Evaluation into Practice to Achieve Targets for Energy Efficiency

EPATEE

Introduction to the project

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FIRE

Webinar EPATEE

14 December 2018

This project has received funding from the European Union's Horizon 2020 Research and innovation programme under grant agreement No 746265.

The EPATEE project

OBJECTIVE: **creating favourable conditions** for improving the number, quality/performance and effective use of **ex-post impact evaluations** of energy efficiency policies.

CONCEPT: improving key stakeholders' evaluation practices can lead to a better understanding and knowledge of impacts and how policies work, and thereby to increasing effectiveness of policies

Create the favourable conditions for ex-post impact evaluations

Building resources based on up-to-date knowledge and concrete experience feedback

Creating the conditions for an effective use of these resources

Knowledge Base
(user-oriented database of references)

Guidance and support

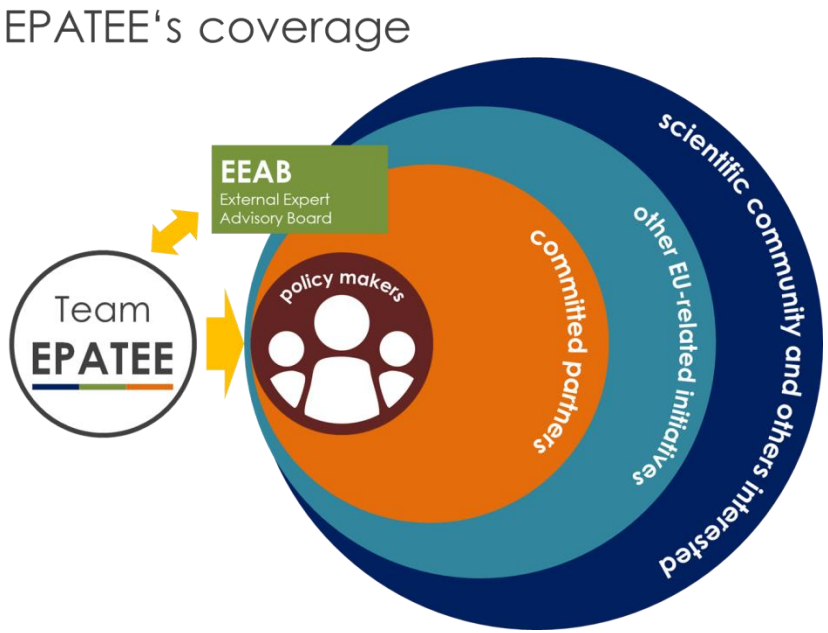
Case studies
(about ex-post evaluations)

Online toolbox
making resources easy to use

Experience sharing
targeted workshops, webinars, etc.

Dissemination
of results

Stakeholder involvement



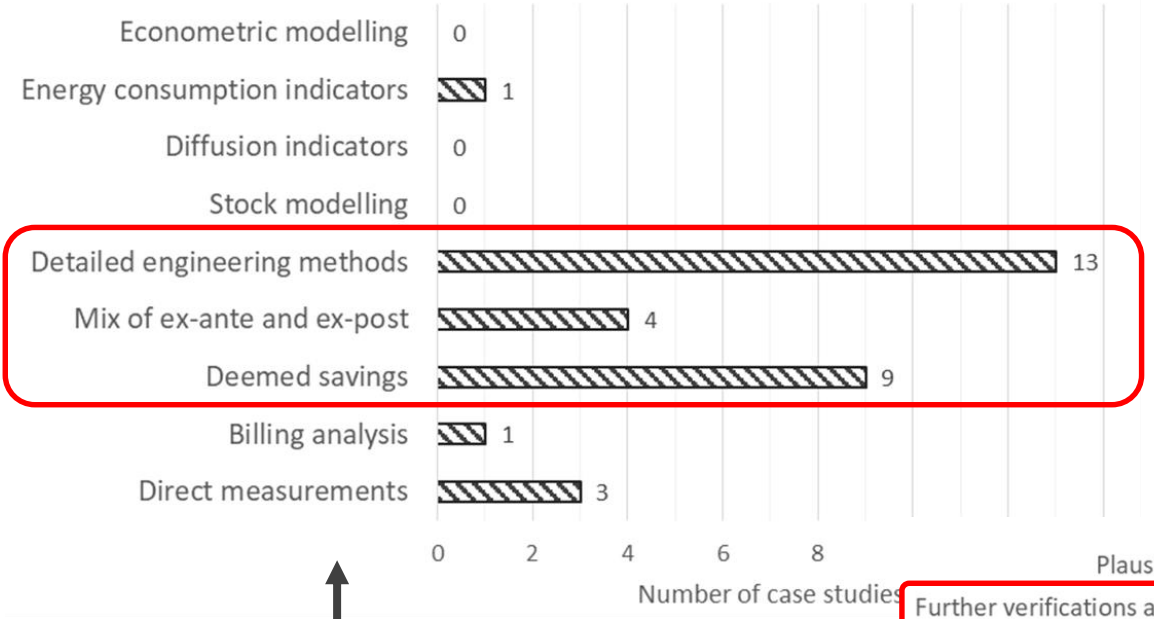
- Interviews with key stakeholders
- Surveys on evaluation practices
- EU peer-learning workshops
- National peer-learning workshops
- Webinars
- Direct support
- EPATEE newsletter

Previous experience sharing webinars about *How energy efficiency policy evaluation can produce* ***benefits and add value to policy makers****?*

Recordings available at:

https://epatee.eu/events-webinars

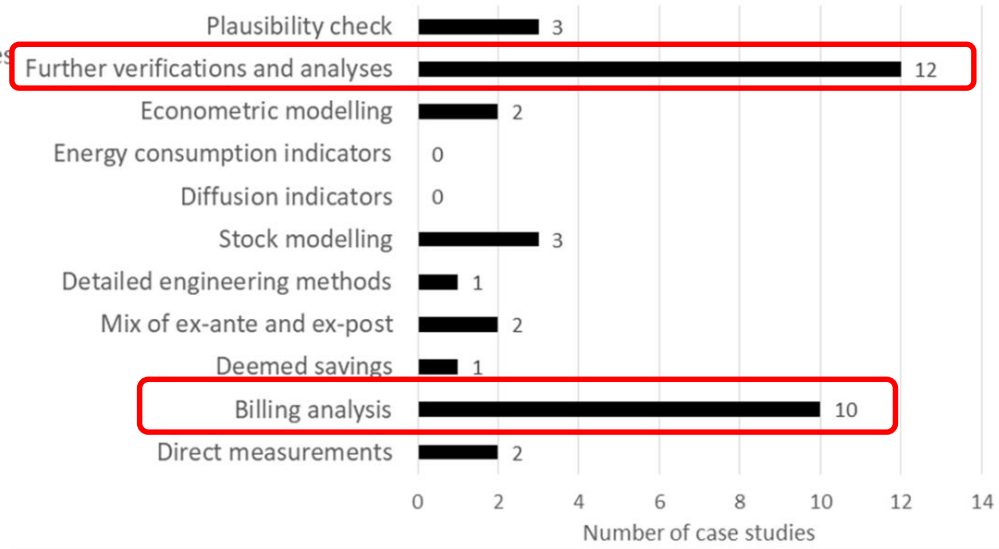
Comparing estimated and measured energy savings: why raising this topic?



