EPBD.wise

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Shaping National Building Renovation Plans: Addressing Policy Needs in Selected Focus Countries

Webinar ZEB Academy #14

TU WIEN

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EPBD.wise in a nutshel

→EPBD.wise provides support for the implementation of the EPBD *recast*

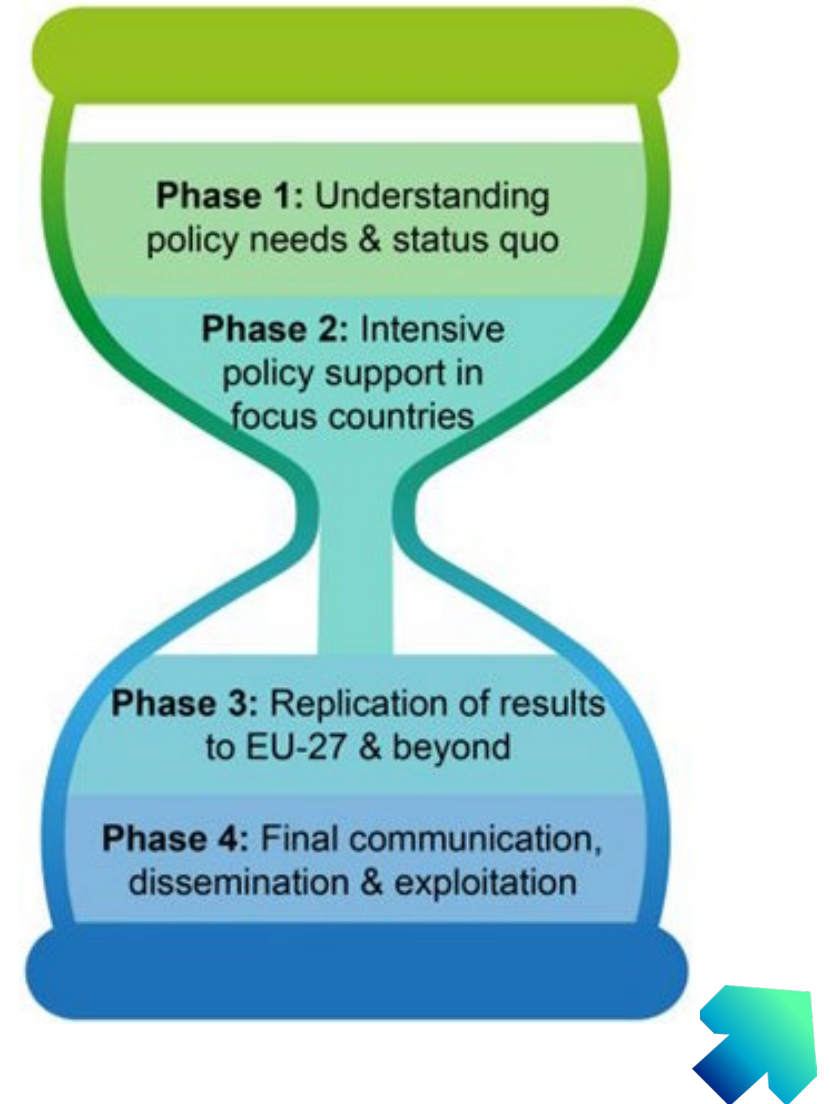→Focus countries: **Bulgaria, Greece, Hungary, Poland, Romania, and Ukraine**

→EPBD.wise provides on-the-ground support for the implementation of 5 key elements of the EPBD:

- **National Building Renovation Plans**
- **Minimum Energy Performance Standards**
- **Energy Performance Certificates**
- **Building Renovation Passports**
- **Zero Emission Buildings**

State of the work

- ✓ **Reports on policy needs and best practices for each topic,** and focused on specific countries (https://www.bpie.eu/epbdwise/)

- ➤ Entering the intensive policy support phase, drafting **policy guidelines for focus countries**

- ➤ In parallel preparing the **replication of results to EU-27**

- ➤ **Project duration: 10/2023-06/2026**

Phase 1: Understanding policy needs & status quo

Phase 2: Intensive policy support in focus countries

Phase 3: Replication of results to EU-27 & beyond

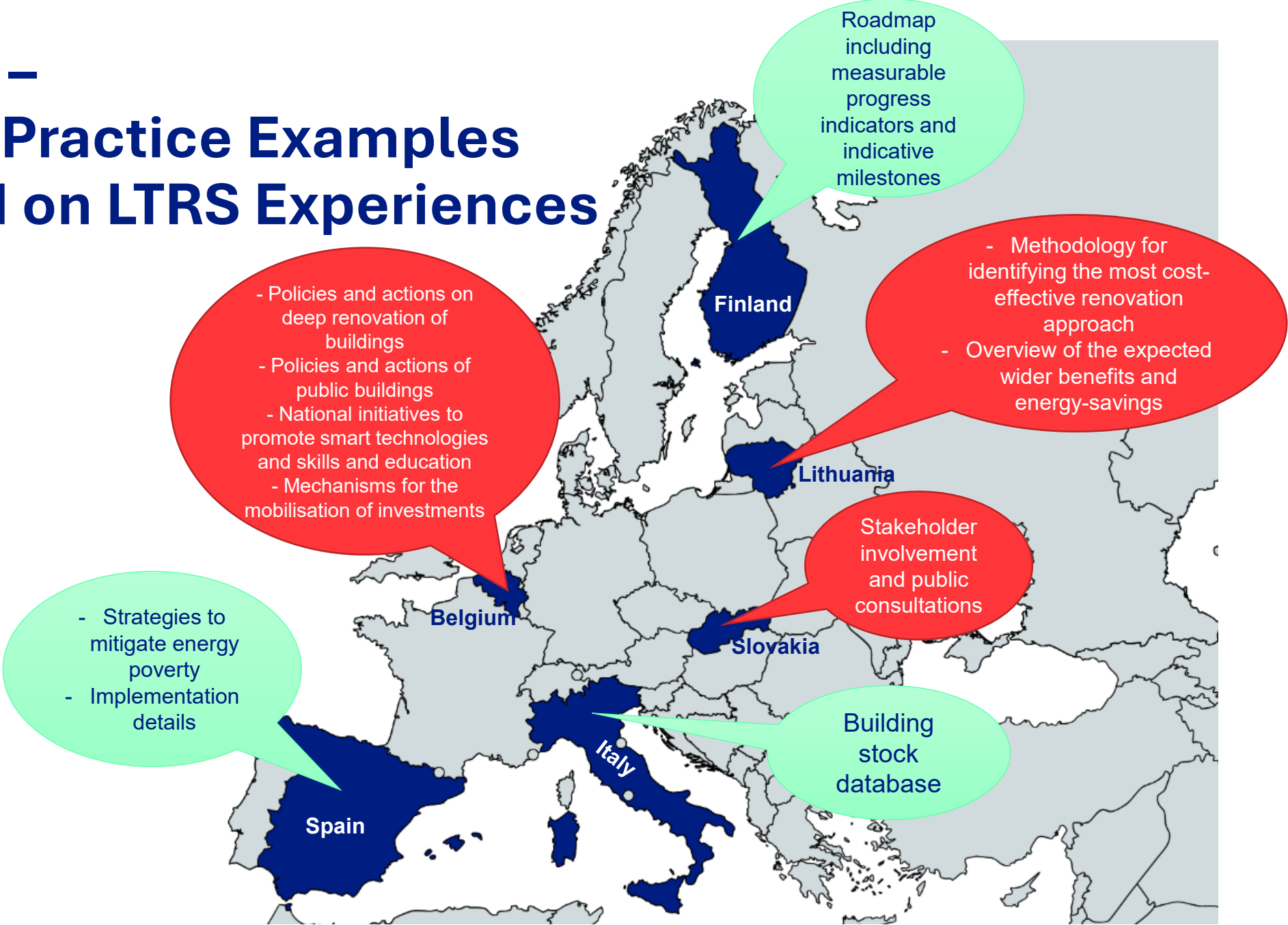**Phase 4:** Final communication, dissemination & exploitation

National Building Renovation Plans will include ...

