

Circular Economy Buildings and Smart Energy Districts

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Session 2

International urban cooperation

Green Deal: Circular Economy and Energy Transition

October 13, 2020



CITERA

Interdepartmental Research Centre for
Land Science, Constructions, Restoration and Environmental Studies



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CENTRO DI RICERCA
INTERDIPARTIMENTALE TERRITORIO
EDILIZIA RESTAURO AMBIENTE CITERA

Multidisciplinary competences

Including 6 DEPARTMENTS of the Engineering, Architecture and Medicine Faculties:

- DIAE Dept. Energy Electric and Astronautics Engineering
- DPTDA Dept. Planning Design and Technology of Architecture
- DISG Dept. Structural and Geotechnical Engineering
- SANITA' Dept. of Public Health and Infectious Diseases
- DSRDA Dept. of History Representation and Restoration of Architecture
- DIAP Dept. of Architecture and Design

FREE is a National Network of 3000 enterprises and industries dealing with
energy efficiency and renewables



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3 Key Topics

**Smart
Energy
Districts**

**Urban
Agriculture
and Collective
Gardens**

**Circular
Economy of
Buildings**



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6 Key Projects

Smart
Energy
Districts



EIP-SCC

European Innovation Partnership
on Smart Cities and Communities

Urban
Agriculture
and Collective
Gardens



**HORTUS
ROMANI**



Circular
Economy of
Buildings



Smart Med

PLATOON



CONDEREFF

Interreg Europe



CINDERELA



**REGIONE
LAZIO**



**18th EUROPEAN WEEK of
REGIONS and CITIES**

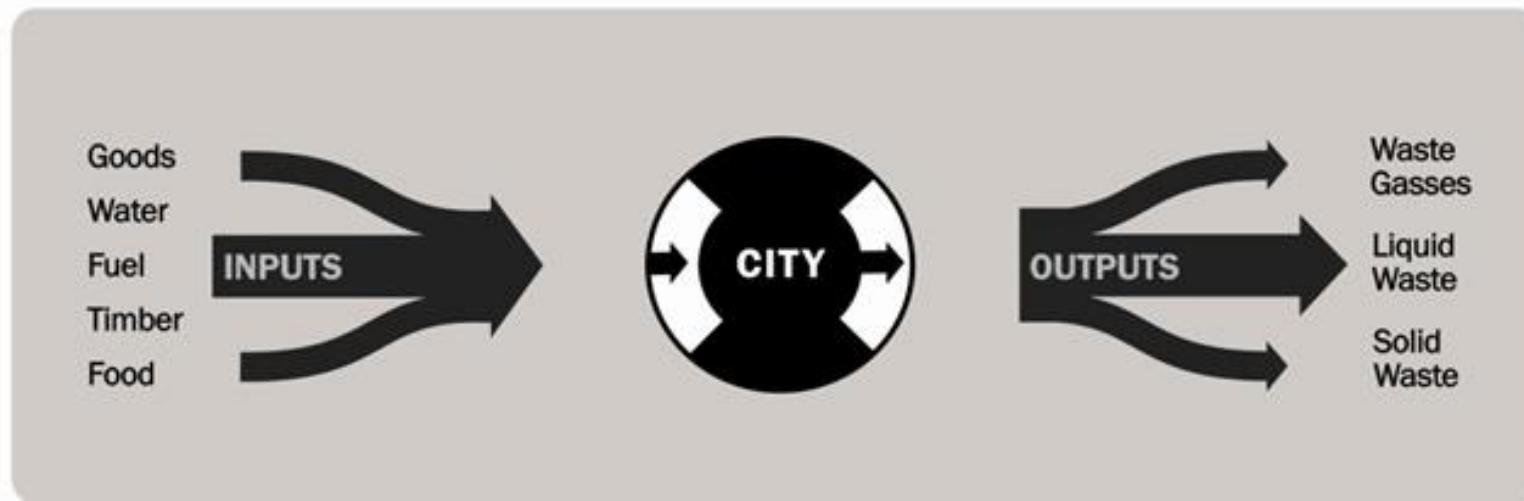
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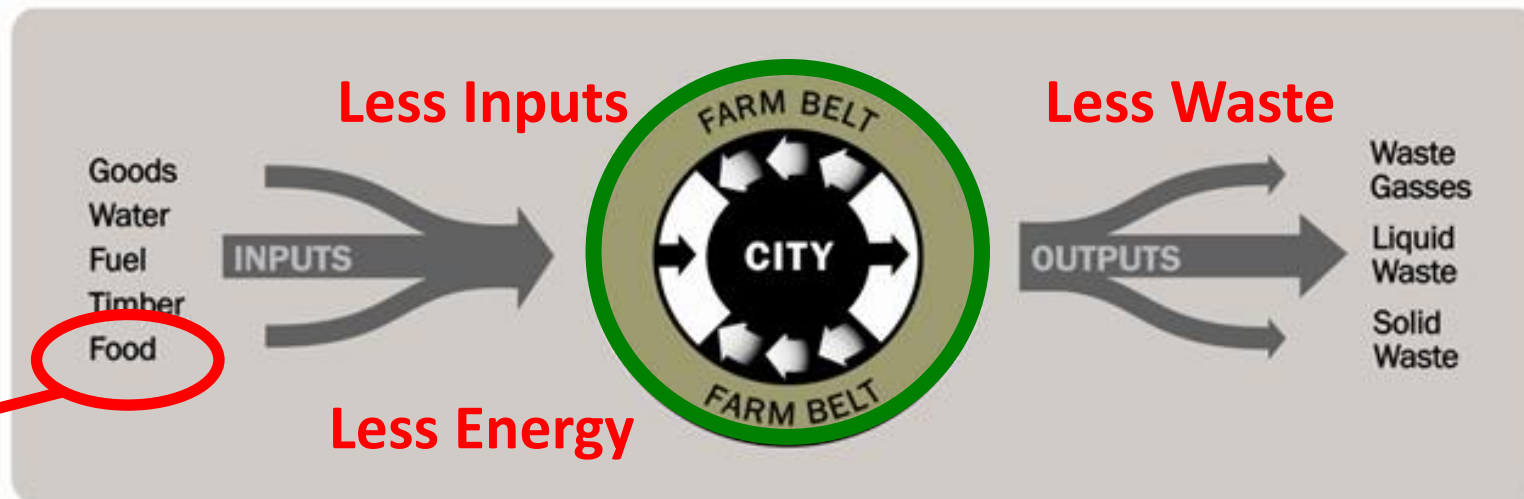
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Bringing Agriculture inside Cities

