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Operational data integration to enhance energy performance certificates

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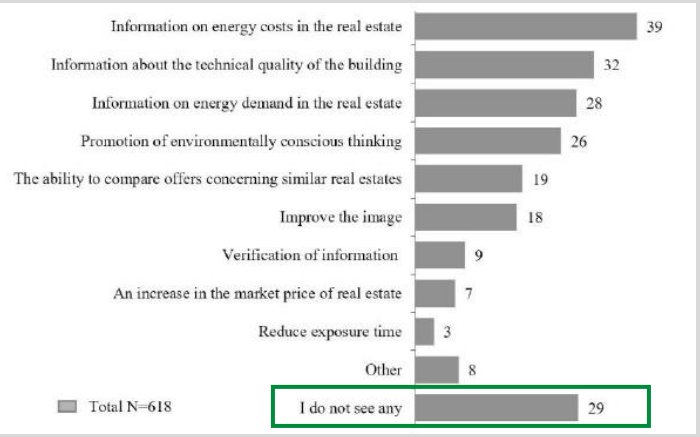
Current EPC generation

- The Energy Performance Certificate (EPC) was intended as an instrument to influence the building market and the future refurbishment scenarios of the existing building stock
- The current EPC generation showed low values in terms of usefulness and reliability, due to:
  - Difficulties in the interpretation of the information by the final tenants
  - "Performance gap"
  - Poor perception of EPCs

Perceived benefits of having an EPC



R.P. Pascuas, G. Paoletti, R. Lollini. Impact and reliability of EPCs in the real estate market. Energy Procedia 2017, 140, pp. 102-114, https://doi.org/10.1016/j.egypro.2017.11.127

The **TIMEPAC project** proposes an **enhanced EPC scheme**, aimed at **improving the accuracy and the reproducibility of the whole energy performance procedure**, and to add (realistic) information related to the current building and suggest renovation actions

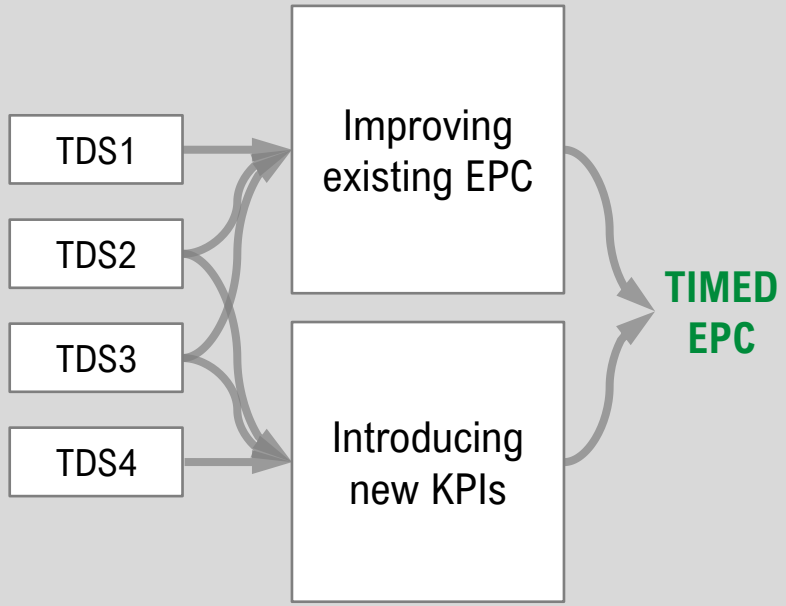
TIMEPAC enhanced EPC

T ailored
IM proved
E nhanced
D ynamic

1. Provide *improved quality of data*
2. Contain a *wider set of parameters*
3. Provide a clear picture of the *roadmap for the renovation* of the building toward the zero-emission target (connection to BRP)
4. Be a *continuously updated* document
5. Be a *flexible* document in relation to the purpose and the user

TIMEPAC Work Package 2
Transversal Deployment Scenarios (TDS)

