

Εγχειρίδιο εφαρμογής της Εφαρμογής 2 (Αγγλική γλώσσα)

Παραδοτέο Ε4

Σχετιζόμενο Πακέτο Εργασίας IMPULSE (1MED15_2.1_M2_178): WP3-Testing

**Ανάπτυξη Διαδικτυακών Εφαρμογών για την χαρτογράφηση Τυπολογιών
Δημοτικών Κτιρίων και για την αυτοματοποιημένη ιεράρχηση μέτρων ενεργειακής
αναβάθμισης**

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ΚΑΠΕ
CRÉS



Deliverable E4: User's manual for the app "Energy, Environmental and Economic Indicators' Processor for buildings' renovation plans (I3ERB)"

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1. Introduction

This report stands for a user's manual for the I3ERB application (*Energy, Environmental and Economic Indicators' Processor for buildings' renovation plans*) which is developed in the framework of the MED project "IMPULSE (1MED15_2.1_M2_178)" coordinated by the Centre for Renewable Energy Sources and Saving (CRES). The objective of the I3ERB app is to process energy, environmental and economic indicators (the so-called Key Performance Indicators, KPIs) of few representative buildings, each one of which being the Ambassador building of a specific group/Typology¹ in its current situation (base-case) and for various retrofit levels i.e. minor, medium, major and deep retrofit, towards:

- The prioritization of up to 3 energy-upgrading scenarios for each retrofit level (minor, medium, major or deep) for each Typology's Ambassador building.
- The prioritization of all scenarios (up to 12 scenarios) among all retrofit levels for each Ambassador building.
- The extrapolation of energy, environmental and economic indicators' impacts from the optimal scenario of each retrofit level to each individual building of each group/Typology.
- The aggregated energy, environmental and economic impacts of all buildings of each group/Typology.

The application presumes that the user has already defined an initial sample of up to 90 buildings, and that he/she has already classified the buildings into up to 15 groups/Typologies based on predefined criteria (in case of energy-oriented classification, suggested criteria may be found in footnote 1). The application also presumes that the user has already selected one (and only one) Ambassador building from each Typology (i.e. up to 15 Ambassadors), and for which its energy, environmental and economic indicators are already known in its current situation as well as in various retrofit situations i.e. for up to 12 retrofit options (up to 3 scenarios per each retrofit level minor, medium, major or deep).

It is noted that the application is built using the algorithm developed in the framework of the excel file "KPIs processing tool: Prioritizing building typologies and retrofit scenarios and extrapolating KPIs to the entire building stock of Communities" which is developed in the framework of the IMPULSE project and maybe downloaded from the following url: https://impulse.interreg-med.eu/what-we-achieve/deliverable-database/detail/?tx_elibrary_pi1%5Blivable%5D=3123&tx_elibrary_pi1%5Baction%5D=show&tx_elibrary_pi1%5Bcontroller%5D=Frontend%5CLivable&cHash=661c222449fa8c5ae7eea9b1d0696d9f.

It is also noted that the aforementioned excel platform is initially developed for processing data regarding public buildings, such as schools, offices, etc. However, it can be also used for other types of buildings e.g. residences, stores, etc. as long as they are well classified into Typologies, an Ambassador is selected for each Typology, and the KPIs are known for each Ambassador.

