

ESPON – Malta event on sustainable tourism

ALDREN

ALliance for
Deep energy
RENovation in buildings

A step forward to the
European Voluntary
Certification Scheme
(EVCS)



ALDREN ALliance
for Deep RENovation
in buildings



ENBEE



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ALDREN partners

30 May 2022, Online

8 European partners worked together to increase the building energy renovation rate and quality



POLITECNICO
MILANO 1863

(research)



aniversari
1986-2016

Instituto
Valenciano de
la Edificación

(certification)



ENBEE

Environment & Building Energy Efficiency



REHVA

Federation of European Heating,
Ventilation and Air-conditioning Associations

(application)



ALDREN

ALLIANCE
for Deep RENOVATION
in buildings

4 Standalone modules

4 STANDALONE MODULES



**ENERGY
RATING
& TARGET**

+



**ENERGY
VERIFICATION**

+



**COMFORT &
WELL-BEING**

+



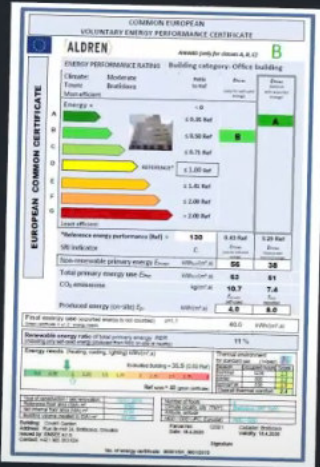
**COST
VALUE
RISK**

<https://aldren.eu/outcomes/>



2 Reporting tools

2 REPORTING TOOLS



EVC:
EUROPEAN VOLUNTARY CERTIFICATE



BRP:
BUILDING RENOVATION PASSPORT



ALDREN pilot buildings



22WR (UK)



MADELEINE (FRANCE)



TODS (FRANCE)



POLITECNICO DI MILANO - POLO TERRITORIALE DI LECCO (ITALY)



HOTEL BENIDORM CENTRE (SPAIN)



DUNAJSKÁ (SLOVAKIA)



MALY TRH2 (SLOVAKIA)



KUPKA (FRANCE)



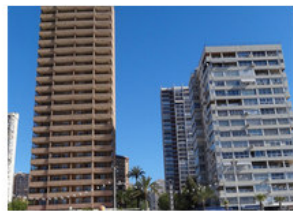
LA SAMARITAINE (FRANCE)



HOTEL DYNASTIC (SPAIN)



HOTEL DYNASTIC (SPAIN)



HOTEL LES DUNES COMODORO (SPAIN)



HOTEL RH BAYREN & SPA (SPAIN)



HOTEL FLAMINGO OASIS (SPAIN)



HOTEL POSEIDON PLAYA (SPAIN)

Large existing buildings (6 hotels, office buildings)

→ high energy savings potential, **60% - 86% of non-renewable primary energy**



ALDREN

Energy rating & Target



COMMON EUROPEAN VOLUNTARY ENERGY PERFORMANCE CERTIFICATE			
ALDREN		AWARD (only for classes A, B, C): B	
ENERGY PERFORMANCE RATING		Building category: Office building	
Climate: Moderate	Ratio to Ref	PE _{req} min	PE _{req} max
Town: Bratislava		consumption	with export
Most efficient	< 0		
A	≤ 0.35 Ref		
B	≤ 0.50 Ref		B
C	≤ 0.71 Ref		C
D	REFERENCE*	≤ 1.00 Ref	
E	≤ 1.41 Ref		
F	≤ 2.00 Ref		
G	> 2.00 Ref		
Least efficient			
*Reference energy performance (Ref) =		129	0.55 Ref 0.46 Ref
SRI indicator (tbc)		C	PE _{req} min PE _{req} max
Non-renewable primary energy PE _{nr,PE} kWh/(m ² ·a)		70	60
Produced PE auto-consumed/exported kWh/(m ² ·a)		18.4	10.0
CO ₂ emissions kg/(m ² ·a)		25.7	15.0
Total primary energy (only auto-consumption) kWh/(m ² ·a)		80.04	
Final energy use kWh/(m ² ·a)		44.0	
Exported energy kWh/(m ² ·a)		4.4	
Ratio of renewable of total PE (including all RES)		13 %	
Energy needs (heating, cooling, lighting) kWh/(m ² ·a)		Evaluated Building = 39.9	
Thermal comfort score for standard use (1=best)		7.0	
Energy needs breakdown (kWh/(m ² ·a))		Heating: 23.8	
		Cooling: 12.3	
		Lighting: 2.3	
		Ventilation: 1.5	
		Other: 0.0	
Ref needs = 40		Overall thermal conduct: 2.4	
Year of construction:	1979	Year of last renovation:	
Reference floor area (GFA):	5010 m ²	Climate locality (climate year):	Bratislava (ARC)
Total internal floor area (TIA):	4750 m ²	Absolde outside:	
Building volume:	38 000 m ³	Heating degree-days:	(ARC, Eurostat)
Number of floors:	8	Cooling degree-days:	(ARC, Eurostat)
Building:	Covent Garden	Parcel No:	12001
Address:	Rue de mot 24, Bratislava, Slovakia	Date:	18.4.2020
Issued by:		City:	Bratislava
Contact: +421 905 333 666		Validity:	18.4.2030
		Signature	
No. of energy certificate: 000019K-00012919			