Analysis of the 23 EPATEE case studies

Regular monitoring

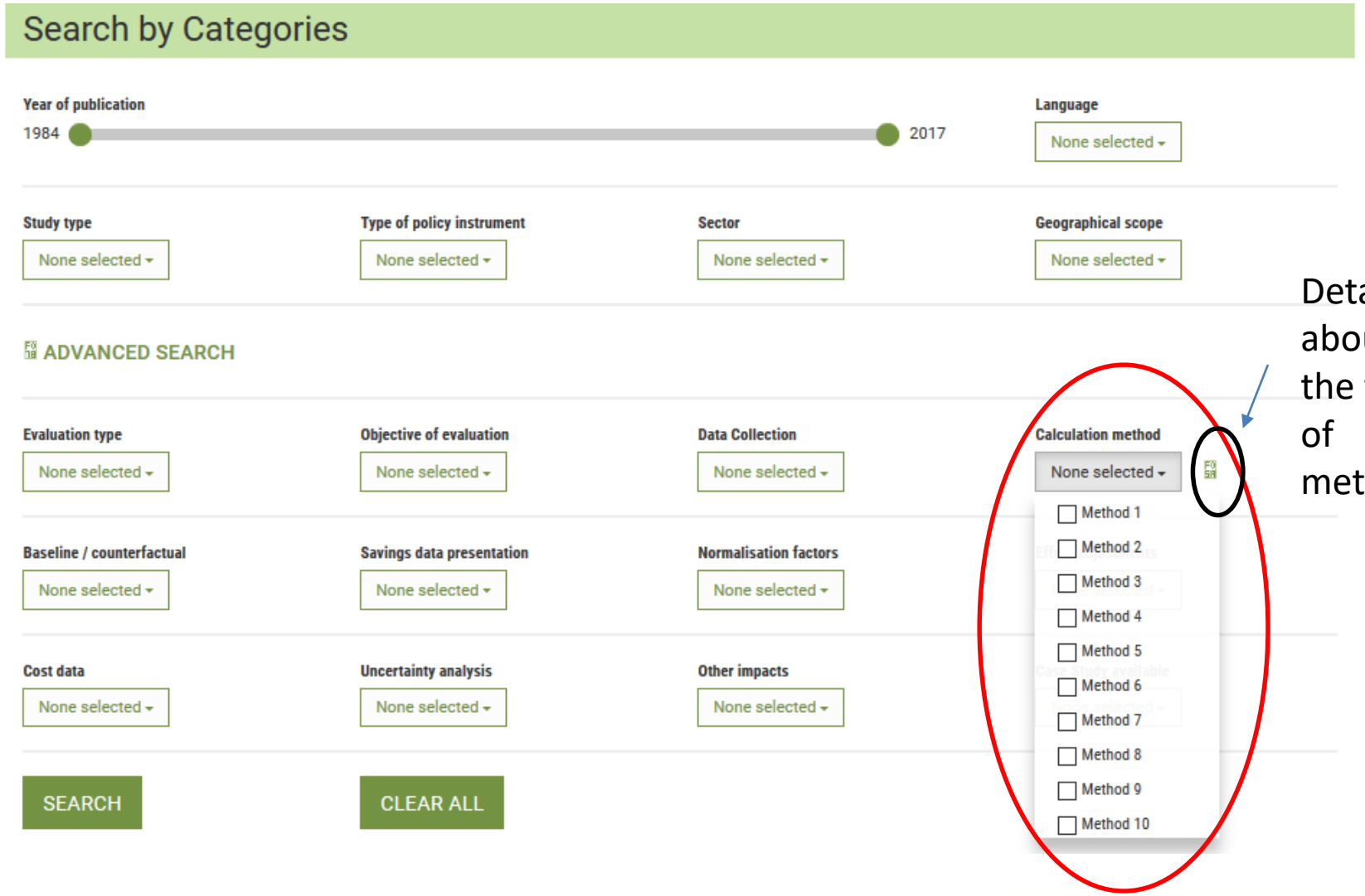
Ex-post evaluations or studies



Comparing different methods: examples

Examples of use or comparison of different methods	Cases where these examples are mentioned
Plausibility check of the overall results (comparison with trends in energy consumption, and/or comparison with previous periods)	Environmental support scheme (AT), EE programmes of Vienna (AT), Primes Energie (BE)
Comparison of surveys and econometric analysis to assess additionality	EEO scheme (DK)
Comparison of different statistical methods	"Future investments" programme
Comparison of engineering calculations and billing data/analysis	Better Energy Homes (IE), Renovation programmes (LT), Subsidy scheme for housing corporations (NL), Supplier Obligation (UK), Warm Front (UK)
Comparison of monitoring of energy efficiency indicators (top-down approach) and monitoring based on engineering estimates at project level	Multi-year agreement (NL)
Comparison of standardised laboratory tests and field measurements	Purchase tax on new cars (NL)
Comparison of different methods to normalised energy consumption for weather conditions	WAP (US)

Looking for more references: EPATEE Knowledge Base



Details about the type of methods

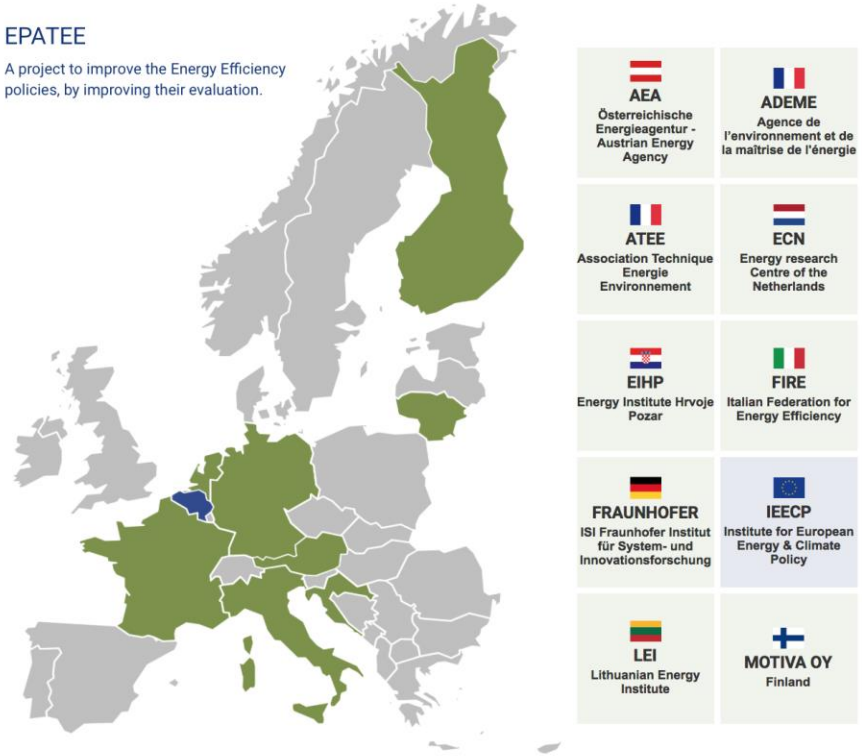
What's next?

