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

Issued by: Partner Nr. 2 - EZVD
Version date: 08.04.2019

Circulation RE – Restricted to BOOSTEE-CE Partners

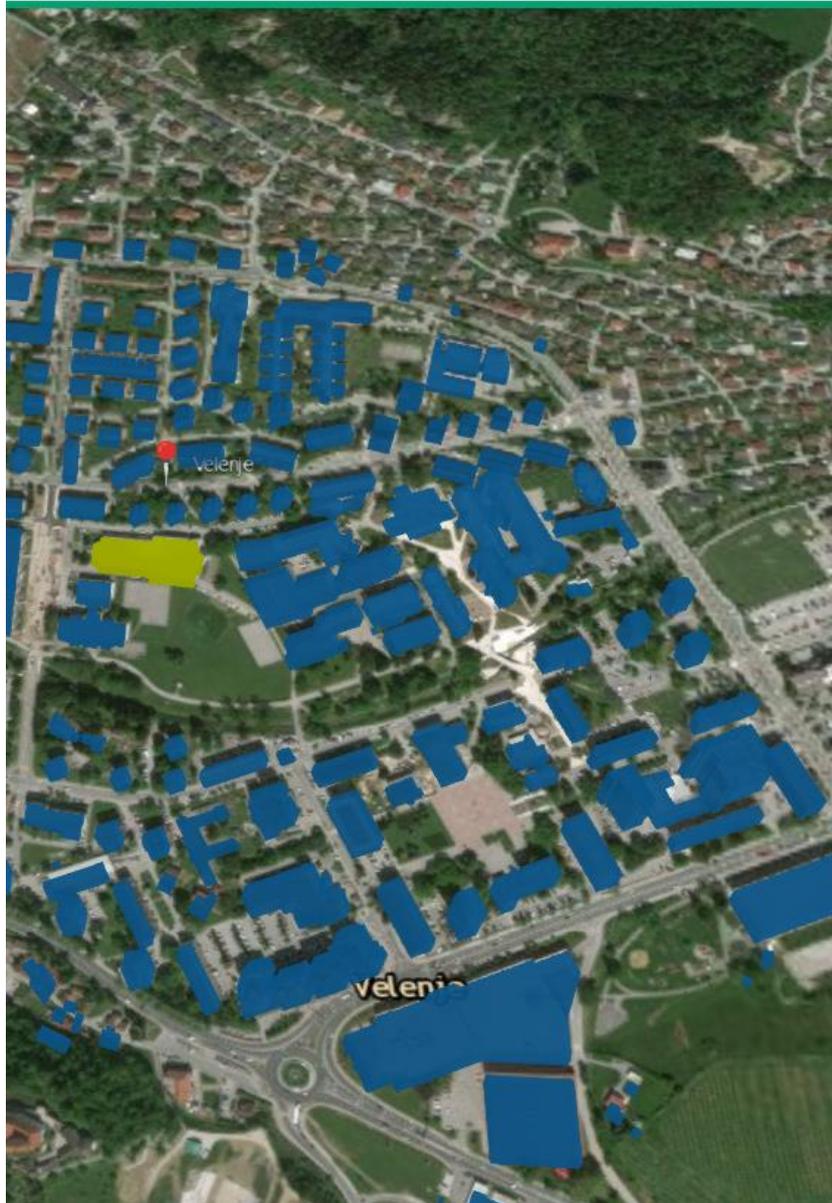| Authors		
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1. Introduction

The 3D Energy Management System (EMS) is one of the four modules of the BOOSTEE-CE OnePlace platform. 3D EMS 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 3D EMS 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 expertisealities. 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 3D EMS 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. 3D EMS 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. 3D EMS 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.

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 understanda ble	☐	☐	☐	☐	☐	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.	☐	☐	☐	☐	☐	Very easy

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

	1	2	3	4	5	
Not useful at all.	☐	☐	☐	☐	☐	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.	□	□	□	□	□	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.	□	□	□	□	□	Very useful.

8. Do you see an opportunity for using 3D EMS in your daily work?
    □ Yes
    □ No

9. Would you attend a training seminar on using the 3D EMS tool, if it was organized in your country?
    □ Yes
    □ No

3. Questionnaire results

The 3D EMS was presented at the focus group meeting of the e5/European Energy Award team on April 2nd 2019 where the overall progress of project BOOSTEE-CE was presented and discussed. The group consists of municipal experts and contains also building and space planers, building managers and energy experts.

