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Sustainable Energy Connectivity in Central Asia

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Improving Energy Efficiency and Decarbonizing EU Buildings

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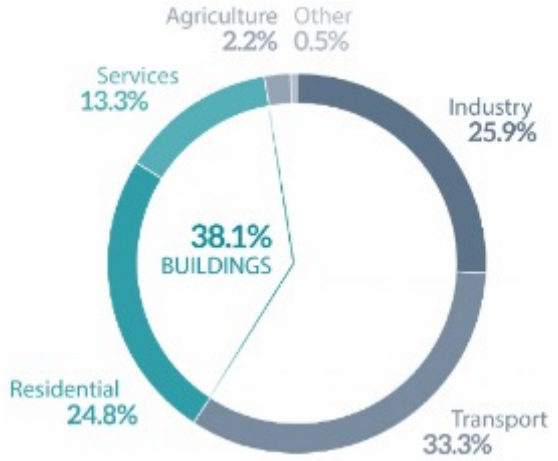
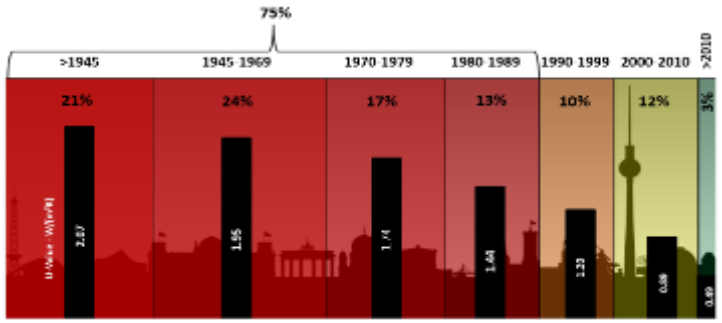
Stantec | intec GOPA International Energy Consultants MEMBER OF GOPA CONSULTING GROUP | ACTED | European University Institute | Robert Schuman Centre for Advanced Studies | FSR ENERGY Florence School of Regulation

Building sector in EU

- **Buildings are the single largest energy consumer in Europe**, they are responsible for approximately **40% of EU energy consumption and 36% of CO_2 emissions**
- At present, about 35% of the EU's buildings are over 50 years old and almost **75% of the building stock is energy inefficient**. At the same time, only about 1% of the building stock is renovated each year
- **Renovation of existing buildings can lead to significant energy savings** as it could reduce the EU's total energy consumption by 5-6% and lower CO_2 emissions by about 5%
- Investments in energy efficiency **stimulates the economy**, especially the construction industry, which generates **about 9% of Europe's GDP** and directly accounts **for 25 million direct jobs**

Energy consumption by sector in EU
Source: Eurostat





Age of the EU building stock and corresponding average U-value for building envelopes.

