ENERGY EVALUATION EUROPE

ENERGY EVALUATION EUROPE CONFERENCE 2025

SHOW ME THE EVIDENCE: EVALUATION AS THE DECISION MAKER'S BEST RESOURCE

25 SEP - 26 SEP 2025

BERLIN

PATTERN

Providing operational economic appraisal methods and practices for informed decision-making on climate and environmental policies

Session 12 – Improving impact evaluations and policy design IV: Bridging ex-post and ex-ante

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Introduction to the analysis

- **Main goals:**
  1. How do emission projections for the years 2000 to 2020 compare with reported emission inventories for the same period?
  2. Which parameters and drivers are most critical in understanding uncertainties in the projection of scenarios?

- **Scope:**
  - **GHG projection scenarios** for the period 2000-2020
  - Buildings sector covering **residential and services sector in Belgium and the Netherlands**

- **Projection scenario included:**
  - Reference scenarios, reference variants and additional policy scenarios
  - **Belgium:** 28 scenarios
  - **The Netherlands:** 15 scenarios

Deviations between CO_2 emission projections and historical trends for residential buildings (kt)

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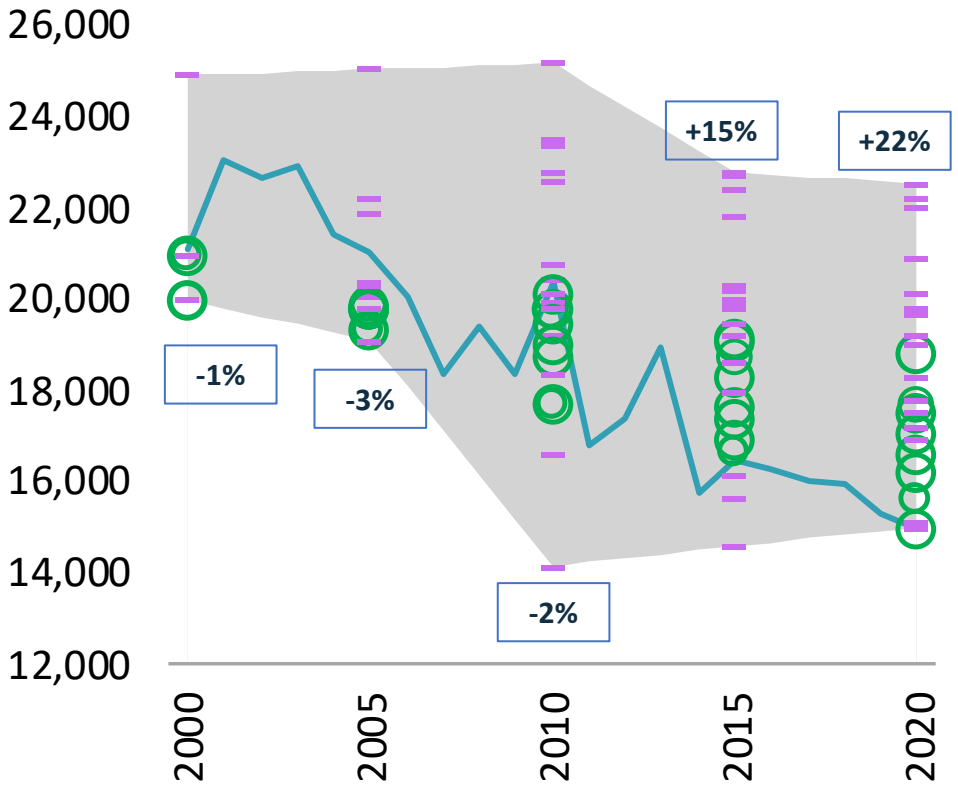