The 3D EMS tool was generally received positively. The three dimensional visualisation of the buildings and above all of the varied terrain of the municipality which is characterized by terraces, valley incisions and mountain ridges were deemed remarkable.

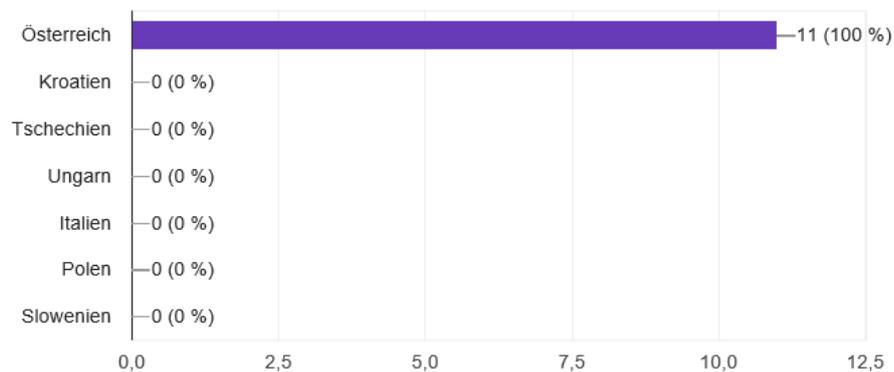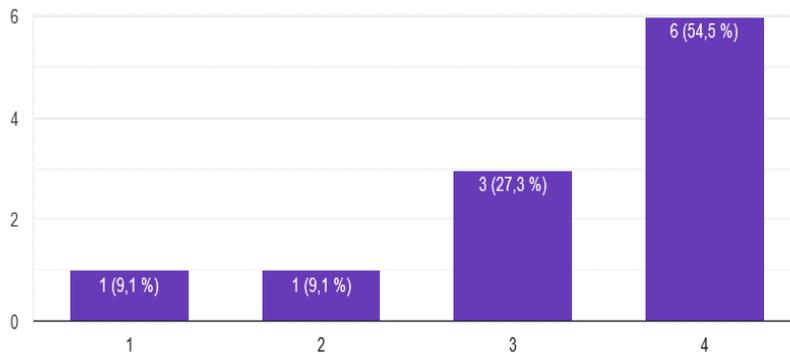11 people gave a feedback in the questionnaire. All of them were from the Judenburg e5-team and hence from Austria.

1. Do you find the display of attributes of pilot buildings not understandable - easy to understand?

1. Finden Sie die Anzeige der Attribute der Pilotgebäude

11 Antworten

The majority of the respondents found the display of the attributes of the pilot buildings understandable. The same goes for the attributes of the other buildings.

Do you have any suggestion for improvement?

Haben Sie Verbesserungsvorschläge?

6 Antworten

Adresse, Typ bei allen Gebäuden
als zusätzliche Informationen Energieausweise, Pläne, alle Basisdaten des Gebäudes - dabei aber Datenschutz berücksichtigen
Jahresverbräuche könnten dokumentiert werden, Energiebuchhaltung
Auf Objekt könnten Informationen zu Wartungen und Fristen, vorhandenen Konzepten (Brandschutz etc.) gelegt werden, sollten aber nicht öffentlich zugänglich sein

Baujahr des Gebäudes

Extended Attributes sollten immer aufscheinen

eigene Dateneingabe

Wärmeverbrauch in kWh/a oder MWh/a

The respondents would like to have more attributes not only for the pilot buildings, but for all buildings. Most importantly the object address should be displayed, also the year of construction and type of building (public, educational, industrial, residential…) plus filtering option is considered useful.

The extended attributes should be displayed automatically and not be hidden in the standard view. More specific data that should be displayed is energy consumption for heating and annual energy consumption in general. Also an application for energy accounting is suggested.

It should be possible that these data are entered by the users themselves, i.e. by the municipality.

As an additional benefit information about energy audits, building plans, all basic building data could be displayed in the attributes. For building management purposes it would be useful to link information about existing concepts (e.g. fire protection) and impending deadlines to the buildings. However, with this kind of information data protection regulations have to be taken into account (restricted access).