NOW: LINEAR METABOLISM



FUTURE: CIRCULAR METABOLISM



The modern Food Supply Chain has an heavy ecological footprint

Proximity Urban Agriculture is a Good Practice of Circular Economy



Project



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Bringing Agriculture inside Cities

Urban Agriculture is a Good Practice of Circular Economy for 2 main aspects

Urban Agriculture and Collective Gardens

Food Production

Short and Circular supply chain



Land Use

Re-use of Abandoned areas





Bringing Agriculture inside Cities

Urban Agriculture as Good Practice of Circular Economy

Short and
Circular
Food supply
chain



Benefits

- ➡ Less Waste
- ➡ More Health
- ➡ Less Energy
- ➡ Other socio-economic benefits



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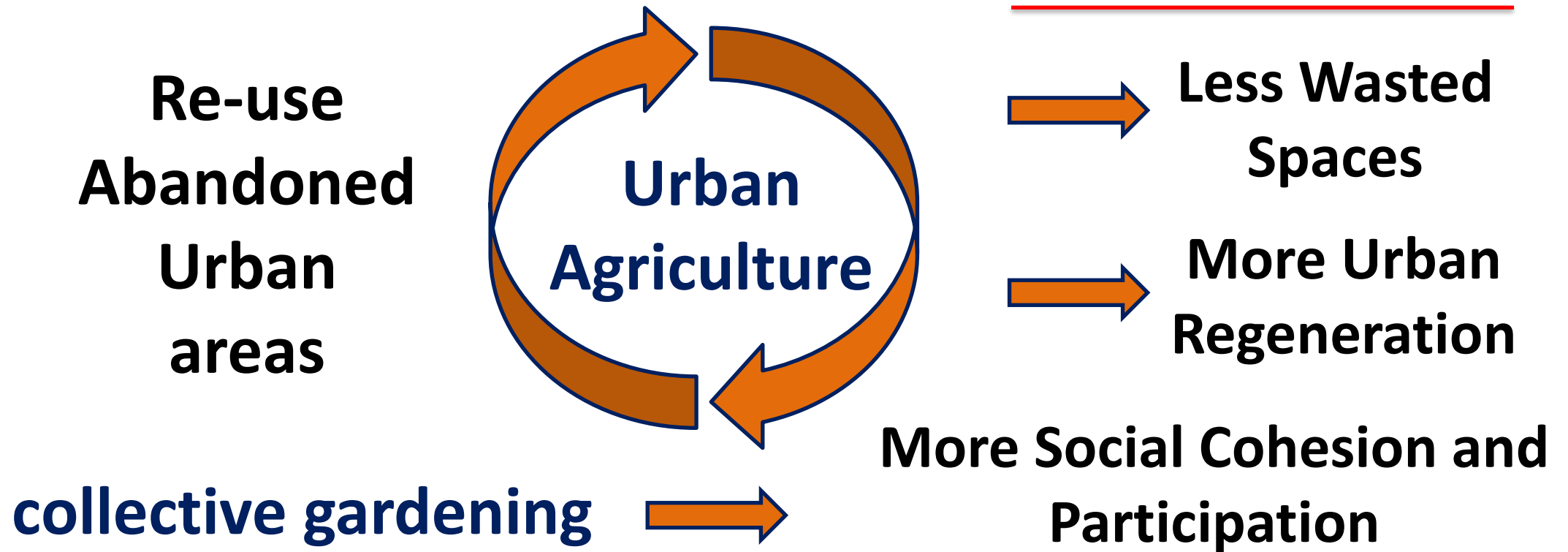
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Bringing Agriculture inside Cities



Urban Agriculture as Good Practice of Circular Economy



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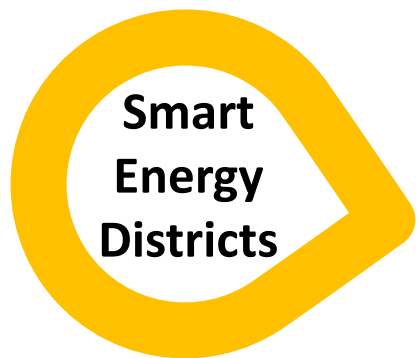


