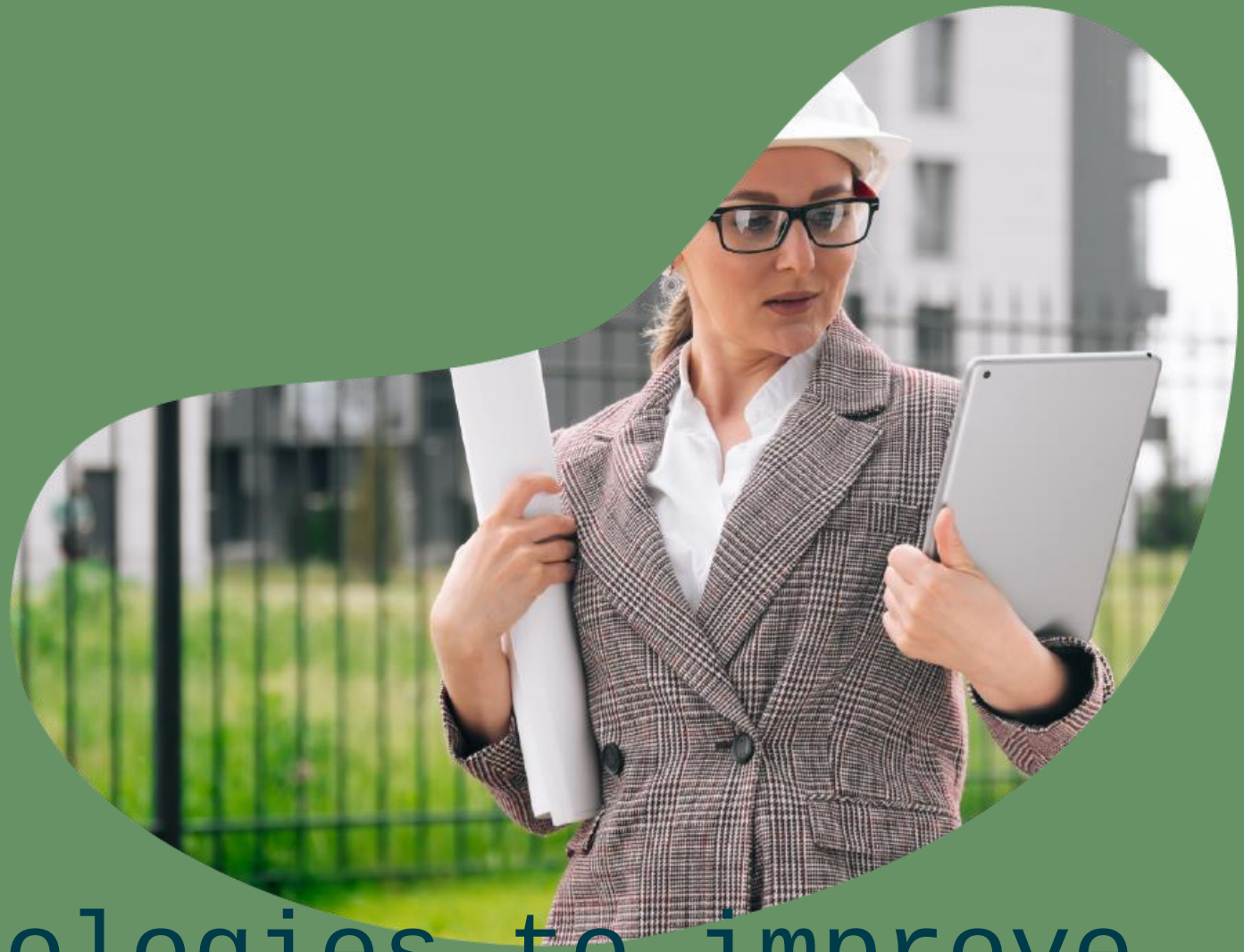
EPC RECAST

ENERGY PERFORMANCE CERTIFICATE RECAST



Digital technologies to improve EPC’s inputs

Sarah Noyé, Tecnalia Research and Innovation, Spain

- Why are ECP inputs important?
- Digital inspection technology
- Energy model input parameters calibration

Why are EPC inputs important?

