IMPULSE PLUS

Integrated Management Support for Energy efficiency in Mediterranean PUblic buildings PLUS

A 3.4 Fine-tuning for transferring.

Instructions for the use of KPIs-processor's PLUG-IN tool

Project co-financed by the European Regional Development Fund

This tool is an improved version of the tool previously developed in the framework of the IMPULSE project.

One of the activities foreseen under the IMPULSE PLUS project was to implement the modifications and adjustments necessary to adapt the KPIs-processor's PLUG-IN tool to the specific contexts of the new receivers' territories, under a transnational and cooperative approach, and in line with EU energy directives (EPBD and EDD) amendments, as well as the new commitments set by the EU in the Renovation Wave Strategy and the European Green Deal.

INSTRUCTIONS ON THE USE OF THE KPIs-processor's PLUG-IN tool

OBJECTIVE

The objective of KPIs-processor's PLUG-IN tool is to recognize the most affordable pathways for renovating, at least, 3% of building-stock area annually, based on each territory recognized typologies and their respective renovation scenarios associated with energy and cost indicators.

The excel-based tool automatically calculates yearly renovation plan for a public administration's building-stock according to specified input data and excel KPIs database previously calculated based on the public-building stock typification and their associated energy performance upgrading scenarios.

It is important to highlight that this tool can be used only if minor to deep renovation scenarios planned in KPIs-processor is gradual. E.g. Deep retrofit scenario is consist of the major retrofit scenario and additional energy efficiency measures, Major retrofit scenario is consist of the medium retrofit scenario and additional ee measures.

The PLUG-IN tool excel file consists of 6 sheets:

- Cover - basic information about deliverable and developers of tool.
- Instructions -how to use the KPIs-processor's PLUG IN tool
- MCA INPUT- the sheet were the user choses input data.
- PLAN - output data: yearly renovation plan
- Ranking - ranking of buildings and associated renovation scenarios to be implemented according to the input data preferences
- MCA-CHART – graphical presentation of results.

The instructions for PLUG IN tool are specified below.

INSTRUCTIONS FOR EACH WORKSHEET

SHEET: MCA-INPUT

In the sheet MCA – INPUT, yellow cells are enabled input data, green cells are enabled to choose from drop down lists, and orange cells are output data automatically calculated.

Step 1.

The first step is to insert the name of the KPIs excel file you are going to work with to calculate the Energy Renovation Plan. This KPIs excel file must be necessarily open during the use of the planning tool.

Table 1 – Name of Excel City/Region file

Name of Excel CITY/REGION File	D3.4.1_KPIs_ELCHE_en_rev2.xlsx

Step 2.

Chose up to 5 the most important KPIs (use drop-down list of KPIs) and they weight factors to define gradual renovation plan.

Table 2 - Input data for weight factors and drop down list for up to five indicators

Key Performance Indicators - Units	**Weight factor**
2. Total annual primary energy consumption - kWh/yr	20
7. Annual generation of Renewable Energy - KWh/m²/yr	20
9. Total annual CO2 emissions - kg/m²/yr	20
23. Total annual primary energy savings - KWh/m²/yr	20
54. Total investment cost per total annual energy saved - National	20

For correct calculation the sum of weight factors must be 100.

Step 3.

In the table 3 below, plug in tool enables user to change final score according to other 3 ponderable categories, which are Public Building Typologies, Retrofit scenarios or Renewable Energy Sources, up to +/- 30%.

Table 3 – Other ponderable categories

Other ponderable categories	**Option**	**Weighting (± 30%)**
Building Typology	PBT1	0%
Type of Retrofit	Deep retrofit	0%
RES	RES	30%

Using weighting (+/-30%) for building typology and type of retrofit, overall score will be increased or decreased for entered value. Using penalization (+/-30%) for RES, score from KPI related to RES (7, 8, 32, 33 and/or 34 KPIs.) will be increased or decreased for entered value.

Step 4.

In table 4 the user must enter the baseline year, so that the renovation plan proposed by the tool will start in the following year (e.g., for 2021 baseline year, the tool will start renovation plan in 2022). User can also refer to the baseline year as 0, and the tool shows the Renovation Plan for the 1, 2, 3...year.

The second data to input is the planed percentage floor area to be retrofitted annually. Tool calculates optimal option of retrofitting to fulfill annual retrofit demand.

After input relative planed retrofit area (eg 3%, 5%,…), it is possible to do combination of retrofit.

Tool shows below (orange cells) the total floor area of public building stock to be potentially renovated and the total floor area to be renovated annually.