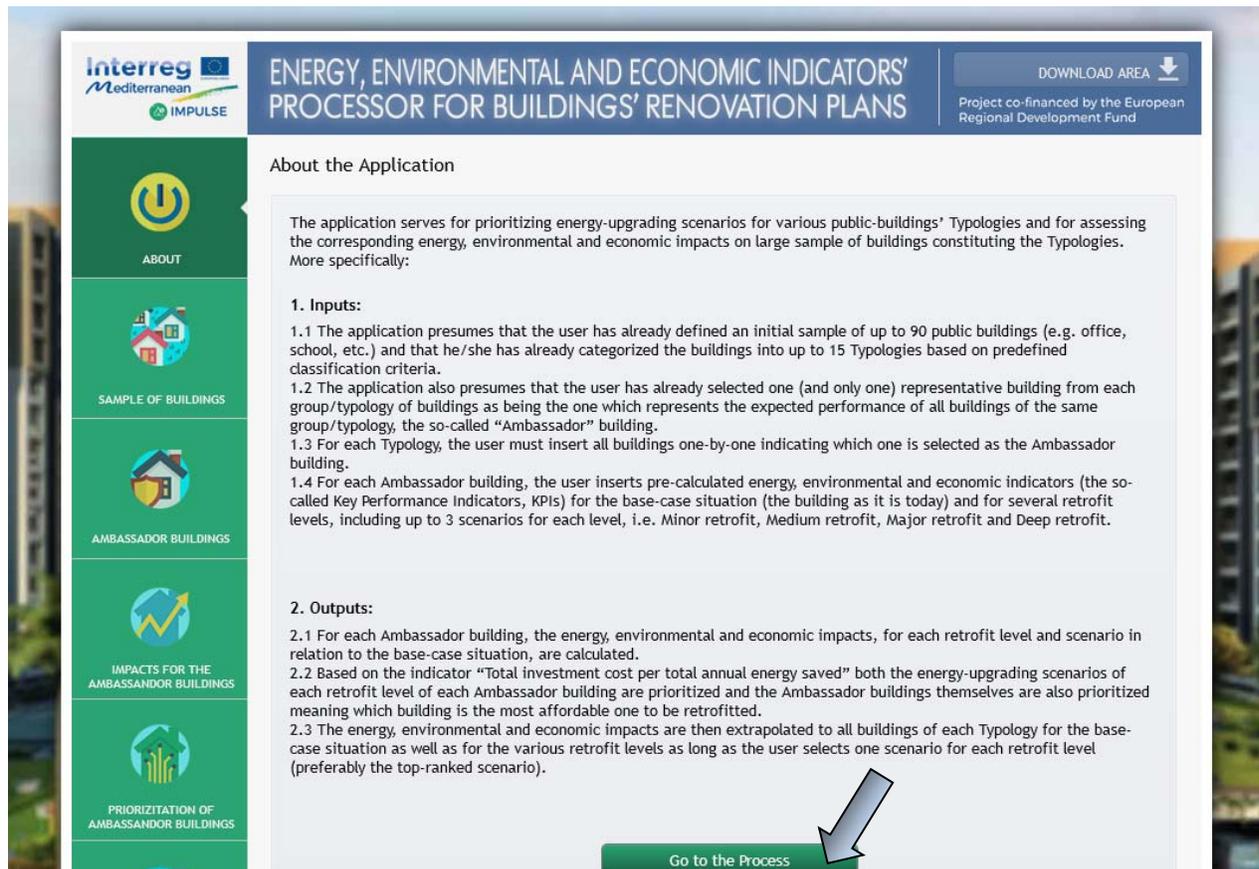
¹ A group or Typology constitutes of buildings with similar energy-related typical properties that are all represented by the Ambassador building of the group/Typology. The terms "Ambassador building" and "Building Typology" are well defined the following document: Deliverable D3.2.1, Preparatory set-up for pilot-activities' implementation, Project IMPULSE (1MED15_2.1_M2_178), June 2017 (url: https://impulse.interreg-med.eu/fileadmin/user_upload/Sites/Efficient_Buildings/Projects/IMPULSE/D3.2.1_Preparatory_setup.pdf).

2. Step-by-step user's guide

2.1 Inputs

2.1.1 Provision of basic information of the initial sample of buildings

First of all, the user must insert typical information of each one of the initial sample of buildings. To do that, the user clicks on the button "Go to the process" existing in the "About" page (see screenshot below).



Clicking on the "Go to the process", the page "SAMPLE of BUILDINGS" appears

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In the screen above, initially the number of entities (buildings) of the initial sample should be defined in the first sliding marker in the field "Number of buildings". **It is highlighted that the app works for not more than 90 buildings.** Right beside the slider, the user should insert the Country and City where the buildings are located. Then, in the following field "Buildings' basic information" the user can start inserting basic information of each building as follows:

- Building number: Give a numbering of each building by selecting it from the dropdown menu.
- Building name: The user types the name of the building.
- Building floor area: Insert the floor area in sq.m.
- Public building typology category: Select from the dropdown menu the Typology (PBT1, PBT2,...,PBT15) that the building belongs to. **Notification: Only up to 15 PBTs are available, i.e. the app works for entities/buildings classified into only up to 15 groups/Typologies. The typology allocation should not be arbitrary and should start from PBT1, then PBT2, then PBT3, ..., PBT15, i.e. do not complete buildings with random selection of typologies e.g. PBT9, PBT4, etc.**

- Finally, it is extremely important that the user notifies which building is an Ambassador building of the specific typology. In case for example the 45th building is an Ambassador of the 4th Typology, then the user should insert:
 - 45 in the "building number"
 - PBT4 in the "Public building typology category"
 - Tick the tick-box in the field "Ambassador building".

It is highlighted that one (and only one) building should be defined as Ambassador for each Typology (PBT).

The third table in the above screen is just to help the user validate that for each Typology only one building is selected as the Ambassador building of the Typology. When this is not the case for any of the Typologies, the table will return an error message. For example, when for Typology PBT4 two Ambassadors are defined then the following message appears in the table:

PBT Category	Nb of Appearance	Ambassador Appointment Check
PBT1	7	✓
PBT2	15	✓
PBT3	12	✓
PBT4	6	You have set more than one Ambassador Building in this category
PBT5	6	✓
PBT6	6	✓

2.1.2 Provision of available data for each Ambassador building

Once completing the above step, the user can move to the following page "Ambassador buildings" wherein the available energy, environmental and economic indicators' data should be inserted. Moving to that page the following screen appears:

ENERGY, ENVIRONMENTAL AND ECONOMIC INDICATORS' PROCESSOR FOR BUILDINGS' RENOVATION PLANS

Retrofit Scenarios: Base-Case Currency: Euro (€)

