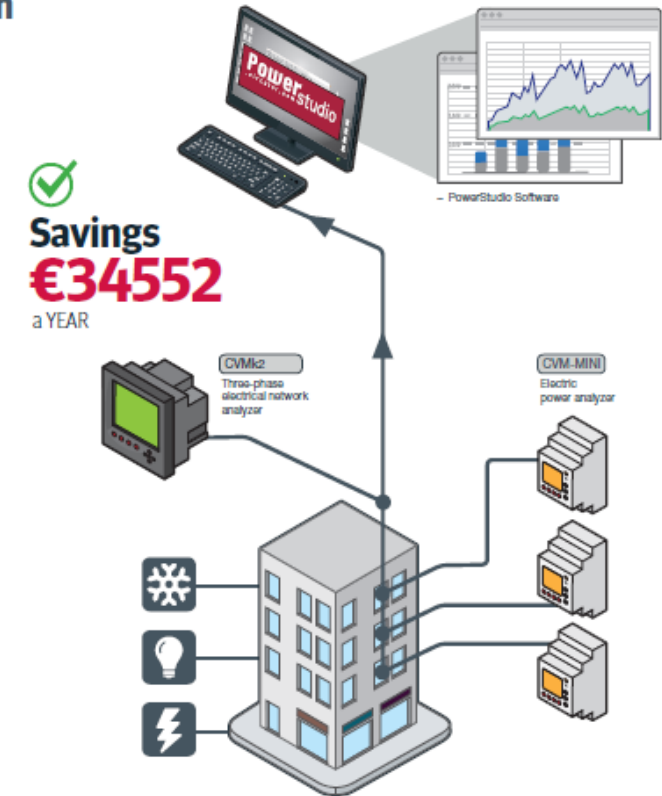
##### INVESTMENT

€17 936



##### PAYBACK PERIOD

6.2 months



#### Thanks

We would like to thank ICAEN and the Department of Business and Employment of the Government of Catalonia for their collaboration.

"The integrated measurement and control system saved €34,552 on the electricity bill during the first year and ensured better energy monitoring and a more environmentally sustainable building."

# RECAP

- ✓ 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
- ✓ Many 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 classified into generic, passive and active measures.
- ✓ Buildings work as a system. Thus, the concrete set of EE measures should be identified based on a thorough audit of the concrete energy performance and needs of each building
- ✓ EE measures can be cost-effective with very short payback times



**Thank you for your attention**

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Block #2

# Q&A Session

**Clara Camarasa, C2E2**

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