

# Energy Management Information System (EMIS)

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Monitoring and reporting on energy consumption and savings in renovated public buildings in Croatia through EMIS System

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# Energy Management Information System (EMIS) in Croatia

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About EMIS

# Energy Management Information System














- ✦ EMIS is a web based software (**www.isge.hr**)
- ✦ EMIS is main tool for continuous data gathering, monitoring and analysis of energy and water consumption in buildings (Energy Efficiency Act of 2014.)
- ✦ EMIS provides a transparent oversight and control of energy consumption, which makes it an indispensable tool for systematic energy management
- ✦ EMIS database contains for each Energy Consumption Center (ECC):
  - ✦ energy and water consumption data
    - ✦ static technical data (e.g. construction data, technical systems, certificates, etc.)
    - ✦ data on institutional user (ECC type, geographical and meteorological data, institution that uses it, etc.)
- ✦ EMIS data is used for a wide range of calculations and analysis



# EMIS - Statistics

STATISTICS | STATISTICS OF MY OBJECTS | PERSONAL CHARTS | MAP

EMIS database statistics (17.10.2024.)

ECC type	 Number of objects	 Number of metering points	 Automatic Meters Count	 Energy bill count	 Number of readings	 Number of automatic readings	 Sensors count	 Number of sensor readings
 Complex	1.085	3.117 (29)	449 (3)	631.273	23.374.328	22.991.645	0	0
 Building in complex	4.566	5.238 (21)	1.644 (5)	797.063	25.396.589	24.797.171	54	2.059.496
 Free-standing building	11.731	27.654 (434)	1.328 (8)	5.776.852	36.654.309	34.529.031	843	27.322.482
 Part	4.295	7.515 (22)	419	1.385.256	14.239.814	13.975.811	2.585	119.876.983
<b>Sum - Building stock</b>	<b>21.677 (16.297)</b>	<b>43.524 (506)</b>	<b>3.840 (16)</b>	<b>8.590.444</b>	<b>99.665.040</b>	<b>96.293.658</b>	<b>3.482</b>	<b>149.258.961</b>
 Public lighting	24.279	23.370	2	6.379.672	1.165	0	0	0
<b>Sum</b>	<b>45.956</b>	<b>66.894 (506)</b>	<b>3.842 (16)</b>	<b>14.970.116</b>	<b>99.666.205</b>	<b>96.293.658</b>	<b>3.482</b>	<b>149.258.961</b>

Criteria for the inclusion of objects in the statistics: must have an EMIS code, must be existing (date of end of existence of the object must be empty), must not belong to the DEMO or TEST projects, object type must have the checkbox "Physical object" checked.

# EMIS - Modules

HOME | USERS | **OBJECTS** | REPORTS AND CHARTS | GEO ADMINISTRATION | ENERGY ADMINISTRATION | ESCO | REMOTE READINGS SENDING | SYSTEM | VALENTINA.MADZAREVIC

Filter | Labels

- Objects
- Objects - Old
- Objects - labels
- Objects - users
- Objects - buildings
- Public lighting
- Public lighting - overview
- Vehicles
- Add object
- Objects - Subtables
- Bills
- Bill items
- Meters
- Meters - New
- Readings
- Locked years
- Locked years - History
- Sensors
- Sensor Readings

EMIS Code / General information	Address / General information about the object	Project / General information	Object Designation / General information	ZIP Code	City/Municipal	Settlement	Object label	Base
HR-10000-0008-1	Opatička ulica 29	SDU		10000	Zagreb		2020; HIO	Free-sta
HR-10000-0009-1	Kušlanova 59/a	SDU		10000	Zagreb		2020; HIO	Free-sta
HR-10000-0010-1	Ulica Vladimira Nazora 53	SDU		10000	Zagreb		2020; HIO	Free-sta
HR-10000-0014-1	Orlovac 2	SDU		10000	Zagreb		2020; HIO	Free-sta
HR-10000-0019-1	Slavonska avenija bb	SDU		10000	Zagreb		2020; HIO	Free-sta
HR-10000-0020-1	Radnička 47	SDU		10000	Zagreb		2020; HIO	Free-sta
HR-10000-0021-1	Ilica 259	SDU		10000	Zagreb		2020; HIO	Free-sta
HR-10000-0022-1	Aleja Bologne 2			10000	Zagreb		2020	Free-sta
HR-10000-0022-1-A	Aleja Bologne 2	SDU		10000	Zagreb		2020; HIO	Part
HR-10000-0023-0	Srebrnjak 100	JLRS		10000	Zagreb		2020; HIO	Comple
HR-10000-0023-1	Srebrnjak 100	JLRS		10000	Zagreb		2020; HIO	Building
HR-10000-0023-2	Srebrnjak 100	JLRS		10000	Zagreb		2020; HIO	Building
HR-10000-0024-0	Ivana Gorana Kovačića 23	SDU		10000	Zagreb		2020; HIO	Comple
HR-10000-0024-1	Ivana Gorana Kovačića 23	SDU		10000	Zagreb		2020; HIO	Building
HR-10000-0024-2	Ivana Gorana Kovačića 23	SDU		10000	Zagreb		2020; HIO	Building
HR-10000-0025-1	Bože i Nikole Bionde 3	SDU		10000	Zagreb		2020; HIO	Free-sta
HR-10000-0026-1	Vladimira Nazora 49	SDU		10000	Zagreb		2020; HIO	Free-sta
HR-10000-0027-0	Selska cesta 132	SDU		10000	Zagreb		2020; HIO	Comple
HR-10000-0027-1	Selska cesta 132	SDU		10000	Zagreb		2020; HIO	Building
HR-10000-0027-2	Selska cesta 132	SDU		10000	Zagreb		2020; HIO	Building
HR-10000-0027-3	Selska cesta 132	SDU		10000	Zagreb		2020; HIO	Building
HR-10000-0028-1	Sv Mateja 70a	SDU		10000	Zagreb		2020; HIO	Free-sta
HR-10000-0029-1	Otona Župančića 14	SDU		10000	Zagreb		2020; HIO	Free-sta
HR-10000-0030-0	Jankomir 11	JLRS	Djelomična obnova	10000	Zagreb		Energetska obnova i korištenj	Comple
HR-10000-0030-1	Jankomir 11	JLRS	Djelomična obnova	10000	Zagreb		Energetska obnova i korištenj	Building
HR-10000-0030-2	Jankomir 11	JLRS	Djelomična obnova	10000	Zagreb		Energetska obnova i korištenj	Building
HR-10000-0030-3	Jankomir 11	JLRS	Djelomična obnova	10000	Zagreb		Energetska obnova i korištenj	Building
HR-10000-0030-4	Jankomir 11	JLRS	Djelomična obnova	10000	Zagreb		Energetska obnova i korištenj	Building
HR-10000-0030-5	Jankomir 11	JLRS	Djelomična obnova	10000	Zagreb		Energetska obnova i korištenj	Buildino

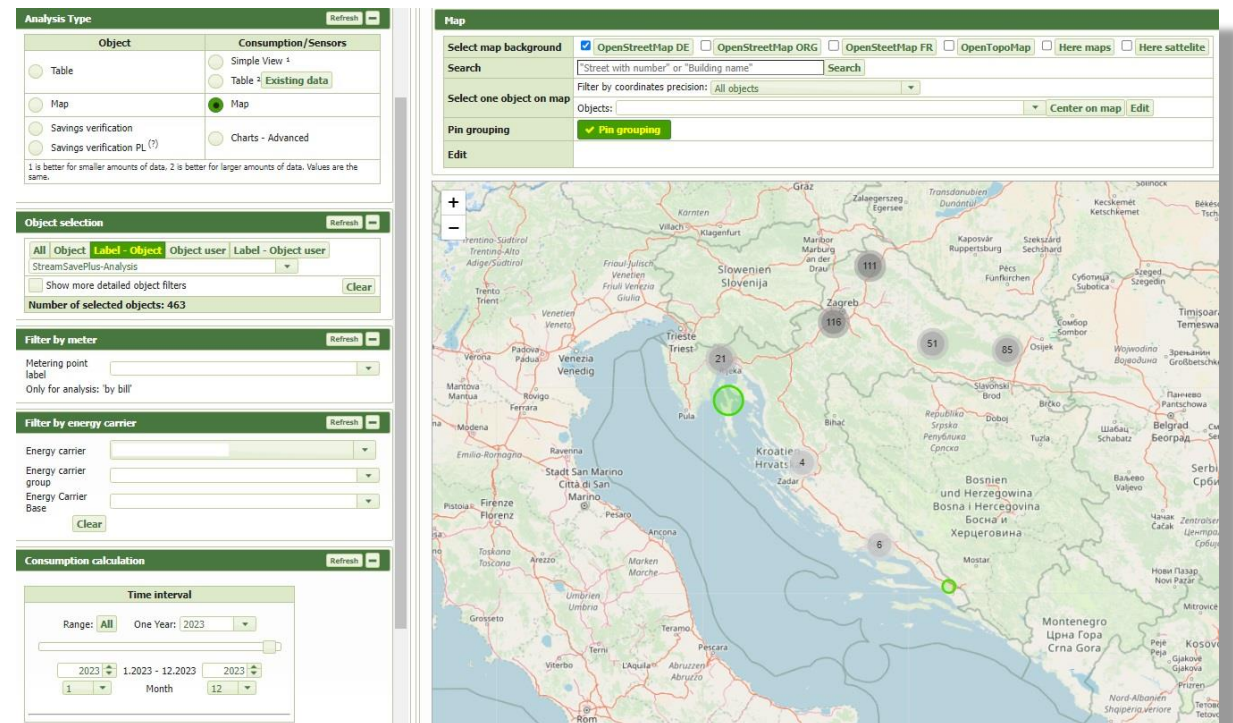
# EMIS - Collection of energy usage data

