EU Building Stock Observatory

Workshop 2

31st January 2019

Today's event

The purpose of this second workshop is to:

- ► Present the consortiums progress to date, against project objectives
- ► Exhibit and demonstrate the revamped BSO website
- ► Outline the consortiums proposals for the rationalisation of the BSO's indicators and the data population plan
- ► Introduce the Renovation/nZEB service contract
- ► Present primary data collection progress to date
- ► Outline a methodology to quantify the EU built stock

Agenda

- **13:30 – 14:00 Welcome and Registration**
- **14:00 – 14:10 Introduction to the Workshop**
- **14:10 – 14:25 Delivery and Progress Against Objectives**
- **14:25 – 14:55 Presentation of the Revamped BSO Website**
  - Demonstration
  - Feedback
- **14:55 – 15:15 BSO Data Rationalisation and Population**
  - Original data position
  - Rationalisation of BSO indicators
  - Population of BSO indicators
  - Proposed data position
- **15:15 – 15:30 Coffee Break**
- **15:30 – 15:50 Progress Update**
  - Service contract – Comprehensive study of building energy renovation activities and the uptake of nZEBs in the EU
- **15:50 – 16:20 Data Collection Progress to Date**
  - Survey response rates and coverage
  - Quantifying the built stock in MS
- **16:20 – 16:30 Questions, Next Steps and Closing Remarks**
- **16:30 – 17:00 Close and Networking**

Setting the Scene

Dimitrios Athanasiou (*DG ENER*)

An initiative of the European Commission's Directorate General for Energy (DG ENER)

RICS®

The Evaluation of the Energy Performance of Building Directive 2010/31/EU stated that there is a **lack of quality, reliable and consistent data** on the actual effect of energy efficiency policies on the building stock across EU Member States

A better understanding of the effectiveness of policy measures and of market support mechanisms is necessary: **to steer an improvement in the depth and rate of buildings' renovation**

More transparent information on building stocks will: **better inform policy makers, supporting the decisions of market players, in particular financial institutions**

EU Building Stock Observatory

![RICS logo]

1st phase

- development of a list of relevant indicators

- a methodology for data collection

- a website which contains a database, a datamapper and factsheets

https://ec.europa.eu/energy/en/eubuildings
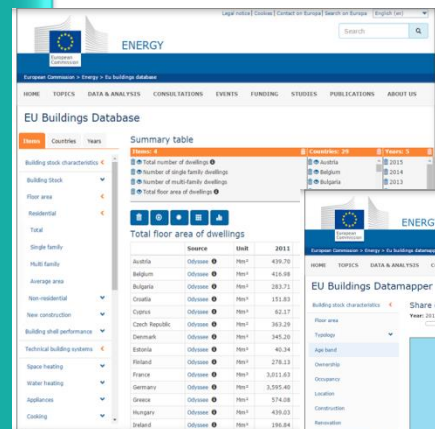
Rationale of the EU BSO

The EU BSO is an "essential piece" of the EU's building energy efficiency policies……….

Data provided in the Observatory will:

- contribute to the improvement of the way the building sector is being considered in **economic modelling** of energy efficiency policy options
- support **monitoring the effect of the EPBD implementation**, as well as of relevant articles of the EED (i.e. Art. 4-5) and of the RED (i.e. Art. 13-14) at national and regional levels
- contribute to **future policy making** and support the review process of EU directives

Our intention is to provide a useful tool that supports decisions related to the energy performance of buildings, but also informs policy decision making, helps academics develop studies and research, financiers benchmark different scenarios, and assist other stakeholders

Phase 1 development

Launched in November 2016, following Phase 1 development by a consortium led by BPIE, the BSO has two primary objectives:

Provide **a snapshot** of the energy performance of the EU building stock, and provide **high-quality data** from all Member States in a consistent and comparable manner

Set a **framework / methodology** for the continuous monitoring of the building stock

Continuation

In the 1st phase of the EU Building Stock Observatory, **data gaps** and limitations to the data **collection**, **aggregation** and **comparison** across EU Member States were identified

The BSO was online but some **features did not work properly so are being revamped**

The intention of the 2nd phase is for the **continuation** of the EU BSO but also to:

- Fill the data gaps,

- Provide better data and statistics to its users,

- Rationalize the indicators, and

- Revamp the website in order to make it more user friendly

![RICS]

Phase 2: Delivery and Progress Against Objectives

David Crosthwaite (*RICS*)

Three partner organisations with expertise in the built environment, energy efficiency and software development

Three-year contract from mid 2017 through to mid 2020……

Phase 2 deliverables

The Consortium are set to deliver <u>three</u> remaining tasks over the next 18 months:

- **Task 1: Maintenance of the website** ONGOING
- **Task 2: Data gap filling** ONGOING
- **Task 3: Data acquisition** ONGOING
- **Task 4: Website revamp** COMPLETE
- **Task 5: Big data feasibility study** COMPLETE
- **Continuation of the EU BSO**

Progress to date

Remaining tasks are focussed on improving the existing data position within the BSO

Deliverable	Status
Task 1: Maintenance and update of the BSO website	Ongoing
Task 2: Data validation, quality control and gap filling	Ongoing
Task 3: Data acquisition via data allocation budget	To follow after data collection phase completed
Task 4: Revamping the existing website	Completed
Task 5: Big data feasibility study	Completed

Task 1 Progressing

T1: Maintenance and update of the BSO website

Deliverable	Status
Quarterly update	Ongoing updates of open source data to populate BSO
Indicator review and recommendations	Completed, but likely to be ongoing process as data collection proceeds
Maintenance response	To follow once revamped existing website goes live
Handover strategy	To follow once revamped existing website goes live
Propose new indicators	To follow once feedback has been received regarding the indicator review

Task 2 Progressing

T2: Data validation, quality control and gap filling

Deliverable	Status
Review existing data strategy	Reviewed existing data sources and calculation methodologies and engaged new EU projects to identify potential data sources and gaps
Data validation and quality control	Developed QA/validation process
Develop data gap closing method	Primary data approaches developed and launched, currently live
Close data gaps	Ongoing activity/work in progress – survey live until early 2020
Stakeholder workshops	First workshop successfully delivered
Annual revision process	To be delivered based on the above

Task 3 Progressing

T3: Data acquisition via data allocation budget

Deliverable	Status
Engage with National data partners	Alternative approach to utilisation of data allocation budget to be progressed
Target member states and topics that represent persistent data gaps	To progress once primary data collection phase complete
Achieve ENER sanction and procure data	To follow once approach agreed

Task 4 Completed

T4: Revamping the existing website

Deliverable	Status
Exploration documentation regarding existing website and tools	Completed Sept 17
Ideation documentation regarding potential solutions available to ENER	Completed Oct 17
Execution and delivery of revamped website and tools	Completed Dec 18

Task 5 Completed

T5: Big data feasibility study

Deliverable	Status
Development of potential Big Data options available to ENER	Completed August 2018
Provide a cost benefit analysis of each option	Completed August 2018
Recommend long-term sustainable data collection strategy	Completed August 2018

Presentation of the Revamped BSO Website

Dave Jeavons (*RICS*)

Website revamp: what we have delivered

Achievements	How we delivered
The website revamp has a new UI/layout that reflects user expectations	We reached out to our own pool of experts and delivered an online experience that was positively received by stakeholders/testers
Optimal view and interaction experience across a wide range of devices	Support for desktop, laptop, tablet and smartphone has been optimised
Responsive website design	As measured during our interactive session at the first workshop
Improved navigation, user friendly UI	Following comprehensive UX design we delivered tools that were considered easy to use by stakeholders/testers
Flexibility for potential introduction of new tools	Improvement to the code base has increased the stability and performance of the BSO website thus facilitating the introduction of new tools as required
Flexibility to allow for the introduction of new data and potential new indicators for regional data and new MS	Ability to add regional and MS data is now feasible when new data becomes available
Two new data visualisation tools for data and indicators in the form of graphs and related tables as well as the ability to download data in different formats	All graphs and tables now allow for the data to be downloaded in a number of formats
The presentation and analysis of time series is now flexible. Permitting the display of current annual data and historical data	We have provided the ability to select multiple years and display the associated data
In addition, we have also delivered:	Improved performance across all three data tools; Datamapper and Factsheet tools now work correctly

Website revamp: what we have delivered

Website revamp: what we have delivered

Website revamp: what we have delivered

Website revamp: what we have delivered

RICS®

🏠 > EU Buildings Factsheets

TOPICS	COUNTRIES

− Building stock characteristics

Building stock characteristics

+ Building shell performance

− Technical building systems

Technical systems

On-site renewable energy

✔ Appliances and lighting

Embodied energy

+ Nearly zero-energy buildings

+ Building renovation

+ Energy consumption

📄 HOW TO USE THIS PAGE

Technical systems

Disclaimer: The graphs below show data available in the EU Building Stock Observatory: a country not represented only means data was not a...

