TIMEPAC Academy

Identification of cost-optimal investments and creation of renovation scenarios

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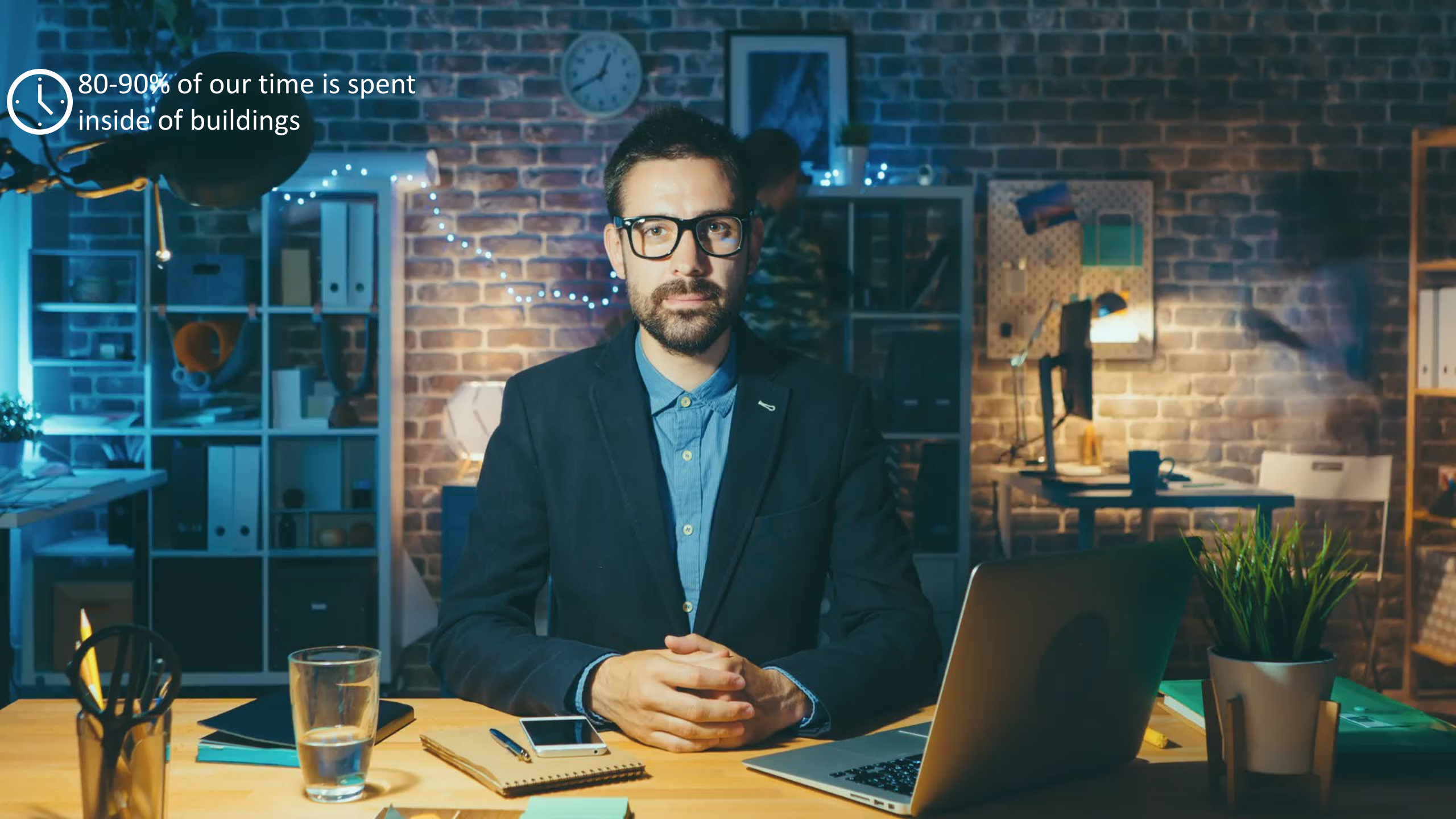
12 March 2024