- ✦ Energy and water consumption data is collected monthly via monthly bills (manually by users, or remotely sent by energy and water suppliers)
- ✦ EMIS allows monitoring of energy and water consumption via meter readings on a weekly, daily or hourly basis (manually or via remote/smart readings)
- ✦ Monitoring of interior conditions via sensor readings (interior temperature, CO2, interior humidity, VOC, etc.)



# EMIS – Advanced Analyzer

- + EMIS functionality that allows data overview, customized data export, calculation of indicators and achieved savings weather for a single ECC, for many ECCs (by label or by institutional user) or for all user's ECCs
- + By selecting type of analysis in Analysis Type box user can choose which analytics to perform: tables, maps and charts
- + Depending on selected analytics, EMIS will offer various parameters for user to chose and to tailor analysis according to their need



# EMIS – Advanced Analyzer

+ Functionality for verification of savings calculates average consumption of electric energy and energy for heating in selected base years which is then compared with consumption in following years

Table  
 Map  
 Savings verification  
 Savings verification PL (?)

Simple View  
 Table Existing data  
 Map  
 Charts - Advanced

1 is better for smaller amounts of data, 2 is better for larger amounts of data. Values are the same.

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**Object selection** Refresh

All  Object  Label - Object  Object user  Label - Object user

StreamSavePlus-Analysis

Show more detailed object filters Clear

Number of selected objects: 463

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**Savings verification** Refresh

2003	Baseline	Calculation
2004	Baseline	Calculation
2005	Baseline	Calculation
2006	Baseline	Calculation
2007	Baseline	Calculation
2008	Baseline	Calculation
2009	Baseline	Calculation
2010	Baseline	Calculation
2011	Baseline	Calculation
2012	Baseline	Calculation
2013	Baseline	Calculation
2014	Baseline	Calculation
2015	Baseline	Calculation
2016	Baseline	Calculation
2017	Baseline	Calculation
2018	Baseline	Calculation
2019	Baseline	Calculation
2020	Baseline	Calculation
2021	Baseline	Calculation
2022	Baseline	Calculation
2023	Baseline	Calculation
2024	Baseline	Calculation

Show only locked

Bills - OBJ  Bills - OBJ\_D

**Reference (base indicators) (?)**

Analysis Type	Energy		CO <sub>2</sub> emission		Primary energy	
	Indicator of energy consumption for heating [Wh/(m <sup>2</sup> HDD)]	Electricity consumption indicator [kWh/m <sup>2</sup> ]	Indicator of CO <sub>2</sub> emission for heating [kgCO <sub>2</sub> /(m <sup>2</sup> HDD)]	Electricity CO <sub>2</sub> emission indicator [tCO <sub>2</sub> /m <sup>2</sup> ]	Indicator primary energy consumption heating [Wh/(m <sup>2</sup> HDD)]	Primary energy electricity consumption indicator [kWh/m <sup>2</sup> ]
Bolnica	108,07	70,45	0,03	0,02	119,91	113,71
Obiteljska	83,06	52,58	0,02	0,01	92,47	84,87
Obrazovna	50,92	19,98	0,01	0,005	59,78	32,24
Ostale nestambene	34,73	36,67	0,008	0,009	38,06	59,18
Sportska dvorana	70,43	32,76	0,02	0,008	99,79	52,88
Uredska	60,60	48,01	0,02	0,01	69,72	77,49

[Export](#)

**Reduction of energy consumption in the year: 2018 (?)**

Analysis Type	Energy				CO <sub>2</sub> emission			
	Energy consumption for heating [kWh]	Electricity consumption [kWh]	Corrected reference (base) energy consumption for heating [kWh]	Corrected reference (base) electricity consumption [kWh]	CO <sub>2</sub> emission of heating [tCO <sub>2</sub> ]	Electricity CO <sub>2</sub> emission [tCO <sub>2</sub> ]	Corrected reference (base) CO <sub>2</sub> emission for heating [tCO <sub>2</sub> ]	Corrected reference (base) CO <sub>2</sub> emission for electricity [tCO <sub>2</sub> ]
Bolnica	46.506.850	12.198.896	51.379.181	12.307.101	10.430	2.864	12.145	2.890
Obiteljska	15.984.909	3.982.459	16.405.919	4.100.501	4.012	935	4.103	963
Obrazovna	50.841.003	7.960.244	54.954.143	8.414.051	13.447	1.869	14.835	1.976
Ostale nestambene	680.059	240.615	625.944	233.575	150	56	138	55
Sportska dvorana	2.773.267	447.289	2.585.879	460.492	934	105	866	108
Uredska	13.364.757	3.579.458	11.431.676	3.524.811	3.205	840	2.878	828
<b>Reduction of energy consumption [kWh]:</b>				7.863.464	<b>Reduction of CO<sub>2</sub> emission [tCO<sub>2</sub>]:</b>			2.937
<b>Reduction of energy consumption [%]:</b>				5 %	<b>Reduction of CO<sub>2</sub> emission [%]:</b>			7 %

[Export](#)

**Reduction of energy consumption in the year: 2019 (?)**

Analysis Type	Energy				CO <sub>2</sub> emission			
	Energy consumption for heating [kWh]	Electricity consumption [kWh]	Corrected reference (base) energy consumption for heating [kWh]	Corrected reference (base) electricity consumption [kWh]	CO <sub>2</sub> emission of heating [tCO <sub>2</sub> ]	Electricity CO <sub>2</sub> emission [tCO <sub>2</sub> ]	Corrected reference (base) CO <sub>2</sub> emission for heating [tCO <sub>2</sub> ]	Corrected reference (base) CO <sub>2</sub> emission for electricity [tCO <sub>2</sub> ]
Bolnica	41.409.732	14.157.429	48.433.313	12.307.101	9.223	3.324	11.449	2.890
Obiteljska	15.885.155	3.938.261	15.477.968	4.100.501	3.980	925	3.871	963
Obrazovna	43.897.475	7.443.949	50.691.679	8.389.819	11.503	1.748	13.685	1.970
Ostale nestambene	647.326	247.138	597.448	233.575	143	58	132	55
Sportska dvorana	2.960.406	456.761	2.487.869	460.492	982	107	833	108
Uredska	10.928.612	4.244.068	10.928.389	3.524.811	2.655	997	2.751	828
<b>Reduction of energy consumption [kWh]:</b>				11.416.653	<b>Reduction of CO<sub>2</sub> emission [tCO<sub>2</sub>]:</b>			3.888
<b>Reduction of energy consumption [%]:</b>				7 %	<b>Reduction of CO<sub>2</sub> emission [%]:</b>			10 %

[Export](#)





