



LECTURE 8

RENOVATION PROGRAMMES FOR EXISTING BUILDINGS: CASE STUDIES

OVERALL AIM:

Gaining knowledge on solutions to overcome barriers for the regeneration and the retrofit of existing buildings



Erasmus+

Why cities

Cities are home to more than half of the world's population.

The population in cities is expected to grow to 70% of the world population in 2050

They consume more than 2/3 of global energy and produce about 70% of greenhouse gas emissions.

Cities are also drivers of economic growth.

By becoming more energy efficient they can help mitigate the effects of climate change and contribute to the achievement of the Sustainable Development Goals – especially SDG7, which aims to ensure access to affordable, reliable, sustainable and modern energy for all.



Why cities

TED TALKS “Seven principles for building better cities”

Peter Calthorpe

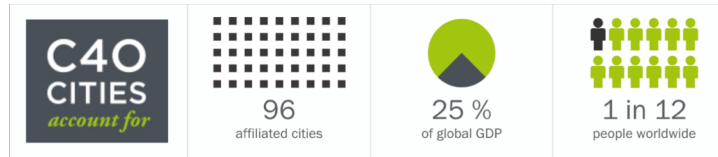
<https://youtu.be/IFjD3NMv6Kw>



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C40 networks



Source: <https://www.c40.org/cities>



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Case studies: European cities



Barcelona



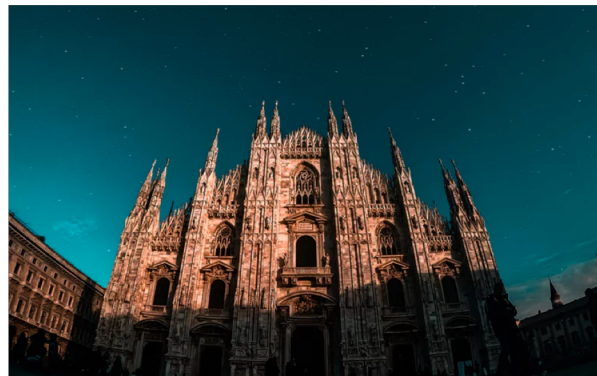
Copenhagen



Stockholm



Warsaw



Milan



Amsterdam



Barcelona

CITY DETAILS

Population	1.62 million
Land Area (km ²)	101.9
Gross Domestic Product (in USD billions)	171
Average Walk Score ⁵	98/100
Annual Rainfall (mm/year)	640
Climate Action Plan	Yes

BUILDING PERFORMANCE EMISSIONS

City-wide Emissions (metric tons CO ₂ e) ⁶	3,783,980
% of Emissions from the Building Sector	--
Municipal Emissions (metric tons CO ₂ e)	--

CITY-LEVEL POLICIES PRESENT

Green Building Codes	✓
Energy Benchmarking and Data Transparency	✗
Green Municipal Buildings	✓
New/Existing Commercial Building Incentives	✗
New/Existing Residential Building Incentives	✓
Green Schools	✓
Neighborhood-Scale Sustainability	✓

Source: C40 (2015)



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Barcelona

PRIVATE SECTOR INCENTIVES

The Housing Consortium of Barcelona awards monetary aid in order to promote weatherization retrofits in the residential sector.

Aid is available to homeowners seeking to improve their property's insulation, upgrade HVAC equipment, or install renewable energy technology – such as solar photovoltaic systems.

In order to qualify for monetary aid, work must not yet have started on the project in question, 70% of the building must be designed for residential purposes, and the minimum cost of proposed work should be cost 2,000 EUR at minimum



Barcelona

GREEN CODES

Barcelona is the first city in Europe to adopt a solar thermal ordinance requiring **solar energy** to be used to supply 60% of running hot water in all newly constructed buildings, renovated buildings, or buildings changing their use type.

The ordinance applies to health facilities, residential properties, commercial developments, industrial plants, and sports complexes.

Compliance is overseen by the Barcelona Energy Agency.

The ordinance has resulted in over 25,000 MWh per year of energy savings



Copenhagen

CITY DETAILS

Population	570,000
Land Area (km ²)	86.2
Gross Domestic Product (in USD billions)	116.5
Average Walk Score ⁶	100/100
Annual Rainfall (mm/year)	612
Climate Action Plan	Yes

BUILDING PERFORMANCE EMISSIONS

City-wide Emissions (metric tons CO ₂ e) ⁷	2,120,000
% of Emissions from the Building Sector	--
Municipal Emissions (metric tons CO ₂ e)	--

CITY-LEVEL POLICIES PRESENT

Green Building Codes	✓
Energy Benchmarking and Data Transparency	✓
Green Municipal Buildings	✓
New/Existing Commercial Building Incentives	✗
New/Existing Residential Building Incentives	✓
Green Schools	✓
Neighborhood-Scale Sustainability	✓

Source: C40 (2015)



Copenhagen

CLIMATE ADAPTATION PLAN

In 2013, the city of Copenhagen received an INDEX: Award in the community category for its Climate Adaptation Plan. The plan includes strategies and initiatives aimed at making the Danish capital carbon neutral by 2025.

It targets the following strategies in buildings as way to help the city achieve its 2025 goal:

- Increasing the use of passive cooling in buildings
- Protecting existing buildings from flooding
- Increasing building insulation
- Incorporating green aspects in private and public buildings
- Establishing storm water management practices



Copenhagen

GREEN CODES

The Danish Building Code includes energy performance guidelines for dwellings, offices, and schools - including those classified as low energy performance buildings.