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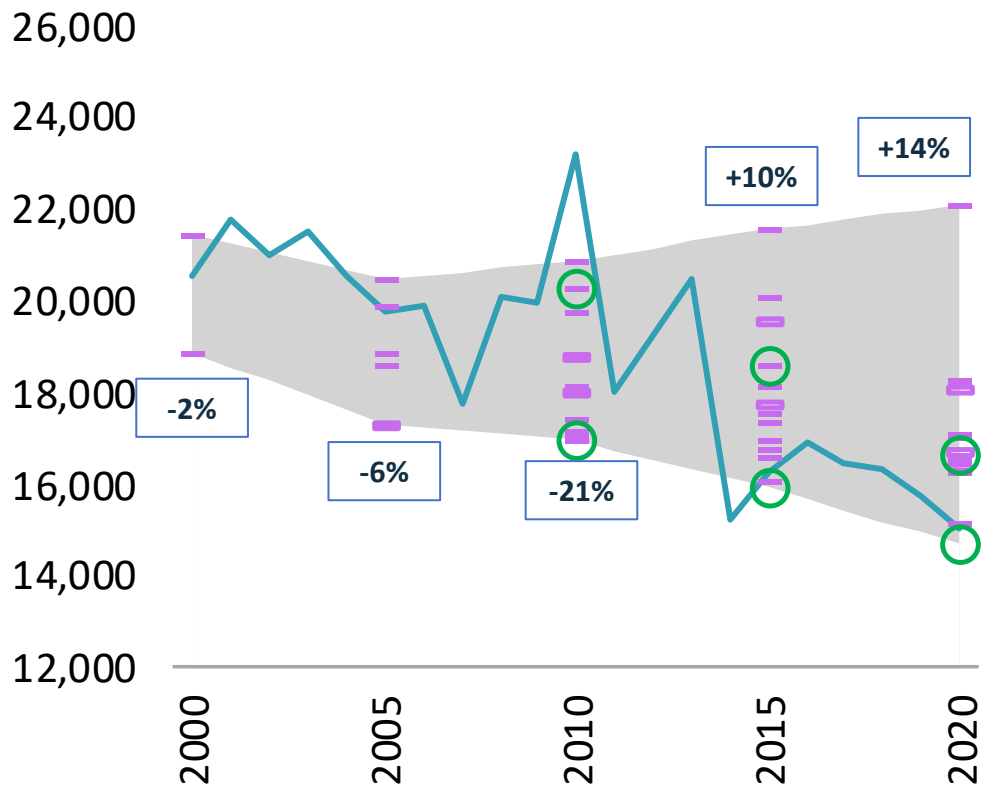

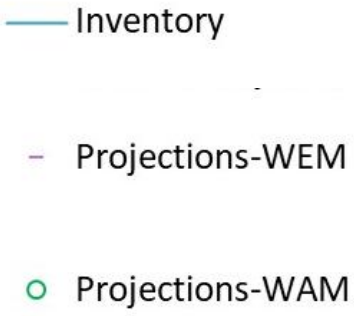

Deviations between CO_2 emission projections and historical trends for the service sector buildings (kt)

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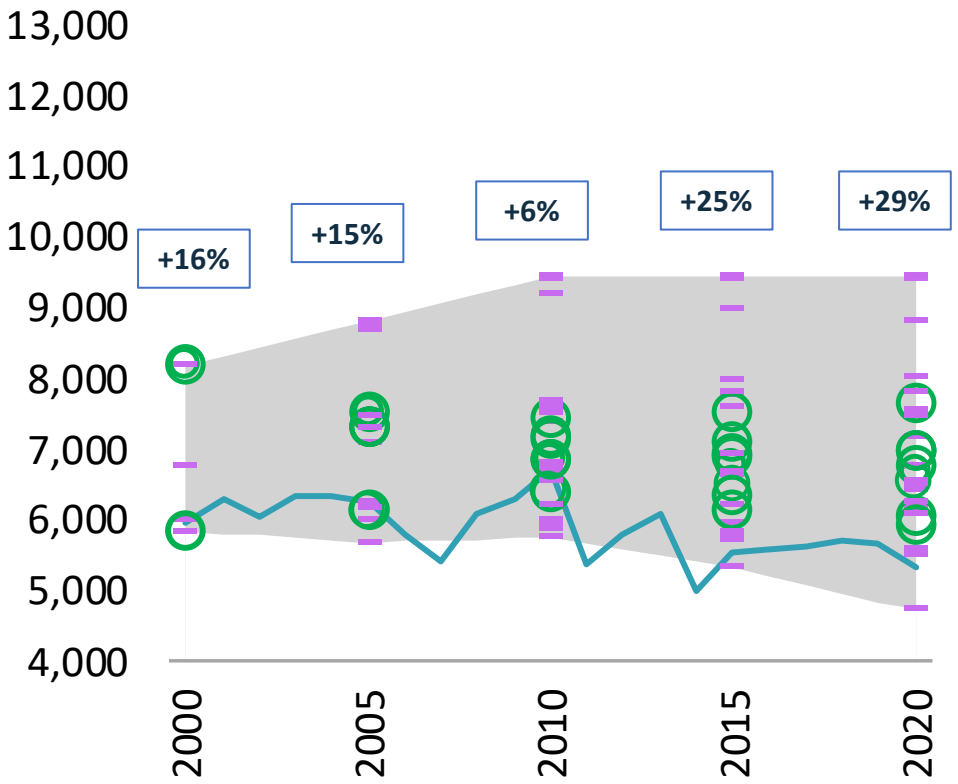