80-90% of our time is spent
inside of buildings

40% of energy is consumed by buildings

36% of greenhouse gas emissions is due to buildings

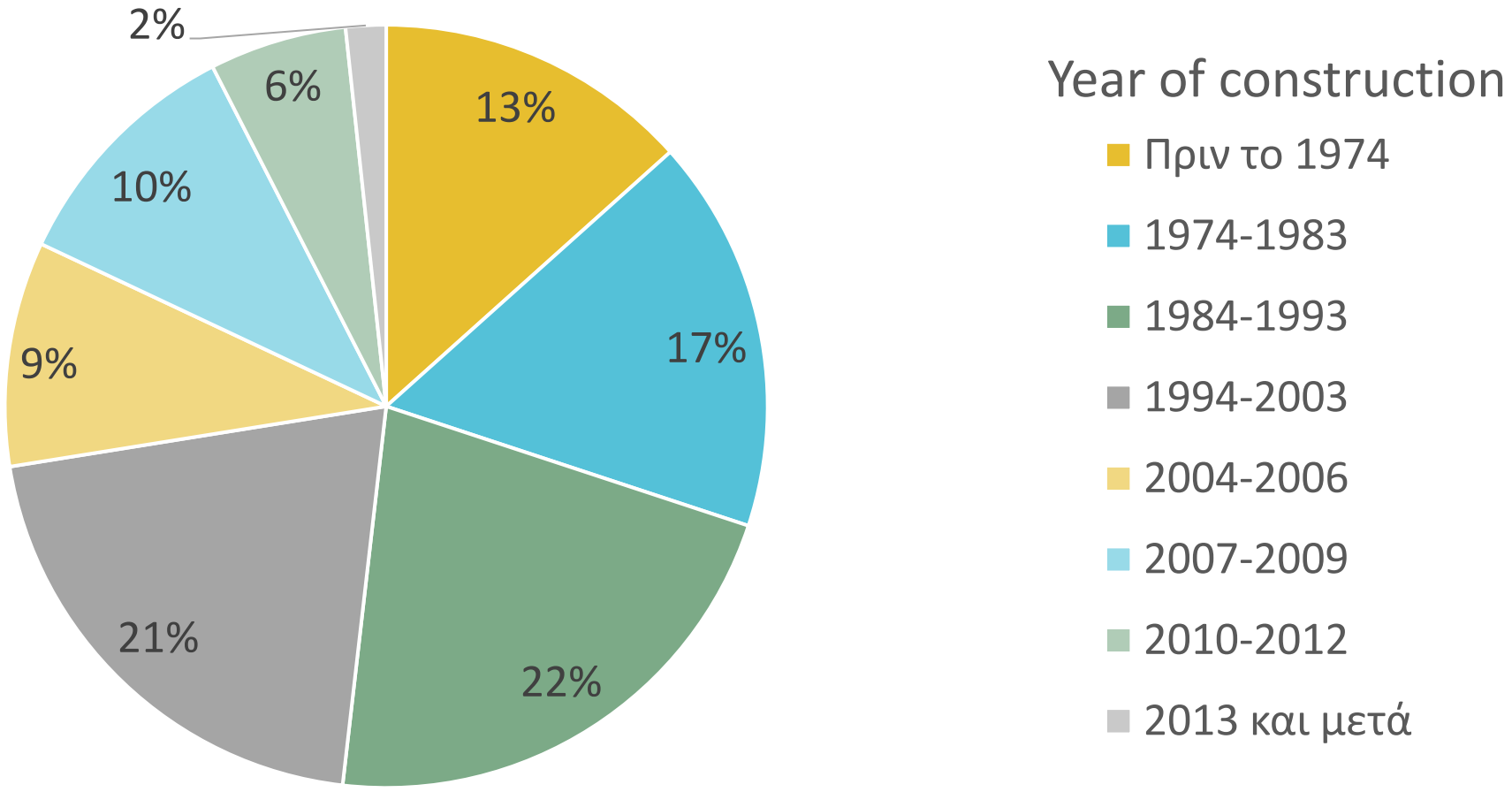
50% of raw materials is consumed in buildings

40% of waste is due to buildings

Cyprus Building Stock

- The characteristics of an area's building stock are directly linked to parameters such as the ***local climate, culture, available construction materials, existing legal framework, minimum requirements for the energy performance of buildings, know-how and skills*** of the human resources involved with the construction sector.
- Nationally, over the past 100 years the building stock has changed, evolved and adapted to a range of measures, trends and necessities of each era.
- Transition from traditional construction with mainly natural materials to reinforced concrete buildings.
- In the recent past, minimum energy efficiency requirements have been adopted.
- **The buildings of Cyprus are characterized by great diversity.**