The building code includes a stipulation that buildings must be planned, designed, built, and fit-out to ensure satisfactory conditions for users. This includes prohibiting the use of building materials that emit gases, vapours, particles, or ionizing radiation that can result in an unhealthy indoor environment



Stockholm

CITY DETAILS

Population	905,200
Land Area (km ²)	188
Gross Domestic Product (in USD billions)	133.6
Average Walk Score ³	98/100
Annual Rainfall (mm/year)	539
Climate Action Plan	Yes

BUILDING PERFORMANCE EMISSIONS

City-wide Emissions (metric tons CO ₂ e) ⁴	2,742,000
% of Emissions from the Building Sector	41%
Municipal Emissions (metric tons CO ₂ e)	--

CITY-LEVEL POLICIES PRESENT

Green Building Codes	✓
Energy Benchmarking and Data Transparency	✗
Green Municipal Buildings	✓
New/Existing Commercial Building Incentives	✓
New/Existing Residential Building Incentives	✓
Green Schools	✓
Neighborhood-Scale Sustainability	✓

Source: C40 (2015)



Stockholm

SUSTAINABLE BUILDINGS

In 2022, the population of Stockholm will reach one million people. Due to its strong population growth, the city of Stockholm needs to plan for 140,000 additional housing units, along with the accompanying services, infrastructure, and work places

Densification and urban transformation are being prioritized as the city seeks to meet the needs of dynamic urban environments while preserving the city's legendary beauty and character



Warsaw

CITY DETAILS

Population	1.72 million
Land Area (km ²)	517
Gross Domestic Product (in USD billions)	74.3
Average Walk Score ⁴	100/100
Annual Rainfall (mm/year)	719
Climate Action Plan	No

BUILDING PERFORMANCE EMISSIONS

City-wide Emissions (metric tons CO ₂ e) ⁵	13,300,000
% of Emissions from the Building Sector	--
Municipal Emissions (metric tons CO ₂ e)	--

CITY-LEVEL POLICIES PRESENT

Green Building Codes	✓
Energy Benchmarking and Data Transparency	✗
Green Municipal Buildings	✗
New/Existing Commercial Building Incentives	✗
New/Existing Residential Building Incentives	✓
Green Schools	✓
Neighborhood-Scale Sustainability	✓

Source: C40 (2015)



Warsaw

BUILDING RETROFIT AND SUSTAINABLE MOBILITY

To meet its greenhouse gas emissions reductions goal, the city of Warsaw will spend 230 million EUR retrofitting public buildings.

The plan includes updating outdoor lighting systems throughout the city to newer more energy-efficient systems, as well as modernizing the mass transit system with energy-efficient metro trains, modern buses (including hybrids), new rapid-city trains, and new trams capable of recovering brake energy



Milan

CITY DETAILS

Population	1.35 million
Land Area (km ²)	182
Gross Domestic Product (in USD billions)	--
Average Walk Score ³	98/100
Annual Rainfall (mm/year)	920
Climate Action Plan	In progress

BUILDING PERFORMANCE EMISSIONS

City-wide Emissions (metric tons CO ₂ e) ⁴	6,300,000
% of Emissions from the Building Sector	40%
Municipal Emissions (metric tons CO ₂ e)	129,000

CITY-LEVEL POLICIES PRESENT

Green Building Codes	✓
Energy Benchmarking and Data Transparency	✗
Green Municipal Buildings	✓
New/Existing Commercial Building Incentives	✓
New/Existing Residential Building Incentives	✓
Green Schools	✓
Neighborhood-Scale Sustainability	✓

Source: C40 (2015)



Milan

BUILDING RETROFIT

Under the Sustainable Energy Action Plan (SEAP), retrofitting of existing buildings and increasing energy efficiency in new buildings represent fundamental intervention strategies

The plan targets buildings in both the private and public sectors

To reach this goal, strategies including HVAC systems renovation, thermal insulation, windows substitution, and solar photovoltaic panels installation will be implemented

Capacity building programs also take place across the municipal sector to encourage city employees to alter their behaviours in order to use energy more efficiently



Milan

GREEN CODES

Milan's updated building code, approved by the City Council in October 2014, sets minimum energy performance and sustainability criteria stricter than limits set by current national and regional legislation. Incentives are offered in the form of increased gross floor area for buildings satisfying more restrictive requirements



Amsterdam

CITY DETAILS

Population	810,909
Land Area (km ²)	219
Gross Domestic Product (in USD billions)	322.3
Average Walk Score ⁴	98/100
Annual Rainfall (mm/year)	838.2
838Climate Action Plan	Yes

BUILDING PERFORMANCE EMISSIONS

City-wide Emissions (metric tons CO ₂ e) ⁵	5,090,000
% of Emissions from the Building Sector	--
Municipal Emissions (metric tons CO ₂ e)	--

CITY-LEVEL POLICIES PRESENT

Green Building Codes	✓
Energy Benchmarking and Data Transparency	✓
Green Municipal Buildings	✓
New/Existing Commercial Building Incentives	✓
New/Existing Residential Building Incentives	✓
Green Schools	✓
Neighborhood-Scale Sustainability	✓

Source: C40 (2015)



Amsterdam

PRIVATE SECTOR INCENTIVES

Amsterdam property owners can apply for a subsidy of 50 EUR per square meter of green roof installed on their property, up to a maximum of 50% of the total installation costs or 20,000 EUR



Amsterdam

GREEN RESIDENTIAL BUILDINGS

Through the Amsterdam Smart City initiative, more than five hundred homes in Amsterdam have been outfitted with smart meters that will enable residents to become more aware of their energy use

The project includes informational sessions, as well as prizes that are awarded to residents for sharing useful ideas on how to better save energy



Further readings

- C40 (2015) GREEN BUILDING CITY MARKET BRIEFS





**Project "SURE - Sustainable Urban Rehabilitation in Europe"
implemented in frames of Erasmus+ Programme
Key Action 2: Strategic Partnership Projects
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