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U-CERT

User-Centred Energy Performance Assessment and Certification

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Indoor Environmental Quality (IEQ) - ALDREN (predic)TAIL

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U-CERT proposes a set of user-centred and effective indicators integrated in a dynamic EPC report, with a view to facilitate the EU-harmonisation by relying on the applicable EPB Standards, and increase user understanding and acceptance towards the increase of quality in the built environment, specially focusing on deep renovations.

What?

U-CERT proposes a set of **added value holistic indicators** contributing to the rebirth of next generation EPB Assessments.

Also, it designs a **new, dynamic, and user-centred EPC report**.



More information
Deliverable 3.2

How?

Learning from the **ethnographic research** performed **at each partner country**.

- Needs and expectations of expert and non-expert users.

More information
Deliverable 2.3

Leveraging the **indicator mapping** performed **at market level**.

- Identification of paths towards **holistic indicators**.

More information
Deliverable 2.4

Briefing findings

- Make **energy more intuitive** and **influence behaviour** of users.

Indicators covering **health, safety, convenience, well-being, and comfort** are valued by final users.

- Accommodate a **wide scope of use**.

Offer **several levels of complexity of user interface**.

Develop a **modular design** in combination with **digitalisation**.

Consider variable **building situation**.

U-CERT's EPC structure

U-CERT's EPC is built to behave as a **repository of indicators and complementary data**.

Depending on the type of **user**, some or all the information is disclosed.



Indicators

U-CERT Certification Scheme considers **four dimensions** of indicators:

- Energy performance.
- Smart Readiness.
- Indoor Environmental Quality.
- Cost.

Their inclusion in U-CERT's EPC report is **sensitive to the assessment type**:

Category	Indicators	Included in U-CERT's EPC	
		Calculated	Measured
Energy Performance	Overall EP indicators	X	X
	Partial EP indicators	X	-
Smart Readiness	SR	X	-
	ALDREN Thermal score	X	-
IEQ	IEQ	-	X
	Cost	-	X