- Two other examples to be presented today during this webinar !
- Topical case study about *Comparing estimated and measured energy savings* → to be published early 2019
- A second webinar on this topic in the first quarter of 2019

STAY TUNED!

Contacts

Thank you for your attention!



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EX POST EVALUATION OF THE CZECH GREEN INVESTMENT SCHEME

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EVROPSKÁ UNIE
Evropské strukturální a investiční fondy
Operační program Výzkum, vývoj a vzdělávání

MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

Fit-to-NZEB
Innovative training schemes for retrofitting to nZEB-levels

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WILEY WIREs ENERGY AND ENVIRONMENT

OVERVIEW

Ex post evaluation of energy efficiency programs: Case study of Czech Green Investment Scheme

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A significant amount of financing has been available for improvements in energy efficiency in buildings in recent years. However, careful evaluation of the real impacts of the programs is still inadequate. The paper provides an insight into the relationship between the expected outcomes and the actual results of an energy efficiency program. It does so on a case example of one of the most significant energy efficiency and renewable energy sources programs in Central Europe, the Green Savings Programme. In total, 206 measures were inspected in 124 projects of the program. The analysis of the inspections showed that there is a significant difference between the expected, verified CO_2 emission reduction and ex post, real attained reduction (25% on average). The reasons are partly methodical, but most can be attributed to the behavioral factors of occupants in the respective buildings. The results therefore clearly show the need to tackle the relationship between the calculated (expected) energy savings (and related CO_2 emission reduction) and the real savings which are highly influenced by building users. Ex post evaluations should be done, among other things, to provide a more accurate picture regarding the member states' energy efficiency improvement obligations. Furthermore, such evaluation also provides an essential input for further optimisation of the future energy efficiency support programs.

This article is categorized under:
Energy Efficiency > Economics and Policy

KEYWORDS
energy efficiency, Green Investment Scheme, policy evaluation, prebound effect

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Valentová Michaela, Karásek Jiří, Knápek Jaroslav. Ex post evaluation of energy efficiency programs: Case study of Czech Green Investment Scheme. *WIREs Energy Environ.* 2018. doi: 10.1002/wene.323

Motivation

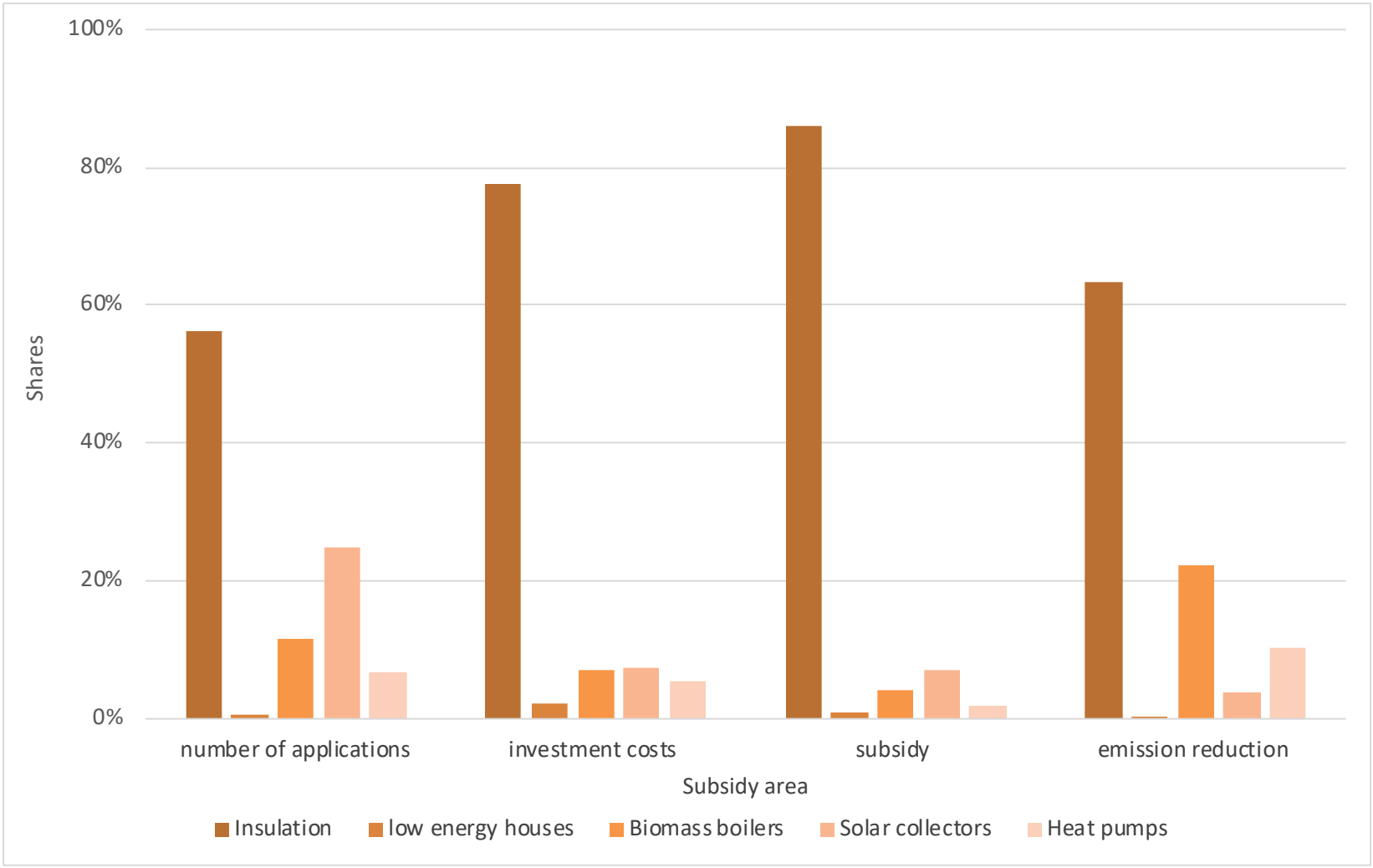
To evaluate **the real outcomes** of the energy efficiency and RES programmes

To bring insight into the **relation between expected and real emission** savings.

