

# 1. Energy use and potential in urban systems

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## **1. Energy use and potential in urban systems**

Trainer(s): John Dulac

**Scenario:** Your mayor/governor is under pressure to reduce energy consumption

**Question:** How do you help the mayor/governor understand the drivers of energy consumption in the city?

## **Training Overview**

1. Activity: mapping of urban authority influence

### 2. Why is urban energy use important?

- Urbanisation and energy use
- Impacts of energy use in urban areas

## 3. What's the potential for energy efficiency in urban systems?

Technologies and solutions that allow higher efficiency

30 mins

15 mins

15 mins





# 1. Activity: Mapping of urban authority influence



### Break into groups of 6

**Scenario:** Your municipal commissioner is under pressure to reduce energy consumption

**Question:** How do you help the commissioner understand the drivers of energy consumption in the municipality?

What level of influence do you have on the energy consuming aspects of your municipality?

What level of influence do you have on the energy consuming aspects of



6





## Urban areas account for the greatest shares of both **global population** and world **economic activity**, two **key drivers of energy use**.

As such, the world's urban areas have substantial influence over **global energy** demand and energy-related emissions





Tools

What are the steps?

### Urban areas are growing, especially in emerging economies

Projected percentage of global urban population 1950-2050

## Percentage of urban dwellers per region, 2018







Role of urban authorities: A few of the main responsibilities of

cities/municipalities are...

Where to start?

## Planning

- Urban planning
- Building regulations
- Infrastructure

## Basic Necessities

- Water supply
- Public health
- Sanitation

Other Services

- Street lighting
- Social housing
- Parking, public transport



#### Where to start?

Tool

What are the steps?

... and they involve energy consuming sectors below in one way or another



Buildings

Public administration buildings, schools, hospitals, libraries, museums, social housing



Transport

Public transport, street design, traffic signals and signage



Utilities

Lighting, water local energy networks



Waste

Landfilling, waste management

Where to start?



## What happens in urban areas: Majority of global energy use and greenhouse emissions comes from cities



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Source Energy Technology Perspectives 2016

## 2. Why is urban energy use important? Impacts



Where to start?

Tools

What are the steps?

What happens in urban areas: Urban structures produce heat island effect, which exacerbates need for cooling



## 2. Why is urban energy use important? Impacts

Where to start?



What happens in urban areas: Local air quality is also worse in urban areas, exceeding WHO guidelines of 20 µg/m3, due to externalities of energy use





## What drives energy use in urban areas?





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#### Source IEA ETP 2016

Source IEA ETP 2016

## 2. Why is urban energy use important? Opportunity



## Where to start? Tools What are the steps? Fortunately, the majority of opportunities to reduce energy use and emissions are also in urban areas 50





## 2. What is the potential? Concept of energy efficiency potential



• **Technical potential:** analysing the total energy efficiency potential without any economic or market constraints (e.g. analysing the energy savings potential if all buildings used best-available technology)

- Economic potential: analysing the energy efficiency potential assuming economic constraints for cost effectiveness (e.g. analysing the energy savings potential if buildings used the most-efficient, cost-effective technology)
- Market potential: analysing the energy efficiency potential assuming market constraints in implementing energy efficiency (e.g. analysing the energy savings potential using an adoption curve to estimate typical market implementation given the available policies and technologies)

Where to start?



Where to start?

Tools

What are the steps?

## URBAN PLANNING and TRANSPORT: Potential of obtaining lower emissions and energy use based on planning design, influencing transport

Carbon footprints (residential emissions) in different neighbourhoods in Toronto, Canada



East York - 1.31 tCO2e/cap (residential only)



Etobicoke - 6.62 tCO2e/cap (residential only)

High-density apartment complexes within walking distance to a shopping center and public transit:

1,31 tCO2e/capita

High-density single family homes close to the city center and accessible by public transit:

6,62 tCO2e/capita



Whitby 13.02 tCO2e/cap (residential only)

Suburbs with large, lowdensity single family homes that are distant from commercial activity and public transit:

13,02 tCO2e/capita





### Improving land use and transport could reduce 50% of global CO<sub>2</sub> emissions. In Southeast Asia, reduction could be between 58% to 93%





1 - 5 HP

- 20 HP

21 - 50 HP

- 100 HP

101 - 200 HP

#### Savings based on the sizes of the motors and hours of operation could go up to 1500 GWhr/yr

201 - 500 HP

- 1000 HP

1000+ HP



Where to start?

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What are the steps?

• **LIGHTING:** Potential to save on street lighting by 2020 using the current generation LED lamps in replacing the existing lamp technologies (India)





• WASTE: Efficient waste management leading to waste-to energy technologies like incineration and gasification can recover between 4 to 10TWhr (Bangkok)



Where to start?





50000 45 40 Energy savings (MWh) 40000 35 savings 30 30000 25 Φ Percentag 20 20000 15 10 0000 5 0 0 Retail mall Private office Hospital Government Institute Others Hotel Office

5-YEAR ENERGY SAVINGS POTENTIAL DUE TO ECBC (JAIPUR)

Actual savings in 5 years (MWh)
Percentage savings

Where to start?







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