ENERGETSKO SERTIFIKOVANJE ZGRADA

ENERGY CERTIFICATION OF BUILDING

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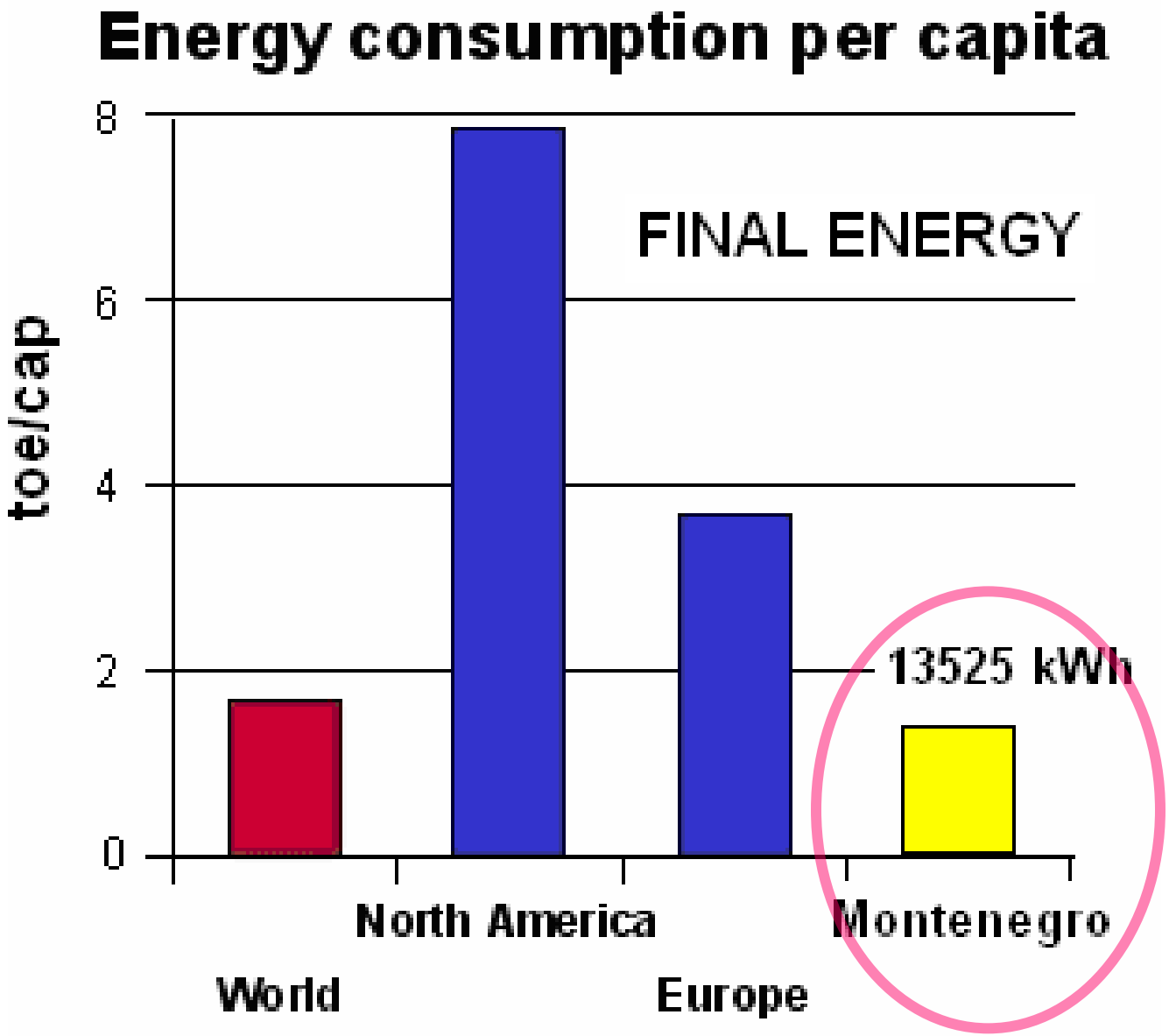
PRESENT SITUATION in MNE



1. ZAŠTO?

- EVROPSKA PRAKSA
- VALORIZACIJA “ENERGETSKOG KVALITETA” ZGRADE
- EKONOMSKI I EKOLOŠKI REZON

2. KAKO?

- IZRAČUNATA POTROŠNJA PRIMARNE ENERGIJE (grijanje, hladjenje, topla voda, rasvjeta)
- INDEX PERFORMANSI (***IP*** *[kWh/m^{2}g]*)
- ENERGETSKE KLASE (**A, B, C, D, E, F, G**)
- ENERGETSKI SERTIFIKAT