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Improving EPCs' reliability and accuracy

- Current EPC suffers lack of trust due to **reliability** issues
- EPCs need to be **accurate** to correctly evaluate real savings and guide the renovation wave

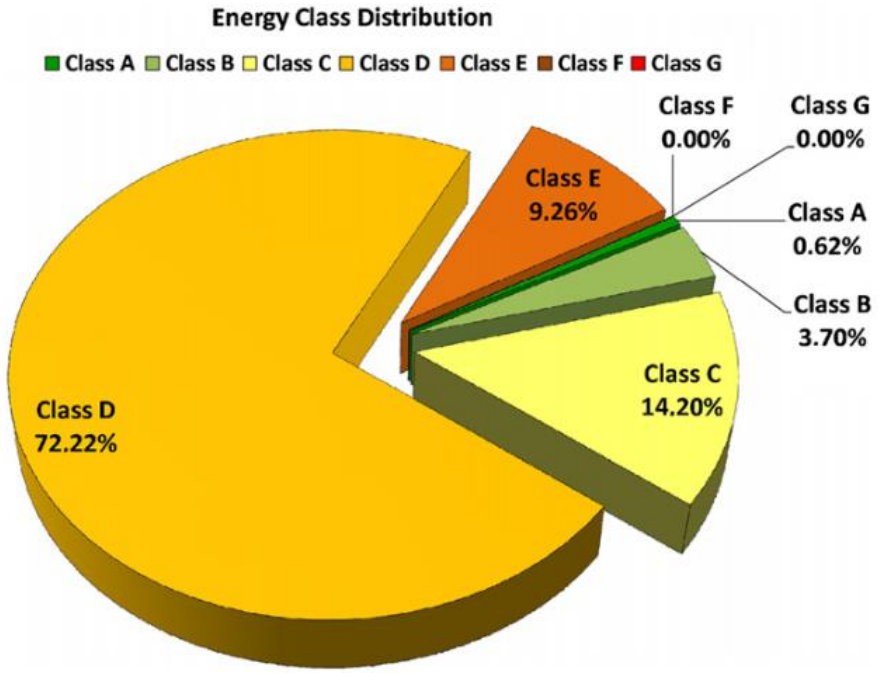

Fig. 7. Energy classification: percentage of energy class attribution.

162 independent experts have been asked to perform an EPC for the same house with the same software.

Tronchin, L., & Fabbri, K. (2012). Energy Performance Certificate of building and confidence interval in assessment: An Italian case study. *Energy Policy*, *48*, 176-184.

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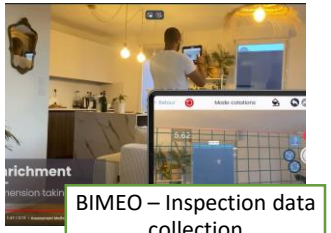
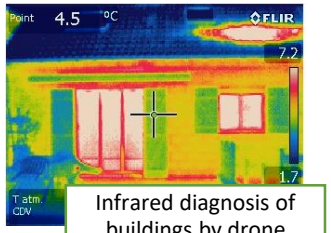
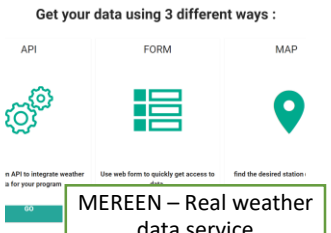
Overview of EPC RECAST technologies