Reasons behind the differences

Based on **ex post on-site inspections** carried out within the programme as a prerequisite by the buyers of AAUs.

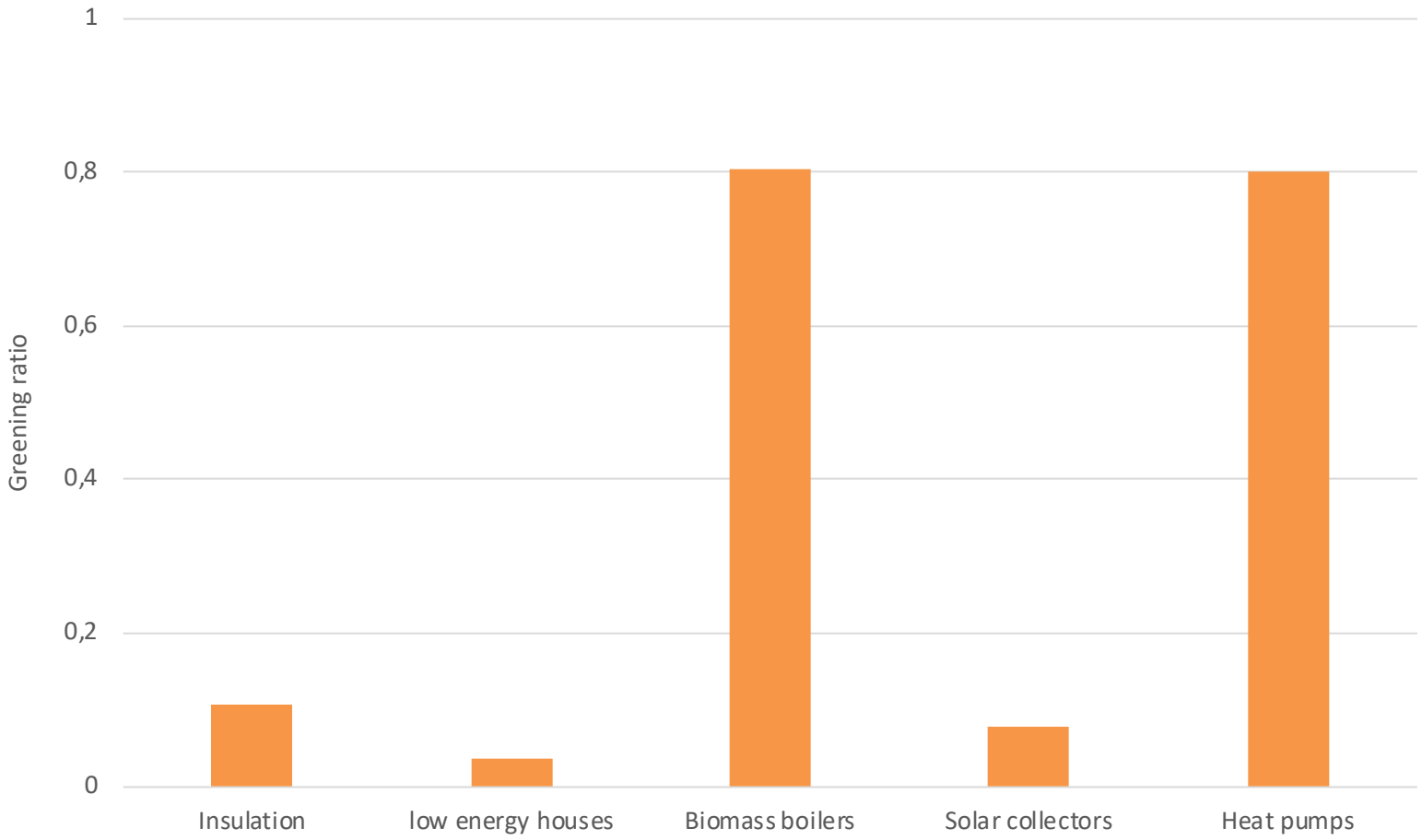
Green Savings Programme overview



Karásek, J., Pavlica, J., 2016. Green Investment Scheme: Experience and results in the Czech Republic. Energy Policy 90, 121–130. https://doi.org/10.1016/j.enpol.2015.12.020

Green Savings Programme overview

Greening ratios for individual subsidy areas.



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Inspections

206 measures inspected in 124 objects in all 14 regions of the Czech Republic

Focus on combinations of measures

On-site personal visits by 2-3 inspectors

Inspections (cont.)

On site, the process of inspection went as follows:

Controlling of the project documents

Determination of the real energy consumption before and after implementation of the measures

Compliance check of the implemented measures to the project documentation, photo documentation

Protocol of the on-site inspection	
Identification of applicant	
Identification No of application	
Applicant	
Type of applicant	
Address	
Region	
Type if building	
Code of EE measure	
1. Administration part of inspection	
Findings related to the administrative part of the project or related to the contractor.	
Availability of the invoices for energy after implementation of EE measures:	
2. Physical part of inspection	
Findings related to the physical part of inspection:	
Description of the figures included as an annex of the protocol:	
3. Results of inspection	
Overall evaluation:	
Results of analysis; energy consumption evaluation of heating hot water preparation after implementation measures in case of energy invoices available:	
Signature of head of inspection group	
Energy expert signature	
Applicant signature	

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Inspections, cont.