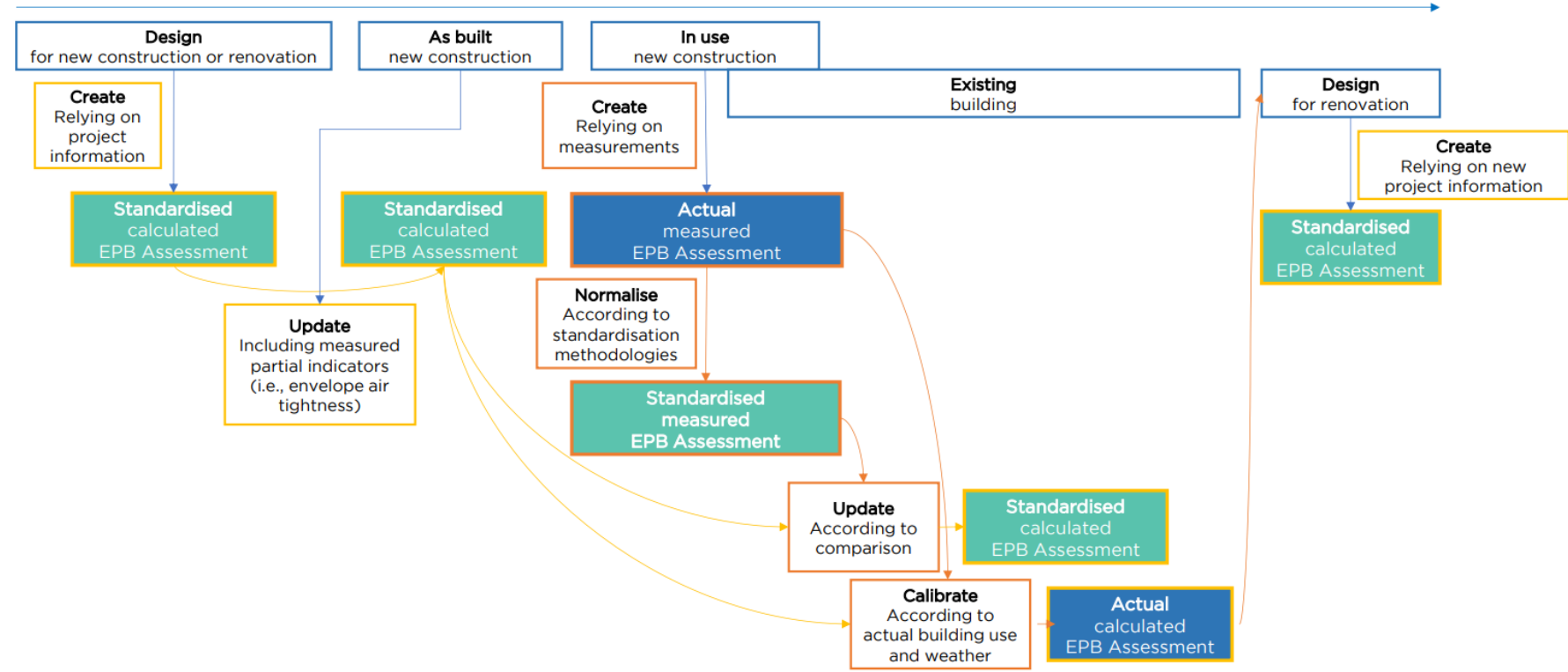
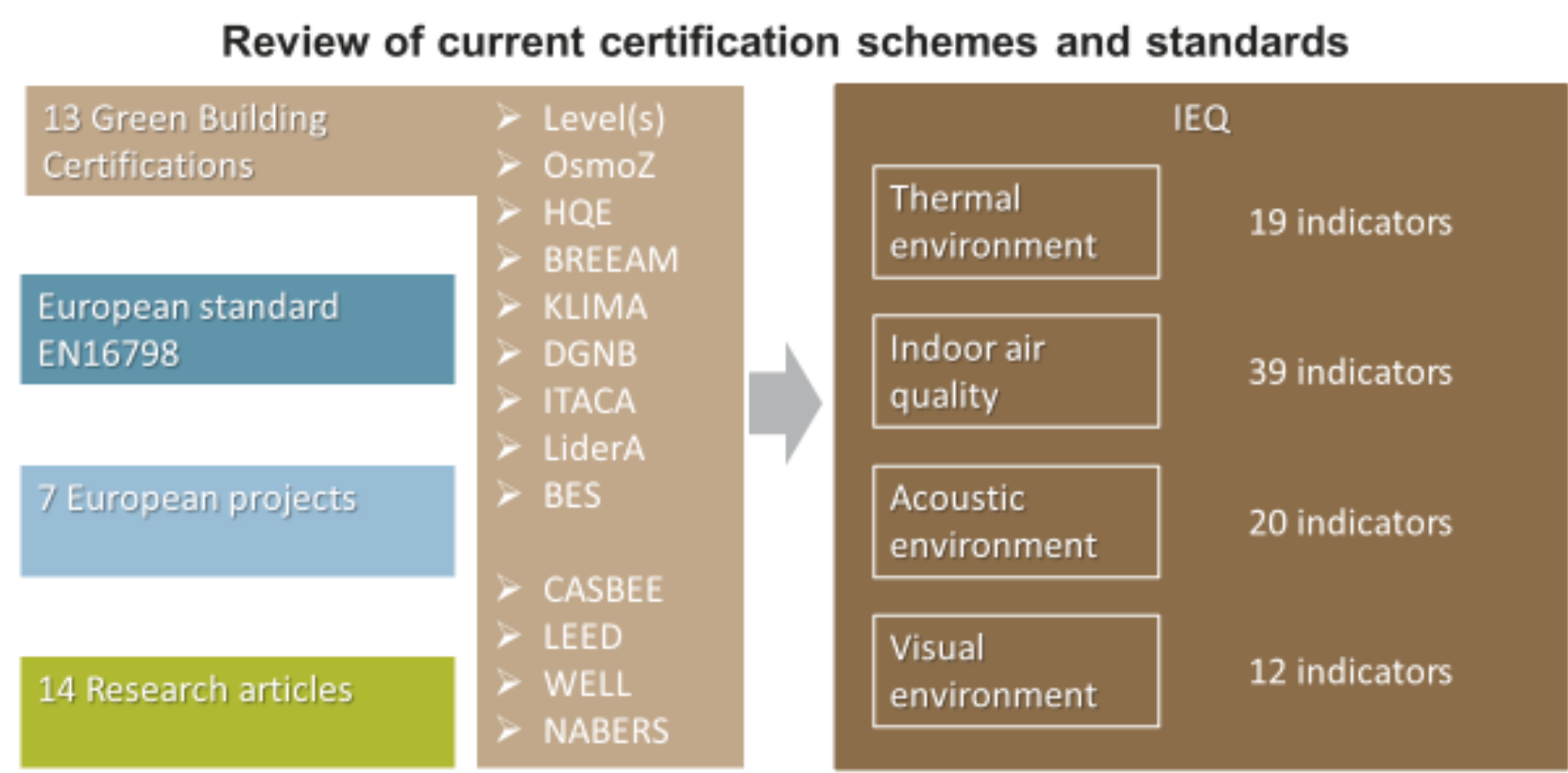