<https://aldren.eu/energy-rating/>



European Voluntary Certificate (EVC)

- ✓ Harmonized indicators compliant with **EU Taxonomy, Level(s)**
- ✓ Highlighting ALDREN NZEB (**GREEN CERTIFICATE**)
- ✓ Recommendations for improvement
 - link to **Building Renovation Passport**

EVC+: European Voluntary Certificate Plus

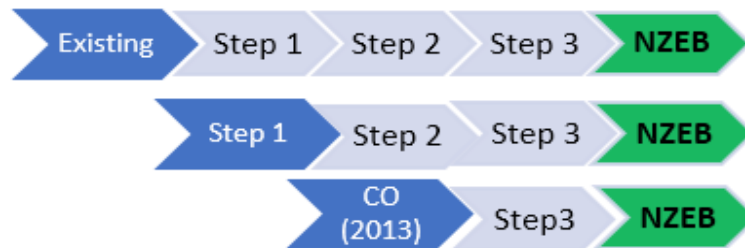
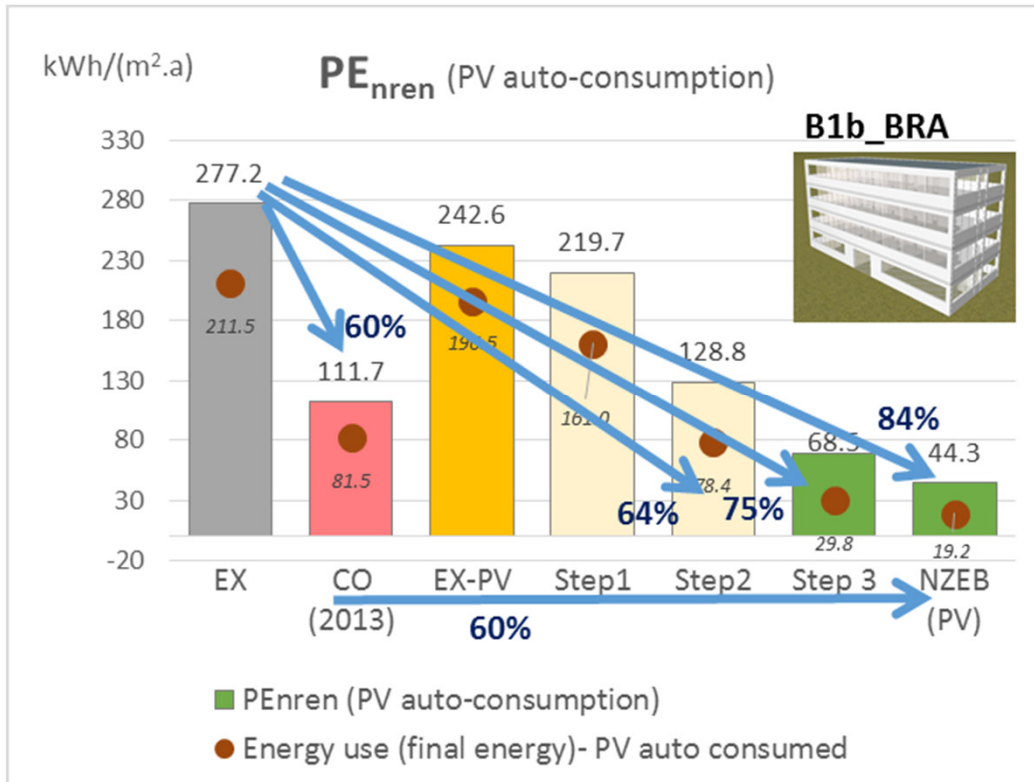
- ✓ Measured energy (verification of performance)
- ✓ New indicators:
 - Smart Readiness Indicator (SRI)
 - TAIL
 - Financial Risk Indicator
 - Financial valuation / Value of ERI

New
ALDREN
indicators

https://aldren.eu/wp-content/uploads/2021/04/ALDREN_D2-2-ANNEX-C-EVC_template_2020.pdf



ENERGY RATING SCALE



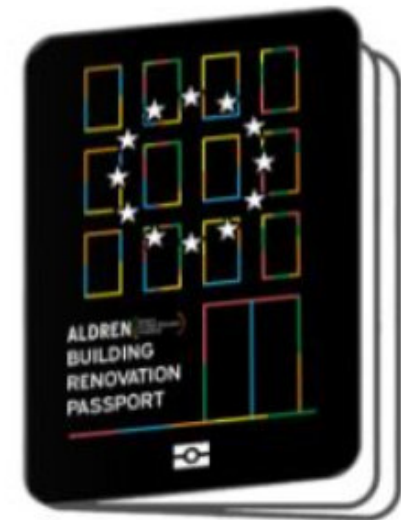
- ✓ **Relative scale** - the ratio to the „reference point“ in kWh/(m².a)
- ✓ **3 climates** - Helsinki, Bratislava, Palermo
- ✓ **The scale has been tested, makes step-by-step renovation visible by energy classes transition**