Energy Efficiency in Buildings

A. INPUT DATA FOR CALCULATIONS

1. CLIMATIC DATA (ZONES 1, 2, 3)

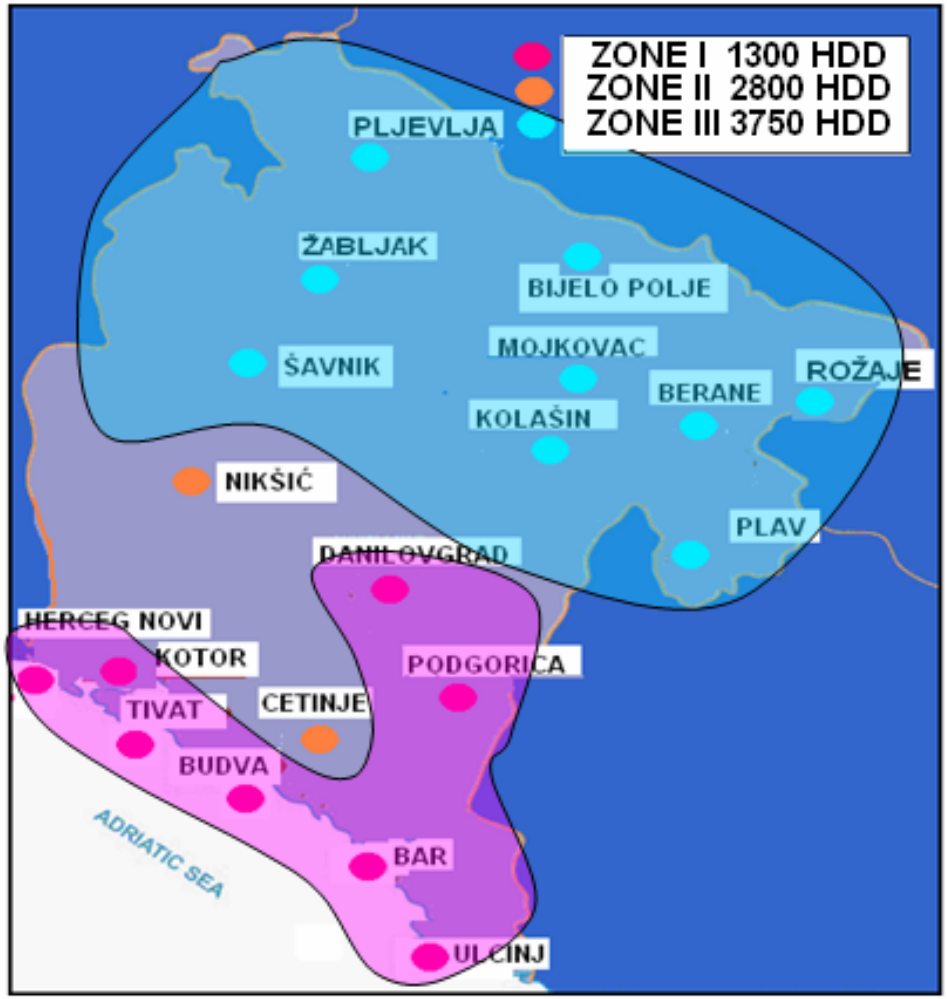
1. BUILDING DATA:
   * TYPE
   * GEOMETRY DATA (DIMENSIONES, AREA, VOLUME)
   * THERMAL PROPERTIES (U_value etc)
   * ORIENTATIONS
   * IZMJENE VAZDUHA (VENTILACIJA)