→ an overview of the national building stock for different types of buildings

→ a roadmap with targets for 2030, 2040 and 2050 and measurable progress indicators

→ implemented and planned policies and measures supporting the implementation of the roadmap

→ investments needs, the financing sources and measures, and the administrative resources

→ minimum energy performance standards for non-residential buildings and national trajectories for residential buildings

→ …

→ Every five years, each MS prepares and submits to the Commission an update of the building renovation plan (as part of the NECPs)

→ First draft NBRP by 31 December 2025, first building renovation plan by 31 December 2026.

NBRP – Good Practice Examples based on LTRS Experiences

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Roadmap including measurable progress indicators and indicative milestones

Finland

- Methodology for identifying the most cost-effective renovation approach
- Overview of the expected wider benefits and energy-savings

- Policies and actions on deep renovation of buildings
- Policies and actions of public buildings
- National initiatives to promote smart technologies and skills and education
- Mechanisms for the mobilisation of investments

Lithuania

Belgium

Stakeholder involvement and public consultations

Slovakia

- Strategies to mitigate energy poverty
- Implementation details

Italy

Building stock database

Spain

# What are policy needs for setting up National Building Renovation Plans (NBRPs)?

What are policy needs for setting up NBRPs?

| Type of policy need	Specific policy needs
Technical	Better overview of the national building stock through enhancing data collection and management.
Legislative and regulatory	Ensuring consistency with the rest of the EPBD implementation as well as with other national or EU strategies touching upon buildings decarbonisation.
Fiscal and financial	Identifying the most appropriate financing sources and developing tailored funding schemes.
Information and perception	Organising effective public consultations with all relevant stakeholders.
Institutional	Building capacity at local and national level for drafting and implementing the NBRP.
	Establishing a monitoring, reporting and evaluation framework for the NBRP (i.e., the policies and measures included within the plan).
	Understanding how to use the NBRP as a reporting and monitoring instrument.

1.
BETTER DATA

Data to underpin renovation strategy and planning, especially for non-residential buildings.
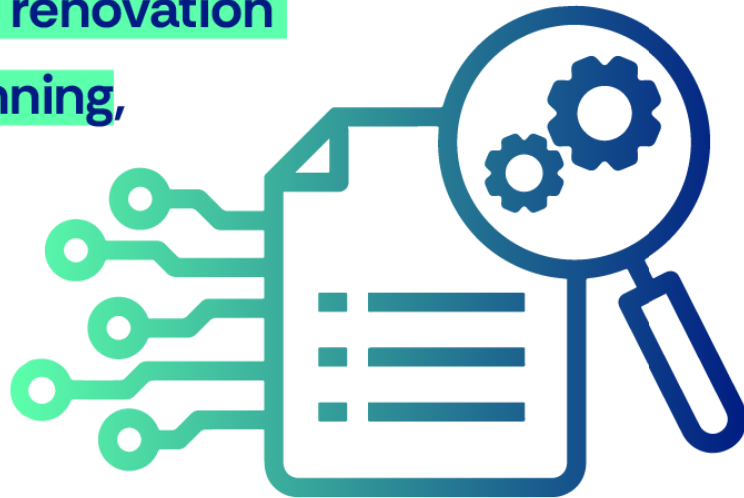
2.
TARGET WORST-PERFORMING BUILDINGS

Align policies to target the buildings most in need of renovation.

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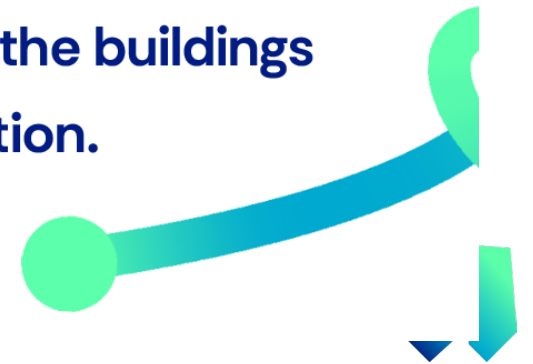
3. SECTORAL APPROACH

Establish measures for public buildings and tackling energy poverty through data-driven analysis.

4. TECHNICAL AND ECONOMIC FEASIBILITY

Consult with industry and citizens for feedback

Challenges for developing NBRPs on MS level

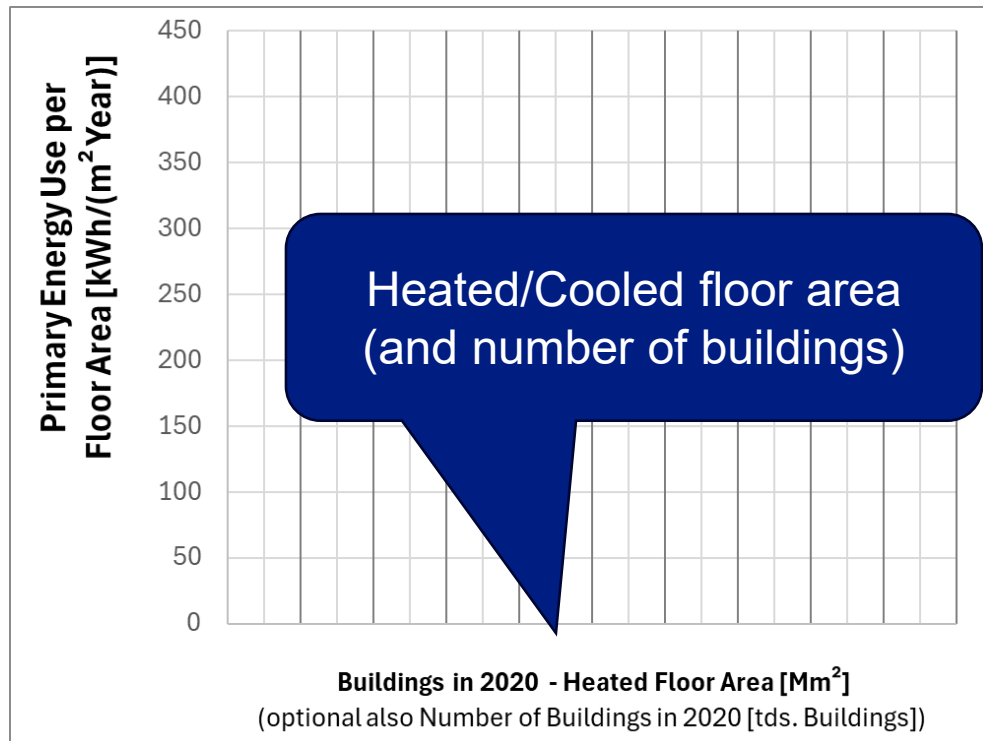| Country	Key Challenges	Specific Support Needs
Bulgaria	• Data on building stock not detailed enough. • Limited policy formulation using available data. • Lack of information about responsibilities to secure funding in the LTRS.	• Policy support based on improved data insights. • Support for engagement and responsibilities to secure funding for the renovation plans.
Greece	• Available statistical data but challenges in deriving actionable insights. • Inconsistent renovation targets and lack of clear policy directives.	• Stakeholder consultation to agree on renovation targets. • Development of actionable strategies. • Support on mobilizing the investments.
Hungary	• Lack of data for the current status of the building stock. • No clear risk/responsibility distribution between public and private stakeholders. • Missing clear financial descriptions and tools.	• Development of specific tools for better estimation of the renovation needs and rate. • Sharing best practice examples for renovation plans, and strategy cases for different focus groups.
Poland	• Insufficient data of the building stock. • Delays in the adoption of policy documents, affecting implementation timelines.	• Tailored support in drafting and operationalizing NBRPs, with a focus on decarbonization. • Initiatives to promote energy-efficient technologies in residential housing.
Romania	• Severe lack of data on building stock, hindering effective policy development. • Lack of relevant financial instruments and funding.	• Comprehensive guidance in developing NBRPs aligned with EPBD (2024/1275). • Robust data collection and analysis methodologies to inform policy and planning. • Support for identifying the appropriate mechanism for the fast implementation of the building stock database.
Ukraine	• Incomplete data on the building stock • Existence of a strategy, but poor implementation. • Focus on thermal modernization not comprehensive.	• Support in refining and executing building renovation plans. • Integration with energy and environmental policies.