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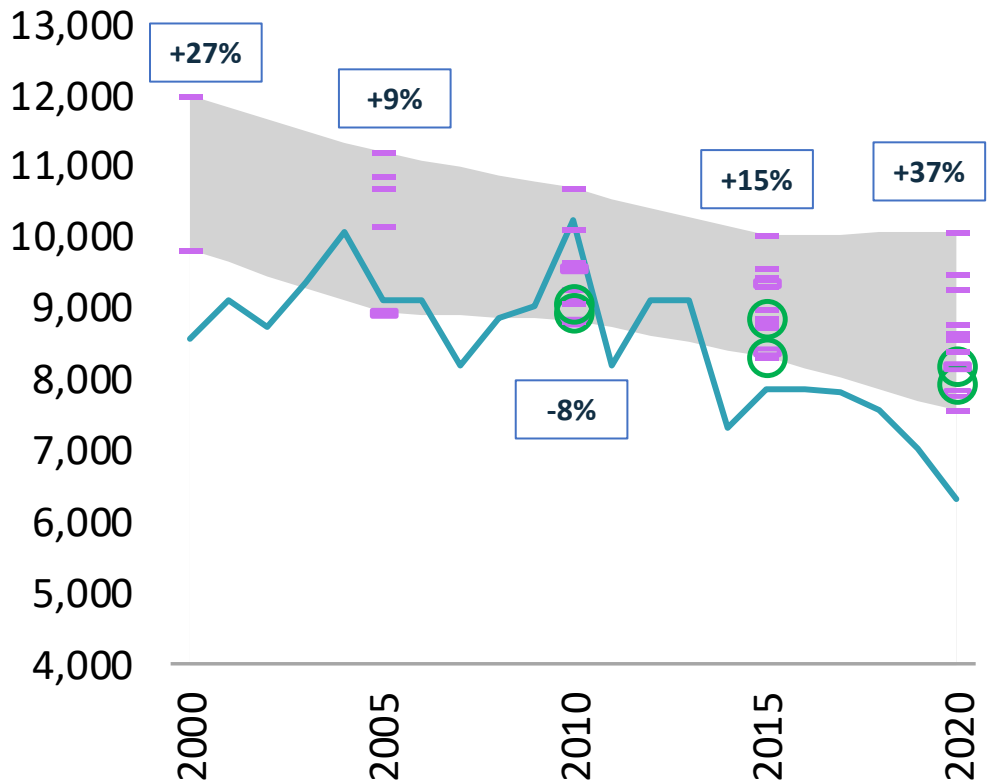
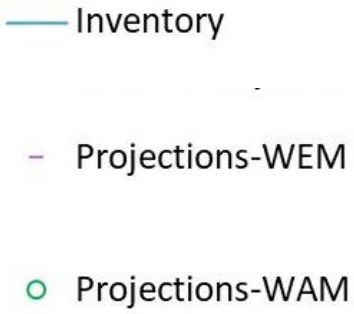
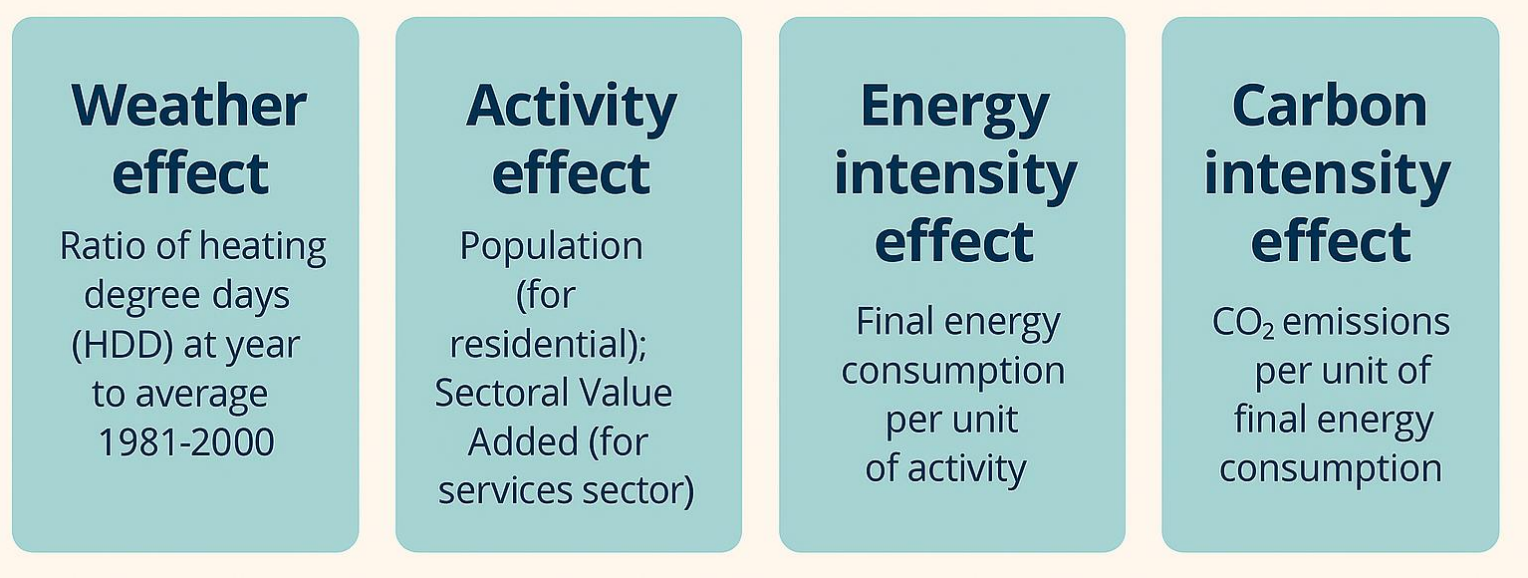