Of all the energy consumed in building... Europe's residential building stock, 71%... result of two elements: (i) heat deman... The EPBD (Directive 2010/31/EU), has... Article 6) asks Member States to imple... establishes minimum mandatory requi... and cooling appliances. In 2013 ecodes... 811/2013; LOT 1), and for water heate... standards are also in place for air cond... 626/2011).

...on is the ...ystems. ...and ...tion ...heating ...13 and ...iciency

European residential energy use

1: European residential energy use, according to functions (2013)

SAVE AS ▼

Cooking: 4.72 %

Appliances: 12.08 %

Lighting: 2.23 %

Factsheets now display content for all topics and countries
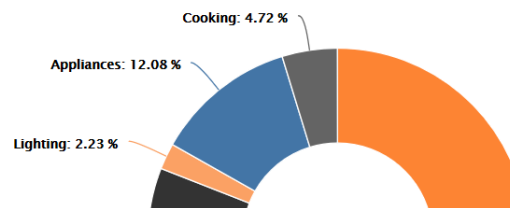
• Ability to download each individual graph and table in appropriate formats
• Switch between tabular and graph view for each individual section

Beta website

Access to the beta version of the revamped website:

► http://euobs.ukwest.cloudapp.azure.com/en/eu-buildings-database
► http://euobs.ukwest.cloudapp.azure.com/en/eu-buildings-datamapper
► http://euobs.ukwest.cloudapp.azure.com/en/eu-buildings-factsheets

► user: preview
► pass: En6rTesT

Data Rationalisation and Population

Rosie Rich (*RICS*)

Data structure

There are six data topics contained within the current structure of the BSO

Topic 1 Building Stock Characterisation

Topic 2 Technical Systems

Topic 3 Certification

Topic 4 Finance

Topic 5 Energy Poverty*

Topic 6 Building codes and standards

*Applicable only to residential built stock

Original data position

Data population and persistent data gaps

▶ The BSO database has historically had significantly low levels of data population

▶ The BSO currently contains approximately 70,000 individual data points (2,400 per MS), of which **87%** are not currently populated with data

Current BSO data population

Donut chart: 87% Data missing (green), 13% Data (orange)
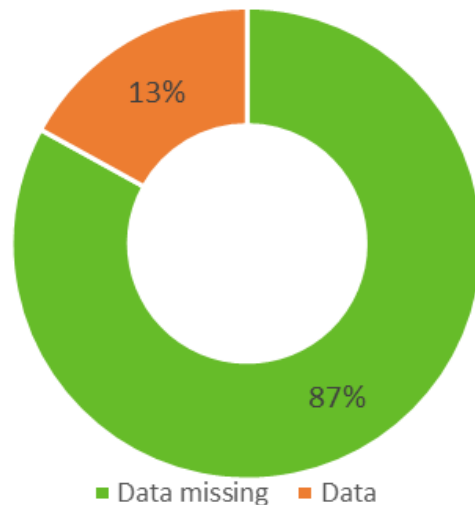
▶ The most significant data gaps occur for **Non-Residential** buildings in:

  ▶ **Topic 1** (Building Stock Characteristics); and

  ▶ **Topic 2** (Technical Systems);

▶ These two **topics** are our current priority for data collection and population

By Member State and building type

▶ Most MS have more than 80% of their data missing, or put another way less than 20% of the current indicators are populated with data

▶ **France** has the highest level of data population with **16%** of filled data points

▶ **Croatia** is at the lower end with **11%** of data points filled

▶ The **Residential** building sector is the most populated with **22%** of its data available

▶ The **Non-Residential** building sector has significantly less data, with only **6%** of its data points filled

▶ Collecting data for non-residential buildings has therefore been highlighted as a priority

Residential

22%

78%

Non-residential

6%

94%

■ Populated Data Points   ■ Persistent Data Gap
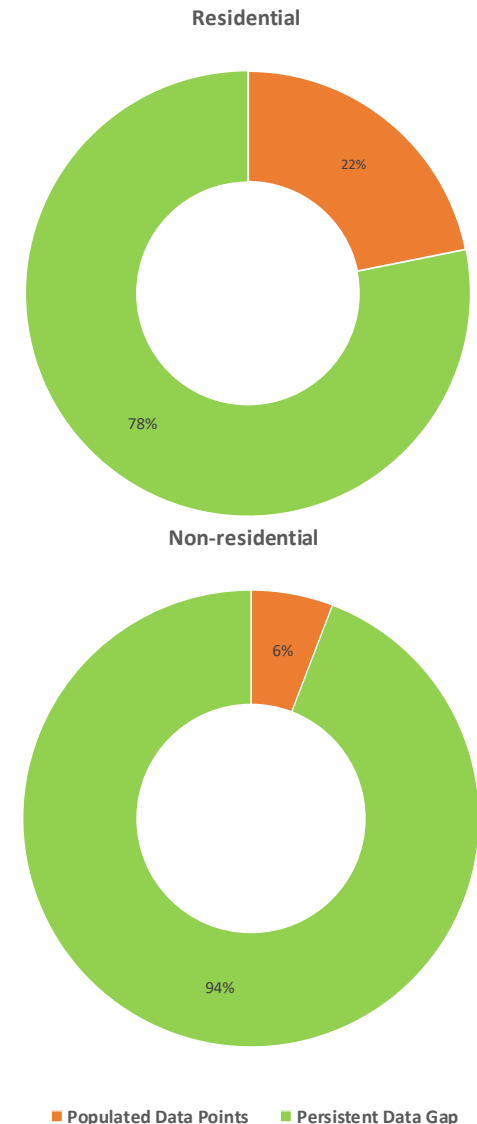
Data position……continued

Data by source

- Of the **13%** of data **present** in the BSO database, approximately:
  - **8%** is sourced from **high quality,** reliable data: National Statistics, Eurostat and Odyssee-Mure
  - **5%** is sourced from completed **EU Projects**: Tabula, Entranze, Inspire etc.

Frequency of data input

- Of the **13%** of data **present** in the BSO database, approximately:
  - **4%** of the data entries are **regularly inputted** for each year and cover each MS
  - **9%** of the data entries are temporally inputted yearly (1-5 entries) and sporadically inputted across MS

Primary and Secondary data collection is a necessity:

► **To address the data gaps** the consortium have developed a 3-stage plan:

1. Rationalise the original set of indicators within the BSO

2. Collect "real" non-residential building data through an **online survey** and a series of focus **interviews**

    i. Which will permit bottom up modelling, which can be benchmarked against the top down data currently held in the BSO

    ii. Assumptions used to model the quantity, type, size and age of the built stock will be based on real building data where available

3. Collaborate with other "live" EU projects that are capturing useful and relevant data (i.e. nZEB service contract)

Rationalisation of indicators

Rationalisation to remove certain indicators from the public domain

► In order to address some of the persistent data gaps the consortium have devised a rationalisation plan

► The rationalisation identifies indicators with certain characteristics which we propose are removed from the public domain

► These indicators could be "mothballed" until data becomes available i.e. from smart metering etc

► Some of the characteristics include:

  ► Duplication of indicators (e.g. Number of Dwellings)

  ► Data not available to the public (e.g. EPCs per year)

  ► Data not known or measured (e.g. EPCs per size of building)

► The proposed rationalisation recommends that **69%** of the existing indicators are **hidden** from the public domain

► Removal of the proposed indicators would improve the data population to **36%** (an increase of 23%)

BSO population plan

To further contribute towards data gap closures

► The consortium regularly source data from National Statistical Offices, Eurostat and Odyssee-Mure databases

► The consortium have been investigating data synergies between other EC funded projects (e.g. Renovation/nZEB project)

► The consortium have implemented **two primary data collection approaches**:

    ► Non-residential online **survey** (*RICS*)

    ► A series of non-residential focus **interviews** (*BSRIA*)

► The primary data collection tools **address** approximately **18%** of the entire BSO database

► Potential synergies between data partners is anticipated to address **a further 10%** of the BSO data population