3. INSTALATION DATA
   * GENERATOR OF HEAT
   * EFFICIENCY
   * FUEL

B. ALGORITHM EN 13 790

C. SOFTWARE (Heating, Cooling)

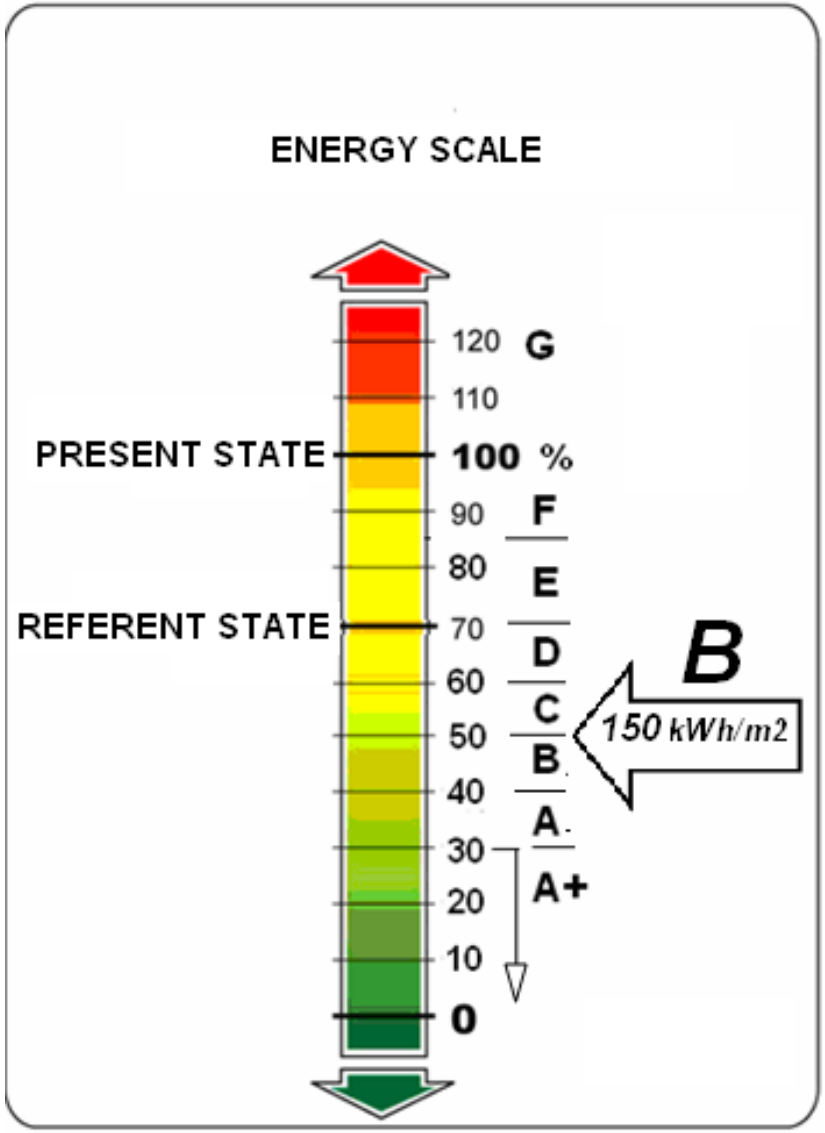
CLIMATIC ZONES in MN



CLIMATIC ZONES OF MONTENEGRO
Klimatske zone u Crnoj Gori odredjene prema broju Grejnih Stepen Dana (Heating Degree Days, HDD)

Energy Efficiency in Buildings

ENERGETSKI SERTIFIKAT



	PRESENT STATE IP_{PS} *(kWh/m²g)*
Residential	**400**
Apartements	**350**
Administration buildings	**300**
Education buildings	**370**
Hospitals	**850**
Hotels	**450**
Commercial buildings	**450**

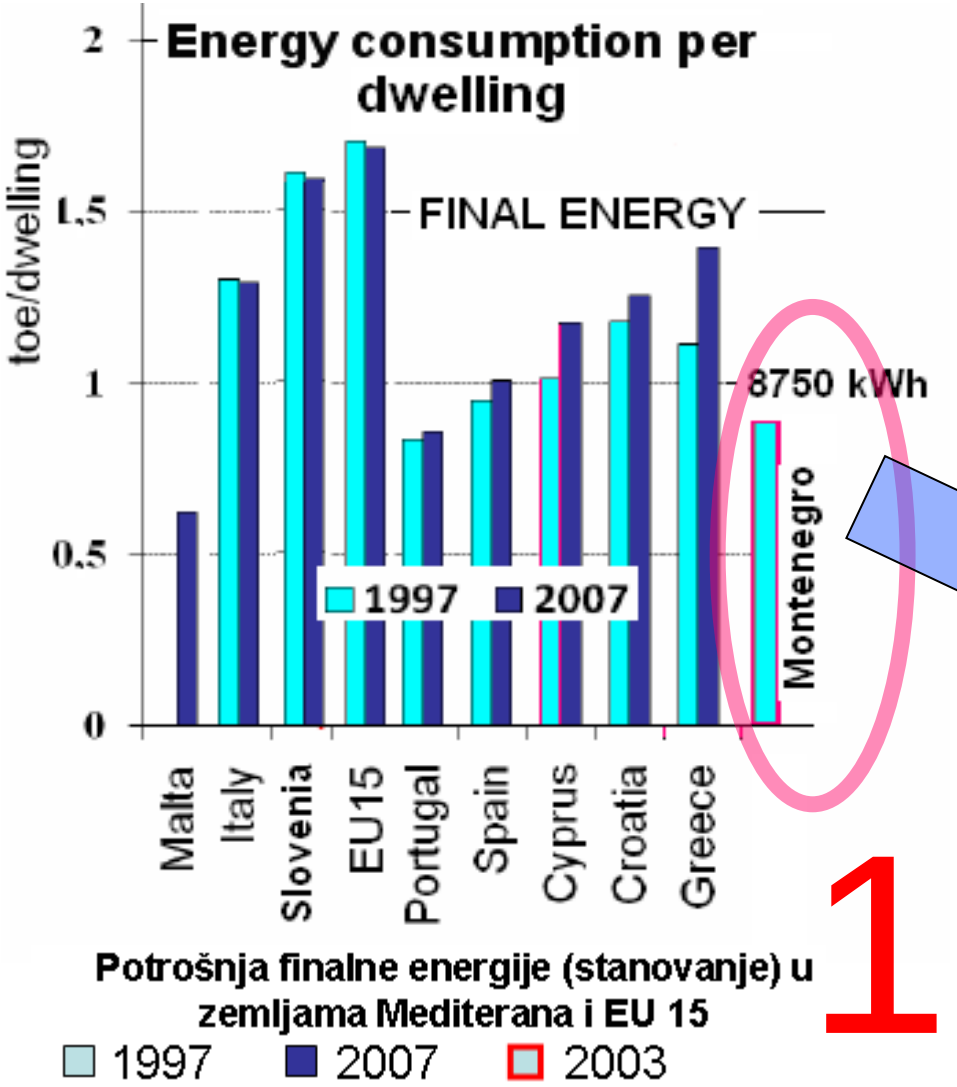
Energetska klasa	***IP*** Indikator energ. efikas. zgrade *kWh/(m² g)*
A⁺	*≤ 30% od* IP_{PS}
A	*31% - 40% od* IP_{PS}
B	*41% - 50% od* IP_{PS}
C	*51% - 60% od* IP_{PS}
D	*61% - 70% od* IP_{PS}
E	*71% - 85% od* IP_{PS}
F	*86% - 100% od* IP_{PS}
G	*>100% od* IP_{PS}