The building stock of Cyprus



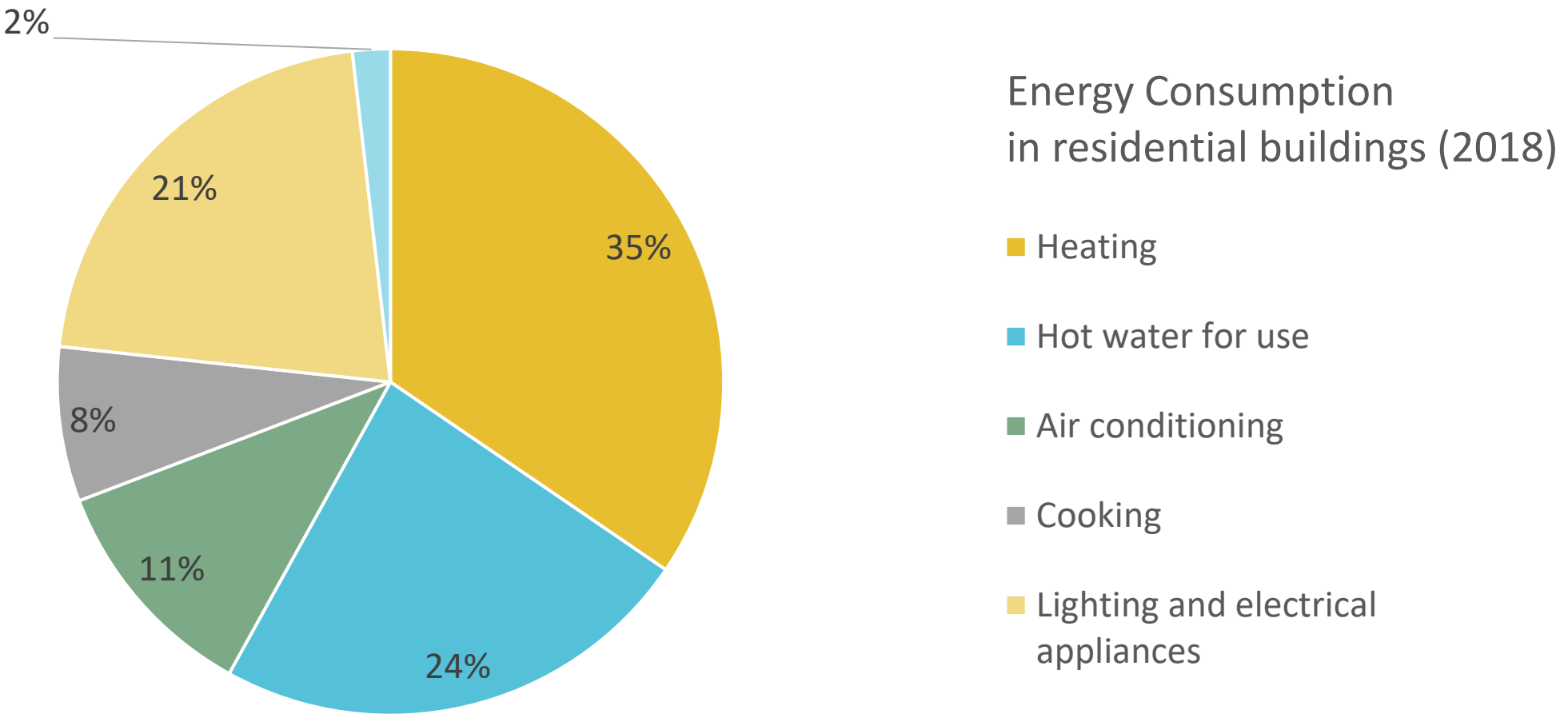
A large percentage of residential buildings is built before 2007, which translates to:

- Outdated solar systems for hot water
- Single-glazed windows
- Most of them do not have roof insulation and if they do, it is usually damaged

Methods for heating:

- Boilers (oil) for central heating
- Traditional fireplaces
- Gas heaters
- Oil heaters
- Electric heaters

The building stock of Cyprus – Residential Buildings



Energy upgrade targets

- Energy saving targets >30%
- Energy class B+ (commercial & public buildings) or
- Energy class A (residential buildings) (nZEB)

Improvement measures in performance

- Thermal insulation of the building envelope (roofs, walls etc)
- Highly efficient external windows and doors
- External shading
- Smart meters
- Thermal plaster
- Heating and air conditioning systems
- High efficiency energy stoves

What is the government promoting?

