

DELIVERABLE D.T2.2.3

Functionality testing and validation of the
3D city models with energy audit
functions

Version 1
04/2019





D.T2.2.3: Deliverable

A.T2.2 Development of an advance 3D Energy Management System (EMS)

Feedback on 3D EMS - SLOVENIA

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Authors		
	Name (organization)	e-mail
WP leader	Valerija Petrinc (EZVD)	valerija@ezavod.si
Contributing participants	Valerija Petrinc (EZVD) Špela Seliga (MOV)	valerija@ezavod.si Spela.Seliga@velenje.si



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1. Introduction

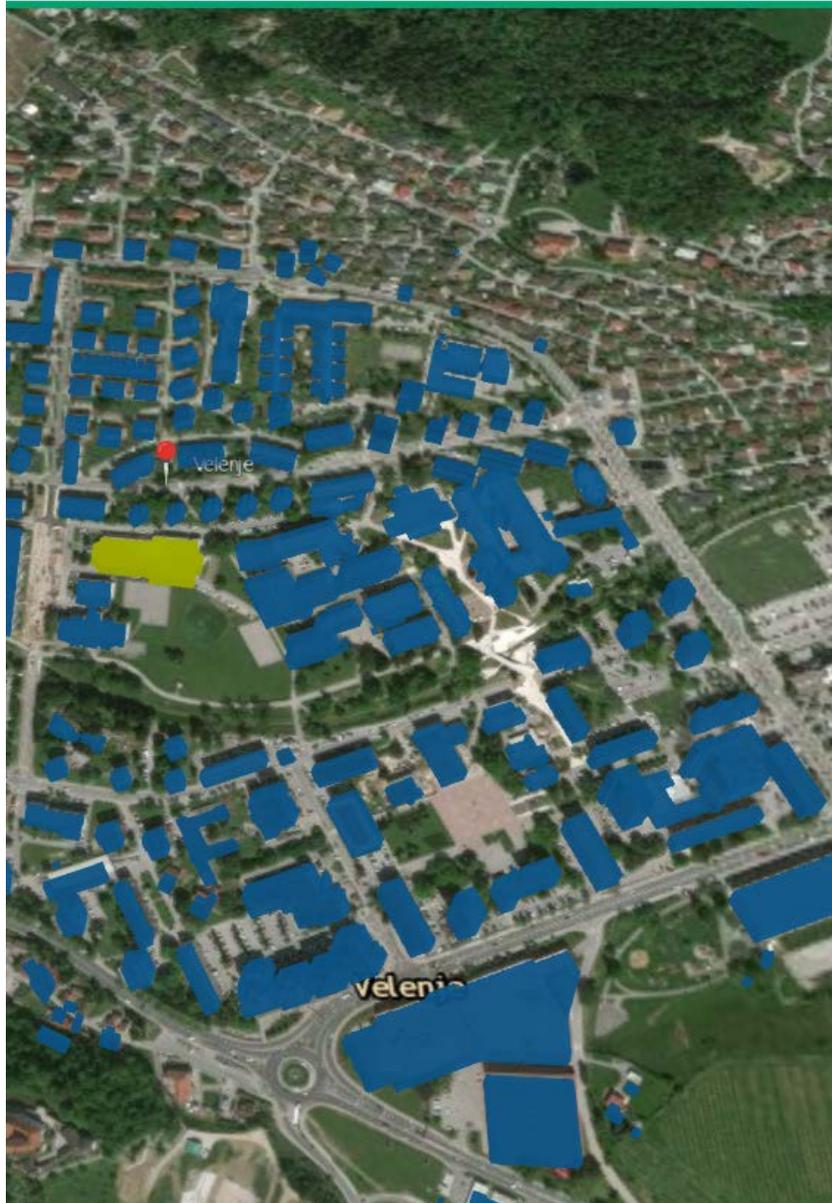
The 3D Energy Management System (EMS) is one of the four modules of the BOOSTEE-CE OnePlace platform. 3DEMS is probably the most important and technological tool developed by the project consortium. It is a simple yet powerful GIS-based tool that provides a 3D representation of a selected set of buildings and is able to display energy-related information (i.e. consumptions, energy audits, building attributes, solar power potential, etc.) available for a building.