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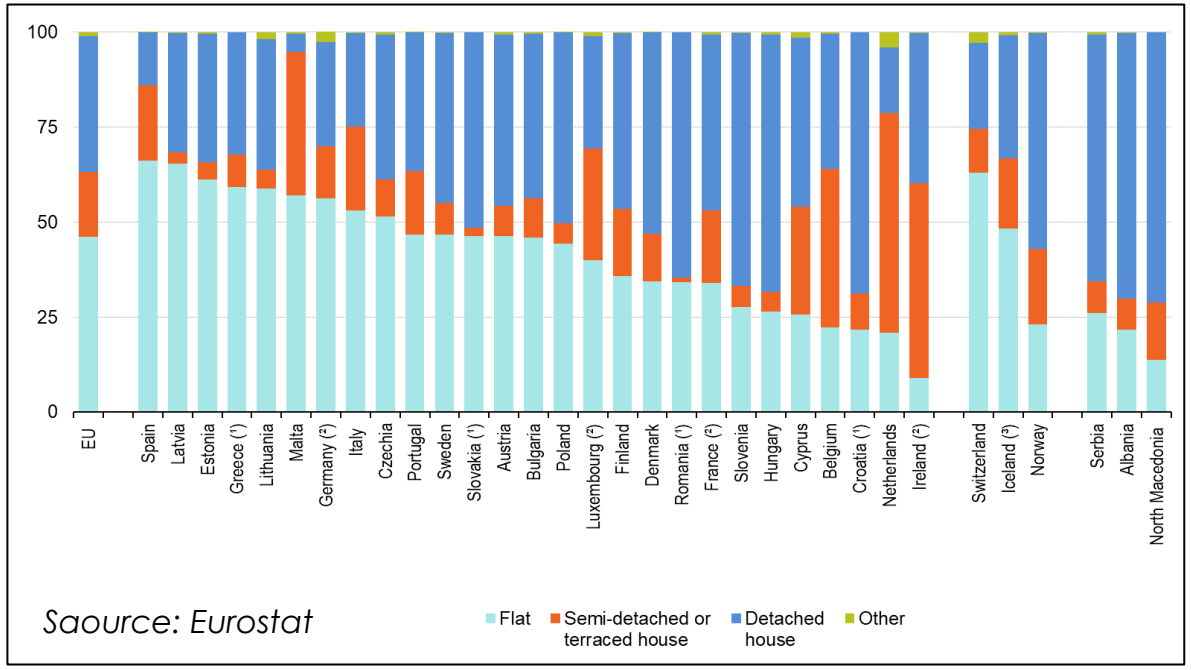
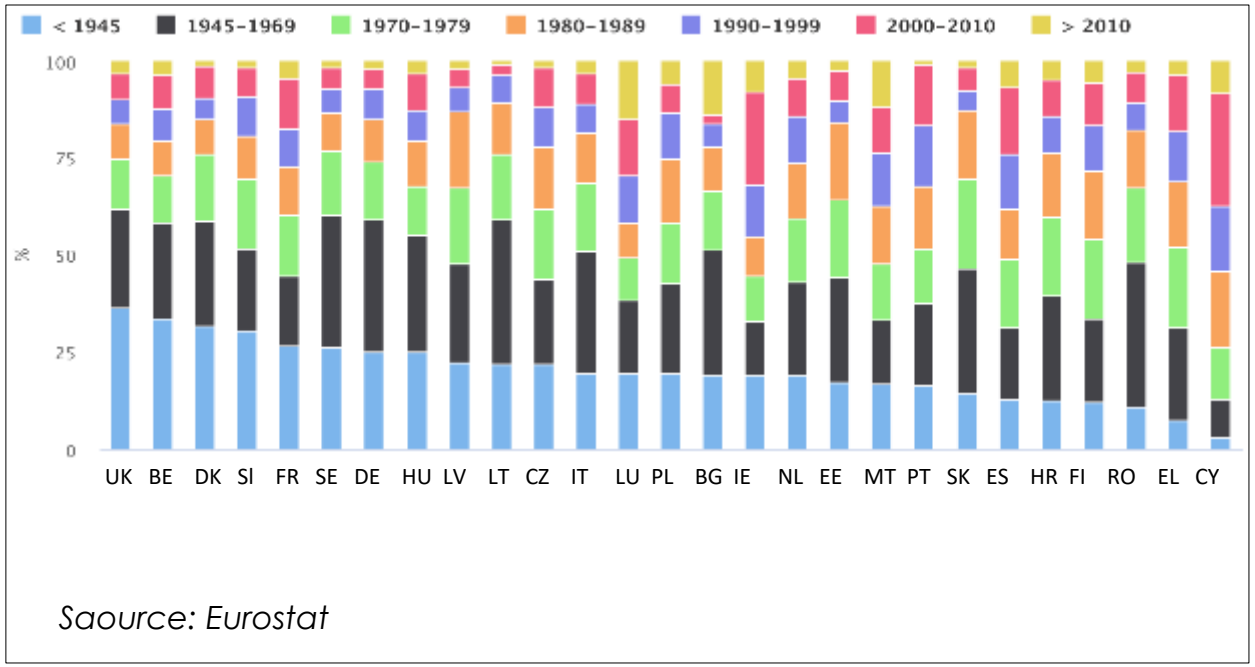
Residential sector building stock



Saource: Eurostat

Distribution of the population by type of dwelling in %



Saource: Eurostat

Breakdown of residential building by construction year

- **46.2 % of the EU population lived in flats**, more than one third (35.8 %) lived in detached houses and close to one fifth (17.0 %) lived in semi-detached;
- In n 2020 almost half of the buildings **were built before 1970**;
- **High energy costs**