- Evaluation of the data
  - **Quantitative**

    the real ex-ante and ex-post energy consumption

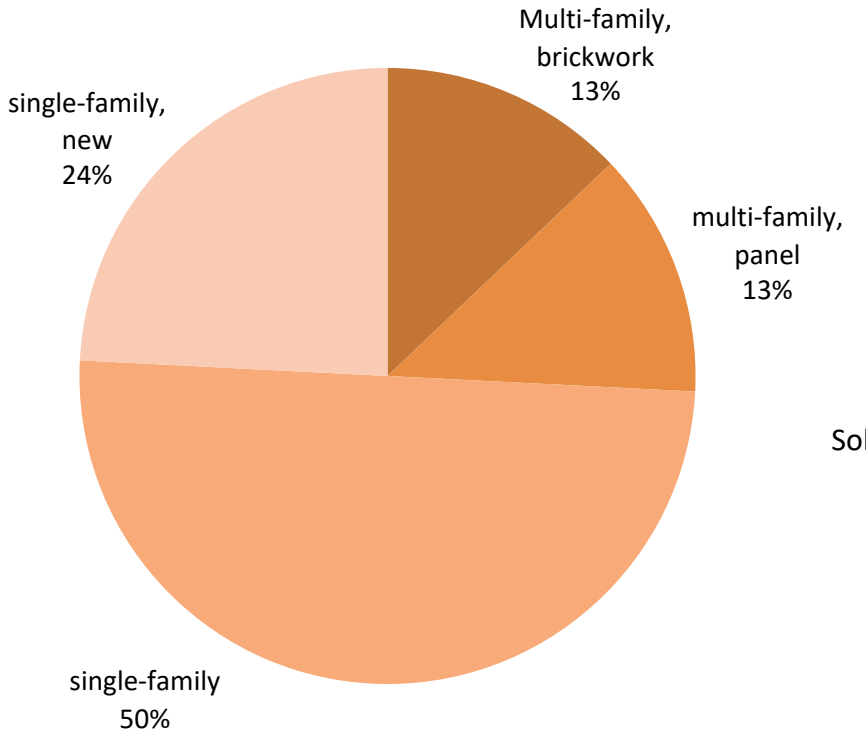
    compared with the calculated energy and CO_2 emission savings from the project documentation.
  - **Qualitative**

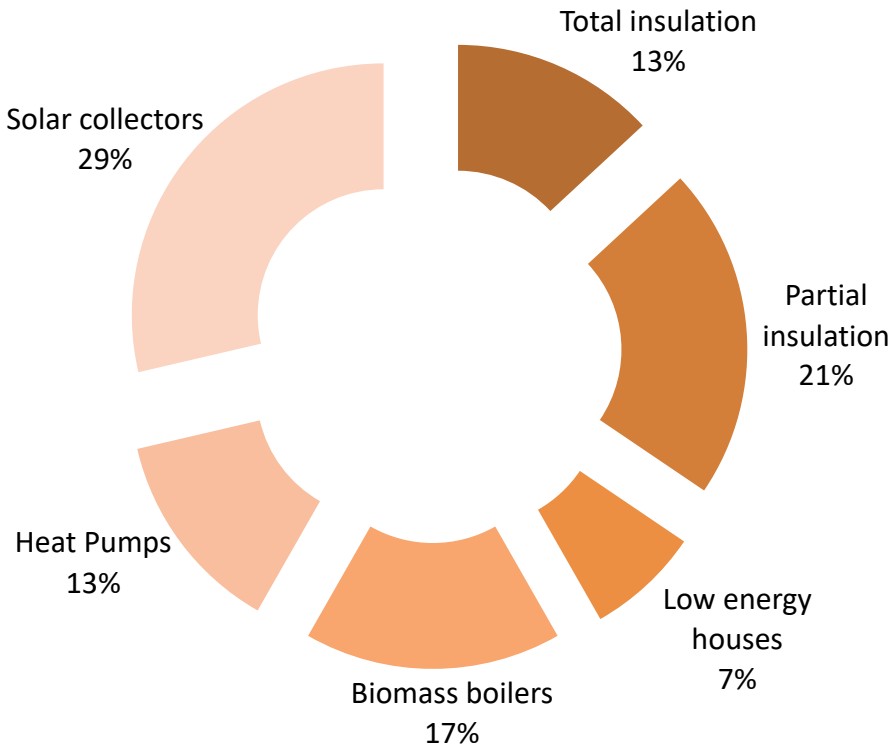
    Semi-structured interviews with the applicants

    about the process, initial expectations, duration of construction works, and overall satisfaction

    explanations to the differences in real and expected savings

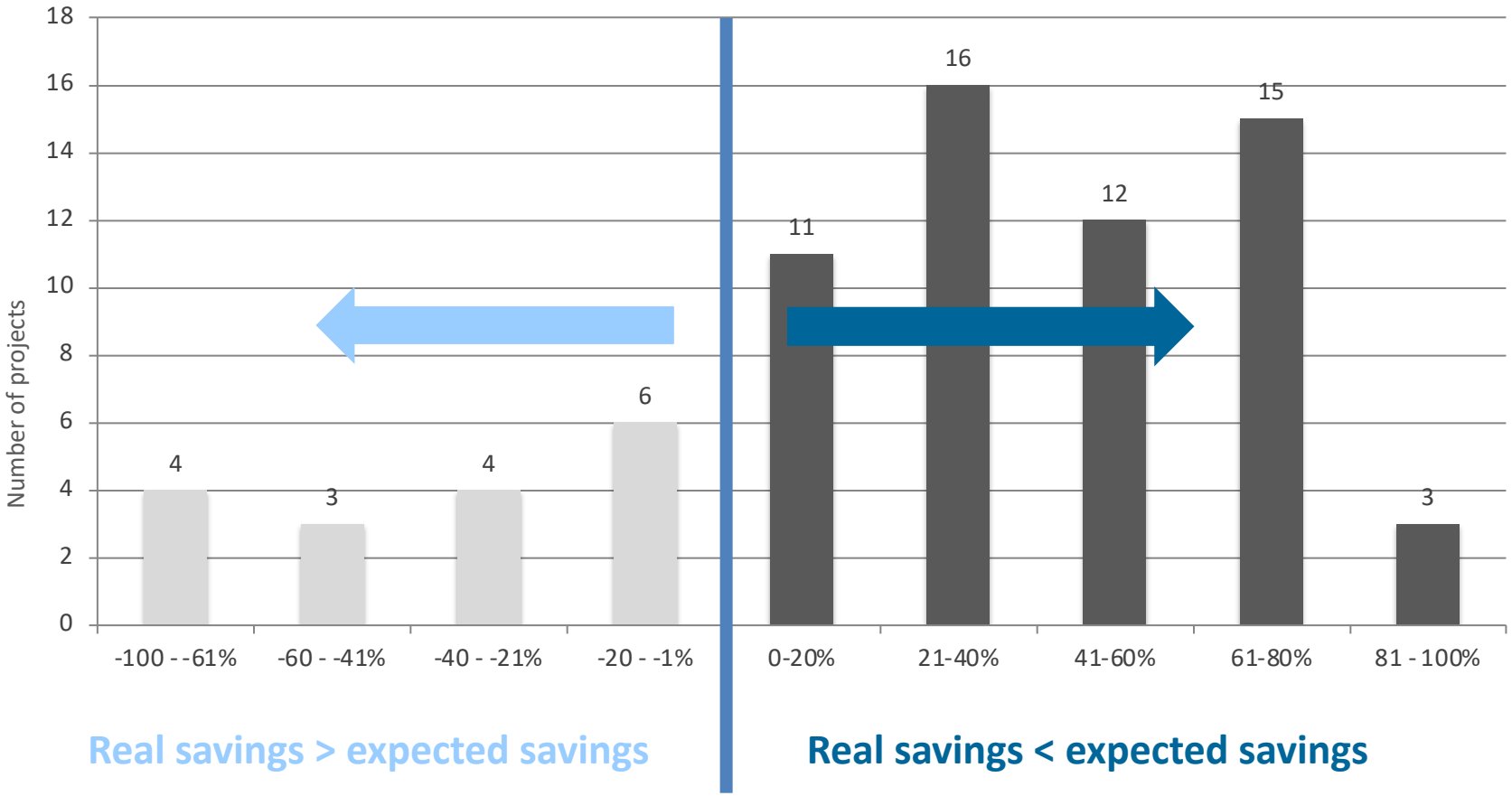
Sample


Multi-family, brickwork 13%
multi-family, panel 13%
single-family 50%
single-family, new 24%

