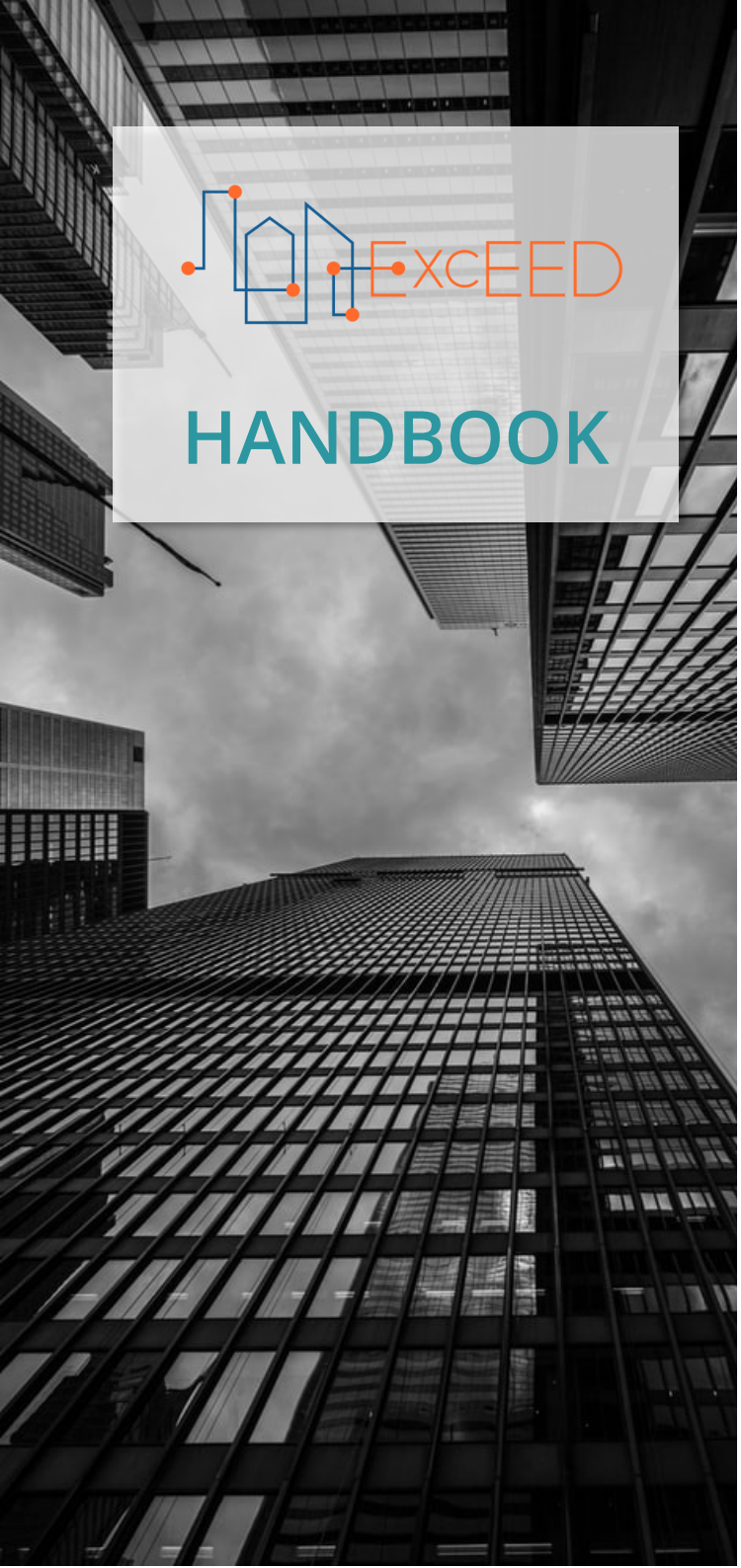


ExcEED HANDBOOK

THE IMPORTANCE OF DATA COLLECTION

In recent years, the European Union has put an emphasis on the role of building energy performance in the clean energy transition. Energy efficiency targets continue strengthening (the current target is a 32.5% increase in energy efficiency by 2030, up from the previous 20% target). A larger emphasis has been put on building performance, as the recent amendments to the Energy Performance of Buildings Directive (EPBD) demonstrates (i.e. achieving a highly efficient and decarbonised building stock by 205).

Data collection, and specifically the ability to benchmark and analyse data, is incredibly important to gauge not only policy effectiveness, but also to identify target areas of action. We need a way to figure out what works, what needs attention, and where to focus future resources.

