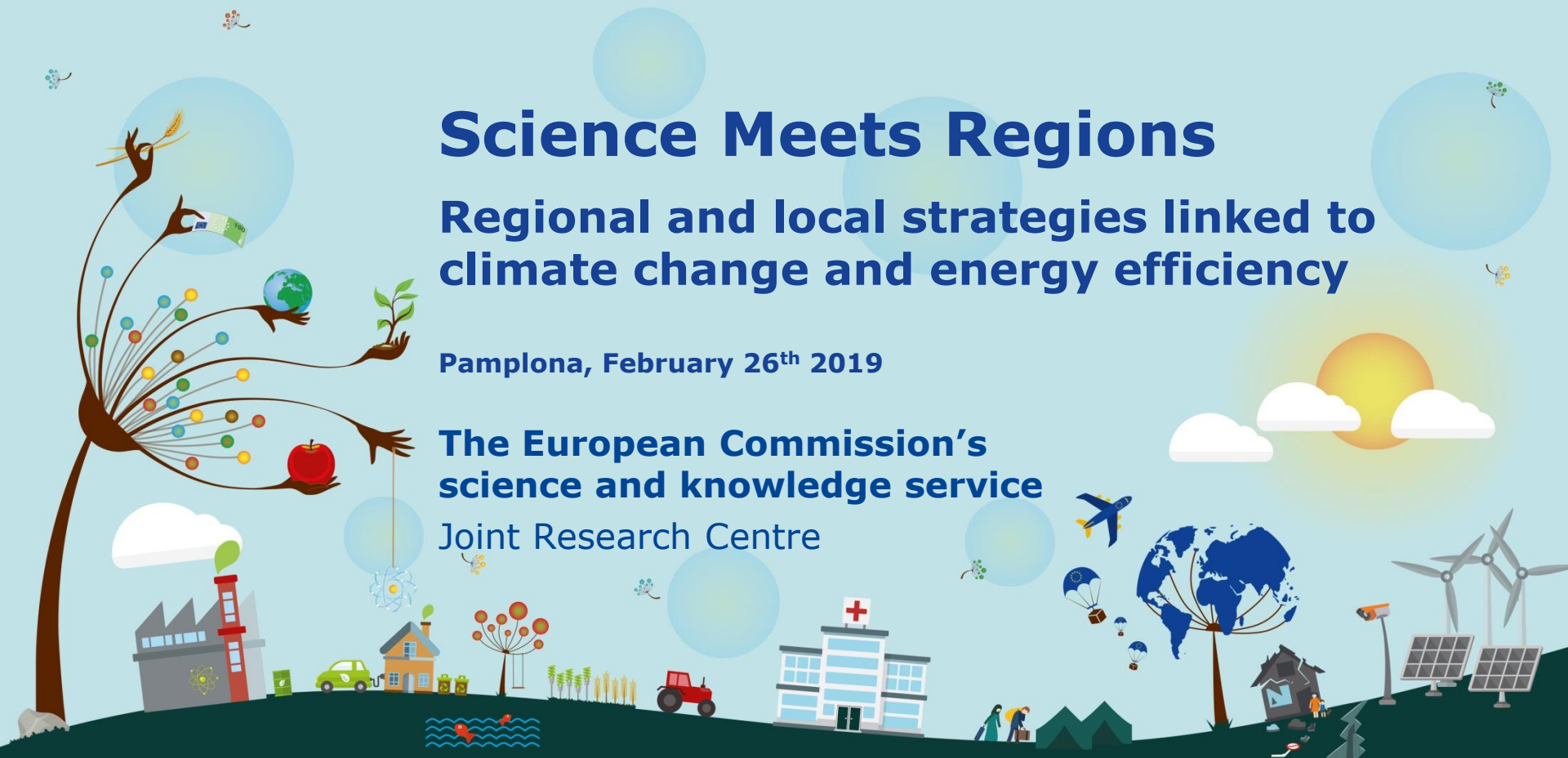


# Science Meets Regions

Regional and local strategies linked to  
climate change and energy efficiency

Pamplona, February 26<sup>th</sup> 2019

The European Commission's  
science and knowledge service  
Joint Research Centre



European  
Commission

**The European Commission's  
science and knowledge service**

Joint Research Centre

# **Citizen empowerment in the energy transition**

**C2 Unit. Energy Efficiency and Renewables  
Directorate C. Energy, Transport and Climate**

Ana Gracia Amillo, Paolo Zangheri, Paolo Bertoldi,  
Irene Pinedo, Christian Thiel

# Context

- Paris Agreement COP21 (Dec 2015).

$\Delta T < 2^{\circ}\text{C}$

- Energy Union (Feb 2015).

Secure, affordable and sustainable energy supply for every EU country.

- Energy Union and Climate Action (Jul 2016).

Low carbon emission transition in all sectors.

- Updated EU targets for 2030 (2018).

- ✓ 40% CO<sub>2</sub> cut emissions
- ✓ 32.5% of energy efficiency
- ✓ 32% gross final energy consumption from renewables



# JRC C2 unit role

- Technical and scientific support to normative and voluntary initiatives.
- Assessment of the implementation of EU directives.
- Development of tools, estimation models and databases.
- Promotion and dissemination.



# JRC C2 unit role

- Technical and scientific support to normative and voluntary initiatives.

## Covenant of Mayors



# Covenant of Mayors for Climate and Energy

- European Union initiative launched by the European Commission in 2008 directly targeting local and regional authorities.
- Signatories voluntarily commit to reduce greenhouse gas emissions and improve climate resilience through the implementation of a Sustainable Energy Access and Climate Action Plan.
- Three pillars:

