



2019



EE

ESCo

EVN

1

2006

LED

IPCC

M&E

MEPSO

()

N/A

NPEEPB

()

SWOT

TRACE

USAID

¹ (EVN)

().
<https://www.evn.at/EVN-Group/Uberblick/Unternehmensprofil.aspx>

1	.....	ERROR! BOOKMARK NOT DEFINED.
1.1	.....	2
1.2	.....	3
1.2.1	.....	3
1.2.2	.....	3
1.2.3	.....	6
1.3	.....	7
2	.....	8
2.1	.....	8
2.2	.....	2
2.3	.....	3
2.4	.....	4
3	.....	7
3.1	.....	7
3.1.1	.....	7
3.1.2	.....	22
3.2	.....	23
3.3	.....	31
3.4	.....	7
4	.....	41
5	.....	42
6	.....	.....
6.1	.....	49
6.2	/	49
6.2.1	.....	.....
6.2.2	.....	59
7	.....	66
8	.....	67
8.1	.....	68
8.1.1	.....	68
8.2	()	0
8.2.1	.....	0
8.2.2	.....	1

8.3	()	72
8.4		73
9	..... ERROR! BOOKMARK NOT DEFINED.	
10		78
10.1		78
10.2		79
10.3		80
APPENDIX I		81
APPENDIX II		82

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

Field Code Changed

1:	.....	3	Field Code Changed
2:	.....	11	Field Code Changed
3:	()	112	Field Code Changed
4:	.....	123	Field Code Changed
5:	2018	14	Field Code Changed
6:	2016 – 2018	135	Field Code Changed
7:	.....	145	Field Code Changed
8:	.....	146	Field Code Changed
9:	.....	146	Field Code Changed
10:	.....	8	Field Code Changed
61:	.....	21	Field Code Changed
12:	.....	.....	Field Code Changed
	, 2019	205	Field Code Changed
13:	.....	216	Field Code Changed
14:	.....	6	Field Code Changed
15:	.....	.....	Field Code Changed
	2018	31	Field Code Changed
16:	.....	32	Field Code Changed
17:	.....	33	Field Code Changed
18:	.....	308	Field Code Changed
7:	.....	40	Field Code Changed
20:	CO ₂	41	
21:	()	45	
22: T	.....	53	
23:	.....	58	
24: T	-	59	
25:	-	63	
26:	.....	66	
27:	.....	69	
28:	.....	71	
29:	.....	74	
30:	.....	76	
Table 29: Information on Program Implementation.....			
Table 30: National Indicative Targets for Energy Savings in ktoe.....			

1:	.....	8	Field Code Changed
2:	.....	10	Field Code Changed
3:	.....	2016	Field Code Changed
4:	.....	159	Field Code Changed
5:	..... kWh/m ³ , 2016 - 2018	169	Field Code Changed
6:	.....	20	Field Code Changed
7:	.....	26	Field Code Changed
8:	.....	26	Field Code Changed
7:	.....	217	Field Code Changed
8:	..... (kWh) (km) , 2016-2018	27	
91:	..... (2016)	229	Field Code Changed
12:	..... (2016)	30	Field Code Changed
13:	..... , TRACE	46	Field Code Changed
14:	..... , TRACE	46	Field Code Changed
10:	..... TRACE	47	
16:	..... TRACE	47	
17:	..... TRACE	48	Field Code Changed
18:	.....	49	
19:	.....	49	
20:	.....	50	
21:	.....	50	
22:	51	
23:	52	
24:	52	
25:	53	
26:	56	
27: -	57	
28:	57	
29:	58	
30:	60	
31:	62	
32:	63	

1

o , o ,

,

() ()