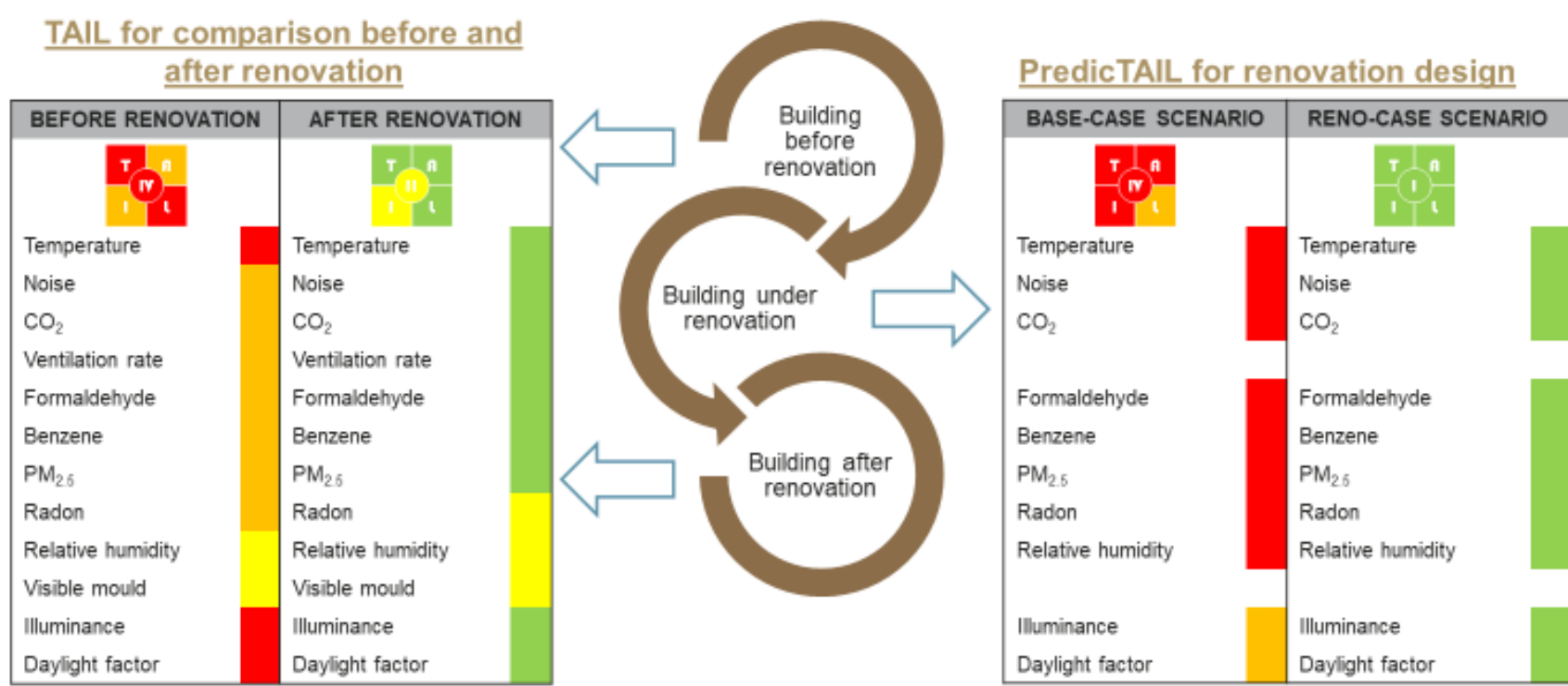