Why create such an online system?

The main advantage of the 3DEMS over more traditional applications is its simpleness and intuitive online solution that building operators, energy planners and municipality staff can use everywhere and every time without the need of special expertise. It is accessible without having to install any program, as it is a web-based tool requiring only a web browser to function.

What is it useful for?

The main function of the 3DEMS is to help building operators, energy & urban planners, municipality staff to better understand energy use and flows within a building in a much more graphical way, having a view also to the surrounding of a building and its location in the city. 3DEMS allows to share, visualize and query energy-related information to citizens and public authorities. It can be combined with smart metering live energy data and, being customizable, a wide range of data can be stored, displayed and managed within the platform. 3DEMS combines the most important functionalities of a GIS/CAD application into an easy-to-use web application which can be easily replicated and adapted to any municipality.

Velenje X

Building type: Educational

Electricity consumption [kWh/year]:
201629.1

Energy audit: **NO**

Energy consumption (heating) [GJ/year]:
785970

Energy efficiency measures already implemented in the building : **reducing heating demand: limiting the exposed surface area**

Energy source type (heat): **District heating**

Estimation of the amount of heating losses in the building: **no data**

Official name: **Glasbena šola Fran Korun Koželjski**

Recommended energy efficiency measures for the building: **Reducing heating demand: selecting efficient heating system**

Technology used to harvest a renewable energy source: **heat pumps**

The total CO2 emissions: **no data**

Typology (number of floors): **2**

Year of construction: **Built in 1987, a newer part in 1998**

Extended attributes (1)

▾ Building ID: **28**



2. Questionnaire

Please select your country

- Austria
- Croatia
- Czech Republic
- Hungary
- Italy
- Poland
- Slovenia

1. Do you find the display of attributes of pilot buildings

	1	2	3	4	5	
not understandable	<input type="checkbox"/>	easy to understand				

Do you have any suggestion for improvement?

2. Would you prefer the attributes in local language?

- Yes
- No



Where the numerical attributes or attributes with coded or text values are available for more than just one building, the analysis / comparison can be performed.

Two different analyses are available:

- **Filter analysis:**

On numerical attributes the following operations are possible:

- Equal
- Not equal
- Less than
- Less or equal
- Greater than
- Greater or equal

On attributes with coded values the following operations are possible:

- Equal
- Not equal

On attributes with text values the following operations are possible:

- Equal
- Not equal
- Regexp*

*regular expression – matching a pattern in text

- **Colour coding** of attribute classes: Visualisation based on colour coding of attribute values segmented into classes.

Possibility to choose number of classes or class values and visualisation of single class.

On numerical attributes and attributes with coded values filtering according to the classes is possible.

3. Do you find the analysis of the attributes easy to perform?

	1	2	3	4	5	
Not easy at all.	<input type="checkbox"/>	Very easy				

4. Do you find these two analysis (filtering, colour coding) useful?

	1	2	3	4	5	
Not useful at all.	<input type="checkbox"/>	Very useful				

Do you have any suggestion for improvement?



5. Would you prefer having additional documents attached to the building like thermal acquisition photo or energy audit document, if available?

- Yes
- No

6. If more energy data would be available, do you find the 3D EMS useful for estimating energy performances in public buildings and producing visualizations?

	1	2	3	4	5	
Not useful at all.	<input type="checkbox"/>	Very useful.				

7. If more energy data would be available, do you find the 3D EMS useful for delineating and prioritizing intervention areas/districts for large-scale, concerted and cost-effective investments aimed at building refurbishment?

	1	2	3	4	5	
Not useful at all.	<input type="checkbox"/>	Very useful.				