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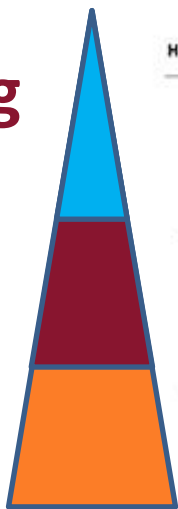
Renewable Energy Sharing & Energy Efficiency

SCALING UP:

Building

Block

District



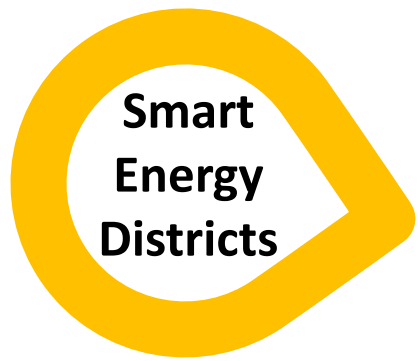
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SCOPE: zero-energy smart city districts

European Union

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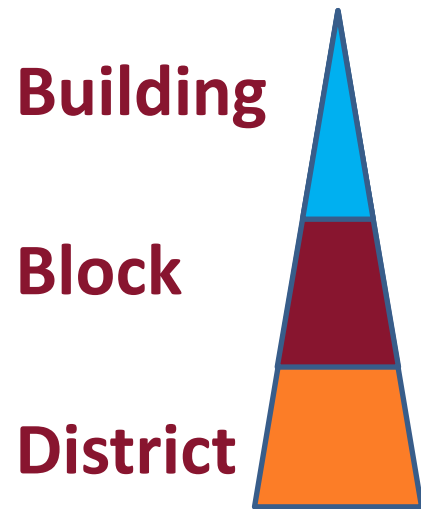


Near Zero Energy Buildings (nZEB)

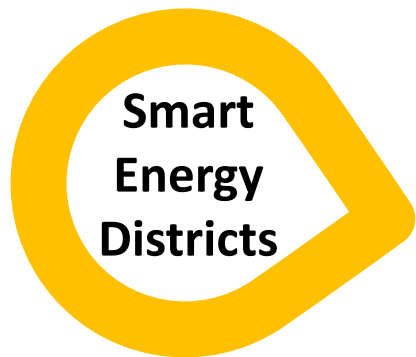
Positive Energy Blocks (PEB)

as cores of a **Smart Energy District**

SCALING UP:



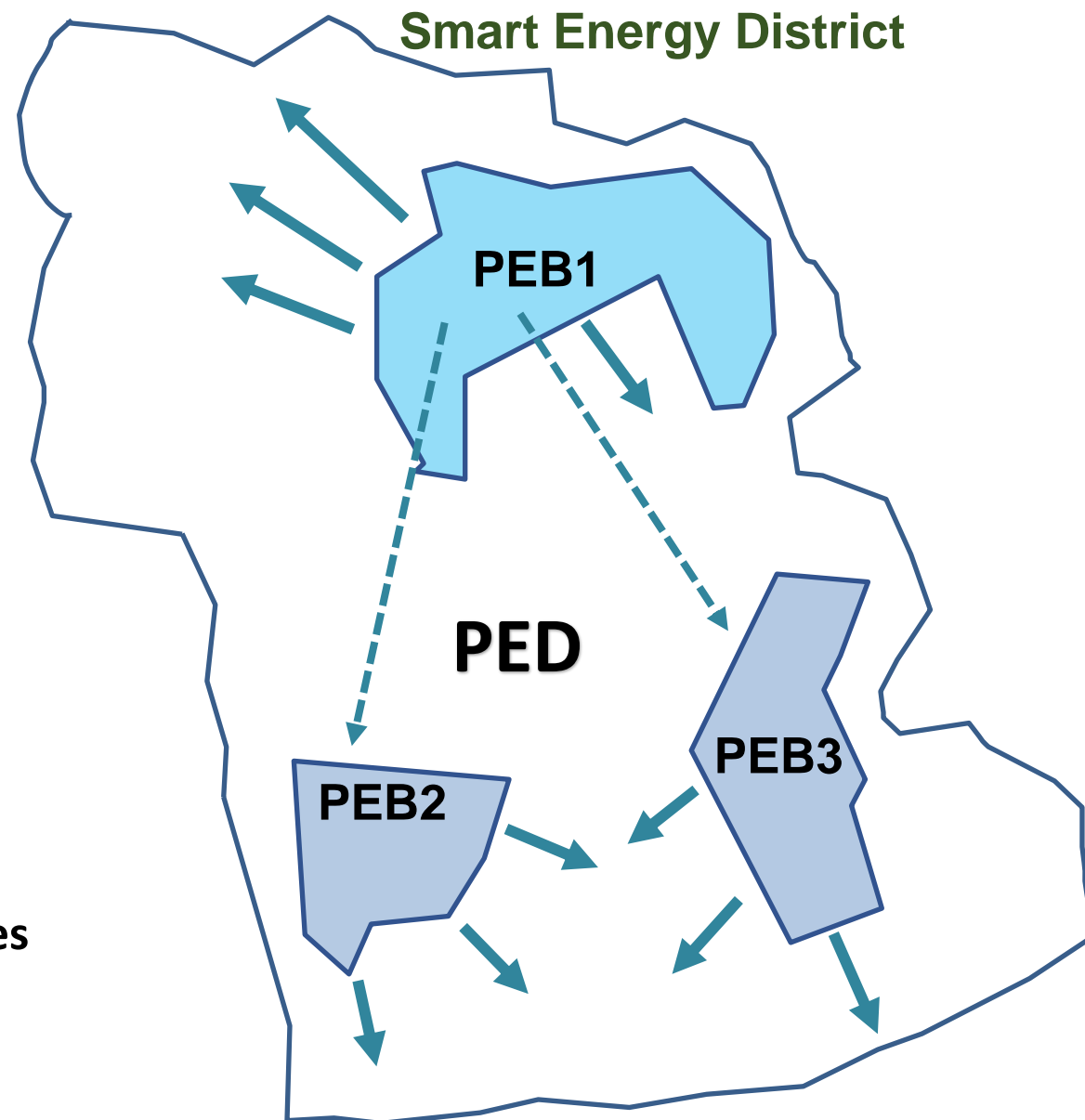
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Progressive Expansion of the Good Practice