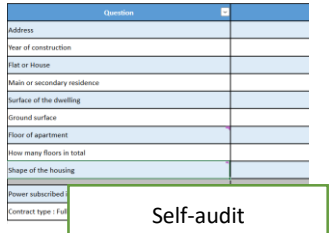
BIMEO – Inspection data collection



Infrared diagnosis of buildings by drone



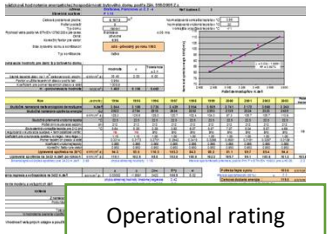
MEREEN – Real weather data service



Self-audit

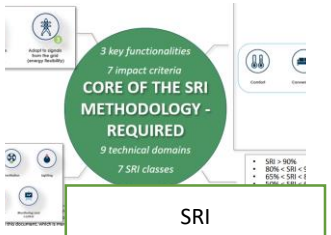
Calibration toolbox

Cometh hourly computational core

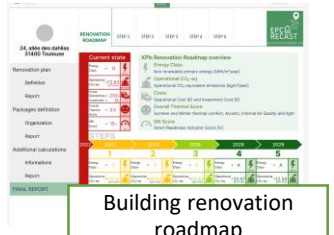


Operational rating

Digital logbook for dwelling

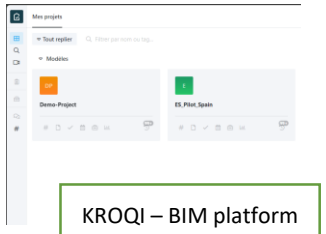


SRI



Building renovation roadmap

Printing App for quality checks



KROQI – BIM platform

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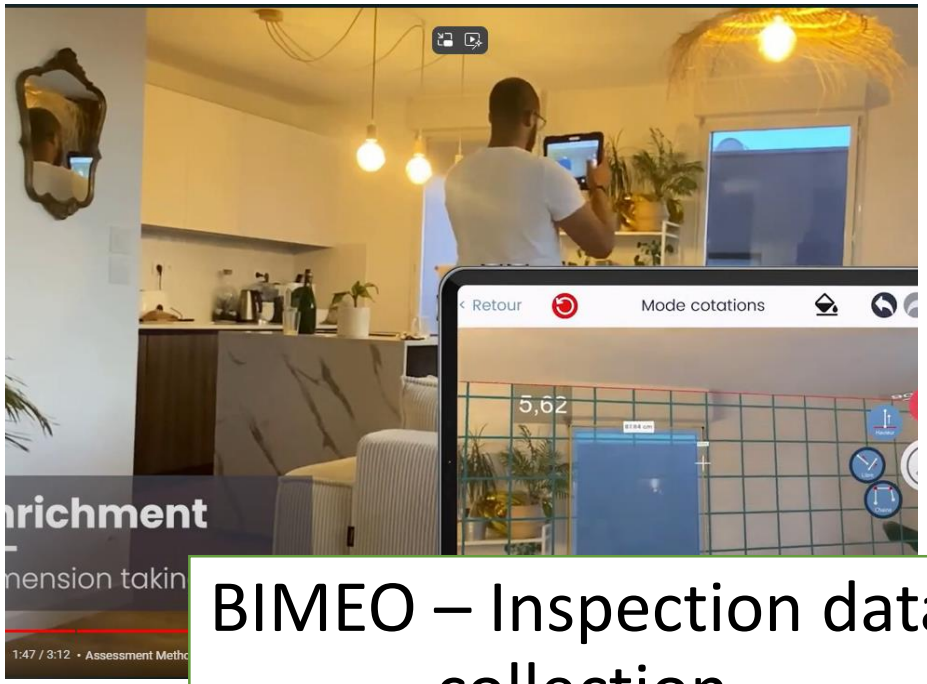
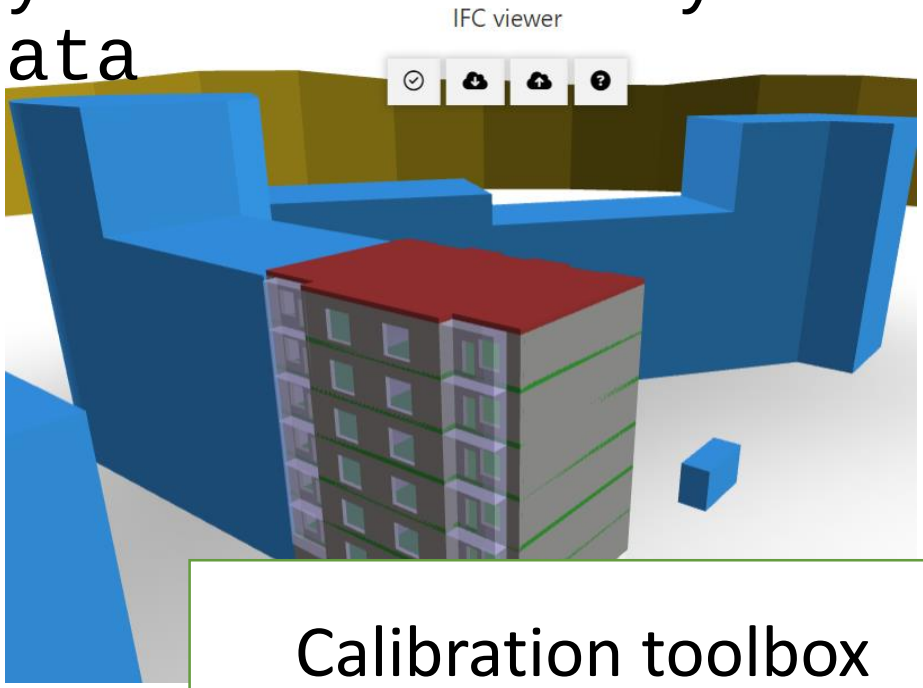
Target inputs