8. Do you see an opportunity for using 3DEMS in your daily work?

- Yes
- No

9. Would you attend a training seminar on using the 3DEMS tool, if it was organized in your country?

- Yes
- No



3. Methodology of the survey

The created online questionnaire was translated into Slovene language.

In an attempt to collect the feedback from key target groups, City of Velenje and E-Institute organised the 3rd focus group meeting of project BOOSTEE-CE in Velenje. Invited were different target groups - municipality employees from different departments, energy experts from regional energy agency and representatives of local business support organisation.

The Max company demonstrated the online platform OnePlace and the functionalities of the 3D module. Focus of the discussion was 3D module - suggestions for the improvement. The participants filled the online questionnaire.

The online obtained answers were automatically summarized (statistics, graphs) by Google Forms.

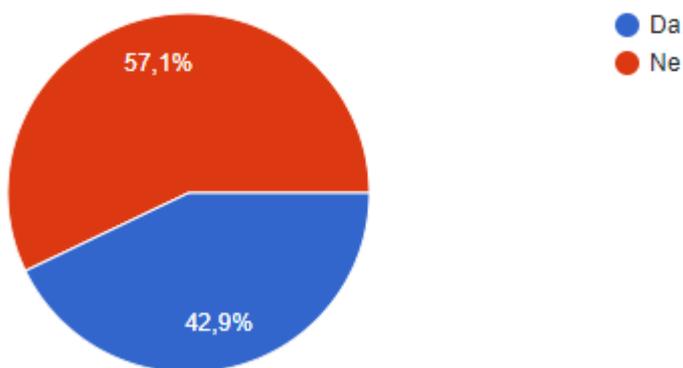
4. Questionnaire results

4.1. Attributes

7 participants responded to the survey and replied to 9 questions.

Only 29% of respondents find the display of attributes of pilot buildings easy to understand. The majority suggested adding more energy related data. One comment was also suggesting presentation of data in table form.

Considering the language of the displayed attributes, 43% of the respondents supported local language.



Graph 1: Preference of attributes in local language



4.2. Analysis

The 3DEMS (<https://oneplace.max.si/3d/>) enables two different types of analyses, where the numerical attributes or attributes with coded or text values are available for more than just one building.

Filter analysis:

On numerical attributes the following operations are possible: Equal / Not equal / Less than / Less or equal / Greater than / Greater or equal

▼ Height [m]: 25.6 

Add Clear ALT_UV 

- Equal
- Not Equal
- Less than
- Less or equal
- Greater than
- Greater or equal

On attributes with coded values the following operations are possible:

Equal / Not equal

▼ Building type: Edificio generico 

Add Clear TIPO 

- Equal
- Not Equal

Edificio generico

Submit

On attributes with text values the following operations are possible:

Equal / Not equal / Regexp*

*regular expression - matching a pattern in text

▼ Building type description: Edificio generico

Add Clear DEC_TIPO 

- Equal
- Not Equal
- Regexp

Submit



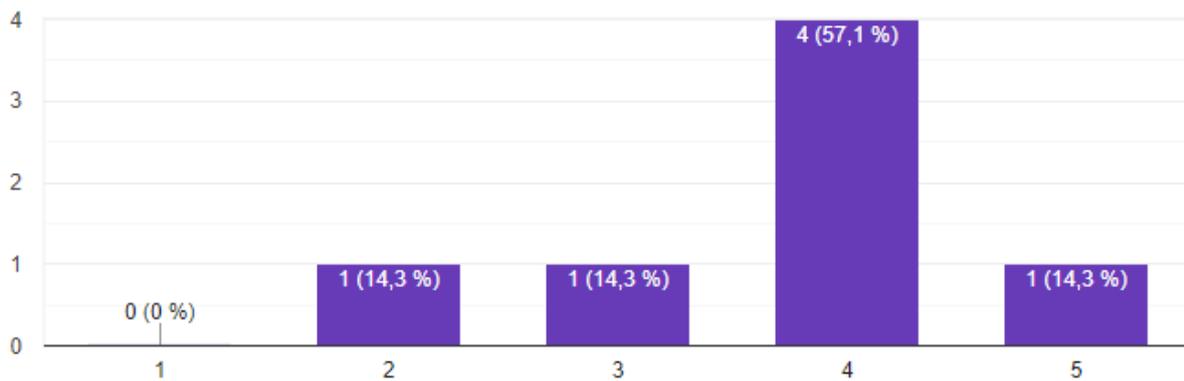
Colour coding of attribute classes: Visualisation based on colour coding of attribute values segmented into classes.