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Better building stock data …

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Which (key) information is needed

Heated/Cooled floor area
(and number of buildings)

Primary Energy Use per Floor Area [kWh/(m²Year)]

450 / 400 / 350 / 300 / 250 / 200 / 150 / 100 / 50 / 0

Buildings in 2020 - Heated Floor Area [Mm²]
(optional also Number of Buildings in 2020 [tds. Buildings])

Key requirement

Information on **heated floor area / number of buildings per building type**

Data sources

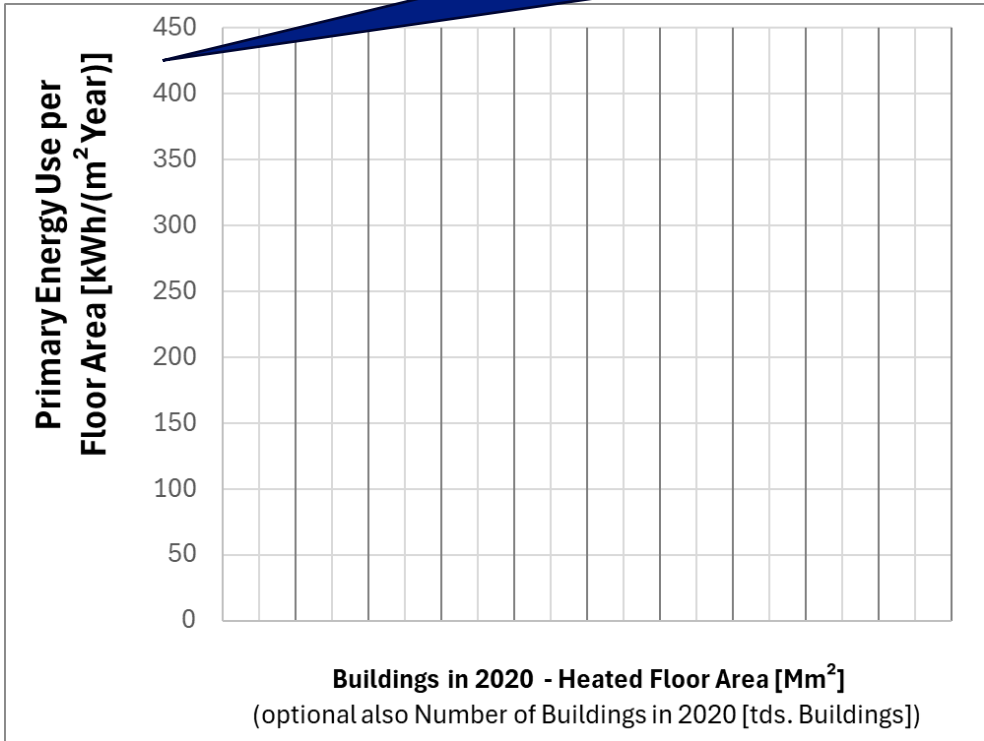o (National/regional) building register, construction permits, …

If not available

o Public databases, e.g. Building Stock Observatory (BSO)

o Hotmaps / Pan European Heat Atlas

o Tabula/Episcope, …

o Commercially available building data and building shapes (google, …)
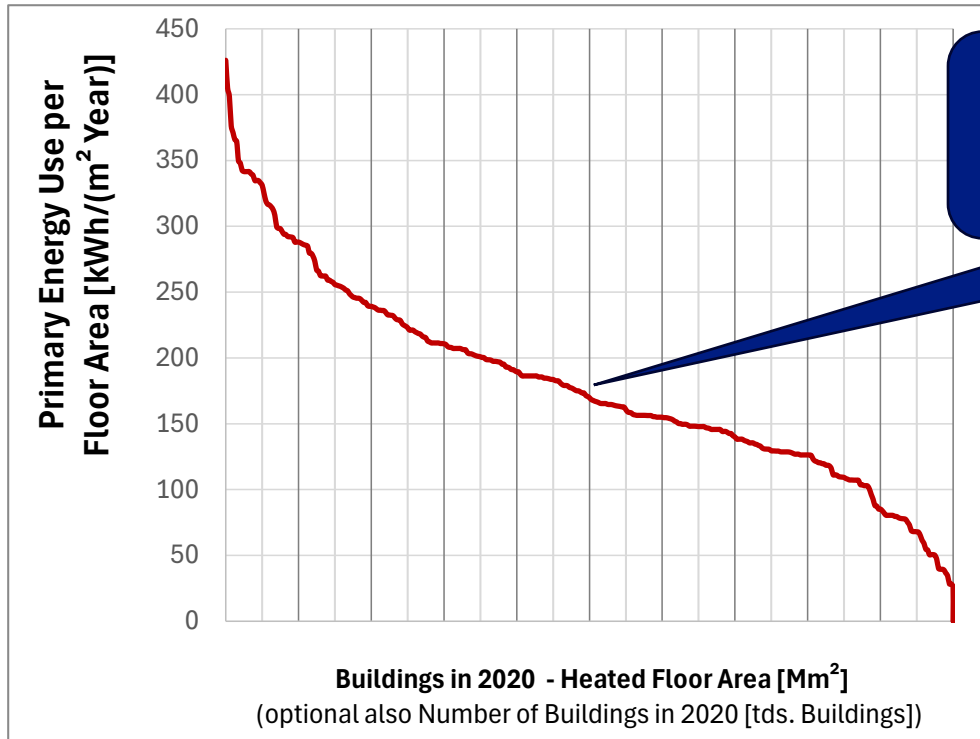
o OSM (open street map), Satellite images