## Mitigation

Decarbonisation

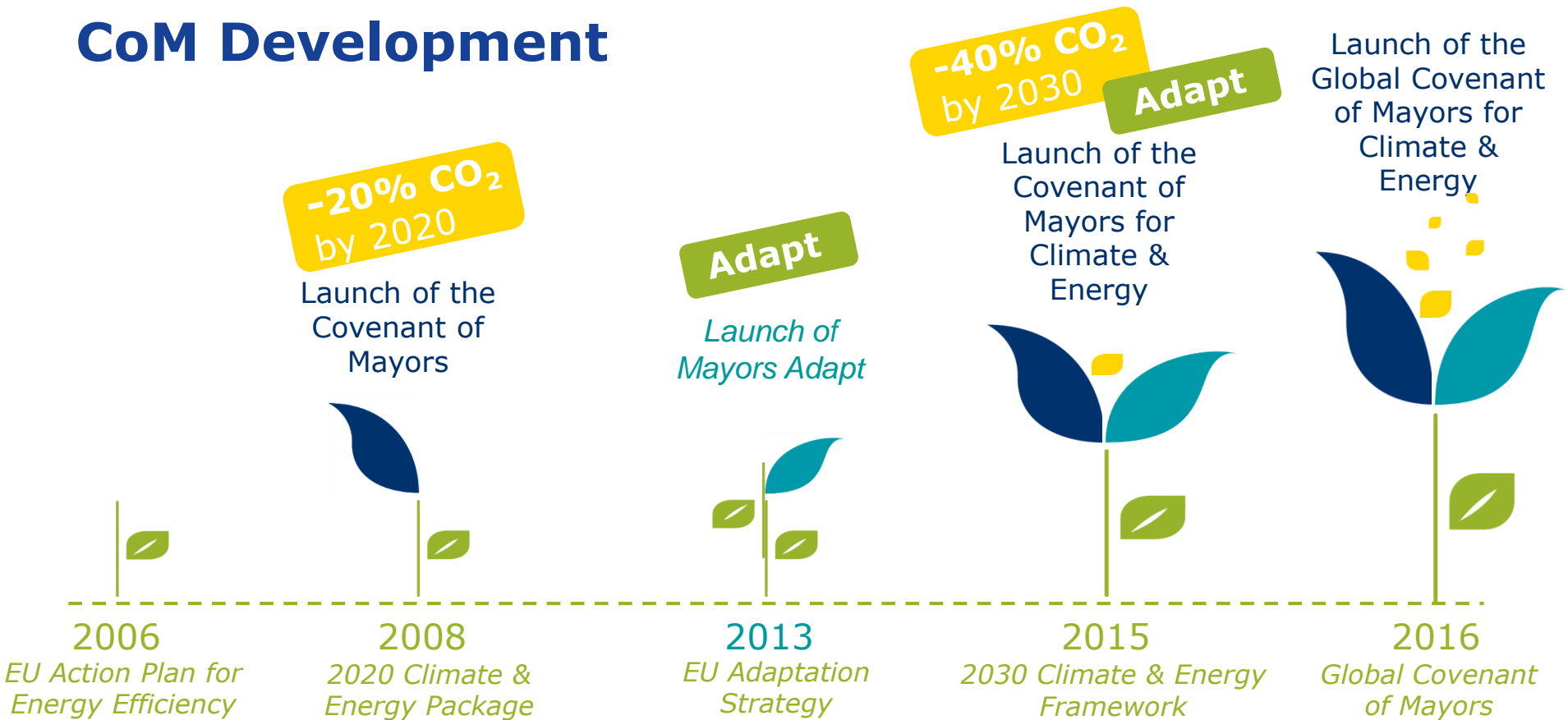
## Adaptation

Resilience

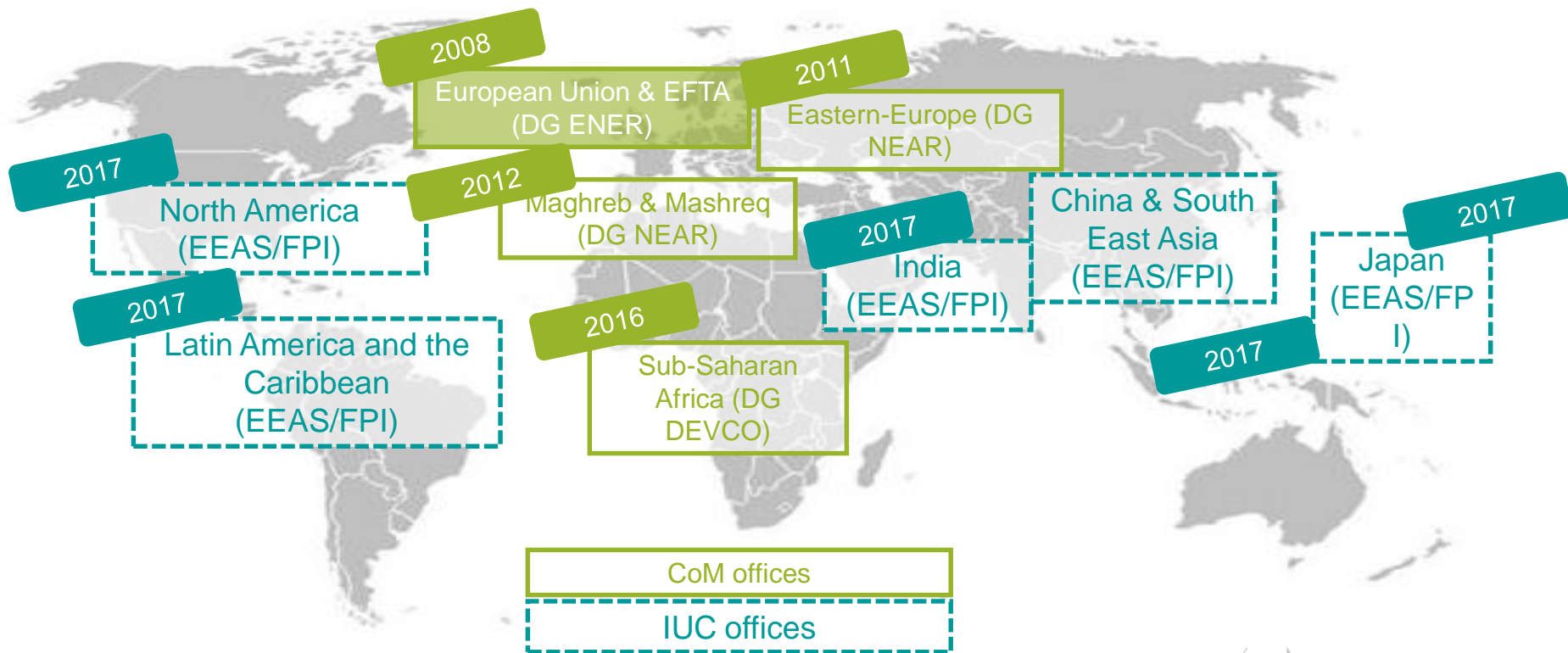
## Access to energy

Secure, sustainable  
and affordable energy

# CoM Development



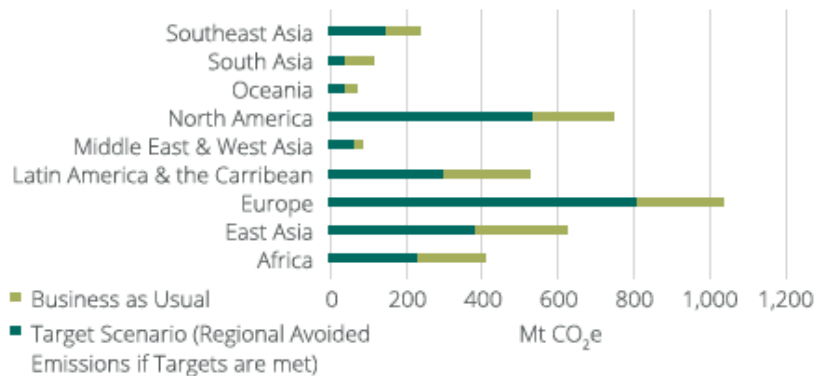
# Global Covenant of Mayors





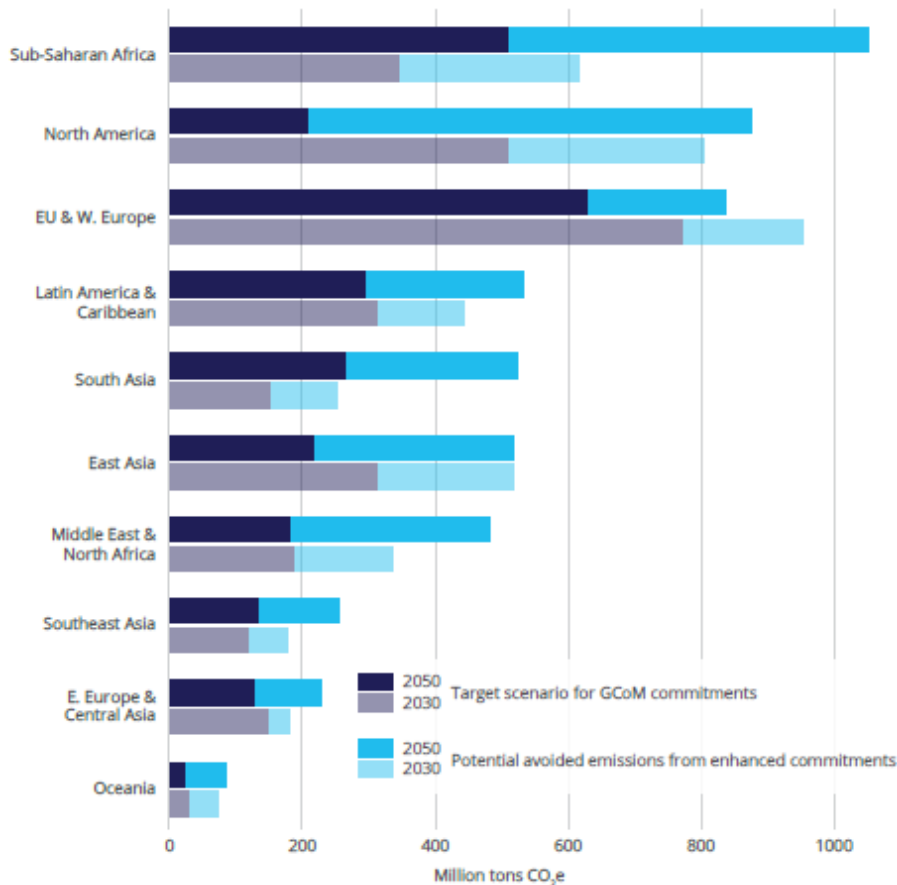
# GCoM achievements

ALL REGIONS ARE PROJECTED TO AVOID SUBSTANTIAL EMISSIONS FROM BAU IN 2030



**9273 cities, +800 million people** worldwide, **10.5%** of the total global population.

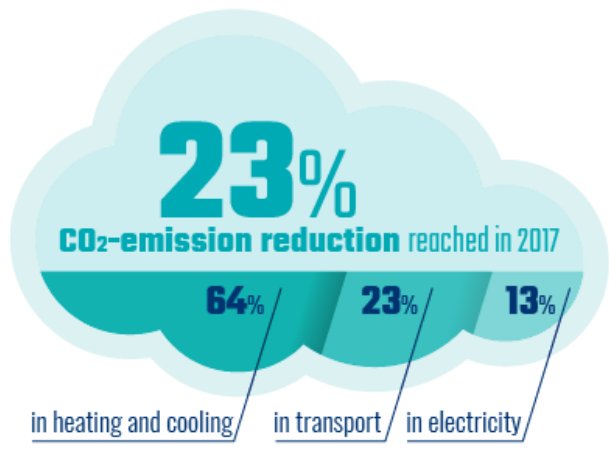
Global Covenant of Mayors' local authorities could collectively reduce **1.4 billion tons of CO<sub>2</sub>e** emissions per year from Business-as-usual in **2030**, and **2.8 billion tons CO<sub>2</sub>e** by **2050**.



# CoM achievements

**+8800 EU cities, +230 million people,**  
almost **50%** of the EU population.

EU Covenant of Mayors **achieved a 133 million tons of CO<sub>2</sub>e emissions reduction** in 2017.



# CoM in Spain and Navarra

Wednesday 6 February 2019

## A district of Pamplona reduces citizens' energy bills by €560/year

Recent leaflet by the Covenant of Mayors - Europe offers examples of cities and regions alleviating energy poverty. In the Spanish Region of Navarra, citizens' energy bills have been reduced by €560/year on average.

Thanks to an energy renovation programme targeting residential buildings in deprived neighbourhoods, Navarra Region has reduced households' energy consumption by 70% compared to 2014 levels.

In the Txantrea district of Pamplona, the renovations consisted in the construction of new thermal envelopes for public and residential buildings constructed between the 50s and the 80s, the renewal of the old district heating systems, and the creation of a new district heating network using biomass.

600 apartments were renovated over the 2014-2017 period, resulting in an average reduction in energy bills of €560/year/household.