Please provide the following Key Performance Indicators (KPIs) for the Ambassador buildings

Building name: Heraklion 19th Primary School (old building part) Building floor area (m2): 1277

Energy Performance Indicators Environmental indicators Cost indicators

Optional fields		
Total annual primary energy consumption	kWh/m2/yr	22.7624
Annual final energy consumption for space heating	kWh/m2/yr	6.578
Annual final energy consumption for space cooling	kWh/m2/yr	0.364
Annual final energy consumption for domestic hot water	kWh/m2/yr	0
Annual final energy consumption for lighting	kWh/m2/yr	3.815
Annual electricity consumption	kWh/m2/yr	5.354
Annual consumption of fossil fuel	kWh/m2/yr	6.578
Annual generation of Renewable Energy	kWh/m2/yr	0
Energy class (According to national energy regulations)		

First of all, the currency adopted in the concerned Country should be selected from the dropdown menu of the top right field "Currency". Then, in the field "Retrofit scenario" the situation of the building should be selected from the dropdown menu as follows:

Retrofit Scenarios: Base-Case

Please provide the following Key Performance Indicators (KPIs) for the Ambassador buildings

Building name: Heraklion 19th Primary School (old building part) Building floor area (m2): 1277

It is advised that initially, the user should select the Base-case situation (standing for the building as it is today) in order to provide all the indicators referring to the current situation. In a next step, the user should select the Typology among PBT1 to PBT15 for which he/she will start providing indicators. For the first combination "Base-case" – PBT, the app returns the Ambassador building in terms of building name and floor area. Thereafter, the user can start providing inputs regarding KPIs related to energy, environment and cost as follows:

Energy Performance Indicators
 Environmental indicators
 Cost indicators

Optional fields

Total annual primary energy consumption	kWh/m ² /yr	22.7624	✕
Annual final energy consumption for space heating	kWh/m ² /yr	6.578	✕
Annual final energy consumption for space cooling	kWh/m ² /yr	0.364	✕
Annual final energy consumption for domestic hot water	kWh/m ² /yr	0	✕
Annual final energy consumption for lighting	kWh/m ² /yr	3.815	✕
Annual electricity consumption	kWh/m ² /yr	5.354	✕
Annual consumption of fossil fuel	kWh/m ² /yr	6.578	✕
Annual generation of Renewable Energy	kWh/m ² /yr	0	✕
Energy class (According to national energy regulations)			✕

Energy Performance Indicators
 Environmental indicators
 Cost indicators

Optional fields

Total annual CO ₂ emissions	kg/m ² /yr	7.415962	✕
Annual CO ₂ emissions from electricity consumption	kg/m ² /yr	5.685948	✕
Annual CO ₂ emissions from fossil fuels consumption	kg/m ² /yr	1.730014	✕
Total annual GHG emissions	kg/m ² /yr		✕
Number of occupancy hours in annual basis within which PMV is retained in the range (-0.7 to 0.7)			✕
Hourly-averaged PMV value (within occupancy hours) on a hot summer day of the year			✕
Hourly-averaged PMV value (within occupancy hours) on a typical winter day of the year			✕
Number of hours of overheating during the occupied period in the year			✕
Minimum winter indoor temperature	(°C)		✕
Maximum summer indoor temperature	(°C)		✕
Number of occupancy hours within which Breathing-zone pollutant is retained below maximum allowed thresholds			✕

Energy Performance Indicators
 Environmental indicators
 Cost indicators

Optional fields

Annual total energy-related operational cost	€/m ² /yr	1.293344	✕
Annual electricity cost	€/m ² /yr	0.8031	✕
Annual fossil fuel cost	€/m ² /yr	0.490244	✕

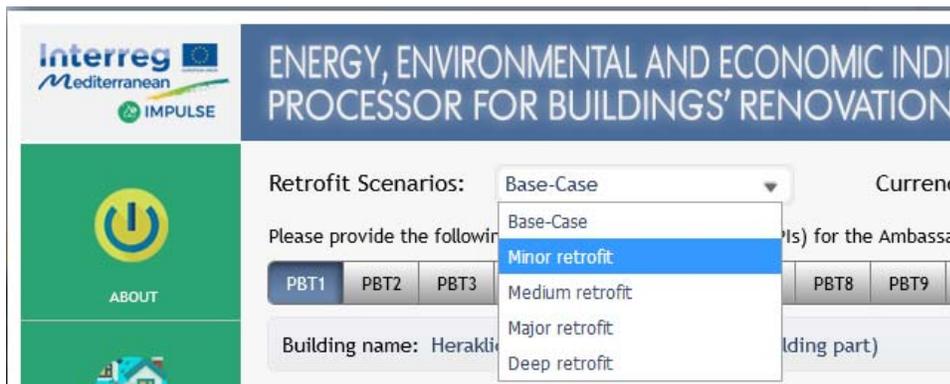


It is noted that the KPIs coloured in grey are optional.

It is noted that whenever a value is inserted the user must click somewhere out of the input box or press "enter" in order for the value to be inserted properly.