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Key requirements

Energy Efficiency Directive

- A **binding energy efficiency target** of reducing final energy consumption by at least 11.7% compared to projections of the expected energy use for 2030
- Extending existing energy savings obligations (1.5%/y)
- **Empower consumers** by granting access to information on their energy consumption
- Introducing an annual energy consumption **reduction target of 1.9% for the public sector** as a whole and **extending the annual 3% buildings renovation obligation** to all the levels of public administration

Energy Performance of Buildings

- Covers a broad range of policies and **support measures helping EU countries to boost the energy performance** of their buildings
- Clear vision for a **decarbonized building stock by 2050**;
- **Smart & Efficient buildings** through use of Information and Communication Technologies and Smart Technologies;

Industry

- **Expanded Audit Requirements** for SME companies if they are large energy consumers
- Large industrial energy consumers required to implement systems to **monitor and optimize energy efficiency**
- EUTaxonomy and EU directive on corporate sustainability
- List of new product groups;
- Bringing in a new obligation to monitor the **energy performance of data centres**
- Promoting **local heating & cooling plans in larger municipalities**

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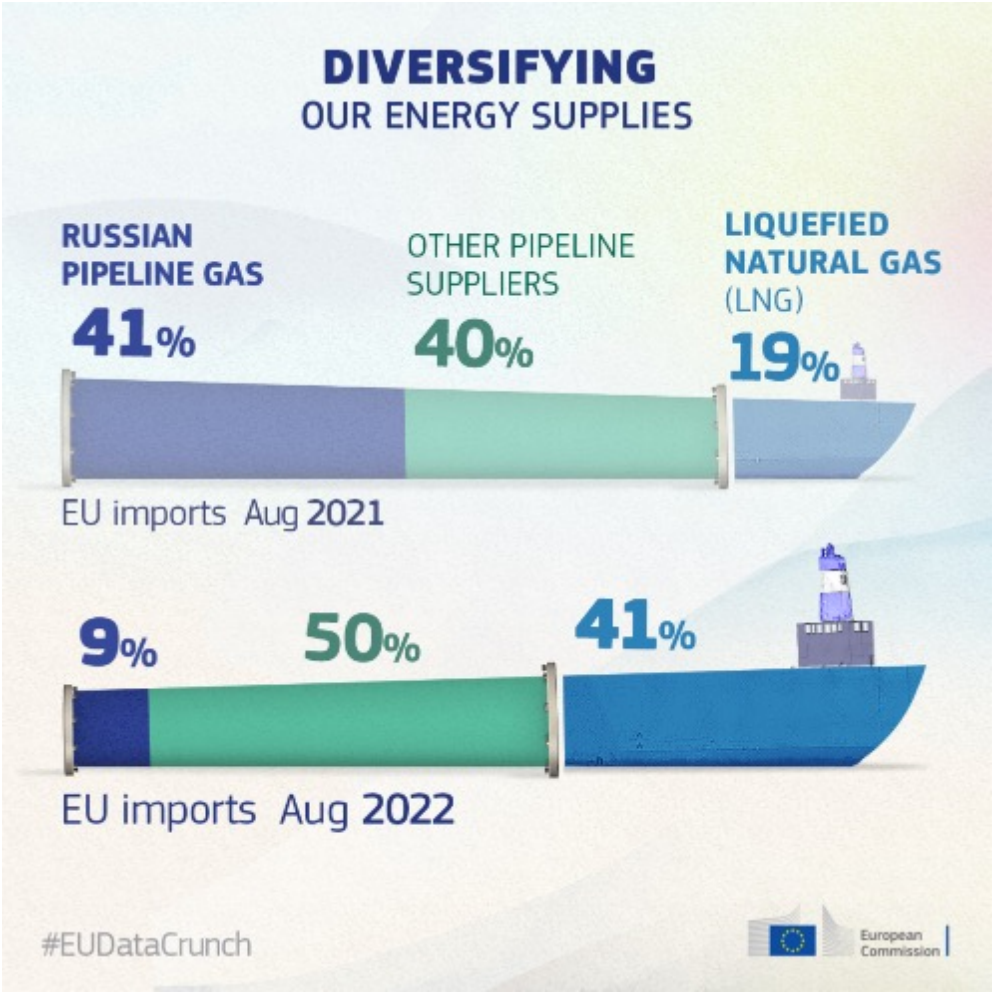
Driving forces - REPowerEU Plan