2. Would you prefer the attributes in local language?

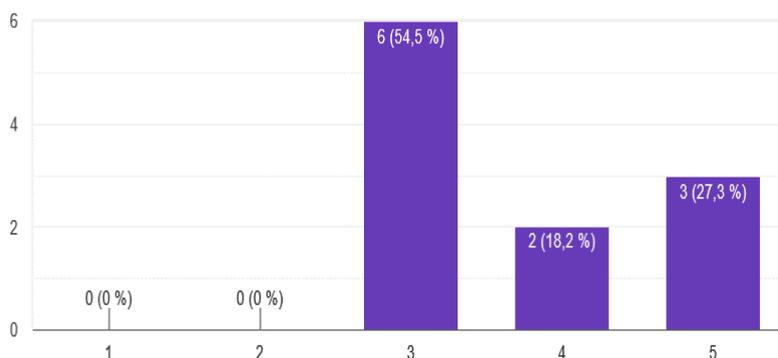### 2. Hätten Sie die Attribute lieber auf Deutsch?
11 Antworten

All respondents would like to have the attributes in German.

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

### 3. Finden Sie es einfach, die Attribute auszuwerten?
11 Antworten

Most respondents have chosen an average value, probably because of lack of real work experience with the tool. Almost as many find the attributes quite easy and very easy to understand and analyse.

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

4. Finden Sie die beiden Arten von Analyse (Filtern, Farbkodierung) nützlich?

10 Antworten
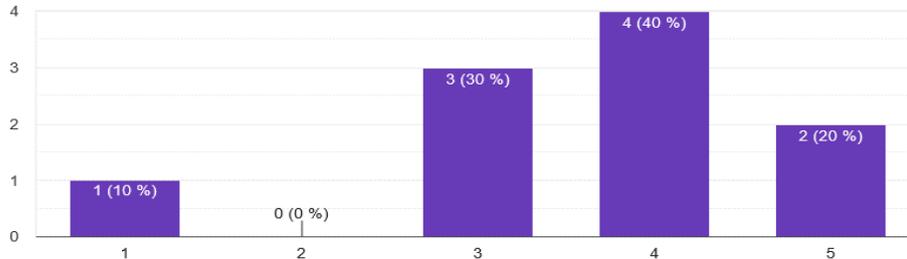
The existence of a filtering option is considered useful by all but one respondent. However, at the time of testing the filters were not displayed properly so the option could not be tried out to full extent. The positive values of the answer show the demand for a filtering option, though.

Do you have any suggestion for improvement?

Haben Sie Verbesserungsvorschläge?

4 Antworten

Filtermöglichkeiten nach Vorhandensein von Energieausweis, Energieversorgung, Gebäudetyp (öffentlich, Schule, Kindergarten, Wohnhaus, Wirtschaftsbetrieb...) wie im WebGIS

Filter wurden nicht angezeigt, für Farbcodierung fehlt Legende

eigene Eingabe von Attributen

Suggestions for additional filtering criteria are: existence of energy audit, kind of energy supply, building type (public, educational, kindergarten, residential, industrial. There is similar kind of filtering option in webGIS which is cited as an example.

There should be the possibility for the user to enter attributes.

It was noted that the filters were not displayed and that there was no legend for the colour coding.

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

5. Hätten Sie im Anhang zu den Gebäuden gern zusätzliche Dokumente, wie Therr

11 Antworten

- Ja.
- Nein.

100%

All respondents would like to have more information and related documents linked to the buildings. Suggestions for additional information are listed above.