PE _{nren}	EX	G
	CO (2013)	D
	NZEB	C
PE _{nren} (PV auto-consumption only)	EX	G
	CO (2013)	C
	NZEB	B
PE _{nren} (balance - PV export)	EX	F
	CO (2013)	A
	NZEB	A+



Building Renovation Passport (BRP)

ALDREN RenoMap



<https://aldren.eu/building-renovation-passport/>

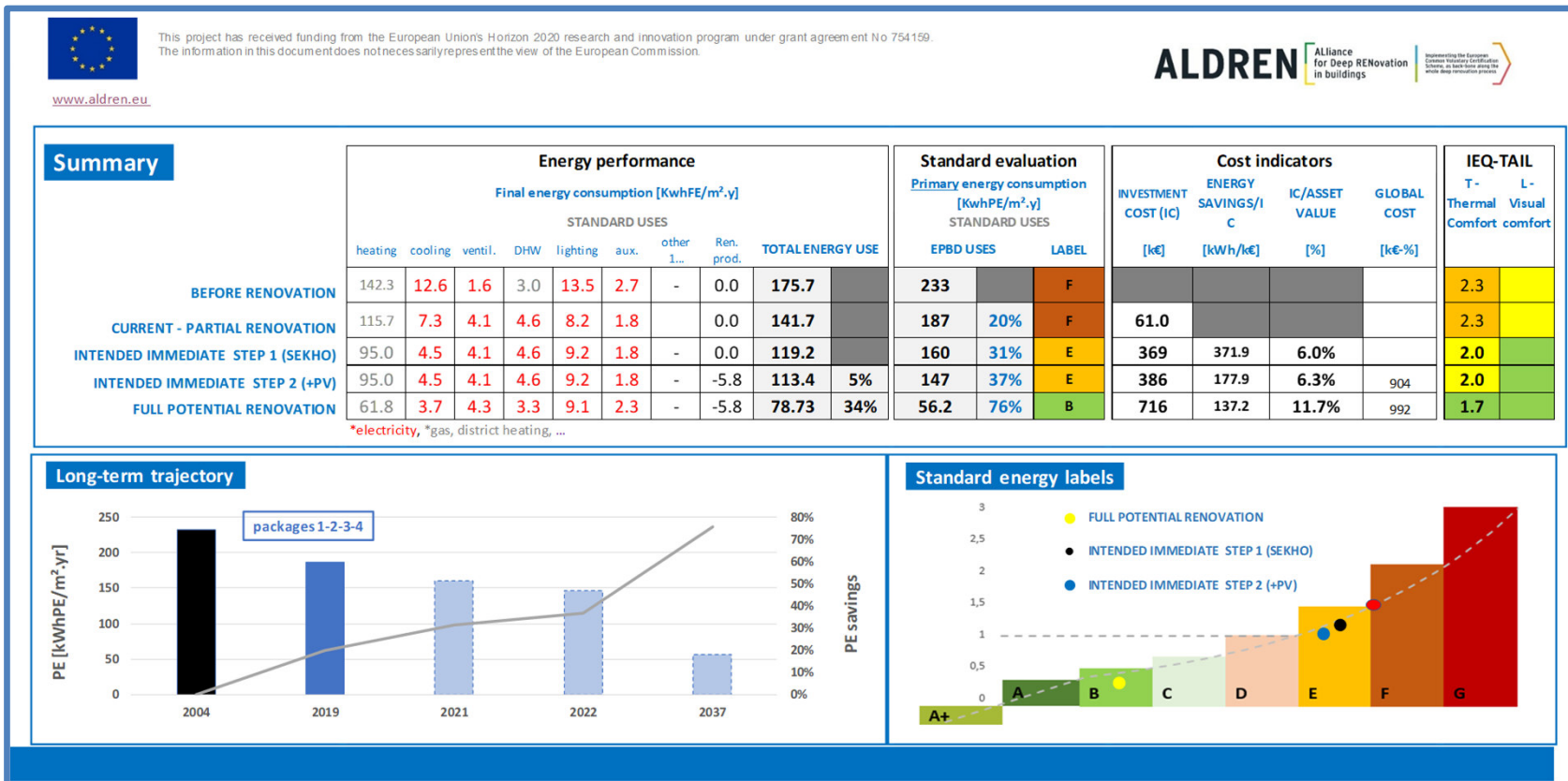


Building Renovation Passport, Renovation Roadmap “RenoMap”

Allows to plan long term strategies for the renovation → towards NZEB, ZEB

Provides a complete overview of the NZEB compliant elementary renovation actions (ERAs) which could be implemented on the building

Identifies the packages of renovation actions to implement and suitable timing



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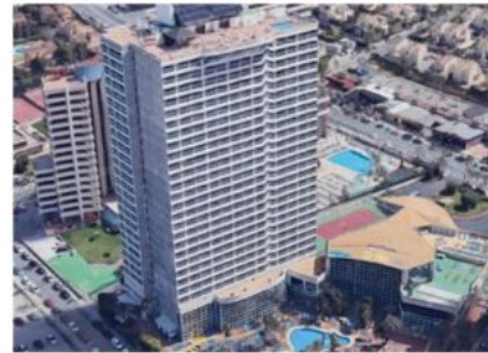


