ComActivate

Enabling community action for energy sufficiency

Guidelines for developing 3D models

D6.4 | 14 September 2026

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Executive Summary

The ComActivate project focuses on reducing energy poverty for people living in multi-family apartment buildings (MFABs) in four pilot municipalities in Bulgaria, Hungary and Lithuania, among other, through the development of Neighbourhood Energy Sufficiency Roadmaps (NESR). A key tool in the development of the NESRs has been the creation of interactive 3D maps of the potential kWh/year savings, as well as other relevant buildings' envelope and energy parameters, in the building stock of each municipality should these buildings undergo renovation.

This report presents step-by-step guidance for the creation of 3D maps with the intention that a user with no prior GIS experience, such as a municipal planner or energy officer, can follow it independently to build their own 3D building stock models. It is intended as a practical, self-contained guidebook rather than a purely descriptive account of project activities.

Within ComActivate, applying this methodology has provided the demonstration sites in Burgas (Bulgaria), Budapest-Józsefváros (Hungary), Kaišiadorys and Elektrėnai (Lithuania) a clearer, more intuitive view of their residential building stock. This supports local authorities and project partners in identifying renovation priorities, communicating the scale and shape of interventions to stakeholders, and grounding the NESR in an up-to-date spatial picture of each pilot area.

The value of this approach, however, is not limited to the four pilot districts. Because the workflow relies on a standard, widely available GIS platform and a repeatable set of steps, it can equally be picked up by municipalities and local authorities outside ComActivate. Any city or district seeking to understand the height, shape and energy-saving potential of its building stock can follow the same steps to create its own 3D neighbourhood model, without needing specialist GIS staff or bespoke software.

The guidance provided in this report is designed to outlive the ComActivate project: it offers a low-barrier, transferable tool that other municipalities can adopt to support their own energy renovation planning, helping to extend the neighbourhood approach to energy poverty alleviation well beyond project's pilot sites.

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Introduction

The European Green Deal aims at reducing carbon emissions by at least 55% by 2030 compared to 1990. The building sector plays a crucial role in achieving this goal because it is responsible for 35% of energy-related greenhouse gas emissions[1] and 43% of energy consumption[2] in Europe. This calls for interventions at building and neighbourhood level which will minimise the absolute energy consumption and green the leftover energy used, to reduce related greenhouse gas emissions. In addition, more than 10% of citizens in the EU are categorised as energy poor.[3] Tackling energy poverty can include change of (collective) behaviour patterns of occupants, improvement of energy performance of the building, or increasing local green energy production to reduce energy bill costs.

Interventions can target single buildings and its occupants. This might be a renovation, ideally using low carbon materials (e.g. secondary materials, easily recyclable elements), changes of occupants' energy consumption user patterns, and of course the installation of renewable energy technologies at single building level. Another approach targets many buildings on a *neighbourhood* level (also referred to as district approach). The neighbourhood approach for tackling energy poverty and climate targets for a city goes beyond the named interventions, such as renovations, of just an *array of single buildings*. It considers indicators that concern the whole geographical urban area with its building stock, green infrastructure and people. Benefits of considering the entire neighbourhood include achieving economies of scale and thus cost-efficiency (e.g. prefabricated renovation elements, sourcing building materials from a close geographical area), tackling social cohesion, sharing energy among buildings with diverging user patterns (e.g. schools and residential houses) and thus profiting from cheap electricity rates, and the possibility to profit from systemic solutions such as district heating. Therefore, interventions for absolute energy reduction in buildings at neighbourhood level are more holistic and integrated and allow to harvest synergies of various social and environmental policy goals.

The European Commission identified the benefits of the neighbourhood approach and its potential, specifically to accelerate renovation rates to increase the energy performance of the building stock and at the same time to reduce carbon emissions in the building sector already in the early 2000s. On the EU level it was considered and mentioned in the Leipzig Charta[4] and the Renovation Wave[5] strategy and was also recognised in the 2024 recast of the EPBD[6] under mandatory indicators of the National Building Renovation Plan requirements for member states.

Member States interpret the concept of the neighbourhood renovation approach differently. Whereas in the Western EU countries multiple instruments to roll out the neighbourhood approach were implemented, in EU countries that joined after 2004 the building sector in general was not targeted in the first place.