THE EXCEED PROJECT

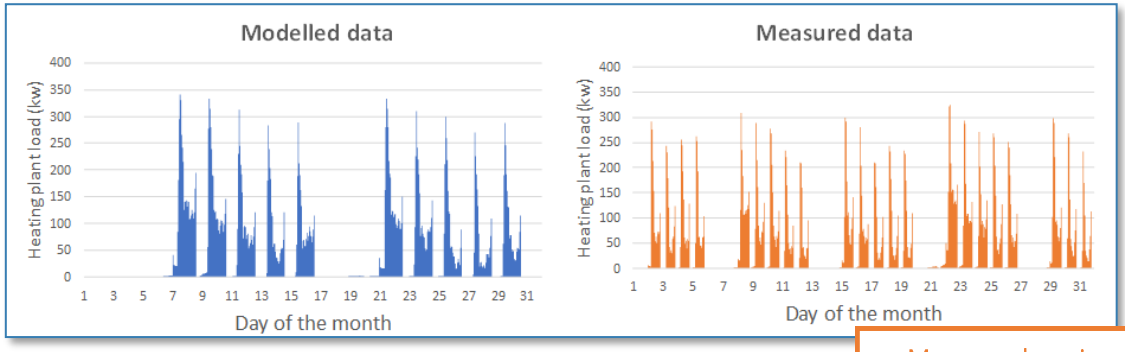
The ExcEED H2020 project responds to the need for transparency and comparability of building energy performance calculations. The ExcEED platform collects measured quantitative (i.e. primary energy consumption, total heated floor area, etc.) and qualitative building data (i.e. occupant comfort), then uses Key Performance Indicators to benchmark the energy efficiency of the building. The geoclustering tool then displays geo-localised data to inform designers, building operators, and policy makers.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723858.

Geoclustered data from the ExcEED platform

On a local level, the geoclustering function of the platform enables policymakers and other stakeholders to assess building targets and performance based on the buildings in their region, or in similar climatic zones. Therefore, users can compare either at the local, municipal, regional, national or EU level. This is useful especially for policymaking at multiple levels of government.

Additionally, it is important to have accurate/realistic benchmarks for making policy and creating targets. Targets are often based on modelled or projected data, although there is often a large discrepancy between modelled (design) and measured (as-built) data. For instance, having measured data can help in fine tuning energy performance of buildings rating threshold and calculation method, based on typical behavior of buildings in operation, or comparing HVAC system working hours with assumptions (i.e. occupancy, heating, cooling, lighting).



Measured vs simulated building data

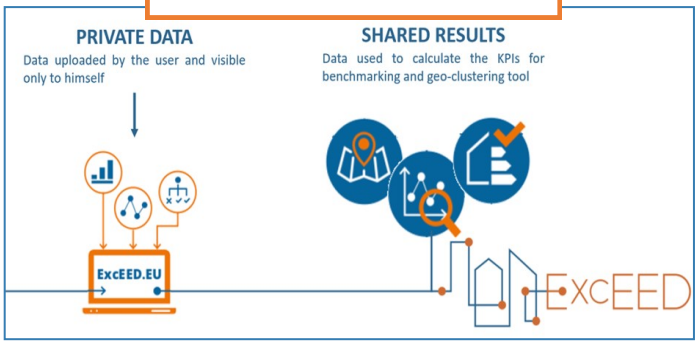
Therefore, having both measured and predicted building performance data (as in the ExcEED platform) helps policymakers assess current building targets and establish realistic ones going forward.

DATA MANAGEMENT

The ExcEED platform has a robust data management plan. Given the recent EU General Data Protection Regulation (GDPR) requirements, data storage and privacy has become a focus area in all "smart data" collection. User's data is only available to him/herself, while the geo-cluster tool (which displays data on the aggregate level) still enables data comparison with other buildings in the platform.

It's important to highlight that the building data, used by the geo-cluster tool, only uses anonymised and aggregated data. Also, the visualisation of buildings in the geoclustering tool does not allow the user to visualize the precise address of buildings on the map but only a large area in which they are located.

How does the ExcEED platform treat buildings' data?