# Use of EMIS system for monitoring, analysis and verification of energy savings

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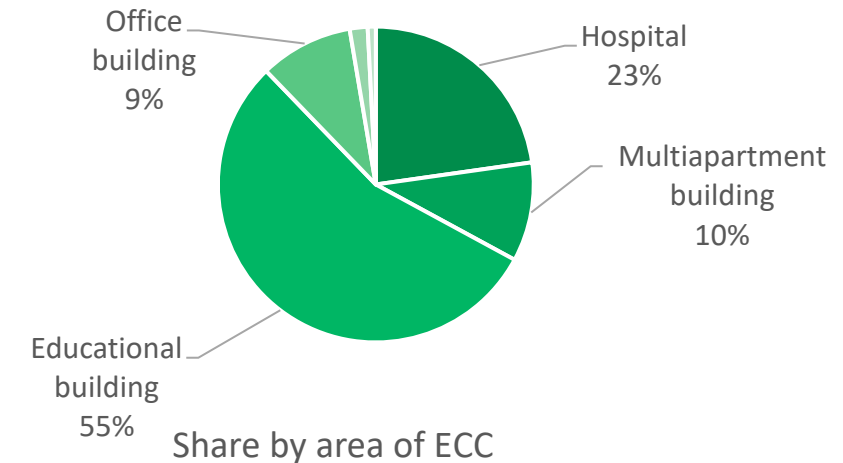
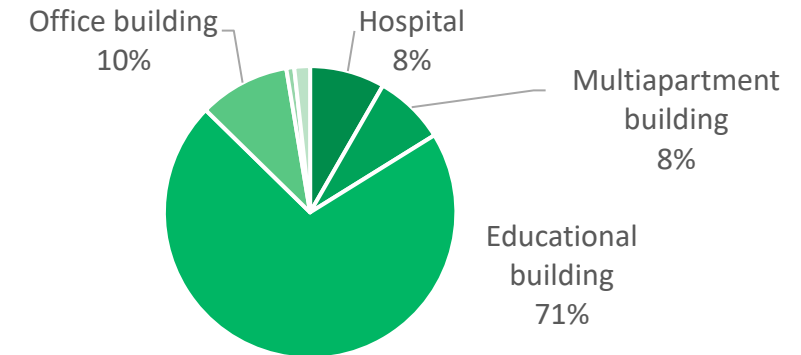
Program for energy refurbishment of public sector buildings

# EMIS – Data selection for calculation of achieved savings on ECC level

- ✦ 810 public sector buildings renovated under ESCO and Operational Program Competitiveness and cohesion (2016.-2019., calls 4c1.2, 4c1.3 and 4c1.4)
- ✦ 229 renovated public sector ECCs of various purposes selected and labeled for the analysis:
  - ✦ continuous monthly monitoring of energy consumption (2015.-2023.)
  - ✦ data on consumption checked by an admin and „locked“
  - ✦ have written in building's heated surface,  $A_k$
  - ✦ located all over Croatia
- ✦ **ECC ≠ building** – EMIS monitors consumption on metering points, building complexes often have only few metering points that are used by many buildings which makes it difficult to know how much of the consumption on a metering point falls on a certain building

# Program for energy refurbishment of public sector buildings

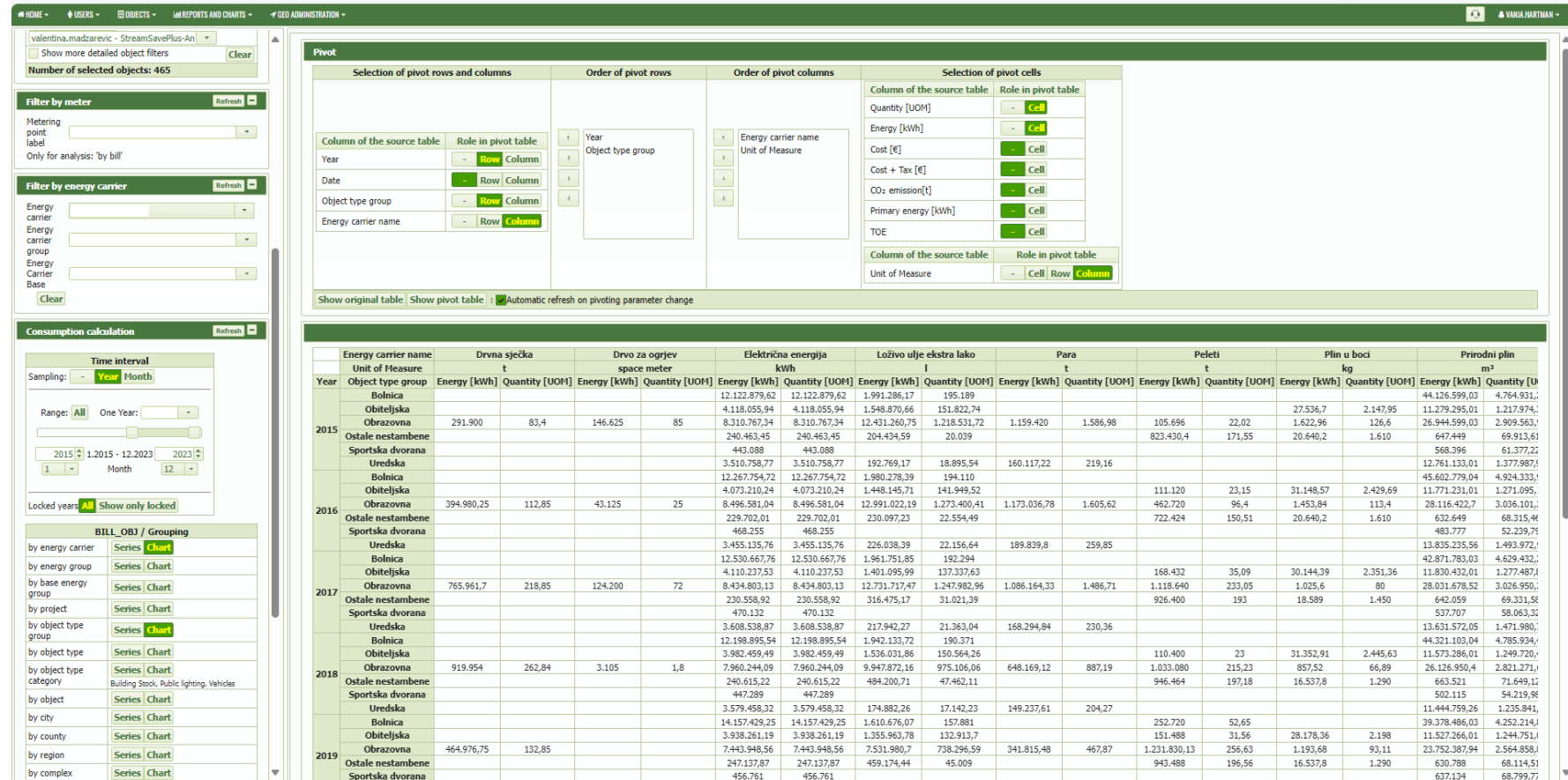
Type of buildings	Number of ECC	Share by number of ECC [%]	Useful floor area A <sub>k</sub> [m <sup>2</sup> ]	Share by A <sub>k</sub> [%]
<b>Hospital</b>	<b>19</b>	<b>8,30%</b>	<b>174.681,86</b>	<b>22,75%</b>
Ambulance	10	4,37%	16.279,83	2,12%
Hospitals	9	3,93%	158.402,03	20,63%
<b>Multiapartment building</b>	<b>18</b>	<b>7,86%</b>	<b>77.982,01</b>	<b>10,16%</b>
Student Dormitory	1	0,44%	1.541,00	0,20%
Residential building	7	3,06%	8766,13	1,14%
Retirement Home	10	4,37%	67.674,88	8,82%
<b>Educational building</b>	<b>163</b>	<b>71,18%</b>	<b>421.193,16</b>	<b>54,86%</b>
Kindergarten	21	9,17%	24.143,74	3,14%
Museums and Libraries	1	0,44%	3.228,70	0,42%
Primary school	126	55,02%	322.848,18	42,05%
Secondary school	15	6,55%	70.972,54	9,24%
<b>Office building</b>	<b>23</b>	<b>10,04%</b>	<b>73.417,36</b>	<b>9,56%</b>
Office building	23	10,04%	73.417,36	9,56%
<b>Sports Hall</b>	<b>2</b>	<b>0,87%</b>	<b>14.055,53</b>	<b>1,83%</b>
Sports Hall	2	0,87%	14.055,53	1,83%
<b>Other non-residential building</b>	<b>4</b>	<b>1,75%</b>	<b>6.370,41</b>	<b>0,83%</b>
Prisons, Penitentiaries and Correctional centres	1	0,44%	2.829,00	0,37%
Buildings for cultural and artistic activities and entertainment	3	1,31%	3.541,41	0,46%
<b>Total</b>	<b>229</b>	<b>100,00%</b>	<b>767.700,33</b>	<b>100,00%</b>



# Monitoring and reporting of final energy consumption - through table view

The Analytics module offers a range of options for grouping and reorganizing data, allowing for easy report generation regardless of the format in which reporting is required.

To ensure accurate reporting, it is essential to have complete data.



The screenshot displays the StreamSave Plus-Analytics interface. On the left, there are filter options for 'Filter by meter' and 'Filter by energy carrier'. Below these is the 'Consumption calculation' section, which includes a 'Time interval' selector (Year/Month), a 'Range' dropdown (All/One Year), and a 'BILL\_OBJ / Grouping' section with various filters like 'by energy carrier', 'by energy group', 'by base energy group', etc.