- Reduced its dependency on Russian fossil fuels
- Saved almost 20% of its energy consumption
- Introduced the gas price cap and the global oil price cap
- Doubled the additional deployment of renewables
- Since September 2022, Russian gas accounts for only 8% of all pipeline gas imported into the EU, compared to 41% of EU imports from Russia in August 2021



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Energy Performance of Buildings Directive

Long-term renovation strategies

- Vision of a **decarbonised building stock by 2050**
- **One-stop-shops** for the energy renovations of buildings and Smart Finance
- **Definition of deep renovation and the introduction** of building renovation passports

Energy Performance certificates (EPC)

Smartness readiness indicators

- **Long-term renovation strategies**
- Minimum **energy performance requirements**
- **Smart technologies**
- Health and well being – **sustainable buildings**
- National **finance measures**

Electro mobility and Renewable energy

- Ensuring new buildings are **solar-ready**
- **Recharging points** in commercial buildings
- A g**radual phase-out of stand-alone** boilers powered by fossil fuels, starting with the end of subsidies to such boilers from 1 January 2025

Nearly Zero-emission buildings

- Standard for new buildings, including a more ambitious vision for buildings to be **zero-emission buildings**
- **Better energy system integration** (for heating, cooling, ventilation, charging of electric vehicles and renewable energy)

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The Reviced Energy Performance of Buildings Directive

- As of **2030 all new buildings must be zero-emission**; new public buildings must be zero emission already by 2027

- The **worst-performing 15% of the EU building** stock will have to be upgraded from Energy Performance Certificate (EPC) **label G to at least label F by 2030,** public and non-residential buildings leading the way by 2027. Residential buildings should be renovated from G to at least F by 2030, and to at least E by 2033

- The **obligation to have an energy performance certificate is extended to buildings undergoing major renovation**, buildings for which **a rental contract is renewed and all public buildings**

- Requirement to roll out **charging infrastructure for electric vehicles in residential and commercial buildings** and to promote dedicated parking space for bicycles

- Buildings or building units which are **offered for sale or rent must have an energy performance certificate**, and the energy performance class and indicator should be stated in all advertisements

- National Building Renovation Plans will be fully integrated into National Energy and Climate Plans to ensure comparability and tracking of progress – they will need to include **roadmaps for phasing out fossil fuels in heating and cooling by 2040 at the latest**

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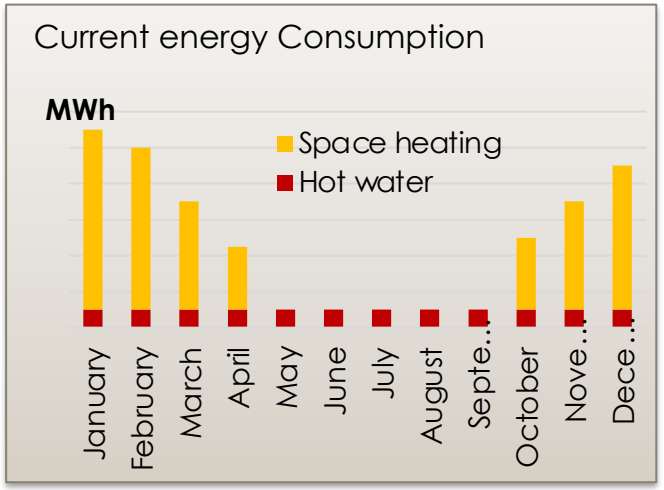
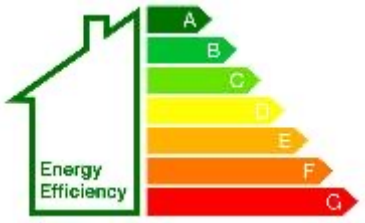
Energy Performance certificates in buildings