ComActivate project (2023-2026) is interested in neighbourhood concepts to address the energy poverty in three pilot countries Bulgaria, Hungary and Lithuania with differing climate, legal, administrative and overall cultural circumstances. In four pilot districts in Burgas (BG), Budapest-Józsefváros (HU), Kaišiadorys (LT) and Elektrėnai (LT) neighbourhood energy sufficiency roadmaps (NESR) will be developed. Within those, the neighbourhood approach is specifically explored to achieve energy poverty alleviation through renovations.

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[1] European Energy Agency (2023)
[2] Rousselot and Pinto Da Rocha (2021)
[3] Widuto (2023). The ComAct project used the REACH project definition of energy poverty in D1.1.
[4] Bundesministerium des Innern und für Heimat (2020)
[5] European Commission (2020)
[6] European Union (2024, pp. 37–38)

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3D city models serve as the foundational spatial and geometric backbone for urban building energy modelling and NESRs, transforming energy sufficiency targets into localised, highly accurate, and actionable neighbourhood roadmaps. Unlike traditional 2D maps or isolated single-building energy audits, 3D models capture the complex physical reality of a neighbourhood. This spatial context is vital for transitioning urban districts toward neighbourhood energy self-sufficiency goals.

3D modelling enables neighbourhoods to visualise and analyse consumption patterns, streamlining the optimisation of (public) funds dedicated to renovation. It facilitates sustainability analysis, performance-driven design, and multi-stakeholder coordination at urban scale, transforming planning concepts into quantifiable metrics that support evidence-based decision-making.

This report provides step-by-step instructions for accessing the web map, editing existing features, drawing new objects, entering mandatory height parameters, and viewing the final extruded models in a 3D application.

Together with other project tasks and reports, this report will help demonstration sites develop approaches to reduce energy poverty in MFABs. The aim of this analysis is to enable relevant authorities to establish efficient and effective policy & finance mechanisms enabling large-scale investments in residential sector of final energy consumption. Each analysis will serve as a reliable planning tool, enabling local authorities to get clear insight in entire residential stock on their territory and scope of pertaining energy-saving and emission-reduction needs and opportunities.

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3D models of neighbourhoods to support renovation

Digital, three-dimensional neighbourhood models present a copy of the buildings, streets, and open spaces in a designated geographical area, designed to be viewed on a computer.

It is a virtual map that shows height, shape, and depth, a mix of photos, measurements, and computer graphics and, at the same time, a tool users can use to rotate the viewed area, zoom in/out or walk through digitally.

The purpose of the 3D model is to show how a place looks from any angle, to test ideas before building them in real life, as well as to help people see space and distance better than a flat map.

In the context of the ComActivate project's work to support the renovation of MFABs to improve their energy efficiency and sufficiency, the guidance provided below is for the creation of 3D models that display the potential energy savings that would come from renovation.

These kind of maps, in addition to the geographic locations of the buildings, visually show their parameters, as well as their comparison between other buildings in the target area. These parameters include:

• buildings geometry • heating system and energy sources • energy needs and savings (heat required in current state of building, specific heat required in current condition of building • heat required after insulation of outer walls • potential saving after insulation of outer walls • heat required after insulation of roof/ceiling • potential saving after insulation of roof/ceiling • heat required in after replacement of windows and doors • potential saving after replacement of windows and doors	• heat required in after insulation of floors • potential saving after insulation of floors • potential saving after all architectural measures • heat required after all architectural measures • specific heat required after all architectural measures and total savings by architectural measures • CO_2, SO_2 and NO_2 emission parameters • investments needed • thermal conduction coefficients at current state and after performance of energy efficiency measures

How to build a 3D model of a neighbourhood

Following the example outlined in this guidebook, anyone can build their own 3D model, taking two key provisions into account:

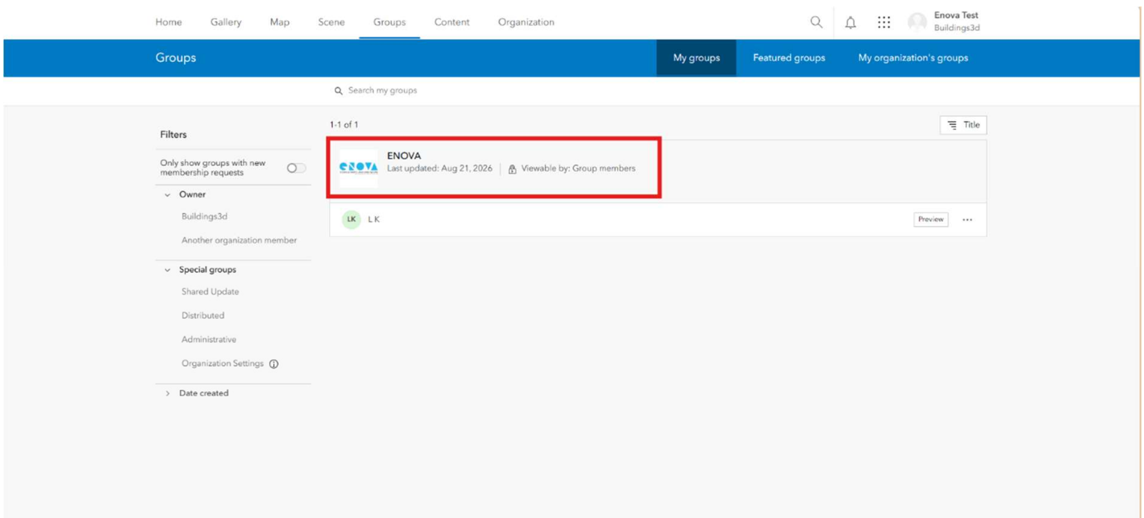
First. that the license to access an appropriate platform for building the model must be purchased, which provides a username and a password. This is a so-called **User Type Contributor subscription license**, which provides the end user (in this case the city) with a workplace for entering and changing data.

Second, the prerequisite for making any such 3D model is to have conducted an analysis of the existing building stock in order to have the required parameters that need be entered into the model. The example of the parameters of interest was outlined in the table in previous chapter.

Accessing the map and layers

Step 1: Select the working group

After logging into the system positioned on an appropriate web platform (in this case https://gdi.ba/portal/home/), **navigate to the main menu** at the top of the screen and click on the **Groups** tab. From your list of available groups, click on the group named **ENOVA**.



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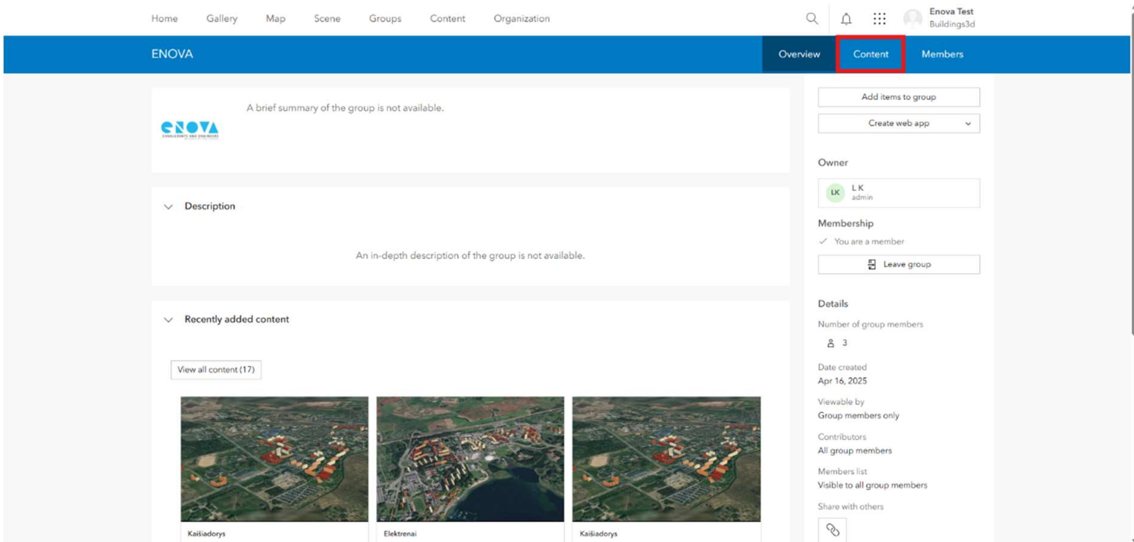
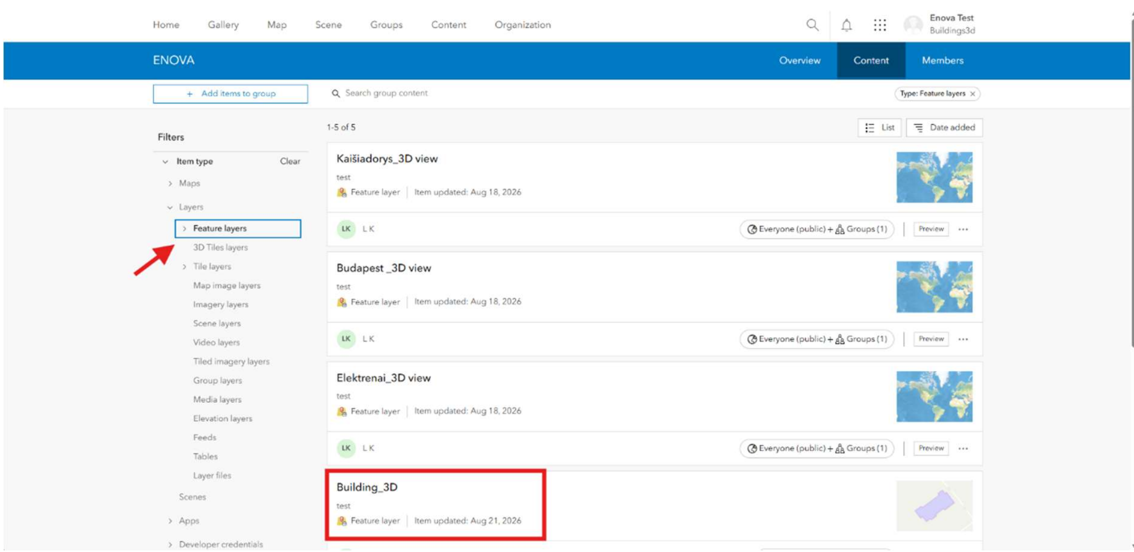
Step 2: Access group content