The *Smart Energy District* can evolve into a *Positive Energy District (PED)* as conceived in the EU SET-Plan, through

- the **expansion** of the PEB model based on deep retrofitting, energy sharing and smart-grid
- the **replication of good practices** experimented in the NZEBs and in the PEBs,
- the progressive **engagement of citizens** and stakeholders within the enlarging **energy communities**
- In Rome Pilot the **schools** are strategically involved possibly at the center of PEBs



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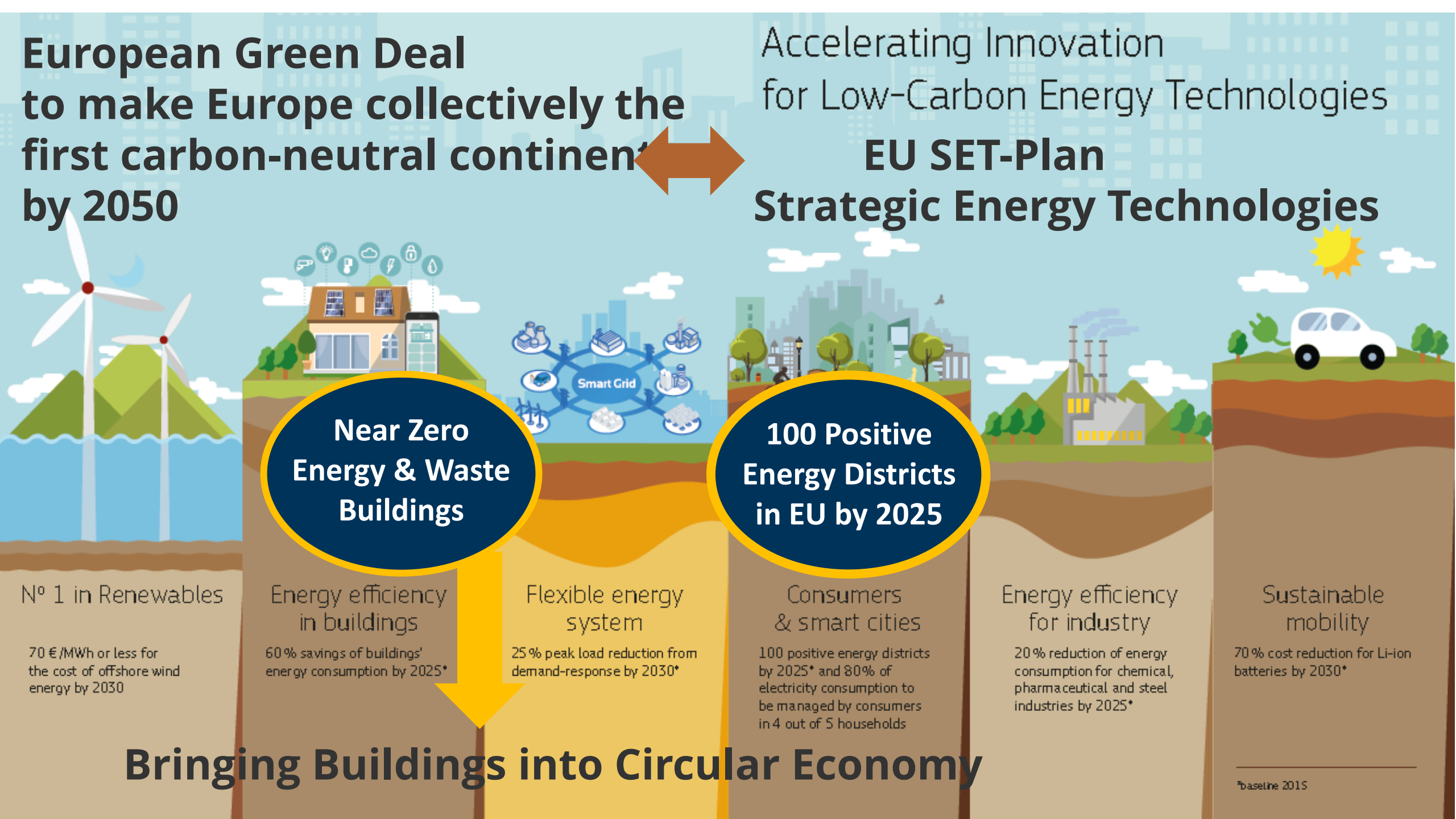


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**European Green Deal
to make Europe collectively the
first carbon-neutral continent
by 2050**

Accelerating Innovation
for Low-Carbon Energy Technologies
**EU SET-Plan
Strategic Energy Technologies**