A

INSTALLATION OF

PHOTOVOLTAIC SYSTEM

IN AN EXISTING RESIDENCE

ELIGIBILITY: Dwellings for which the application for the issuance of a building permit or town planning permit has been submitted **before 01.01.2017**

B

INSTALLATION OF

ROOF THERMAL INSULATION

IN AN EXISTING RESIDENCE

ELIGIBILITY: Dwellings for which the application for the issuance of a building permit or town planning permit has been submitted **before 21.12.2007**

BONUS €750

IN CASE OF GRANT APPROVAL FOR BOTH INVESTMENTS

Grant Scheme "Saving - Upgrading of Residential Buildings" - 2023

TYPES OF INVESTMENTS:

- **CATEGORY A:** INTEGRATED ENERGY UPGRADING OF RESIDENCES INTO BUILDINGS WITH NEARLY ZERO ENERGY CONSUMPTION (nZEB)
- **CATEGORY B:** ENERGY UPGRADING OF RESIDENCES IN COMBINATION WITH INSTALLATION OF PHOTOVOLTAIC SYSTEMS (NET-BILLING)
- **CATEGORY C:** ENERGY UPGRADING OF RESIDENCES

MAXIMUM GRANT AMOUNT PER TYPE OF INVESTMENT:

- **CATEGORY A:** Up to € 32,000
- **CATEGORY B:** Up to € 27,000
- **CATEGORY C:** Up to € 22,000

NOTE: For all types of investments, the amount of the sponsorship is determined by a simplified cost procedure, depending on the investments implemented

PEDIA Project – Cyprus

"An innovation project exclusively for the schools of Cyprus. A project of total building upgrade for quality education. A project for sustainability and the school environment."

PEDIA

Promoting Energy efficiency & Developing Innovative Approaches in schools

Project objectives :

Energy renovations of 25 schools across Cyprus in order to reach the nZEB level.

SUGGESTED ENERGY UPGRADE MEASURES

TO TRANSFORM SCHOOL BUILDINGS INTO nZEBs:

- Thermal Insulation of the Building Envelope
- Thermal Insulation and Waterproofing of Flat Roofs
- Thermal Insulation Inside of False Ceilings (for Sloped Roofs)
- Replacement of Existing Openings (new heat-insulating windows and doors)
- Replacement of Existing Lighting with new LED lighting
- Replacement of Existing Ventilators
- Repair and Maintenance of Existing Shading Elements
- Green Roofs
- Planting of Trees for Natural Shading