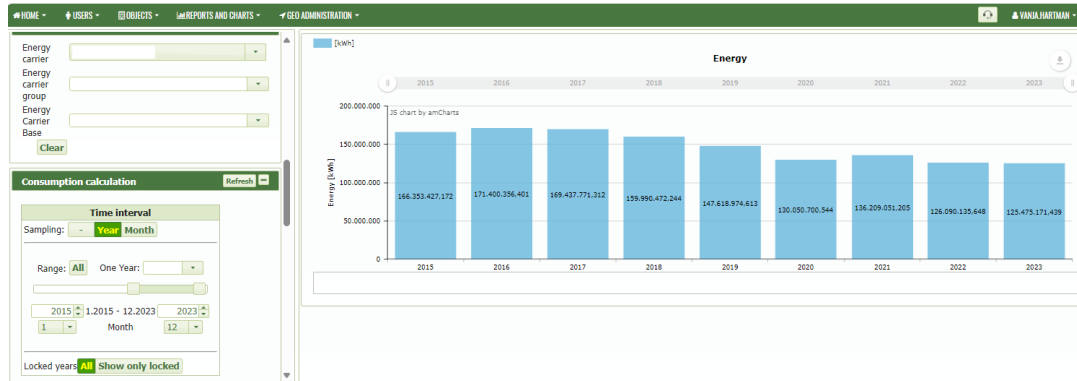
The main area shows a 'Pivot' configuration window with sections for 'Selection of pivot rows and columns', 'Order of pivot rows', 'Order of pivot columns', and 'Selection of pivot cells'. The 'Selection of pivot cells' section shows a grid where users can select rows and columns for the pivot table.

Below the pivot configuration is a large data table with the following columns: Year, Energy carrier name, Unit of Measure, Drvna sječka (Energy [kWh], Quantity [UOUM]), Drvo za ogrjev (Energy [kWh], Quantity [UOUM]), Električna energija (Energy [kWh], Quantity [UOUM]), Loživo ulje ekstra lako (Energy [kWh], Quantity [UOUM]), Para (Energy [kWh], Quantity [UOUM]), Peleti (Energy [kWh], Quantity [UOUM]), Plin u bocima (Energy [kWh], Quantity [UOUM]), and Prirodni plin (Energy [kWh], Quantity [UOUM]).

Year	Energy carrier name	Unit of Measure	Drvna sječka Energy [kWh]	Drvna sječka Quantity [UOUM]	Drvo za ogrjev Energy [kWh]	Drvo za ogrjev Quantity [UOUM]	Električna energija Energy [kWh]	Električna energija Quantity [UOUM]	Loživo ulje ekstra lako Energy [kWh]	Loživo ulje ekstra lako Quantity [UOUM]	Para Energy [kWh]	Para Quantity [UOUM]	Peleti Energy [kWh]	Peleti Quantity [UOUM]	Plin u bocima Energy [kWh]	Plin u bocima Quantity [UOUM]	Prirodni plin Energy [kWh]	Prirodni plin Quantity [UOUM]
2015	Bolnica		12.122.879,62	12.122.879,62			1.991.286,17	195.189									44.126.599,03	4.764.931,1
	Obiteljska		4.118.055,94	4.118.055,94			1.548.870,66	151.822,74									11.279.295,01	1.217.974,1
	Obrazovna		8.310.767,34	8.310.767,34			12.431.260,75	1.218.531,72			1.159.420	1.586,98	105.696	22,02	1.622,96	126,6	26.944.599,03	2.909.563,1
	Ostale nestambene		240.463,45	240.463,45			204.434,59	20.039					823.430,4	171,55	20.640,2	1.610	647.449	69.913,61
2016	Sportska dvorana		443.088	443.088													568.396	61.377,22
	Uredska		3.510.758,77	3.510.758,77			192.769,17	18.895,54			160.117,22	219,16					12.761.133,01	1.377.987,1
	Obiteljska		12.267.754,72	12.267.754,72			1.980.278,39	194.110					111.120	23,15	1.314,57	2.429,69	45.602.779,04	4.924.333,1
	Obrazovna		394.980,25	112,85	43.125	25	4.073.210,24	4.073.210,24	1.440.145,71	141.945,52			462.720	96,4	1.453,84	113,4	28.116.422,7	3.036.101,1
2017	Ostale nestambene		229.702,01	229.702,01			12.991.022,19	1.273.400,41			1.173.036,78	1.605,62	722.424	150,51	20.640,2	1.610	632.649	68.315,46
	Sportska dvorana		468.255	468.255			230.097,23	22.554,49									483.777	52.239,75
	Uredska		3.455.135,76	3.455.135,76			226.038,39	22.156,64			189.839,8	259,85					13.835.235,56	1.493.972,1
	Obiteljska		12.530.667,76	12.530.667,76			1.961.751,85	192.294					168.432	35,09	30.144,39	2.351,36	42.871.783,03	4.629.432,1
2018	Obrazovna		765.961,7	218,85	124.200	72	4.110.237,53	4.110.237,53	1.401.095,99	137.337,63							11.830.432,01	1.277.487,1
	Ostale nestambene		8.434.803,13	8.434.803,13	12.731.717,47	1.247.982,96	1.086.164,33	1.486,71	1.118.640	233,05	1.025,6	80	28.031.678,52	3.026.950,1			642.059	69.331,58
	Sportska dvorana		230.558,92	230.558,92	316.475,17	31.021,39					926.400	193	18.589	1.450			537.707	58.063,32
	Uredska		470.132	470.132			3.608.538,87	3.608.538,87	217.942,27	21.363,04	168.294,84	230,36					13.631.572,05	1.471.980,1
2019	Obiteljska		12.198.895,54	12.198.895,54			1.942.133,72	190.371					110.400	23	31.352,91	2.445,63	44.321.103,04	4.785.934,1
	Obrazovna		919.954	262,84	3.105	1,8	7.960.244,09	7.960.244,09	9.947.872,16	975.106,06	648.169,12	887,19	1.033.080	215,23	857,52	66,89	26.126.990,4	2.821.271,1
	Ostale nestambene		240.615,22	240.615,22	484.200,71	47.462,11					946.464	197,18	16.537,8	1.290			665.521	71.649,11
	Sportska dvorana		447.289	447.289			3.579.458,32	3.579.458,32	174.882,26	17.142,23	149.237,61	204,27					502.115	54.219,98

# Monitoring and reporting of final energy consumption - through chart view

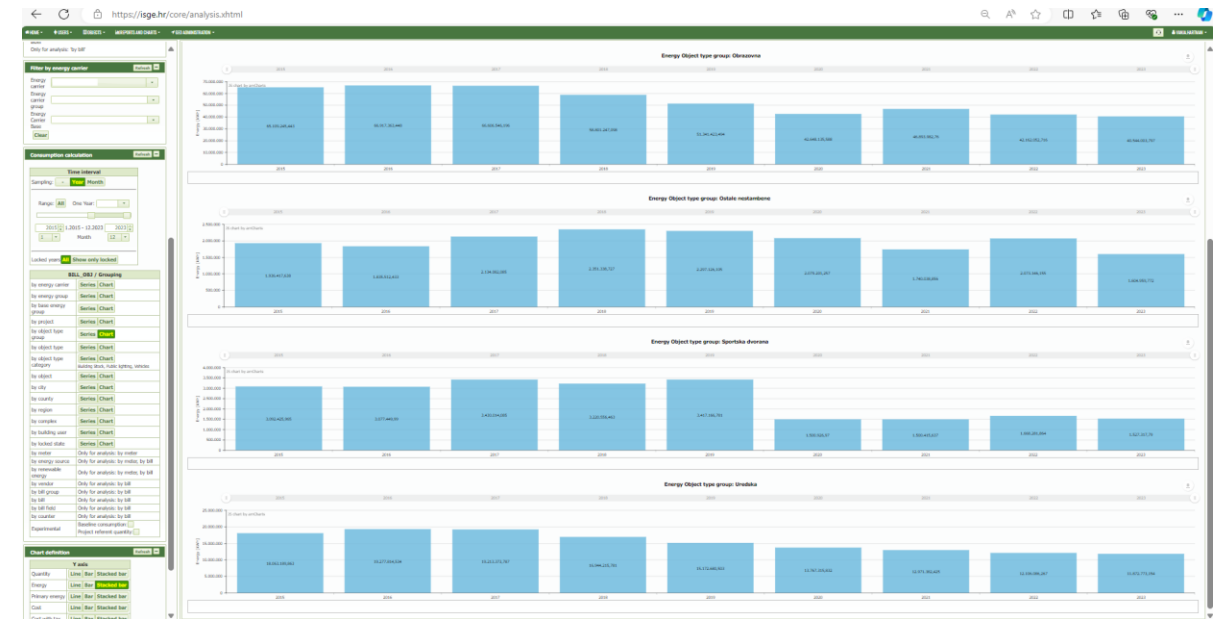
1



This level provides a quick visual overview of the data, allowing for immediate identification of any reduction in consumption, whether for a group sample or an individual building.