The inserting process is continued for the rest available PBTs in the base-case situation.

To provide KPIs for the various retrofit levels for each Ambassador building of each Typology, the user selects first of all the Retrofit scenario:



For each selected retrofit level, the following screen appears (for example, in the minor retrofit case):

ENERGY, ENVIRONMENTAL AND ECONOMIC INDICATORS' PROCESSOR FOR BUILDINGS' RENOVATION PLANS

Retrofit Scenarios: Minor retrofit Currency: Euro (€)

Please provide the following Key Performance Indicators (KPIs) for the Ambassador buildings

PBT1 PBT2 PBT3 PBT4 PBT5 PBT6 PBT7 PBT8 PBT9 PBT10 PBT11 PBT12 PBT13 PBT14 PBT15

Building name: Heraklion 19th Primary School (old building part) Building floor area (m2): 1277

S1 Scenario 1 - Short description S2 Scenario 2 (Optional) S3 Scenario 3 (Optional)

Energy Performance Indicators Environmental indicators Cost indicators

Optional fields		Scenario 1 (S1)	Scenario 2 (S2)	Scenario 3 (S3)
Total annual primary energy consumption	kWh/m2/yr	17.3895	16.0473	15.3037
Annual final energy consumption for space heating	kWh/m2/yr	6.729	6.769	6.093
Annual final energy consumption for space cooling	kWh/m2/yr	0.362	0.36	0.36
Annual final energy consumption for domestic hot water	kWh/m2/yr			
Annual final energy consumption for lighting	kWh/m2/yr	1.907	1.43	1.43
Annual electricity consumption	kWh/m2/yr	3.444	2.966	2.966
Annual consumption of fossil fuel	kWh/m2/yr	6.729	6.769	6.093
Annual generation of Renewable Energy	kWh/m2/yr			
Energy class (According to national energy regulations)				

In the above screen, the user must insert the requested energy, environmental and cost indicators in the same manner as presented above in the base-case situation, with the option to insert KPIs for up to 3 studied energy-upgrading scenarios. It is strongly advised that the user provides descriptions to each scenario by clicking in the relevant boxes and simply by typing the descriptions, For example:

S1 Replacement of lighting with LED S2 Installation of thermostatic valves S3 BEM system

Energy Performance Indicators Environmental indicators Cost indicators

The inserting process can be repeated for all Ambassador Buildings of PBTs and for each scenario of each retrofit level considered.

2.2 Outputs

2.2.1 Impacts for the Ambassador buildings

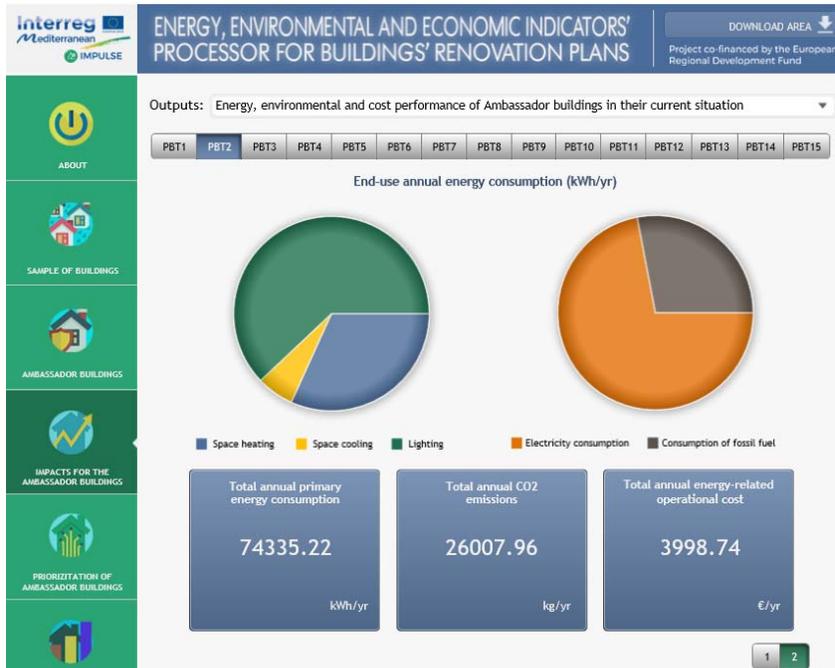
After completing the above process, the user can move to the page "Impacts for the Ambassador buildings" where he/she can see the automatically calculated impacts of each considered scenario in terms of the energy, environmental and economic performance of the Ambassador building. First of all, the summary of KPIs results either in the base-case or in any retrofit level can be viewed simply by selecting the scenario from the dropdown menu in the following screen:

Energy Performance Indicators		
Total annual primary energy consumption	kWh/yr	29067.58
Annual final energy consumption for space heating	kWh/yr	8400.11
Annual final energy consumption for space cooling	kWh/yr	464.83
Annual final energy consumption for domestic hot water	kWh/yr	0.00
Annual final energy consumption for lighting	kWh/yr	4871.76
Annual electricity consumption	kWh/yr	6837.06
Annual consumption of fossil fuel	kWh/yr	8400.11
Annual generation of Renewable Energy	kWh/yr	0.00