Energy Audit

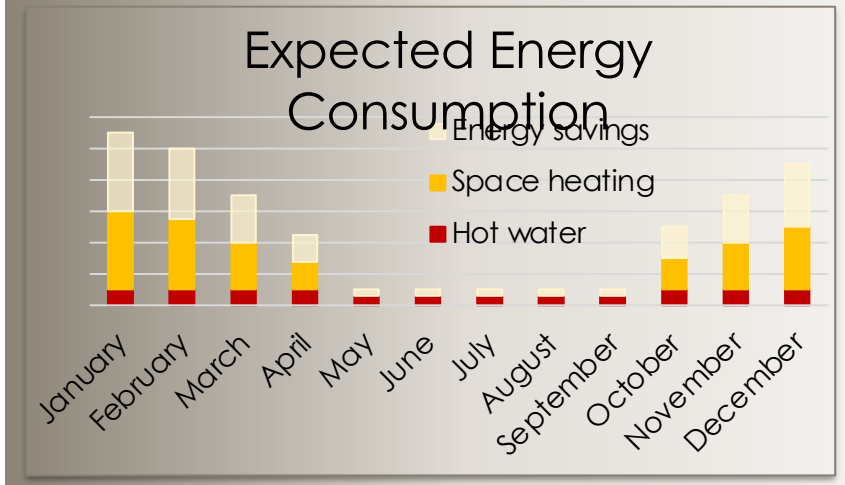




EPC - Energy Audit Report

Economic and financial analysis

Identify and quantify measures



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Energy performance certification of buildings

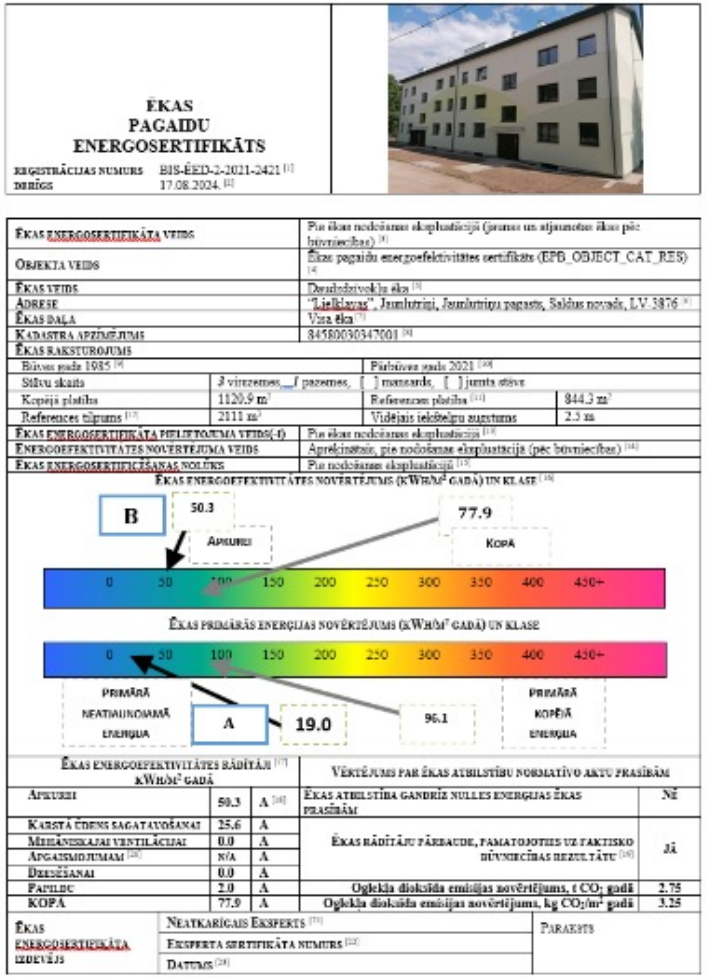
- All public buildings above 250 m^2
- All apartment buildings have to be certified by 2040
- All single family buildings have to be certified by 2050
- If apartment building uses more than 150 kWh/m^2 per year for space heating it has to plan energy efficiency measures

Increased reliability, quality and digitalisation of Energy Performance Certificates with energy performance classes to be based on common criteria:

- Quality
- Harmonisation (based on a harmonised scale using only letters from A to G and a template)
- Accessibility of Energy Performance Certificates

Inspection of heating and air-conditioning systems

Foreseen calculation life-cycle Global Warming Potential (GWP) and its disclosure through the energy performance certificate of the building