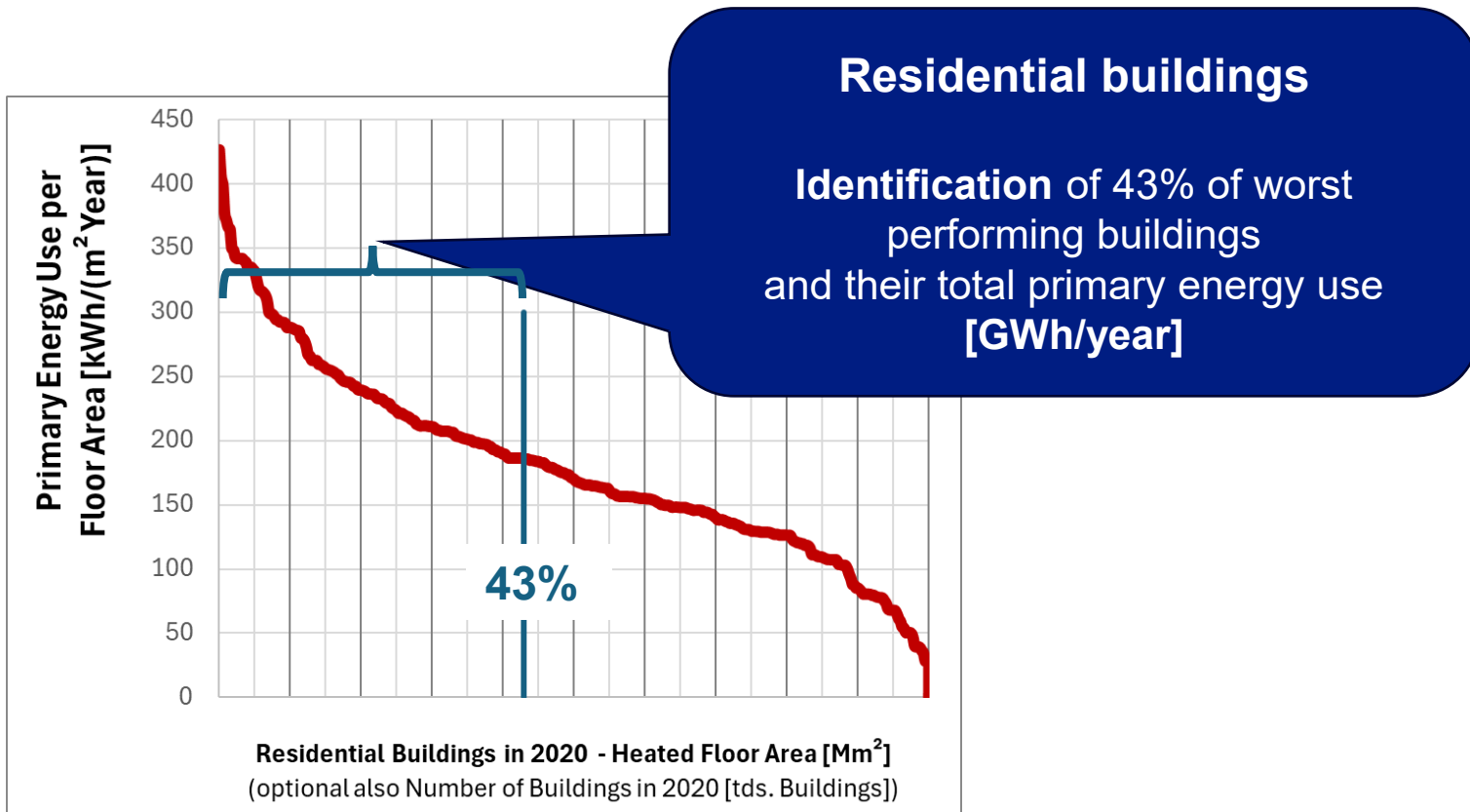# Which (key) information is needed

Primary Energy Use per Floor Area [kWh/(m² Year)]

Distribution of PEU per m² for residential and non-res. buildings

Buildings in 2020 - Heated Floor Area [Mm²]
(optional also Number of Buildings in 2020 [tds. Buildings])

Which (key) information is needed

Residential buildings

Identification of 43% of worst performing buildings
and their total primary energy use
[GWh/year]

Primary Energy Use per Floor Area [kWh/(m²Year)]

450
400
350
300
250
200
150
100
50
0

43%

Residential Buildings in 2020 - Heated Floor Area [Mm²]
(optional also Number of Buildings in 2020 [tds. Buildings])

Which (key) information is needed

Non-residential buildings

PEU threshold of the 16th% and 26th%-quantile worst performing building [kWh/(m²year)]

43%

Residential Buildings in 2020 - Heated Floor Area [Mm²]
(optional also Number of Buildings in 2020 [tds. Buildings])

Non-Residential Buildings in 2020 - Heated Floor Area [Mm²]
(optional also Number of Buildings in 2020 [tds. Buildings])

How to derive the primary energy use data needed

Distribution of primary energy use for the national building stock

Y-axis: Primary Energy Use per Floor Area [kWh/(m² Year)] — 0, 50, 100, 150, 200, 250, 300, 350, 400, 450

X-axis: Buildings in 2020 - Heated Floor Area [Mm²]
(optional also Number of Buildings in 2020 [tds. Buildings])
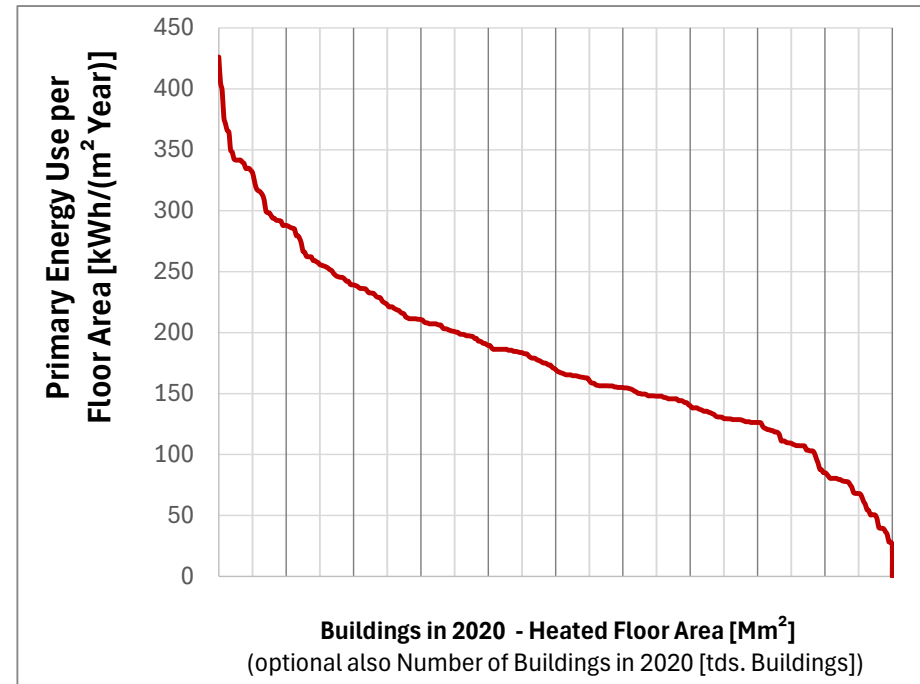
Requirements

Information on **heated floor area / number of buildings per building type by**

➢ Construction periods (building age, vintage classes)

➢ Refurbishment status (share of renovated buildings)

➢ Heating system

➢ Optional/if applicable
  ➢ climatic zones, degree of urbanization, availability of district heating, restrictions regarding renovation (e.g. cultural heritage)

➢ Primary energy factors

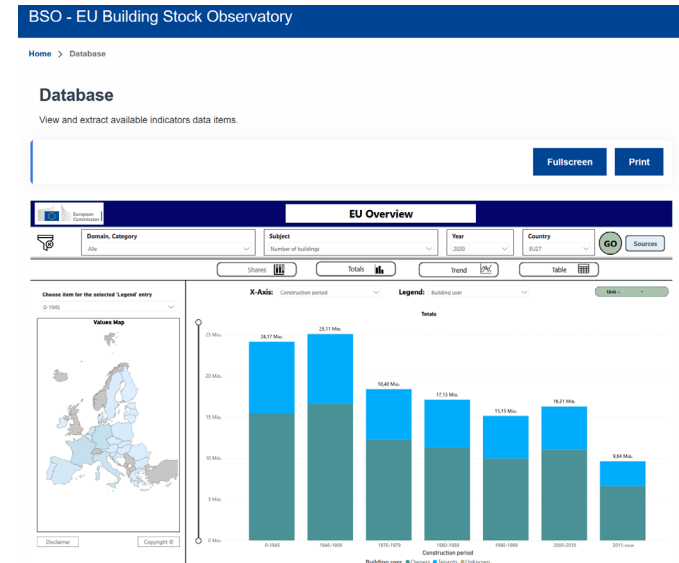➢ **Total primary energy use** per floor area