DEVELOPMENT OF RELEVANT SECTORIAL KEY PERFORMANCE INDICATORS (KPIs)

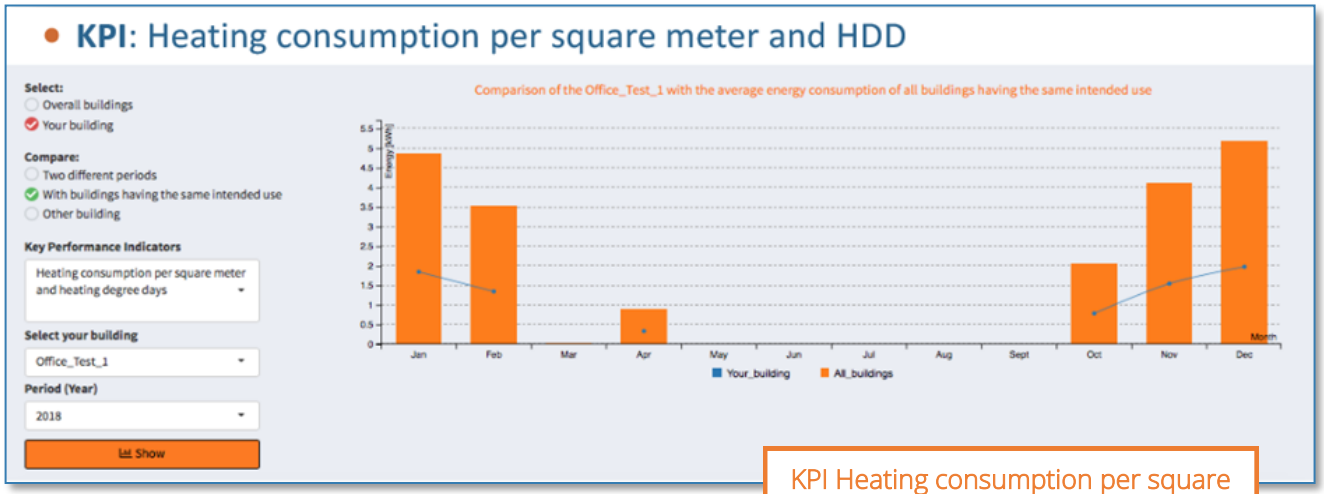
The ExcEED platform incorporates 27 Key Performance Indicators (KPIs) into the platform so that users can assess their buildings' performance and benchmark their data with similar uploaded ones, highest performing ones and overall regional averages.

The 27 selected Key Performance Indicators (KPIs):

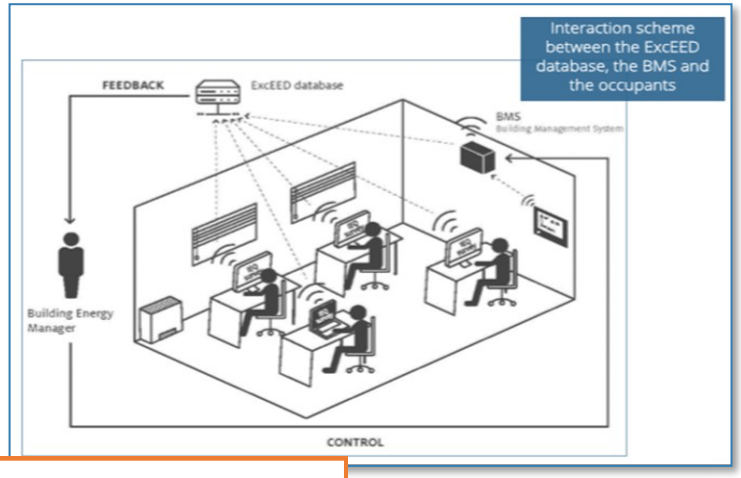
1. Overall heating consumption per floor area
2. Total cooling energy consumption per floor area
3. Heating consumption per square meter and heating degree days
4. Total cooling consumption per square meter and cooling degree days
5. Max power of generator (used for heating) normalized by square meter
6. Max power of generator (used for cooling) normalized by square meter
7. Number of overheating hours during the heating season
8. Number of overheating hours during the cooling season
9. Number of overcooling hours during cooling season
10. Overall electricity consumption of the building per square meter
11. Overall electricity consumption for lighting per square meter
12. Electricity consumption of indoor lighting per square meter
13. Overall electricity consumption of appliances per square meter
14. Electricity consumption of mechanical ventilation systems normalized by square meter
15. Flow rate of mechanical ventilation normalized by square meter
16. Heat pump seasonal efficiency
17. CO_2 concentration ranges
18. Percentage of the time CO_2 exceeds limit
19. Energy production of solar thermal system vs Thermal energy consumption of the building
20. Electricity production of photovoltaic system vs overall electricity consumption of the building
21. Energy production of renewable energy system vs overall energy consumption of the building
22. Primary energy generated by Renewable energy system vs primary energy consumed by the building
23. Energy Signature
24. Visual Comfort
25. Temperature profile
26. Humidity profile
27. Energy performance rate

These indicators can be used in the whole building life cycle, initially defined with simulation tools, and then measured. Using these KPIs supports the decision-making process during the design and operational phases, and they provide analysis showing the differences between predicted performance and actual performance. Overall, this enables stakeholders to analyse a buildings' actual energy performance in comparison with benchmarks and identify target areas in the building. For instance, building owners can select a KPI to determine if their building is consuming more energy for cooling in the warm months than other similar buildings in the regions (below), and assess the cause.