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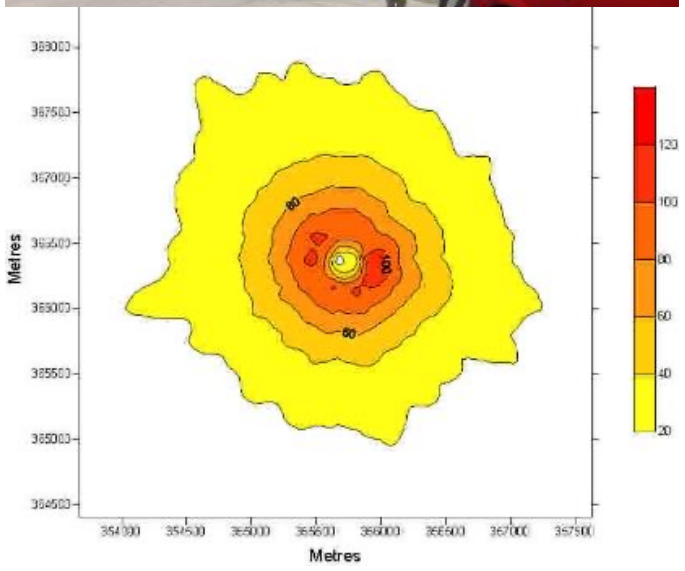
HVAC system energy audit

- Under the Energy Performance of Buildings Directive (2010/31/EU), all EU countries have established **independent control systems for energy performance certificates and inspection reports for heating and cooling systems**

Flue gas analysis (CO, NOx, t, O_2), fuel analysis (moisture %, Qzd), heat carrier flows (m^3/s)



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Requirements for energy auditors in buildings

- **Higher professional or academic education**, if the relevant educational program provides knowledge of thermal engineering of building envolope, building engineering systems (heating, cooling, ventilation, air conditioning, water supply, lighting), building climatology and indoor microclimate, energy efficiency assessment and calculation methods;
- Has gained **at least two years of practical experience** in assessing the energy efficiency of buildings, **working under the supervision of an independent expert**, whose competence has been proven for assessing the energy efficiency of an operational building or its part and issuing a building energy certificate, as well as for assessing the energy efficiency of planned new constructions, reconstructed or renovated buildings or their parts and issuing a temporary building energy certificate;
- **Passed the exam** at the certification institution (LSGUTIS)

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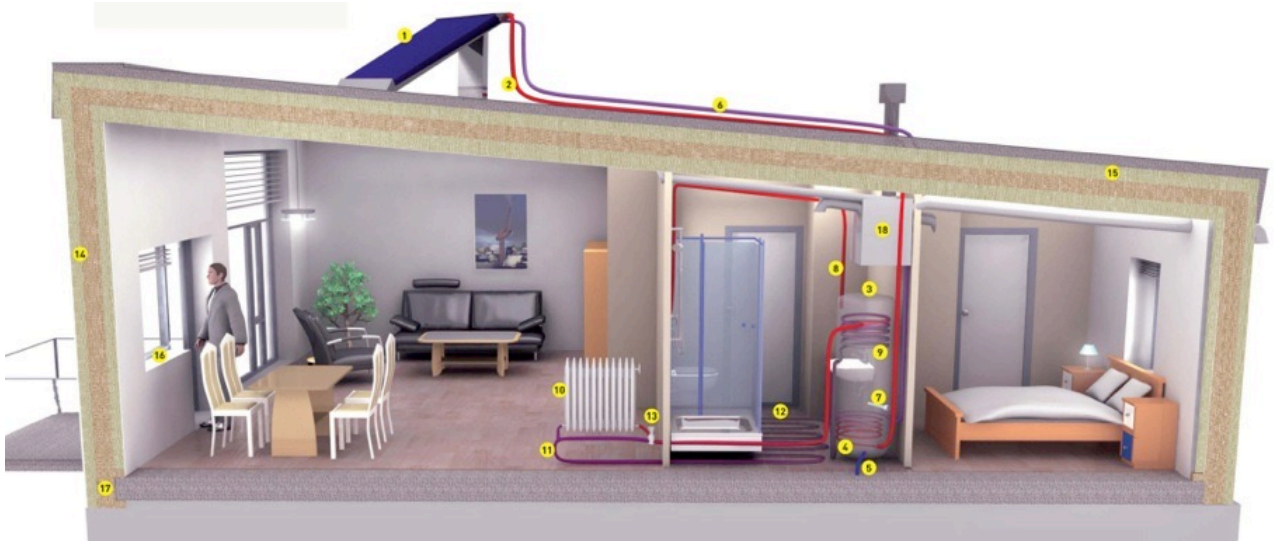
Nearly Zero Energy buildings