Table 4 – Baseline year and relative annual retrofitting area

Baseline year	2021
Relative annual retrofitting area	8%
Total floor area (m²)	166.011
Annual retrofitting area (m²)	13.281

Step 5.

In Cell C21 of this sheet there is dropdown list with total of 5 possibilities. If you select minor, medium, major or deep, the tool calculates only retrofit options as selected, and not considering other retrofit type (in this case you do not need to input yellow cells). By selecting "Combination" it is possible to interact with multiple retrofit types.

If chosen option is "Combination" as shown in table below it is necessary to input yellow cells. Yellow cells in this tables present the factor that decrees floor area of building by the type of retrofit. Depending on retrofit scenario, user can choose the area factor considering boundaries presumed by the developer of this tool.

Table 5 – Combination of different retrofit types

Renovation scenarios	Combination
Minor	15%
Medium	30%
Major	90%
Deep	100%

It means that if you have in calculations "Minor" retrofit of some building, for calculations of total retrofit floor area, it will consider only 15% of that floor area (or percentage you entered). But if you have in next option the same building with deep retrofit, in that step it will take the rest of 85% of floor area.

Step 6.

Select PBT and retrofit scenario you want to consider for the calculation and presentation.

Table 6 - Select building typology and retrofit level for calculation

	Minor retrofit	Medium retrofit	Major retrofit	Deep retrofit
PBT1	✗	✓	✓	✓
PBT2	✓	✗	✓	✓
PBT3	✓	✓	✓	✓
PBT4	✓	✓	✓	✓
PBT5	✓	✗	✓	✓
PBT6	✓	✓	✗	✓
PBT7	✓	✓	✓	✓
PBT8	✓	✓	✓	✓
PBT9	✓	✓	✗	✓
PBT10	✗	✓	✓	✓
PBT11	✓	✓	✓	✗
PBT12	✓	✓	✓	✓
PBT13	✓	✓	✓	✓
PBT14	✓	✓	✓	✓
PBT15	✓	✓	✓	✓

In table above, it is possible to select or unselect each building type or level of retrofit. With input "1" in each cell you select that indicator, and with input "0" you deselect.

Step 7.

In table 7 the user can select up to 10 combinations of building with associated retrofit scenario to be excluded from the calculation and presentation.

Table 7 - Select building together with associated scenario you want to exclude for calculation

Building and associated scenario to be excluded from the initial sample
PBT3 - Preschool and primary school Ausias March - Minor Retrofit
PBT4 - Nursery School Don Crispín - Medium Retrofit
PBT1 - Adult Training Center Mercé Rodoreda - Deep retrofit

Step 8.

In table 8 the user enters the targets to be achieved for CO2 emission reduction (%), Primary Energy Consumption reduction (%), and the share of public-building stock Primary Energy consumption covered by Renewable Energies (%).

Table 8 - Checking of objectives to be achieved with the gradual renovation plan

TARGETS check	
CO2 reduction (%)	55%
kWh reduction (%)	30%
RES share (%)	9%

These data make it possible to later check at what stage of the renovation plan these targets are or are not achieved.

Step 9.

In table 9, the user enters the yearly public budget allocated for investment in energy renovation for public buildings.

Table 9 – Checking budget constrains

LIMITS check	
Annual Investment	1.000.000 €

This data makes it possible to later check if the yearly investment required is higher/lower than public budget availability.

RESULTS

SHEET: PLAN

Columns from E to X present yearly plan of renovation according to total result gained from user preferences explained in steps above.

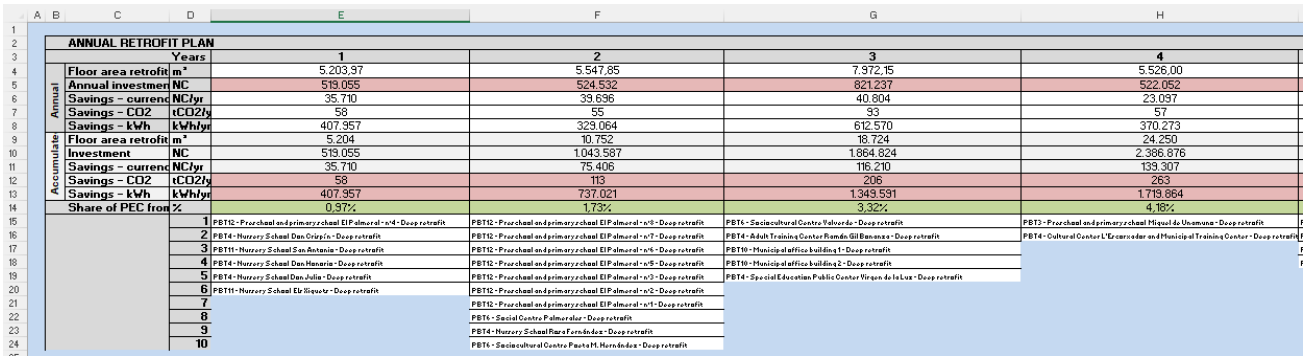
The information in row 4-8 in same columns present yearly floor area presumed for retrofit, investments costs and savings (CO2, kWh and National Currency).

