



# RESEARCH & INNOVATION FOR BUILDINGS IN THE EU: WHERE TO INVEST NOW FOR NET-ZERO EMISSIONS BY 2050

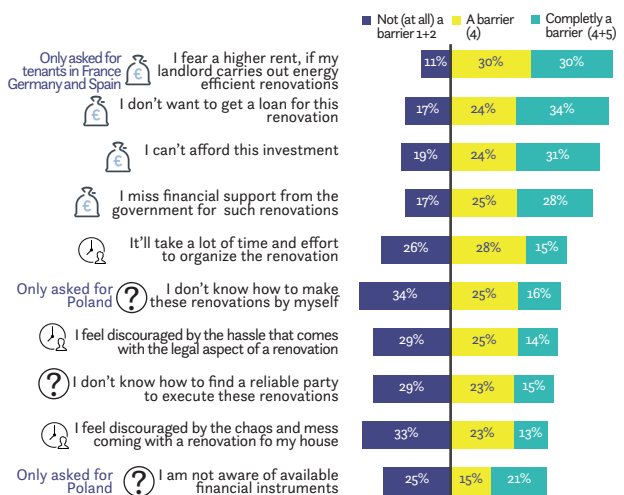
## Strategic importance of European buildings, and its decarbonisation by 2050:

- ✓ Buildings are the EU's single largest energy consumer. They account for 40% of energy consumption and 36% of CO<sub>2</sub> emissions.
- ✓ Over a third of EU's buildings are over 50 years old, and 97% of them are not energy label class A.
- ✓ A quality renovation of buildings improves residents' health, makes homes more affordable, increases property value, and alleviates energy poverty. Their present refurbishment rate needs to be scaled up by at least a factor of three.
- ✓ Investments in energy efficient components and technologies can stimulate the construction industry, responsible for close to 9% of Europe's GDP and 18 million direct jobs.
- ✓ The Energy Performance of Buildings Directive (EPBD) mandates development of stronger long-term national renovation strategies to renovate existing buildings into nearly zero-energy buildings (NZEB) in order to decarbonise national building stocks by 2050.
- ✓ The EPBD requires all new buildings must be NZEB by the end of 2020, and requires the issuance of energy performance certificates (EPCs) when buildings are sold or leased.

## Investments in innovation are key to decarbonising the buildings sector

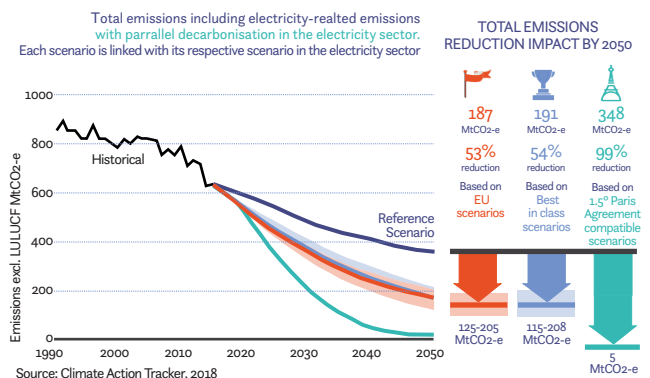
Innovation area	Priority areas for innovation investments
Smart buildings/ electrification	Smart-meters with sensors to integrate user behaviour
	Power-to-heat or activation of smart appliances
	Demand/response schemes
	Building automation and control systems
	Energy storage, e.g. flow batteries and molten salt storage
	On-site renewable energy generation systems
Digitalisation	Meta-database on building stock characteristics and needs, and financial prospects
Electrification	Deep electrification of energy services
	Embedded e-mobility infrastructure
Materials	3D scanning and building information models to prefabricate components
	3D printing, or additive manufacturing
Building envelope	Vacuum insulation panels, gas-filled panels, aerogels, and nano insulation materials
Heating & cooling	Thermally activated walls
	Heat pump and solar thermal water heaters
Lighting	Next generation light-emitting diodes

## Top 10 Barriers for energy efficient renovations: Citizens are mainly held back by costs, convenience, and of procedural awareness



Source: Ipsos, 2018

## Residential building sector. Potential emissions reductions by 2050



## Delivering net-zero homes at no extra costs for residents

### Case Study

energie sprong

- ✓ Dutch Energiesprong retrofits make homes net-zero energy through prefabricated facades, insulated rooftops coupled with solar panels, smart heating, as well as ventilation and cooling installations.
- ✓ Entire works can be carried out in under 10 days, in some instances these have been done in a single day. Retrofits come with an up to 40 year performance warranty for the indoor climate and energy performance of the home.
- ✓ Under a pay-as-you-save model, retrofits are financed by future energy cost savings and budgets allocated for maintenance and repairs for the next 30 years.
- ✓ A partner of the Horizon2020 project, Energiesprong is responsible for the retrofit of 5000 homes in the Netherlands and it is expanding its operations to other EU countries.