Once you are on the ENOVA group page, look at the secondary blue navigation bar and click on the **Content** tab to view all the items shared within this group.



Step 3: Filter and select the feature layer

In the left-hand panel under **Filters**, expand the **Layers** section and click on **Feature layers**. This will filter the content list. In the main view, locate the feature layer named **Building_3D** and click on it to open its details page.



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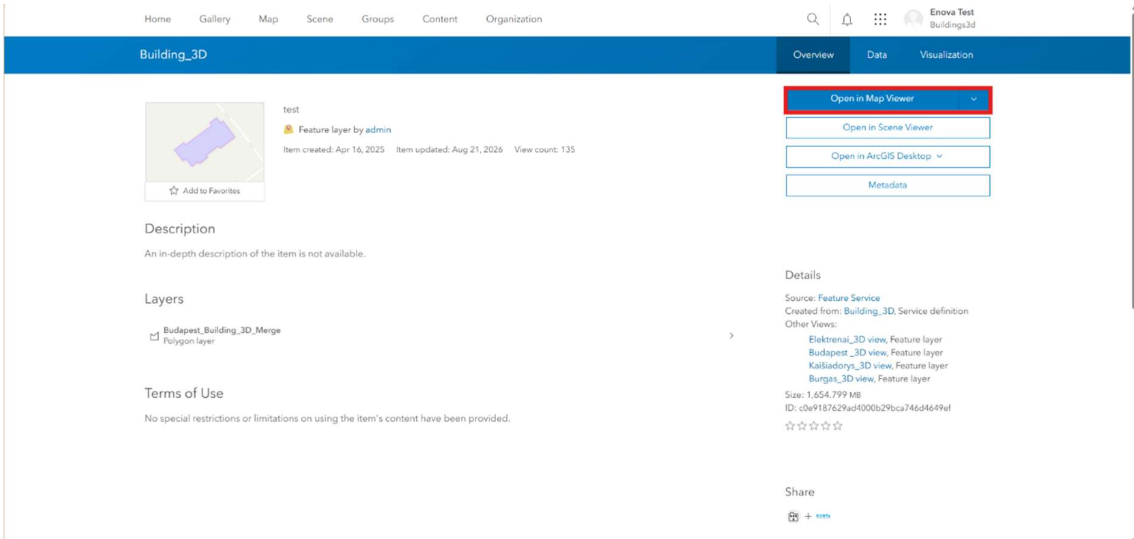
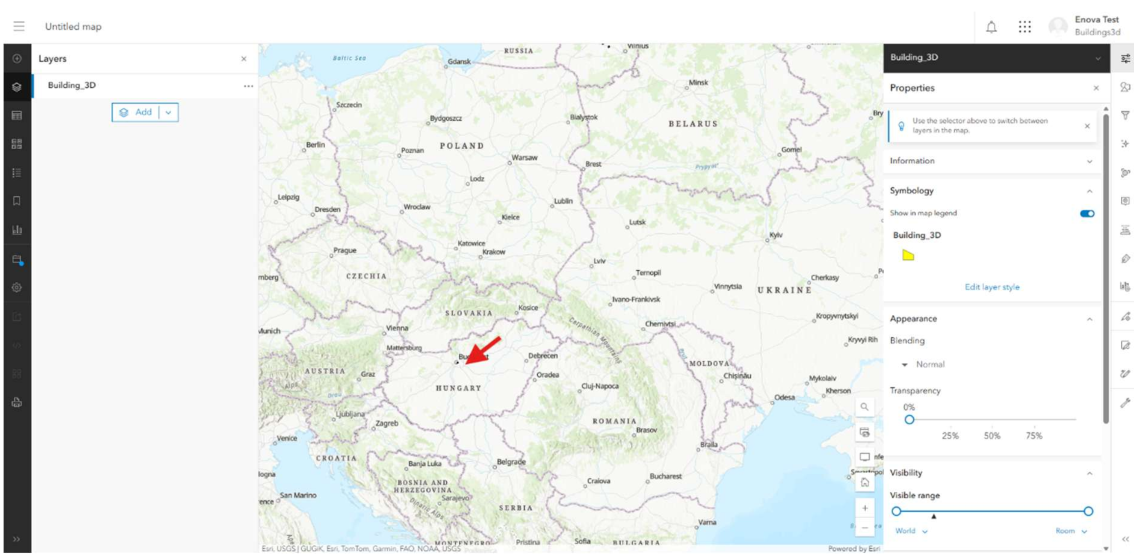
Step 4: Open the map viewer

