



*Risk reduction for Building Energy Efficiency investments*

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## EEnvest search&match guidelines

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research

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## List of abbreviations and acronyms

<b>ICL</b>	Intelligent Community Lifecycle
<b>CC</b>	Collaboration Cloud
<b>CIM</b>	Community Information Model
<b>PIM</b>	Portfolio Information Model

---

# 1 Introduction

## 1.1 SCOPE OF THE EENVEST PLATFORM

EEnvest web platform act as a marketplace and bridge the gap between building owners, interested in upgrading their buildings for reducing energy consumption, and investors that are willing to provide the capital investment that generates profits through savings and energy efficiency. In parallel, the platform will promote investing in energy efficiency in buildings by making the initial investment risk analysis simple and attractive for the potential investors. The focus is on commercial office buildings, while the solution will be scalable to be applicable to large databases and other building types globally. Finally, a blockchain validation mechanism will ensure the validity of the data in the platform, allowing the investors to trust that there's no reliance on a 3rd party or there's no data tampering on the platform.

## 1.2 GENERAL WORKFLOW AND CONCEPT

The platform is based on a Search & Match concept, that allows the different users (or actors) to contribute in the growth of the platform. The EEnvest Search & Match will operate fully on the cloud and will be accessible by the actors via a web User interface on a Web browser, responsive to all types of screens and devices.

The workflow behind the EEnvest Search & Match is the following:

1. The Project Owner logs into the portal and uploads information which is describing their building and potential retrofit project
2. Data is initially stored on a centralised cloud database
3. Once ready Calculation of KPIs is triggered by the Project Uploader/Viewer
4. The EEnvest calculation model is activated, it collects all necessary data from the database, calculates risks and KPIs and returns results to the database
5. Results are ready for display to the user Project Uploader/Viewer, who selects if they want to publish their project to the investors or not
6. To ensure the integrity of the data a blockchain validation mechanism is triggered which encrypts all the data and the calculation model
7. The encryption message is stored as a new transaction on a public blockchain (e.g. Ethereum)
8. Public blockchain nodes verify the transaction
9. The User Interface automatically requests a check that stored data is validated, generates encrypted message and compares it with the one stored in public blockchain
10. Investor is ready to view the public projects in the User Interface and filter/customise results to find the best investment option based on their needs

The host of the User Interface of the EEnvest Search & Match platform is the IES Collaboration Cloud, described in paragraph 2, while the host of the cloud database and risk assessment models is the Microsoft Azure<sup>1</sup>.

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<sup>1</sup> <https://azure.microsoft.com/en-us/>

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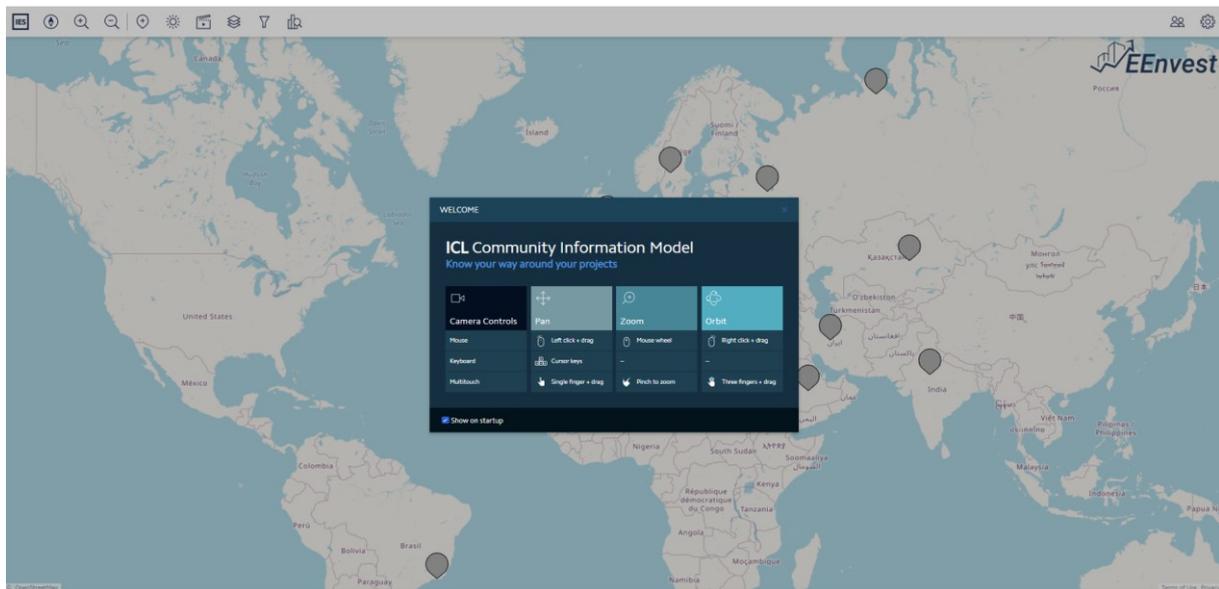
## 2 Host platform – IES Collaboration Cloud

The EEnvest Search & Match platform is developed based on the existing infrastructure of the IES Collaboration cloud<sup>2</sup>.

The ICL<sup>3</sup> Collaboration Cloud (CC) is a cloud-based information ecosystem of tools that facilitates the storage, retrieval, querying, manipulation, management and visualisation of urban models. CC tools are components of the Intelligent Community Lifecycle (ICL), a digital twin technology developed by IES to create virtual interactive models of any built environment and the visualisation of key performance indicators and data. The CC can scale from an interactive 3D environment that uses live data feeds from any ICL tool for community engagement with the digital twin to integrated view across communities at a national or even global level.