Three approaches to derive the primary energy use data needed

➤ **Archetype-based** (reference buildings)
bottom-up **modelled results** based on
geometries and U-values, installed
technology
e.g. EU Building Stock Observatory (BSO)

➤ **Measured energy consumption data** for
a representative sample of buildings

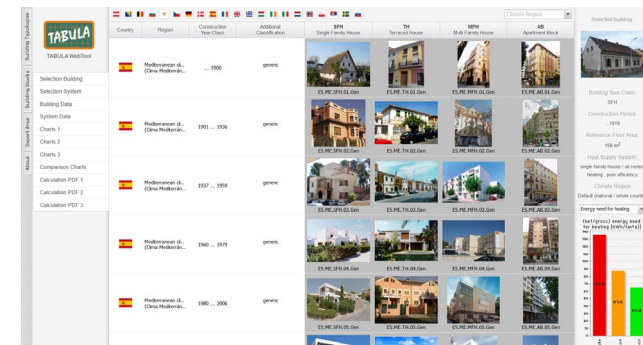➤ **EPCs** (from a representative sample for
the whole building stock)

Primary Energy Use per Floor Area [kWh/(m^2 Year)]

Buildings in 2020 - Heated Floor Area [Mm^2]
(optional also Number of Buildings in 2020 [tds. Buildings])

Archetype-based bottom-up **modelled results** based on geometries and U-values, installed technology

✓ Data with reasonable quality available for many countries
  ➢ E.g. EU Building Stock Observatory:
    ➢ Data collection of the EU's building stock in a common form for all MS
    ➢ Maintained and data collected through service contract
    ➢ Wide range of data sources: statistical offices, reports,…

➢ **Needs to be enhanced by expert guesses**
  ➢ E.g. share of previously performed building renovation activities and heating systems in different categories
  ➢ ….
➢ **and/or other data sources**
  ➢ E.g. Tabula / Episcope
  ➢ …

Source: https://building-stock-observatory.energy.ec.europa.eu/

Source: https://webtool.building-typology.eu/

Archetype-based bottom-up **modelled results** based on geometries and U-values, installed technology

➢ **Underestimates the variance of the distribution (i.e. "curve is too flat")**

Unobserved "real" distribution

Primary Energy Use per Floor Area [kWh/(m²Year)] vs **Residential Buildings in 2020 - Heated Floor Area [Mm²]** (optional also Number of Buildings in 2020 [tds. Buildings])

Legend:
- —— Unobserved 'real' distribution
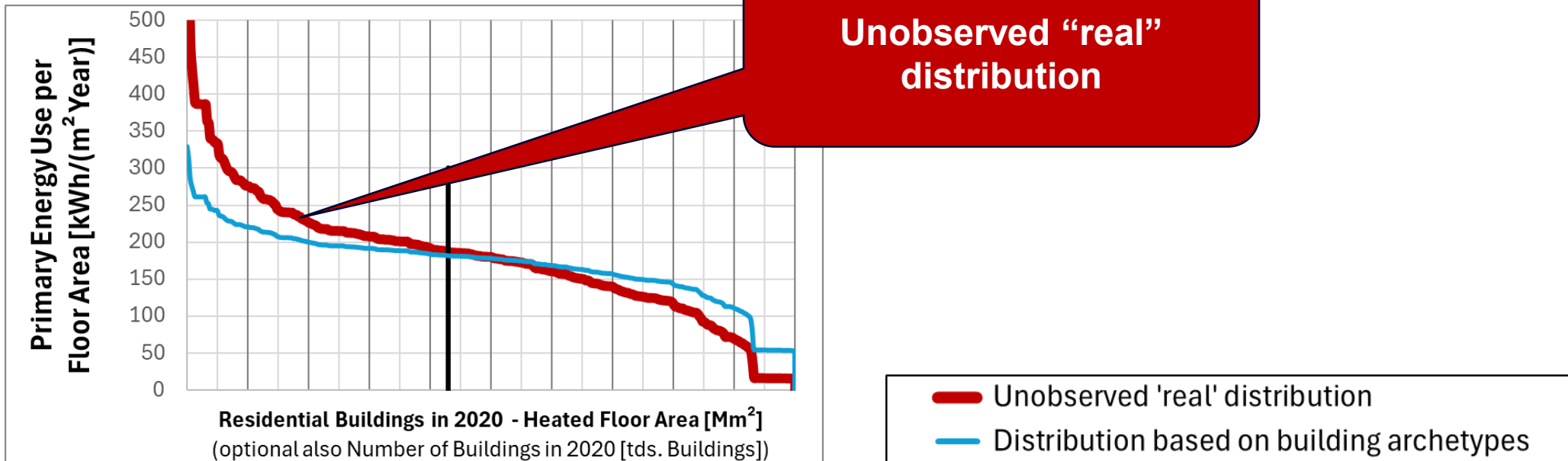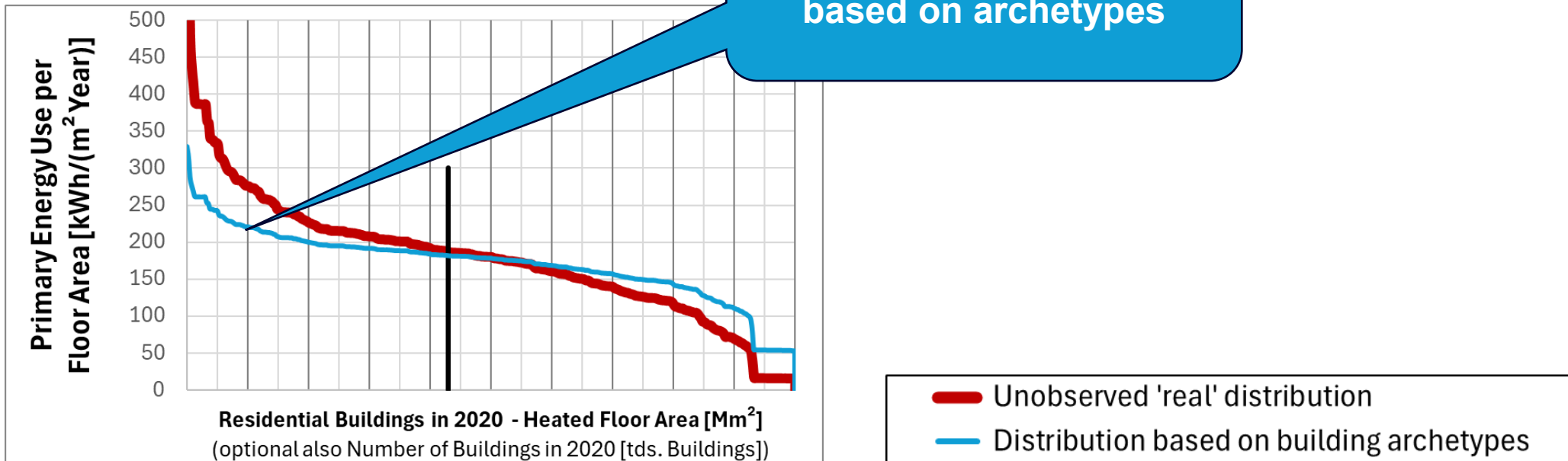- —— Distribution based on building archetypes

Archetype-based bottom-up modelled results based on geometries and U-values, installed technology