>

>

>

2

2030

2020

2018

,

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>

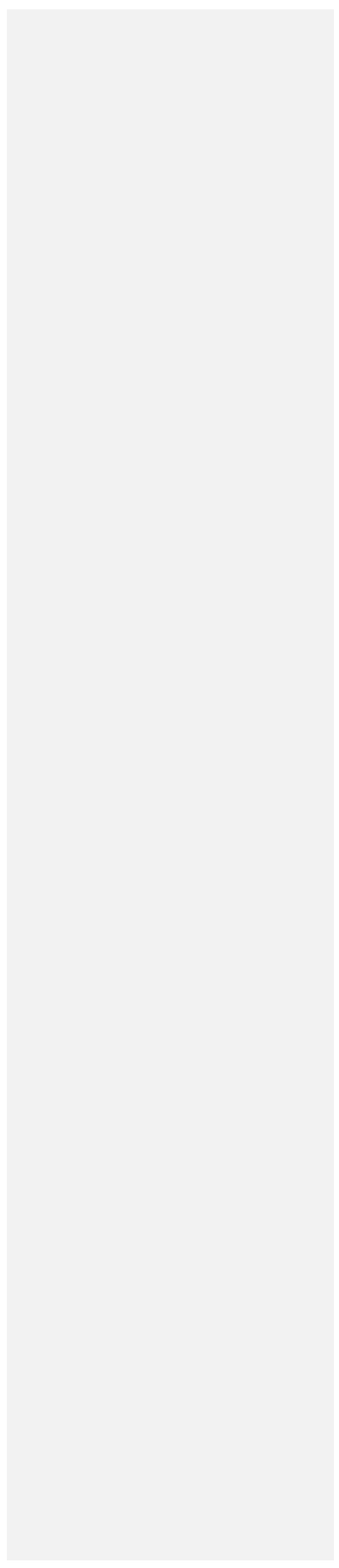
>

>

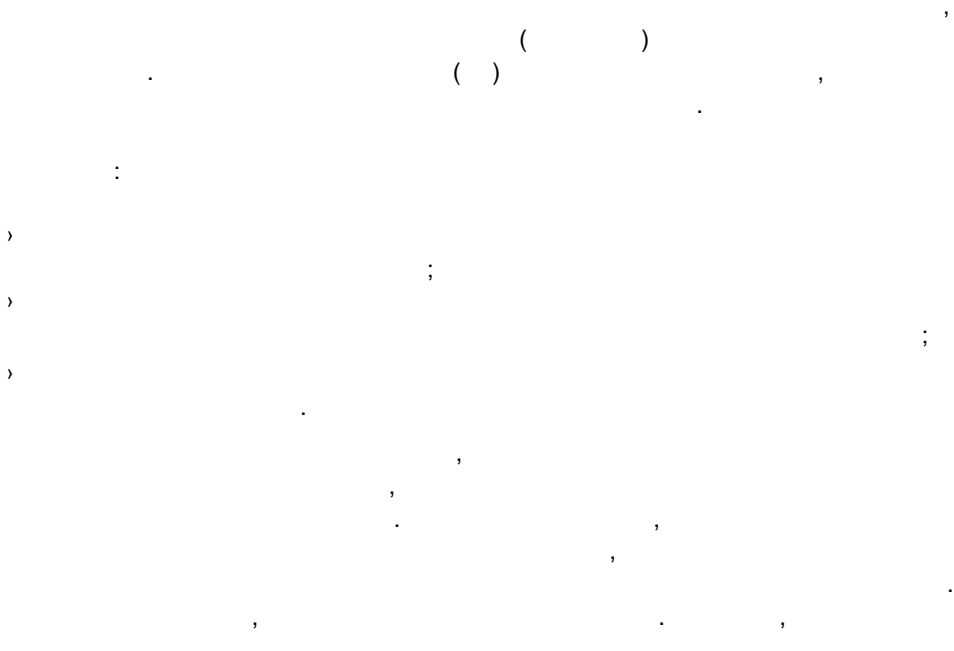
,

.

2 .16 2 2011 .



1.1



11:

1.2

()

1.2.1

8:

(2011 – 2015)		2010	
(2019-2024)		/	SWOT

1.2.2

3

(LSGs).

,

2020 (

.143/10).

2018

9%

2002-2006 2020

14,5%,

20%

(1)

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(ESCO)

); (2)

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); (3)

(

); (4) (,)

).

2018 (05.04.2011).

2006/32/EC , USAID.

9% 2018 ,

2020.

406 ,

1,360 ,

().

(,)

).

2030

(.61/10).

.

2020 (.

125/10).

2030

(.16/11).

,

() ,

5 , 2015 .

(,

), ,

› (.94/13).

2010/31 /
19.05.2010 (CELEX 32010L0031).

› (.94/13).

› (.130/09).

› (.05/02).

› (.07/08, 139/08, 64/09 52/10).

(),

› (.61/04).

› (.53/05).

()

()

1.2.3

1998

- > 2002/91 / C, 2010/31 / U
- > 93/76 / C 2006/32 / C.
- > 2008/1 / C
- > 2012/27 / U , 2004/8 / EC
- 2009/125 / C 2010/30 / U
- 2006/32 / C
- > 92/42 / C, 2004/8 / C.

1.3

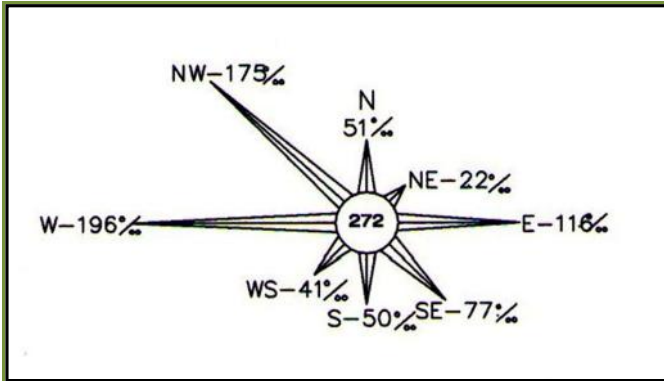
Econoler

12:

13,5° 13,0° (7,5°).
24° , 42° ,
1,2° . -21° .
(127, 168) 2,258.5 / 71.
2.326
6,4
562 mm,
1.292
13,1
72%.
60%, (-),
80-85%.
11,3 10,3
:
() ,
196 ‰; 3,4 m/s
22,5 m/s.
175 ‰, 4,8 m/s
30,5 m/s.
() .
116 ‰; 2,6 m/s 22,5
m/s. 77 ‰ 2,7 m/s
51 ‰
50 ‰ 4,6 m/s.
41 ‰ 2,9 m/s.
22 ‰
2,5 m/s.
272 ‰.

