

# The contribution of research and innovation in the construction sector to energy efficiency and integration of renewable energy in buildings

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# Conclusions (for discussions)

1. Policy makers and the related implementation process should pay specific attention to facilitating a correct assessment of innovative building and control technologies in regulatory EPBD related approaches
2. Construction 4.0 (with BIM) can substantially contribute to smarter implementation of building related energy policies but it requires preparation
3. Renovation policies and solutions should not only think with the typical solutions of today and may require specific actions

# Overall context

## Energy policy

- NZEB requirements (and beyond) are **challenging**
- **Reliability** of EPC and compliance is important
- Environmental impact of the existing building stock must drastically reduce by 2050, which is economic challenging

## Technology context

- Interesting developments in building products and systems and in control
- Construction 4.0 and BIM
- Renewables will cover by 2050 a major part of energy production

# 1. Development of new materials and systems

- **Building envelope:** insulation, windows, solar control, airtightness, ...
  - Sometimes small improvements, sometimes disruptive changes
  - Examples: vacuum insulation, vacuum glazing, ...
- **HVAC technologies**
  - Heating and cooling: heat pumps, geothermal systems, ...
  - Ventilation: demand controlled systems
- **Smart technologies**
  - Indoor climate control, optimal system use
  - Good indoor climate (avoidance overheating, good IAQ), ...

**Important developments**

# 1. Development of new materials and systems

- Possibilities for substantial reduction in energy **demand**
  - Less need for energy supply to the building (heating, cooling, lighting, domestic hot water)
- Possibilities for substantial increase in efficiency of energy **production**
  - Lower environmental impact of energy production
- Possibilities for substantial improvements in **control** (indoor climate and power management)
  - Better living conditions
  - Better match between demand and supply

**Practical impact**

# 1. Development of new materials and systems

- EPBD related assessment frameworks must allow to correctly integrate these new systems and innovations
- The QUALICHeCK project indicates that this is in many countries not really the case
- If not, EPBD legislation can be a major barrier for innovation

Considerations regarding energy policy





## CONSTRUCTION 4.0



## 2. Construction 4.0 – BIM

- **Use of present EPB methods towards NZEB: various concerns**
  - Move towards NZEB and beyond means often an increased complexity
  - EPBD methodology is sometimes a barrier for innovation
  - It is challenging to correctly assess issues as e.g. overheating
  - Often limited compliance checks and/or enforcement
  - Each country has its own methodology (quite similar but not the same)
  - It is challenging to have a smart assessment of 'smart'
  - Growing need for a more global assessment (from building to communities)

Important developments





## 2. Construction 4.0 – potential of BIM

### Smart implementation of BIM ...

- Very substantial reduction in required efforts for data collection
- Possible to simplify and at the same time to have a more refined analysis
- Potential of much more robust framework for compliance
- More suitable for dealing with innovation
- More chances for a really European EPBD method
- EPBD assessment can become part of design process
- Potential contribution to a better quality of the works
- Same approach possible for e.g. environmental assessment

**Potential impact of BIM**



## 2. Construction 4.0 – BIM

- **Regulatory environment:**

- (National) authorities should consider/evaluate the possibilities for stimulating/allowing BIM for EPBD assessment

- **Standardisation:**

- BIM use for EPBD assessment might allow more refined assessment methods AND require more and/or different CEN standards

**Considerations regarding energy policy**





# **We often optimise by using present technologies for providing answers in 2050...**



**Very well insulated and  
airtight building envelope**



**Condensing boiler**

### 3. Renovation policies and solutions should not only think with the typical solutions of today

- Today:
  - Condensing boiler can be a good choice
- In ...20... years
  - Probably necessary to replace the boiler - Probably less evident to use then gas or fuel
  - Possible alternatives:
    - Heat pumps - District heating and cooling - ...
  - Important that possibilities for such switch are optimally prepared
- In terms of EPC:

	Building with condensing boiler	Building with heat pump
Today	100	100



**Condensing boiler**



# In case of existing buildings



**Very well insulated and airtight building envelope?**

- **Non-insulated cavity wall**

- Filling existing cavity with insulation is easy, not so expensive (...20 €/m<sup>2</sup>) and reasonable pay-back time, substantial comfort improvements
- Modest investment – easy to implement
- If one wants a high performance wall:
  - External (or internal) insulation
  - Expensive, pay-back time not evident
  - External insulation may substantially upgrade building look
- Each € can only be invested one time...

- **Non-insulated floor on ground**

- Very substantial and expensive works to insulate
- Is it a must to insulate or can it be a valid alternative to focus in such case on improved energy production?

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