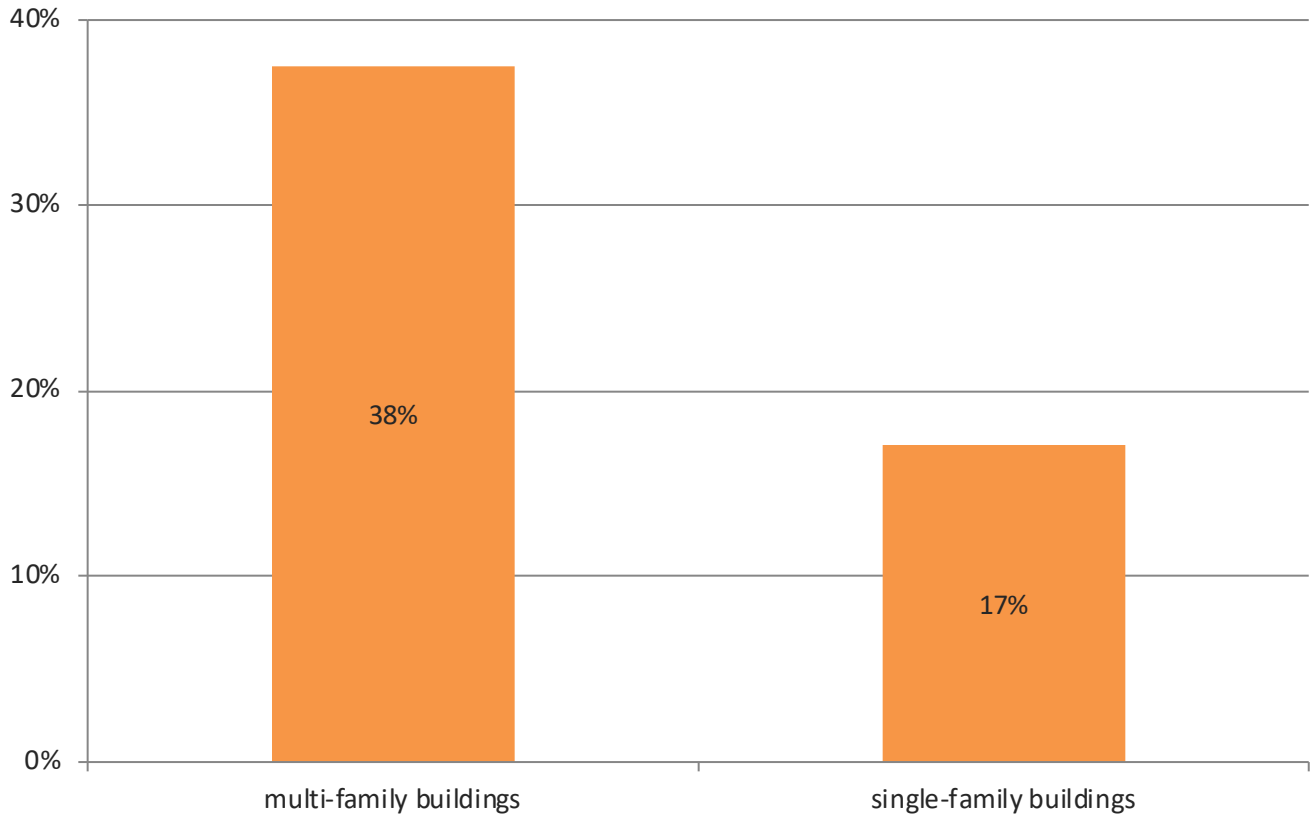

Total insulation 13%
Partial insulation 21%
Low energy houses 7%
Biomass boilers 17%
Heat Pumps 13%
Solar collectors 29%

Results

Difference between expected and real CO_2 emission savings



Results (cont.)



Share of inspected objects with higher real than expected CO_2 emission reduction

Results, cont.

Factors influencing the difference between expected and real outcomes

Methodical factors

Unavailability of invoices or low level of detail of the invoice

Wrong categorization of heat sources

Additional heat source (fireplace)

Results, cont.

Factors influencing the difference between expected and real outcomes

Behavioural factors

Usage of homes (temperature, heated area, life changes)

Number of occupants

Results, cont.

Further aspects discovered during the inspections

Overall satisfaction with the implementation of the measures (suppliers)

Quality and experience with **low energy houses construction**

Benefits: lower bills, higher comfort

Principal-agent problem

Additionality of the measures

Lessons learnt

Ex post evaluation should be a **common part** of the energy efficiency programme

- To avoid deception
- To provide data for learning

Behavioural factors play significant role in achieving the energy savings

Discrepancy between the reporting (Art. 7) and the national energy balance accounts

THANK YOU FOR YOUR ATTENTION.

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Evaluating the Impacts of the Kirklees Warm Zone Scheme

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Why this study is important

- We need to know more about the extent to which retrofit schemes actually work.
  - To what extent do they change domestic energy use, reduce fuel poverty, reduce carbon emissions?
  - To what extent are outcomes affected by performance gaps and rebound effects?
  - How do they impact on lower, middle and upper income households?
  - What is the direct cost-benefit case, what are the broader indirect benefits?
- There are few large scale, ex post evaluations of the actual impacts of retrofit schemes.

The KWZ Scheme (1)

- One of the largest retrofit schemes completed in the UK to date.
- Ran from 2007 to 2010 with a budget of £21m
- Initiated by Kirklees Council, managed Yorkshire Energy Services (not for profit) with insulation installed by the private sector.
- Offered free energy assessments and surveys and, where technically feasible, free loft and cavity wall insulation to all households in the area.
- Of the 176,000 households in the area, 134,000 had a preliminary (doorstep) assessment, 111,000 of which went on to have a fuller survey and 51,000 households had measures installed.
- A total of 64,000 measures were installed, including insulation in 43,000 lofts and 21,000 cavity walls.