Develop and deliver new methods and tools to **implement enhanced EPCs schemas**



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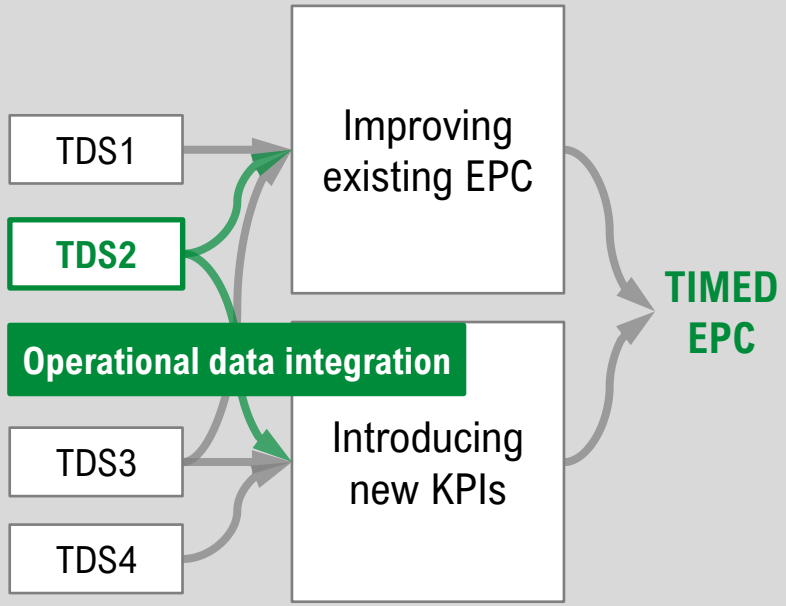
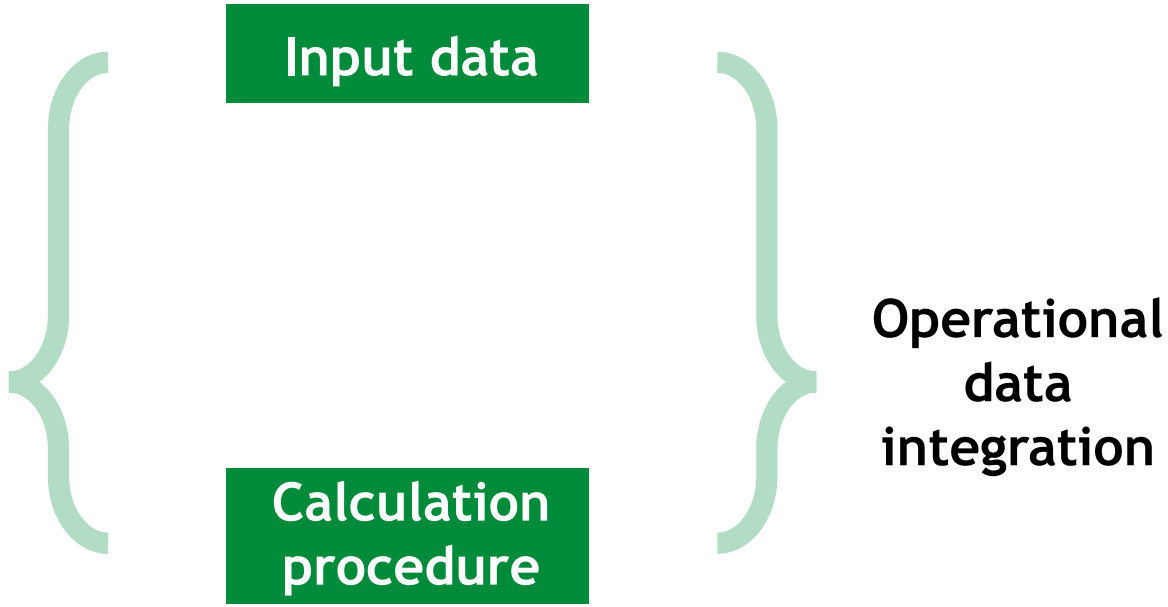


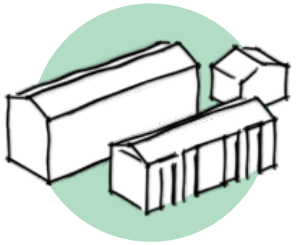
Operational data integration

Objectives of the scenario:

- Expand the set of **energy performance indicators** in the EPC as to carry out a holistic approach in the assessment of the building overall performance
- Improve the **accuracy** and **reproducibility** of the whole energy performance assessment procedure
- Assess the impact of advanced building technologies



Operational data integration



REPRESENTATIVE BUILDINGS

DATA COLLECTION

- Building documentation
- Actual energy consumptions
- In-field measurements
- Questionnaires for user behaviour

STANDARDISED PROCEDURES

DATA ANALYSIS

- Standard EP assessment
- Tailored EP assessment
- Model calibration
- IEQ assessment
- ECM assessment
- BACS impact assessment

ADDITIONAL PERFORMANCE INDICATORS

Guidelines to allow the correct application of the proposed enhanced EPC, and to guarantee the accuracy and reliability of the process

Data collection

Data can be collected by consulting the **building documentation** (existing EPC, energy audit reports, etc.), by **in-field measurements**, and **questionnaires**

According to the availability and the analysis to be performed, the data to be collected may be:

1. **Real** data
2. **Conventional** (standard) data
3. **Reference** data

	Standard EP assessment	Tailored EP assessment	Model calibration	ECM assessment	IEQ assessment	BACS impact assessment
General information	Real	Real	Real	Real	Real	Real
Geographical and climatic data	Conventional (standard)	Conventional (standard)	Real	Conventional (standard)	Conventional (standard)	Conventional (standard)
Geometrical characteristics	Real	Real	Real	Real	Real	Real
Building components characteristics	Real data or reference	Real data or reference	Real data or reference	Real data or reference	Real data or reference	Real data or reference
TBSs characteristics	Real data or reference	Real data or reference	Real data or reference	Real data or reference	Real data or reference	Real data or reference
Occupancy information	Conventional (standard)	Real	Real	Real data or conventional	Real data or conventional	Real data or conventional
Energy consumptions	/	/	Real	/	/	/
Economic data	/	/	/	Real data or reference	/	/

Data analysis

The data analyses will be performed by applying established methodologies specified in technical standards and literature

1)	Model calibration	ASHRAE Guidelines 14
2)	IEQ assessment	EN 16798-1
3)	ECM assessment	EN 15459-1 / PD ISO/TS 50044
4)	BACS impact assessment	EN ISO 52120-1

Model calibration

Building energy model calibration

is the process of fine-tuning the simulation inputs so that the observed energy consumptions (or environmental parameters) closely match those predicted by a simulation program

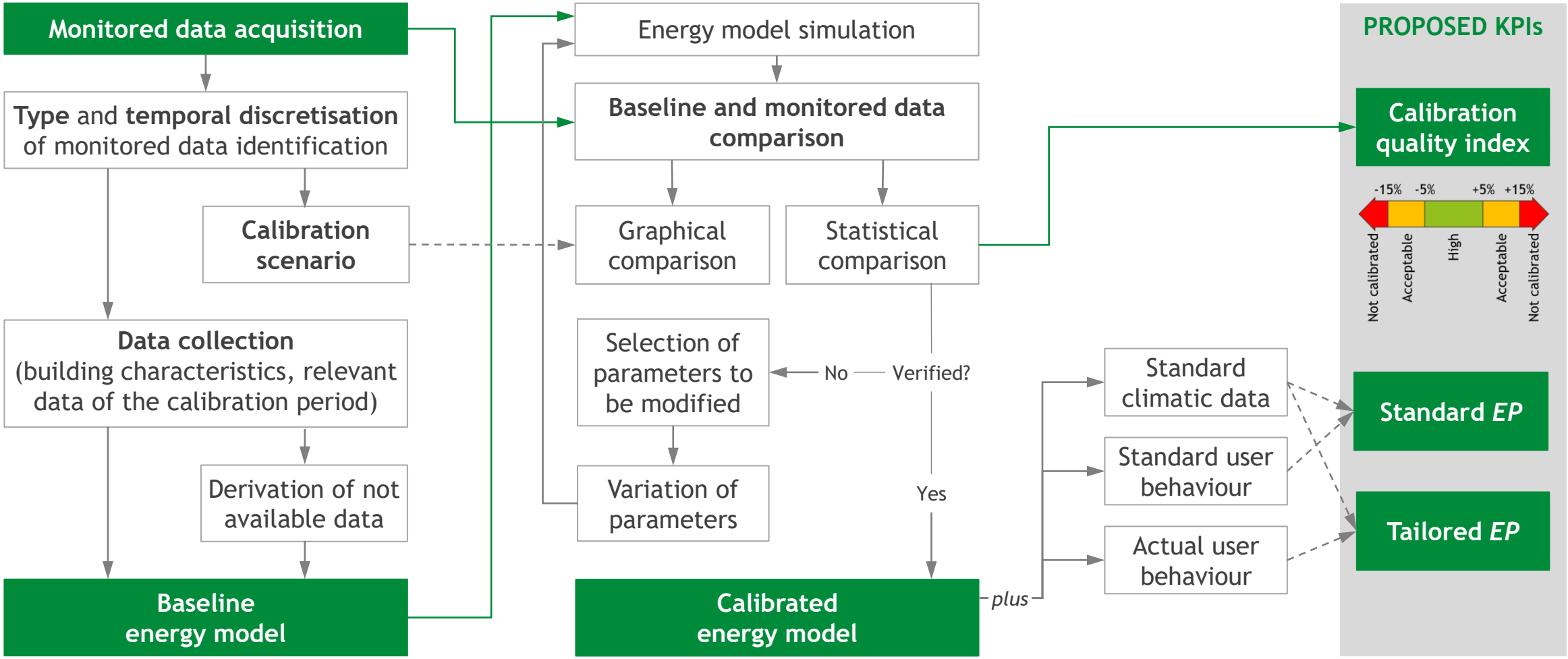
Opportunities related to the use of a calibrated energy model:

1) Reliability of input data used to assess the building EP
   - Inaccurate input data
   - Standard input data, assumed in case of not available input data
2) Accuracy in the declared energy performance
   - Input data quality
   - Replacement of standard with the **actual user behaviour**