From a technology perspective the CC can be broken down into the following parts:

- Access API – A web API that allows the outside world to communicate with the CC.
- Data store - using Postgres.
- 2D - 3D viewer - a client of the Web API - can be run in a browser that supports WebGL.



**Figure 1:** *The ICL collaboration cloud, view of the Community Information Model (CIM)*

The ICL CIM tool has been repurposed to suit the needs of the Search & Match platform according to the specifications identified during EEnvest project.

It is recommended that the CIM is accessed via the Google Chrome web browser<sup>4</sup>.

### 2.1 CIM WELCOME SCREEN

When the user clicks to open a project, the first thing that is seen on the iCIM project is the welcome page. This welcome page helps to understand how to navigate around the project in iCIM.

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<sup>2</sup> <https://www.iesve.com/icl/collaboration-cloud>

<sup>3</sup> <https://www.iesve.com/icl>

<sup>4</sup> <https://www.google.com/chrome/>

---

For Pan, Zoom and Orbit navigational options for mouse, keyboard and multitouch are provided for ease of working.

- Pan: is used to move left or right when viewing the model
- Zoom: is used to move closer or move far away from an object in the model
- Orbit: is used to change viewing plane in the model

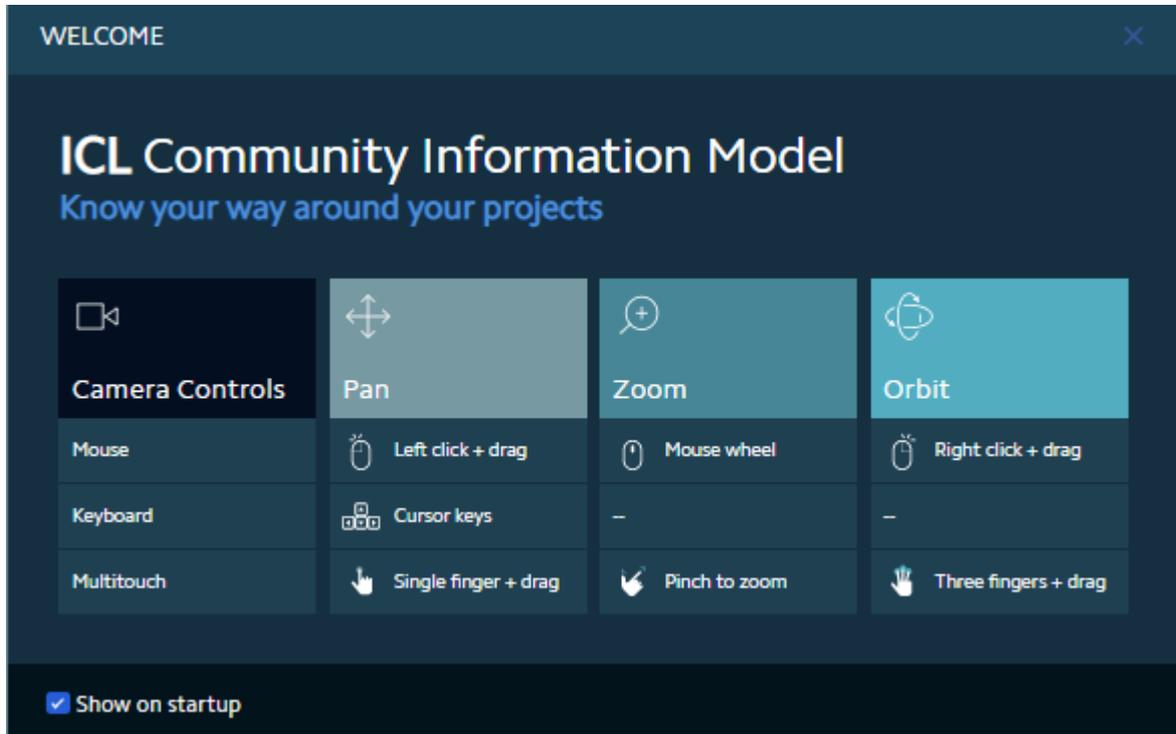


Figure 2: CIM welcome screen

## 2.2 CIM TOOLBAR

On the top left of the CIM tool there is a toolbar, as seen below.



The toolbar consists in the following tools :

 **Home**

It indicates the direction of the view, that can not be changed.

It is also used to revert the model back to the original opening/welcome page position i.e. World map view.

 **Zoom**

These icons allow to zoom in and out on the map.

 **Sun**

---

This is used to generate shadows for the 3D model. This function is not used in the current version of the EEnvest platform.

### **Layers**

This shows all the layers present in the model such as Roads, Hard Landscapes, Soft Landscapes, Water Bodies, Buildings, and Boundaries etc. This function is set up by the administrator.

### **Custom Object**

This function allows to create a new custom object, EEnvest project. The iCIM Project Viewer is not allowed to use it.

### **Scenes**

The user can create new scenes based on the way they want to view the model. Any number of scenes can be created and saved for future use.

### **Filters**

This function has to be used in conjunction with the Analysis tool. This option is used to create specific data views in the platform. The projects which satisfy the filter condition will be displayed while all the others will appear in grey.

### **Analysis Inspector**

The Analysis Inspector uses thematic rendering to view data in the platform. Thematic rendering is used to colour the pins based on a specific attribute, such as energy consumption, building total floor area and any other numerical or categorical attribute.

## 2.3 MULTILINGUAL SUPPORT

The CIM tool is translated to all languages available using the Google translate function that is built in the Google Chrome browser, or available as add-in in any other browser.