3. OČEKIVANI EFEKTI?

- UŠTEDA ENERGIJE
- REDUKCIJA EFEKTA “TOPLOTNOG OSTRVA”
- OTVOREN PUT KA PASIVNOJ KUĆI
- ITD

- ENERGY SAVINGS

PRESENT SITUATION in MNE



DWELLINGS

ZONE I 53 %

ZONE II 16 %

ZONE III 31 %

A_{dwell}=65 m^2

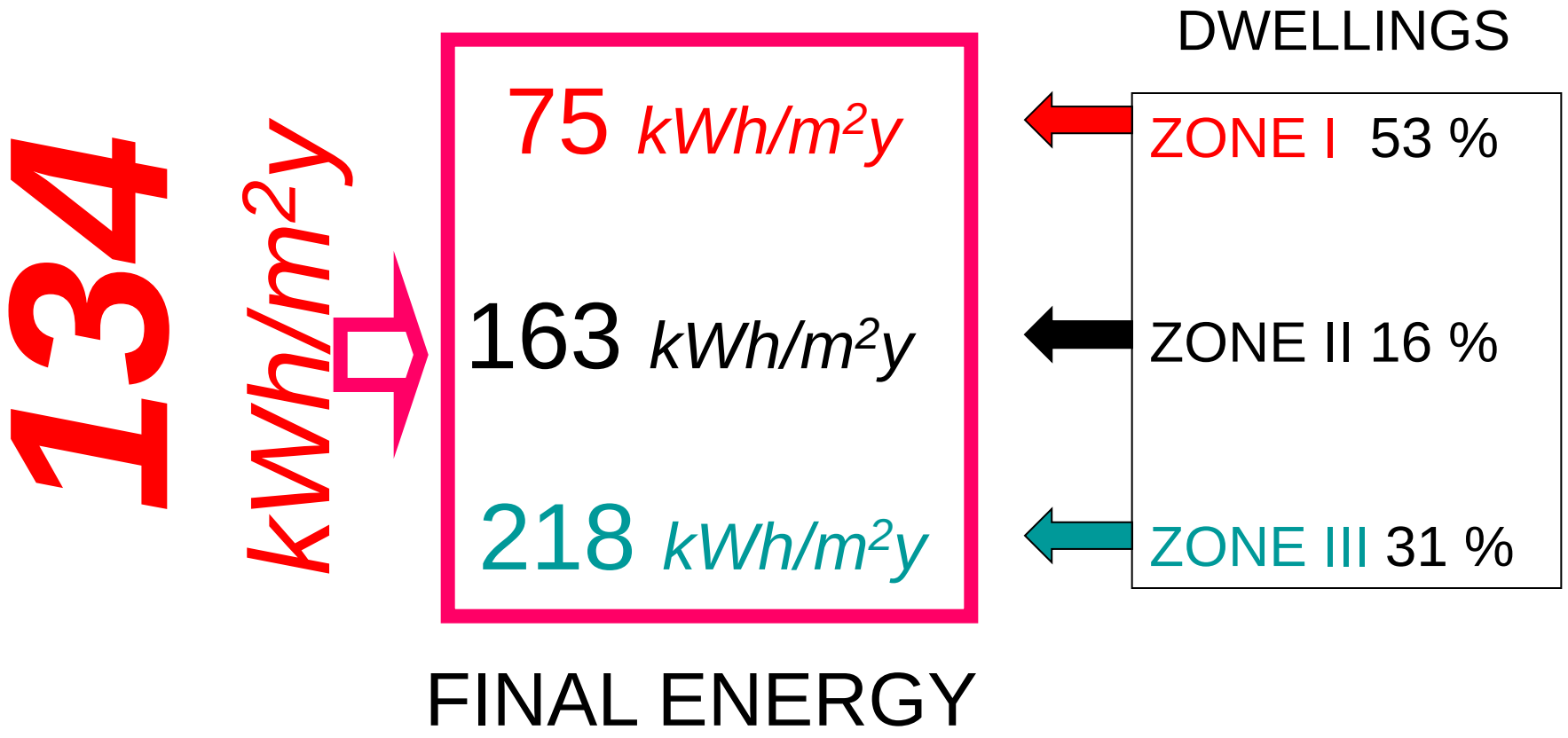
134 kWh/m^2y

Energy Efficiency in Buildings

- ENERGY SAVINGS

PRESENT SITUATION in MNE

Index of Performance – **IP** *[kWh/m²y]*



Energy Efficiency in Buildings

- ENERGY SAVINGS

PRESENT SITUATION in MNE

Index of Performance – **IP** *[kWh/m²y]*

PRIME ENERGY~ 180 *kWh/m²y*

FINAL ENERGY **134** *kWh/m²y*

DWELLINGS

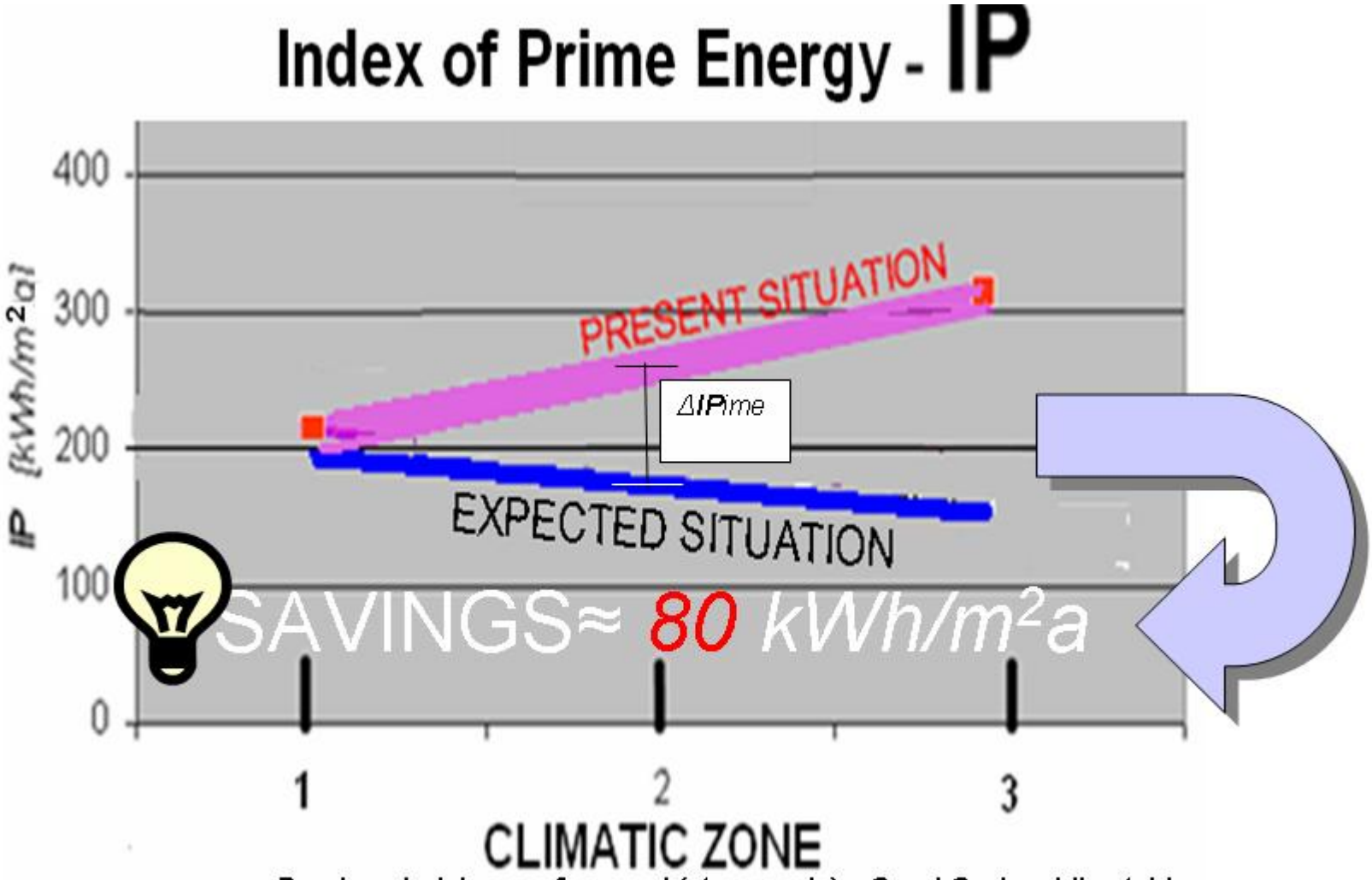
75 *kWh/m²y* ← ZONE I 53 %

163 *kWh/m²y* ← ZONE II 16 %

218 *kWh/m²y* ← ZONE III 31 %

PRIME ENERGY~ 300 *kWh/m²y*

- ENERGY SAVINGS



Procjena Indeksa performansi (stanovanje) u Crnoj Gori po klimatskim zonama

- ENERGY SAVINGS

KOLIKO KOŠTA 1 *kWh* PRIMARNE ENERGIJE?