- Geometrical data



BIMEO – Inspection data collection

- Thermo-physical and system efficiency data



Calibration toolbox

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Common Data Environment

KROQI
Bâtir avec le numérique

Data model and files

EPC RECAST core process

On-Site Diagnosis

On-Site Measurements

Consumption data

Dynamic energy simulation

Automated Model calibration (Real conditions) → EPC calibrated Simulation (Standard conditions)

Data model and files

Next Gen. EPC

Renovation roadmap

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Digitalizing and automating the inspection process

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Impact on EPC

- Inaccuracy of surface and volumes can affect the EPC results

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Impact on EPC

- AR scanning can speed up the geometrical data collection process, especially when there is no floor plan available
- It can lead to improved accuracy and help identify uncertainties
- Output in standard data format (BIM + linked data) can

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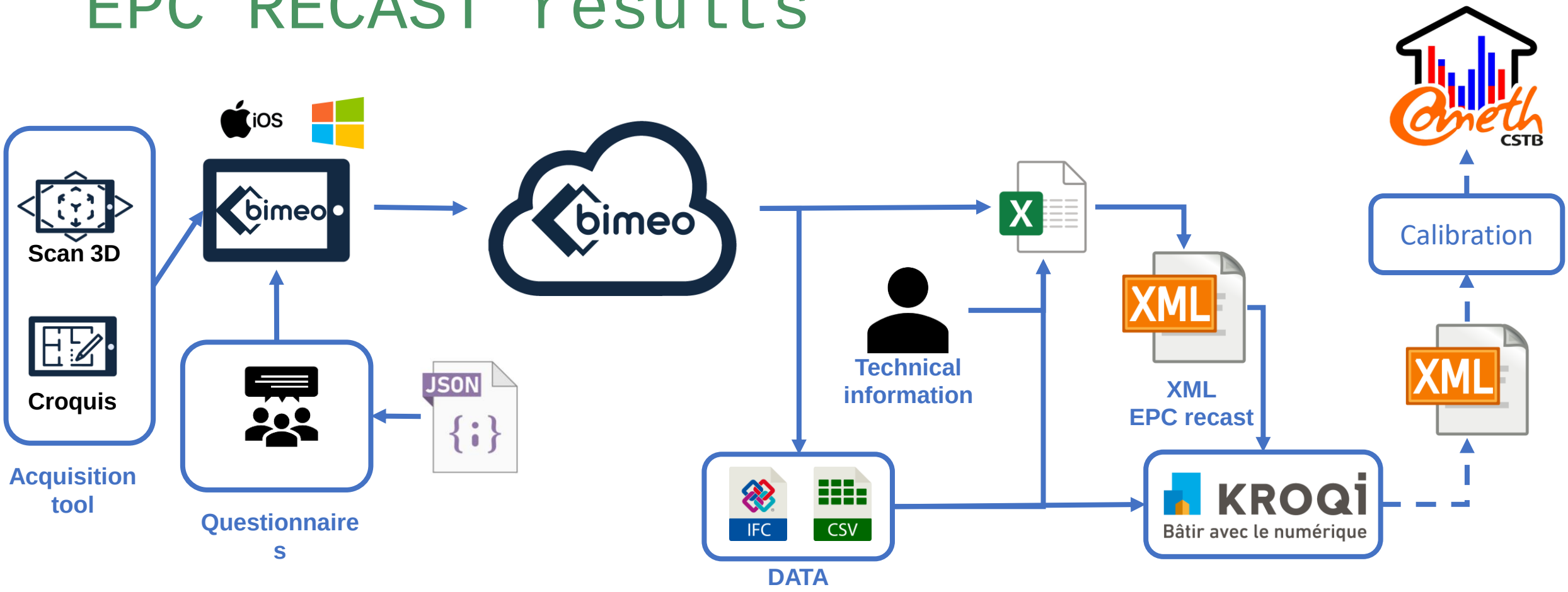
EPC RECAST results