13:

2



9:

-	www.opstinavasilevo.gov.mk
E-mail	opstina_vasilevo@yahoo.co.uk
	/
	2411
	+389 (0)34
[km ²]	
	219 км2
	777 ха
	2174
	12122
	599
	3,306
()	
	.%
	1, 800 m ²
[ha]	1,802
[ha]	7,516
(m)	208
(° , ")	(%)
(° , ")	(%)
	1
(°C) ⁴	-15
(°C)	5.9
()	169
(HDD)	2,388

2.2

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4

: (3).

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- >
- >
- >

;

;

10: ()

				Notes
	5	(/)		
	*			
	N/A			
	N/A			
	N/A			
	** / ***			
	/			
	/			

* ()
 ** ()
 *** ()

().

⁵
 (Error! Reference source not found..)

2.3

11:

() 10 MW	
(,)	

12:

2008⁶

		(m ³)	(m ³)	%	2008				
					(m ³)	(m ³)	(m ³)	(m ³)	%(m ³)
	/	/	/	/	/	/	/	/	/
7	/	/	/	/	/	/	/	/	/

(,)

2019

(, , ,),

7 8

9

7:

		()	
1			
2	()		
3			

8:

		()	
1		0.3	
2			

9:

		()
1	1950/53	
2	(LED)	
3		

3

8% 9%

2019

(

3.1

3.1.1

2005

5.056

12 l/s.

5 l/s.

2,357

10:

	()	[l/s]	
	15	12	-/-
	14	5	-/-

2005

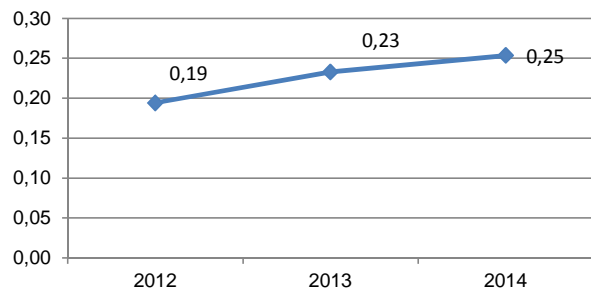
14:

2016 - 2018⁸

2017
2018

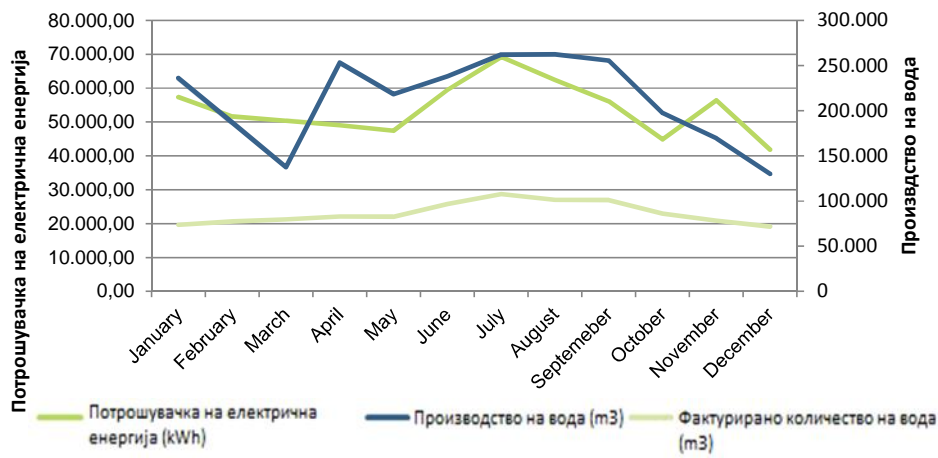
2017
2018

2017



15: kWh/m³, 2016 - 2018

6



16: 2018

6,

100% , 40% , () , ()

11:

		2018 (m ³)	(kWh/a)	[kWh/(m ³ a)]	(%)
	7,416	195,000	22,085	0.25	40%

> :
 > ,
 > ,
 > : ()
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 >
 > ;
 > ;
 > ;

› ;
› ;
› ;

3.1.2

() . , // // , 100%
,

3.2

, ,
, ,
105

, - , ()
,) ;
, ;
, - () ,

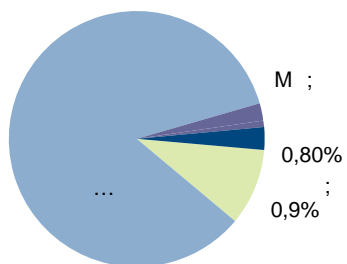
100%

12:

2018

		(W)			(kW)
(HPM)	1 /	250	31	31	7,750
(MH)	1 /	400	42	42	16,800
	1 /	30	320	320	9,600
	1 /	50	700	700	35,000
				1,093	69150
					1093
					/

95%



7:

8:

13:

	(km)	(km)	(%)
	/	/	/
()	5,135	5,135	

17:

(kWh)

(km)