Home > Extensions > Google Translate



### Google Translate

Offered by: [translate.google.com](https://translate.google.com)

★★★★★ 43,856 | Productivity | 10,000,000+ users

Available for Android. [Get it.](#) | By Google

Figure 3: Google translate tool in Chrome Browser web store

Once installed in the Chrome browser, the whole EEnvest project in CIM can be translated to all the languages supported. The screenshots below show the EEnvest project translated to Greek language using Google translate.

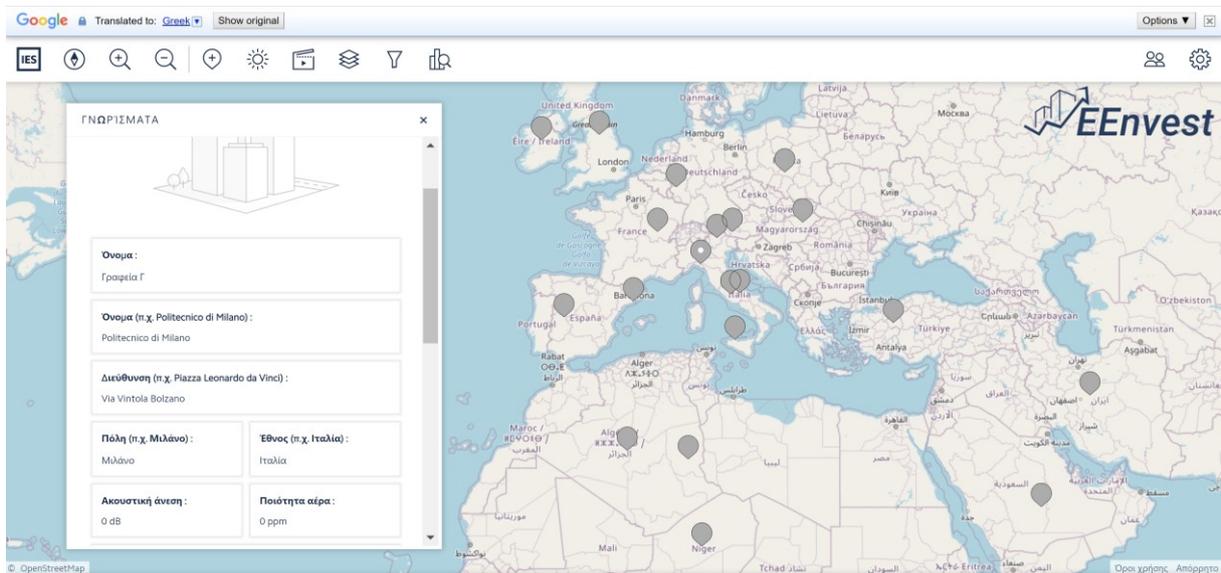
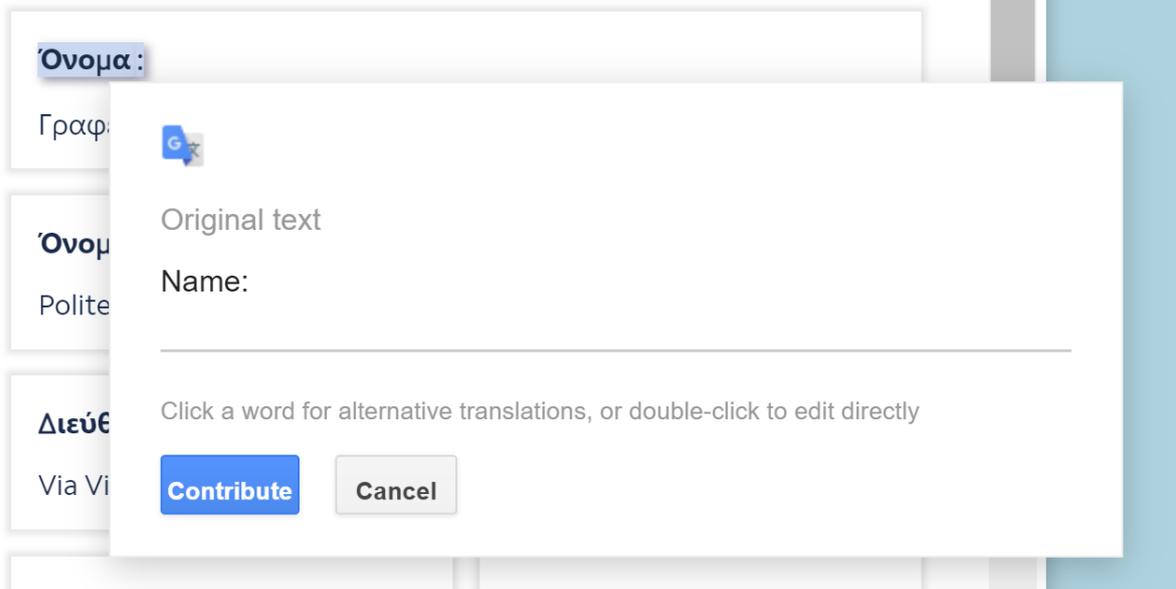


Figure 4: CIM translated to Greek language



**Figure 5: Translations showing original text**

---

## 3 EEnvest Platform in CIM

### 3.1 THE EENVEST ROLES

Two are the main roles as the end-users of the platform, besides an administrator that has full control of the platform. These are:

- The Project Owner that seeks for investment in their building’s renovation project and advertises their project in the platform by using the de-risking calculation model.
- The Investor that can navigate to see all the renovation project opportunities advertised in the market place and select the best investment project based on their needs.

Below are the profiles of our two potential users:

The Project Owner can be either an occupant or a landlord that has identified that their building needs to be retrofitted for energy efficiency to benefit from energy savings and potential value increase. The Building Owner has performed an audit of the status of the building, including identifying the current status, potential retrofit scenarios and their associated energy savings. The only piece missing in the Building Owner’s puzzle is to calculate the metrics and quantify the risks associated to their potential investment. The Building Owner might be a self-investor of their own funds or someone that wants to attract investors that can fund their project and generate income from the energy savings.