Environmental indicators		
Total annual CO2 emissions	kg/yr	9470.18
Annual CO2 emissions from electricity consumption	kg/yr	7260.96
Annual CO2 emissions from fossil fuels consumption	kg/yr	2209.23

Cost indicators		
Annual total energy-related operational cost	€/yr	1651.60
Annual electricity cost	€/yr	7260.96
Annual fossil fuel cost	€/yr	2209.23

When clicking to page "2" at the bottom right of the screen above, the above KPIs appear in user-friendly graph form:



The above refers to the summary of KPIs in the base-case scenario (current situation of each Ambassador building). By selecting the other option "...for the various retrofit scenarios", the following screen appears:

ENERGY, ENVIRONMENTAL AND ECONOMIC INDICATORS' PROCESSOR FOR BUILDINGS' RENOVATION PLANS

DOWNLOAD AREA
Project co-financed by the European Regional Development Fund

Outputs: Energy, environmental and cost impacts of Ambassador buildings for the various retrofit scenarios

Minor retrofit Medium retrofit Major retrofit Deep retrofit

Scenarios: Scenario1_PBT1 (available) Impacts: Energy Performance Indicators impacts

Ambassador 1 - Scenario 1				
Total annual primary energy savings	kWh/m ² /yr	5.37	23.60	%
	kWh/yr	6861.19		
Annual final energy savings for space heating	kWh/m ² /yr	-0.15	-2.30	%
	kWh/yr	-192.83		
Annual final energy savings for space cooling	kWh/m ² /yr	0.00	0.55	%
	kWh/yr	2.55		
Annual final energy savings for domestic hot water	kWh/m ² /yr	0.00		%
	kWh/yr	0.00		
Annual final energy savings for lighting	kWh/m ² /yr	1.91	50.01	%
	kWh/yr	2436.52		
Annual electricity savings	kWh/m ² /yr	1.91	35.67	%
	kWh/yr	2439.07		
Annual savings of fossil fuel consumption	kWh/m ² /yr	-0.15	-2.30	%
	kWh/yr	-192.83		
Annual increase of Renewable Energy generation	kWh/m ² /yr	0.00		%
	kWh/yr	0.00		

In the above screen, simply by selecting one of the level of retrofits among Minor, Medium, Major and Deep, the scenario considered (any of the ones inserted in the page "Ambassador buildings") from the dropdown menu of the field "Scenarios" and any of the energy, environmental and cost indicators impacts from the dropdown menu of the field "Impacts" (note that the dropdown menu provides a note "available" or "not available" when retrofit scenarios are considered or not, respectively, in the previous field "AMBASSADOR BUILDINGS").

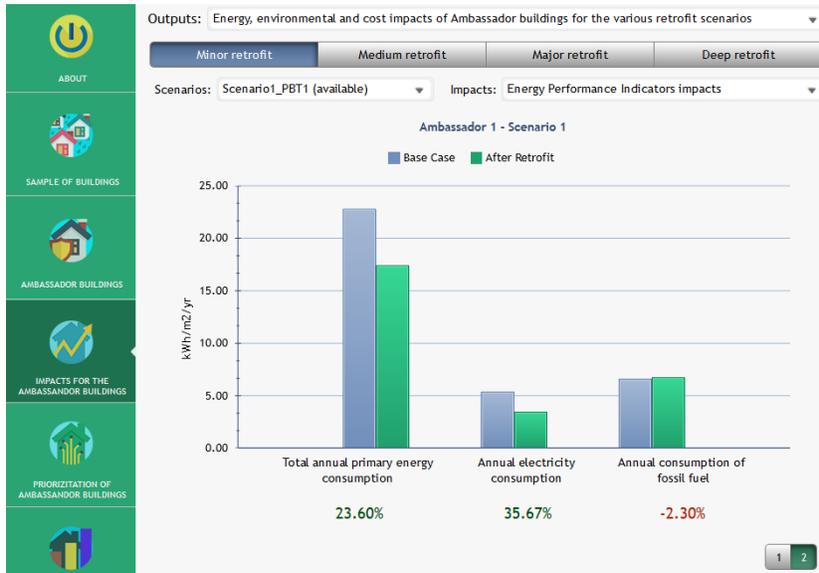
ENERGY, ENVIRONMENTAL AND ECONOMIC INDICATORS' PROCESSOR FOR BUILDINGS' RENOVATION PLANS

Outputs: Energy, environmental and cost impacts of Ambassador buildings for the various retrofit scenarios