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

6. Finden Sie 3D EMS brauchbar für die Beurteilung des energetischen Zustands vo

11 Antworten
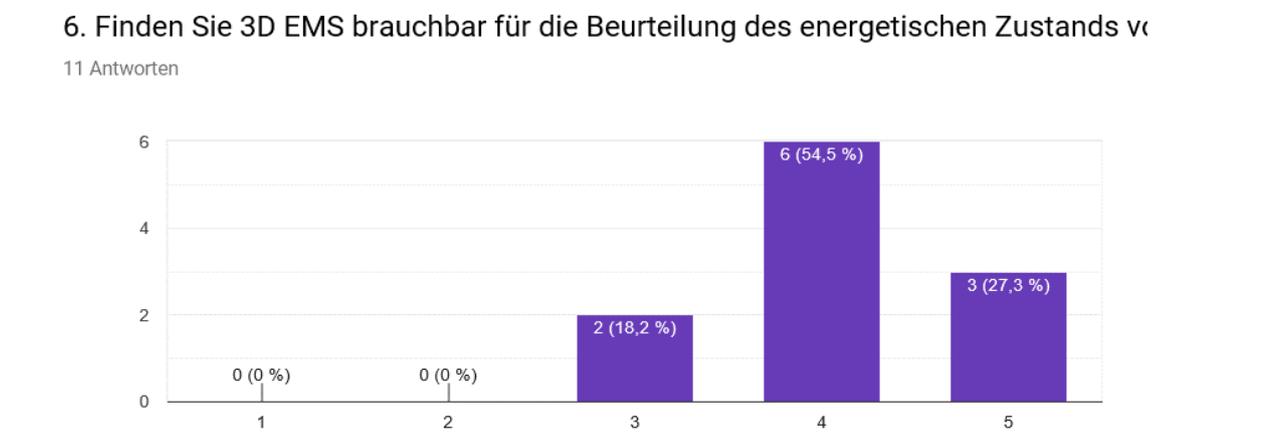
In accordance with the suggestions already given with other questions and the general favourable evaluation of the 3D EMS, most respondents find the tool useful for the assessment of the energetic performance of public buildings.
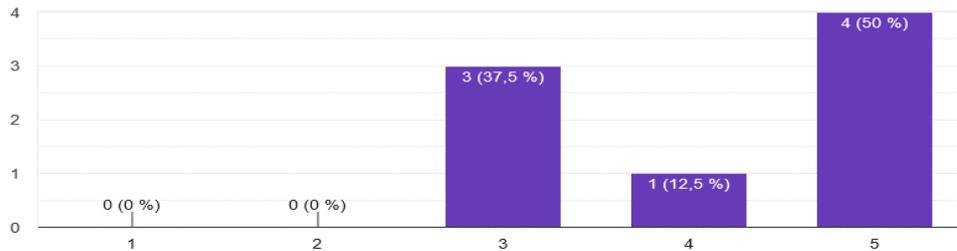
7. If more energy data were available, do you find the 3D EMS useful for delineating and prioritizing intervention areas/districts for large-scale, concerted and cost-effective investments aimed at building refurbishment?

8 Antworten

The 3D EMS is considered a useful tool to identify areas with potential for refurbishment and expansion of renewable energy sources, especially if there is a filtering option to display the distribution of district heating, gas, solar energy etc. This would require special filtering possibilities.

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

8. Halten Sie es für möglich, dass Sie 3DEMS in Ihrer täglichen Arbeit verwenden?

11 Antworten

- Ja.
- Nein.

Ja.
9 (81,8%)

18,2%
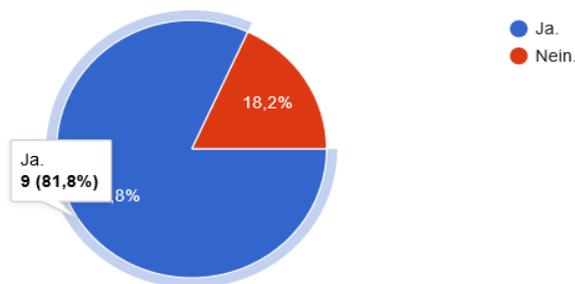
Nine out of ten people can imagine using 3D EMS in their work. The other two respondents who do not see any usage of the tool for them are probably team members who do not work in technical fields.

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

9. Würden Sie ein Seminar über die Anwendung des 3DEMS-Tools besuchen, wenr

11 Antworten

- Ja.
- Nein.

81,8%

18,2%
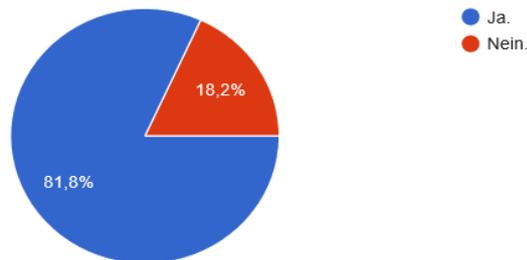
The same number of people who can imagine using 3EDMS practically also wish some schooling on how to use the tool and would attend a seminar if they had the possibility.

4. Conclusions and recommendations

Most members of the focus group said that they could imagine to use the 3D EMS tool under certain conditions.