Additionally, the platform contains an Indoor Environmental Survey where building occupants can provide important feedback on how buildings perform. The way they perceive the indoor environmental conditions can affect their comfort, health, and productivity. Post Occupancy Evaluation (POE) surveys can provide a quick and cost-effective solution in identifying problems in buildings and consequently improve their operation. POE can further create an evidence-base for future building design assumptions by linking building/system design and occupants. This adds a deeper analysis of the results by taking into account users' perception of the indoor environmental conditions and the corresponding measured parameters.



KPI Heating consumption per square meter and heating degree per days



Link between ExcEED and BMS

RESULTS

As of September 2019, ExcEED has more than 150 registered users and around 20 uploaded buildings. Of the uploaded buildings, the majority are office buildings located in Europe.

RECOMMENDATIONS

"AGGREGATING MANY SIMILAR, SMALL- SCALE PROJECTS MAKES ENERGY EFFICIENCY INVESTMENTS MORE ATTRACTIVE TO INSTITUTIONAL INVESTORS LOOKING FOR LARGER INVESTMENTS"

POLICY PERSPECTIVE

Data is essential to inform policy: Data helps identify what is working and what areas need specific attention. In the context of Energy Performance of Buildings Directive (EPBD) implementation, ExcEED can serve as a useful tool to advise policymakers. In addition to helping build a national and regional overview of the building stock (a provision of the EPBD), by providing benchmarks to compare individual buildings with other similar ones, the ExcEED platform facilitates the process of identifying areas of the building or HVAC systems that are underperforming, based on the KPIs.

It's fundamental to highlight that the EXCEED platform needs a consistent amount of building cases to (easily) demonstrate its clear added value to the policy makers. As the quantity of building data uploaded to the platform increases, benchmarking and aggregated results becomes more and more relevant for policy makers.

While there is benefit to individual building owners and managers uploading their data, reaching critical mass, and encouraging uploading to the platform will require incentivizing. Incentivising building owners/managers (i.e. by providing access to specialised funds, tax incentives, funder expectations, reporting requirements, etc.) to upload their data onto a centralised platform would facilitate national data collection efforts and mutualize the cost. In terms of policy design and evaluation, especially at the EU level, comparability of data across countries is of paramount importance to give meaning to the data at the regional level. ExcEED provides a framework for standardised data collection and helps overcome this barrier. An agreement among policymakers to recognise a common "EBPD-compliant" data platform (such as ExcEED), where companies and building managers could bulk upload their monitoring data, would harmonise and streamline the data collection process, making it easier to monitor building on the regional, national and EU level.

BUSINESS PERSPECTIVE

The ExcEED platform supports building managers, designers, and industry to create more comfortable and energy efficient buildings. Uploading data on the platform and utilising the selected KPIs allows stakeholders to understand and adjust their building performance, based on identified poorly performing areas, to ultimately improve their designs. Furthermore, building managers can use this data to draw comparisons between buildings within their portfolio.

For large groups of similar buildings, uploading these projects to a central, comparable platform, can be used in future to aggregate projects. One of the biggest barriers to investment in energy efficiency building projects is their relatively small size. Aggregating many similar, small- scale projects makes energy efficiency investments more attractive to institutional investors looking for larger investments.

Additionally, the platform helps industry (i.e. ESCOs, service and technology providers) calculate, share and benchmark projected vs gained energy savings. Showing monitored data has a growing importance, replacing modelled energy use or calculated data. Private sector stakeholders can also use and visualise the data for their clients/customers – thereby demonstrating the features of the building in comparison to the local building stock.

NEXT STEPS

Continuing to gather building data will be of central importance to the effectiveness of the platform, which has been renamed "**enbuibench**", that stands for the "**en**ergy and comfort **bui**lding performance characterization and **bench**marking platform".

enbuibench will support platform users in the building performance characterisation and benchmarking. It is a totally free and ready-to-use web-based EU platform that will be managed by EURAC Research, who coordinates the H2020 ExcEED project. After one year, the mid-term business plan will be reassessed and presented to the wider public.