Transforms a building or building:

- before 1 January 2030, into a **nearly zero-energy building** (starting from 2021)
- as of 1 January 2030, into a **zero-emission buildings (**as of 1 January ***2028***, new buildings owned by public ***bodies***)



Bosco Verticale, Milan

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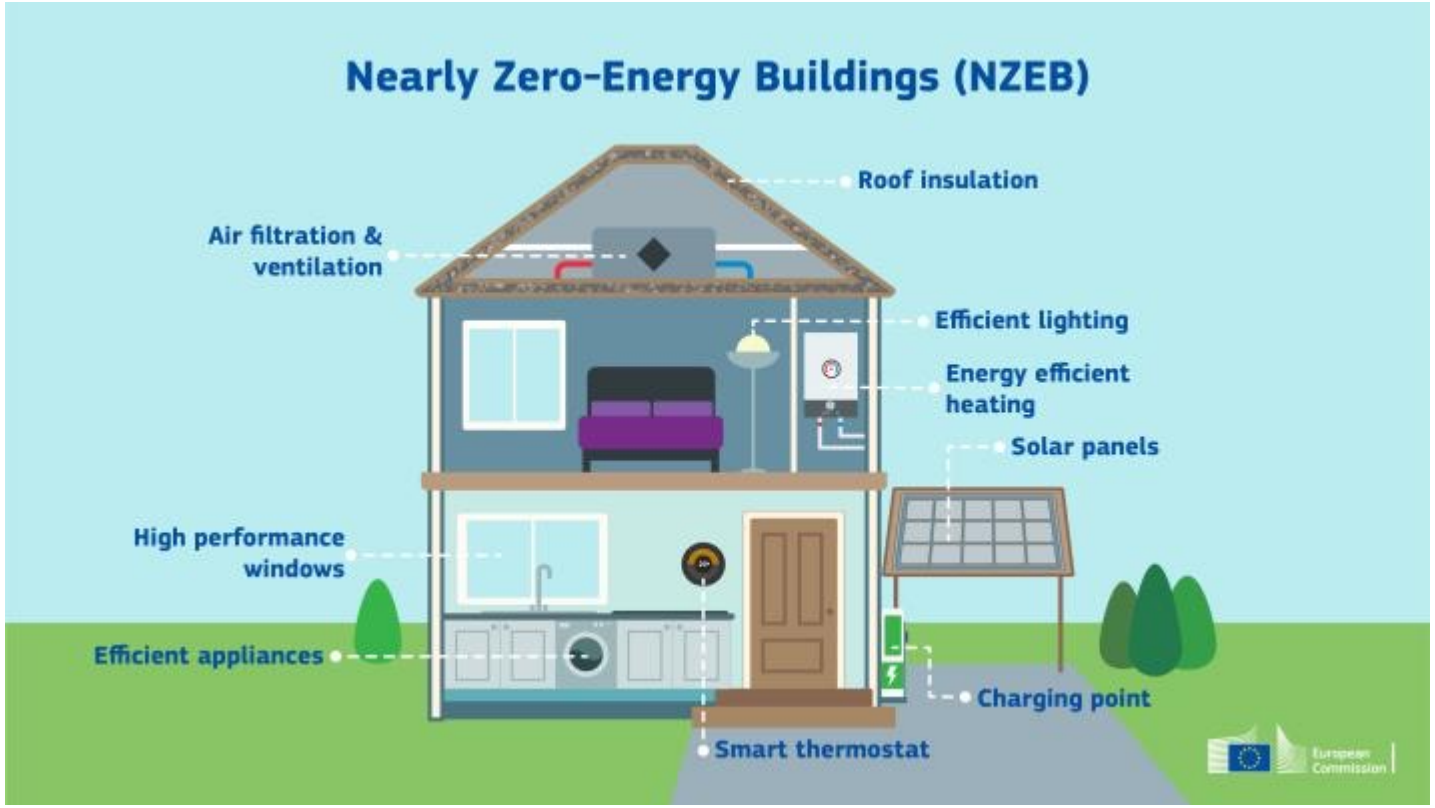
Zero-emission buildings