EXTERNAL COST OF *1 kWh* el.

EXTERNAL COST ELECTRICITY PRODUCTION IN THE EU FOR EXISTING TECHNOLOGIES (IN € CENT PER KWH)

Country	Coal & lignite	Peat	Oil	Gas	Nuclear	Biomass	Hydro	PV	Wind
AT				1-3		2-3	0.1		
BE	4-15			1-2	0.5				
DE	3-6		5-8	1-2	0.2	3		0.6	0.05
DK	4-7			2-3		1			0.1
ES	5-8			1-2		3-5			0.2
FI	2-4	2-5				1			
FR	7-10		3-11	2-3	0.3	1			
GR	5-8		3-5	1		0-0.8	1		0.25
IE	6-8	3-4							
IT			3-6	2-3			0.3		
NL	3-4			1-2	0.7	0.5			
NO				1-2		0.2	0.2		0-0.25
PT	4-7			1-2		1-2	0.03		
SE	2-4					0.3	0-0.7		
UK	4-7		3-5	1-2	0.25	1			0.15

BASIC COST + EXTERNAL COST ~ *0.05* *Eu / kWh*

- ENERGY SAVINGS

SAVINGS OF PRIME ENERGY

80 kWh/m²a ≈ 4 Eu / m²a

INVESTMENT in Energy Efficiency

50-100 Eu / m²

Energy Efficiency in Buildings

- ENERGY SAVINGS

SAVINGS OF PRIME ENERGY

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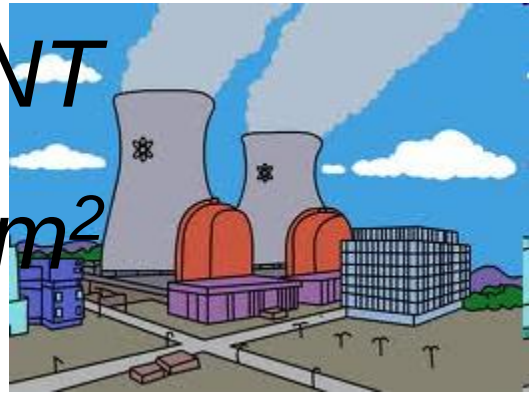
INVESTMENT in Energy Efficiency