9,

2016 ===== 563,333

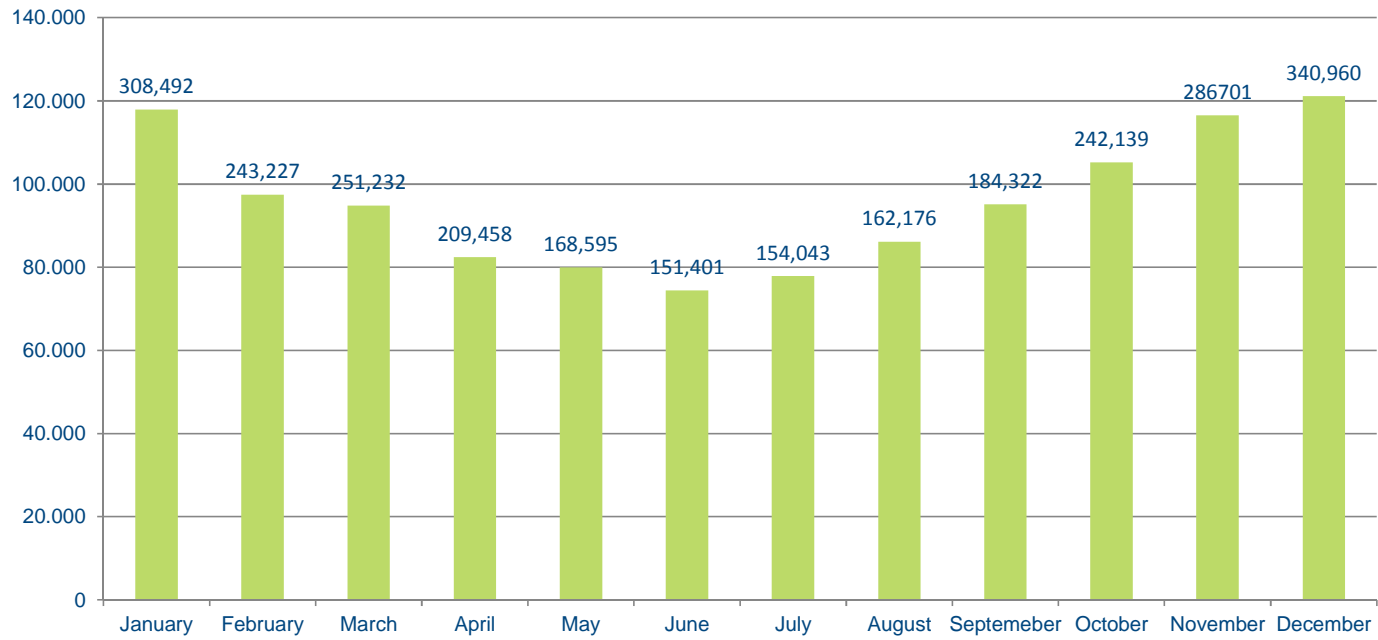
2017=====582,686

2018=====963,376

18:

, 2016-2018

, 2018



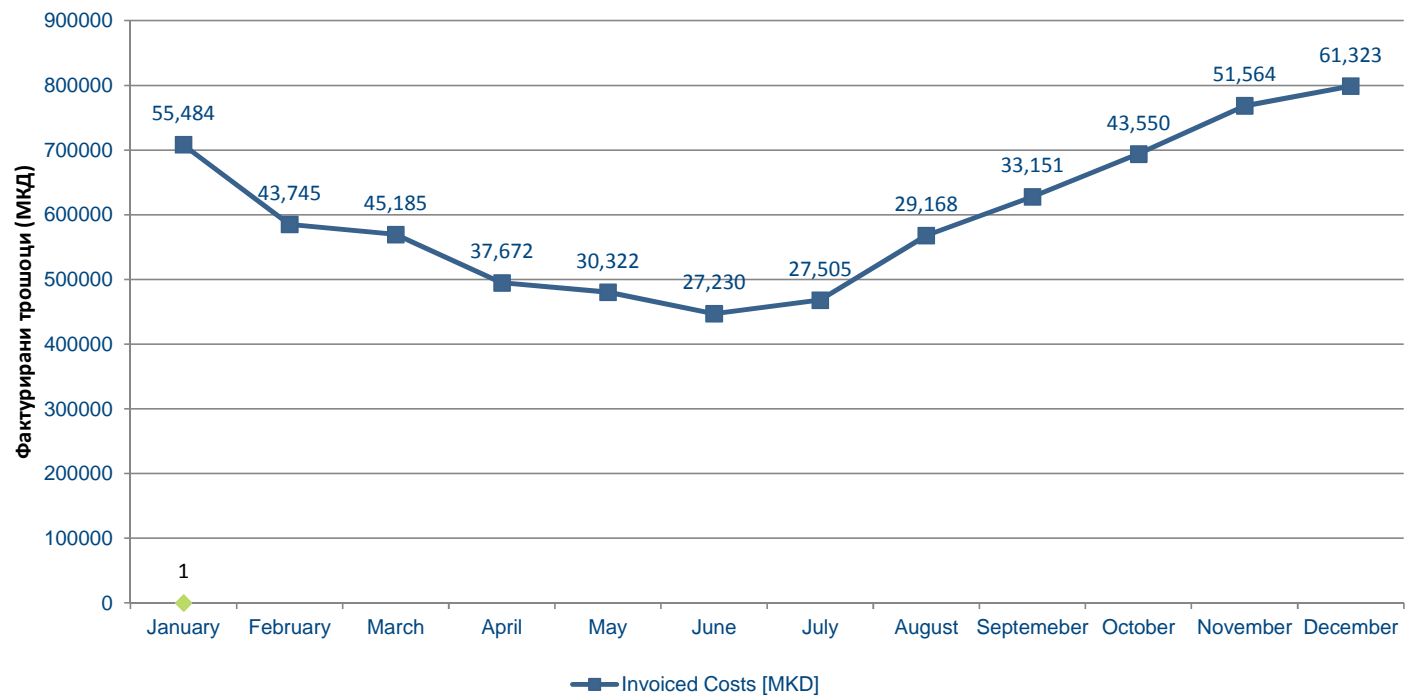
: 2,702,746

191:

(2018)

(

kWh)



12: (2018)

15:

2018

	(pcs)		(km)		(km)	(kWh/a)	[kWh/(per pole.a)]	km	%
								[kWh/(km.a)]	(%)
	1 /	1,027	()	/	5,135	486,105	473	9,46	/
	2018								
		1,027		/	5,135	486,105	473	9,46	

3.3

2

16:

			(m ²)
		15	10,047
		1	160
		1	16
		1	150
		18	10,373

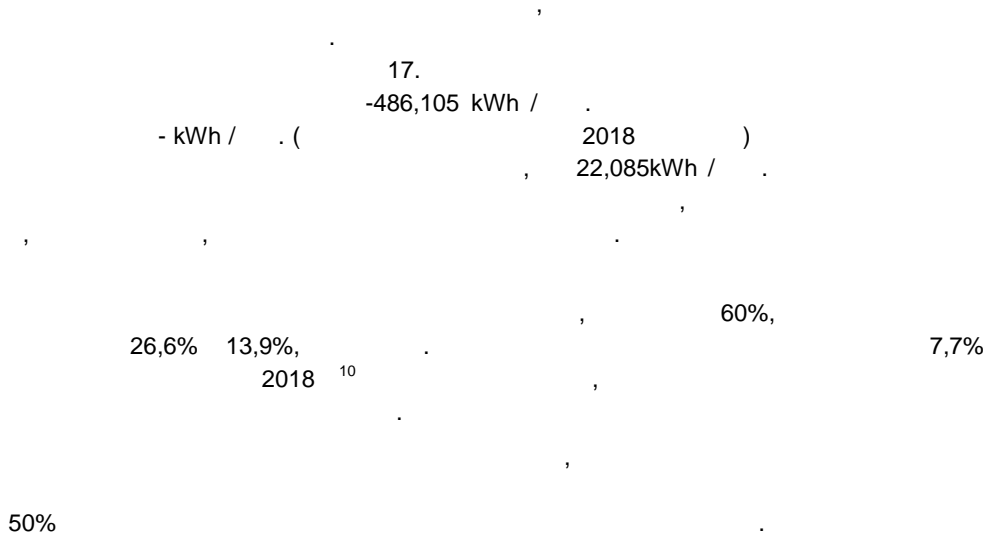
17:

Краен корисник	Број на станари	Вкупна површина на зградата m ²	Вкупна грејна површина kWh/a	Потрошувачка на електрична енергија kWh/a	Потрошувачка на топлинска енергија kWh/a	Вкупна потрошувачка на енергија kWh/a	Специфична потрошувачка на електрична енергија kWh/(m ² .a)	Специфична потрошувачка на топлинска енергија kWh/(m ² .a)	Специфична потрошувачка на енергија kWh/(m ² .a)	Трошоци на енергија МКД/а	Трошоци на енергија како % %
.											
" "		1,274									
" "		288									
" "		288									
" "		175									
" "		280									
" "		335									
" "		490									
" "		338									

Краен корисник	Број на станари	Вкупна површина на зградата m ²	Вкупна грејна површина kWh/a	Потрошувачка на електрична енергија kWh/a	Потрошувачка на топлинска енергија kWh/a	Вкупна потрошувачка на енергија kWh/a	Специфична потрошувачка на електрична енергија kWh/(m ² .a)	Специфична потрошувачка на топлинска енергија kWh/(m ² .a)	Специфична потрошувачка на енергија kWh/(m ² .a)	Трошоци на енергија МКД/а	Трошоци на енергија како % %
'' ''		375									
'' ''		875									
'' ''		350									
'' ''		240									
'' ''		265									
		5,574									3.04

Краен корисник	Број на станари	Вкупна површина на зградата m ²	Вкупна грејна површина kWh/a	Потрошувачка на електрична енергија kWh/a	Потрошувачка на топлинска енергија kWh/a	Вкупна потрошувачка на енергија kWh/a	Специфична потрошувачка на електрична енергија kWh/(m ² .a)	Специфична потрошувачка на топлинска енергија kWh/(m ² .a)	Специфична потрошувачка на енергија kWh/(m ² .a)	Трошоци на енергија МКД/а	Трошоци на енергија како % %
	1										0.76
											0.78
											4.60

3.4



¹⁰

4 (28.223.005). 27,089,847.59
" (;)

18:

	11 [kWh/a]						kWh/a	/a	/a	/a
		[kWh/a]	kWh/a	kWh/a	kWh/a	kWh/a				
		N/A	N/A	N/A	N/A	N/A	22,085	138,693	N/A	
		N/A	N/A	N/A	N/A	N/A	486,105	2,702,744	N/A	
		N/A			N/A					
		N/A		N/A						
		N/A	N/A							
		N/A								

11

().