➤ **Underestimates the variance of the distribution (i.e. "curve is too flat")**

Estimates distribution based on archetypes

Primary Energy Use per Floor Area [kWh/(m²Year)]

Residential Buildings in 2020 - Heated Floor Area [Mm²]
(optional also Number of Buildings in 2020 [tds. Buildings])

— Unobserved 'real' distribution
— Distribution based on building archetypes

Archetype-based bottom-up **modelled results** based on geometries and U-values, installed technology

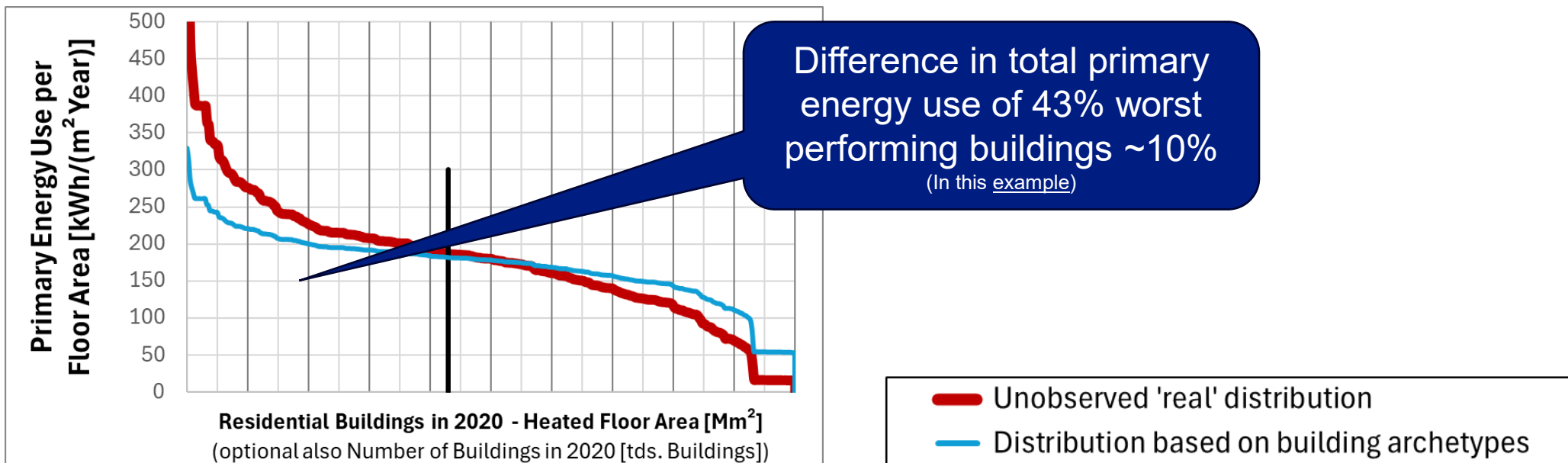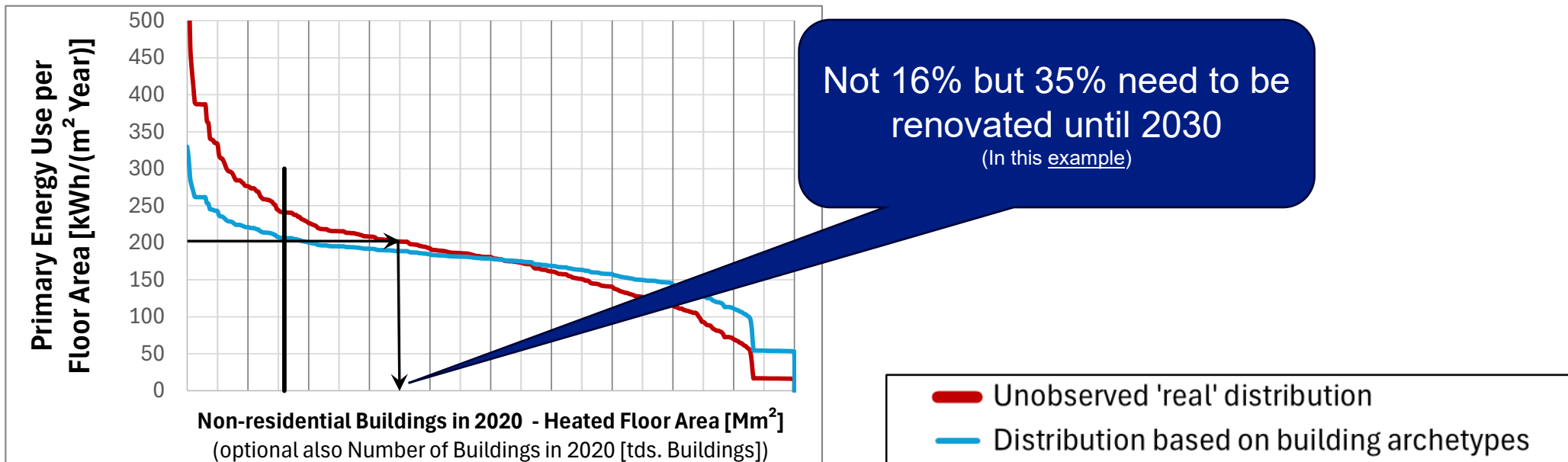➤ **Underestimates the variance of the distribution (i.e. "curve is too flat")**

➤ **Probably sufficiently accurate** to derive the PEU of the 43% of worst performing **residential buildings**

Difference in total primary energy use of 43% worst performing buildings ~10%
(In this example)

Primary Energy Use per Floor Area [kWh/(m²Year)]

Residential Buildings in 2020 - Heated Floor Area [Mm²]
(optional also Number of Buildings in 2020 [tds. Buildings])

— Unobserved 'real' distribution
— Distribution based on building archetypes

Archetype-based bottom-up **modelled results** based on geometries and U-values, installed technology

➢ **Underestimates the variance of the distribution (i.e. "curve is too flat")**

➢ Probably **NOT-sufficient** to derive the 16th% / 26th%-quantile threshold for **non-residential building**

Not 16% but 35% need to be renovated until 2030
(In this example)

Primary Energy Use per Floor Area [kWh/(m² Year)]

Non-residential Buildings in 2020 - Heated Floor Area [Mm²]
(optional also Number of Buildings in 2020 [tds. Buildings])

— Unobserved 'real' distribution
— Distribution based on building archetypes

# **Measured energy consumption data** for a representative sample of buildings

- ✓ **Data incorporate actual building usage, refurbishment status, climate,** etc.
- ✓ If high share of gas or district heating, **data are concentrated** at a rather small number of Utilities / Energy Service Companies (ESCos)
- ✓ Conversion to total primary energy

- ➢ Electricity as counted in EPBD (lighting, etc.) not directly measured, secondary heating systems not included
- ➢ Data might contain other energy service as well (process heat, cooking, in case of electricity also appliances, etc.)
- ➢ Difficult if large share of electricity, heating oil, biomass, etc. is used for heating or if high cooling demand

- ➢ Process needs to be in line with data protection, unbundling, …
- ➢ The floor area might not be known by the utility/ESCo
- ➢ Consumption data contain user behaviour on an individual level