The Investor can be a person that represents a financial institution or a fund, interested in investing in promising projects that can bring back revenue with reasonable risk and payback time. The investor is trying to find the best investment opportunities with quantified risks and, while possessing great interest in mitigating climate change though “green” investments they are still sceptical about investments in building energy efficiency retrofit project. The investor wants easy and reliable information about investment indicators and risks related to such project, connect with potential Building Owners and trust that the data they process is genuine.

The EEnvest roles described in 1.2 are translated to end-user roles in the Search & March Platform

EEnvest Name	CIM Name	Description
Search and match Platform	EEnvest Project	In the iCIM ecosystem, EEnvest Platform is an iCIM project
Administrator	Project Owner	The EEnvest administrator has the role of Project Owner in the EEnvest Project
Building Owner/Project Promoter	Project Contributor	The EEnvest Project Owner has the role of Project Contributor in the EEnvest Project
Investor	Project Viewer	The EEnvest Investor has the role of Project Viewer in the EEnvest Project
Project	Custom Object	An EEnvest Renovation Project is called Custom Object in the platform
Building Data	Attribute	The Building Data are called Attributes in the platform
Risk Calculation	Action	

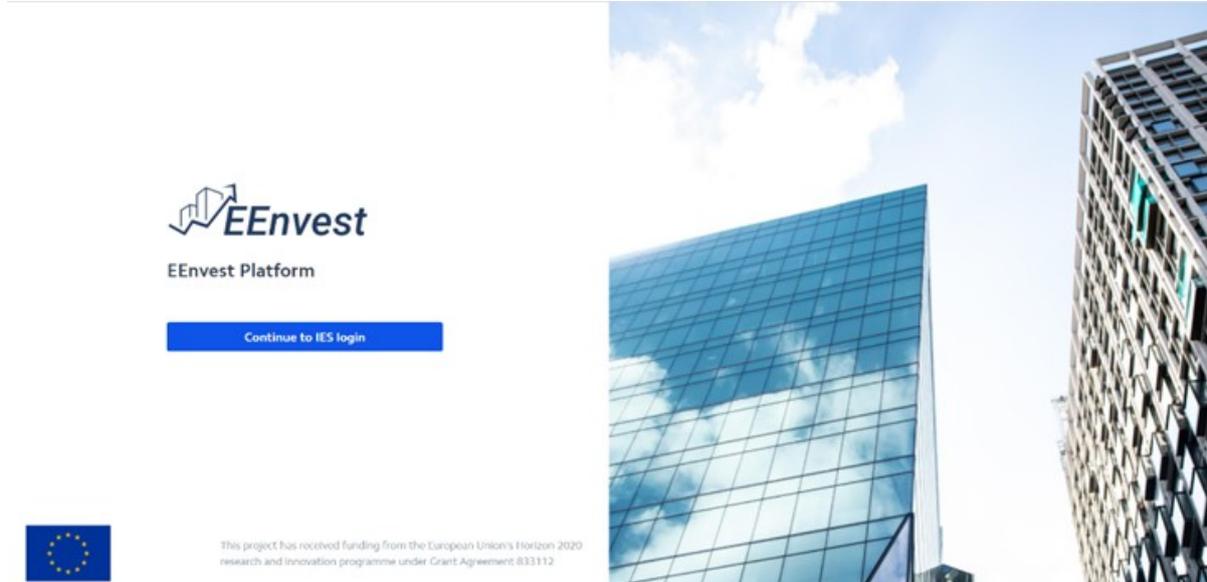
In the Annex 1 all the roles are described together with their permissions. In the current version of the EEnvest platform, the role is assigned by the administrator.

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## 3.2 HOW TO ACCESS EENVEST SEARCH AND MATCH (ALL USERS)

The EEnvest platform can be accessed [HERE](#).

From the EEnvest Search & Match Home Page, click on ‘Continue to IES login’.



This action will automatically lead to the Sign in page. If it is the first time that you access the tool, a new IES account is required to be created. Click on “Click here to register” button, as seen below.

IES

### Sign in

Not registered? [Click here to register](#)

Email

Password

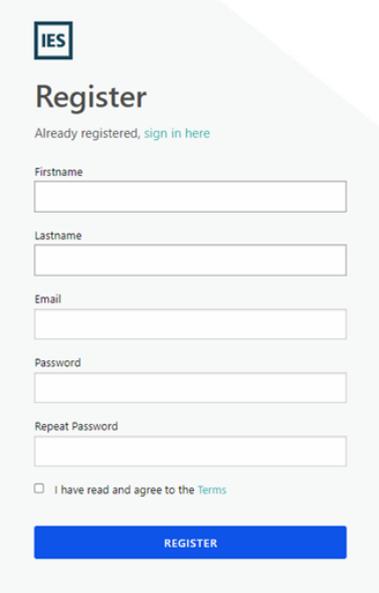
[LOGIN](#)

[Forgotten your password?](#)

In case you forgotten your password, click “Forgotten your password” to recover it.

---

In registration page it is possible to create a personal account, by inserting name, email, and password.