Covenant of Mayors  
kick-off event in  
Navarra Region

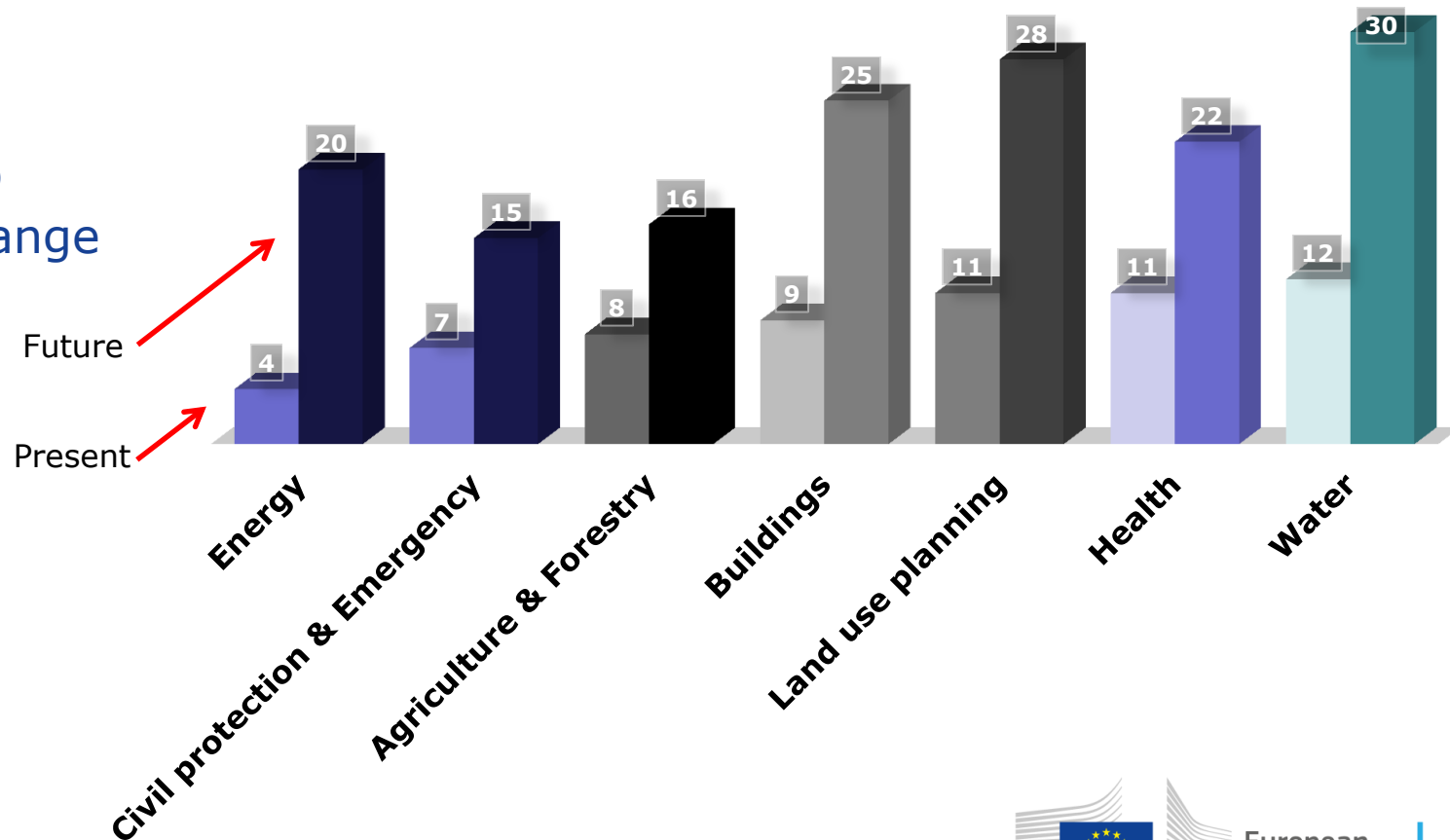
20  
FEB

📍 PALACIO EL CONDESTABLE, PAMPLONA

El 20 de Febrero la Consejería de Desarrollo Rural, Medio Ambiente y Administración Local de Navarra estará organizando conjuntamente con la...

# CoM. Risk & Vulnerability assessment

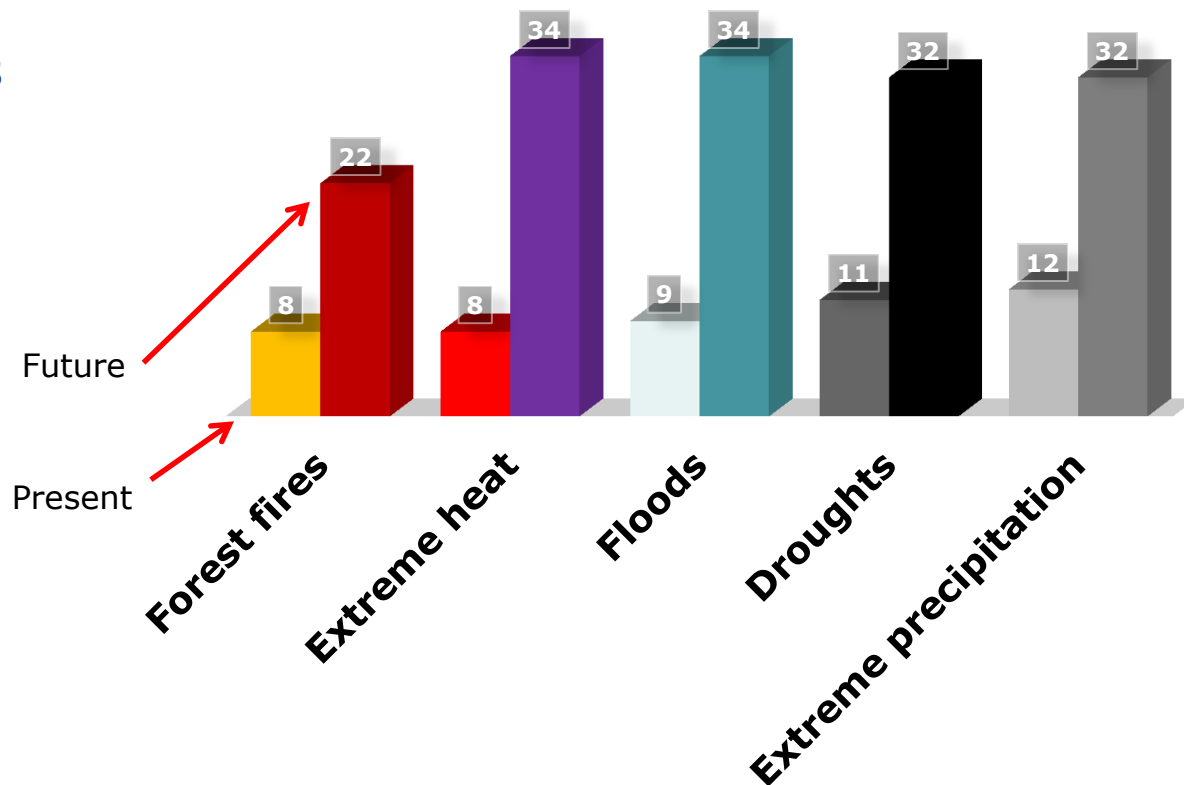
Sectors  
potentially  
exposed to  
climate change