ENERGY RENOVATIONS OF SCHOOLS

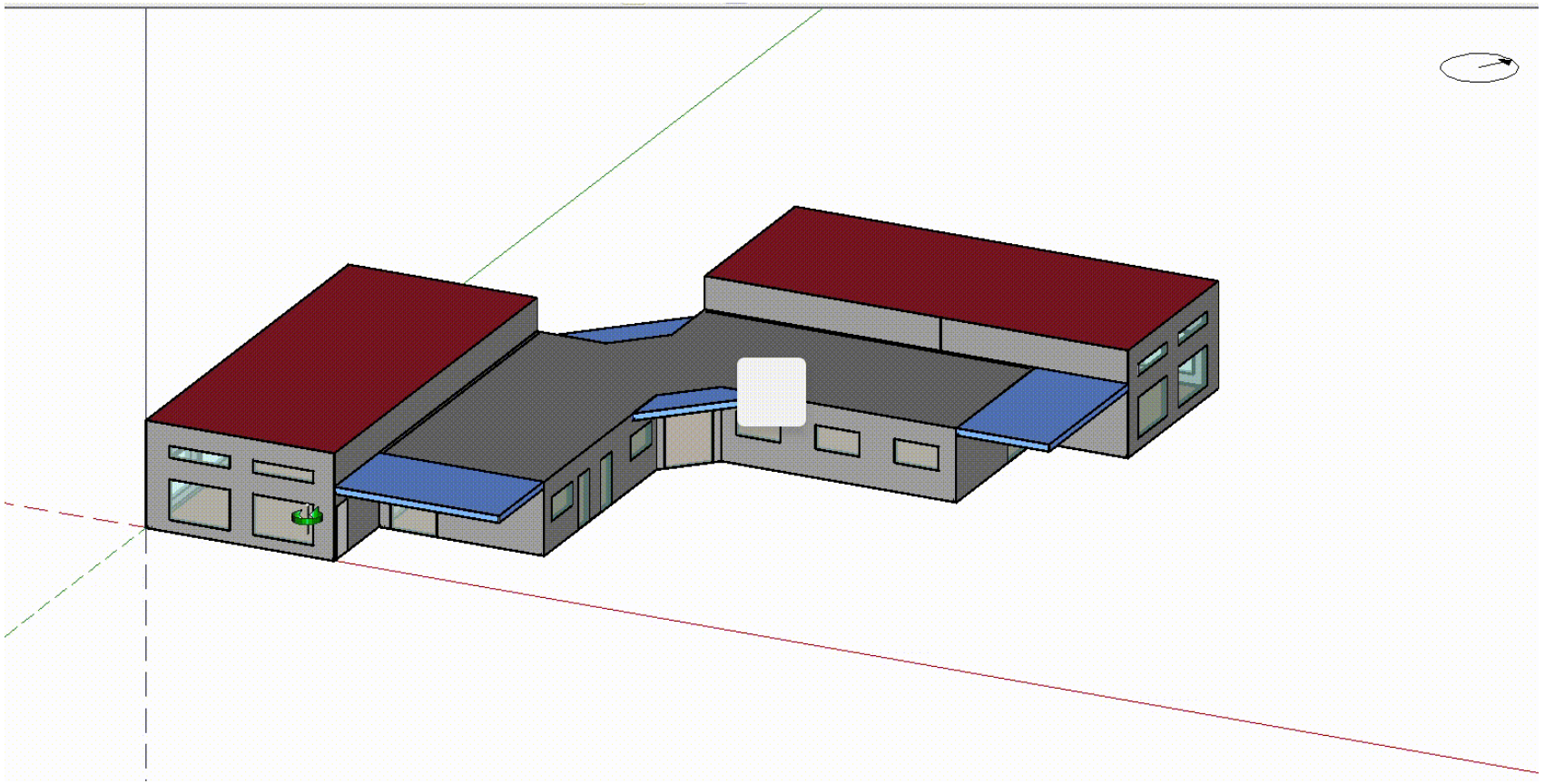
Agios Dometios , Nicosia
Gymnasium

BEFORE

AFTER

Cyprus Energy Agency

TIMEPAC Academy



Aglantzia Kindergarten, Nicosia

nZEB Scenario - Case Studies

When the Scope of the Energy Upgrade is not JUST economic viability but also:

- Compliance with Legislation
- Achievement of Thermal Comfort
- Environmental Aspects (emission reduction e.g. CO2, SOx, NOx)
- Indoor Air Quality
- Pilot for Optimising Contracting Procedures and increasing replicability
- Smart Readiness
- Others

A Nearly Zero Energy Building (nZEB) as determined by legislation in Cyprus, is a building that has a total energy consumption of 100kwh/m2/yr or lower, while this energy demand is covered by at least 25% by RES.

nZEB Scenario - Case Studies

PEDIA Project:

No economic sense BUT…

Σ.	Technical Criterion – Energy Upgrade Measure	Energy Savings ($kWh_{el/th}/a$)	Primary Energy Savings (KWh_{pr}/a)	CO2 Emissions Reduction ($kg \cdot CO_2/a$)	Differential Net Present Value [$NPV_{,diff}$] (€)	Capital Cost[2] (€)
1	Lighting Replacement	**3946**	**10,654**	**8,459**	**+9039,10**	**3,910**
2	Room Thermal Insulation	**7,040**	8,575	2,964	-9,129	14,600
3	Façade Thermal Insulation	**4,298**	5,345.4	1,937	-9,409	15,040
4	Openings Replacement	**7,470**	8,786.7	2,782	-41,262	43,475
nZEB		**20,879**	33.861	18,590	-51,407	77,025