Figure 5. Interrelation of EPB Assessment types during a building's lifecycle

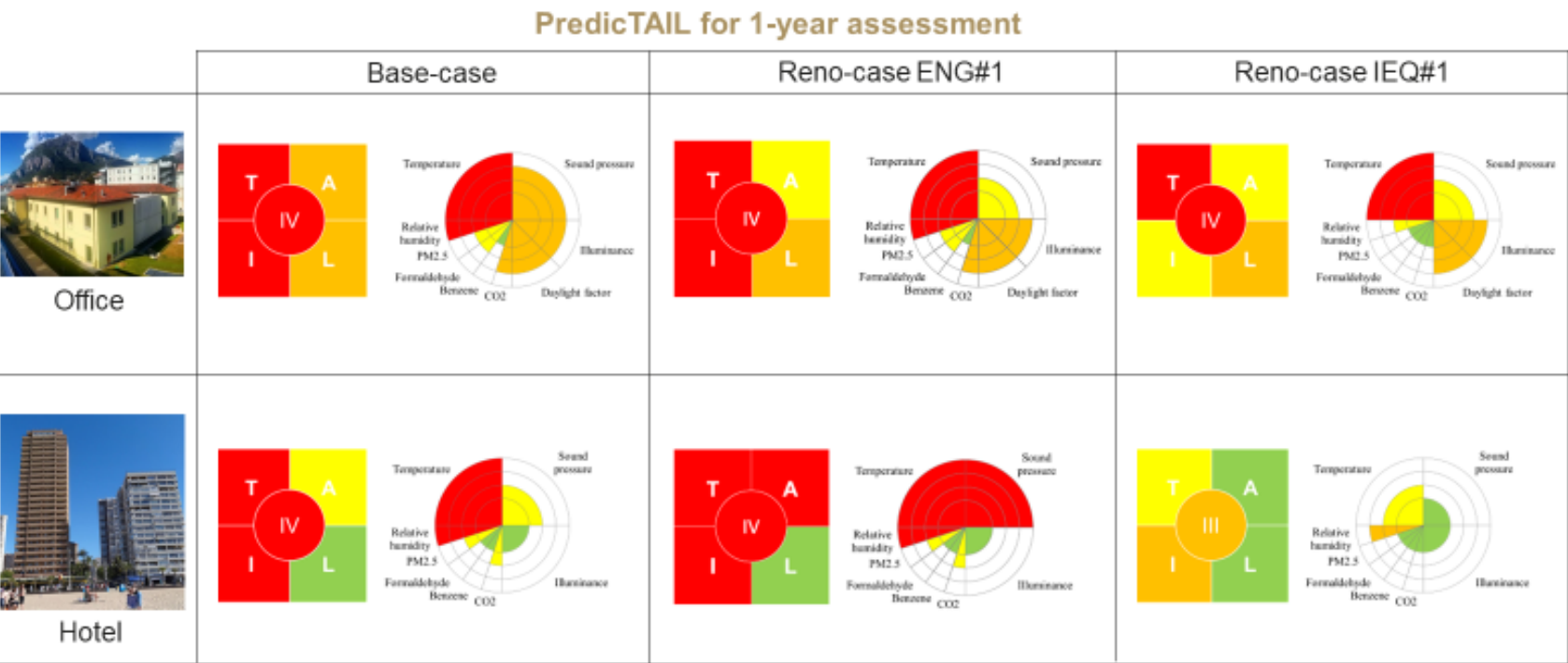


Wei et al. Energy & Buildings 209 (2020) 109683

Building undergoing deep energy renovation



Example studies



TAIL for offices and hotels

Four components:
Thermal environment
Acoustic environment
Indoor air quality
Light – Luminous (visual) environment

Overall IEQ:



TAIL for offices and hotels

- General protocols for measurements**
- TAIL is determined based on measurements during the heating and cooling seasons or during the same season before and after renovation.
 - TAIL is determined for the working hours in offices and sleeping hours in hotels.
 - 2 – 10 rooms per building are selected to be representative of different orientations, floors, and room types.
 - Measurements should last 2 months for radon in radon-prone areas, 1 month for temperature and relative humidity, and 1 week for the other parameters.
 - Interim rating is calculated for each parameter if it is measured in several rooms in a building.
 - The final ratings of T, A, I, and L are determined according to the worst quality level among the parameters.
 - The final rating of the overall IEQ is determined according to the worst quality level among T, A, I, and L.

The **ALDREN project** attempts to **harmonize the IEQ indicators and develop a systematic method for IEQ rating in buildings**:

- (1) To guarantee that IEQ is not degraded during renovation to satisfy the EPBD mandate,
- (2) To document any improvements in IEQ after renovation,
- (3) To estimate potential additional benefits from renovation including benefits for health and well-being, as well as the financial benefits from improved productivity and increased value of a building on a market.

To ensure that **occupants' health and well-being** are not compromised in energy-efficient buildings, the EPBD states that **“the energy needs for space heating, space cooling, domestic hot water, ventilation, lighting, and other technical building systems shall be calculated in order to optimize health, indoor air quality and comfort levels”**.

To ensure that this guidance is observed, **indoor environmental quality (IEQ) in buildings must be monitored**. This requires standard methods for rating the overall IEQ in buildings and the quality of the thermal, acoustic, and luminous environment and indoor air quality (IAQ). **No agreed, and standard method exists at the moment to provide such a rating**. Consequently, a rating scheme called TAIL has been developed (Wei et al., 2020a, Wargocki et al., 2021).

The quality of the TAIL components is determined by evaluating **twelve parameters** in buildings under regular use. Ten of them are measured, one is inspected, and one is modelled. These parameters were **selected to describe components of IEQ adequately, based on a literature review of existing IEQ standards, green building certification schemes, European research projects, and scientific publications** (Wei et al., 2020b). Their **ranges were defined based on recommendations and prescriptions in the current EPB standard (EN 16798-1, 2019) and air quality guidelines (WHO, 2005, 2010), as well as other relevant documents (Level(s), 2017)**.

According to the protocols defined by TAIL, these parameters should be evaluated at least in one season.

TAIL and PredicTAIL provide a complete tool allowing characterization of IEQ in buildings. It is expected that they will become a standard method of benchmarking IEQ in buildings when applied. This requires however further validation. It is also expected that they will stimulate actions leading to the general improvement of the IEQ in buildings.