2

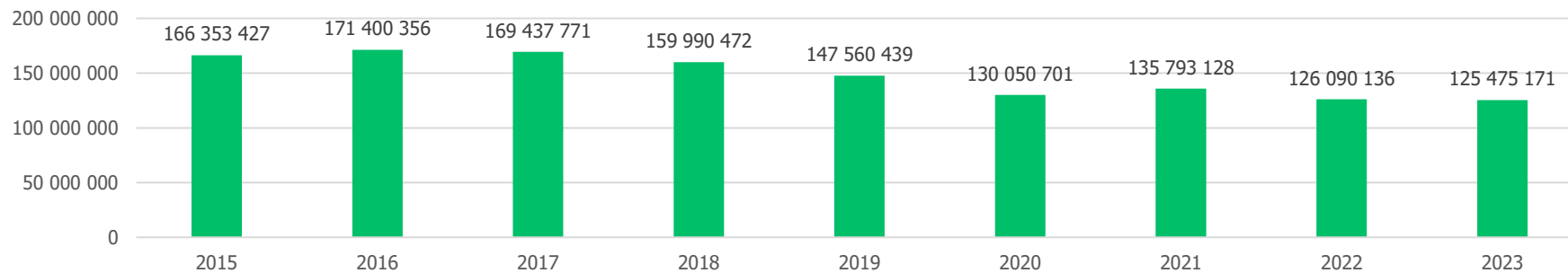
In the next step, it is possible to disaggregate the data with one click by, for example, types of buildings, and see which of them and how much affects the reduction in consumption.



# The impact of renovation on the reduction of final consumption – after 2017

Final consumption - no adjustments	Year	Number of ECC	A <sub>k</sub> [m <sup>2</sup> ]	2015_2016_2017 (baseline)	Year	Savings Year/Baseline	
				Energy consumption - total (kWh)	Energy consumption - total (kWh)	Energy savings - total (kWh)	Energy savings - total (%)
	2015	229	767.700,33	169.063.851,63	166.353.427		
	2016	229	767.700,33	169.063.851,63	171.400.356		
	2017	229	767.700,33	169.063.851,63	169.437.771		
	2018	229	767.700,33	169.063.851,63	159.990.472	9.073.379	5,37%
	2019	229	767.700,33	169.063.851,63	147.560.439	21.503.412	12,72%
	2020	229	767.700,33	169.063.851,63	130.050.701	39.013.151	23,08%
	2021	229	767.700,33	169.063.851,63	135.793.128	33.270.723	19,68%
	2022	229	767.700,33	169.063.851,63	126.090.136	42.973.716	25,42%
	2023	229	767.700,33	169.063.851,63	125.475.171	43.588.680	25,78%

Baseline



# The impact of renovation on the reduction of final consumption – after 2021

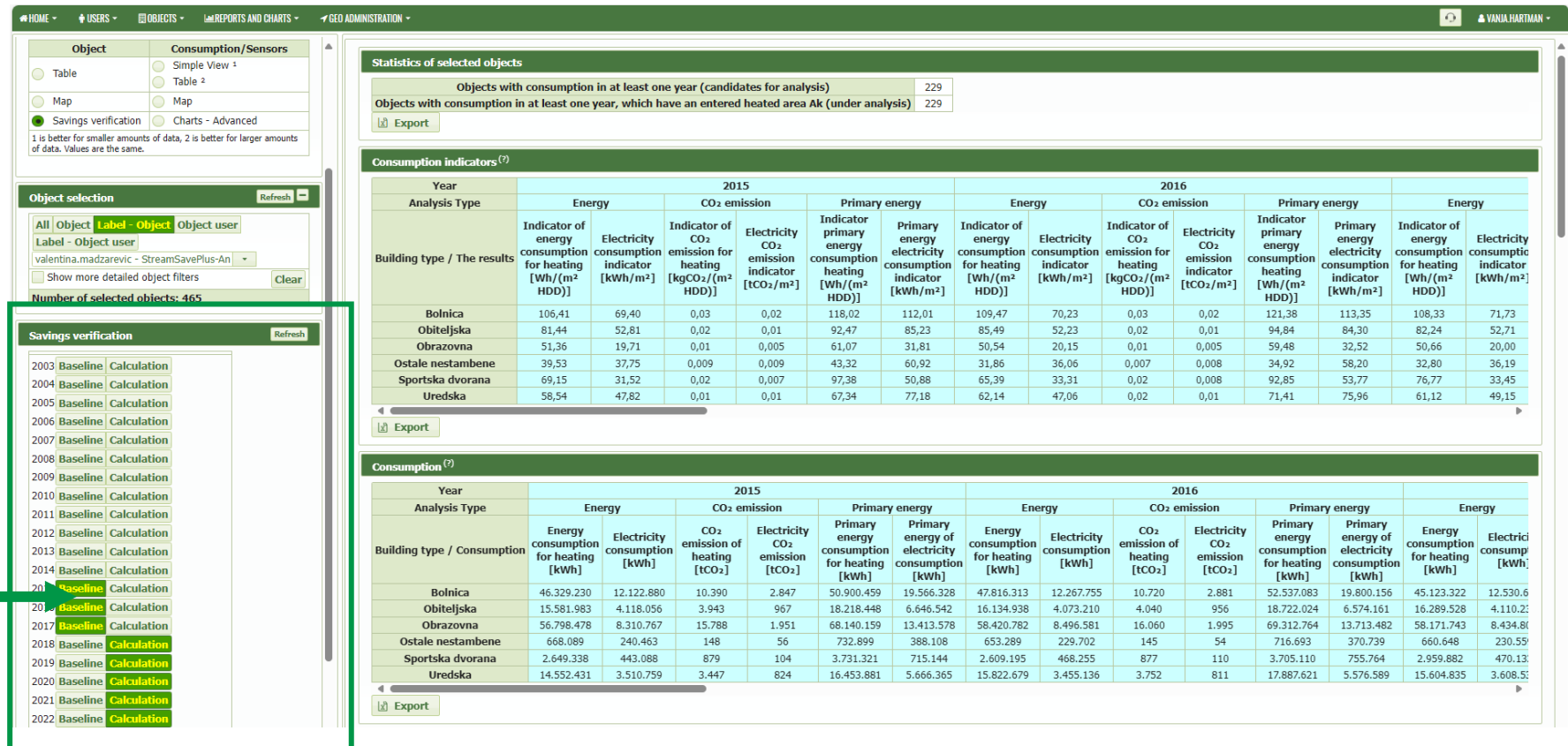
Final consumption - no adjustments	Group of ECC by purpose	Number of ECC	A <sub>k</sub> [m <sup>2</sup> ]	2021 (baseline)	2022	Savings 2022/2021	
				Energy consumption - total (kWh)	Energy consumption - total (kWh)	Energy savings - total (kWh)	Energy savings - total (%)
	Hospitals (Outpatient clinic, Hospital)	19	174.681,86	55.145.875	52.587.024	2.558.851	4,64%
	Multiapartment buildings (Student Dormitory, Residential building, Retirement Home)	18	77.982,01	17.957.357	15.493.545	2.463.812	13,72%
	Educational buildings (Kindergarten, Museum and Libraries, Primary school)	163	421.193,16	46.893.983	42.162.053	4.731.930	10,09%
	Office buildings	23	73.417,36	12.971.382	12.106.086	865.296	6,67%
	Sports Hall	2	14.055,53	1.500.416	1.668.282	-167.866	-11,19%
	Other non-residential building (Prisons, Penitentiaries and Correctional centres; Buildings for cultural and artistic activities and entertainment)	4	6.370,41	1.740.039	2.073.146	-333.107	-19,14%
	<b>Total</b>	<b>229</b>	<b>767.700,33</b>	<b>136.209.051</b>	<b>126.090.136</b>	<b>10.118.915,57</b>	<b>7,43%</b>
	Group of buildings by purpose	Number of buildings	A <sub>k</sub> [m <sup>2</sup> ]	2021 (baseline)	2023	Savings 2023/2021	
			Energy consumption - total (kWh)	Energy consumption - total (kWh)	Energy savings - total (kWh)	Energy savings - total (%)	
Hospitals (Outpatient clinic, Hospital)	19	174.681,86	55.145.875	54.789.307	356.567	0,65%	
Multiapartment buildings (Student Dormitory, Residential building, Retirement Home)	18	77.982,01	17.957.357	15.136.810	2.820.547	15,71%	
Educational buildings (Kindergarten, Museum and Libraries, Primary school)	163	421.193,16	46.893.983	40.544.004	6.349.979	13,54%	
Office buildings	23	73.417,36	12.971.382	11.872.773	1.098.609	8,47%	
Sports Hall	2	14.055,53	1.500.416	1.527.318	-26.902	-1,79%	
Other non-residential building (Prisons, Penitentiaries and Correctional centres; Buildings for cultural and artistic activities and entertainment)	4	6.370,41	1.740.039	1.604.960	135.079	7,76%	
<b>Total</b>	<b>229</b>	<b>767.700,33</b>	<b>136.209.051</b>	<b>125.475.171</b>	<b>10.733.879,79</b>	<b>7,88%</b>	