Understanding deviations using decomposition analysis



Main limitations:

- Limited documentation of scenario assumptions restricted the depth of analysis, focusing results on broad patterns rather than detailed insights
- Energy intensity: broad - capturing aggregated effects of technological and behavioural changes
- Comparability of parameters between scenarios: relied only on variables consistently available across scenarios
- Availability of historical data: excluding important factors, e.g., insulation levels, heating system types, building stock data

A focus on the residential buildings

The key drivers of emissions in residential buildings

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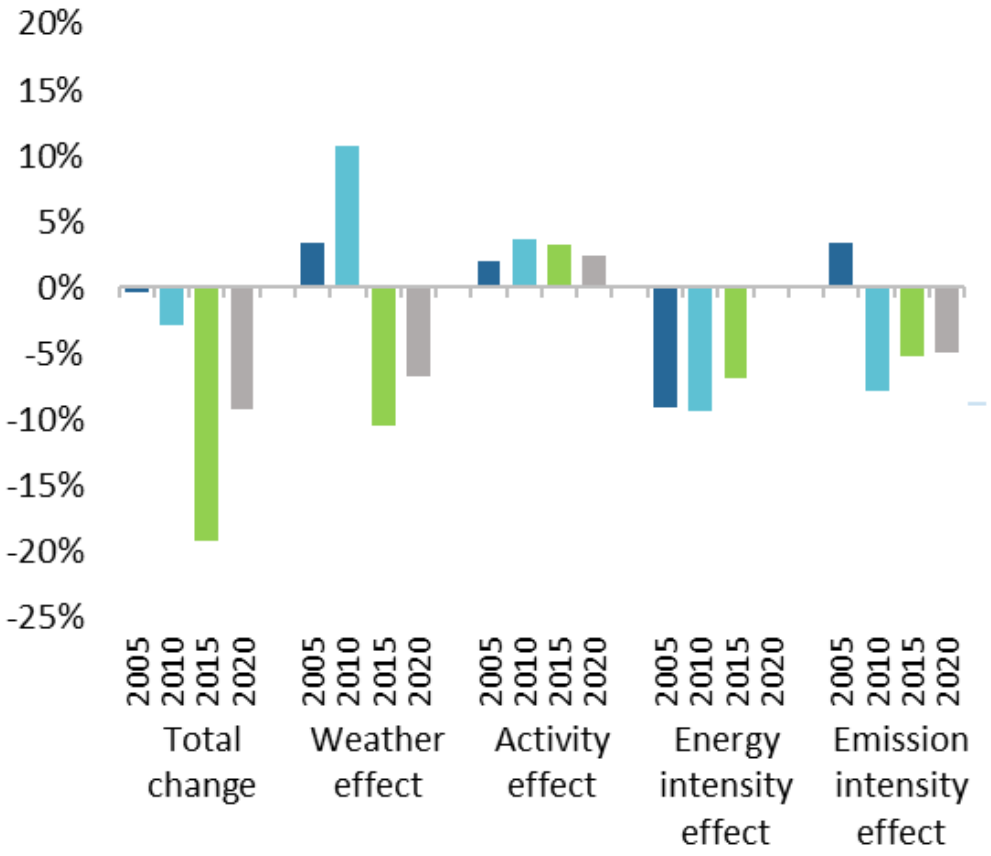

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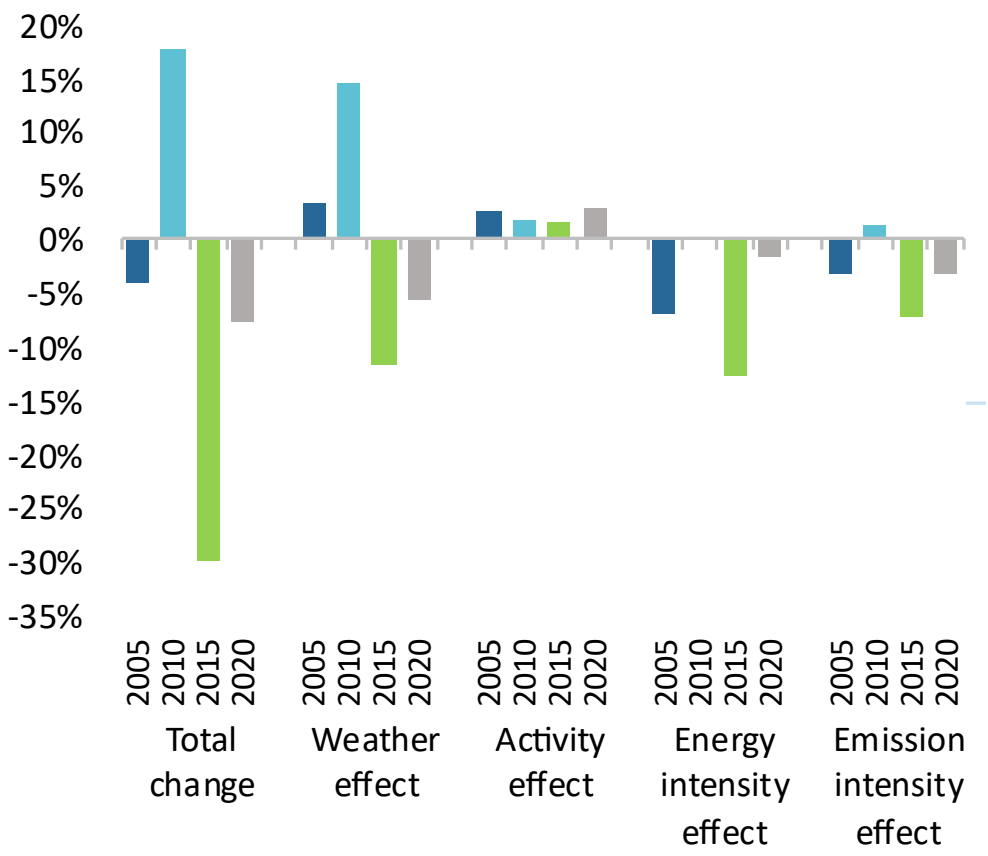
Based on GHG inventory