50-100 Eu / m²

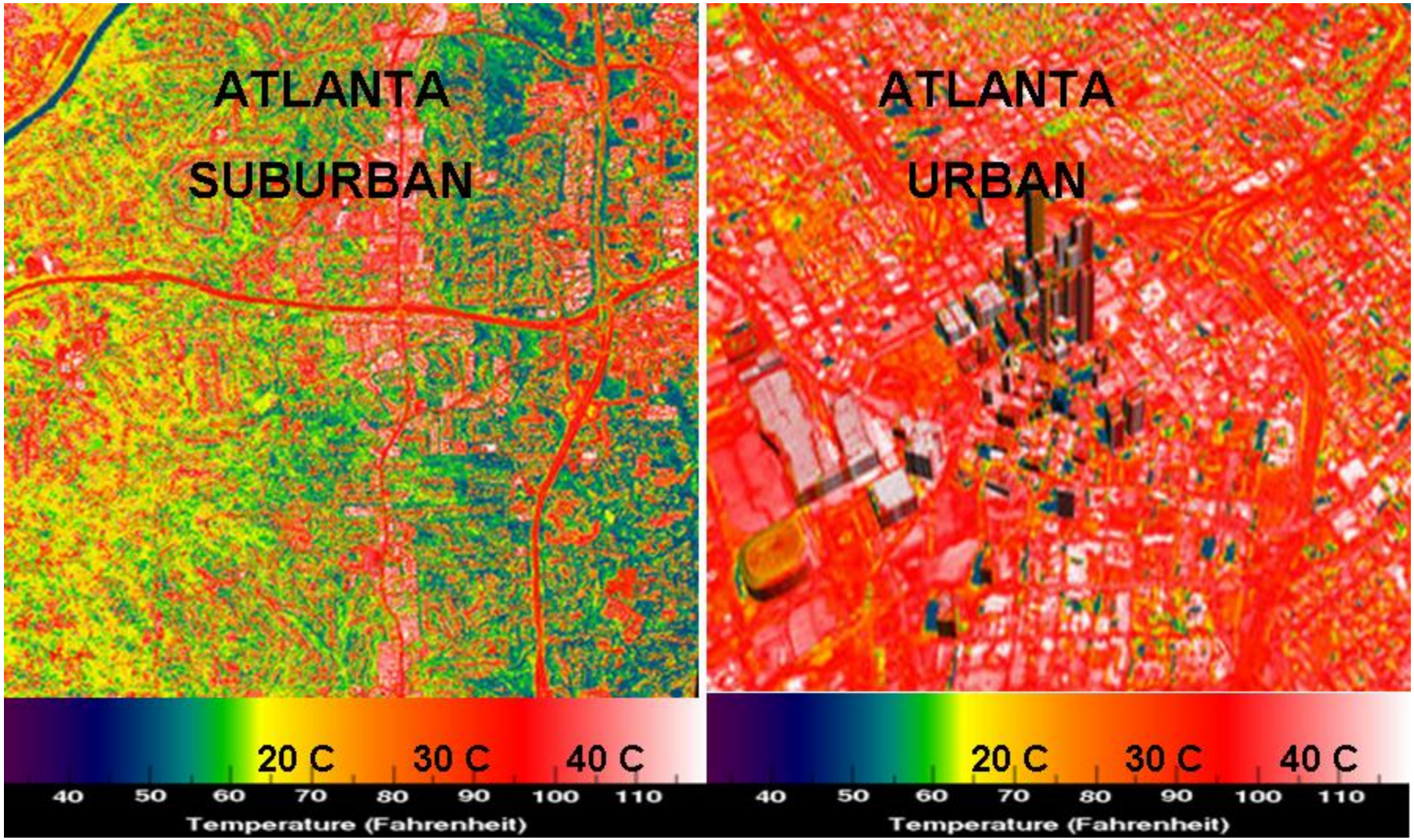
INVESTMENT IN POWER PLANT

1.6 Eu / kWh a ~ ***70-80*** *Eu /m²*

(50 kWh/m²a_el.energije)