They found energy use and energy planning the most suitable fields of usage, especially to visualize supply areas of district heating, gas and other heating fuels, the distribution of solar energy and PV and possible areas of expansion. The focus group also saw a potential use for city planners and architectural competitions. Also for building management purposes the tool is seen as potentially valuable if it is possible to link more specific building related information to the database and visualisation.

For private users the 3D visualization tool could be of general interest, and more specifically people who intend to purchase building land, buy or hire real estate can better assess the surroundings of the contemplated object (height of neighbouring buildings, shading situation, view).

The attributes should be available in German and expanded. As interesting information energy audits (links), kind of heating fuel, existence of solar systems and PV were mentioned. Most importantly the address of the building objects should be indicated.

The most important questions are how it is possible to continue using the tool after the end of the project and how data can be entered, maintained and kept up-to-date by the municipality themselves. Judenburg has collected extensive sets of energy and building related data which should be connected to the database underlying the 3D EMS. The challenge is to find a key which makes is possible to automatically combine different databases so that it is not necessary to enter additional data by hand which is too much effort. Most preferred is a conjunction of the 3D EMS database with the official address and buildings register which contains all commissioned buildings and addresses. It is online and maintained constantly and would therefore provide the best way to keep the database up-to-date.

5. Annexes

5.1. Annex 1: Online questionnaire

BOOSTEE-CE Nutzer-Feedback für 3DEMS

Formularbeschreibung

:::

Bitte wählen Sie Ihr Land aus:

☐ Österreich

☐ Kroatien

☐ Tschechien

☐ Ungarn

☐ Italien

☐ Polen

☐ Slowenien

1. Finden Sie die Anzeige der Attribute der Pilotgebäude

	1	2	3	4	
unverständlich	○	○	○	○	leicht verständlich.

Haben Sie Verbesserungsvorschläge?

Langantwort-Text

:::

2. Hätten Sie die Attribute lieber auf Deutsch?

○ Ja

○ Nein

3. Finden Sie es einfach, die Attribute auszuwerten?

	1	2	3	4	5	
Überhaupt nicht einfach.	○	○	○	○	○	Sehr einfach.

4. Finden Sie die beiden Arten von Analyse (Filtern, Farbkodierung) nützlich?

	1	2	3	4	5	
Überhaupt nicht nützlich.	○	○	○	○	○	Sehr nützlich.

Haben Sie Verbesserungsvorschläge?

Langantwort-Text

5. Hätten Sie im Anhang zu den Gebäuden gern zusätzliche Dokumente, wie Thermographieaufnahmen oder Energieausweise, sofern verfügbar?

○ Ja.

○ Nein.

6. Finden Sie 3D EMS brauchbar für die Beurteilung des energetischen Zustands von öffentlichen Gebäuden und die Erstellung von Visualisierungen, wenn mehr Energiedaten verfügbar wären?

	1	2	3	4	5	
Überhaupt nicht brauchbar.	○	○	○	○	○	Sehr brauchbar.

7. Wenn mehr Energiedaten verfügbar wären, finden Sie 3D EMS brauchbar für die Abgrenzung und Priorisierung von Gebieten, wo große Gebäudesanierungsprojekte durchgeführt werden sollen?

	1	2	3	4	5	
Gar nicht brauchbar.	○	○	○	○	○	Sehr brauchbar.

8. Halten Sie es für möglich, dass Sie 3DEMS in Ihrer täglichen Arbeit verwenden?

○ Ja.

○ Nein.

9. Würden Sie ein Seminar über die Anwendung des 3DEMS-Tools besuchen, wenn in Ihrem Land eines organisiert werden würde?
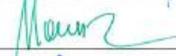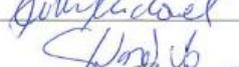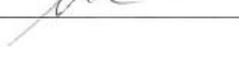
○ Ja.

○ Nein.

5.2. Annex 2: List of participants

Anwesenheitsliste

BOOSTEE-CE Focus group meeting 2.4.2019

Name	Unterschrift
EVA VOLKAR	
Florian Auer	
Heide Rothwangl-Heber	
OTTO MAUNZ	
CHRISTIAN MOSER	
Michael Reiter	
KAROLINE STRANER	
Horst Schvihwieger	
Helfried Kucile	
INGO WIESER	
ERWIN STAMHIESBACHER	