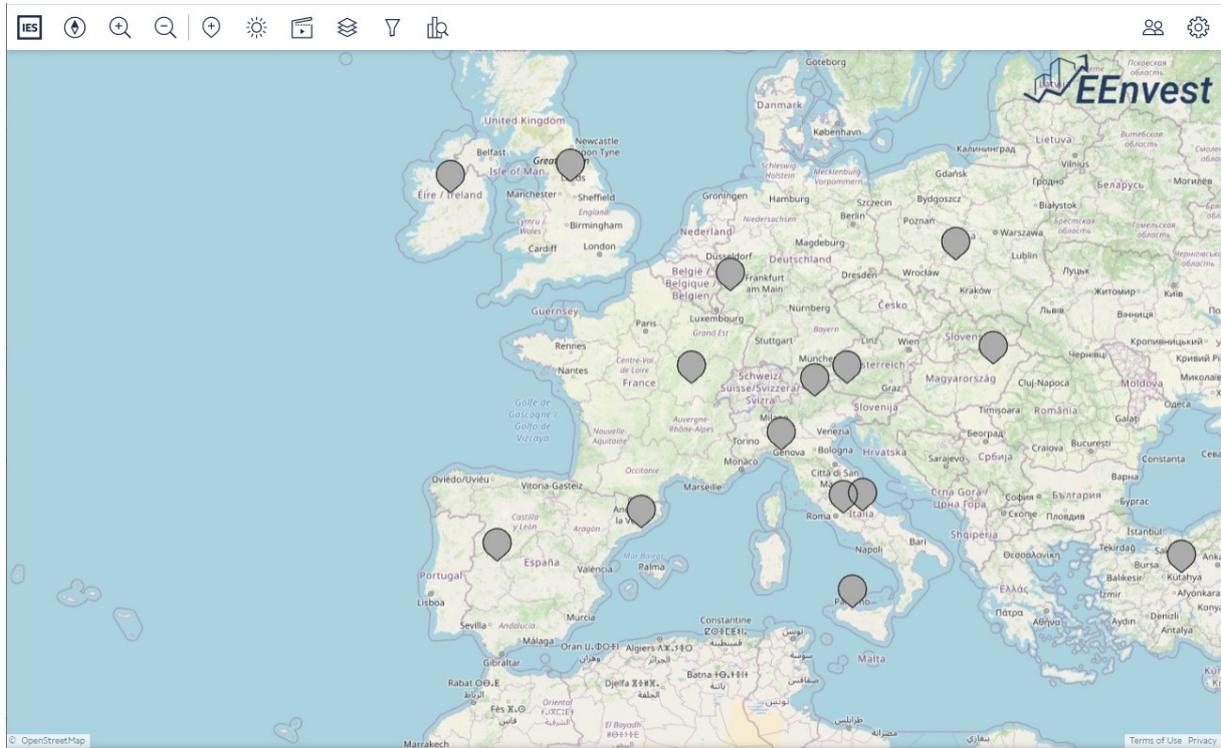
The image shows a registration form for IES. At the top left is the IES logo. Below it is the heading "Register" and a link "Already registered, sign in here". The form contains five input fields: "Firstname", "Lastname", "Email", "Password", and "Repeat Password". Below the fields is a checkbox labeled "I have read and agree to the Terms". At the bottom is a blue button labeled "REGISTER".

Once the account is created, return to the EEnvest home page to Sign in as described above. The Privacy Policy and Terms of use are found in the Annex. The creation of IES account is free of charge.

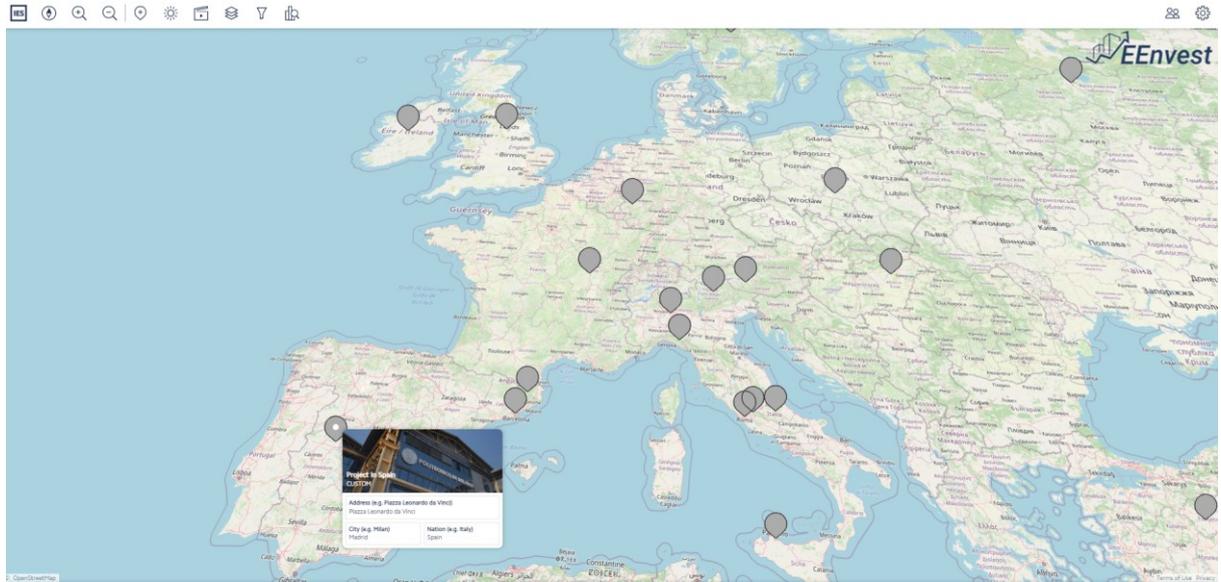
In the current version of the EEnvest platform, the role is assigned by the administrator. Once the IES account is created, the user is advised to contact the EEnvest representative to declare their role in the platform (Investor or Project Owner).