Differences between decomposition of emissions in the inventory and projections for residential buildings

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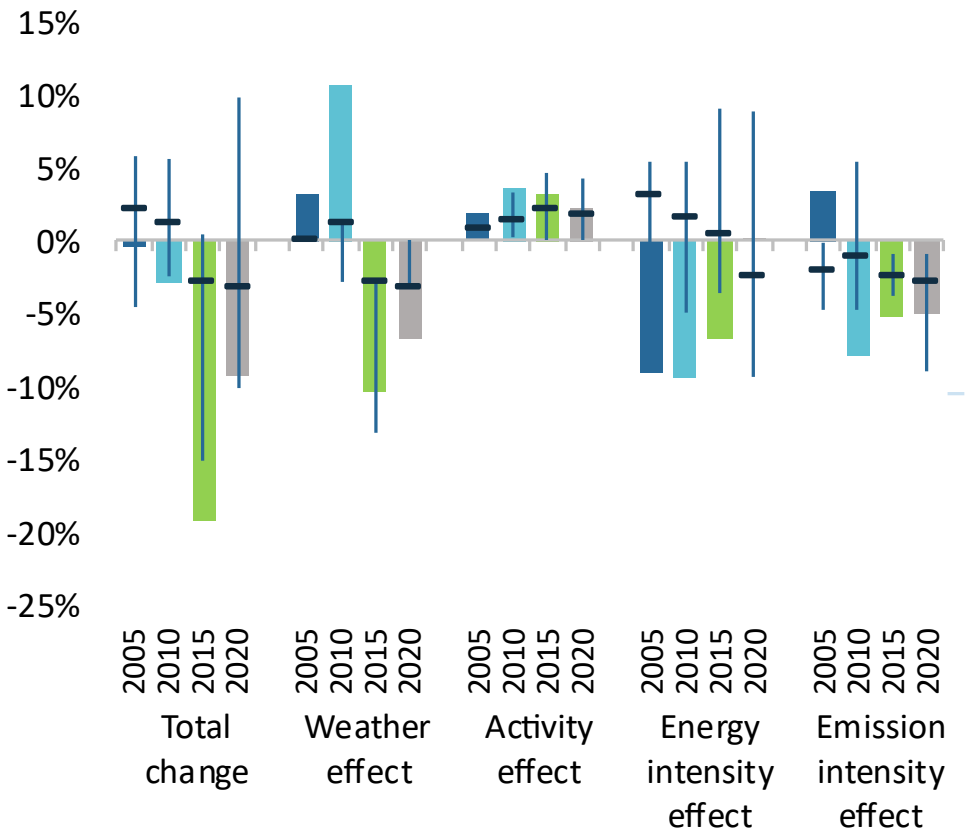