# Calculation of achieved savings with adjustments to final consumption

An analytical module is currently **under development** in which the methodology for calculating energy savings is integrated

adjustment of thermal energy for heating according to the heating degree days

Multiple possibilities of defining the baseline year



The screenshot displays the StreamSavePlus web application interface. It includes a navigation menu at the top with options like HOME, USERS, OBJECTS, REPORTS AND CHARTS, and GEO ADMINISTRATION. The main content area is divided into several sections:

- Object Selection:** A sidebar with filters for 'Object' (Table, Map) and 'Consumption/Sensors' (Simple View, Table, Charts - Advanced). It shows 'Savings verification' as the active filter. Below this, there are input fields for 'All Object', 'Label - Object', and 'Object user', with a dropdown menu showing 'valentina.madzarevic - StreamSavePlus-An'. A 'Number of selected objects: 465' is displayed.
- Statistics of selected objects:** A summary table showing 'Objects with consumption in at least one year (candidates for analysis)' and 'Objects with consumption in at least one year, which have an entered heated area Ak (under analysis)', both with a count of 229.
- Consumption indicators (2):** A table showing energy and CO2 emission indicators for 2015 and 2016, categorized by building type. The table includes columns for Energy, CO2 emission, and Primary energy for both years.
- Consumption (2):** A table showing energy and CO2 emission indicators for 2015 and 2016, categorized by building type. The table includes columns for Energy, CO2 emission, and Primary energy for both years.
- Savings verification:** A table listing years from 2003 to 2022, with columns for 'Baseline' and 'Calculation'. The 'Calculation' column is highlighted in yellow for years 2017 through 2022.



# Calculation of achieved savings with adjustments to final consumption

Navigation: HOME | USERS | OBJECTS | REPORTS AND CHARTS | GEO ADMINISTRATION | VANJA HARTMAN

**Object**

Table  Map  Savings verification  Charts - Advanced

1 is better for smaller amounts of data, 2 is better for larger amounts of data. Values are the same.

---

**Object selection** Refresh

All Object Label - Object Object user

Label - Object user

valentina.madzarevic - StreamSavePlus-An

Show more detailed object filters Clear

Number of selected objects: 465

---

**Savings verification** Refresh

2003	Baseline	Calculation
2004	Baseline	Calculation
2005	Baseline	Calculation
2006	Baseline	Calculation
2007	Baseline	Calculation
2008	Baseline	Calculation
2009	Baseline	Calculation
2010	Baseline	Calculation
2011	Baseline	Calculation
2012	Baseline	Calculation
2013	Baseline	Calculation
2014	Baseline	Calculation
2015	Baseline	Calculation
2016	Baseline	Calculation
2017	Baseline	Calculation
2018	Baseline	Calculation
2019	Baseline	Calculation
2020	Baseline	Calculation
2021	Baseline	Calculation
2022	Baseline	Calculation
2023	Baseline	Calculation

**Reference (base indicators) (?)**

Analysis Type	Energy		CO <sub>2</sub> emission		Primary energy	
	Indicator of energy consumption for heating [Wh/(m <sup>2</sup> HDD)]	Electricity consumption indicator [kWh/m <sup>2</sup> ]	Indicator of CO <sub>2</sub> emission for heating [kgCO <sub>2</sub> /(m <sup>2</sup> HDD)]	Electricity CO <sub>2</sub> emission indicator [tCO <sub>2</sub> /m <sup>2</sup> ]	Indicator primary energy consumption heating [Wh/(m <sup>2</sup> HDD)]	Primary energy electricity consumption indicator [kWh/m <sup>2</sup> ]
Bolnica	108,07	70,45	0,03	0,02	119,91	113,71
Obiteljska	83,06	52,58	0,02	0,01	92,47	84,87
Obrazovna	50,85	19,96	0,01	0,005	59,71	32,21
Ostale nestambene	34,73	36,67	0,008	0,009	38,06	59,18
Sportska dvorana	70,43	32,76	0,02	0,008	99,79	52,88
Uredska	60,60	48,01	0,02	0,01	69,72	77,49

Export

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**Reduction of energy consumption in the year: 2018 (?)**

Analysis Type	Energy				CO <sub>2</sub> emission of heating [tCO <sub>2</sub> ]	CO <sub>2</sub> emission			
	Energy consumption for heating [kWh]	Electricity consumption [kWh]	Corrected reference (base) energy consumption for heating [kWh]	Corrected reference (base) electricity consumption [kWh]		Electricity CO <sub>2</sub> emission [tCO <sub>2</sub> ]	Corrected reference (base) CO <sub>2</sub> emission for heating [tCO <sub>2</sub> ]	Corrected reference (base) CO <sub>2</sub> emission for electricity [tCO <sub>2</sub> ]	Primary energy CO <sub>2</sub> emission [tCO <sub>2</sub> ]
Bolnica	46.506.850	12.198.896	51.379.181	12.307.101	10.430	2.864	12.145	2.890	51.105.714
Obiteljska	15.984.909	3.982.459	16.405.919	4.100.501	4.01	935	4.103	963	18.555.056
Obrazovna	50.841.003	7.960.244	54.950.572	8.414.051	13.447	1.869	14.838	1.976	58.819.239
Ostale nestambene	680.059	240.615	625.944	233.575	150	56	138	55	745.739
Sportska dvorana	2.773.267	447.289	2.585.879	460.492	934	105	866	108	388.353
Uredska	13.364.757	3.579.458	11.431.676	3.524.811	3.20	840	2.878	828	686.050
Reduction of energy consumption [kWh]:			7.859.893	Reduction of CO <sub>2</sub> emission [tCO <sub>2</sub> ]:	2.939	Reduction of CO <sub>2</sub> emission [%]:	7 %	Reduction of CO <sub>2</sub> emission [%]:	7 %
Reduction of energy consumption [%]:			5 %	Reduction of CO <sub>2</sub> emission [%]:	7 %	Reduction of CO <sub>2</sub> emission [%]:	7 %	Reduction of CO <sub>2</sub> emission [%]:	7 %

Export

---

**Reduction of energy consumption in the year: 2019 (?)**

Analysis Type	Energy				CO <sub>2</sub> emission	CO <sub>2</sub> emission			
	Energy consumption for heating [kWh]	Electricity consumption [kWh]	Corrected reference (base) energy consumption for heating [kWh]	Corrected reference (base) electricity consumption [kWh]		Electricity CO <sub>2</sub> emission [tCO <sub>2</sub> ]	Corrected reference (base) CO <sub>2</sub> emission for heating [tCO <sub>2</sub> ]	Corrected reference (base) CO <sub>2</sub> emission for electricity [tCO <sub>2</sub> ]	Primary energy CO <sub>2</sub> emission [tCO <sub>2</sub> ]
Bolnica	46.506.850	12.198.896	51.379.181	12.307.101	10.430	2.864	12.145	2.890	51.105.714
Obiteljska	15.984.909	3.982.459	16.405.919	4.100.501	4.01	935	4.103	963	18.555.056
Obrazovna	50.841.003	7.960.244	54.950.572	8.414.051	13.447	1.869	14.838	1.976	58.819.239
Ostale nestambene	680.059	240.615	625.944	233.575	150	56	138	55	745.739
Sportska dvorana	2.773.267	447.289	2.585.879	460.492	934	105	866	108	388.353
Uredska	13.364.757	3.579.458	11.431.676	3.524.811	3.20	840	2.878	828	686.050
Reduction of energy consumption [kWh]:			7.859.893	Reduction of CO <sub>2</sub> emission [tCO <sub>2</sub> ]:	2.939	Reduction of CO <sub>2</sub> emission [%]:	7 %	Reduction of CO <sub>2</sub> emission [%]:	7 %
Reduction of energy consumption [%]:			5 %	Reduction of CO <sub>2</sub> emission [%]:	7 %	Reduction of CO <sub>2</sub> emission [%]:	7 %	Reduction of CO <sub>2</sub> emission [%]:	7 %

Calculated indicators by building type

Energy consumption by type of building in selected year - with and without adjustment

Energy consumption savings in selected year - with adjustment

# EMIS - Calculation of achieved savings with adjustments to final consumption

✦ Recapitulation of savings made using EMIS

Final consumption - with adjustments	Year	Number of ECC	A <sub>k</sub> [m <sup>2</sup> ]	2015_2016_2017 (baseline)		2021 (baseline)	
				Energy savings - total (kWh)	Energy savings - total (%)	Energy savings - total (kWh)	Energy savings - total (%)
				2018	229	767.700,33	7.859.893,00
2019	229	767.700,33	11.413.973,00	7			
2020	229	767.700,33	31.797.345,00	20			
2021	229	767.700,33	42.321.599,00	24			
2022	229	767.700,33	41.085.981,00	25	3.166.008,00	2	
2023	229	767.700,33	2.344.285,00	2	-21.739.198,00	-25	

# Conclusion



# Project partners



# Thank You

Get in touch for more information!