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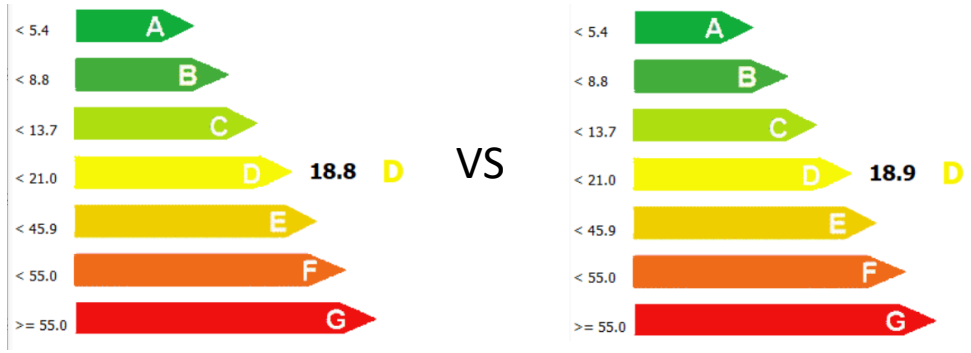
EPC RECAST results



BIMEO Manual

What EPC assessors said

- "The 3D survey may ensure that there are no omissions regarding the number of walls, thermal bridges, etc. Limits cheating."
- "I was very positively impressed by the ease of detecting the surfaces of the rooms, and the insertion of the input data into the program."
- "The tool seemed very useful to me both for reducing the time of the inspection and for the subsequent processing of the data and the preparation of the EP assessment."
- "I would likely pay to have a license when it will become a commercial product"
- "It definitely seems like a

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Conclusions

- AR scanning technologies can assist the EPC assessor to get the geometrical information for the EPC rapidly and accurately
- Tablet format is adapted to inspection
- Geolocalizing annotation facilitate back-office work

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Recommendations

- Such inspection tools need to be integrated with the EPC simulation software
  - BIMEO is working with several French EPC software provider for integration
- Need for a EU-level standard ontology based on CEN standard to facilitate data exchange between building energy efficiency tools

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EPC Energy model calibration

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Impact on EPC

- The mathematical models used for EPC performance evaluation relay on many assumptions.
  - Most of the input values come from standards and have high uncertainty.
- People don’t understand the link between the certificate and their energy bill…
- … but to be useful for policy making, the EPC need to be about the intrinsic properties of the building, not the occupants’ behaviour.