Measured energy consumption data for a representative sample of buildings

Energy consumption for heating
(~3400 Buildings, mostly individual housing, ~500 tds. m^2 heated area)
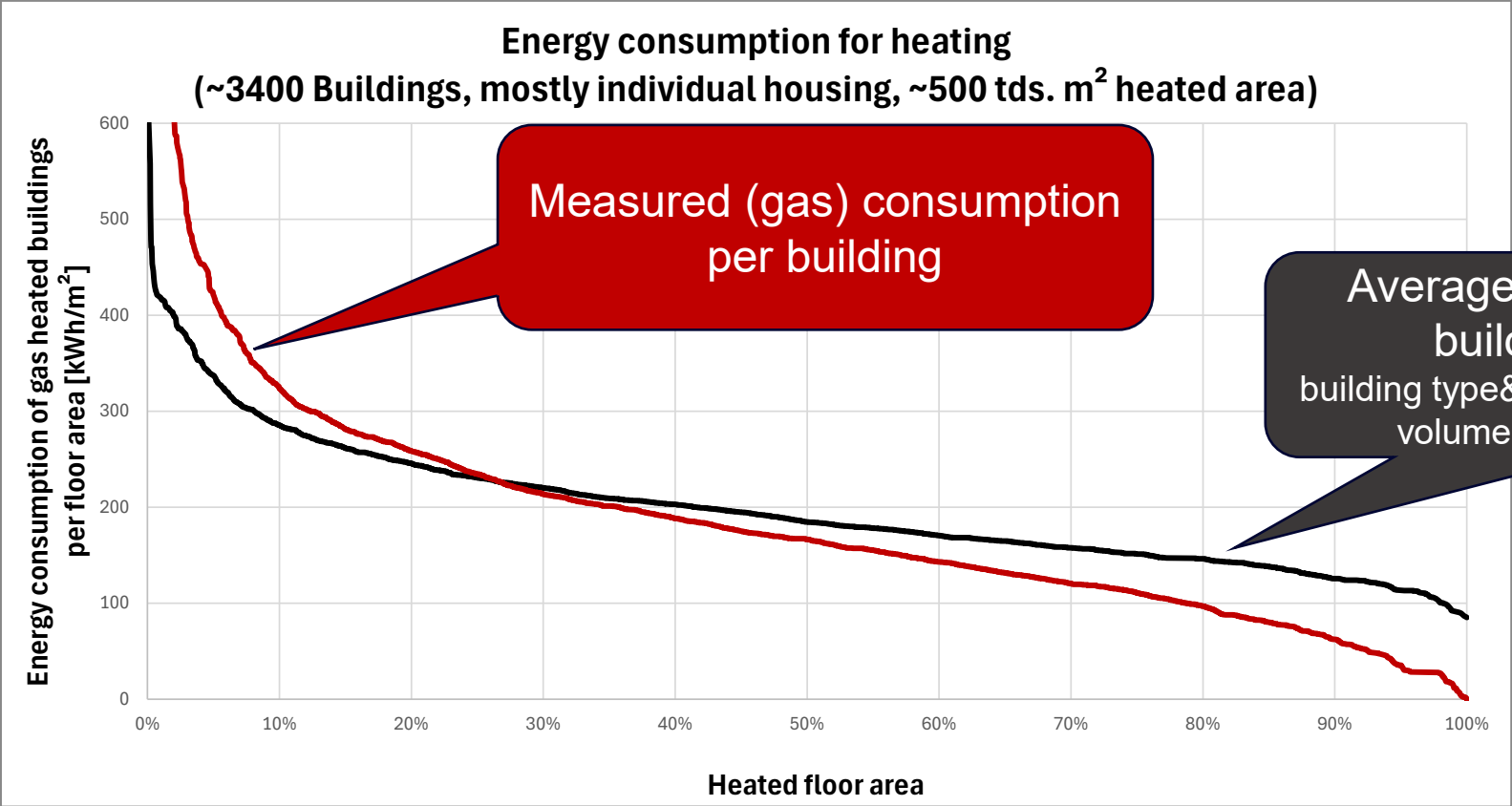
Measured (gas) consumption per building

Average gas consumption per building, corrected by building type&size, vintage class, surface-to-volume ratio, (renovation status)

Energy consumption of gas heated buildings per floor area [kWh/m^2]

Heated floor area

EPCs (from a representative sample for the whole building stock)

✓ **Include required information**
✓ **Rather common methodology**
✓ **In many countries stored in one or few databases and accessible**

➢ Total sum of primary energy use as reported by EPCs most probably
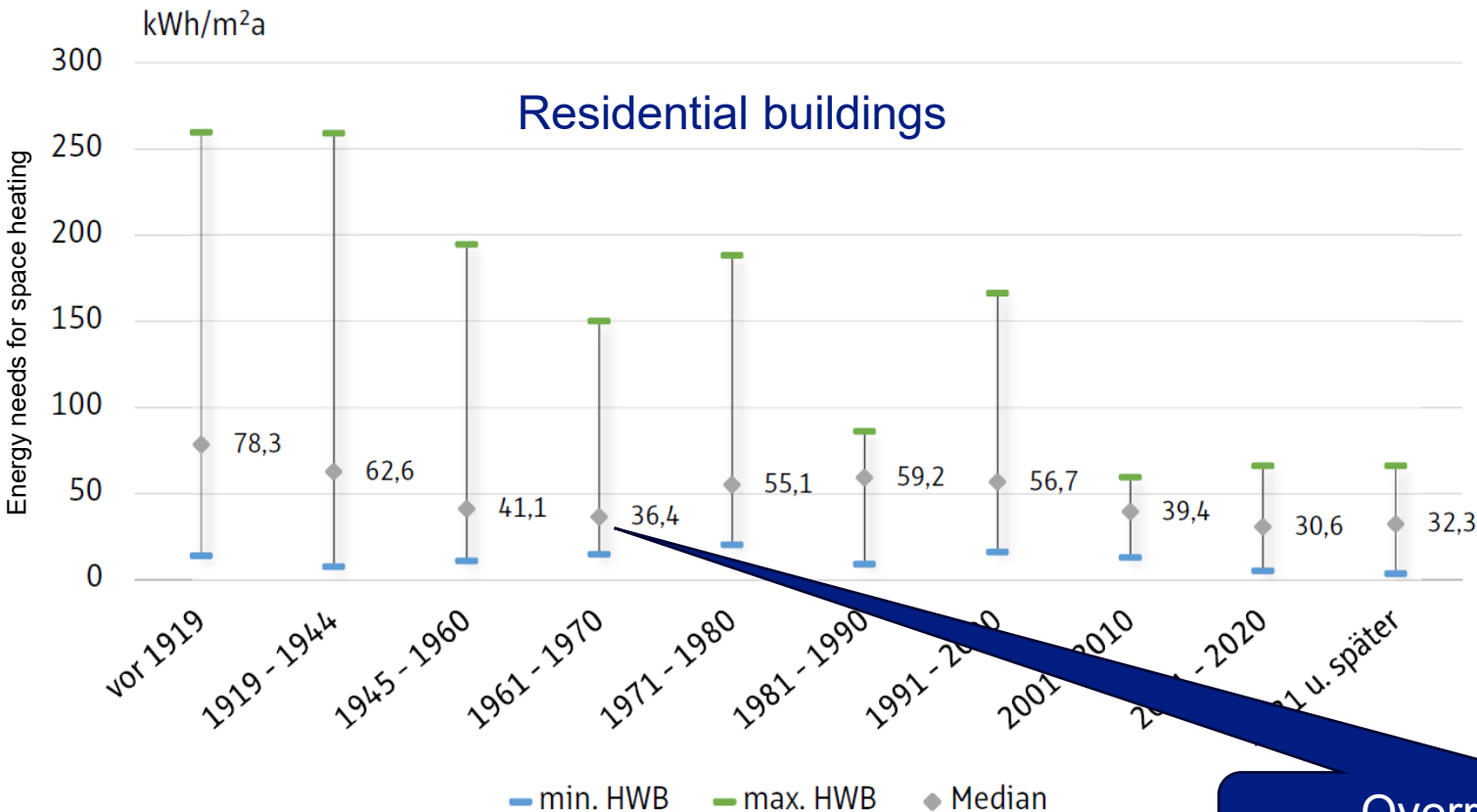not consistent with energy balances

➢ Many countries most probably do not have a representative unbiased data sample
  ➢ Typically, unrenovated, owner-occupied buildings are underrepresented

EPCs (from a representative sample for the whole building stock)

Exemplary region: City with population of ~130 tds.

