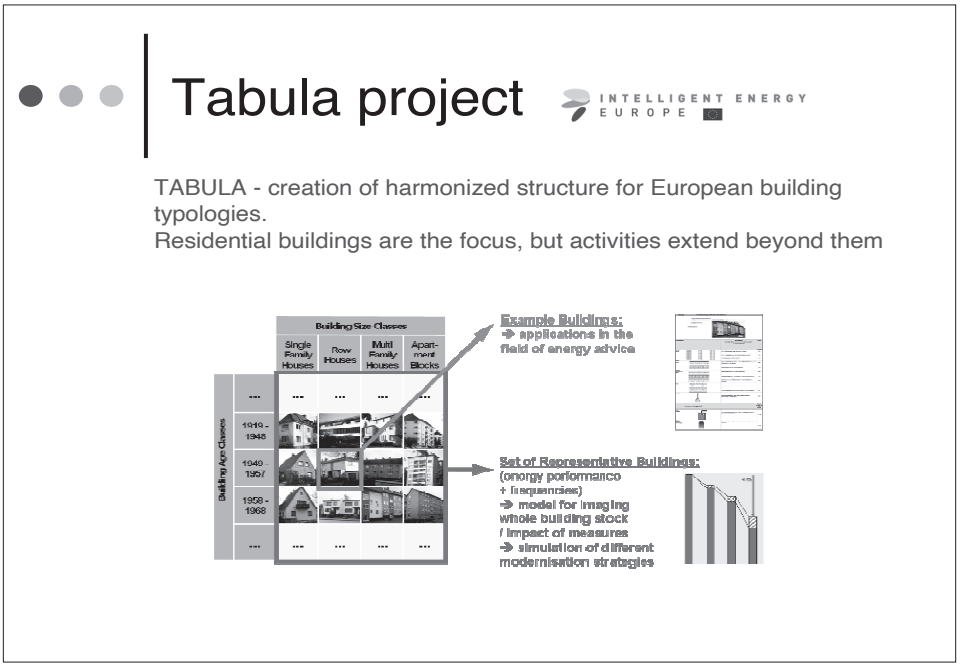
Milica JOVANOVIĆ POPOVIĆ[1], Dušan IGNJATOVIĆ[1], Nataša ĆUKOVIĆ[1]

TABULA BASED METHODOLOGY FOR ESTIMATION OF ENERGY SAVINGS POTENTIAL ON LOCAL LEVEL



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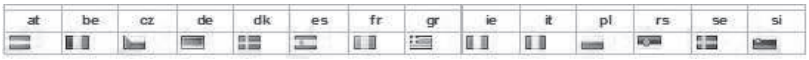
Tabula project

INTELLIGENT ENERGY EUROPE

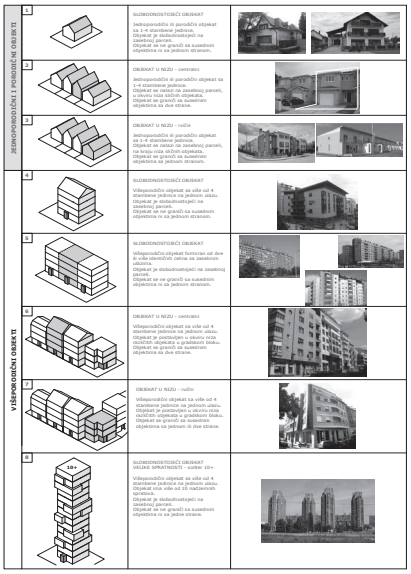
Participating countries:



Serbia:
joined as
associated partner
Feb. 2011.