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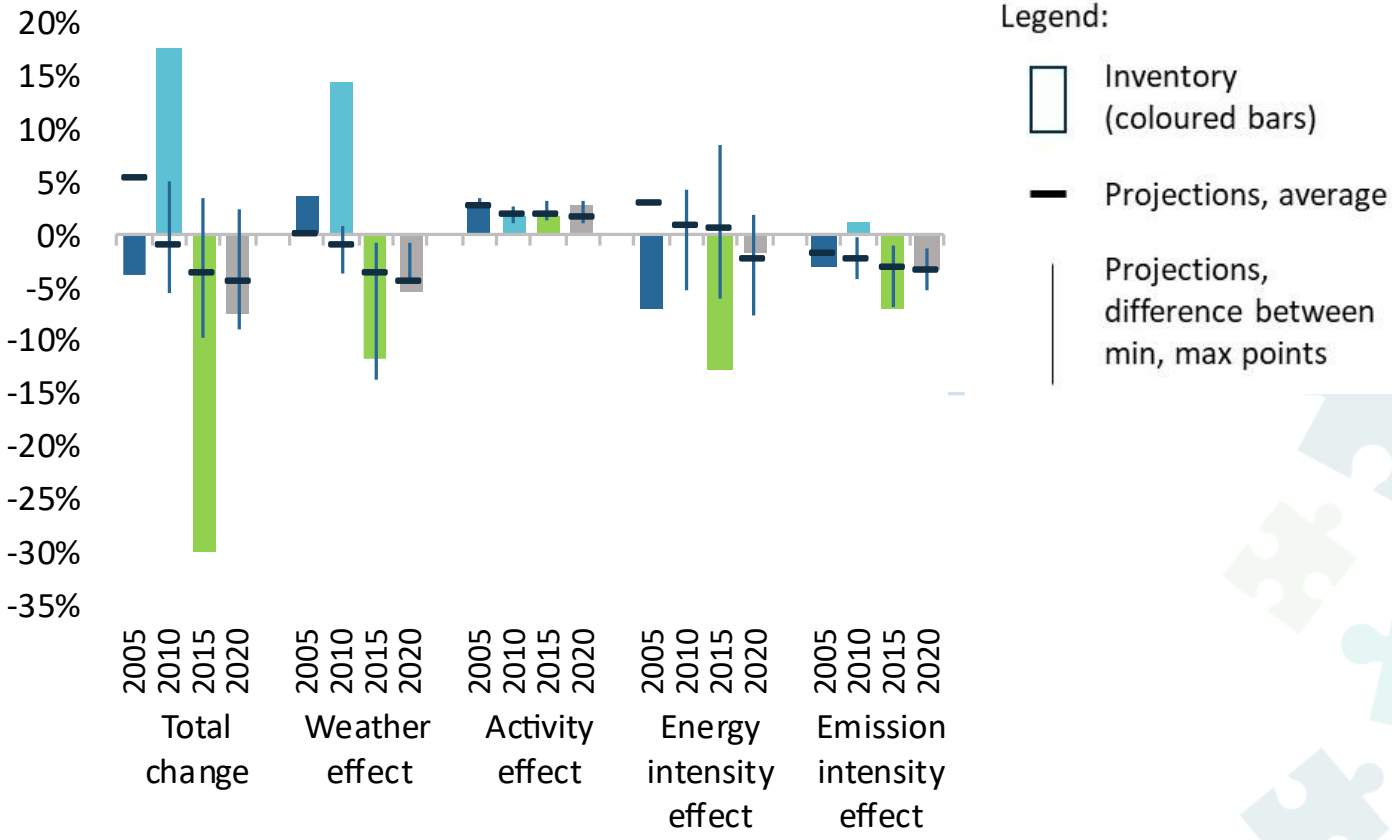
Including projections



Main findings

- **Key uncertainties**:
  - **Energy intensity** (efficiency improvements) – consistently misrepresented, often conservative.
  - **Heating degree days (HDD)** – methodological inconsistencies and climate assumptions added uncertainty.
  - **Socio-economic activity** – population fairly well captured, but **economic growth overestimated**, especially in the service sector.
  - **Emission intensity** (fuel mix shifts) – relatively accurate due to gradual, stable declines
- **Systematic overestimation**: Projections for Belgium and the Netherlands consistently overestimated CO_2 emissions and energy use, especially in the **service sector**
- **Ambition levels**: Many scenarios underestimated the impacts of energy efficiency and policy measures. Even recent scenarios still showed deviations >10%

Lessons learnt

- **Energy Intensity is a critical driver**: The main uncertain and overestimated parameter. Need for better modelling of efficiency gains, building stock evolution, and behavioural change
- **Emission intensity more accurate than energy intensity**: Projections aligned well with historical steady decline, but underestimated potential for structural energy mix changes
- **Weather assumptions**: HDD projections varied, often underestimated, showing the need for improved modelling of climate impacts on heating (and cooling) demand
- **Prevailing concerns shaped scenarios**: Conservative assumptions limited the scope for anticipating deeper transitions
- **Future needs**:
  - Develop multiple policy scenarios to reflect a wider range of uncertainties.
  - Incorporate dynamic modelling of **economic, demographic, and weather variables**.
  - Integrate **retrospective and ex-post policy assessments** to improve accuracy.
  - Account for **emerging structural shifts** (e.g., remote working, new technologies).