"We are used to thinking about buildings in terms of energy use, but they can now become a source. The renovation and modernisation of buildings improves our people's quality of life and creates local, qualified jobs in the construction and engineering sectors."

Kadri Simson, European Commissioner for Energy



# RESEARCH & INNOVATION FOR BUILDINGS IN THE EU:

## WHERE TO INVEST NOW FOR NET-ZERO EMISSIONS BY 2050

### Net-zero emissions European for buildings by 2050 is achievable

A climate-neutral European building stock by 2050 requires all new buildings to be NZEB. For existing buildings, these core energy efficiency measures must be implemented:

- 1 Improve building envelopes
- 2 Upgrade/modernise technical building systems with smart-ready technologies
- 3 Utilise renewable energy sources for (both thermal energy and electricity)
- 4 Innovation in new materials and new renovation business models

### Demand side R&I priorities

- » One-stop shops offering trustworthy technology advice to consumers to uptake renovation works.
- » Buildings that self-assess their energy performance and generate data:
  - At building-level and at system/appliance level.
  - To improve business intelligence and create predictive models.
- » Embedded e-mobility infrastructure.
- » Increased penetration of building integrated PV solutions to enhance roofs, facades and shading devices.
- » Integration of smart systems, smart controls, smart metering and smart appliances into existing buildings to interface and/or control energy consumption from appliances.

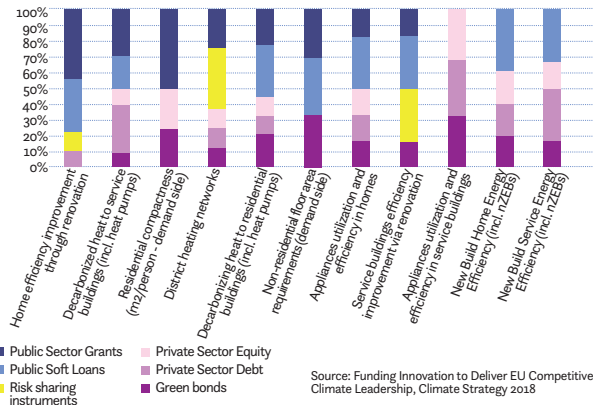
### Supply side R&I priorities

- » Automation and IT solutions to help manage energy within existing buildings and interact with the grid to provide more energy efficiency, flexibility, generation and storage, based on user preferences and requests.
- » Solutions to retrofit building-level heating and cooling systems and the integration of on-site renewable energy generation, energy storage systems which allow for:
  - Optimisation and flexible consumption.
  - Integration with district heating and cooling systems.
- » Energy efficient construction methods.
- » Develop infrastructure for safe and cost-efficient transport, storage and provision of green hydrogen.

### R&I investments need an aligned policy environment

- 1 Develop NUTS1-level strategies for construction companies, articulated with an EU strategy for building materials production
- 2 Align renovation efforts with building codes for inception of E-mobility infrastructure in buildings
- 3 Mobilise innovative public and private financing and investment for renovation works
- 4 Combat energy poverty and reduce household energy bills through renovation
- 5 Offer performance guarantees for energy consumption and indoor environmental quality as incentives
- 6 Develop a Smart Readiness Indicator (SRI) to measure buildings' capacity to embed new technologies and electronic systems
- 7 Synchronize the SRI with EPCs to conduct a joint assessment process of buildings to reduce overall assessment costs

### Finance Instruments needed to decarbonise EU buildings according to expert survey



### Case Study



### Innovative roof tiles that generate carbon-free solar energy

- ✓ Belgium's Smartroof has developed a range of roof tiles that fully integrate elements of solar PV panels.
- ✓ This potentially helps increase the area of house rooftops that can be covered by solar panels when compared to traditionally mounted PV systems. Smartroof's main product – called "suntiles" – can be integrated into the buildings' natural aesthetics. They can also be combined with traditional tiles like the ceramic tiles so common on rooftops across Europe.
- ✓ Homeowners can monitor performance of their solar roof tiles through a PC or smartphone app. Users can see daily, monthly, and annual returns. In the event of a technical issue they will be notified in real time.
- ✓ Smartroof's value proposition also entails:
  - Integration of PV with internal cooling solutions and heat recuperation capabilities
  - Financial return within 10 years
  - High efficiency
  - Modular solution with electrical circuits formed by clicking tiles together

### Participant Institutions:

CLIMATE & STRATEGY PARTNERS