**Near Zero
Energy & Waste
Buildings**

**100 Positive
Energy Districts
in EU by 2025**

N° 1 in Renewables

70 €/MWh or less for
the cost of offshore wind
energy by 2030

Energy efficiency
in buildings

60 % savings of buildings'
energy consumption by 2025*

Flexible energy
system

25 % peak load reduction from
demand-response by 2030*

Consumers
& smart cities

100 positive energy districts
by 2025* and 80% of
electricity consumption to
be managed by consumers
in 4 out of 5 households

Energy efficiency
for industry

20 % reduction of energy
consumption for chemical,
pharmaceutical and steel
industries by 2025*

Sustainable
mobility

70 % cost reduction for Li-ion
batteries by 2030*

Bringing Buildings into Circular Economy

*baseline 2015

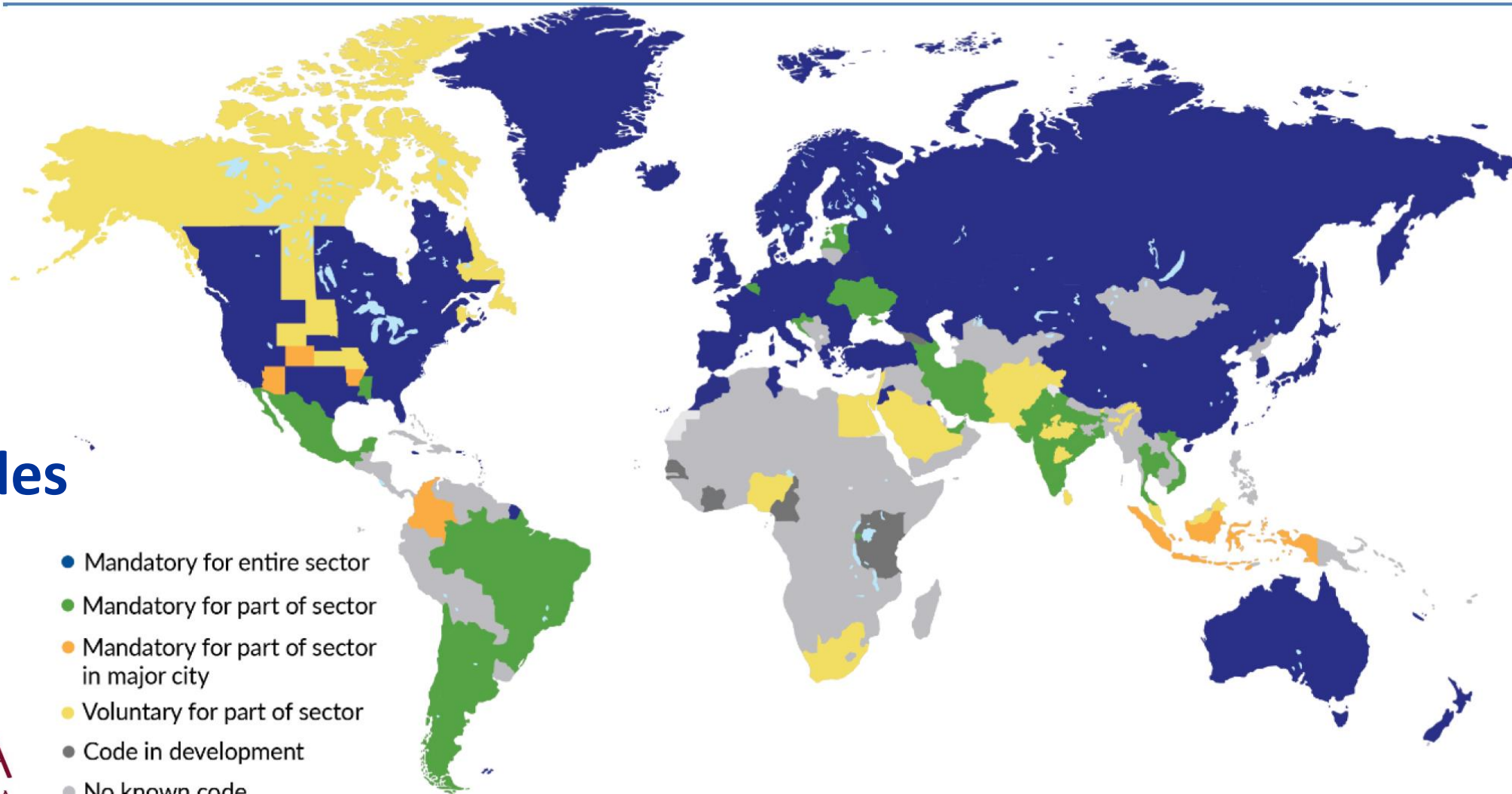
Bringing Buildings toward energy efficiency

Map 2 • Building energy codes by jurisdiction, 2018-19

73

Countries
adopted
Energy Codes

- Mandatory for entire sector
- Mandatory for part of sector
- Mandatory for part of sector in major city
- Voluntary for part of sector
- Code in development
- No known code



Circular
Economy of
Buildings

36%

2010 – 2018:

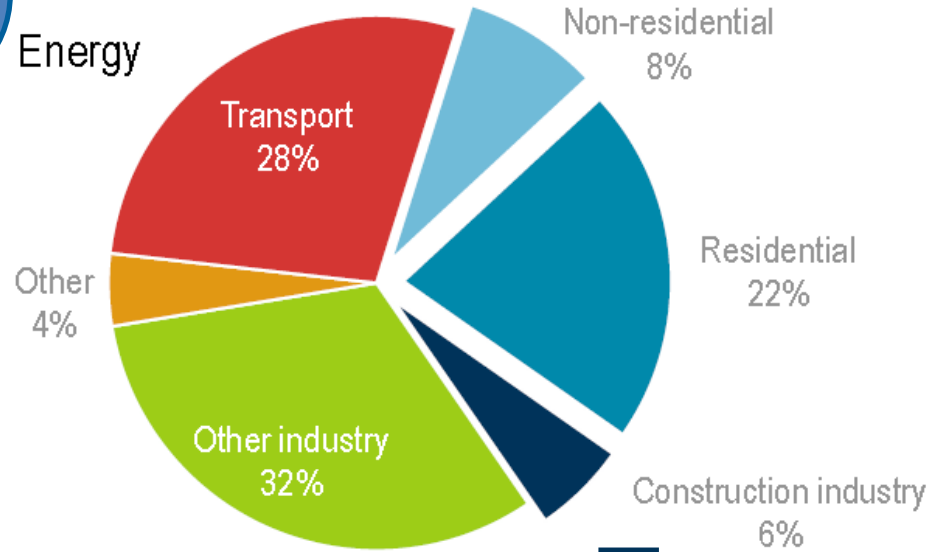
+3% Energy

+23% Floor Area

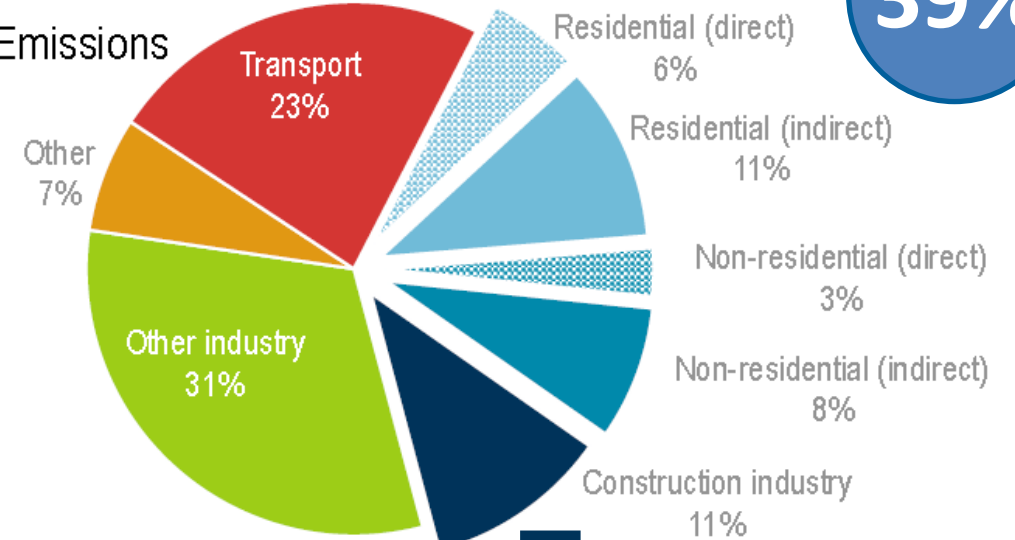
**Decoupling
Energy and
GDP !**

Bringing Buildings toward energy efficiency

Global share of buildings and construction final energy and emissions, 2018



Emissions



39%

IEA (2019). All rights reserved.

... but Construction Industry is growing in impact in terms
of Emissions and Waste



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Some data on Construction Demolition Waste