The information in row 9-13 in same columns present accumulated data for floor area presumed for retrofit, and investments costs and savings (CO2, kWh and National Currency).

The information in row 14, in same columns, presents the share (%) of primary energy consumption covered by renewable energies, for the entire stock of public buildings, each year, considering the energy efficiency measures implemented so far.

The information from row 15 up to 175, in each column (E to X), shows the name of the buildings and associated retrofit scenarios to be implemented in this year.

When operating the tool with the combination of several possible levels of retrofitting scenarios, when a "lower/lesser" retrofitting scenario appears after than a "higher/upper" scenario, the tool automatically removes it from the ranking.



				1	2	3	4
			Years				
Annual		Floor area retrofit	m²	5.203,97	5.547,85	7.372,15	5.526,00
		Annual investmen	NC	519.055	524.532	821.237	522.052
		Savings - currenc	NC/yr	35.710	39.696	40.804	23.097
		Savings - CO2	tCO2/y	58	55	93	57
		Savings - kWh	kWh/yr	407.957	329.064	612.570	370.273
Accumulate		Floor area retrofit	m²	5.204	10.752	18.724	24.250
		Investment	NC	519.055	1.043.587	1.864.824	2.386.876
		Savings - currenc	NC/yr	35.710	75.406	116.210	139.307
		Savings - CO2	tCO2/y	58	113	206	263
		Savings - kWh	kWh/yr	407.957	737.021	1.343.591	1.713.864
		Share of PEC fron	%	0,37%	1,73%	3,32%	4,16%
	1			PBT12 - Preschool and primary school El Palmeral - nº4 - Deep retrofit	PBT12 - Preschool and primary school El Palmeral - nº8 - Deep retrofit	PBT6 - Sociocultural Centre Valverde - Deep retrofit	PBT3 - Preschool and primary school Miguel de Unamuno - Deep retrofit
	2			PBT4 - Nursery School Don Crispín - Deep retrofit	PBT12 - Preschool and primary school El Palmeral - nº7 - Deep retrofit	PBT4 - Adult Training Center Ramón Gil Bonanza - Deep retrofit	PBT4 - Cultural Center L'Escorxador and Municipal Training Center - Deep retrofit
	3			PBT11 - Nursery School San Antonio - Deep retrofit	PBT12 - Preschool and primary school El Palmeral - nº6 - Deep retrofit	PBT10 - Municipal office building 1 - Deep retrofit	
	4			PBT4 - Nursery School Don Honorio - Deep retrofit	PBT12 - Preschool and primary school El Palmeral - nº5 - Deep retrofit	PBT10 - Municipal office building 2 - Deep retrofit	
	5			PBT4 - Nursery School Don Julio - Deep retrofit	PBT12 - Preschool and primary school El Palmeral - nº3 - Deep retrofit	PBT4 - Special Education Public Center Virgen de la Luz - Deep retrofit	
	6			PBT11 - Nursery School Els Xiquets - Deep retrofit	PBT12 - Preschool and primary school El Palmeral - nº2 - Deep retrofit		
	7				PBT12 - Preschool and primary school El Palmeral - nº1 - Deep retrofit		
	8				PBT6 - Social Centre Palmerales - Deep retrofit		
	9				PBT4 - Nursery School Rosa Fernández - Deep retrofit		
	10				PBT6 - Sociocultural Centre Poeta M. Hernández - Deep retrofit		