## 4 Investor Workflow

Once logged in to the EEnvest platform as an investor, the following scene appears on the screen:



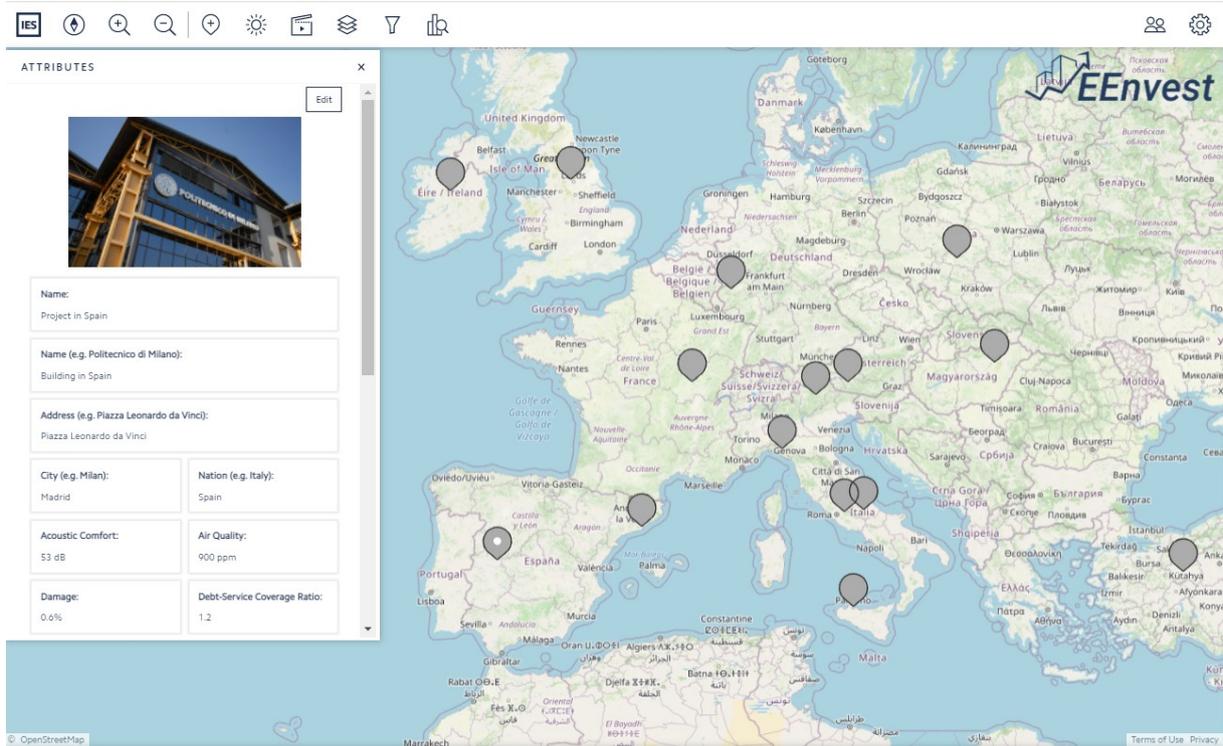
The grey pins in the map represent the EEnvest renovation projects advertised in the marketplace by the building owners, and can be selected. Hovering over a pin reveals a white dot in the pin and a window some basic information about the building.



Upon clicking the pin, the Attributes panel of the building is popping-up as seen below. The pin is

formatted again with a white dot in the middle.

## 4.1 VISUALISING DATA AND RESULTS



The attributes panel is displaying the project information together with the EEnvest KPIs for the de-risking of the renovation project, calculated using the EEnvest Risk Calculation Model.

The attributes panel is also displaying the clickable URL to download:

- The EEnvest Risk Calculation Report in PDF format
- The Digital Report, verified using blockchain technology in JSON format

More details are found in paragraphs 4.4 and **Errore. L'origine riferimento non è stata trovata..**

## 4.2 FILTERING BASED ON RESULTS

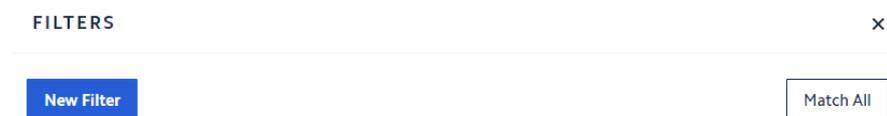
The projects can be filtered based on their attributes using the Filters tool.



This option is used to create specific data views in the platform. The projects which satisfy the filter condition will be displayed while all the others will appear in grey or not appear at all.

To create a filter:

- Click on the Filter icon and 'New Filter'



- Select an attribute from the drop down list

The screenshot shows a dialog box titled 'FILTERS' with a close button (X) in the top right corner. Below the title bar, there are three dropdown menus, each labeled 'Select...' with a downward arrow. The first dropdown menu is highlighted with a red rectangular box. Below the dropdowns, there are two buttons: 'Save' and 'Cancel' on the left, and 'Add Condition' and 'Match All' on the right. A trash icon is located to the right of the third dropdown menu.

- Select the condition in the second drop down list

The screenshot shows the same 'FILTERS' dialog box. In this view, the second dropdown menu is highlighted with a red rectangular box. The other elements, including the first and third dropdown menus, the 'Save', 'Cancel', 'Add Condition', and 'Match All' buttons, and the trash icon, remain the same as in the previous screenshot.

- Insert the value/variable in the third space
- If desired, press 'Add condition' to create another condition related to the same filter, by following the same procedure described above.

The screenshot shows the 'FILTERS' dialog box with three dropdown menus. The 'Add Condition' button, located below the second dropdown menu, is highlighted with a red rectangular box. The other elements of the dialog box are consistent with the previous screenshots.