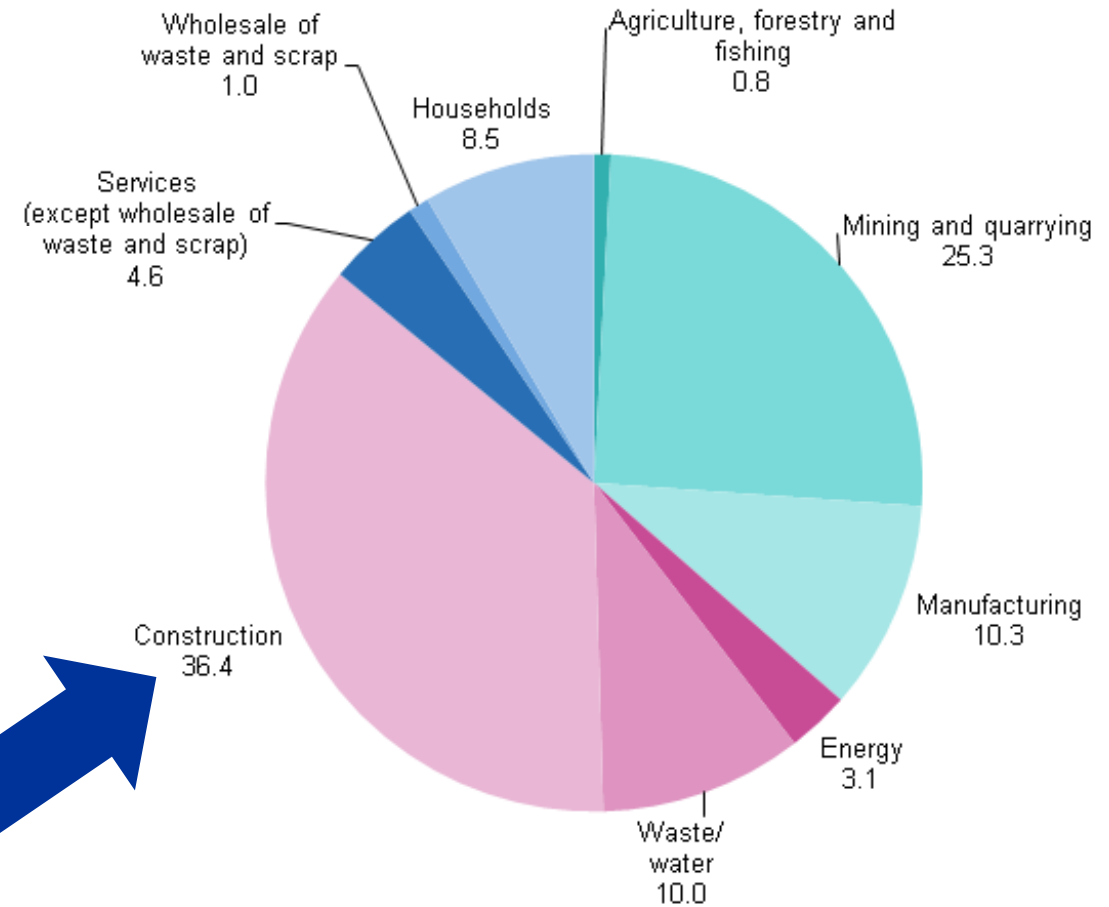
In the WORLD

- Construction and demolition: 1/3 of all **waste**
- Buildings are responsible for 1/3 of **global greenhouse gas emissions**, with much of their life cycle impacts coming from materials sources and supply chains.

In EUROPE

- CDW was 374 million tonnes in the EU in 2016, excluding excavated soil
- EU countries are on track to meet the 70 % recovery target of 2030 with most countries already exceeding the target

Waste generation by economic activities and households, EU-28, 2016 (%)

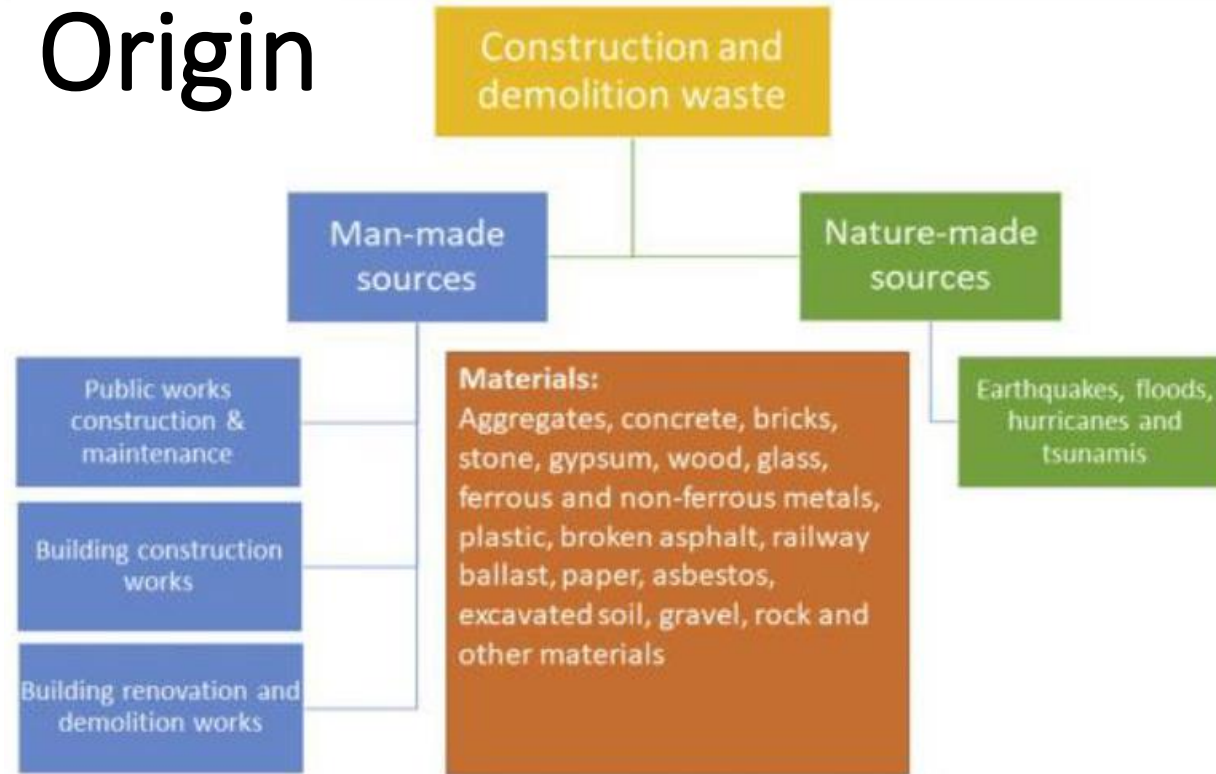


Source: Eurostat (online data code: env_wasgen)