Proposed data position

RICS

Data position following rationalisation and population

Original Data Position

- 13%
- 87%

■ Persistent Data Gaps ■ Populated Data

Proposed Data Position

- 39%
- 61%

■ Persistent Data Gaps ■ Populated Data
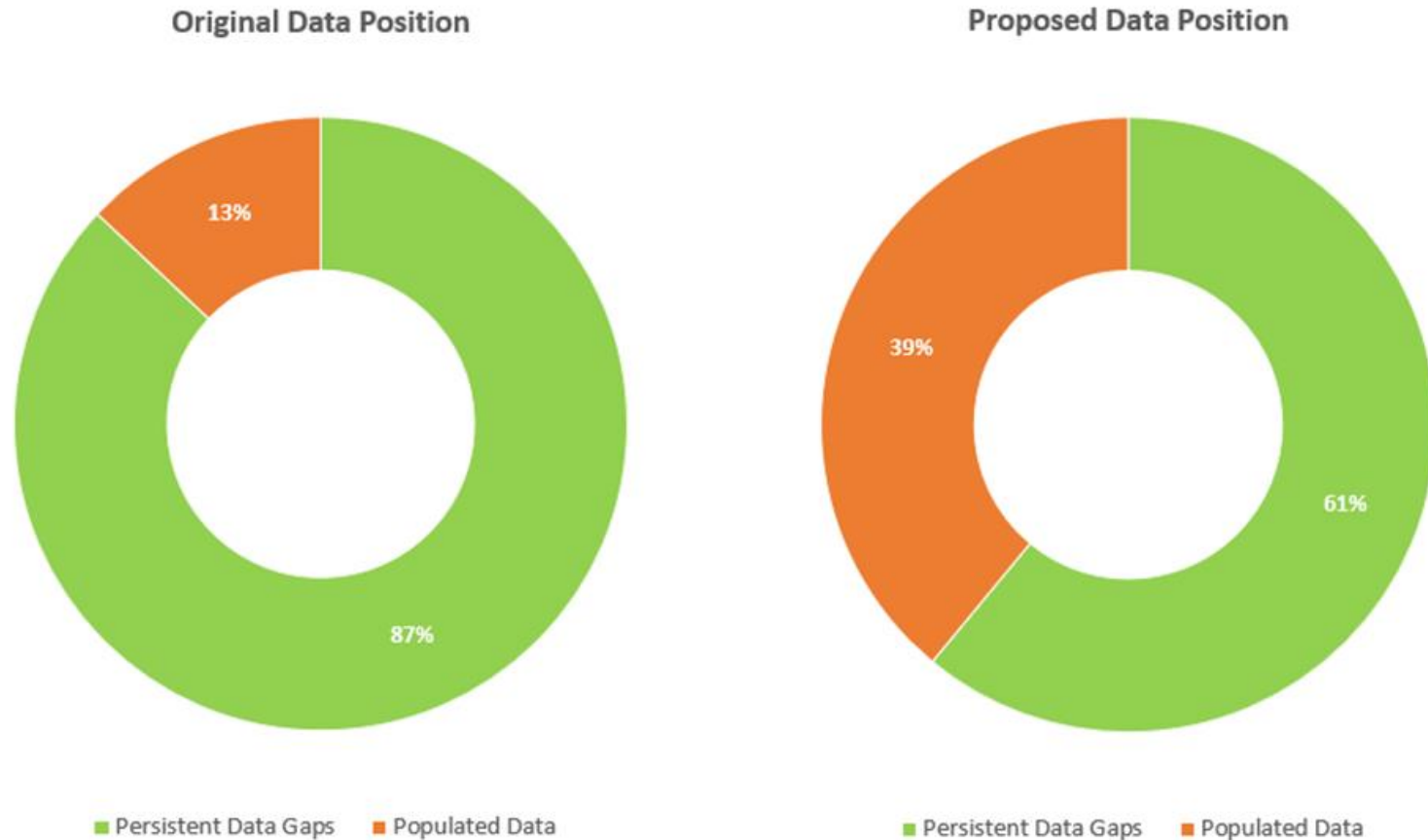
► The population of data points within the BSO would increase by 26%

Coffee Break

COMPREHENSIVE STUDY OF BUILDING ENERGY RENOVATION ACTIVITIES AND THE UPTAKE OF NEARLY ZERO ENERGY BUILDINGS

- Dr. Andreas Hermelink,
  Sven Schimschar

1. PROJECT OVERVIEW

2. DESCRIPTION OF ACTIVITIES

- Task 1 – Development of a methodology and its application in different countries
- Task 2 – Detailed study of building energy renovation and NZEB uptake trends in EU-28

3. EXPECTED DELIVERABLES

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PROJECT OVERVIEW

NAVIGANT

- IPSOS (formerly GfK) & Navigant (formerly Ecofys)
- Statistical, comprehensive analysis of renovation and NZEB uptake in EU 28
- Complements Building Stock Observatory (BSO)
- 3 large scale surveys
  - Consumers
  - Architects
  - Installers
- Complex methodology => new set of indicators to measure & monitor
  - renovation rates per renovation depth,
  - investments per renovation depth,
  - energy savings per renovation depth and
  - uptake of NZEBs.
- Residential & and non-residential, all EU & each MS, 2012-2016.
- Duration: 11/2017 – 03/2019 (potential extension until 06/2019)

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2. DESCRIPTION OF ACTIVITIES

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Overall Goal	Undertake a robust statistical and comprehensive **analysis of the renovation activities and NZEB uptake** in the EU28 to complement the **EU Building Stock Observatory**

Task 1
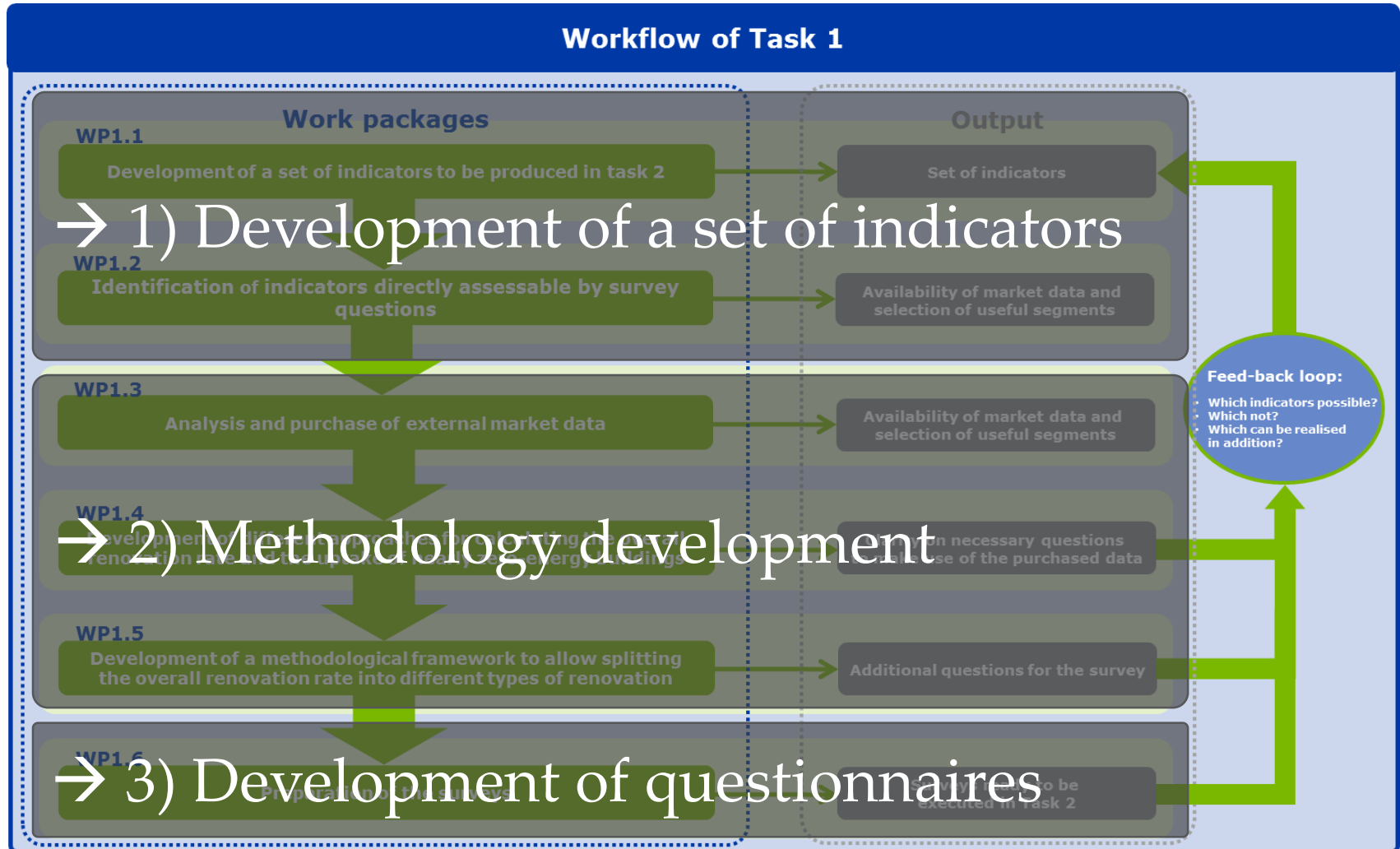**Development of a methodology and its application in the different countries**

Task 2
Detailed study of building energy renovation and uptake trends in EU-28

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Workflow of Task 1

Work packages

Output

WP1.1
Development of a set of indicators to be produced in task 2

Set of indicators

→ 1) Development of a set of indicators

WP1.2
Identification of indicators directly assessable by survey questions

Availability of market data and selection of useful segments

WP1.3
Analysis and purchase of external market data

Availability of market data and selection of useful segments

Feed-back loop:
- Which indicators possible?
- Which not?
- Which can be realised in addition?