Possibility to choose number of classes or class values and visualisation of single class.

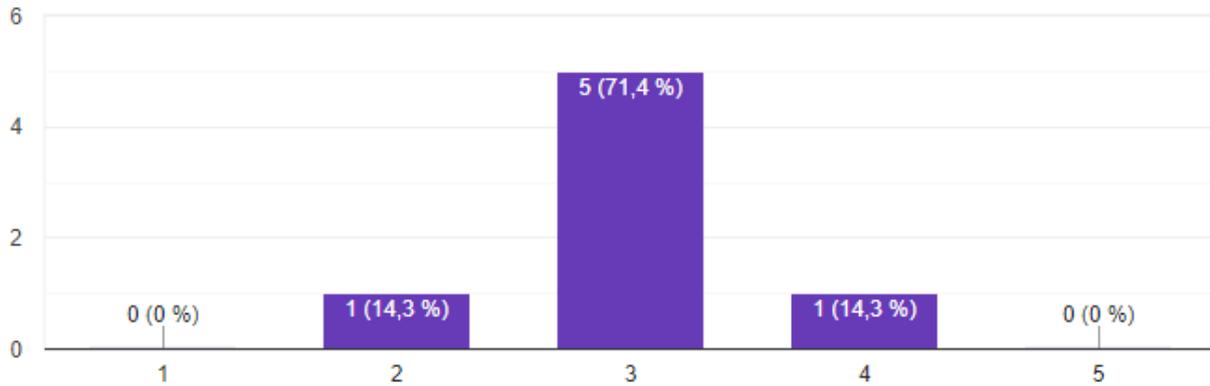
On numerical attributes and attributes with coded values filtering according to the classes is possible.



Most of the respondents rated the demonstrated analysis enabled in 3D module easy to perform (57 %, graph 2) and useful (71 %, graph 3). No suggestions for the improvement of the analysis were given.