Transition from **standard** to **tailored EP assessment**

Reduction of the «PERFORMANCE GAP»

Model calibration



IEQ assessment

Three different domains will be considered for the indoor environmental quality (IEQ) assessment, as specified in the EN 16798-1 technical standard:

1) Thermal comfort

2) Indoor air quality (IAQ)

3) Visual comfort

Calculated, adopting the **adaptive comfort theory**

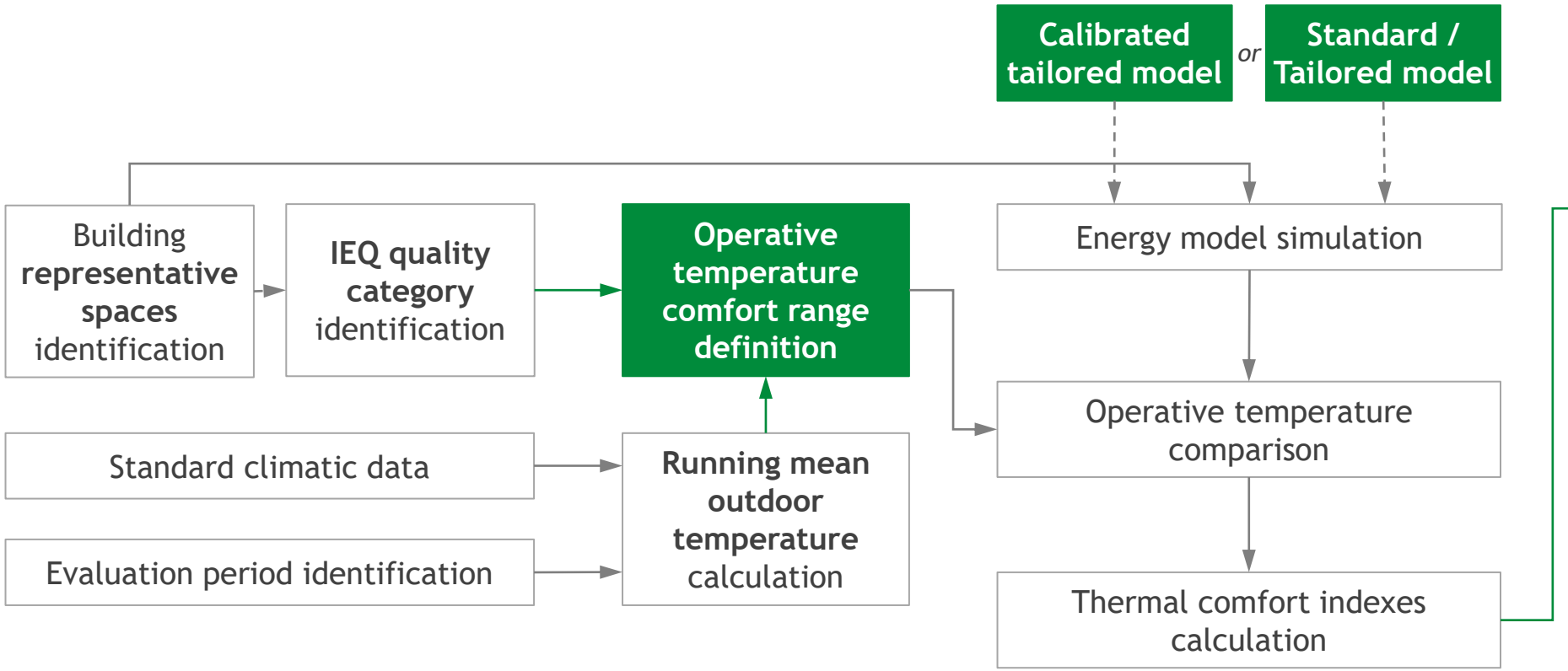
Verification of **limit comfort values** (design values, calculated, or monitored data)

PROPOSED KPIs

- Verification of maximum CO_2 level
- Verification of minimum illuminance on task areas

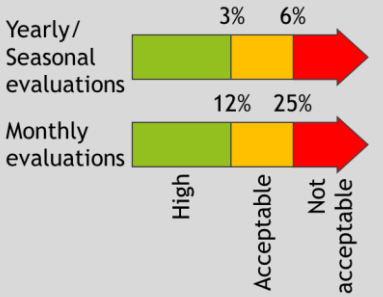
IEQ assessment (thermal comfort)

Adaptive comfort theory



PROPOSED KPIs

Thermal comfort quality index



Conclusion

Will it be useful and effective?

Will it actually influence the building market?

Will it really lead to the refurbishment of the building stock?

If you would like more information, please contact us at

giovanna.deluca@polito.it

Thanks for your attention!