	Minor retrofit	Medium retrofit	Major retrofit	Deep retrofit
Scenarios:	Scenario1_PBT1 (available)			
	Scenario1_PBT1 (available)			
	Scenario2_PBT1 (available)			
	Scenario3_PBT1 (available)			
Total area	Scenario1_PBT2 (available)			
	Scenario2_PBT2 (available)			
Ann	Scenario3_PBT2 (available)			
	Scenario1_PBT3 (available)			
Ann	Scenario2_PBT3 (not available)			
	Scenario3_PBT3 (not available)			
Ann	Scenario1_PBT4 (available)			
f	Scenario2_PBT4 (available)			
Ann	Scenario3_PBT4 (available)			
	Scenario1_PBT5 (available)			
Ar	Scenario2_PBT5 (available)			
	Scenario3_PBT5 (not available)			
A	Scenario1_PBT6 (available)			
	Scenario2_PBT6 (available)			
Ann	Scenario3_PBT6 (available)			
	Scenario1_PBT7 (available)			
	Scenario2_PBT7 (available)			

the table provides the summary of KPIs' impacts in relation to the base-case situation of the corresponding Ambassador building.

By clicking the page "2" at the bottom right of the above screen, the impacts in graphical form are presented:



2.2.2 Prioritization

In the page "Prioritization" there are three output tables:

a) Table in Page 1: Calculated total investment cost per total annual primary energy saved

REFERENCE COST INDICATOR
Total investment cost per total annual energy saved (€/ (kWh of energy saved))

Ambassador	Minor retrofit			Medium retrofit			Major retrofit			Deep retrofit		
	Scenario1	Scenario2	Scenario3	Scenario1	Scenario2	Scenario3	Scenario1	Scenario2	Scenario3	Scenario1	Scenario2	Scenario3
PBT1	3.24	2.90	2.80	9.80			18.54			11.76		
PBT2	1.03	0.98	17.70	9.89			9.89			7.60		
PBT3	0.91			0.34			0.34			1.91		
PBT4	0.53	1.27	0.56	3.88			3.88			4.15		
PBT5	2.84	2.57		6.17			10.04			7.30		
PBT6	0.62	0.60	0.65	0.92			3.41			3.80		
PBT7	1.31	1.86	2.03	3.22			3.22			2.42		
PBT8	0.39	0.53	1.03	1.13			1.54			2.31	2.49	
PBT9	1.25	0.90	2.42	9.09			9.09			4.98		
PBT10	0.18	0.20	0.53	2.35			2.35			2.37		
PBT11												
PBT12												
PBT13												
PBT14												
PBT15												

b) Table in Page 2: Prioritization of scenarios for each Ambassador building (ranking in ascending order of the indicator "investment cost per energy saved")

PRIORITIZATION OF SCENARIOS FOR EACH AMBASSADOR
1st Ranking Place=lowest reference cost indicator (best); Last ranking place=highest reference cost indicator (worse)

Ambassador	Minor retrofit			Medium retrofit			Major retrofit			Deep retrofit		
	Scenario1	Scenario2	Scenario3	Scenario1	Scenario2	Scenario3	Scenario1	Scenario2	Scenario3	Scenario1	Scenario2	Scenario3
PBT1	3	2	1	4			6			5		
PBT2	2	1	6	4			4			3		
PBT3	3			1			1			4		
PBT4	1	3	2	4			4			6		
PBT5	2	1		3			5			4		
PBT6	2	1	3	4			5			6		
PBT7	1	2	3	5			5			4		
PBT8	1	2	3	4			5			6	7	
PBT9	2	1	3	5			5			4		
PBT10	1	2	3	4			4			6		
PBT11												
PBT12												
PBT13												
PBT14												
PBT15												

c) Table in Page 3: Prioritization of building typologies

PRIORITIZATION OF BUILDING TYPOLOGIES IN TERMS OF AFFORDABILITY
1st Ranking Place=lowest reference cost indicator (best); Last ranking place=highest reference cost indicator (worse)

Ambassador	Minor retrofit		Medium retrofit		Major retrofit		Deep retrofit	
	Ranking of Buildings	Corresponding Best Scenario						
PBT1	23	Scenario3	9	Scenario1	10	Scenario1	11	Scenario1
PBT2	13	Scenario2	10	Scenario1	8	Scenario1	10	Scenario1
PBT3	12	Scenario1	1	Scenario1	1	Scenario1	1	Scenario1
PBT4	5	Scenario1	6	Scenario1	6	Scenario1	7	Scenario1
PBT5	22	Scenario2	7	Scenario1	9	Scenario1	9	Scenario1
PBT6	8	Scenario2	2	Scenario1	5	Scenario1	6	Scenario1
PBT7	18	Scenario1	5	Scenario1	4	Scenario1	4	Scenario1
PBT8	3	Scenario1	3	Scenario1	2	Scenario1	2	Scenario1
PBT9	11	Scenario2	8	Scenario1	7	Scenario1	8	Scenario1
PBT10	1	Scenario1	4	Scenario1	3	Scenario1	3	Scenario1
PBT11		N/A		N/A		N/A		N/A
PBT12		N/A		N/A		N/A		N/A
PBT13		N/A		N/A		N/A		N/A
PBT14		N/A		N/A		N/A		N/A
PBT15		N/A		N/A		N/A		N/A

In the first table above, the app calculates and returns the so-called affordability indicator investment cost per energy saved for each scenario of each retrofit level considered. Obviously, the lower is the indicator the better the scenario as it corresponds to an intervention which ensures the highest energy saving with the least investment cost. Based on that observation, the scenarios are ranked in ascending order for each Ambassador building of each PBT in the second table above (in a row direction), i.e. the 1st Ranking Place is taken by the scenario with the lowest value of the affordability indicator (best), while the last ranking place is taken by the scenario with the highest affordability indicator (worse).