eurostat 

Most of the CDW in the world is LOST

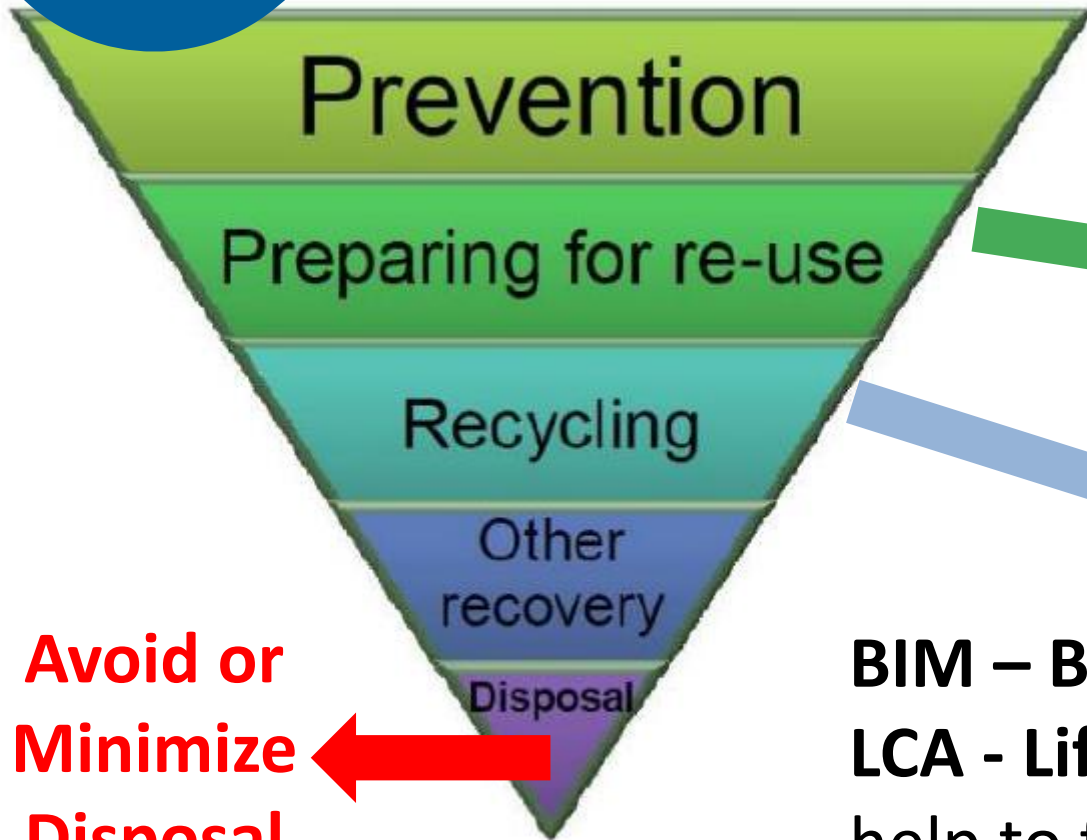
Origin



Current Opinion in Green and Sustainable Chemistry

Circular
Economy of
Buildings

Bringing Buildings into the Circular Economy



**Avoid or
Minimize
Disposal**

C&D Waste Reduction

SAPIENZA R&D Projects



on Circular NZEB Buildings

CONDEREFF

Interreg Europe

On-site Reuse Solutions & Policies



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Secondary Raw Materials (SRM) Market

**BIM – Building Information Modeling &
LCA - Life Cycle Assessment** for buildings
help to focus measures to reduce energy and waste



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Circular Buildings – Some Pilots

Best Practice : Atlante Inerti – Design of SRM-based product

An Italian Start-up company focused on the market up-scaling of secondary raw materials products.

The integration of design competences and a circular economy approach to the market is the main lever for raising the value of CDW and increasing user's trust.

<http://atlanteinertiproject.yolasite.com/prodotti.php>

Atlante Inerti Project



Circular Buildings – Some Pilots

Best Practice: Large Buildings Selective Demolition in urban center

The Tour UAP in Lyon had to be demolished and replaced with a taller, more technological skyscraper.

Two towers in Glasgow were dismantled without use of explosives. In just three months the towers had disappeared. The Italian company Despe won twice the prestigious ‘World Demolition Awards’ performing these demolition safely, swiftly and with 95% of recycled materials.



Innovative Design & Selective Demolition

Digitalisation of Construction and Demolition processes:

- **Building Information Modeling (BIM)** to extend and decarbonize life cycle of buildings
- **Pre-demolitions Audits based on BIM**
- Surveying and Analysis Tools to estimate materials composition, typologies and weights
- **Geographic Information Systems (GIS)** applications for secondary materials supply chains

Life Cycle Assessment & BIM to reduce energy and waste



GISBIM
INTERNATIONAL SUMMER SCHOOL

Thank You



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Cooperation Framework with IUC

We are working with Chinese, Malaysian, Latin-American Cities, Research Institutions and Innovative Companies to develop Cooperation Projects engaging **Rome Cluster** key competences:

- **Energy Management** and Deep Retrofitting solutions
- **Near Zero Energy Buildings** and **Positive Energy Districts** models
- **Smart Grids** and Energy Community models
- **Digital Twins (GIS/BIM)** for innovative design and planning workflow
- Interactive platforms for knowledge and **open innovation management**
- **Age-Friendly Building** Certification and design Guidelines
- Cultural Heritage **Restoration**, Heritage BIM (HBIM) and AR/VR
- Natural Based Solutions and **Urban Agriculture**
- Sustainable and **Electric Mobility**

**International
Cooperation
represents**

**a Great Common
Opportunity**



**to tackle the
Climate Change**

**Fostering
Green Economy
and
Sustainability**



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