The KWZ Scheme (2)

- 30% participation rate was secured through sustained marketing and repeated household visits from a trusted provider that placed great emphasis on customer care and the quality of installations.

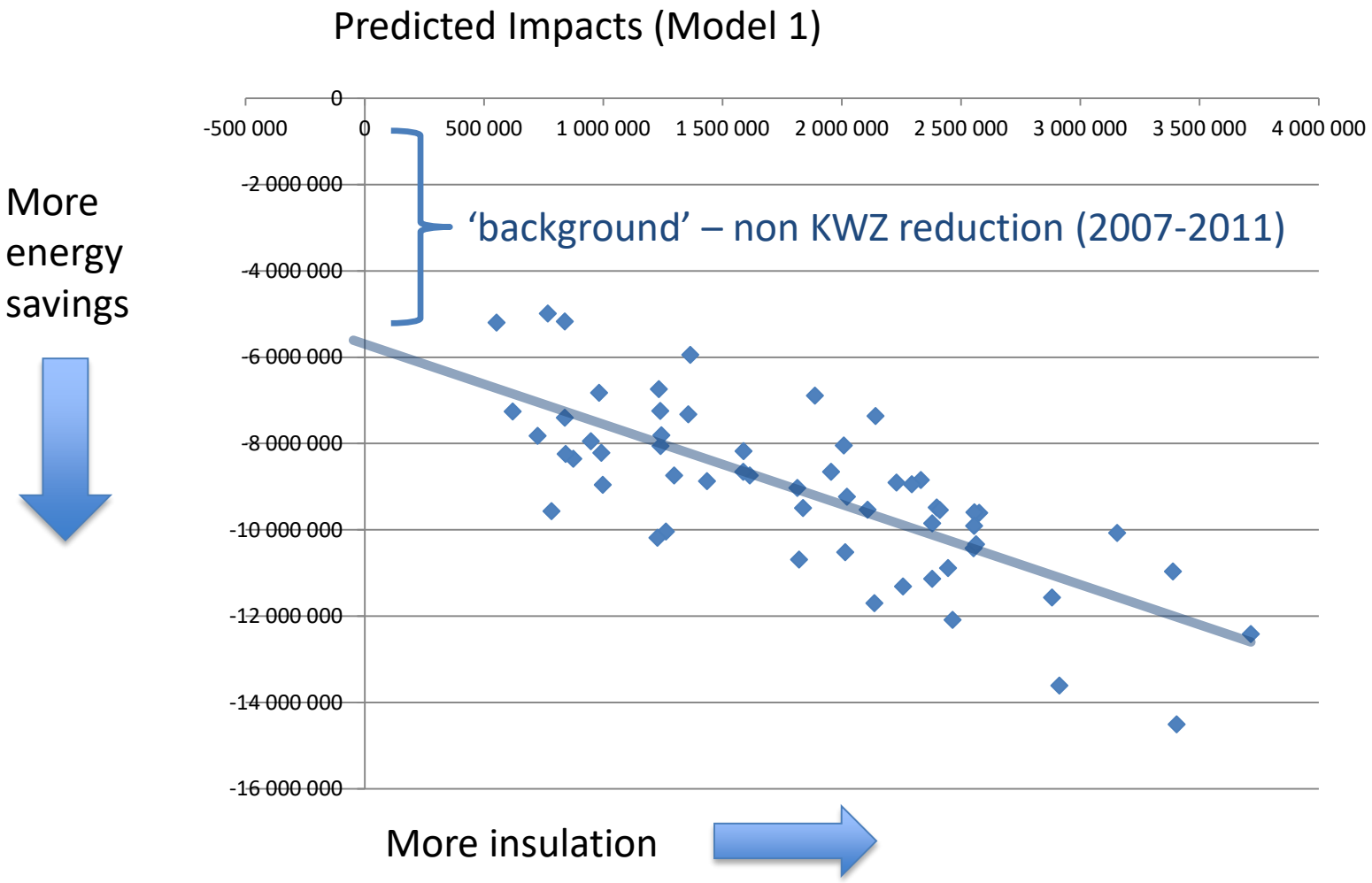
- It also relied on the provision of insulation measures at no cost with steps (such as assisted loft clearances) taken to limit disruption in participating households.

- KWZ makes a good case study for a large-number, *ex post* analysis because of the its scale, geographical and temporal concentration the data on KWZ activity that was collected by the local authority.