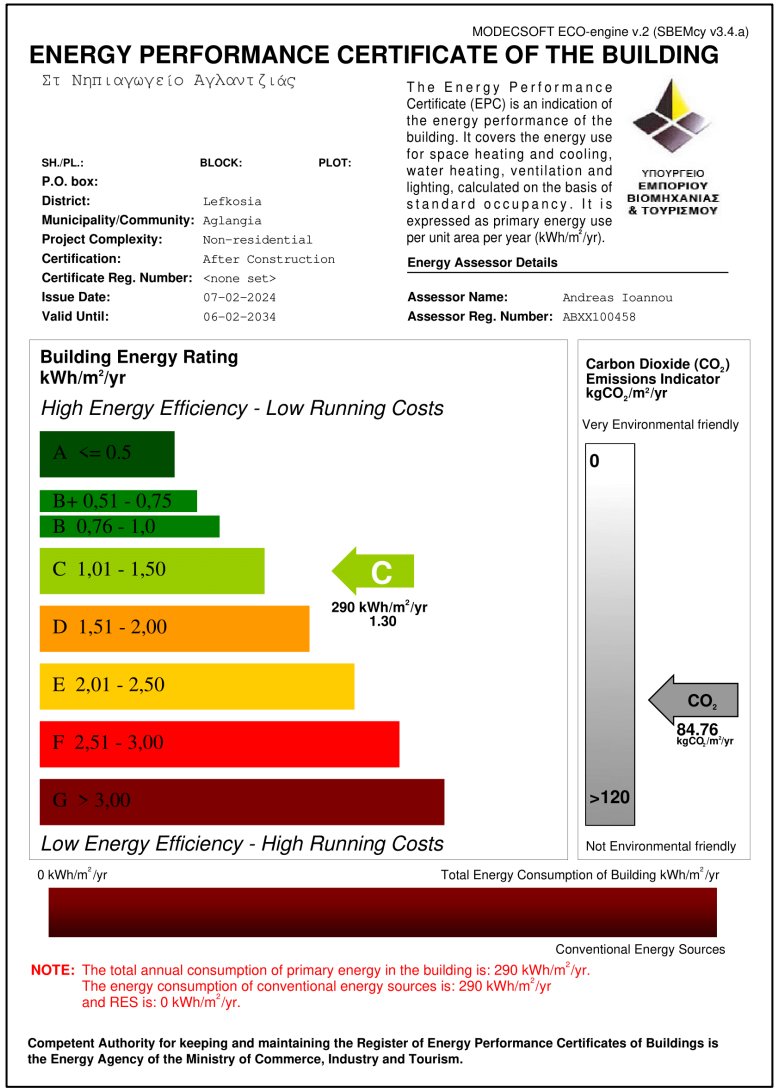
nZEB Scenario - Case Studies

PEDIA Project:

No economic sense BUT Quality Goals and Other Goals were the Scope and need…

Σ.	Goal	Qualitative Criterion	Benefit	Significance	Achievement Degree
1	Compliance with the National Legislation	Energy upgrade to class B+ or better for any public building undergoing large-scale renovation (ΚΔΠ 121/2020)	Compliance with legislation and the public school being a good example to promote	Highly important	Achieved
2	Thermal comfort satisfaction in the summer period	Satisfying comfort conditions on 90% of the hottest days when schools are in operation without the need to install and use air conditioners	Achievement of comfort conditions	Highly important	Achieved
3	Improving thermal comfort during the winter period	Improved comfort conditions with reduced energy requirements	Achievement of comfort conditions	Highly important	Achieved
4	Reducing carbon emissions and contributing to the achievement of the National Energy and Climate Action Plan	Emission Reduction	Improving air quality with all that entails and contributing to the relevant national objectives.	Very Important	Achieved
5	Improving employment opportunities in the construction sector	Creation of Jobs		Less Important	Achieved
6	Successful pilot application to set energy upgrade standards for existing school buildings	Possibility of replicability of energy upgrades in other schools	Immediacy and Readiness of large-scale energy upgrades with reduced pre-processing .	Very Important	Achieved
7	Reduction of primary energy consumption **based on the EPC**	By 163 kWh/m2/year which translated to 56%.	Reduced operating costs, increased thermal comfort and contribution to national targets.	Very Important	Achieved

nZEB Scenario - Case Studies



MODECSOFT ECO-engine v.2 (SBEMcy v3.4.a)

ENERGY PERFORMANCE CERTIFICATE OF THE BUILDING

Στ Νηπιαγωγείο Αγλαντζιάς

The Energy Performance Certificate (EPC) is an indication of the energy performance of the building. It covers the energy use for space heating and cooling, water heating, ventilation and lighting, calculated on the basis of standard occupancy. It is expressed as primary energy use per unit area per year (kWh/m²/yr).

ΥΠΟΥΡΓΕΙΟ ΕΜΠΟΡΙΟΥ ΒΙΟΜΗΧΑΝΙΑΣ & ΤΟΥΡΙΣΜΟΥ

SH./PL.:	BLOCK:	PLOT:
P.O. box:		
District:	Lefkosia	
Municipality/Community:	Aglangia	
Project Complexity:	Non-residential	
Certification:	After Construction	
Certificate Reg. Number:	<none set>	
Issue Date:	07-02-2024	
Valid Until:	06-02-2034	