In the third table, the app ranks the Ambassador buildings with each other (in a column direction) for each level of retrofit. In that case, the app identifies the optimal scenario (i.e. the one with the lowest affordability indicator) for each Ambassador and for each retrofit level and it ranks it in comparison with the minimum affordability indicators of the other Ambassadors. As it can be seen in the example herein, when more than just one scenario is considered for any level of retrofit (refer to minor retrofit) the consecutiveness of the ranking is destroyed. Nonetheless, the ranking is always correct and indeed reveals the correct order among Ambassador buildings. This is a small bug which will be improved in the near future.

2.2.3 Impacts for the sample of buildings

In the final tab "Impacts for the sample of buildings" the app provides the following results:

1. The projected results of KPIs for the base-case and for each retrofit level, extrapolated from the Ambassador building to each one of the same Typology of the initial sample of buildings.
2. The aggregated values of KPIs for each typology (i.e. the total values of indicators for all buildings of each typology).

In the first screen, the user can select from the dropdown menu "Outputs" the various situations of the buildings considered. It is advised that initially, the current situation should be selected in order to check the extrapolated results from the Ambassador buildings to each building of the initial sample.

Interreg Mediterranean IMPULSE

ENERGY, ENVIRONMENTAL AND ECONOMIC INDICATORS' PROCESSOR FOR BUILDINGS' RENOVATION PLANS

DOWNLOAD AREA

Project co-financed by the European Regional Development Fund

Outputs: Energy, environmental and cost performance of all buildings in their current situation

Energy, environmental and cost performance of all buildings-Minor retrofit

Energy, environmental and cost performance of all buildings-Medium retrofit

Energy, environmental and cost performance of all buildings-Major retrofit

Energy, environmental and cost performance of all buildings-Deep retrofit

Building No.	Total annual primary energy consumption kWh/yr	Annual electricity consumption kWh/yr	Annual consumption of fossil fuel kWh/yr	Annual generation of renewable energy kWh/yr
1	11,030.44	2,328.04	3,889.44	0
2	16,336.976	3,448.016	5,760.576	0
3	26,085.5	5,505.5	9,198	0
4	225,080.6	47,504.6	79,365.6	0
5	74,335.22	22,338.68	8,682.24	0

Scrollable Table View basic info of buildings

AGGREGATED INDICATORS FOR EACH BUILDING TYPOLOGY

PBT1 PBT2 PBT3 PBT4 PBT5 PBT6 PBT7 PBT8 PBT9 PBT10 PBT11 PBT12 PBT13 PBT14 PBT15 ALL

Total annual primary energy consumption 278533.52 kWh/yr

Annual electricity consumption 58786.16 kWh/yr

Annual consumption of fossil fuel 98213.62 kWh/yr

Annual generation of renewable energy 0.00 kWh/yr

Electricity Consumption Fossil fuel consumption Renewable energy gener

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In the first table the extrapolated indicators to each building appear, while in the field "AGGREGATED INDICATORS..." the total values of all buildings of each typology are presented, both at the current situation of the buildings.

In a next step, the user can select from the dropdown menu in the field "Outputs" the retrofit level should be selected. For example, when selecting the option "...-Minor retrofit", the following screen appears:

The screenshot displays the 'ENERGY, ENVIRONMENTAL AND ECONOMIC INDICATORS' PROCESSOR FOR BUILDINGS' RENOVATION PLANS. The interface includes a sidebar with navigation options: ABOUT, SAMPLE OF BUILDINGS, AMBASSADOR BUILDINGS, IMPACTS FOR THE AMBASSADOR BUILDINGS, PRIORITIZATION OF AMBASSADOR BUILDINGS, and IMPACTS FOR THE SAMPLE OF BUILDINGS. The main content area shows the following details:

- Outputs:** Energy, environmental and cost performance of all buildings-Minor retrofit
- Building No.:** 1 (Building name: Heraklion 14th Kindergarten)
- Scenario:** 1 (Selected), 2, 3 (Proposed Scenario: Scenario2)
- Building typology:** PBT1

Two tabs are available: 'Buildings' performance indicators' (selected) and 'Buildings' performance impacts indicators'. Under the selected tab, three radio buttons allow selection of 'Energy Indicators' (selected), 'Environmental Indicators', or 'Cost Indicators'.