Graph 2: Performance of the analysis in 3D modul

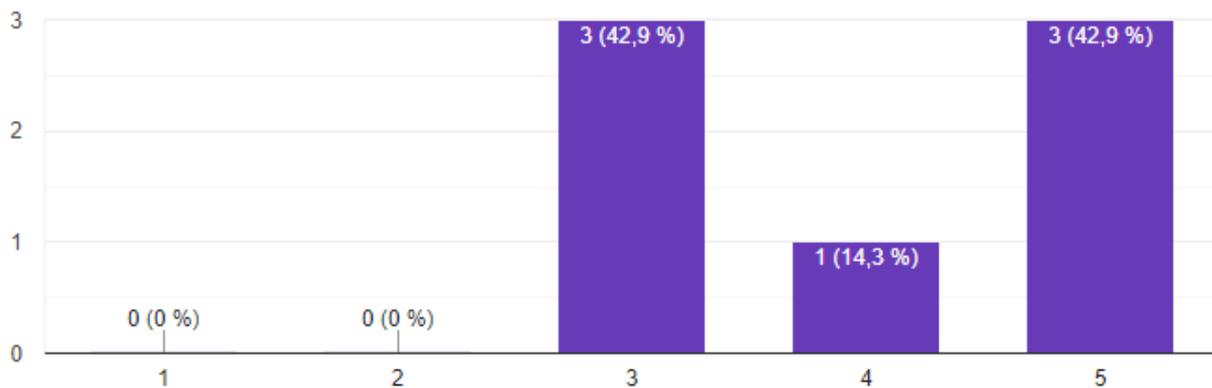


Graph 3: Usefulness of the analysis in 3D modul

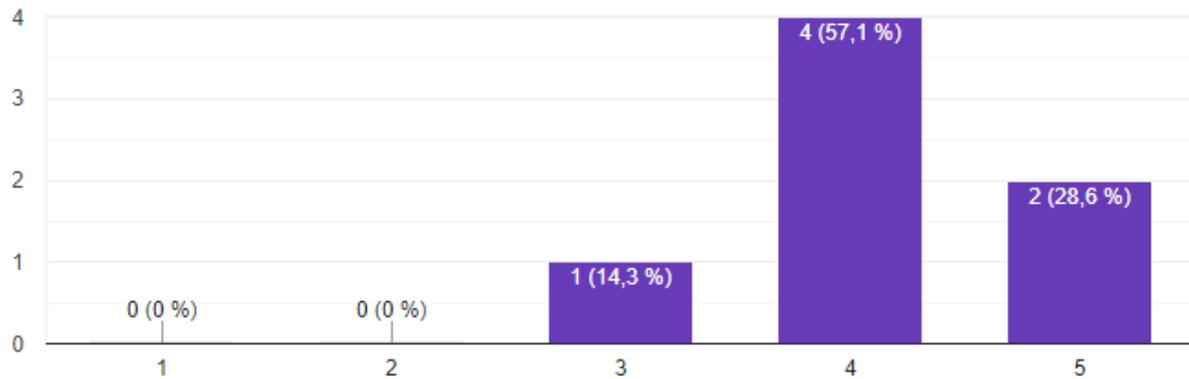
4.3. Upgrade of 3D EMS

Most of the respondents (86 %) would prefer having additional documents attached to the building like thermal acquisition photo or energy audit document.

3D EMS tool is according to the opinion of respondents more useful for prioritizing intervention areas (graph 5) then for estimating energy performances in public buildings and visualisation of energy related data (graph 4).



Graph 4: Usefulness of the 3D EMS for estimating energy performances in public buildings and visualisation of energy related data



Graph 5: Usefulness of the 3D EMS for prioritizing intervention areas

4.4. Future of 3D EMS

57 % of respondents see an opportunity to use 3D EMS in their daily work and the majority of respondents would attend a training, if it was organised in Slovenia.



5. Conclusions and recommendations

Photovoltaic potential, which is also part of 3D EMS in form of solar maps, is very interesting as there is high demand from the potential investors. Very useful would be to have data available such as roof area, 3D model of the roof, information gable roof / mono-pitched roof.

3D EMS modul has a potential to serve as a municipality database for data on consumption of energy and resources. It could visualize the consumption data for all public buildings (monthly consumption would be recommended).

3D EMS modul can serve as a support for strategic planning for municipality, energy agencies and local services (district heating, water supply ...).

3D EMS modul is very practical for the visualisation of energy related data and can be used for public presentations -to collect initiatives and opinions from citizens.



6. Annexes

6.1. Annex 1: Online questionnaire

BOOSTEE-CE: vaše mnenje o orodju 3DEMS

1. Izberite svojo državo

Izberite vse primerne odgovore.

- Austria
- Croatia
- Czech Republic
- Hungary
- Italy
- Poland
- Slovenija

2. 1. Ali se vam zdi nabor atributov za izbrano stavbo

Označite samo en oval.

	1	2	3	4	
zelo nerazumljiv in nepregleden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	popolnoma razumljiv in pregleden

3. Ali imate kakšen predlog za izboljšavo?

4. 2. Ali bi vam bila ljubša predstavitev atributov v slovenščini?

Označite samo en oval.

- Da
- Ne

5. 3. Ali se vam zdi analiza atributov enostavna?

Označite samo en oval.

	1	2	3	4	5	
Sploh ni enostavna.	<input type="radio"/>	Zelo enostavna.				