13:

[/a]	[/a]	[/a]	[/a]	[/a]	[/a]	[/a]
	N/A		15.2%	0.5%		
20.6%						100.0%

4

—

CO2. 18

CO2,

CO2

20:

CO₂

	¹²						
	kg CO ₂ /kWh _{eq}	kWh/a	CO ₂ kg CO ₂ /a	kWh/a	kWh/a	CO ₂ kg CO ₂ /a	kWh/a
	0.915	645,957.00	591,050.70	1,148,964.14	1,051,302.20	433,547.77	396,696.21
						1,900,080.00	507,321.40
	0 (0.403) ¹³					829,725.00	334,379.20
		645,957.00	591,050.70	1,148,964.14	1,051,302.20	3,163,352.77	1,238,396.81

¹² : "

¹³ 0 kg CO₂ / kWh
2: "

"

0,403 kg CO₂ / kWh

94 04.07.2013.

12.07.2013.

IPCC, 2006,

5

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TRACE

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TRACE 200.000

198.000 523.000 . . 10-

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TRACE

TRACE.

TRACE,

TRACE

TRACE,

TRACE

TRACE.

NPEEPB¹⁴

¹⁴

ENSI

, 2012-2018 ,

"
".
" ODYSSEE-MURE ' .¹⁵

(Energy Saving International AS),
GEF.

2012 ,

¹⁵ <http://www.odyssee-mure.eu/project.html>

			TRACE	
16	MJ/ km	/		N/A
			TRACE	
17	kWh/m ³	0,25		0.25
17	%	40		/
18	kWh/(m ³ .a)	/		N/A
			TRACE	
16	kWh/	473		262,9
km	kWh/km	9,46		5,259
16	%	62.5		/
			NPEEPB	
	kWhe/(m ² .a)	175		115.71
	kWh/(m ² .a)	27		11.01
	kWhe/(m ² .a)	185		145.85
	kWh/(m ² .a)	44		13.07
	kWhe/(m ² .a)	190		278.61
	kWh/(m ² .a)	51		25.30

16
17
18

C	kWh/(m2.a)	100	19	N/A
D	kWh/(m2.a)	150		N/A
			TRACE	
20	kg/	260.6		N/A
			TRACE	
21	%	22.3		N/A
			ODYSSEE-MURE ²²	
	/	/		/
	/	/		/
	/	/		/

21: ()

3 17 ()

TRACE

19 "

20 "

21 "

22 "

94 4 , 2013

2000-2012



13: , TRACE

23

21 (TRACE

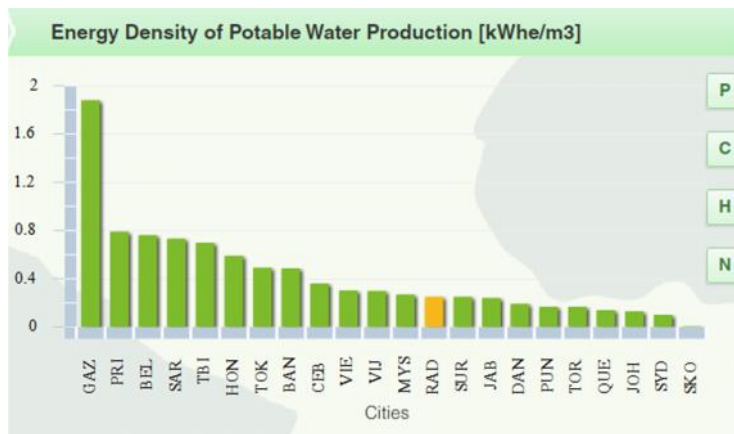
13)

kWh/

(CEB)

(SKO).

473



14: , TRACE

24

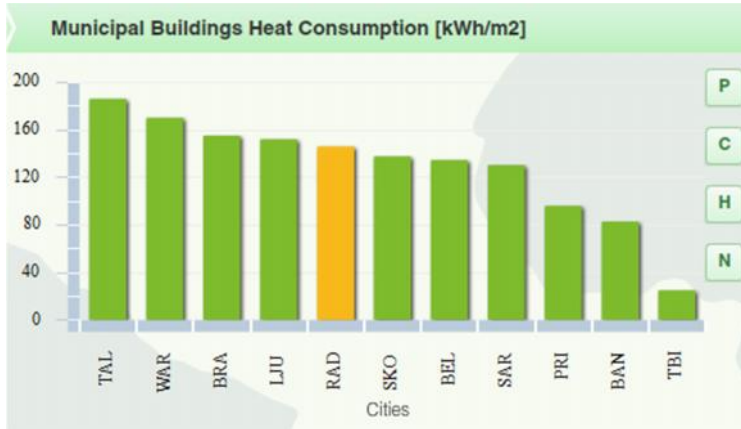
23 BAN - ; QUE - ; GAZ - ; SAR -
 ; SKO - ; GA1 - ; NYC - ; BEL - ;
 ; TBI - ; MYS - ; CEB - ; JAB - ; BHO - ;
 ; VIJ - ; PUN - ; DAN - ; SUR - ; PRI
 24 GAZ - ; PRI - ; BEL - ; SAR -
 ; TBI - ; HON - ; TOK - ; BAN - ;
 ; CEB - ; VIE - ; VIJ - ; MYS - ;
 SUR - ; JAB - ; DAN - ; PUN - ; TOR - ;
 ; JOH - ; SYD - ; SKO -

0,25 kWh/m³)

10
14)

22
(SUR)

(TRACE
(MYS).