- **REDUCTION of "URBAN HEAT ISLAND" Effect**



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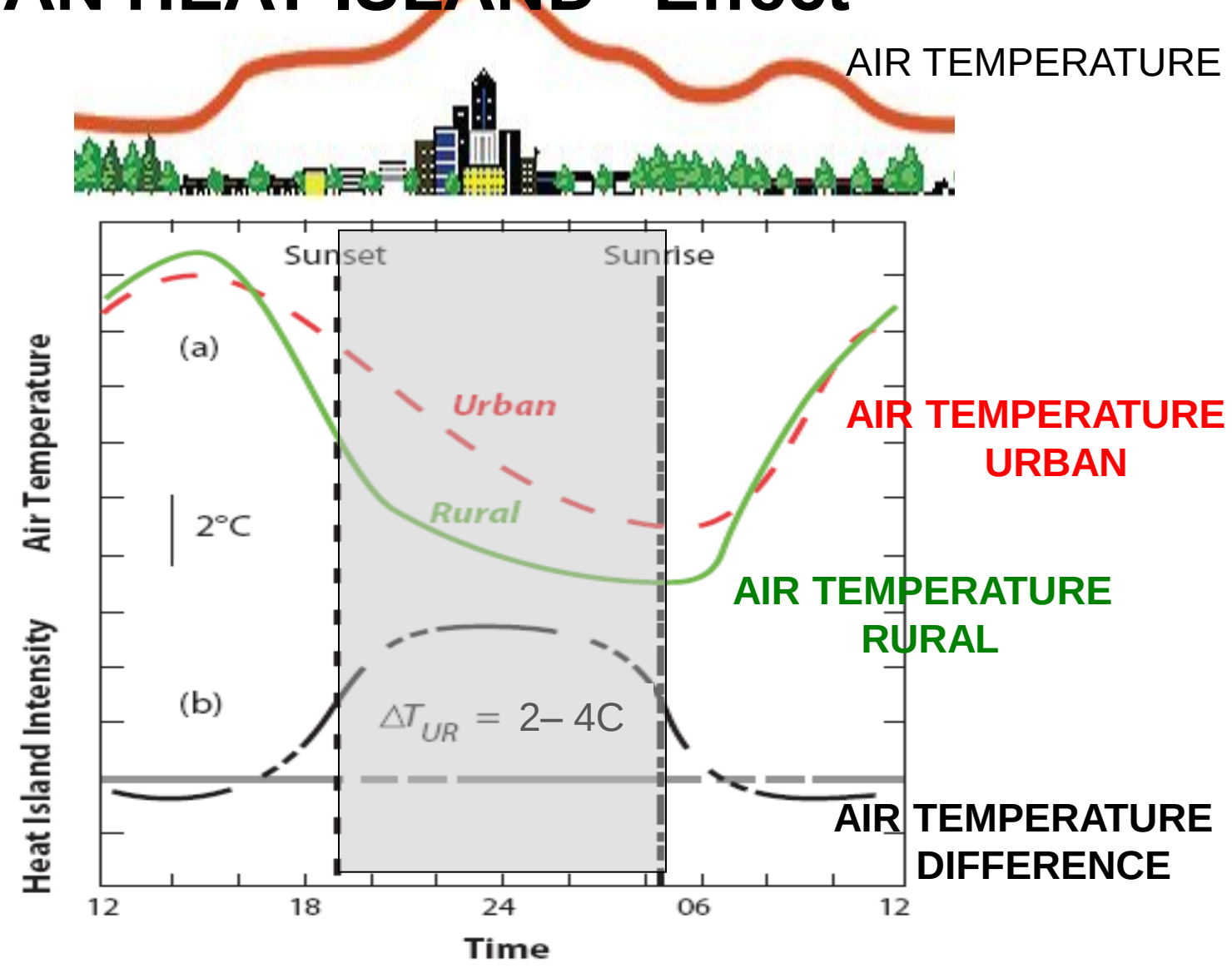
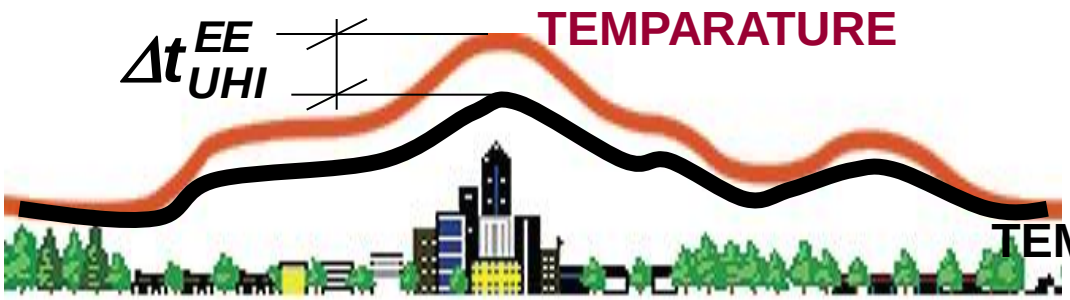
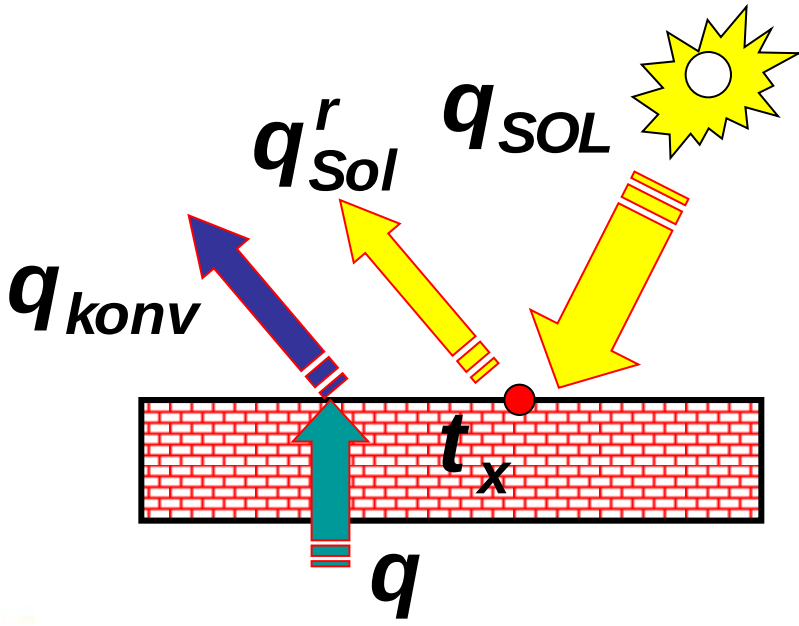