Energy Assessor Details

Assessor Name:	Andreas Ioannou
Assessor Reg. Number:	ABXX100458

Building Energy Rating kWh/m²/yr

High Energy Efficiency - Low Running Costs

A <= 0.5
B+ 0,51 - 0,75
B 0,76 - 1,0
C 1,01 - 1,50
D 1,51 - 2,00
E 2,01 - 2,50
F 2,51 - 3,00
G > 3,00

C
290 kWh/m²/yr
1.30

Low Energy Efficiency - High Running Costs

Carbon Dioxide (CO_2) Emissions Indicator kgCO_2/m²/yr

Very Environmental friendly

0

>120

CO_2
84.76 kgCO_2/m²/yr

Not Environmental friendly

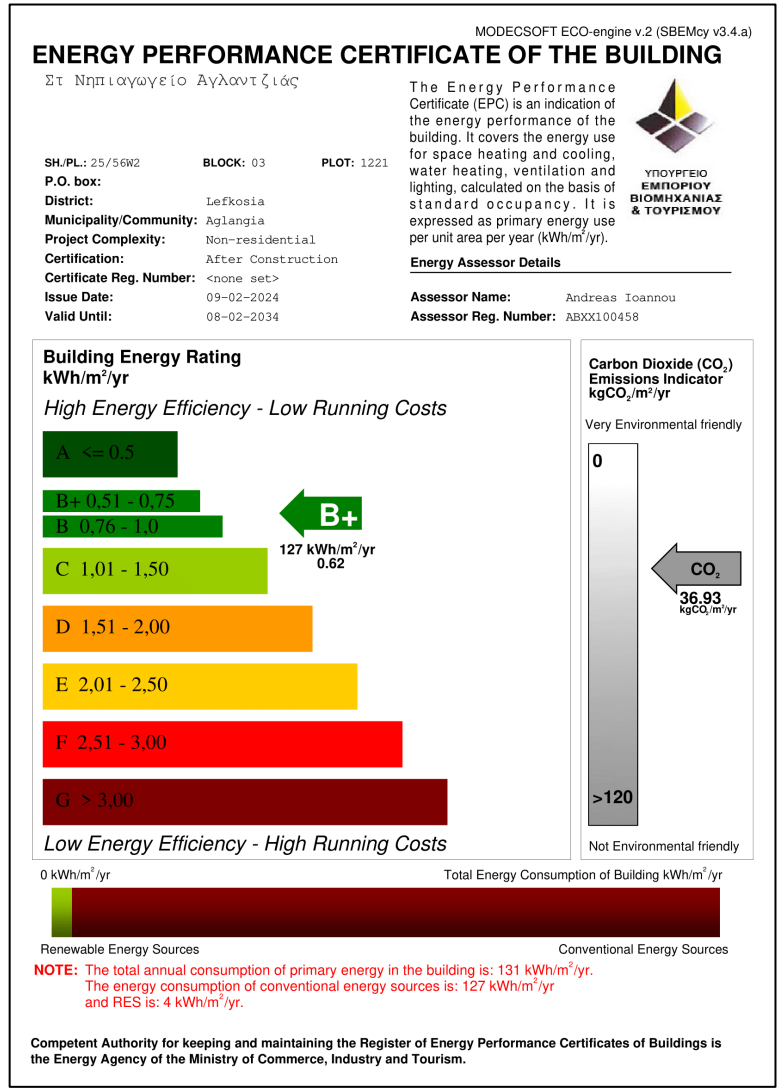
0 kWh/m²/yr — Total Energy Consumption of Building kWh/m²/yr

Conventional Energy Sources

NOTE: The total annual consumption of primary energy in the building is: 290 kWh/m²/yr.
The energy consumption of conventional energy sources is: 290 kWh/m²/yr
and RES is: 0 kWh/m²/yr.

Competent Authority for keeping and maintaining the Register of Energy Performance Certificates of Buildings is the Energy Agency of the Ministry of Commerce, Industry and Tourism.

before



MODECSOFT ECO-engine v.2 (SBEMcy v3.4.a)

ENERGY PERFORMANCE CERTIFICATE OF THE BUILDING

Στ Νηπιαγωγείο Αγλαντζιάς

The Energy Performance Certificate (EPC) is an indication of the energy performance of the building. It covers the energy use for space heating and cooling, water heating, ventilation and lighting, calculated on the basis of standard occupancy. It is expressed as primary energy use per unit area per year (kWh/m²/yr).

ΥΠΟΥΡΓΕΙΟ ΕΜΠΟΡΙΟΥ ΒΙΟΜΗΧΑΝΙΑΣ & ΤΟΥΡΙΣΜΟΥ

SH./PL.: 25/56W2	BLOCK: 03	PLOT: 1221
P.O. box:		
District:	Lefkosia	
Municipality/Community:	Aglangia	
Project Complexity:	Non-residential	
Certification:	After Construction	
Certificate Reg. Number:	<none set>	
Issue Date:	09-02-2024	
Valid Until:	08-02-2034	

Energy Assessor Details

Assessor Name:	Andreas Ioannou
Assessor Reg. Number:	ABXX100458

Building Energy Rating kWh/m²/yr

High Energy Efficiency - Low Running Costs

A <= 0.5
B+ 0,51 - 0,75
B 0,76 - 1,0
C 1,01 - 1,50
D 1,51 - 2,00
E 2,01 - 2,50
F 2,51 - 3,00
G > 3,00

B+
127 kWh/m²/yr
0.62

Low Energy Efficiency - High Running Costs

Carbon Dioxide (CO_2) Emissions Indicator kgCO_2/m²/yr

Very Environmental friendly

0

>120

CO_2
36.93 kgCO_2/m²/yr

Not Environmental friendly

0 kWh/m²/yr — Total Energy Consumption of Building kWh/m²/yr

Renewable Energy Sources — Conventional Energy Sources

NOTE: The total annual consumption of primary energy in the building is: 131 kWh/m²/yr.
The energy consumption of conventional energy sources is: 127 kWh/m²/yr
and RES is: 4 kWh/m²/yr.