On the Building_3D item details page, locate the blue button on the right side of the screen. Click the dropdown arrow on it and select **Open in Map Viewer**.



Step 5: Navigate to the location

Once the map interface loads, use your mouse wheel or the on-screen zoom controls to zoom in and **pan the map to your target location** (e.g., Budapest), ensuring the existing building footprint layers are clearly visible on the screen.



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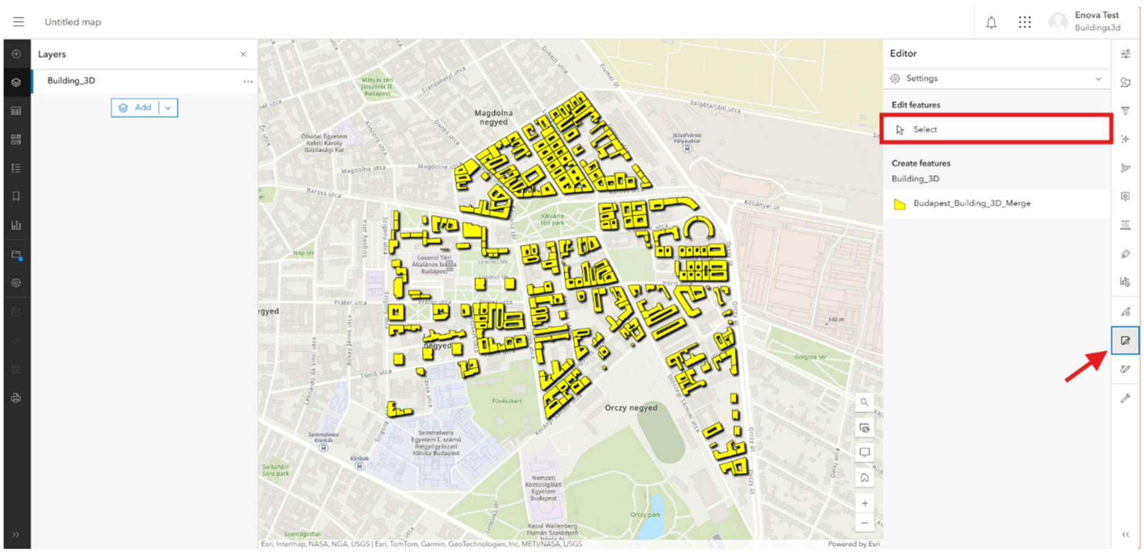
Editing existing features

Step 6: Activate the selection tool

To modify a building that is already on the map, click the **Edit** icon (the pencil symbol) located in the right-hand vertical toolbar. Then, in the panel that opens under Edit features, click on the **Select** tool (the cursor arrow icon).