Building Renovation Passport, Renovation Roadmap “RenoMap”

Potential to reduce CO₂ emissions by **32-85%**



Hotel “Poseidón Playa” (3*)



Hotel “Flamingo Oasis” (4*)



Hotel “Les Dunes Comodoro” (4*)



Hotel “Dynastic” (4*)



Hotel “Benidorm Centre” (4*)



Hotel “RH Bayren & Spa” (4*)



The ALDREN “Building Renovation Passport, BRP” is delivered to six Spanish hotels to advise them during their renovation process (Apr 20, 2021)

<https://aldren.eu/the-aldren-building-renovation-passport-brp-is-delivered-to-six-spanish-hotels-to-advise-them-during-their-renovation-process/>



ALDREN

Energy Verification



<https://aldren.eu/energy-verification/>



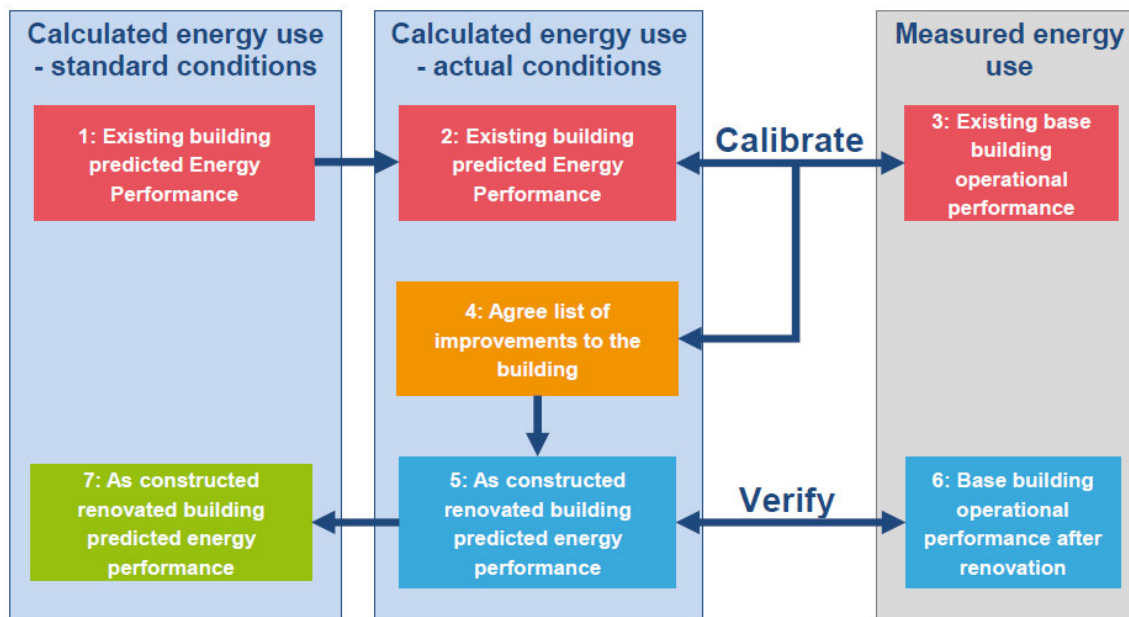
ALDREN ENERGY VERIFICATION



Calibration of calculation - actual (measured) performance to be compared with simulated (predicted) performance

Performance Verification protocol

The process for ensuring the target energy performance of a deep retrofit is achieved and verified using measured data



<https://aldren.eu/energy-verification/>

CALCULATED AND MEASURED ENERGY PERFORMANCE					
(Derived from methodology in ALDREN Task 2.3) (Optional)					
For offices In order to achieve a Verified EVC, the measured consumption for all significant EVC end uses must fall within 25% of the predicted value. A significant end use is defined as an end use with total consumption accounting for over 10% of the total EVC consumption measured in kWh/m². These are highlighted in blue in the "End use" column of the table.					
Key to end use validation:					
GREEN	All values for this end use meet 25% variance criterion				
AMBER	End use meets 25% variance criterion, but this end use & fuel combination exceeds 25% variance				
RED	End use exceeds 25% variance criterion due to high variance in this end use & fuel combination				
Fuel	End use	EVC under actual conditions kWh/m²	Measured kWh/m²	Variance measured vs. EVC under actual conditions kWh/m²	Variance measured vs. EVC under actual conditions %
Electricity	Space Heating	0.0	0.0	0.0	0%
Electricity	Hot water	6.0	8.0	2.0	33%
Electricity	Cooling	18.0	21.0	3.0	17%
Electricity	Fans	16.0	14.0	-2.0	-13%
Electricity	Pumps	3.5	4.0	0.5	14%
Electricity	Controls	2.0	2.1	0.1	5%
Electricity	Humidification	0.0	0.0	0.0	0%
Electricity	Lighting (internal)	23.0	21.0	-2.0	-9%
Fossil fuel	Space Heating	60.0	55.0	-5.0	-8%
Fossil fuel	Hot water	10.0	7.0	-3.0	-30%
Heat	Space Heating	0.0	0.0	0.0	0%
Coolth	Cooling	0.0	0.0	0.0	0%
Heat	Hot water	0.0	0.0	0.0	0%
All	EVC uses	139	132		
EVC verified? Verified					
Building name: Covert Garden Address: Rue de mot. 24, Brussels, Belgium		Building category: Office building Parcel No: 3300		Office building Cadastral: Brussels ALDREN	
No. of energy certificate: 00001/SK_0001/2017					