Competent Authority for keeping and maintaining the Register of Energy Performance Certificates of Buildings is the Energy Agency of the Ministry of Commerce, Industry and Tourism.

after

The first 5 schools – before & after (Energy Upgrades 2023)

SCHOOL	YEAR OF BUILD	SIZE m□	Initial Energy Needs (KWh/m□ .year)	New Energy Needs (KWh/m□.year)	Energy savings	Savings in CO_2 emissions	Energy Class - BEFORE	New Energy class
Agios Dometios High School	1969	3248	154	58	62 %	62 %	C	A
6th Kindergarten of Aglantzia	2009	569	290	127	56 %	56 %	C	B+
Agios Antonios Kindergarten	1961	437	299	53	82 %	84 %	D	A
Agioi Trimithia Primary School	1956	1505	282	81	71 %	71 %	D	A
2nd Primary School of Idaliou	1969	2156	136	43	68 %	68 %	D	A

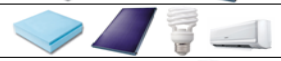
Results:

- Solve critical problems and address challenges with new intervention design patterns for energy upgrades.
- Development of the long-term strategy of the Ministry of Education by adopting holistic approaches that have been documented through technical assistance and experience from the pilot applications.
- Promotion of the Public School as a model example of good practice in Cyprus and Europe.

PEDIA

Results from the energy upgrades of 25 homes of vulnerable population groups in Cyprus

PP	ΕΠΕΜΒΑΣΕΙΣ	PV	ΚΟΣΤΟΣ	ΠΕΑ ΠΡΙΝ		ΠΕΑ ΜΕΤΑ		ΕΞΕ	ΑΠΕ
		kW	€	Class	kWh$_{pr}$/ m^2.year	Class	kWh$_{pr}$/ m^2.year	%	%
1		1.2	9300	G	746	C	241.12	68%	16
2			7635	G	713	D	438	39%	1
3		1.5	7494	G	1069	F	517	52%	8
4		3	11250	G	778	D	389	50%	25
5		1	6910	G	647	C	207	68%	19%
6		1	6230	G	914	E	491	46%	9%
7		3	8447	E	330	A	137	59%	32%
8		3	7500	D	334	B	79	76%	55%
9		1	7730	G	871	D	428	51%	19%

PP	ΕΠΕΜΒΑΣΕΙΣ	PV	ΚΟΣΤΟΣ	ΠΕΑ ΠΡΙΝ		ΠΕΑ ΜΕΤΑ		ΕΞΕ	ΑΠΕ
		kW	€	Class	kWh$_{pr}$/ m^2.year	Class	kWh$_{pr}$/ m^2.year	%	%
10		3	9955	G	611	B	99	84%	48%
11			8069	E	439	C	280	36%	2%
12			7950	G	841	C	284	66%	2%
13			10780	F	506	D	288	43%	2%
14			8603	G	747	E	373	50%	2%
15			9000	G	1175	D	395	66%	1%
16			8585	F	598	D	351	41%	2%
17			8136	G	626	D	306	51%	2%
18		3	7880	C	306	A	12	96%	92%
19			8575	F	555	D	405	27%	1%

PP	ΕΠΕΜΒΑΣΕΙΣ	PV	ΚΟΣΤΟΣ	ΠΕΑ ΠΡΙΝ		ΠΕΑ ΜΕΤΑ		ΕΞΕ	ΑΠΕ
		kW	€	Class	kWh$_{pr}$/ m^2.year	Class	kWh$_{pr}$/ m^2.year	%	%
20		1.4	7870	G	852	D	341	60%	14%
21			8476	G	771	E	499	35%	1%
22		3.6	9437	D	347	A	83	76%	61%
23		1.9	9325	G	950	C	247	74%	21%
24			7100	G	651	E	338	48%	1%
25			7000	G	649	F	590.64	9%	1%


PEDIA

TIMEPAC The new EPC for Europe

If you would like more information, please visit www.timepac.eu or contact us at

idrmac@eihp.hr

Thanks for your attention!

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