Step 7: Update attribute data

Click on the specific building footprint you want to edit on the map (it will be highlighted with a blue outline). An attribute form will open in the right panel. **Update the necessary fields**, such as Ground area m^2, and then click the blue **Update** button at the bottom of the panel to **save your changes**.

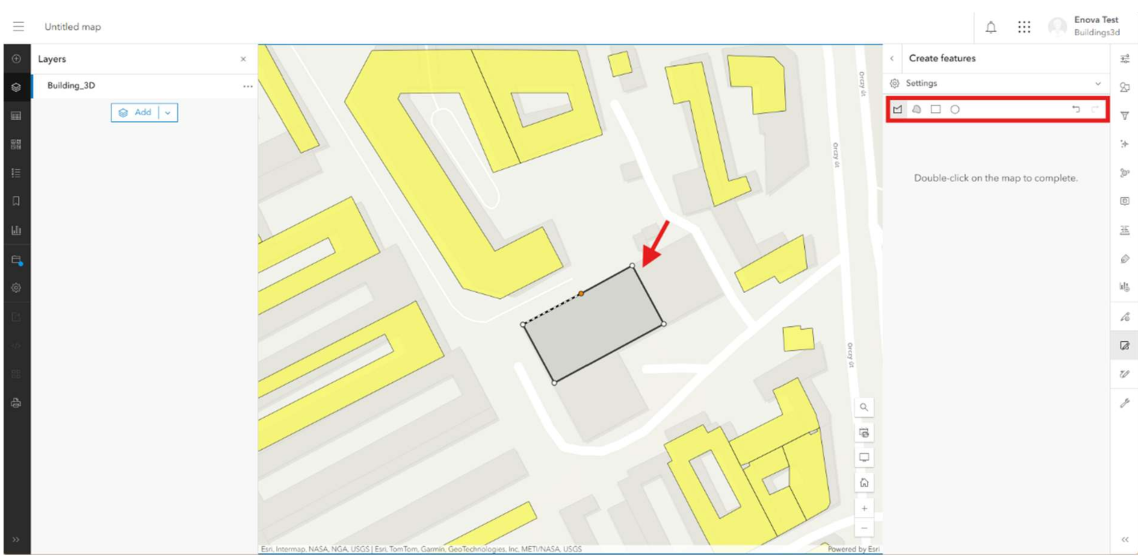
Drawing new features and entering critical data

Step 8: Select the drawing template

To draw a completely new building, make sure the Edit panel is still open. Under the **Create features** section, **click on the specific layer template** (e.g., Budapest_Building_3D_Merge). This will activate the polygon drawing tool.

Step 9: Draw the 2D geometry

Move your cursor to the map and **click to place the corners (vertices) of the new building footprint**. Connect all the corners to form the shape of the building, and **double-click when placing the final point** to complete the polygon.