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Impact on EPC

- What are the data with high uncertainty in EPCs?
  - Window surface and total volume
  - External walls heat transfer
  - Window heat transfer and solar factor
  - Infiltration rate
  - Real boiler efficiency
- What data can be easily avaiable?
  - Hourly smart meter data
  - Monthly gas or district heating bills

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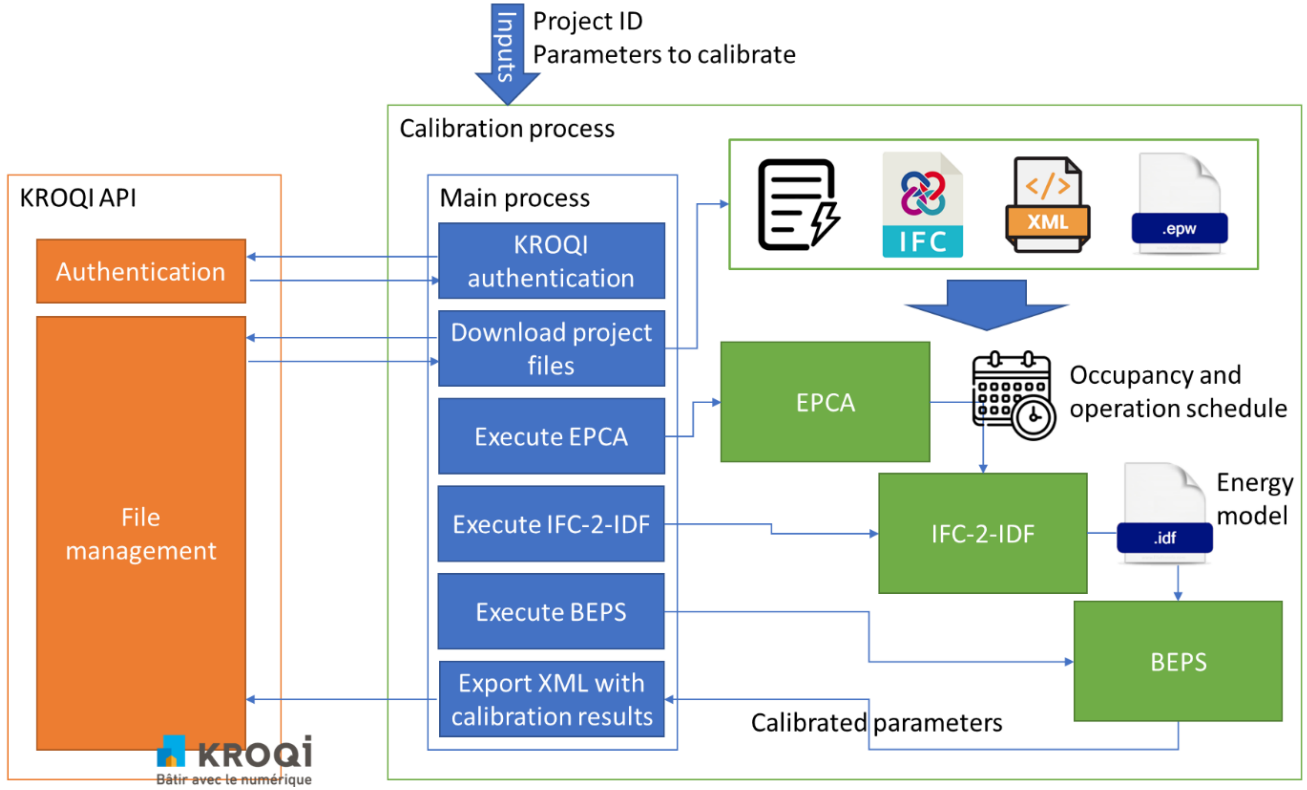
EPC RECAST results

- Step 0: Identification of the most uncertain parameters
- Step 1: Hourly simulation of the EPC energy model under real condition
  - Weather, Occupancy estimation
- Step 2: Comparison with real energy consumption and fine tuning of thermo-physical parameters
- Step 3: Simulation of the EPC model in