**Project coordinator** – Jiří Karásek, SEVEn



All project reports will be available for download on the streamSAVE website [www.streamsave.eu](http://www.streamsave.eu)



Email the project at [contact@streamsave.eu](mailto:contact@streamsave.eu)



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Follow the project on Twitter [@stream\\_save](https://twitter.com/stream_save)



# Use of EMIS system for monitoring, analysis and verification of energy savings

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Example: Energy renovation of the primary school building and sports hall “Donja Dubrava”

# Example: Energy renovation of the school building and sports hall

## Energy renovation of the school building and sports hall of the Primary School “Donja Dubrava”

Project implementation period	19.11.2018. - 19.11.2020.
Total investment	903.568 EUR ( 871.342 EUR)
Co-financing	529.674 EUR ( 60,79% eligible costs)

### Measures

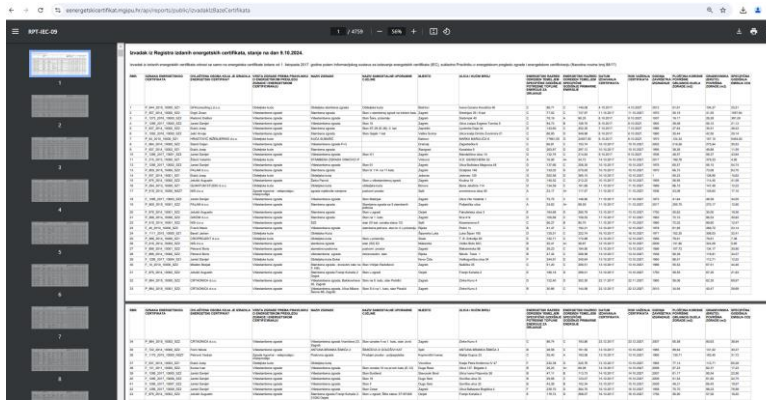
1	Thermal insulation of the outer envelope (walls, ceiling, roof)
2	Replacement of exterior windows and doors
3	Replacing existing gas boilers with new ones
4	Automation control of the heating system
5	Installation of thermostatic valves
6	Installation of ECO hood and exhaust fan
7	Replacing the lighting system with new LED lighting



[Osnovna škola Donja Dubrava - ENERGETSKA OBNOVA \(skole.hr\)](http://skole.hr)

# Data from the Register of issued energy certificates

✈ Only selected set of publicly available information



✈ On site available information or in IEC



RBR	69564	70493	TOTAL
Energy Performance Certificate Label	P_1082_2018_10109_NSZ2	P_1082_2018_10111_NSZ6	
Type of building	Educational building	Sports hall	
Name	Primary School "Donja Dubrava" - BUILDING	Primary School "Donja Dubrava" - SPORTS HALL	
City	DONJA DUBRAVA	DONJA DUBRAVA	
$Q_{H,nd}$ [kWh]	<b>92.957,81</b>	<b>42.011,59</b>	<b>134.969,4</b>
$Q''_{H,nd}$ [kWh/m <sup>2</sup> a]	53,13 (C)	57,5 (C)	
$E_{prim}$ [kWh]	<b>147.989,80</b>	<b>61.923,15</b>	<b>209.912,95</b>
$E_{prim}$ [kWh/m <sup>2</sup> a]	84,59 (C)	85,2 (A+)	
$E_{del}$	<b>126.066,70</b>	<b>53.901,96</b>	<b>179.968,66</b>
Date of issue	30.10.2020.	19.11.2020.	
Date of validy	30.10.2030.	19.11.2030.	
Year of construction of building	1983	1983	
$A_k$ (m <sup>2</sup> )	1.749,51	726,84	<b>2.476,35</b>



# EMIS Analytics – Final energy consumption (by energy bills, without adjustments)

✈ available information in IEC

AFTER RECONSTRUCTION	
$Q_{H,nd}$ [kWh]	134.969,4
$E_{prim}$ [kWh]	209.912,95
$E_{del}$ [kWh]	179.968,66

Vremenski interval

Uzorkovanje: - Godina Mjesec

Raspon: Sve Jedna godina: [dropdown]

2015 1.2015 - 12.2023 2023

1 Mjesec 12

Zaključane godine Sve Prikaži samo zaključane


BILL\_OBJ / Grupiranje

po energentu	Serijski Graf
po grupi energenata	Serijski Graf
po bazi grupe energenata	Serijski Graf
po sektoru	Serijski Graf
po grupi vrsta objekata	Serijski Graf
po vrsti objekta	Serijski Graf
po kategoriji vrste objekta	Serijski Graf

Zaključane godine Sve Prikaži samo zaključane

BILL\_OBJ / Grupiranje

- po energentu
- po grupi energenata
- po bazi grupe energenata
- po sektoru
- po grupi vrsta objekata
- po vrsti objekta
- po kategoriji vrste objekta



Naziv energenta Mjerna jedinica	Električna energija			Prirodni plin			Voda		
	Energija [kWh]	količina [M.J.]	Trošak [€]	Energija [kWh]	količina [M.J.]	Trošak [€]	Energija [kWh]	količina [M.J.]	Trošak [€]
2015	31.859	31.859	5.017,08	334.346	36.103,75	13.092,31	0	707	1.085,96
2016	31.317	31.317	4.058,99	349.522	37.742,5	11.993,48	0	594	916,19
2017	29.902	29.902	4.161,83	316.242	34.148,82	9.394,2	0	564	871,11
2018	29.913	29.913	4.605,45	319.878	34.541,45	9.952,07	0	596	919,19
2019	27.433	27.433	4.296,77	319.607	34.512,19	11.584,74	0	560	865,1
2020	16.369	16.369	2.450,95	272.626	29.439,03	8.414,9	0	581	896,65
2021	19.669	19.669	2.531,24	243.622	26.307,08	6.423,84	0	358	561,61
2022	20.722	20.722	2.948,9	219.840	23.739,03	5.465,74	0	483	774
2023	20.277	20.277	2.982,32	238.350	25.737,8	6.023,09	0	523	877,41

REAL ENERGY CONSUMPTION AFTER RECONSTRUCTION

# EMIS Analytics – Verification of energy savings (by energy bills, with adjustments)



Statistika odabranih objekata

Objekti s potrošnjom u bar jednoj godini (kandidati za analizu) 1  
Objekti s potrošnjom u bar jednoj godini koji imaju unesenu površinu AK (u analizi) 1

Objekt: Eksportiraj

Godina: 2017

Vrsta analize	Energija	Emisija CO <sub>2</sub>		Primarna energija	
Tip zgrade / Rezultati	Pokazatelj potrošnje energije za grijanje [Wh/(m <sup>2</sup> SDG)]	Pokazatelj potrošnje električne energije [kWh/m <sup>2</sup> SDG]	Pokazatelj emisije CO <sub>2</sub> električne energije [kgCO <sub>2</sub> /(m <sup>2</sup> SDG)]	Pokazatelj primarne energije za grijanje [Wh/(m <sup>2</sup> HDO)]	Pokazatelj primarne energije za električnu energiju [kWh/m <sup>2</sup> SDG]
Obrazovna	43,30	12,08	0,01	0,003	47,42

Godina: 2018

Vrsta analize	Energija	Emisija CO <sub>2</sub>		Primarna energija	
Tip zgrade / Rezultati	Pokazatelj potrošnje energije za grijanje [Wh/(m <sup>2</sup> SDG)]	Pokazatelj potrošnje električne energije [kWh/m <sup>2</sup> SDG]	Pokazatelj emisije CO <sub>2</sub> električne energije [kgCO <sub>2</sub> /(m <sup>2</sup> SDG)]	Pokazatelj primarne energije za grijanje [Wh/(m <sup>2</sup> HDO)]	Pokazatelj primarne energije za električnu energiju [kWh/m <sup>2</sup> SDG]
Obrazovna	316,242	29,902	70	7	346,285