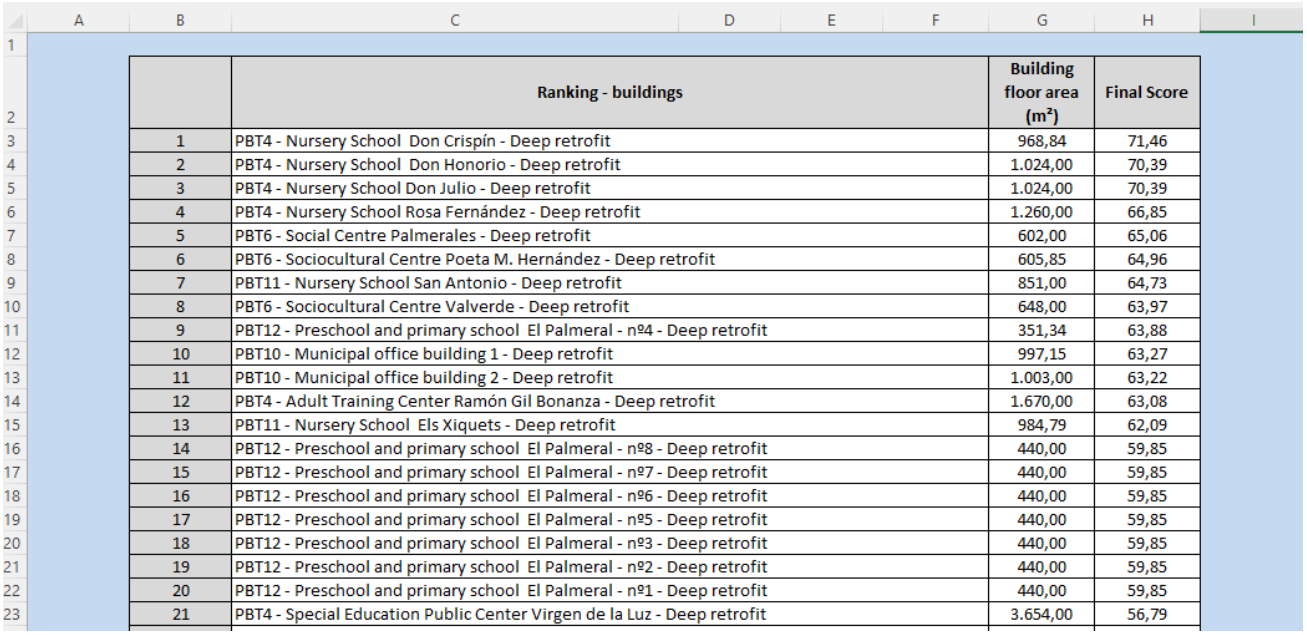
Example of the first 4 years of the renovation plan.

The cells in row 5, referring to the annual investment required, are shaded in red when the budget limit set in the MCA-INPUT sheet, cell F22, is exceeded. Otherwise, when the investment is below the established limit, it is shaded in green.

Similarly, rows 12, 13 and 14 are shaded red when CO2 reduction, energy reduction, and RES share targets defined in respective cells F17, F18 and F19 of the MCA-INPUT sheet are not achieved and are shaded green when the defined targets are met.

SHEET: Ranking

The table presents the intervention ranking of all building considering the input data from tables 2,3,5,6 and 7 in MCA-INPUT worksheet: chosen indicators, weighting factors of those indicators, other ponderable categories considered, selected building type and level of retrofit, and building and associated retrofit scenarios excluded.