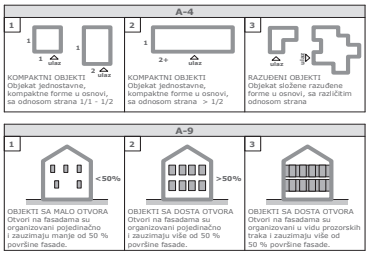
Principi formiranja
tipologije

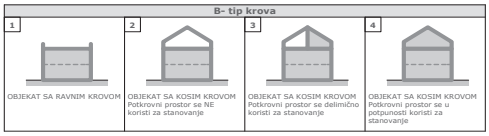
Explanitory chart

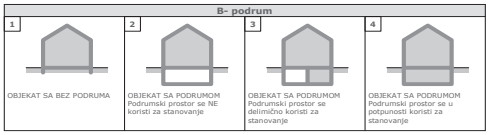


Principi formiranja tipologije

Explanitory chart

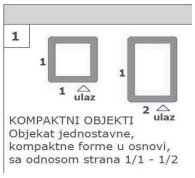






Nacionalna tipologija

Explanatory charts –shape of building

Compact building		
Jagged building		

Nacionalna tipologija

Cluster analysis – model building description

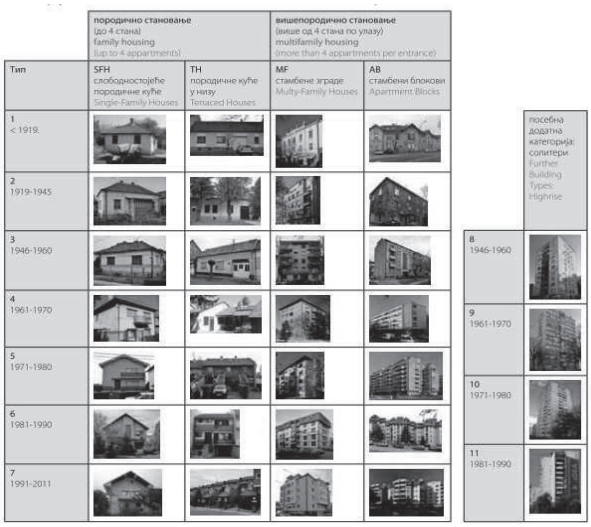
				
A before 1919.		Compact floor plan Number of floors 3 (Gf+1+A or Gf+2) Sloped roof Attic can be used for living Façade made of plaster		
B 1919-1945	Compact floor plan Number of floors 3 (Gf+2 or Gf+3) Sloped roof Attic not used for living Façade made of plaster	Compact floor plan Number of floors 4 (Gf+2+A) Sloped roof Attic is used for living Façade made of plaster	Compact floor plan Number of floors 4 (Gf+2+A or Gf+3) Sloped roof Attic can be used for living Façade made of plaster	

SERBIA residential building typology

(real buildings as representatives of model buildings)

SERBIA residential building typology Based on TABULA principle

(real buildings as representatives of model buildings)



Karta 165 opština

165 municipalities of Serbia

REPUBLIKA SRBIJA
Pregledna karta opština 01.01.2005.

Municipality
Aleksandrovac

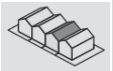
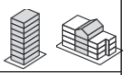
		Ukupno		Porodicno: Slobodnostojeci		Porodicno: U nizu		Slobodnostojeca/ U gradskom bloku		Lamela/ Soliter	
Opstina	Period	Zgrade	Povrsina m2	Zgrade	Povrsina m2	Zgrade	Povrsina m2	Zgrade	Povrsina m2	Zgrade	Povrsina
Aleksandrovac	Do 45.	1,427	117,624	1,412	108,724	5	400	10	8,500	0	0
	46-60	1,167	103,557	1,154	86,435	5	390	4	3,820	4	12,912
	61-70	1,710	253,950	1,578	107,147	6	423	104	92,568	22	53,812
	71-80	2,479	429,948	2,338	187,040	9	748	101	131,800	31	110,360
	81-90	2,053	406,581	1,910	181,450	7	691	94	111,040	42	113,400
	91-2011	1,080	217,051	995	94,525	4	395	64	69,431	17	52,700
Ukupno Opstina		9,916	1,528,711	9,387	765,321	36	3,047	377	417,159	116	343,184

Municipality
Kragujevac

		Ukupno		Porodicno: Slobodnostojeci		Porodicno: U nizu		Slobodnostojeca/ U gradskom bloku		Lamela/ Soliter	
Opstina	Period	Zgrade	Povrsina m2	Zgrade	Povrsina m2	Zgrade	Povrsina m2	Zgrade	Povrsina m2	Zgrade	Povrsina
Kragujevac	Do 45.	6,213	437,436	5,258	341,770	928	71,456	27	24,210	0	0
	46-60	5,400	458,112	4,811	327,148	534	43,040	32	28,768	23	59,156
	61-70	8,947	893,752	8,700	609,000	87	7,212	112	147,100	48	130,440
	71-80	13,605	1,808,966	13,006	1,001,462	198	19,404	274	371,000	127	417,100
	81-90	12,049	1,604,050	11,761	976,163	47	4,963	136	192,529	105	430,395
	91-2011	8,195	1,346,986	7,681	675,928	31	3,472	457	594,656	26	72,930
Ukupno opstina		54,409	6,549,302	51,217	3,931,471	1,825	149,547	1,038	1,358,263	329	1,110,021