- **REDUCTION of "URBAN HEAT ISLAND" Effect**

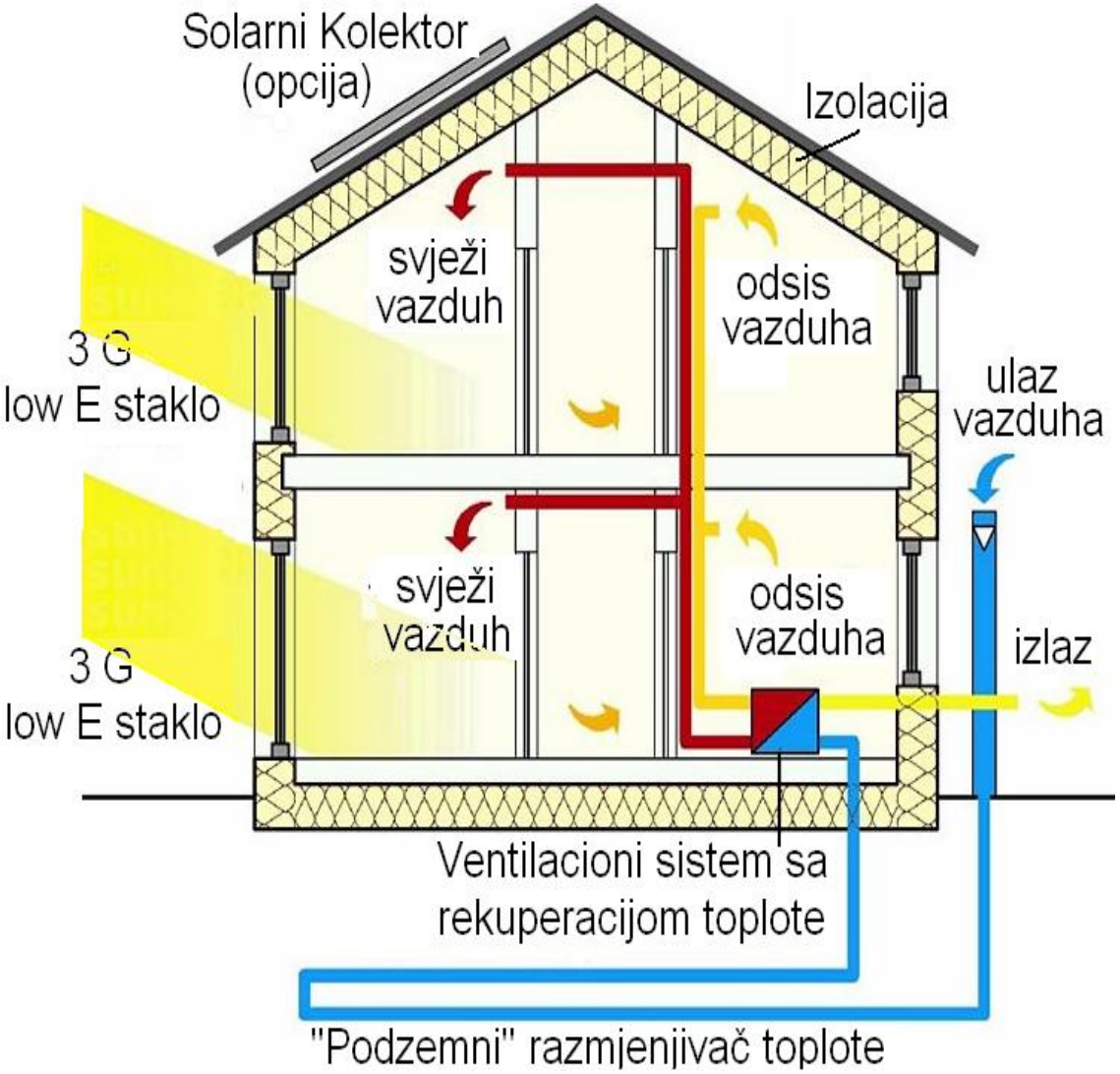
$$\Delta t_{UHI}^{EE} \approx \frac{A_{Build}}{A}\frac{q}{\alpha}\left(1-\frac{q^{EE}}{q}\right)+t_x\left(1-\frac{t_x^{EE}}{t_x}\right) > \frac{A_{Build}}{A}\frac{q}{\alpha}\left(1-\frac{q^{EE}}{q}\right)$$

$$\Delta t_{UHI}^{EE} > \frac{1}{2}\frac{100}{25}(1-0.7) \sim \boxed{0.6\ C}$$





• ROAD TO PASSIVE HOUSE



Ključni parametri:

Toplotno opterećenje

$q_D = 10\ W/m^2$

Broj izmjena vaduha

$n = 0.5\ h^{-1}$

Primarna energija

$IP = 120\ kWh/m^2g$

- **ROAD TO PASSIVE HOUSE**