# CoM. Risk & Vulnerability assessment

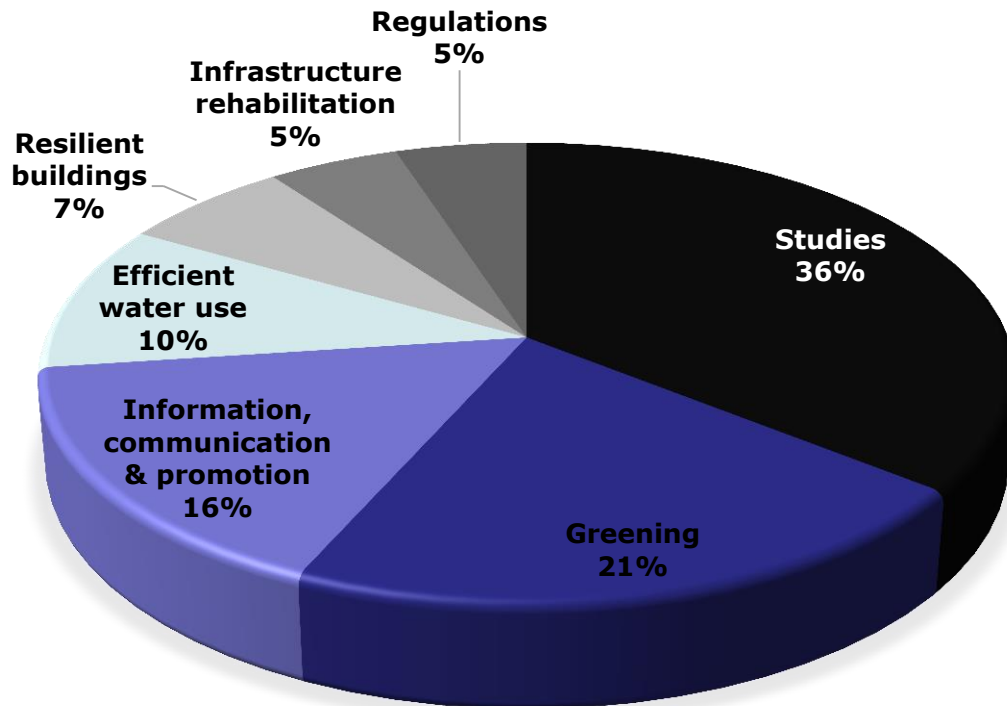
## Climate hazards

**Water scarcity**  
**Storms**  
**Sea level rise**  
**Coastal erosion**



# CoM. Adaptation plans

## Adaptation actions



# JRC role in the Covenant of Mayors

- Part of the **technical working group** developing the "standards" for city emission reporting, targets, action plans and adaptation.
- Setting the **methodological basis** of the initiative including guidebooks, monitoring tools and instructions.
- **Methodological adaptation** for the different regions.
- **Evaluation and approval** of cities Sustainable Energy Access and Climate Action Plans.
- Technical **training** for cities and regions.

# JRC C2 unit role

- Technical and scientific support to normative and voluntary initiatives
- Assessment of the implementation of EU directives.

## Energy Efficiency Directive (EED)

## Energy Performance of Building Directive (EPBD)





# Energy Efficiency Directive

Member states (MSs) need to update every three years their **National Energy Efficiency Action Plans (NEEAPs)** where they define the estimated energy consumption, planned energy efficiency measures and the improvements expected to achieve including all sectors (building, industry, transport, etc.).

Buildings:

- Art 4. Long term building renovation strategy
- Art 5. Energy efficiency in central government building

**JRC role:** analyse the implementation of all EED articles and the MSs' reports regarding some articles related to buildings.

# Long term building renovation strategy

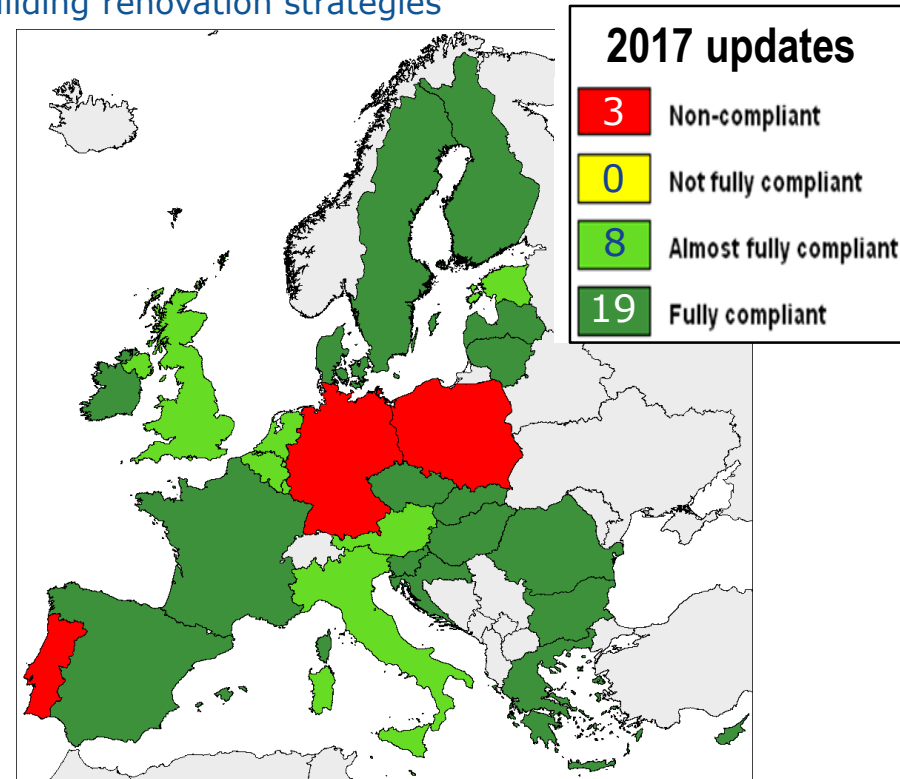
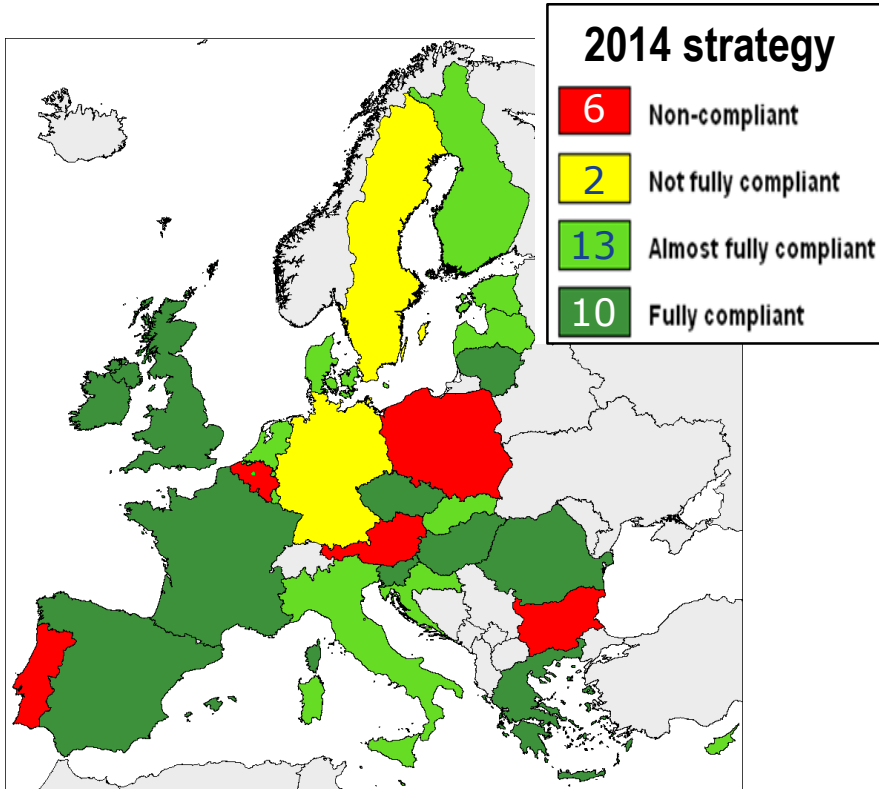
Member states have to establish a long-term strategy for the renovation of national stock of residential and commercial buildings, both public and private.