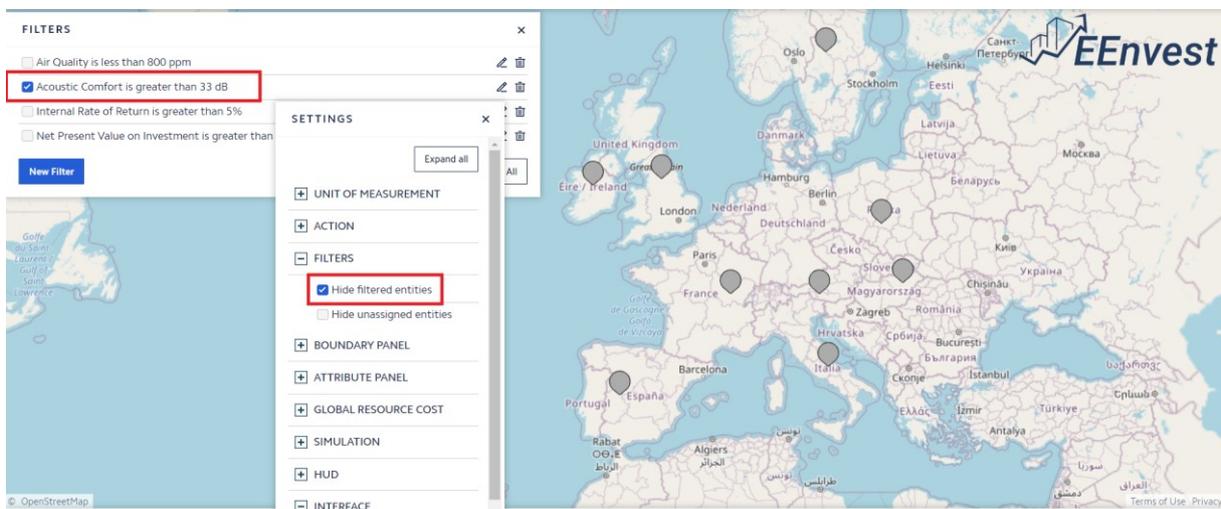
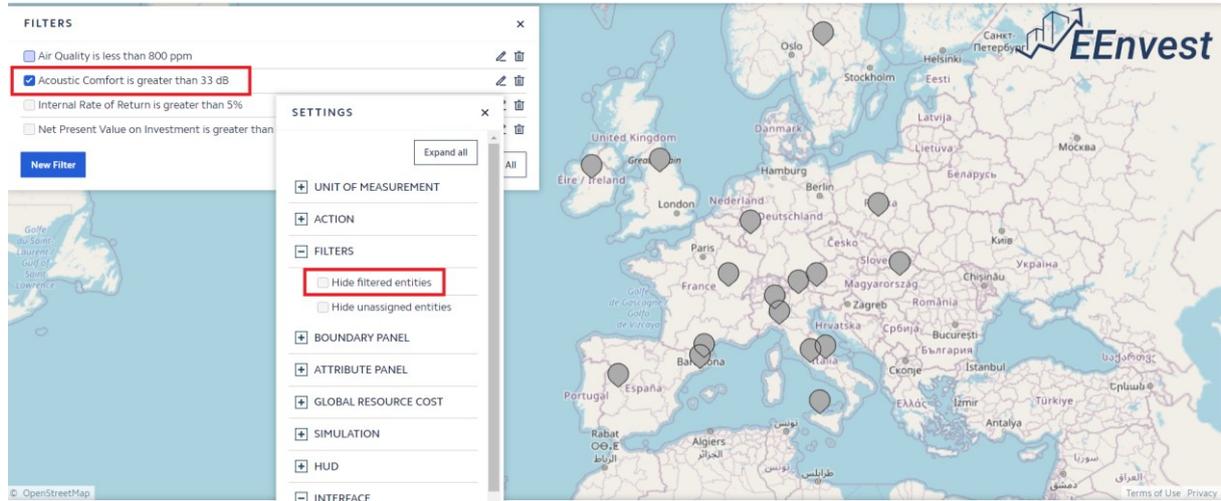
- Once all conditions are created, click on 'Match All' or alternatively on the same button 'Match Any'. This allows to visualise the projects that match the conditions inserted according to two logical filtering way:

'Match All' allows to include only projects for which both the conditions are true. Therefore, the name of the filter automatically created by the software contains 'AND'.

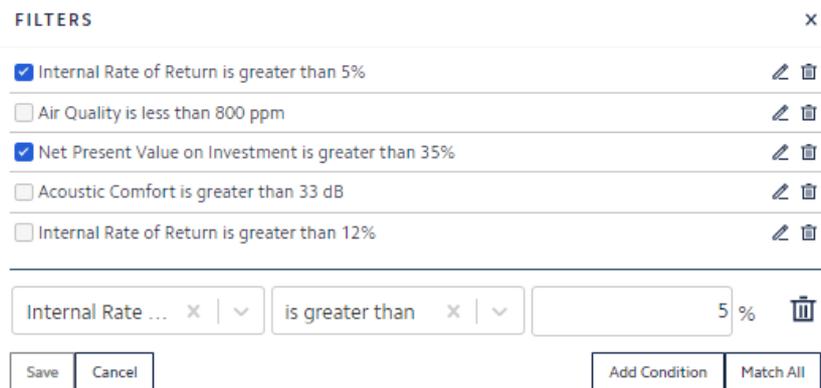
'Match Any' allows to include all projects for which either one condition is true. Therefore, the name of the filter automatically created by the software contains 'OR'.

Once created, keep the filter checked. Then go to the Analysis tool and select the same attribute to view the results. The pins in grey are the ones that don't match the conditions of the filter(s) checked. See the example of the Analysis tool to better understand the use of the filters in combination with the Analysis tool.