WP1.4
→ 2) Methodology development
necessary questions
e of the purchased data

WP1.5
Development of a methodological framework to allow splitting the overall renovation rate into different types of renovation

Additional questions for the survey

WP1.6
→ 3) Development of questionnaires
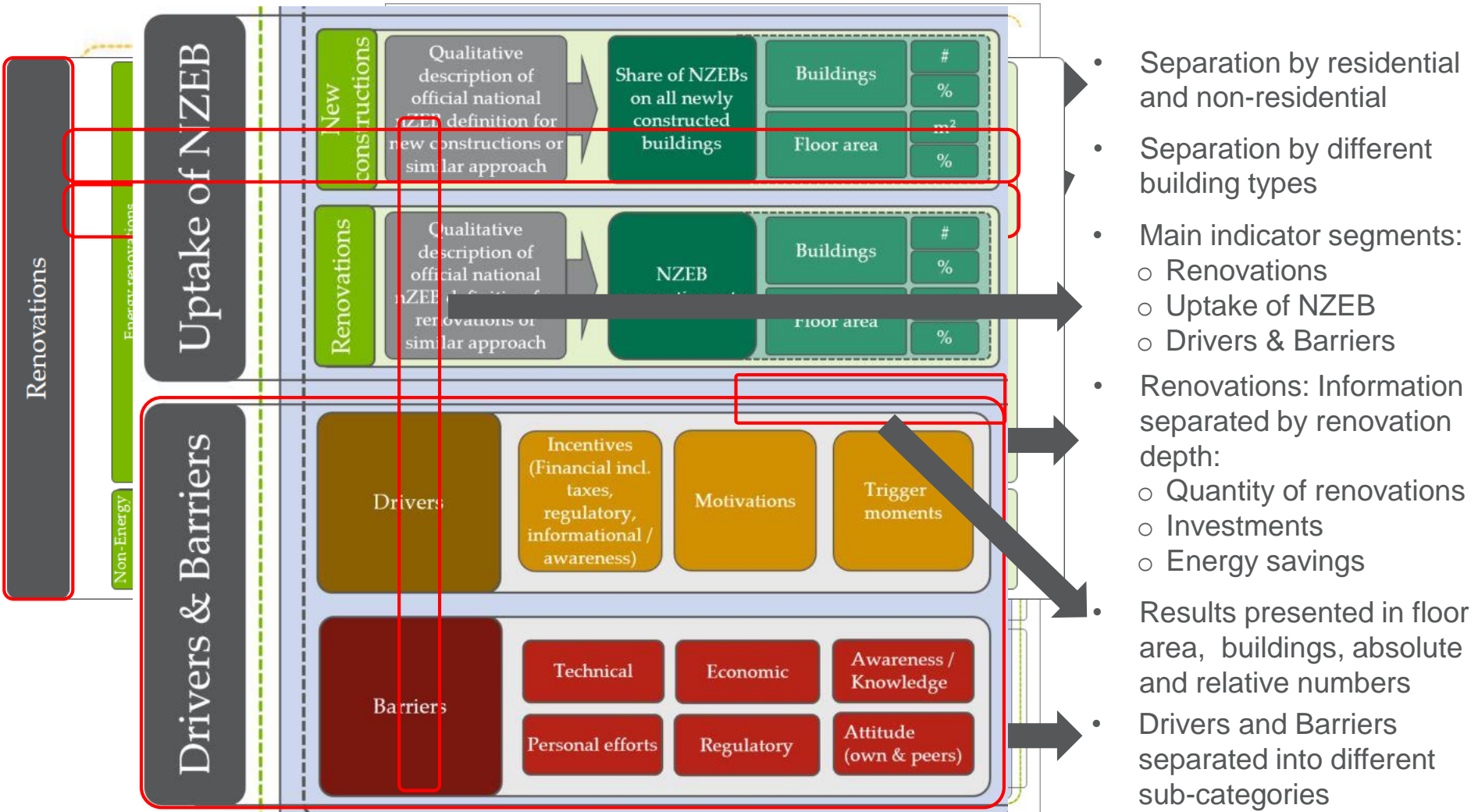to be executed in Task 2

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WP1.1 & WP1.2: DEVELOPMENT OF A SET OF INDICATORS

- Evaluation and review of relevant existing building observatory indicators
  - overlaps, inconsistencies, gaps , need for adaptations / deletions / new indicators
  - revision of indicators
- Updated set of relevant indicators
  - Precise definitions
  - Allows exact determination of data to be collected
  - Optimized for data collection and processing
  - Allows to measure and monitor renovation of EU building stock for EU and all 28 MS
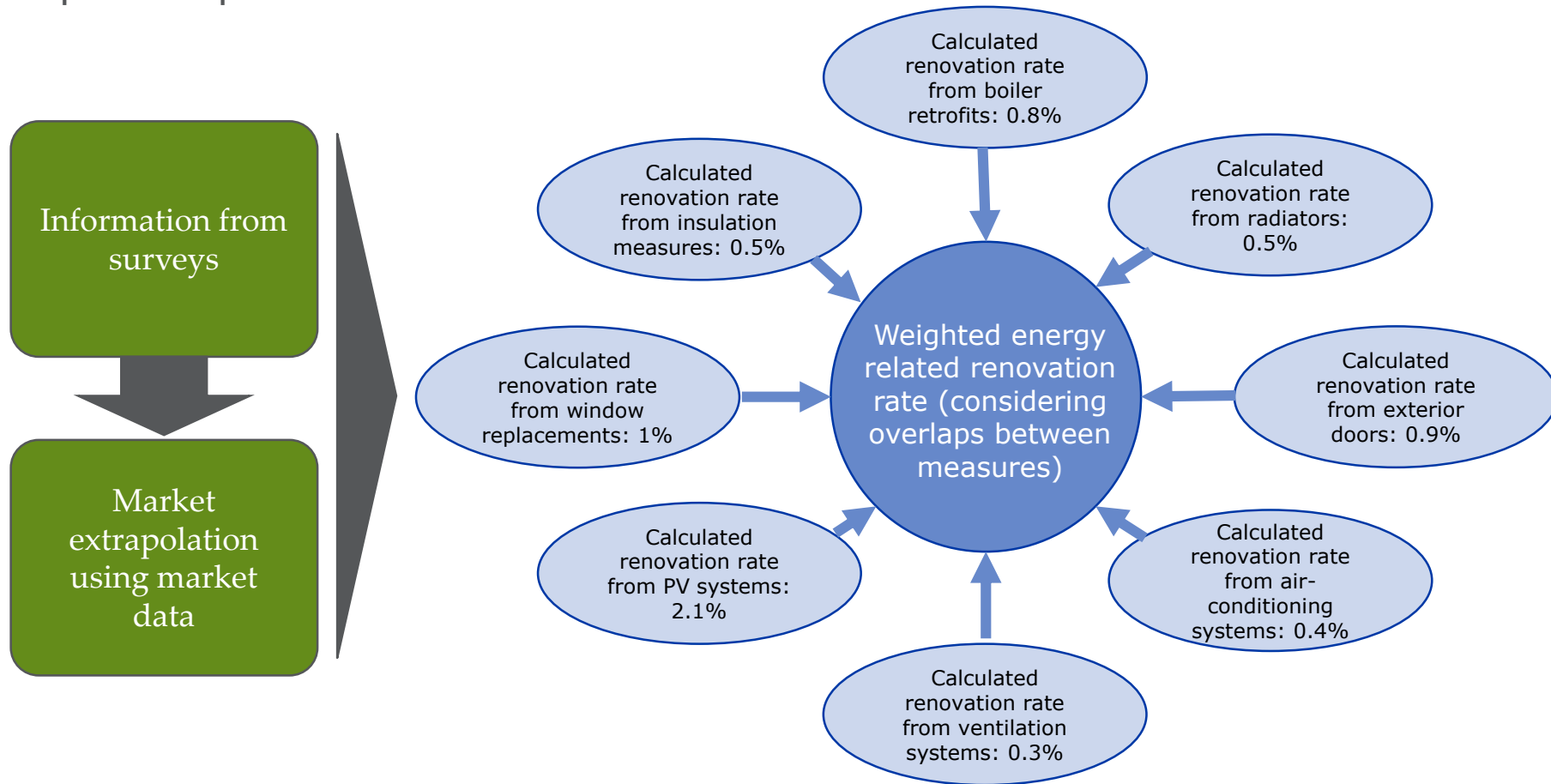
~~Completed~~

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- Separation by residential and non-residential

- Separation by different building types

- Main indicator segments:
  - Renovations
  - Uptake of NZEB
  - Drivers & Barriers

- Renovations: Information separated by renovation depth:
  - Quantity of renovations
  - Investments
  - Energy savings

- Results presented in floor area, buildings, absolute and relative numbers

- Drivers and Barriers separated into different sub-categories

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WP1.3, WP1.4 & WP1.5: METHODOLOGY DEVELOPMENT