- Overview of the national building stock
- Identification of cost-effective renovation actions
- Definition of policies and measures to stimulate cost-effective deep renovations
- Forward-looking perspective to guide investment decisions
- Evidence-based estimate of expected energy saving and benefits

Update version every three years.

# Long term building renovation strategy

Synthesis Report on the assessment of Member States' building renovation strategies



# Energy Performance of Building Directive

Member states need to draw up national plans and policies for increasing the number of **Nearly Zero Energy Buildings (NZEB)**. By December 31<sup>st</sup> 2020 all new buildings need to be NZEB.

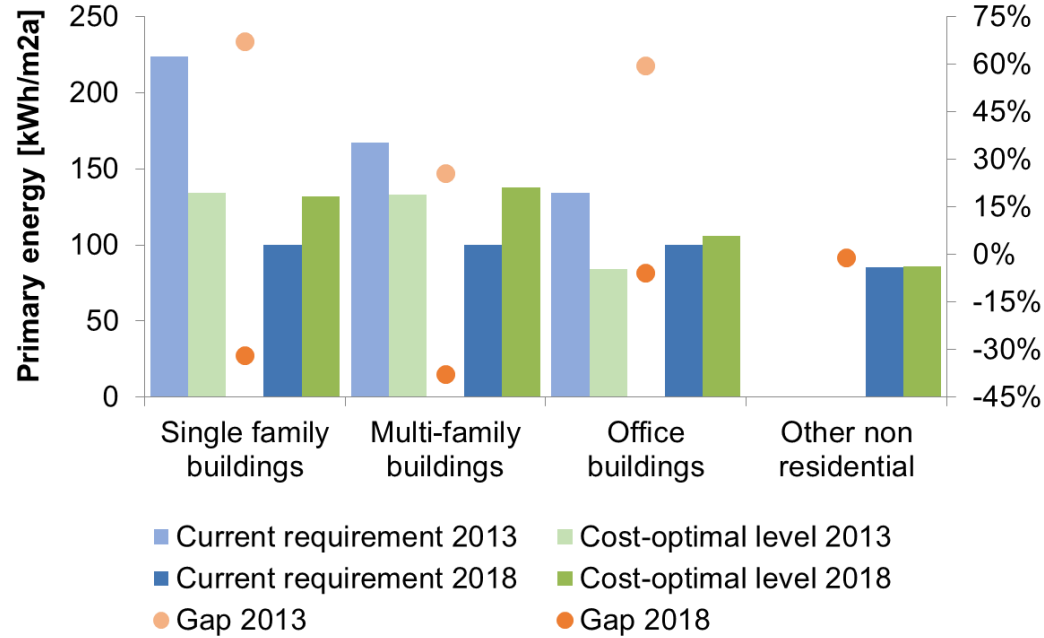
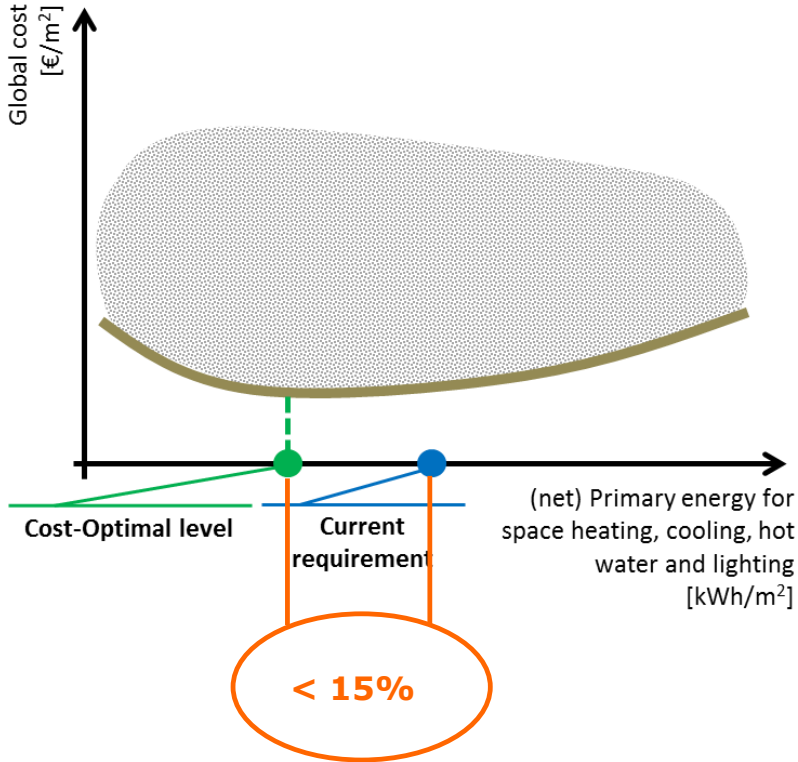
The national plans shall include:

- Definition of NZEB including an estimation of the primary energy used (kWh/m<sup>2</sup>.year)
- Targets to improve the energy performance
- Policies and financial measures to promote NZEB

Cost optimal levels of minimum energy performance requirements.