EXTRAPOLATED INDICATORS FOR THE SELECTED BUILDING OF THE INITIAL SAMPLE

Building No.	Total annual primary energy consumption kWh/yr	Annual electricity consumption kWh/yr	Annual consumption of fossil fuel kWh/yr	Annual generation of renewable energy kWh/yr
1	9,676.24	1,835.2	3,957.52	0

AGGREGATED INDICATORS FOR EACH BUILDING TYPOLOGY

Buttons for building typologies: PBT1 (selected), PBT2, PBT3, PBT4, PBT5, PBT6, PBT7, PBT8, PBT9, PBT10, PBT11, PBT12, PBT13, PBT14, PBT15, ALL.

Summary indicators for PBT1:

- Total annual primary energy consumption: 9676.24 kWh/yr
- Annual electricity consumption: 1835.20 kWh/yr
- Annual consumption of fossil fuel: 3957.52 kWh/yr
- Annual generation of renewable energy: 0.00 kWh/yr

A pie chart shows the composition of energy consumption: Electricity Consumption (blue), Fossil fuel consumption (green), and Renewable energy gener (yellow).

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For each building, the user can select different retrofit scenarios among the up-to-three ones considered in the tab "AMBASSADOR BUILDINGS" for each retrofit level. By default, the app selects Scenario No.1, however it is advised here to declare the scenario which is prioritized in the tab "PRIORITIZATION OF AMBASSADOR BUILDINGS". At the right hand-side of this selection tab, the app provides the proposed scenario according to the prioritization in the aforementioned tab. In the above example, the proposed scenario for the building "Heraklion 14th Kindergarten" is Scenario2 because it had the lowest indicator "investment cost per energy saved". After selecting the scenario for each building, the user can see the extrapolated values of KPIs for each building in the table "EXTRAPOLATED INDICATORS...". Finally, in the table "AGGREGATED INDICATORS..." the app provides the total values of KPIs for all buildings of each typology.

In case the impacts of scenarios, i.e. in relation to the base-case, are concerned the tab "Buildings' performance impacts indicators" should be clicked which returns the following screen:

ENERGY, ENVIRONMENTAL AND ECONOMIC INDICATORS' PROCESSOR FOR BUILDINGS' RENOVATION PLANS

DOWNLOAD AREA

Project co-financed by the European Regional Development Fund

Outputs: Energy, environmental and cost performance of all buildings-Minor retrofit

Building No. 1 Building name: Heraklion 14th Kindergarten

Scenario 1 Proposed Scenario: Scenario2 Building typology: PBT1

Buildings' performance indicators Buildings' performance impacts indicators

Energy Indicators Environmental Indicators Cost Indicators

EXTRAPOLATED IMPACT INDICATORS FOR THE SELECTED BUILDING OF THE INITIAL SAMPLE

Building No.	Total annual primary energy savings		Annual electricity savings		Annual savings of fossil fuel consumption		Annual increase of renewable energy generation	
	kWh/yr	%	kWh/yr	%	kWh/yr	%	kWh/yr	%
1	1,354.2	12.277	492.84	21.17	-68.08	-1.75	0	0

AGGREGATED IMPACT INDICATORS FOR EACH BUILDING TYPOLOGY

Typology	Total annual primary energy savings		Annual electricity savings		Annual savings of fossil fuel consumption		Annual increase of renewable energy generation	
	kWh/yr	%	kWh/yr	%	kWh/yr	%	kWh/yr	%
PBT1	268857.28	96.53	56950.96	96.88	94256.10	95.97	0.00	0.00

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In the above, the app presents first of all the extrapolated impacts for each selected building (from the dropdown "Building No.") and finally, the aggregated impacts for all buildings of each building typology in a table and bar-graph form (Blue: After retrofit; Green: Before retrofit). In that way the app provides the opportunity to scale-up and view impacts from few buildings (Ambassador buildings) to all buildings of the initial sample considered.

3. Download area

The download area appears once the user clicks on the relevant top right icon of the app. The click moves to the following screen which will give the option to the user to extract a small pdf report of the exercise in order to keep the data for further external processing.

4. Limitations

The following limitations when using the app should be considered:

1. The best functionality (speed and graphics) is ensured when using Internet Explorer or Chrome.
2. For all fields/tabs for which KPIs are inserted or different options are selected for the different PBTs the user must make sure that the correct PBT is clicked.
3. The app does not save the session started by the user for a continuation of the exercise in case of re-boot. The case study should be completed in a single session of using the app.

5. Initial registration

In order to use the app, the user must first of all register as follows: Enter the link <https://cres.mygis.gr> then click on "Register" and complete the form:



ΚΑΠΕ
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Deliverable E4: User's manual for the app "Energy, Environmental and Economic Indicators' Processor for buildings' renovation plans (I3ERB)"

By providing typical information mainly professional. GDPR provisions have been thoroughly considered as stated in the terms and conditions. Once clicking on "register" the user will receive an activation email of his/her account and then enter the app.

Conclusion-Remark

The I3ERB application is a useful tool targeted to facilitate the processing of data related to the energy performance of large sample of buildings and it is based in the logic of entities' bundling. It is strongly believed that the app will help the stakeholders draw affordable energy efficiency action plans for large sample of buildings in accordance to the objectives of the IMPULSE project.