Component specific renovation rates:

- Iterative development process between Navigant and Ipsos for three questionnaires

- Questionnaires designed for
  - getting all information needed for methodologies
  - Filling all indicators

- Simultaneous development of three questionnaires
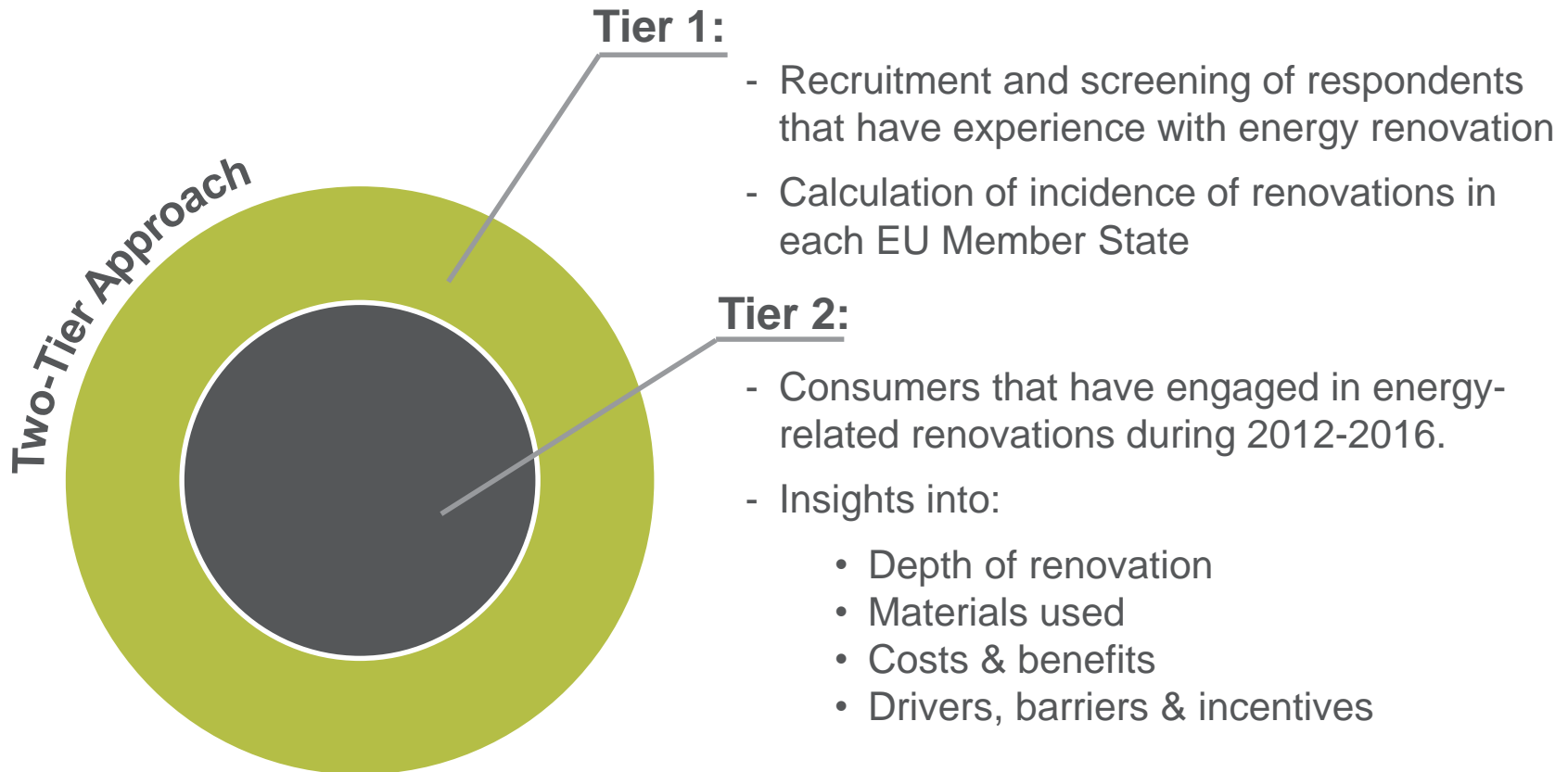 - ensure consistency
  - allow cross linkages

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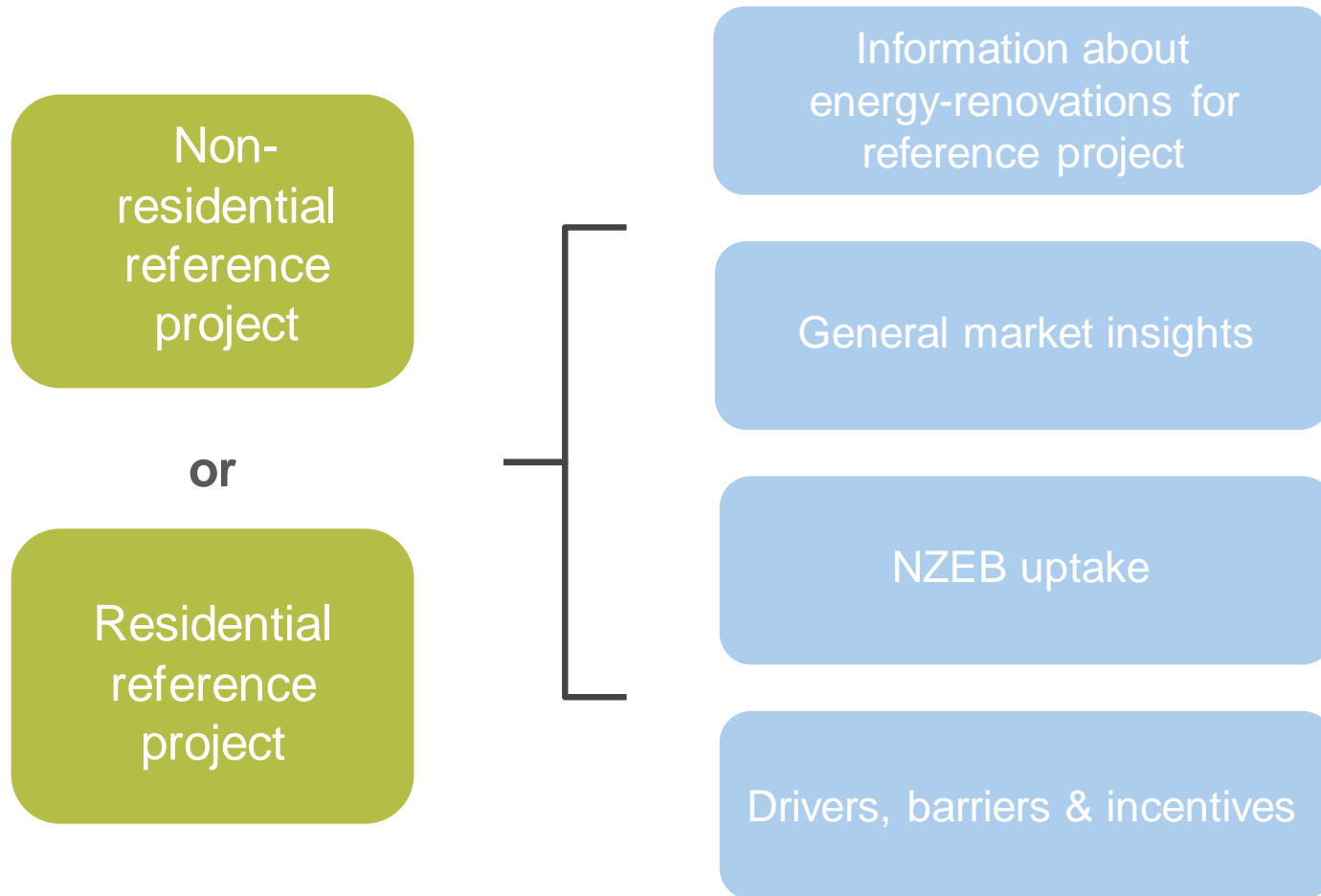|	**Consumer survey**	**Architects survey**	**Survey of main contractors and installers**
Coverage	EU28		
Method	CAWI, GfK online panels	CAWI	CATI
Sample size	n=16 800 ✓	n=1 500 (fieldwork ongoing)	n=1 990 ✓
Target group	Consumers having undertaken residential renovations	Architects involved in renovation activities and new constructions (NZEB relevant)	Construction companies involved in renovation activities and new constructions (NZEB relevant)
Objective	Collect data on **residential building** renovations and new constructions	Focus on **non-residential buildings** but also aspects on residential buildings are covered	Collect data on the demand, supply chain and quality of the works in **residential and non-residential buildings**

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Two-Tier Approach

Tier 1:

- Recruitment and screening of respondents that have experience with energy renovation

- Calculation of incidence of renovations in each EU Member State

Tier 2:

- Consumers that have engaged in energy-related renovations during 2012-2016.