**JRC role:** analyse and assess the national plans and the cost optimal calculations.

# Energy Performance of Building Directive



# JRC C2 unit role

- Technical and scientific support to normative and voluntary initiatives
- Assessment of the implementation of EU directives
- Development of tools, estimation models and databases.

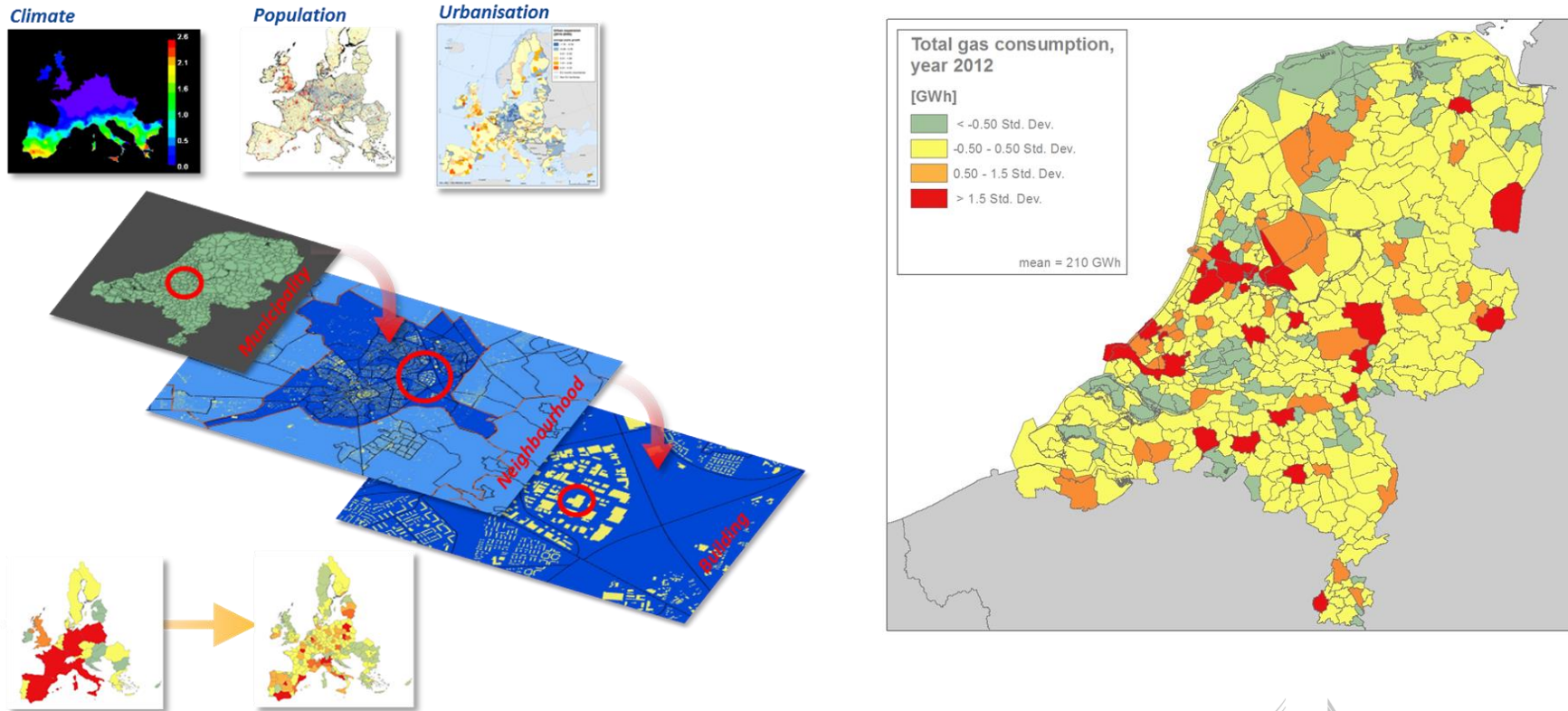
**Building Stock Observatory**

**Building Stock Modelling**

**Typical Meteorological Year**

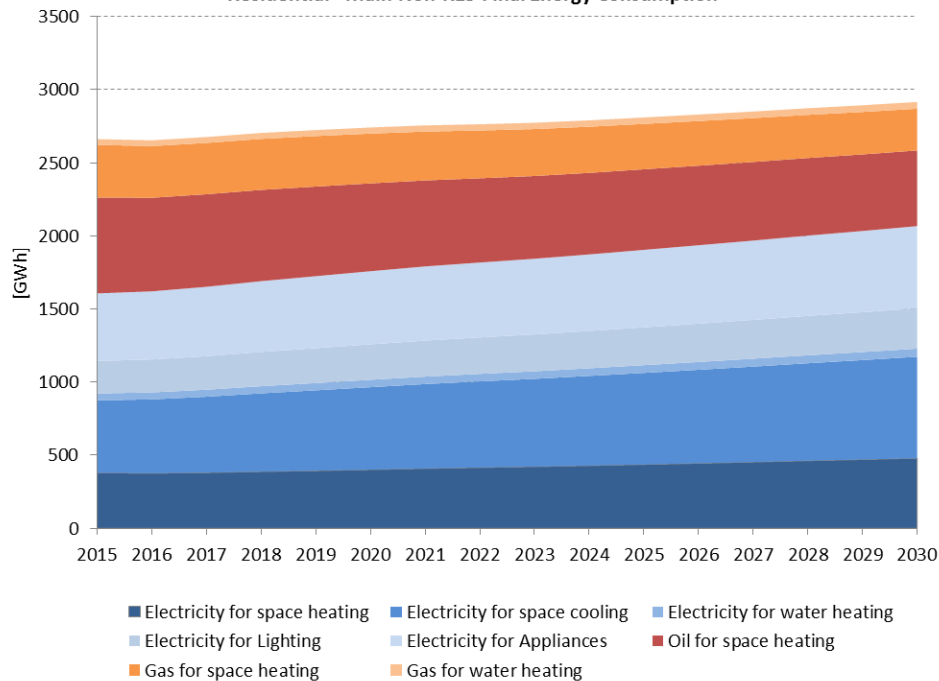


# Downscaled data for Building Stock Observatory

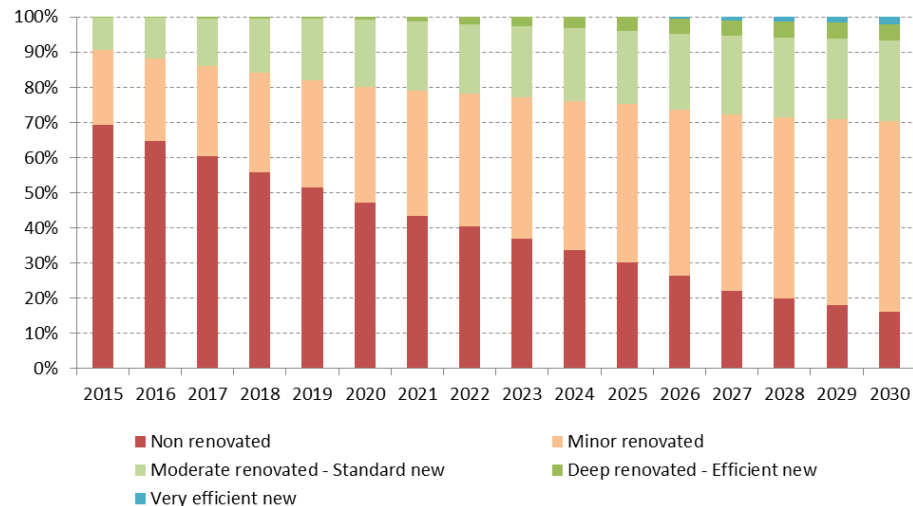


# Building Stock Modelling

Residential - Main Non-RES Final Energy Consumption

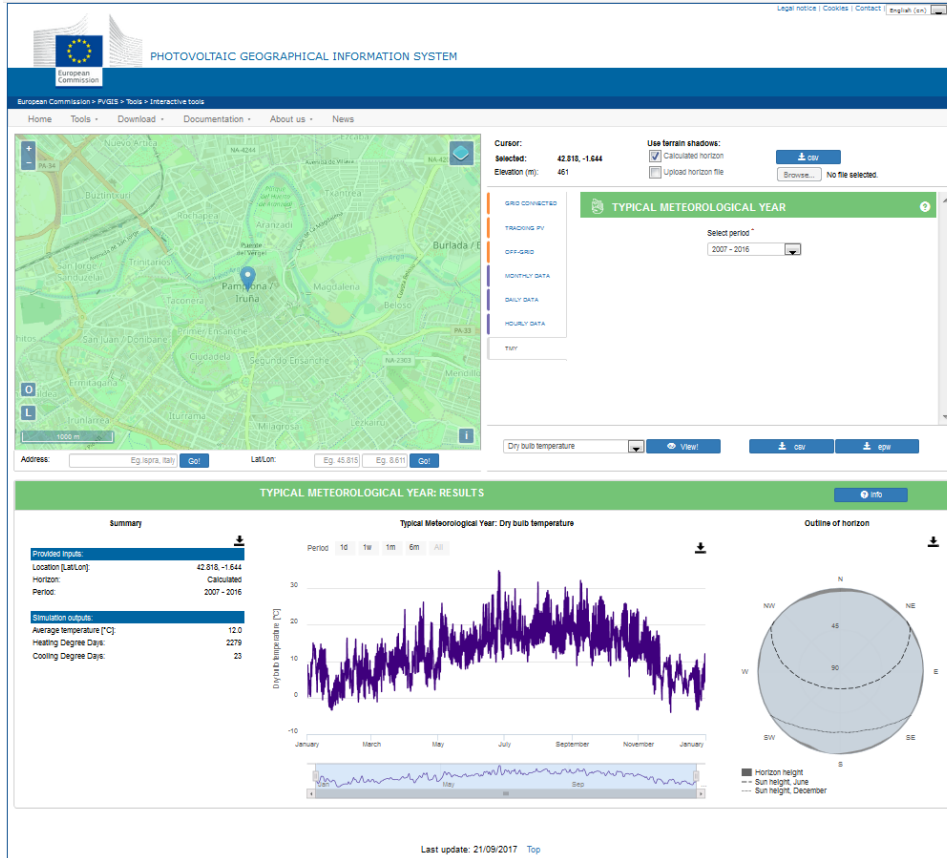


Residential - Distribution of building types





# Typical Meteorological Year



Meteorological data for one artificial year containing hourly values of:

- Dry bulb temperature (°C)
- Relative Humidity (%)
- Global horizontal irradiance (W/m<sup>2</sup>)
- Direct (beam) normal irradiance (W/m<sup>2</sup>)
- Diffuse horizontal irradiance (W/m<sup>2</sup>)
- Infrared radiation downwards (W/m<sup>2</sup>)
- Wind speed (m/s)
- Wind direction (°)
- Air pressure (Pa)

# PVGIS

# Photovoltaic Geographical Information System

<https://ec.europa.eu/jrc/en/pvgis>