- Nearly zero-emission building (NZEB) means a building that has a very **high energy performance**, while the nearly zero or very low amount of energy required should be covered to a very **significant extent by energy from renewable source**
- and w**ithout on-site carbon emissions** from fossil fuels
- Focus of the proposal is the reduction of **operational greenhouse** gas emissions, ZEB definition further include the calculation life-cycle Global Warming Potential (GWP) and its disclosure through the energy performance certificate of the building



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Most popular sustainable building certification systems

Voluntary sustainable building certification shames:

- BREEAM - Building Research Establishment's Environmental Assessment Method
- LEED - Leadership in Energy and Environmental Design
- DGNB - German Sustainable Building Council
- PH – passive house
- CASBEE - Comprehensive Assessment System for Built Environment Efficiency
- ..

EU legislative requirements:

- Energy Performance certificates and minimum energy efficiency requirements
- CO_2 life cycle perspective and Level(s) framework
- SRI – Smart Readiness Indicators

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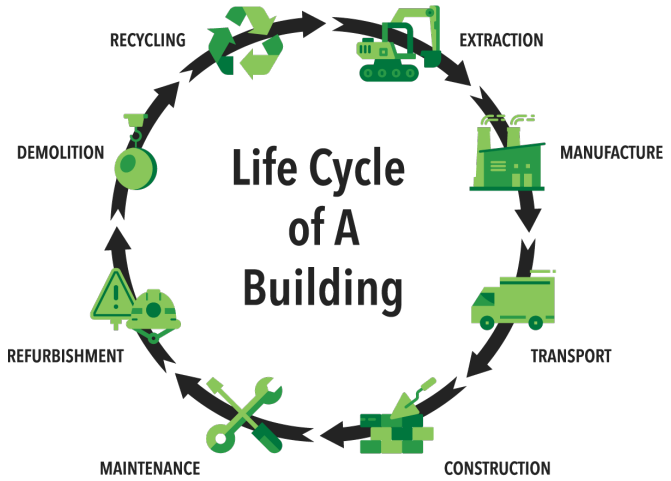
EU initiative that joins up sustainable building thinking across the EU

- **Sustainable building certifications,** also known as green building rating tools, evaluate and acknowledge buildings meeting specific sustainability criteria
- **These certifications serve to reward companies and organizations** for constructing and operating environmentally friendly buildings



LEED GOLD 2002 U.S. GREEN BUILDING COUNCIL

DGNB

BREEAM®

Energy Efficiency

Certified Passive House
Passive House Institute

CASBEE®

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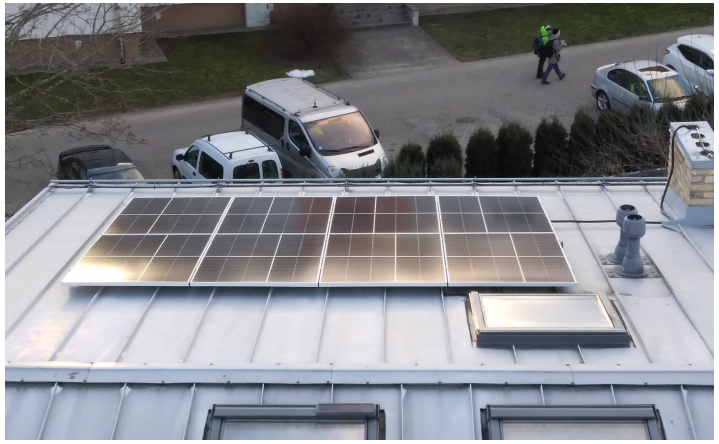
Energy management systems

- EE directive makes energy **management systems a mandatory requirement** for large industrial energy consumers to monitor and optimize their energy efficiency

- EPBD directive introduce Smart Readiness Indicators for buildings and use of BMS

- EPBD requires the mandatory **installation of building automation and control systems** for **non-residential buildings.** Whereas the threshold is currently set at an effective rated output >290 kW (large buildings), from 2030 this would be lowered to >70 kW (medium and large buildings)

- EU countries will also have to **promote local heating and cooling plans in large municipalities** having populations above 45 000



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