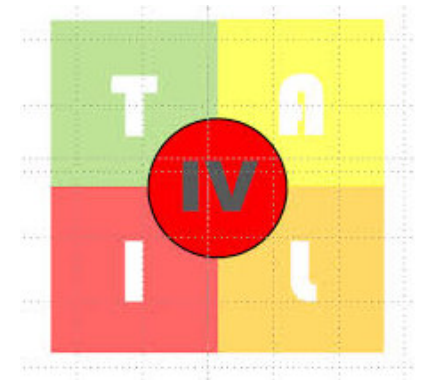
Optional page in EU voluntary certificate



Comfort & Well-being ALDREN TAIL



<https://aldren.eu/comfort-well-being/>



Comfort & Well-being

12 parameters selected to define IEQ components within 4 IEQ components

	IEQ parameter	Measured	Modelled	Visual inspection
<u>T</u>	Indoor temperature (°C)	x	(x)	
<u>A</u>	Noise level (dB(A))	x		
<u>I</u>	CO ₂ (ppm)	x	(x)	
	Ventilation rate (L/s)	x	(x)	
	Formaldehyde (µg/m ³)	x		
	Benzene (µg/m ³)	x		
	Fine particles PM _{2.5} (µg/m ³)	x		
	Radon (Bq/m ³)	x		
	Indoor air relative humidity (%)	x	(x)	
	Visible mold (cm ²)			x
<u>L</u>	Daylight factor (%)		x	
	Illuminance (lux)	x		



Comfort & Well-being



Each of the 12 parameters is assessed according to 4 categories

All the indicators are assessed against 4 categories defined by EN16798 (2019) standard and WHO guidelines, mainly:

- **Category I:** High level of expectation and recommended for spaces occupied by sensitive and fragile people with special requirements like some disabilities, sick, very young children and elderly persons, to increase accessibility
 - **Category II:** Normal level of expectation
 - **Category III:** Moderate level of expectation
 - **Category IV:** Low level of expectation. Poor quality. Unacceptable regarding health
- ➔ Each indicator is associated to a category at every studied location in the building.

The ALDREN TAIL RATING SCHEME

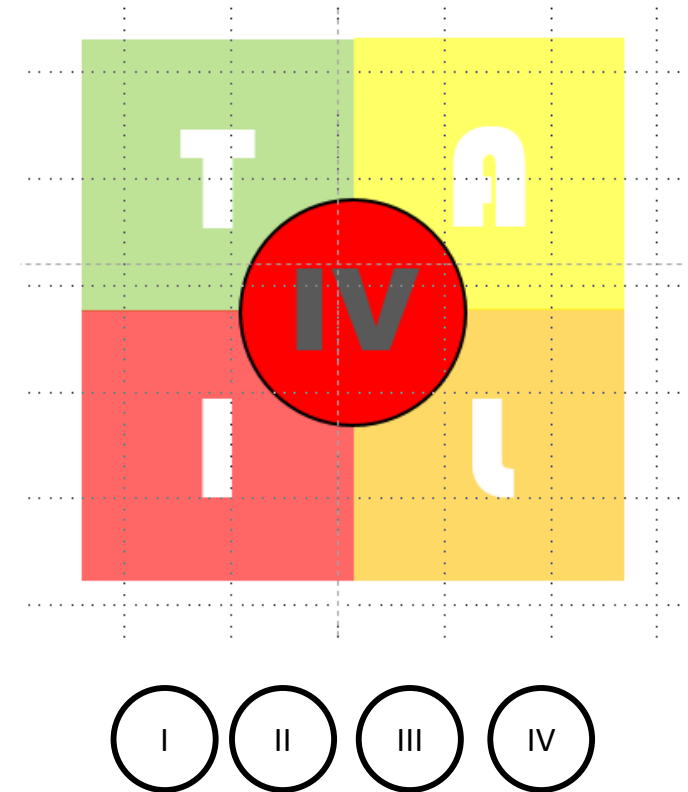
Four components:

- Thermal environment
- Acoustic environment
- Indoor air quality
- Light – Luminous (visual) environment