Verifikacija ušteda

2009 Baza potrošnja Izračun  
2010 Baza potrošnja Izračun  
2011 Baza potrošnja Izračun  
2012 Baza potrošnja Izračun  
2013 Baza potrošnja Izračun  
2014 Baza potrošnja Izračun  
2015 Baza potrošnja Izračun  
2016 Baza potrošnja Izračun  
2017 Baza potrošnja Izračun  
2018 Baza potrošnja Izračun  
2019 Baza potrošnja Izračun  
2020 Baza potrošnja Izračun  
2021 Baza potrošnja Izračun  
2022 Baza potrošnja Izračun  
2023 Baza potrošnja Izračun  
2024 Baza potrošnja Izračun

Prilikom samo zaključane

● Računi - OBI ● Računi - OBI\_D

Eksport sirovih podataka za Izračun

Referentni (bazni pokazatelj) (%)

Vrsta analize	Energija	Emisija CO <sub>2</sub>	Primarna energija
Tip zgrade / Rezultati	Pokazatelj potrošnje energije za grijanje [Wh/(m <sup>2</sup> SDG)]	Pokazatelj potrošnje električne energije [kWh/m <sup>2</sup> SDG]	Pokazatelj potrošnje primarne energije za grijanje [Wh/(m <sup>2</sup> HDO)]
Obrazovna	46,15	11,74	0,01

Smanjenje potrošnje energije u godini: 2020 (%)

Vrsta analize	Energija	Emisija CO <sub>2</sub>	Primarna energija
Tip zgrade / Potrošnja	Potrošnja energenta za grijanje [kWh]	Potrošnja električne energije [kWh]	Korigirana referentna (bazna) potrošnja energenta za grijanje [kWh]
Obrazovna	272,626	16,369	317,595

Smanjenje potrošnje energije (%): 17%    Smanjenje emisije CO<sub>2</sub> (%): 17%    Smanjenje potrošnje primarne energije (%): 18%

Smanjenje potrošnje energije u godini: 2021 (%)

Vrsta analize	Energija	Emisija CO <sub>2</sub>	Primarna energija
Tip zgrade / Potrošnja	Potrošnja energenta za grijanje [kWh]	Potrošnja električne energije [kWh]	Korigirana referentna (bazna) potrošnja energenta za grijanje [kWh]
Obrazovna	243,622	19,669	344,452

Smanjenje potrošnje energije (%): 30%    Smanjenje emisije CO<sub>2</sub> (%): 30%    Smanjenje potrošnje primarne energije (%): 30%

## ENERGY SAVINGS

Godina	Ušteda (kWh)	Ušteda (kWh)	Ušteda (%)
2020	57.683,00	kWh	17,00 %
2021	110.243,00	kWh	30,00 %
2022	117.201,00	kWh	33,00 %
2023	10.452,00	kWh	4,00 %

Verifikacija ušteda

2009 Baza potrošnja Izračun  
2010 Baza potrošnja Izračun  
2011 Baza potrošnja Izračun  
2012 Baza potrošnja Izračun  
2013 Baza potrošnja Izračun  
2014 Baza potrošnja Izračun  
2015 Baza potrošnja Izračun  
2016 Baza potrošnja Izračun  
2017 Baza potrošnja Izračun  
2018 Baza potrošnja Izračun  
2019 Baza potrošnja Izračun  
2020 Baza potrošnja Izračun  
2021 Baza potrošnja Izračun  
2022 Baza potrošnja Izračun  
2023 Baza potrošnja Izračun  
2024 Baza potrošnja Izračun

Prilikom samo zaključane

● Računi - OBI ● Računi - OBI\_D

Eksport sirovih podataka za Izračun

Smanjenje potrošnje energije u godini: 2022 (%)

Vrsta analize	Energija	Emisija CO <sub>2</sub>	Primarna energija
Tip zgrade / Potrošnja	Potrošnja energenta za grijanje [kWh]	Potrošnja električne energije [kWh]	Korigirana referentna (bazna) potrošnja energenta za grijanje [kWh]
Obrazovna	219,840	20,722	328,680

Smanjenje potrošnje energije (%): 33%    Smanjenje emisije CO<sub>2</sub> (%): 33%    Smanjenje potrošnje primarne energije (%): 33%

Smanjenje potrošnje energije u godini: 2023 (%)

Vrsta analize	Energija	Emisija CO <sub>2</sub>	Primarna energija
Tip zgrade / Potrošnja	Potrošnja energenta za grijanje [kWh]	Potrošnja električne energije [kWh]	Korigirana referentna (bazna) potrošnja energenta za grijanje [kWh]
Obrazovna	238,350	20,277	239,996

Smanjenje potrošnje energije (%): 4%    Smanjenje emisije CO<sub>2</sub> (%): 4%    Smanjenje potrošnje primarne energije (%): 5%

# Data in SMIV information system

**Mjera - Integralna obnova postojećih zgrada (M1)**

**Opći podaci**

SMIVID	19766
Naslov mjere	Osnovna škola Donja Dubrava
Opis mjere	018-10/18-02/36
Vrsta mjere	Integralna obnova postojećih zgrada (M1)
Lokacija	Međimurska
Sektor	ZGRADARSTVO
Grupa	USLUŽNI JAVNI
Vrsta goriva (stari)	Prirodni plin
Vrsta goriva (novi)	Prirodni plin
Datum provedbe	18.9.2020
Vrijedi do	18.9.2040
MIS kod	KK.04.2.1.04.0053
Lokacija mjere	Donja Dubrava
Ulica i broj	Krbulja 21
Nositelj uštede	Fond za zaštitu okoliša i energetske učinkovitost
Odgovorna osoba (ime)	Opći kontakt Fonda
Odgovorna osoba (email)	kontakt@fzoeu.hr
Odgovorna osoba (tel)	5391800
Komentar	

Sufinanciranje  
 Dokumenti

**Uštede i troškovi**

Uštede primarne energije [kWh/god]	394.077,70
Ušteda energije [kWh/god]	372.122,47
CO2 ušteda [t]	79,63
Kumulativne uštede energije (NN 30/2022)	5.259.579,04
Trošak mjere	6.561.204,59

Prijenos uštede

**Podaci za izračun**

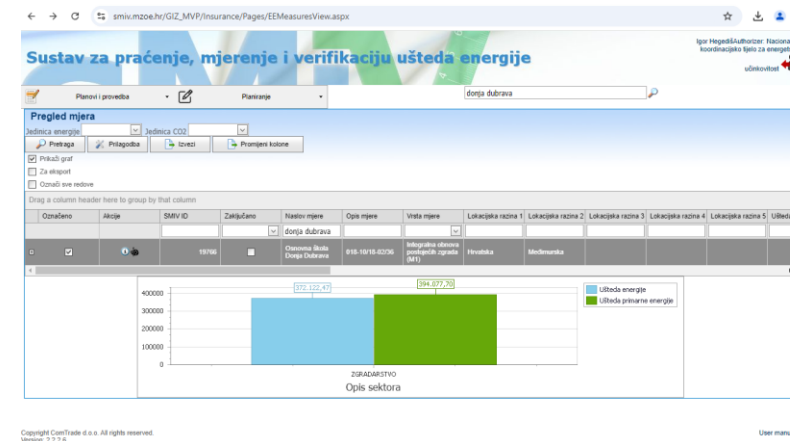
Formula  $FES = \left( \frac{SHD_{intc} - SHD_{new}}{\eta_{intc} - \eta_{new}} \right) \cdot A_{kated}$

Specifična potreba za grijanjem - Stara [kWh/m2]	135,38
Specifična potreba za grijanjem - Nova [kWh/m2]	61,08
Ploština korisne površine zgrade [m2]	2476,35
Učinkovitost sustava grijanja - Stara (ukupno)	0,609000 - Predefinirana vrijednost
Učinkovitost sustava grijanja - Nova (ukupno)	0,848000 - Predefinirana vrijednost
Učinkovitost sustava grijanja - Stara (kotao)	
Učinkovitost sustava grijanja - Nova (kotao)	
Učinkovitost sustava grijanja - Stara (emisija)	
Učinkovitost sustava grijanja - Nova (emisija)	
Učinkovitost sustava grijanja - Stara (distribucija)	
Učinkovitost sustava grijanja - Nova (distribucija)	

Faktor normalizacije: 1,00

Uredi | Pridruži | Zaključaj | Kao predložak | Obriši

Calculation of energy savings according to the methodology for verification of savings



Energy savings → 372.122,47 kWh/year