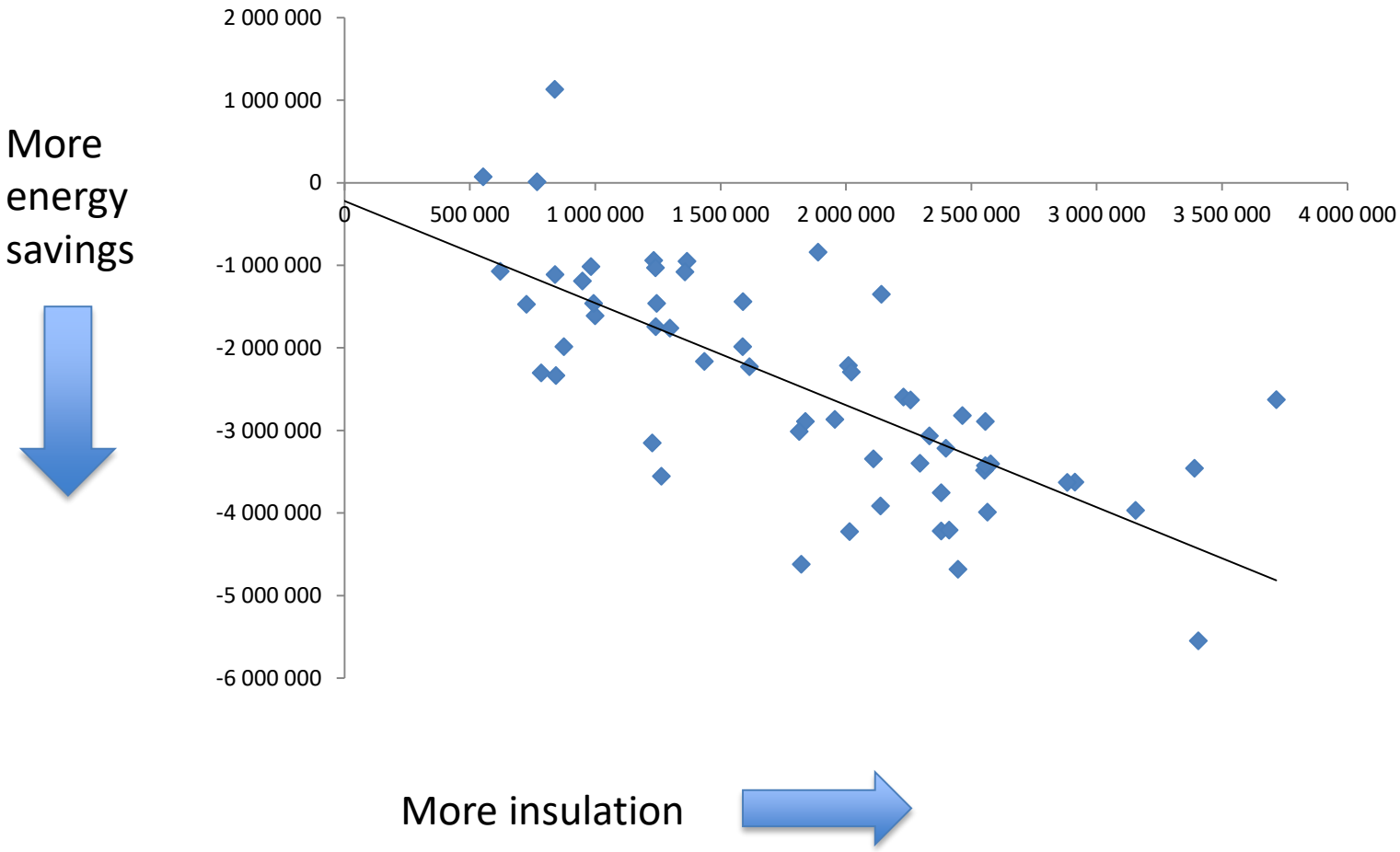
Our Approach

- Data set 1 – on 176,000 households (inc. size, age, type) and insulation measures pre and post KWZ.
- Data set 2 – on household energy at MLSOA level (inc. domestic gas, economy 7, electricity usage) for 58 MLSOAs
- Corrected for changes in numbers of meters and weather
- We predict energy savings from KWZ insulation using two models
- CERT (RdSAP) model used up to 2012
- BRE model developed for Committee on Climate Change
- We examine correlations between actual reductions in energy demand and predicted impacts of different levels of KWZ activity to separate background trends from KWZ impacts.

Correlating Actual and Predicted Impacts



Correlating Actual and Predicted Impacts After Adjusting for Background Trends



Impacts Across Income Groups

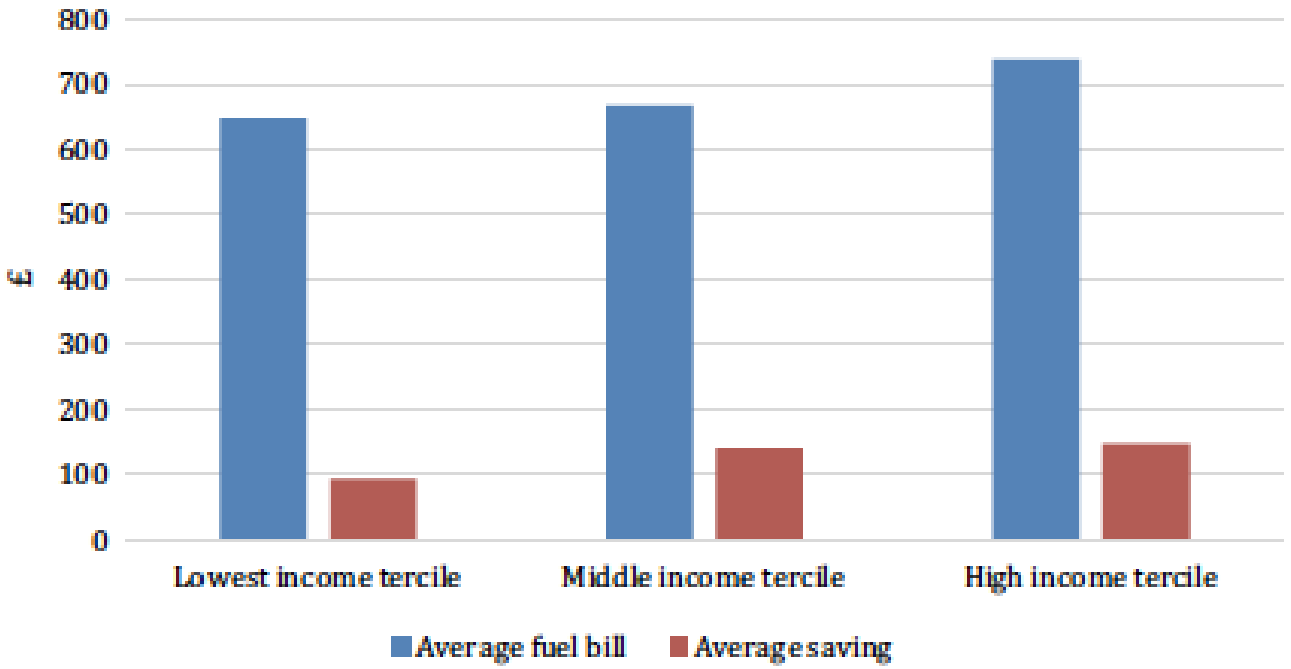


Fig. 3. Average 2011 fuel bills and energy savings for lower, middle and upper income areas.

Key Findings (1)

- BRE model assumes that 44% of the full technical energy saving potential of insulation would be realized in practice.
- Results suggest 76% of potential is actually realized in practice, with 53% of the technical potential realized in the lowest income areas, but 85-93% in the middle and highest income areas.
- CERT model assumes that 50% of the of the full technical energy saving potential of insulation would be realized in practice.
- Results suggest 62% is actually realized in practice, with 49% of the technical energy savings potential secured in the lowest income areas, but 70-71% in middle and higher income areas.

Key Findings (2)

- Losses due to performance gaps and rebound effects are roughly as predicted in lower income areas but are lower than predicted in middle and upper income areas.

- Poorer households split the benefit between improved quality of life and monetary savings. This addresses fuel poverty. Middle and upper income households save more energy and benefit most monetarily.

Key Findings (3)

- In aggregate, we identify a reduction of 4.2% in 2007 levels of household demand for energy for space and water heating that can be attributed to KWZ and a further 12.3% that is independent of KWZ.

- For participating households, this amounts to an average per household KWZ reduction in energy use of 2,655 kWh over the 2007-2011 period due to KWZ, compared to 2177kWh reductions from background trends.

Key Findings (4)

- For its initial investment of £21m, KWZ has generated reductions in energy bills totaling £6.2m a year at 2011 energy prices.
- This is equivalent to an average annual saving of £125 per year at 2011 energy prices for each participating household, which represents a saving on the total average household energy bill of 10.6%.
- In 2011, Kirklees commissioned studies which estimated the non energy related local economic impact at £39m and the health benefits at £3.9m over 5 years.