Assessed respectively according to the levels of the 12 parameters

Finally, assessment of the **overall IEQ**

<https://aldren.eu/comfort-well-being/>

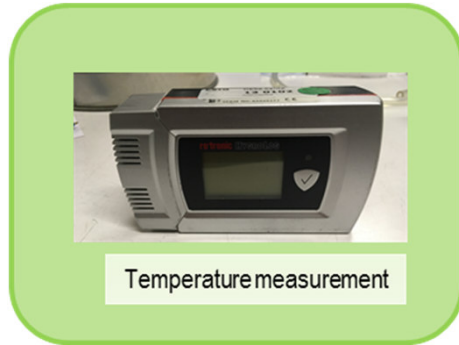


Wargocki et al. (2019) ASHRAE Journal

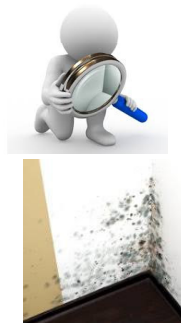
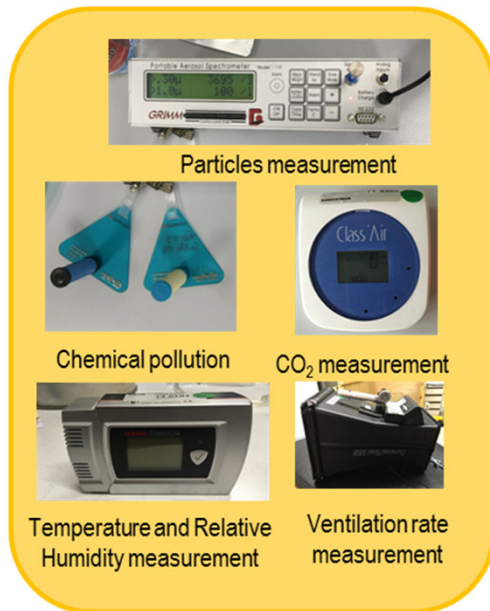


Description of the measuring equipment

Applied in 11 pilot buildings: 5 hotels and 6 office buildings



Assessments **ideally** performed in the **center of the room**, not closer than 1 m to the wall, about 0.8 to 1 m over the floor or on a table/desk or the bedside table.



Mould observations



Radon measurement during heating season if risk area



The ALDREN TAIL RATING SCHEME

Example from pilot building

TAIL Index for Health & Wellbeing	
Building location	Spain
Building type	Hotel_POS
Date of renovation	
Thermal environment	Category 2
Acoustic environment	Category 4
Indoor air quality	Category 4
Lighting (visual) environment	Category 3
TAIL	IV

New ALDREN Indicator

THE HEALTH & WELLBEING INDICATORS									
(Derived from the methodology in ALDREN Task 2.4) (Optional)									
Overall quality of indoor environment									
<table border="1"> <tr><td>I - High</td></tr> <tr><td>II - Medium</td></tr> <tr><td>III - Moderate</td></tr> <tr><td>IV - Low</td></tr> </table>						I - High	II - Medium	III - Moderate	IV - Low
I - High									
II - Medium									
III - Moderate									
IV - Low									
T-A-I-L									
	Category								
Thermal environment	4								
Acoustic environment	4								
Indoor air quality	3								
Lighting (visual) environment	3								
TAIL	IV								
T - Thermal environment									
	Room #1	Room #2	Room #3	Room #4	Room #5				
Air temperature	4	4	4	4	4				
TAIL-T building =	4								
I - Indoor air quality									
	Room #1	Room #2	Room #3	Room #4	Room #5				
CO2	3	4	3	3	2				
Ventilation rate	0	0	0	0	0				
Air relative humidity	4	2	3	3	3				
Visible mold	0	0	0	0	0				
Benzene	2	2	2	2	2				
Formaldehyde	1	2	1	1	1				
Radon	1	0	0	0	0				
PM2.5	2	2	2	2	2				
TAIL-I building =	3								
A - Acoustic									
	Room #1	Room #2	Room #3	Room #4					
Noise level	4	4	4	4					
TAIL-A building =	4								
L - Light									
(in lux)	Room 1	Room 2	Room 3	Room 4	Room 5				
Min	307	341	229	565	228				
Max	730	464	1145	998	685				
SCORE	3	1	4	4	1				
Building name: Covent Garden		Building category: Office building		Cadaster: Brussels					
Address: Rue de mot 24, Brussels, Belgium		Parcel No: 3500							
No. of energy certificate: 00001/SK_0001/2017									