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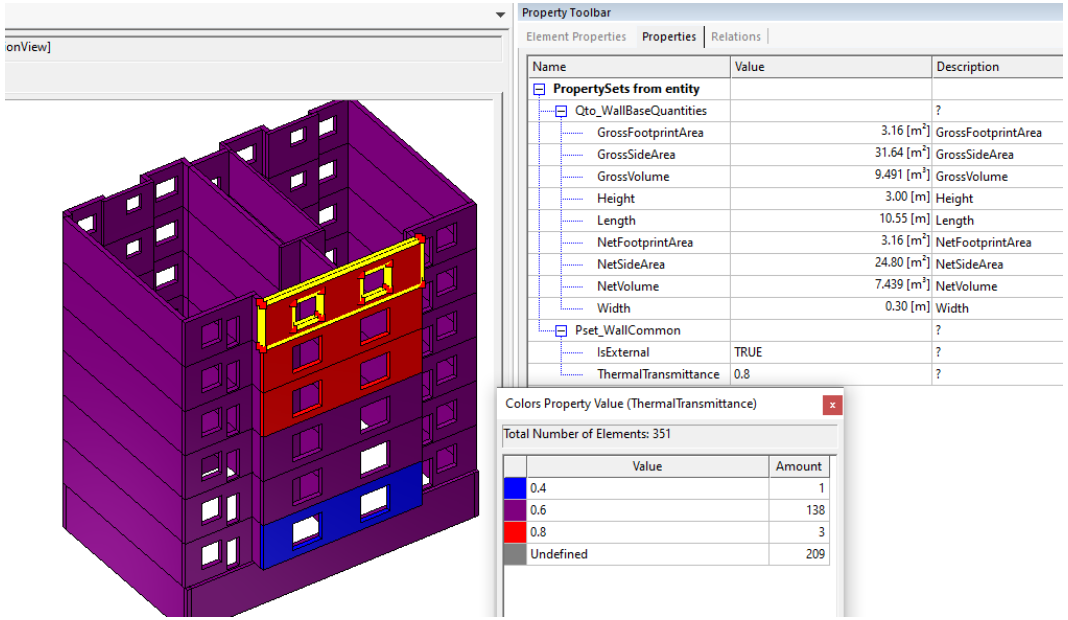
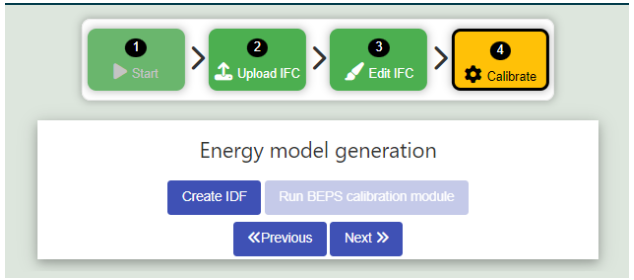
EPC RECAST results



Parameter	Default	Calibrated
Windows U-value (W/m²·K)	3	2.78
Window solar control	0.8	0.77
Wall internal resistance (m²·K/W)	1.4	0.26
Infiltration rate (change / hour)	0.7	2.79
Boiler efficiency	0.88	0.96



About 5% improvement of the accuracy of the energy model.

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Conclusions and recommendations

- The ability to calibrate the EPC energy models should be included in EPC software
  - Possibility to input real conditions (weather, occupancy, energy consumption) to evaluate the validity of the standard model and improve the inputs with high uncertainty.
- Automation of the calibration still requires further research
  - Facilitate the import of the real condition data
  - Better understanding of the relation between the calibration results and the real characteristics of the building

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Conclusions and recommendations

- A good understanding of energy model calibration should be part of the EPC assessors' skills

- Even if the process is automated, the assessor should have the final decision on input parameters of the standard energy model

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General conclusion

Digital tools can contribute to improve data collection for EPCs

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