- Insights into:

  • Depth of renovation
  • Materials used
  • Costs & benefits
  • Drivers, barriers & incentives

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Non-residential reference project

or

Residential reference project

Information about energy-renovations for reference project

General market insights

NZEB uptake

Drivers, barriers & incentives

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75%

25%

Installers

- Façade
- Windows
- Heating systems
- Photovoltaic systems, air-conditioning or electric heating
- Roof
- Mechanical ventilation

Main Contractors

Insights

- Understand the demand and supply chain and the quality of the works related to energy efficiency and NZEB
- Drivers, barriers & incentives

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Data cleaning and validation

- **Screening Phase**: systematically looking for problems with the data
- **Diagnostic Phase**: identifying the condition of any suspect data
- **Treatment Phase**: deleting or editing the data or leaving it as is as appropriate

Data weighting

Making results representative for the national population in terms of socio-demographic characteristics for each of the countries surveyed

In-depth analysis

Analysing the results of the three surveys at EU and country level. Presenting results according to additional breaks (e.g. age, gender, other socio-demographic characteristics, country grouping etc.).

Data file

cleaned and restructured microdata from all three surveys in Excel and SPSS

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Level of detail of information for **EU28 building stock inventory** and **new constructions**

Building types

Single family houses
Multi family houses
Offices
Educational buildings
Hospitals
Hotels and restaurants
Sports facilities
Wholesale and retail trade services buildings
Other types of energy-consuming buildings

Units

Building floor area (m²)
Number of Buildings (#)

Years

2012 - 2016

Collect data by:

Building Stock data (WP 2.3)
- **Update and revision of IA EPBD inventory**

→ **Needed to calculate the renovation rates**

New Construction data (WP 2.4)
- EUROCONSTRUCT and EECFA data
- other literature (e.g. long-term renovation strategies) and IPSOS local offices

→ **Needed to calculate the share of NZEB buildings in new constructions**

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Applying approaches as developed in task 1:

- Component specific renovation rates
- Overall renovation rates (per renovation depth)
- Calculation of investment costs
- Calculation of energy savings

Indicators to be assessed per MS:

Building energy renovation

- **Renovation rates by renovation depth**
- **Investments**
- **Energy savings**
- **Context / determinants of renovation rates and depths based on survey:**
  - Drivers
  - Barriers

NZEB uptake new constructions

- **Number** of newly constructed **NZEB**
- **Share** of newly constructed **NZEB**

Aggregation of country results on EU scale

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3. EXPECTED DELIVERABLES

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MAIN PROJECT DELIVERABLES

- **Filled indicators**

- **Report**
  - comprehensive country chapters for each Member State
  - will distinguish between renovation work and NZEB uptake trends
  - renovation rate, depths and resulting savings on Member State level and EU28 level
  - comprehensive descriptive analysis
  - visualised data from all three surveys as graphs and charts.

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BSO Data Collection Progress to Date

David Crosthwaite (*RICS*)

Survey instruments

On-line survey and focussed interviews

► We are collecting data from real buildings, asking respondents specifically about the building they occupy

► "Real" building data will permit **bottom up modelling** which can be **benchmarked** against the **top down data currently held in the BSO**, thereby ensuring it's continued relevance

► The primary data collection tools were designed to address persistent data gaps in both priority topics:

  ► **Topic 1** (Building Stock Characteristics); and

  ► **Topic 2** (Technical Systems)

Primary data collection

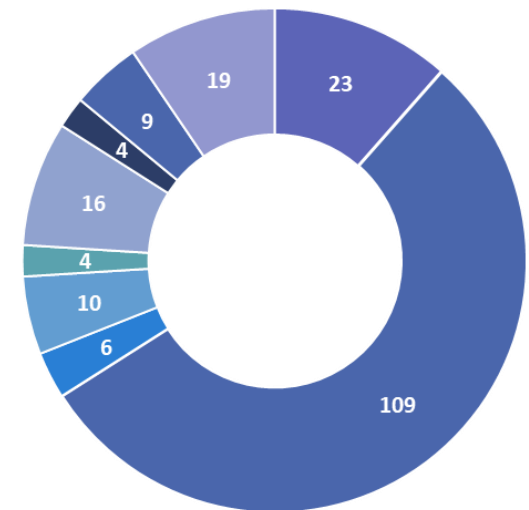**We are collecting data concerned with:**

- ► Building stock by building type: Public and Private Offices, Wholesale & Retail Trade, Healthcare, Hotels and/or Restaurants, Educational, Sports Facilities, Other

- ► Building stock by age, and Building floor area

- ► Building ownership, Occupancy rates, and Operational hours

- ► EPC's: Total, year, and whether its publicly displayed

- ► Energy renovations

- ► On-site renewable energy generation

- ► Metering systems: Smart meters, thermostats, cooling, ventilation, and BACS

- ► Technical systems: Heating, cooling, hot water, lighting

- ► Annual total energy consumption, and electricity consumption (kWh)

Topic 1: Gap filling

▶ Completed survey responses received: **202** (January 2019)

▶ Geographically: **27** of the EU 28 MS are covered, leaving **1** MS with no representation

▶ The majority of the responses currently cover both **private** and **public** offices (**109** and **23** responses respectively)
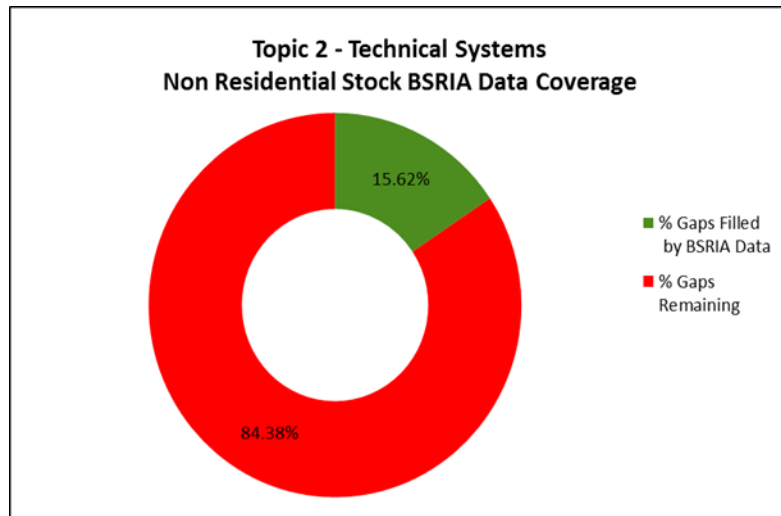

MS Coverage of Survey Responses
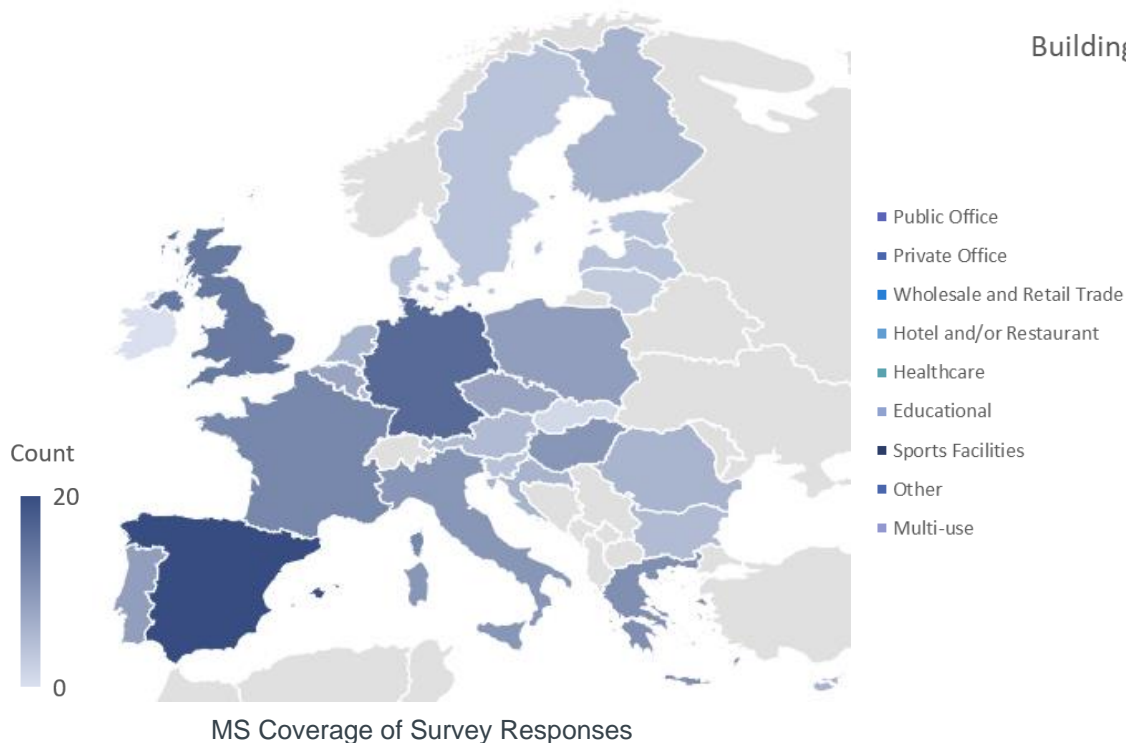
Building Type Coverage of Survey Responses