Optional page in EU voluntary certificate



Financial valuation

Cost, Value, and Risk



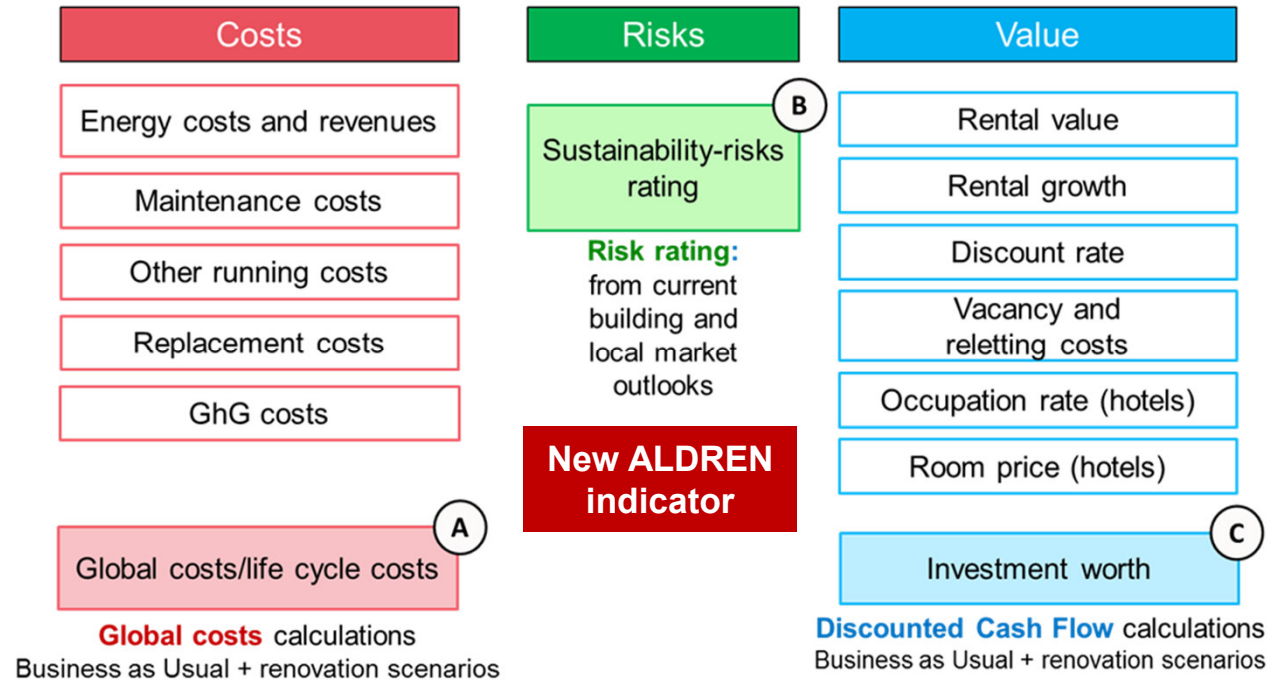
- The aim is to define how, **beyond the expected energy savings**, the energy features of buildings can be “translated” into **economic value**
- make suggestions to improve the integration of energy and sustainability related characteristics into **investment decision-making process** and **asset valuation**

<https://aldren.eu/cost-value-risk/>

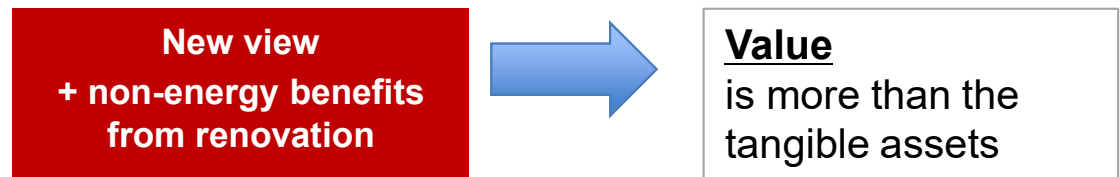


FINANCIAL VALUATION

- Selection of key economic and financial indicators



Financial comparisons between renovation scenarios – how the technical improvement will improve cash flows and value

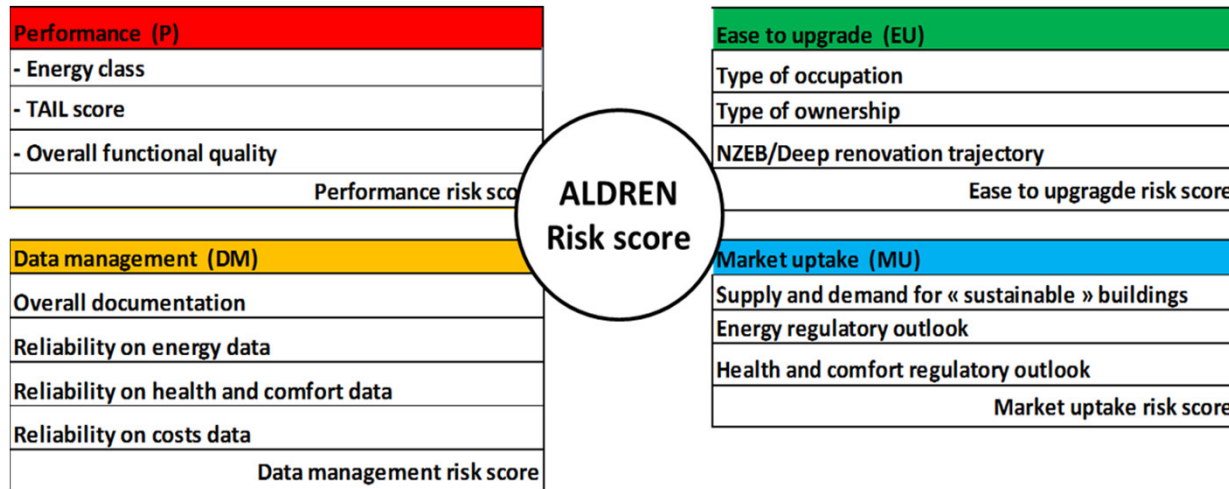


<https://www.rehva.eu/rehva-journal/chapter/linking-aldrens-energy-and-ieq-performance-assessments-to-financial-value-of-buildings>



ALDREN FINANCIAL RISK INDICATOR

4 SUB-RISK CATEGORIES



ALDREN Risk indicator associated with the financial value loss in connection with the **climate change**.

Risk rating to appraise and compare buildings in terms of: exposure to risk due to performance (**energy, IEQ**), **management**, possibility to **upgrade**, local market situation (**regulatory trends**).