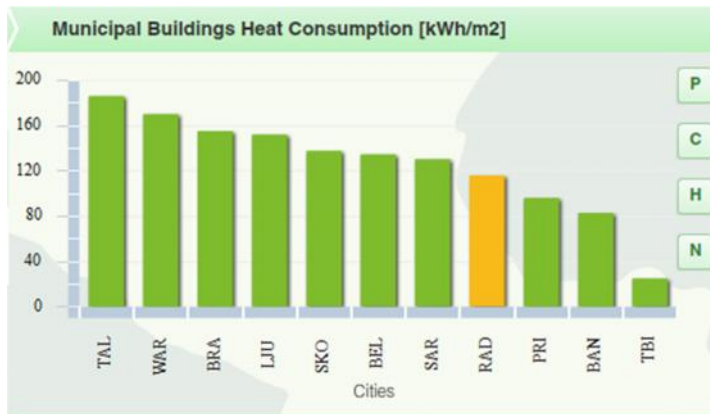
20:

TRACE

)²⁵

(
(SKO)

15) 145.9 kWh/m².a
(LJU).

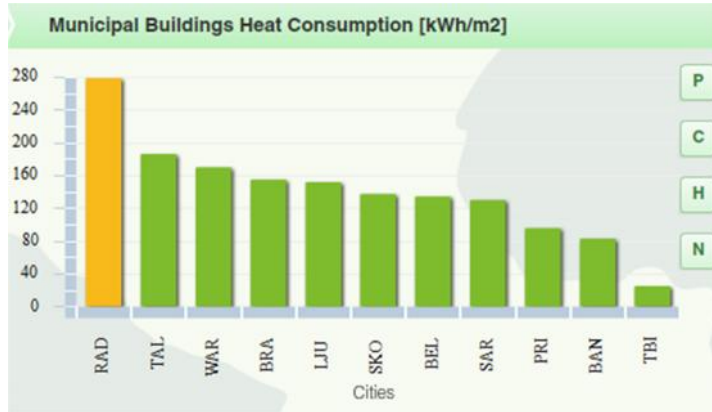


16:
TRACE

)²⁶

²⁵ TAL - ; WAR - ; SKO - ; BRA - ; LJU - ;
 RAD - ; PRI - ; BAN - ; BEL - ; SAR - ; TBI -

(PRI) (115.7 kWh/m2.a, 16) (SAR).



17:

(TRACE))²⁷

(278.6 kWh/m2.a, 17) TRACE, 1,5

().

²⁶ TAL - , WAR - ; BEL - ; BRA - ; LJU - ;
 SKO - ; PRI - ; SAR - ; BAN - ; TBI -
²⁷ ; LJU - ; TAL - , WAR - ; BRA - ;
 ; SKO - ; BEL - ; SAR - ;
 ; PRI - ; BAN - ; TBI -

6

). TRACE ESMAP (
/

6.1

2.2: "TRACE"

>
>
>

, (benchmarking) "TRACE" 19 ,

Benchmark Data Save

Data collated during the pre-mission phase, using the templates provided should be entered here. Go through each of the tabs on the left to access each sector. Don't forget to add the year and source of the data. If a proxy has been used (e.g. national data), check the box on the right and enter the year and source

Data Point	Year	Source	Proxy
Water Consumption [L/capita/day]			<input type="checkbox"/>
Energy Density of Potable Water Production [kWh/m ³]	2014	EE Manager	<input type="checkbox"/>
Percentage of Non Reverse Water [%]	2014	EE Manager	<input type="checkbox"/>
Energy Cost for Water Treatment (Potable and Wastewater) as a Percentage of the Total Water Operating Cost [%]			<input type="checkbox"/>
Energy Density of Wastewater Treatment [kWh/m ³]			<input type="checkbox"/>

18:

Benchmark Data Save

Data collated during the pre-mission phase, using the templates provided should be entered here. Go through each of the tabs on the left to access each sector. Don't forget to add the year and source of the data. If a proxy has been used (e.g. national data), check the box on the right and enter the year and source

Data Point	Year	Source	Proxy
Electricity Consumed per km of LT Roads [kWh/km]	2012	Feasibility Study for Street Lighting	<input type="checkbox"/>
Percentage of City Roads LT [%]	2012	Feasibility Study for Street Lighting	<input type="checkbox"/>
Electricity Consumed per Light Pole [kWh/pole]	2012	Feasibility Study for Street Lighting	<input type="checkbox"/>

19:

Benchmark Data Save

Data collated during the pre-mission phase, using the templates provided should be entered here. Go through each of the tabs on the left to access each sector. Don't forget to add the year and source of the data. If a proxy has been used (e.g. national data), check the box on the right and enter the year and source

Data Point	Year	Source	Proxy
Municipal Buildings Electricity Consumption [kWh/m ²]	2014	EVN	<input type="checkbox"/>
Municipal Buildings Heat Consumption [kWh/m ²]	2014	EE Manager	<input type="checkbox"/>
Municipal Buildings Energy Spent as a Percent of Municipal Budget [%]	2014	EE Manager	<input type="checkbox"/>

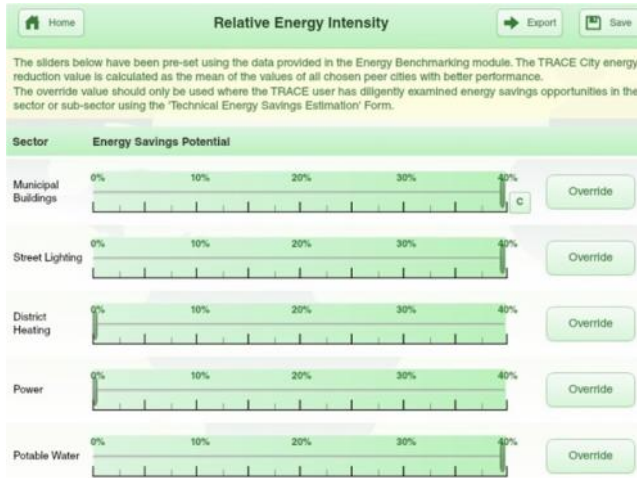
20:

()

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/

“TRACE”



21:

TRACE,
18.

()
19.

[Home](#) **Sector Energy Spending** [Save](#)

Enter the amount of money spent per calendar year (\$USD) in each sector using the input boxes below. If no money is spent at the city level in a sector, leave the box blank.

Sector	Energy Spending (\$USD)	City Authority	City Wide
Municipal Buildings	293055.40	<input checked="" type="radio"/>	<input type="radio"/>
Street Lighting	131094	<input checked="" type="radio"/>	<input type="radio"/>
District Heating	0	<input type="radio"/>	<input type="radio"/>
Power	0	<input type="radio"/>	<input type="radio"/>
Potable Water	68393.40	<input checked="" type="radio"/>	<input type="radio"/>

22:

[Home](#) **City Authority Control** [Export](#) [Save](#)

Use the sliders below to indicate the level of control city officials have in each sector. Each step in the sliders indicates a separate, discreet level of control (see Legend). Each slider must be moved from its starting position to continue.

Sector	City Authority Control	Level of Control
Municipal Buildings	0% 25% 50% 75% 100%	<input checked="" type="checkbox"/> National Stakeholder <input checked="" type="checkbox"/> Local Stakeholder <input checked="" type="checkbox"/> Local Committee <input checked="" type="checkbox"/> Multi-Agency <input checked="" type="checkbox"/> Policy Formulator <input checked="" type="checkbox"/> Regulator/Enforcer <input checked="" type="checkbox"/> Budget Control
Street Lighting	0% 25% 50% 75% 100%	
District Heating	0% 25% 50% 75% 100%	
Power	0% 25% 50% 75% 100%	
Potable Water	0% 25% 50% 75% 100%	

23:

Sector Prioritization				
Based upon the answers to the sector prioritization questions, two separate lists of sectors have been created: CA Control and City-wide.				
				3 of 3 selected
City Authority Sector Ranking				
Rank	Sector	REI%	Spending CA (US \$) Control	Score Check to Select
1	Municipal Buildings	41.3	293,055 1.00	121,262 <input checked="" type="checkbox"/>
2	Street Lighting	45.2	131,094 1.00	59,331 <input checked="" type="checkbox"/>
3	Potable Water	42.4	68,393 1.00	29,067 <input checked="" type="checkbox"/>
City Wide Sector Ranking				
Rank	Sector	REI%	Spending CA (US \$) Control	Score Check to Select

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Initial Appraisal Export Save

The matrix below presents the results of the initial appraisal of recommendations in each prioritized sector, comparing each recommendation's minimum requirements against the observed levels of competency and opportunity in the TRACE city. Back to Initial Appraisal

A Assets & Infrastructure
P Policy Regulation and Enforcement
D Data and Information
H Human Resources
F Finance

Recommendation	C	F	H	D	P	A	Check to select
Radovich score							
City-Wide Integrated Public Lighting		l	m	m	m	m	<input checked="" type="checkbox"/>
Lighting Timing Program		l	l	l	m	m	<input checked="" type="checkbox"/>
Procurement Guide for New Street		l	m	l	h	l	<input checked="" type="checkbox"/>
Public Spaces Lighting Audit and		m	m	m	m	m	<input type="checkbox"/>
Street Lights Audit and Retrofit		m	m	m	m	m	<input checked="" type="checkbox"/>
Street Signage Lighting Audit and		l	l	m	m	l	<input type="checkbox"/>
Traffic Signals Audit and Retrofit		l	l	m	m	m	<input type="checkbox"/>

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03.07.2019