Register for free to the platform here! Once registered, you will have access to the user manual for data upload and for geo-cluster tool.

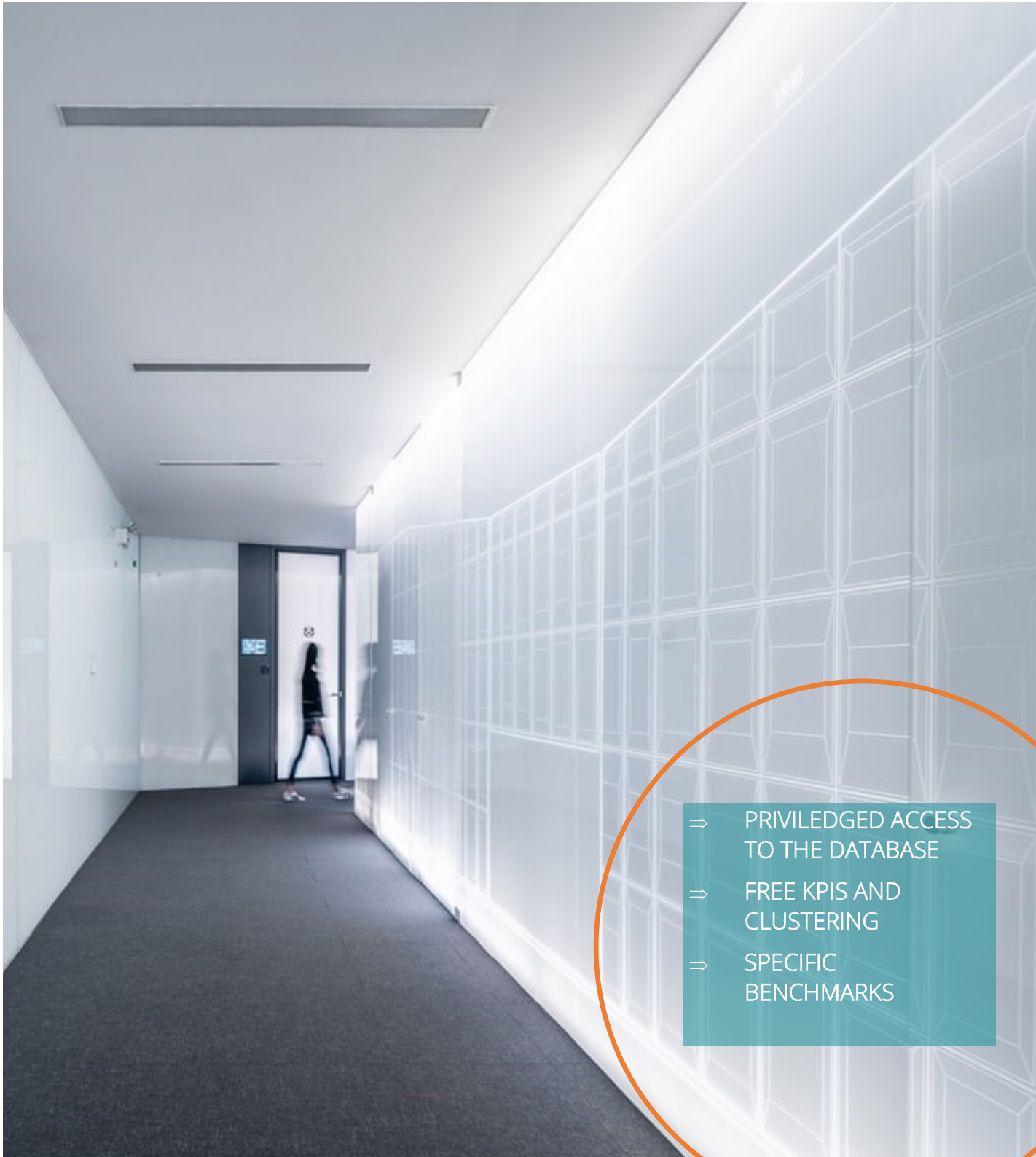
For questions regarding registration on the platform, data upload, platform tools, contact the ExcEED Customer Support (exceed_customersupport@eurac.edu) and you will be contacted and helped by a member of the team.

ExcEED

www.exceed-project.eu

@ExcEED_H2020

group: ExcEED - Knowledge sharing on buildings data



- ⇒ PRIVILEDGED ACCESS TO THE DATABASE
- ⇒ FREE KPIS AND CLUSTERING
- ⇒ SPECIFIC BENCHMARKS