FINANCIAL RISK INDICATOR

Performance High risk	Management Low risk
Upgrade Medium risk	Market Very high risk

<https://www.rehva.eu/rehva-journal/chapter/linking-aldrens-energy-and-ieq-performance-assessments-to-financial-value-of-buildings>



FINANCIAL VALUATION

Net present value

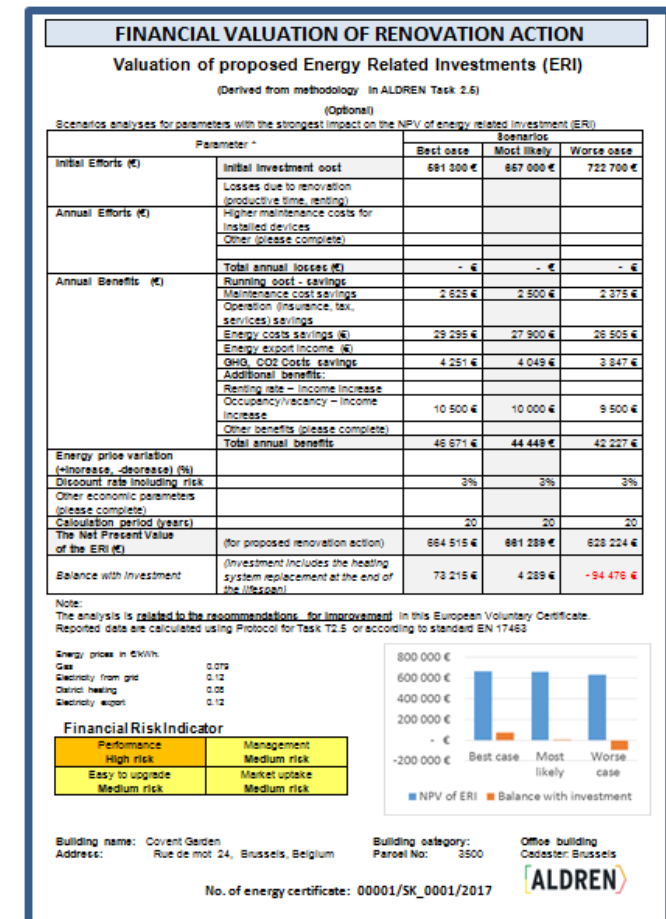
of proposed renovation action
 or of the whole building cash flow
including energy and non-energy benefits
 (IEQ, occupancy, renting revenue,
 maintenance, replacement costs).

The uncertainty of real future developments:
 ✓ BEST CASE, PROBABLE, WORSE CASE

ALDREN FINANCIAL RISK INDICATOR

**New ALDREN
 indicator**

Reference to EN 15459, EN 17463



Optional page in common EU voluntary certificate – link to recommendations for improvement in EVC and BRP.



HOW TO TAKE RENOVATION AND IMPROVED IEQ INTO ACCOUNT IN PROPERTY VALUATION?



MARKET VALUE

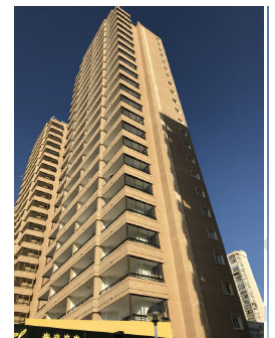
MARKET VALUE (INCOME APPROACH) FOR DIFFERENT RENOVATION SCENARIOS

- ✓ Initial investment costs in energy related renovation
- ✓ Energy costs savings
- ✓ Maintenance and replacement costs, planned measures
- ✓ Voids, vacancy period (%) (link to IEQ)
- ✓ Renting (link to IEQ)
- ✓ Discount rate (including risk associated with the building marketability)
- ✓ Green tax, CO₂ emissions
- ✓ Climate resilience

Tested on pilot buildings

- Hotel in Alicante, Spain (Cushman & Wakefield) **(+8.3%)**
- 2 Office buildings in Bratislava (ENBEE) **(+13%, +26%)**

<https://aldren.eu/interview-chayma-oueslati-senior-consultant-at-cushman-wakefield/>



**Increase of market value after deep renovation
exceeds the initial investment costs**



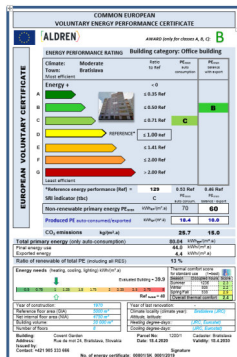
CONCLUSION

- ✓ One common EU holistic evaluation (EVC) for comparability accross EU
- ✓ Modular structure, verification by measured energy



- ✓ **Building Renovation Passport, ALDREN RenoMap, advice, plan long term renovation strategies, avoid lock-in effect**

- ✓ **Economic valuation with non-energy benefits**
only energy costs savings might not be sufficient motivation for **deep renovation towards NZEB, ZEB**



- **Increased market value** by deep renovation exceeds the investment costs in examples from ALDREN pilot buildings
- **Low energy performing buildings** may fall below standards for a next transaction → **Risk** of increased overheads or loss of income
→ **Future financial risks** connected with the **climate change and regulatory trends** have to be communicated and considered (Energy, Health & Comfort, Green tax, climate resilience,..).

ALDREN provides reliable indicators based on CEN standards



Thank you

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ALDREN Alliance
for Deep RENovation
in buildings



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