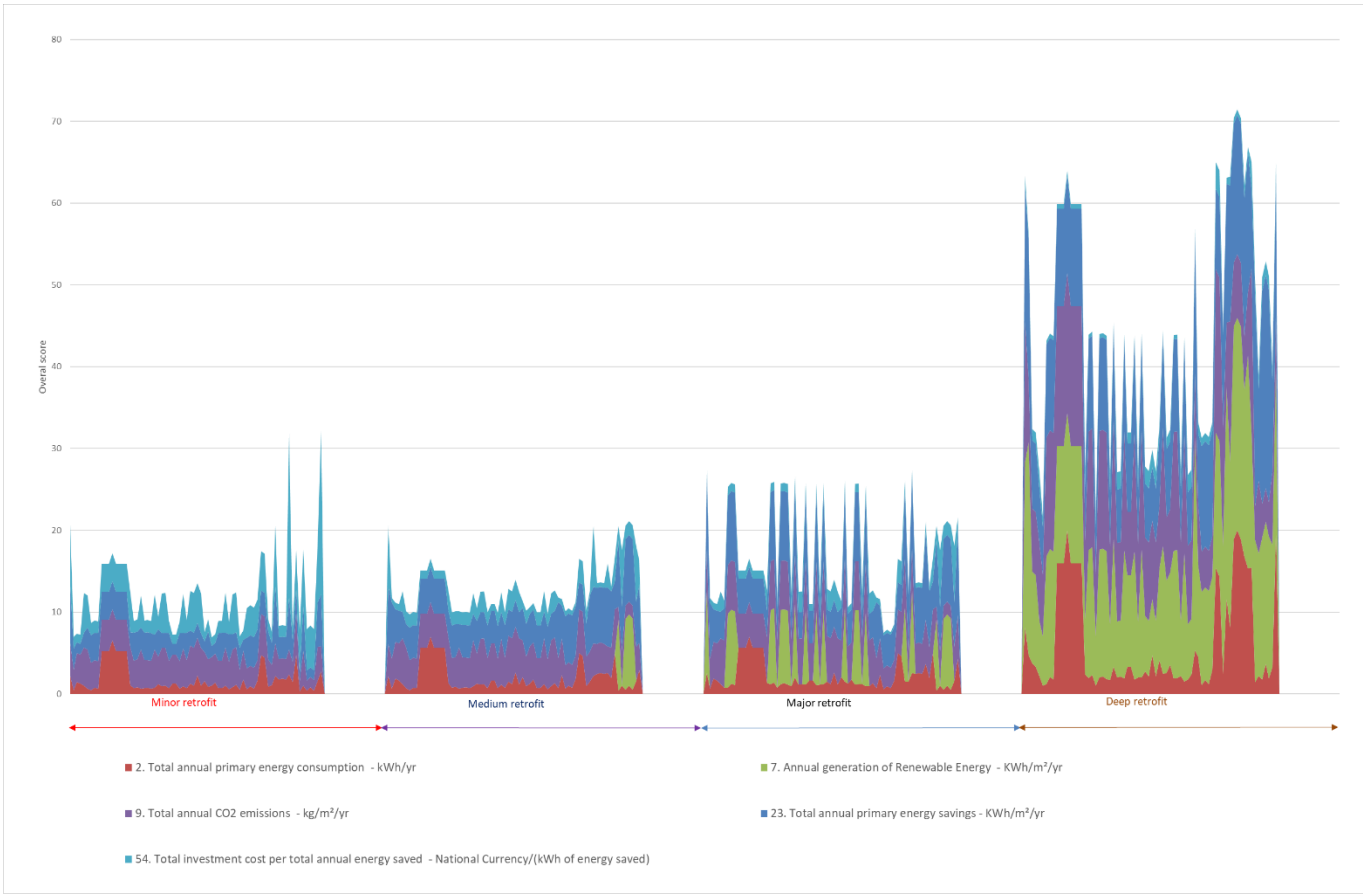


	Ranking - buildings	Building floor area (m²)	Final Score
1	PBT4 - Nursery School Don Crispín - Deep retrofit	968,84	71,46
2	PBT4 - Nursery School Don Honorio - Deep retrofit	1.024,00	70,39
3	PBT4 - Nursery School Don Julio - Deep retrofit	1.024,00	70,39
4	PBT4 - Nursery School Rosa Fernández - Deep retrofit	1.260,00	66,85
5	PBT6 - Social Centre Palmerales - Deep retrofit	602,00	65,06
6	PBT6 - Sociocultural Centre Poeta M. Hernández - Deep retrofit	605,85	64,96
7	PBT11 - Nursery School San Antonio - Deep retrofit	851,00	64,73
8	PBT6 - Sociocultural Centre Valverde - Deep retrofit	648,00	63,97
9	PBT12 - Preschool and primary school El Palmeral - nº4 - Deep retrofit	351,34	63,88
10	PBT10 - Municipal office building 1 - Deep retrofit	997,15	63,27
11	PBT10 - Municipal office building 2 - Deep retrofit	1.003,00	63,22
12	PBT4 - Adult Training Center Ramón Gil Bonanza - Deep retrofit	1.670,00	63,08
13	PBT11 - Nursery School Els Xiquets - Deep retrofit	984,79	62,09
14	PBT12 - Preschool and primary school El Palmeral - nº8 - Deep retrofit	440,00	59,85
15	PBT12 - Preschool and primary school El Palmeral - nº7 - Deep retrofit	440,00	59,85
16	PBT12 - Preschool and primary school El Palmeral - nº6 - Deep retrofit	440,00	59,85
17	PBT12 - Preschool and primary school El Palmeral - nº5 - Deep retrofit	440,00	59,85
18	PBT12 - Preschool and primary school El Palmeral - nº3 - Deep retrofit	440,00	59,85
19	PBT12 - Preschool and primary school El Palmeral - nº2 - Deep retrofit	440,00	59,85
20	PBT12 - Preschool and primary school El Palmeral - nº1 - Deep retrofit	440,00	59,85
21	PBT4 - Special Education Public Center Virgen de la Luz - Deep retrofit	3.654,00	56,79

Example of buildings intervention ranking

SHEET: MCA-CHART

Graphic presentation of all results is presented in sheet MCA-CHART.



Example of MCA-CHART