6. 4. Ali se vam zdita obe analizi, ki sta na voljo, uporabni?

Označite samo en oval.

	1	2	3	4	5	
Popolnoma neuporabni.	<input type="radio"/>	Zelo uporabni.				

7. Ali imate kakšen predlog za izboljšavo?

8. 5. Ali se vam zdi potrebno k stavbi pripenjati še dodatne dokumente kot npr. termografski posnetek ali poročilo energetskega pregleda?

Označite samo en oval.

- Da.
- Ne.

9. 6. Če bi energetski podatki bili na voljo za več javnih stavb ali bi po vašem mnenju bilo 3DEMS orodje uporabno za oceno energetske učinkovitosti ter njeno vizualizacijo?

Označite samo en oval.

	1	2	3	4	5	
Popolnoma neuporabno.	<input type="radio"/>	Zelo uporabno.				

10. 7. Če bi energetske podatki bili na voljo za več javnih stavb ali bi po vašem mnenju predstavljeno orodje 3DEMS bilo uporabno za določevanje prioritetenih območij za intervencije oz prednostne naložbe z namenom energetske prenove stavb?

Označite samo en oval.

	1	2	3	4	5	
Popolnoma neuporabno.	<input type="radio"/>	Zelo uporabno.				

11. 8. Ali vidite možnost uporabe orodja 3DEMS pri svojem vsakodnevem delu?

Označite samo en oval.

- Da.
 Ne.

12. 9. Ali bi se bili pripravljene udeležiti usposabljanja oz izobraževanja za uporabo orodja, če bi bilo organizirano v vaši državi?

Označite samo en oval.

- Da.
 Ne.



6.2. Annex 2: List of participants



**BOOSTEE-CE CE906 - BOOSTING ENERGY EFFICIENCY IN CENTRAL EUROPEAN CITIES
THROUGH SMART ENERGY MANAGEMENT**

CENTRAL EUROPE Program

LISTA PRISOTNIH / LIST OF PARTICIPANTS

ZADEVA / EVENT: **FOCUS GROUP MEETING in VELENJE**

DATUM in KRAJ (DATE and PLACE): *17.4.2019, MO Velenje, Velenje*

IME in PRIIMEK	ORGANIZACIJA / URAD	KONTAKTNI PODATKI (E-NASLOV / TEL.)	PODPIS
<i>BLONCA MAVRIC</i>	<i>MOU</i>	<i>blanca.mavric</i>	<i>[Signature]</i>
<i>VALERIJA PETRINEC</i>	<i>E-ZAVOD</i>	<i>valerija@ezavod.si</i>	<i>[Signature]</i>
<i>BOBIS LAŠIČ</i>	<i>WIMBIS d.o.o.</i>	<i>BOBIS@MAX.SI</i>	<i>[Signature]</i>
<i>NIKO MATEK</i>	<i>KSSENA</i>	<i>niko.natek@kssepa.velenje.si</i>	<i>[Signature]</i>
<i>GORAN SEMEČNIK</i>	<i>MOU - OUP</i>	<i>goran.semecnik@velenje.si</i>	<i>[Signature]</i>
<i>JURĚ BOČEK</i>	<i>ADESCO</i>	<i>jure.bocek@adesco.si</i>	<i>[Signature]</i>
<i>MAKSIMILIJAN ARLIČ</i>	<i>MOU</i>	<i>maks.arlic@velenje.si</i>	<i>[Signature]</i>
<i>ŠPELA ŠELIGA</i>	<i>MOU</i>	<i>spela.seligo@velenje.si</i>	<i>[Signature]</i>

«Zbrani osebni podatki bodo uporabljeni izključno za potrebe izvajanja projekta, v sklopu katerega so bili zbrani.»

"The collected data will be used exclusively for the needs of the project,
under which they were collected."

Mestna občina Velenje, Titov trg 1, 3320 Velenje, Slovenija; telefon: +386(0)38961-600