The screenshot displays the PVGIS web interface. At the top, it features the European Commission logo and the title 'PHOTOVOLTAIC GEOGRAPHICAL INFORMATION SYSTEM'. Below this is a navigation menu with options like 'Home', 'Tools', 'Download', 'Documentation', 'About us', and 'News'. The main area is split into a map on the left and a configuration panel on the right. The map shows Pamplona, Spain, with a blue location pin. The configuration panel includes a 'Cursor' section with coordinates (42.818, -1.644) and elevation (461 m). It has checkboxes for 'Use terrain shadows' (Calculated horizon and Upload horizon file) and a 'Download csv' button. Below this is a 'PERFORMANCE OF GRID-CONNECTED PV' section with various settings: 'TRACKING PV' (set to OFF-GRID), 'Solar radiation database' (PVGIS-CMSAF), 'PV technology' (Crystalline silicon), 'Installed peak PV power [kWp]' (1), 'System loss [%]' (14), 'Fixed mounting options' (Mounting position: Free-standing, Slope: 35, Azimuth: 0), and 'PV electricity price' (PV system cost, Interest, and Lifetime fields). At the bottom of the panel are 'Visualize results' and 'Download csv' buttons.

## PV production

- Grid & Off-grid
- Fixed & Tracking
- Stand alone & BIPV

## Solar radiation data

- Hourly timeseries
- Daily, monthly av.

TMY

**Thank you for your attention!**

# Stay in touch



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