- Public Office
- Private Office
- Wholesale and Retail Trade
- Hotel and/or Restaurant
- Healthcare
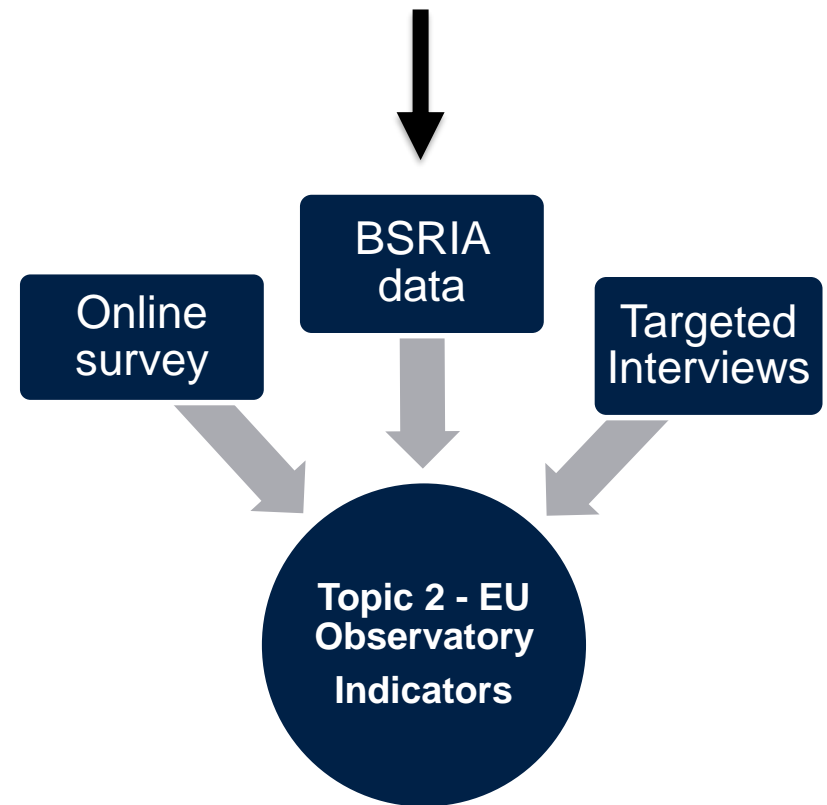- Educational
- Sports Facilities
- Other
- Multi-use

Topic 2: Gap filling

- ► Topic 2 Technical Systems
- ► 194 indicators
- ► BSRIA Primary data collection
  - ► Focussed interviews (May – Dec 2018)
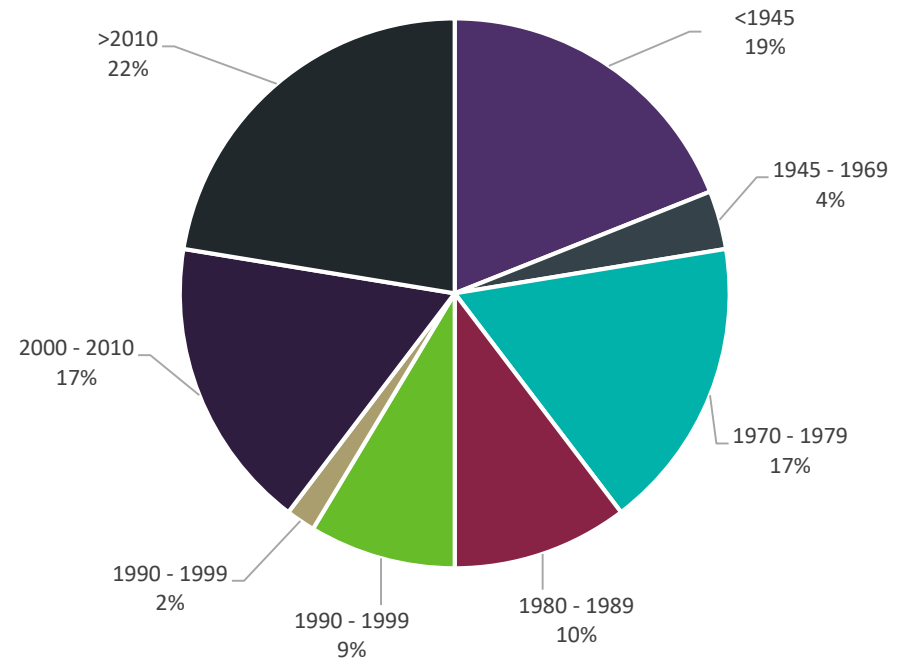 - ► BSRIA data (June – Sept 2018)

Non Residential Indicators

Topic 2 - Technical Systems
Non Residential Stock BSRIA Data Coverage

- 15.62%
- 84.38%

■ % Gaps Filled by BSRIA Data
■ % Gaps Remaining

Focussed interviews

- ► Questionnaire addresses ~60% missing indicators

- ► Topics Addressed:
- ❏ Building Stock characteristics
- ❏ Energy Performance
- ❏ Space Heating
- ❏ Space Cooling
- ❏ Hot Water Supply
- ❏ Lighting
- ❏ Metering and Control

Focused Interview Data Coverage by Age of Building Stock

- >2010: 22%
- <1945: 19%
- 1945 - 1969: 4%
- 1970 - 1979: 17%
- 1980 - 1989: 10%
- 1990 - 1999: 9%
- 1990 - 1999: 2%
- 2000 - 2010: 17%

Focussed interviews - progress

▶ **Total interviews – 58** (January 2019)

▶ No. of countries addressed – 25

▶ Countries not addressed – HU, IE, SK

Country	Interviews	Country	Interviews
AT	2	IE	0
BE	2	IT	2
BG	4	LV	2
HR	2	LT	2
CY	2	NL	2
CZ	3	PL	2
DE	2	PT	2
DK	2	RO	2
EE	2	SK	0
ES	2	SL	3
FI	3	SE	2
FR	2	MT	2
GR	2	LU	2
HU	0	UK	2

Focused Interview Data Coverage by Building Type

- Private Office, 15
- Public Office, 5
- Wholesale and Retail Trade, 2
- Hotel and/or restaurant, 4
- Health Care, 4
- Education, 11
- Sports Facilities, 5
- Warehouse, 3
- Other (Social Care, Exhibition Centre), 9
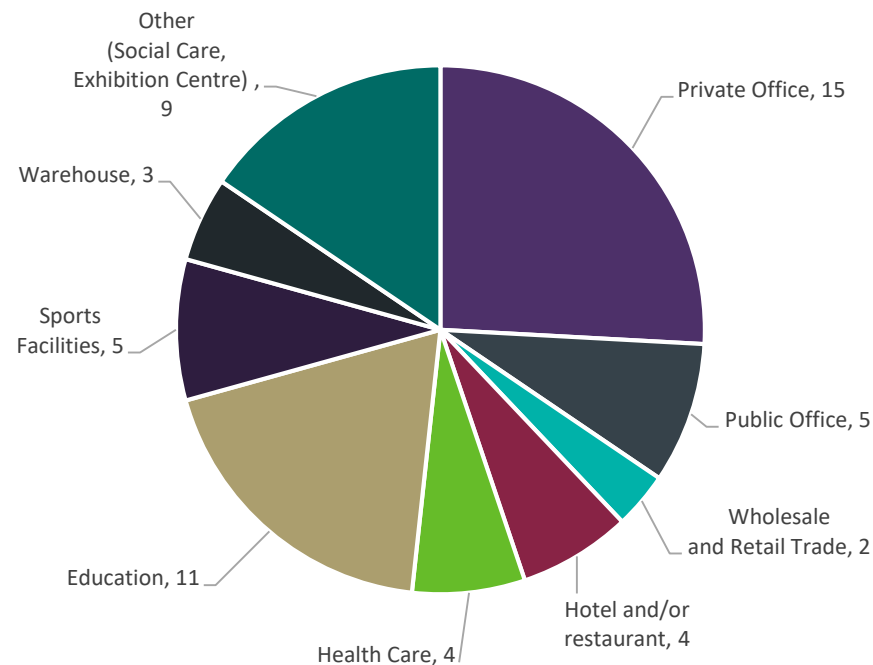
Primary data collection: moving forward