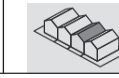
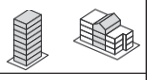
Municipality

Primer: opština iz Srbije

	Building period Period Gradnje	Num. of Buildings Broj zgrada				
			Family housing Porodično stanovanje		Multifamily housing Višeporodično stanovanje	
A,B	<1946.	1,266	1,135	127	4	0
C	1946.-1960	4,186	3,741	415	16	14
D	1961.-1970.	5,737	5,324	359	43	11
E	1971.-1980.	7,119	7,004	27	73	15
F	1981.-1990.	7,456	7,298	28	102	28
G	1991.-2011.	4,359	4,020	17	224	98
	ukupno	30,123	28,522	973	462	166

Municipality

Primer: opština iz Srbije

	Building period Period gradnje	površina area (m2)				
			Family housing Porodično stanovanje		Multifamily housing Višeporodično stanovanje	
A,B	<1946.	71,348	61,290	7,150	2,908	0
C	1946.-1960	328,487	257,007	29,714	10,994	30,772
D	1961.-1970.	443,138	350,852	18,848	47,438	26,000
E	1971.-1980.	686,244	539,308	2,268	98,168	46,500
F	1981.-1990.	798,176	569,244	2,382	178,950	47,600
G	1991.-2011.	799,959	321,600	1,484	318,175	158,700
	ukupno	3,127,352	2,099,301	61,846	656,633	309,572

Municipality

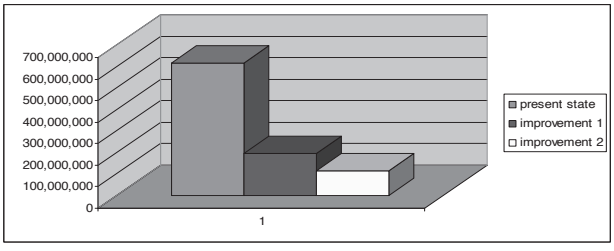
Primer: opština iz Srbije

			Present state		Improvement 1		Improvement 2	
			Specific energy demand for heating	Energy demand for heating	Specific energy demand for heating	Energy demand for heating	Specific energy demand for heating	Energy demand for heating
Type	period	Area (m^2)	KWh/m2 a	KWh a	KWh/m2 a	KWh a	KWh/m2 a	KWh a
A,B	<1946.	61,290	242	14,832,180	111	6,803,190	74	4,535,460
C	1946.-1960	257,007	251	64,508,757	111	28,527,777	90	23,130,630
D	1961.-1970.	350,852	252	88,414,704	87	30,524,124	70	24,559,640
E	1971.-1980.	539,308	327	176,353,716	82	44,223,256	62	33,437,096
F	1981.-1990.	569,244	339	192,973,716	107	60,909,108	74	42,124,056
G	1991.-2011.	321,600	240	77,184,000	79	25,406,400	66	21,225,600
	UKUPNO	**2,099,301**		**614,267,073**		**196,393,855**		**115,575,386**

Possible savings of energy through the renovation process

Municipality

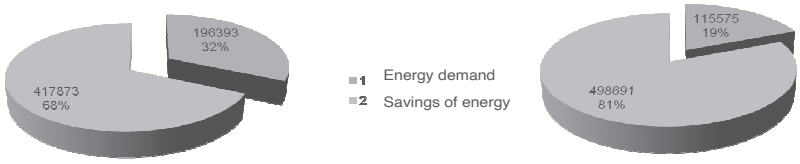
Primer: opština iz Srbije



Possible savings of energy through the renovation process (KWh a)

Municipality

Primer: opština iz Srbije



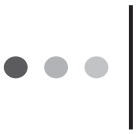
Energy demand (MWh/a)
after
Improvement 1 (32%)

Energy demand (MWh/a)
after
Improvement 2 (19%)

Primer: opština iz Srbije

Type A1 1266 houses		U (W/mK)		
	area (m2)	present state	improvement 1	m2
façade wall	88.8	0,96	0,36 (10 cm Ti)	112421
windows	11.2	4,6	1,50	14179
doors	6.6	3,00	1,50	8356
floor c. to attic	73.9	0,77	0,20 (10cmTi)	93557
ground floor	73.9	0,68	0,33 (5cm Ti)	93557

Potrebne količine termoizolacije za proces energetske obnove



For each building type and municipality

Calculation of :

1.potential energy savings

2. Potential CO_2 reduction

2.Need for window production (m_2)

3. Need for thermal insulation production(m_2)