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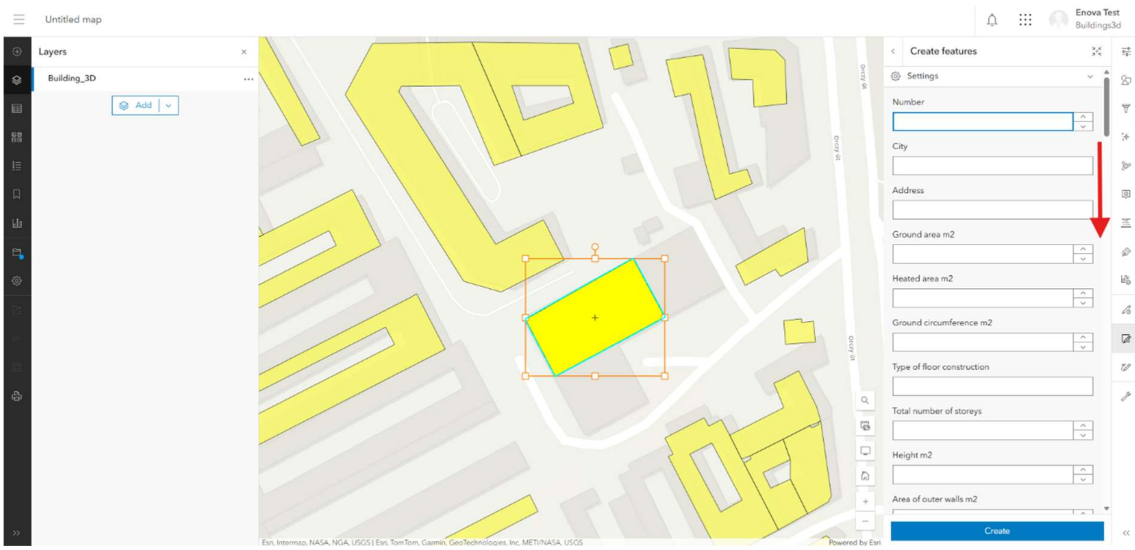
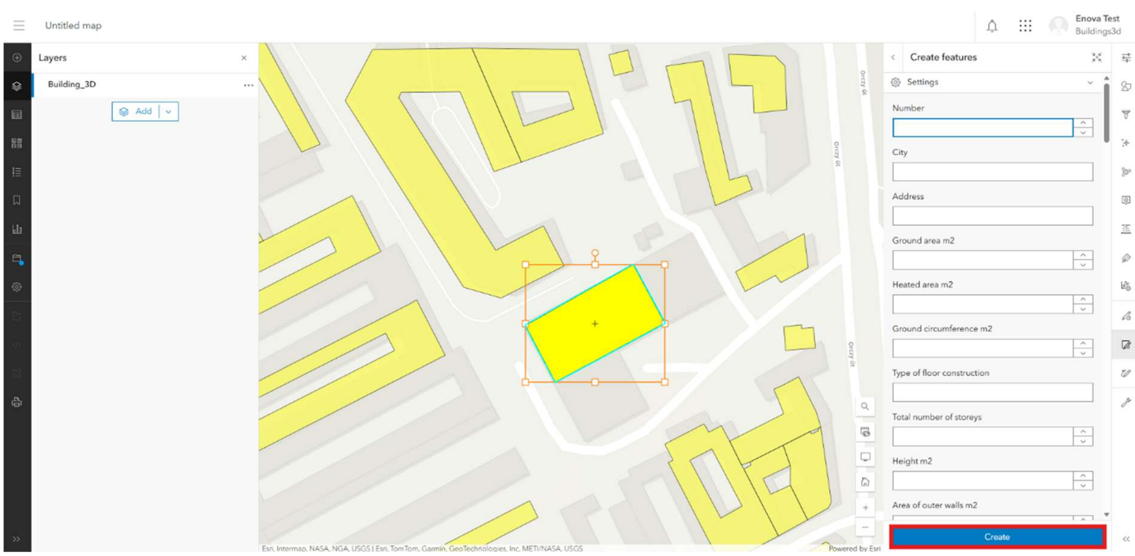
Step 10: Scroll to required attributes

Immediately after double-clicking to finish the drawing, an attribute entry form will appear in the right panel. Use the scroll bar (as indicated by the red arrow) to scroll down and reveal all the available data fields.



Step 11: Enter the height and create

The mandatory fields for the 3D model have to be filled in to generate it properly. Find the **Height m^2** field and enter the exact height of the building. **Fill in other relevant fields (e.g. Ground area m^2)**, and finally, click the blue **Create** button at the very bottom to save the object to the database.



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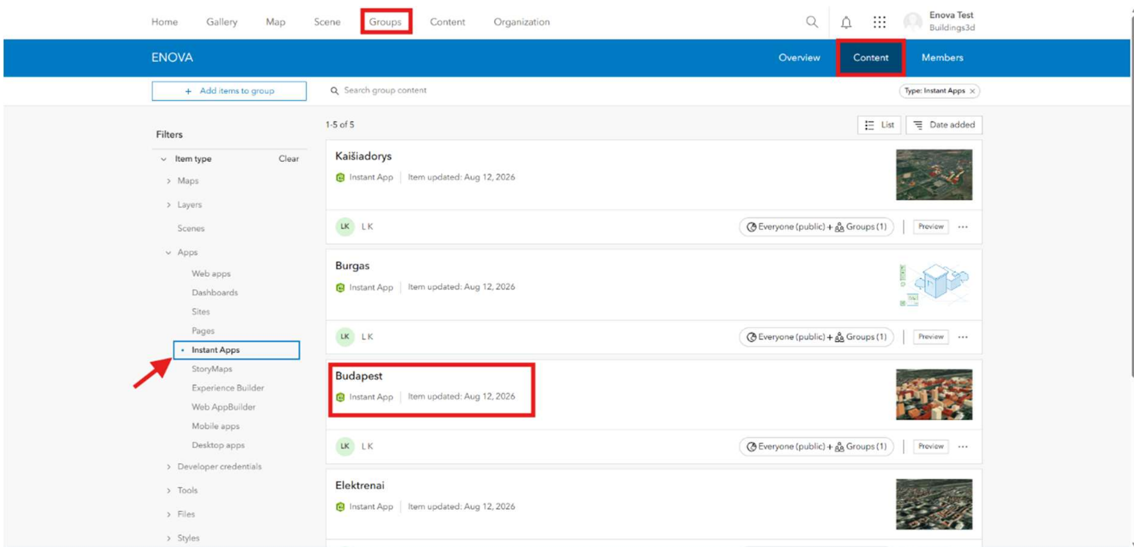
Viewing the extruded 3D object