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- ▶ GDPR legislation has hindered the survey process
- ▶ Not currently a representative distribution across all MS and building types
- ▶ Utilised organisational survey platform and "opted in" respondents list to boost survey returns
- ▶ Moving forward, need to focus on respondents from MS where we have no responses
  - ▶ Followed by focus on the **8 MS** that have 1-4 responses
  - ▶ Then the 4 **MS** with 5 responses
- ▶ Further focus on **Wholesale and Retail buildings** (6 responses), **Healthcare** (4 responses), and **Sports Facilities** (4 responses) as a first priority
  - ▶ Second priority **Hotels and/or Restaurants** (10 responses), and **Educational buildings** (16 responses)
- ▶ We are currently in the process of looking at where the Task 3 data allocation budget could be utilised to boost survey coverage
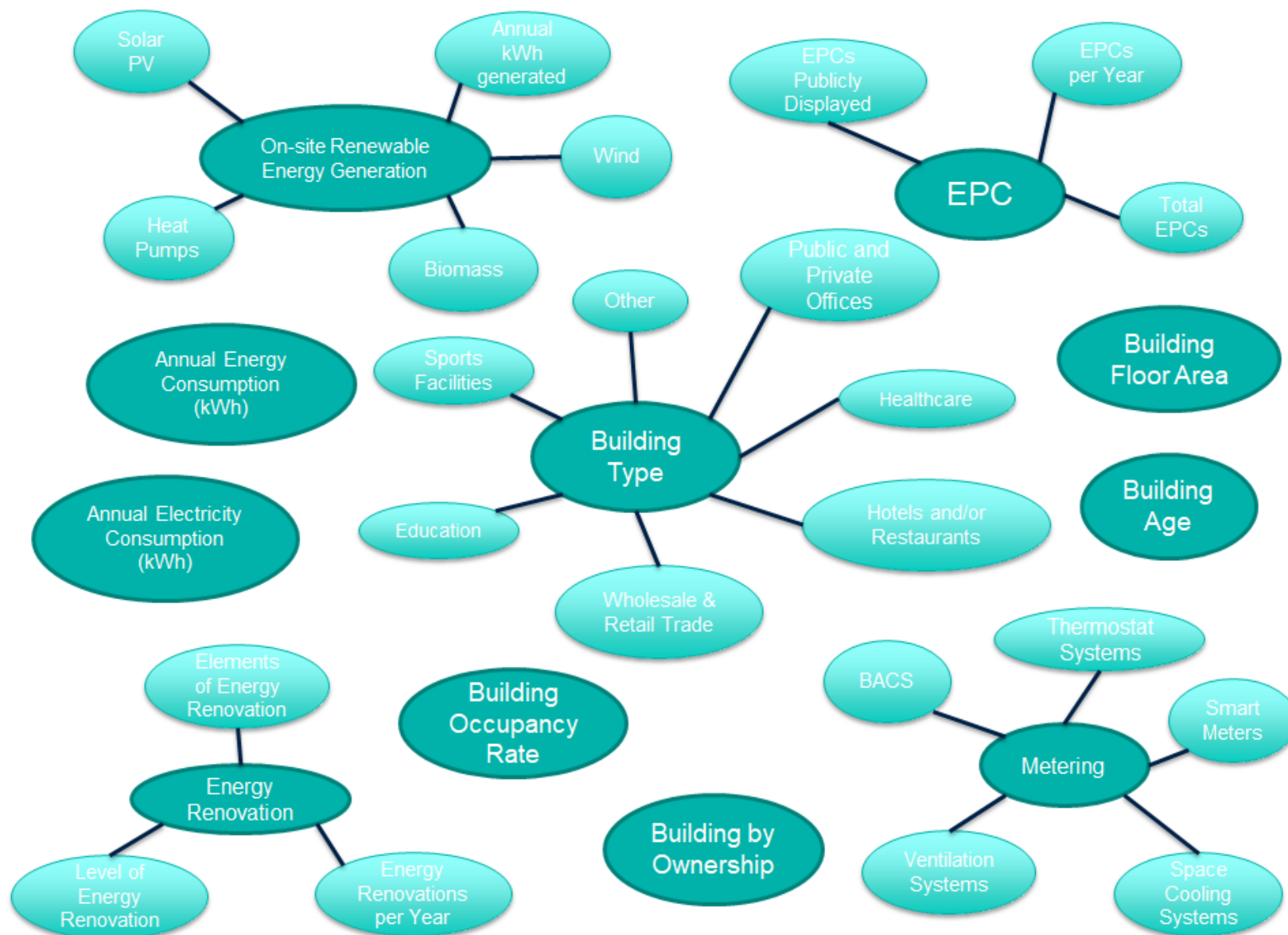
Utilising primary data

Application of primary data

▶ Once there has been a sufficient amount of primary data collected indicators with missing data can be populated with modelled data

▶ The survey data is expected to close around **18%** of the persistent data gaps within the BSO database

▶ The need to model the data to be representative of each individual MS is due to several factors:

  ▶ Even with the anticipated survey returns this only equates to data for around 10 buildings per MS

  ▶ 280 buildings representing the entire EU non-residential built stock (10 per MS), is simply not representative

▶ **There is therefore a need to estimate the quantum of the EU built stock**

Quantifying the EU built stock

Modelling the EU non-residential sector

► Measurement of the quantum of the built stock is fundamental to understanding the **implications of future energy efficiency adaptation**

► However, a census of the built stock is not achievable within the constraints of this research

► The amount of data anticipated to be collected from the primary data tools could never be representative of the position in individual EU MS

► Baseline estimates are therefore being prepared quantifying the volume of the built stock across 28 MS via:

　► Synthesised/imputed approach for the non-residential stock

　► Census returns for the residential stock, adjusted using demolition/ construction rates

Quantifying the EU built stock

Modelling the built stock: Raw data

- ► The consortium contacted the National Statistical Office in each MS to try to obtain:
  - ► Total non-residential buildings stock (k),
  - ► Total non-residential building floor area (m2),
  - ► Stratified by the seven non-residential building types
- ► 18 MS responded that they had no available data
  - ► Main response being that these data simply don't exist
  - ► 4 MS didn't respond to our request
- ► **6 MS** provided absolute data on the non-residential built stock
  - ► 2 MS gave data from the 2011 census
    - ► **Austria and Greece**
  - ► 4 MS gave data correct from 01.01.2018
    - ► **Estonia, Finland, Netherlands and Slovenia**

Methodology

1. The average number of non-residential buildings was calculated from the six absolute values provided

2. The average land area (km2) of these 6 MS was also estimated

3. The average number of non-residential buildings, was divided by the average land area of the 6 MS. To give the **average number of non-residential buildings per km2**

4. The average number of non-residential buildings per km2, was then multiplied by land area per MS (km2) to give the **estimated non-residential building stock per MS**

Quantification of the non-residential built stock

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Estimated <u>total</u> non-residential built stock numbers

MS	Estimated Stock	MS	Estimated Stock
France	14,547,433	Lithuania	1,423,789
Spain	11,334,435	Latvia	1,413,999
Sweden	9,320,845	Croatia	1,271,461
Germany	7,920,157	Netherlands	1,128,240
Poland	6,911,216	Slovakia	1,092,715
Italy	6,681,452	Denmark	963,897
UK	5,495,491	Slovenia	944,800
Romania	5,222,022	Estonia	816,192
Bulgaria	2,464,350	Greece	795,130
Portugal	2,077,760	Belgium	687,771
Hungary	2,035,464	Austria	212,486
Czech Republic	1,754,682	Cyprus	209,911
Ireland	1,564,692	Luxembourg	58,742
Finland	1,523,196	Malta	7,178

Highlighted cells indicate MS which provided absolute NR built stock numbers

Application of stock data

- ► By quantifying the total number of non-residential buildings, by MS and also by building type, further assumptions and calculations can be carried out to address a substantial number of persistent data gaps

- ► Numerous indicators present in the database have sub-indicators by total number of buildings and then by type (e.g. EPC's per year by building type, total energy consumption by building type, etc.)

- ► It would be useful to compare our estimates to those prepared by others i.e. KIDs data

- ► Once the scale and nature of the EU built stock is defined, the energy performance and energy efficiency factors can then be further understood

Next steps

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Enhanced cooperation with Concerted Action EPBD, Member States and industry

Enhanced cooperation with Eurostat

Further development and potential additional features:

► Focus on data collection and closing data gaps

► Surveys designed to capture built stock characteristics across 28 MS

► Focused interviews relating to the technical systems of buildings

► Work with other EU projects to capture all available data

► Quantify EU building stock

► Procure data sets that appropriately supplement the EU BSO

► 3rd BSO workshop Spring 2020

- Regional breakdown of EU buildings data
- Modelling of building stock
- Big data and artificial intelligence

Special plea

We'd be very grateful to receive additional data from you, the more we can collect the more robust any estimates contained within the BSO will be. To complete the survey follow the link:

► EU BSO Non-residential Building Stock Survey

Workshop feedback

If you have a moment please fill out the feedback form for the conference

► https://www.surveymonkey.co.uk/r/EUBSO

Questions, Closing Remarks and Networking

David Crosthwaite (*RICS*)