- EPCs are available for about 12-15% of buildings
- Overrepresentation of
  - Newly constructed buildings
  - Multifamily/Apartment building
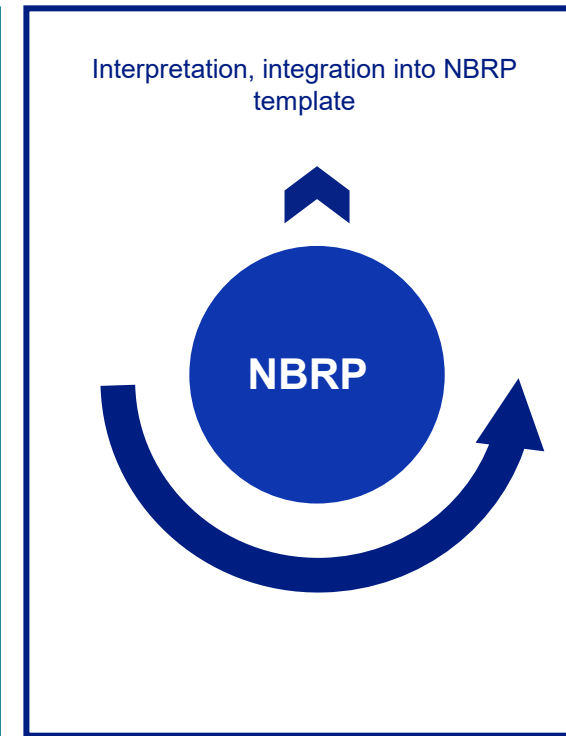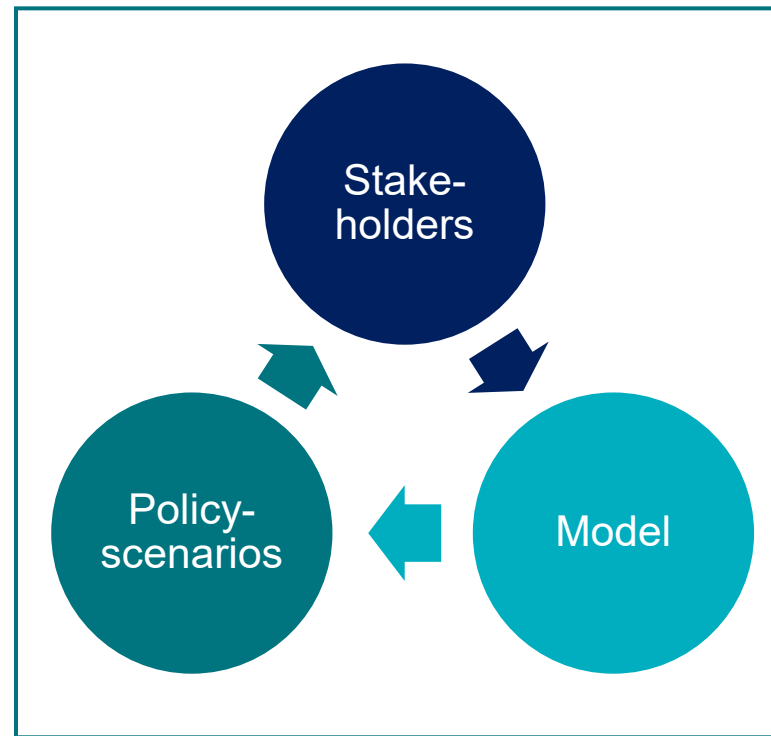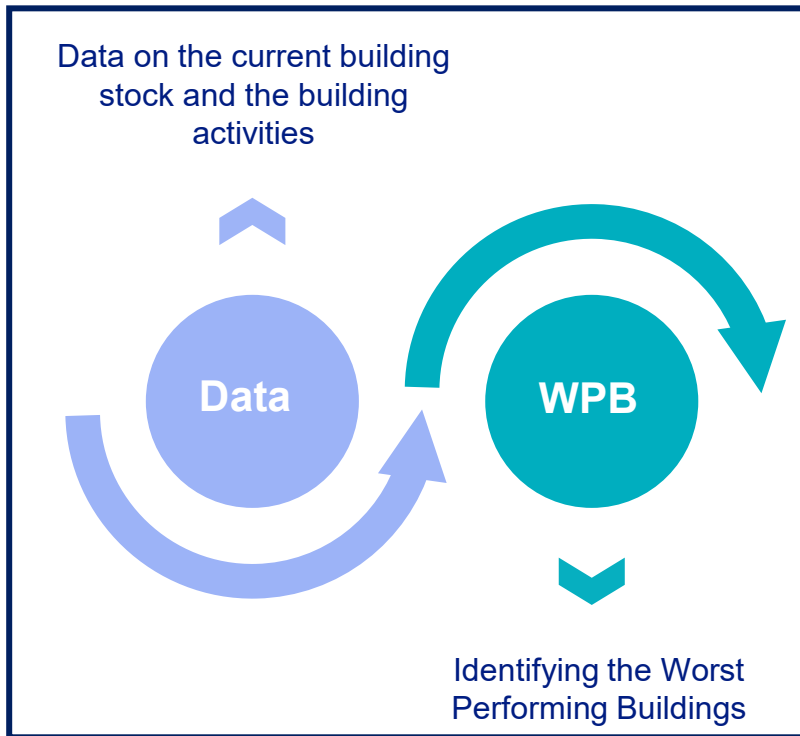 - Refurbished buildings

Residential buildings

Energy needs for space heating — kWh/m²a

Values (Median): 78,3 · 62,6 · 41,1 · 36,4 · 55,1 · 59,2 · 56,7 · 39,4 · 30,6 · 32,3

Periods: vor 1919 · 1919 - 1944 · 1945 - 1960 · 1961 - 1970 · 1971 - 1980 · 1981 - 1990 · 1991 - 2000 · 2001 - 2010 · 2011 - 2020 · 2021 u. später

Legend: min. HWB · max. HWB · Median

Overrepresentation of refurbished buildings

Conclusions regarding improved building stock data for deriving NBRPs

➢ Deriving the required data with a sufficient quality will be challenging for many countries
➢ Urgent steps shall be taken, if process is not yet in place

➢ For many countries, a combination of the three presented approaches is recommended
  ➢ Data, gathered by different approaches need to be converted to get a common, consistent dataset
  ➢ Consistency of aggregated bottom-up data with energy balances needs to be checked

➢ Archetype-based approach (reference buildings), consistently enhanced by additional data sources, is probably sufficient for residential buildings

➢ For non-residential buildings, the archetype-based approach might lead to inaccurate thresholds

➢ Improve the existing data quality as quickly as possible

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Data on the current building stock and the building activities

Data → WPB

Identifying the Worst Performing Buildings

Stake-holders

Policy-scenarios

Model

Interpretation, integration into NBRP template

NBRP

Next steps in EPBD.wise

→ Set-up a data set and modelling framework for PL, RO, UA

→ Discuss scenario settings and possible policy design with country representatives

→ Derive model based scenarios for the renovation roadmap

→ Policy guidance document providing concrete suggestions how to fill selected elements of the NBRP-template provided by DG ENER

→ Stakeholder discussion processes

→ Replication to EU-27

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Q&A?

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