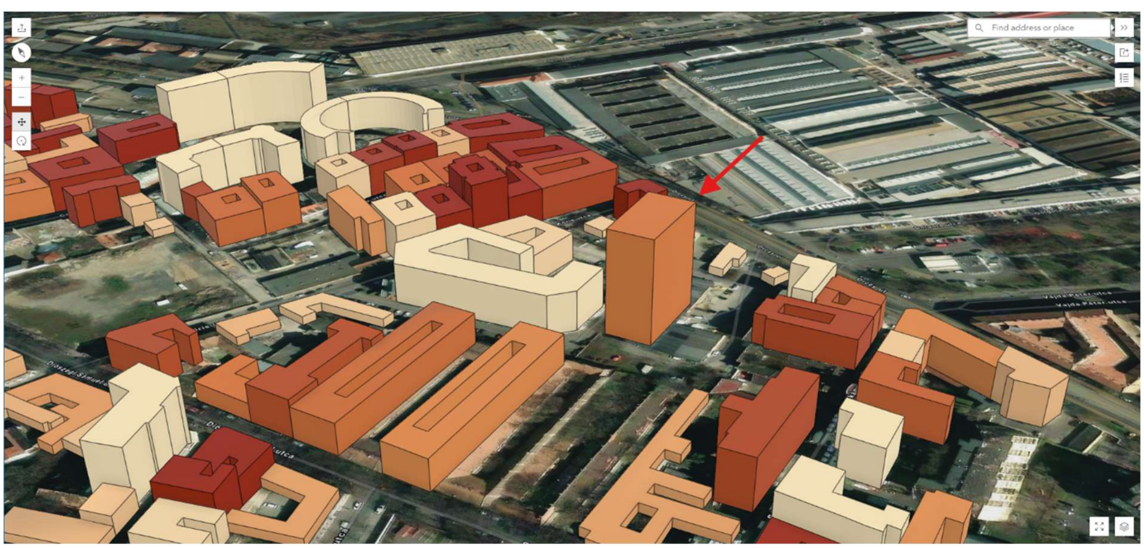
Step 12: Launch the 3D instant app

To view your newly drawn building in 3D, return to the Content tab of the ENOVA group (as done in Step 2). In the left **Filters** menu, expand **Apps** and select **Instant Apps**. Find the 3D application for your specific city (e.g., Budapest) and **click on it** to open the scene.



Step 13: Verify the 3D extrusion in the scene

Navigate within the 3D application to the location where you drew the new footprint. Newly created building properly extruded into a 3D block can now be seen, correctly matching the height parameter assigned in Step 11.



Using the 3D model

3D city models act as a digital blueprint that helps neighbourhoods plan how to become self-sufficient in energy. Unlike flat 2D maps or single-building checks, 3D models show the true physical layout and shape of an entire area. This makes it easier to track energy use, spend renovation funds wisely, and help city planners, designers, and residents make smart, data-driven decisions.

These maps show more than just where buildings are located. They let users compare key details for every building in the target area, both in their current state and after making energy improvements. Specifically, the following parameters can be visually seen and compared:

- Building shape and size: The physical geometry of each structure;
- Energy and heating: Current heating systems, energy sources, and overall energy needs;
- Financials and savings: The money saved on energy and the investments required for renovations;
- Environmental impact: Greenhouse gas emissions;
- Insulation quality: Thermal conduction coefficients (how well a building keeps heat in).

Imagine a city where many low-income residents live in older, poorly insulated apartment buildings. These families face energy poverty, spending a massive chunk of their income just to stay warm. The city has a limited budget for insulation grants, but they do not know which buildings need help most urgently. Instead of opening a generic application portal where wealthier landlords might apply first, the city uses these 3D maps to proactively pinpoint the most vulnerable "cold spots." They can then directly deploy public funds to insulate those specific high-risk buildings, lowering energy bills for the residents who need it most.

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