Use it to hide filtered entities. By checking this function, the projects filtered by checked filters will not be visible. The pictures below show what changes when the 'hide filters' function is checked and unchecked. The projects that do not match the filters conditions disappear when the filter is hidden.



## 4.2.1 Example of how to use the Filters tool

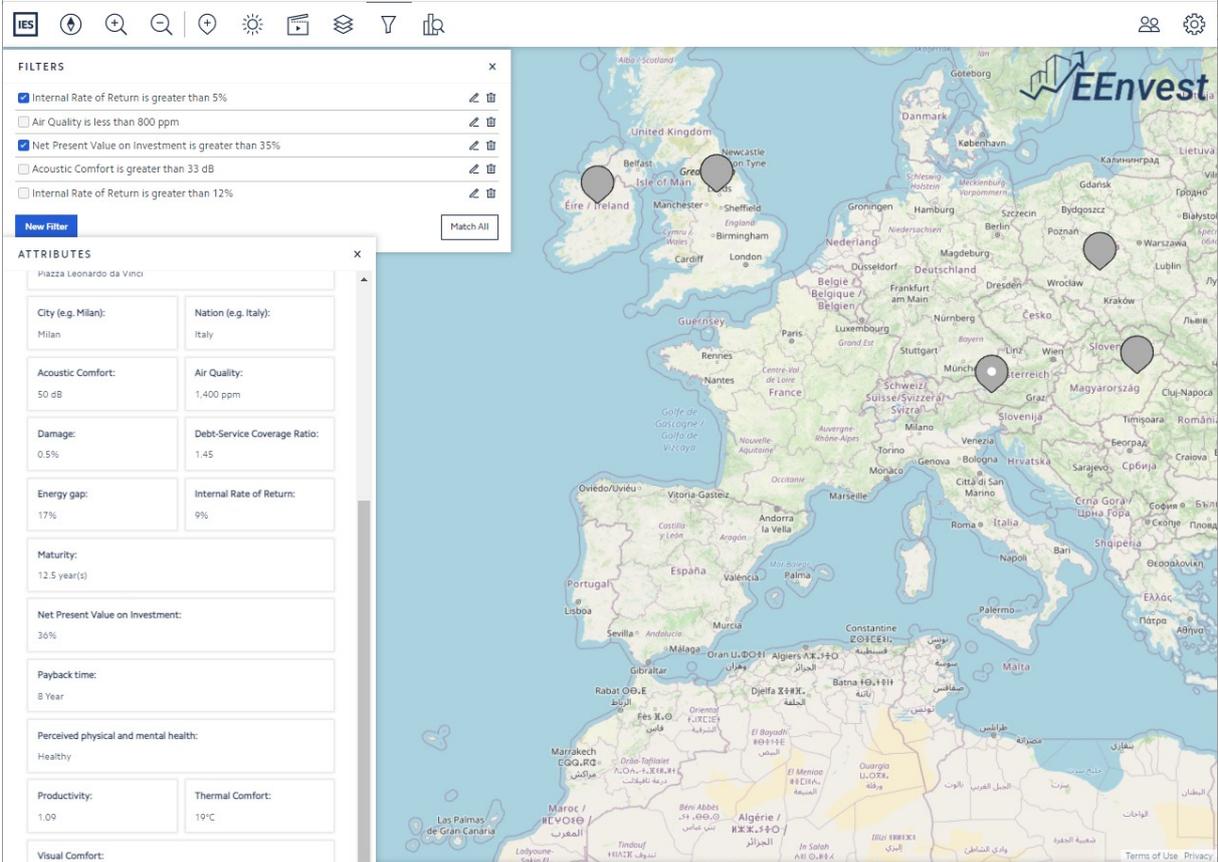


The filtered attribute is the Internal Rate of Return.

After clicking on 'Add Condition', add Net Present Value as second condition.

By pressing on 'Match All' / 'Match Any' it is possible to decide if the conditions need to be valid together or separately.

In the example below, the two filters shown above are selected. When selected, only the filtered projects are displayed in the marketplace. In this version of the platform, the filters are common for all users, when a user creates a filter, it appears for all users to use.

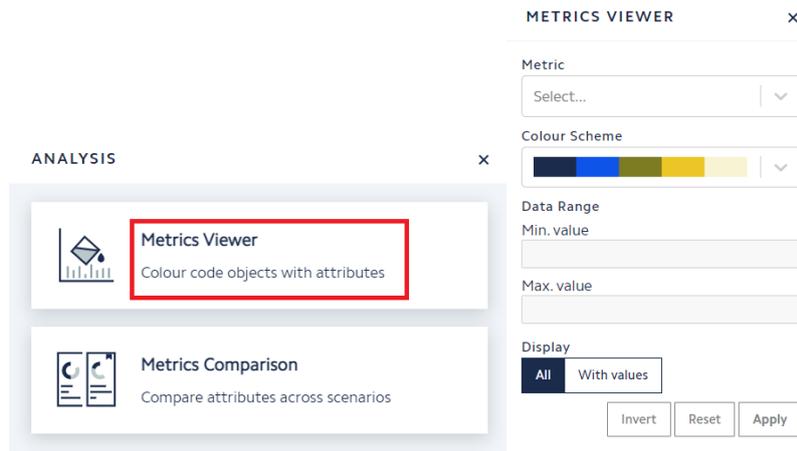


### 4.3 PROJECTS COMPARISON USING METRIC VIEWER

#### Analysis

The Analysis Inspector uses thematic rendering to view data in the platform. Thematic rendering is used to colour the pins based on a specific attribute, such as energy consumption, building total floor area and any other numerical or categorical attribute.

Using the metrics viewer found in the analysis tool at the top left toolbar, the projects in the map can be colour coded based on user selected preferences.



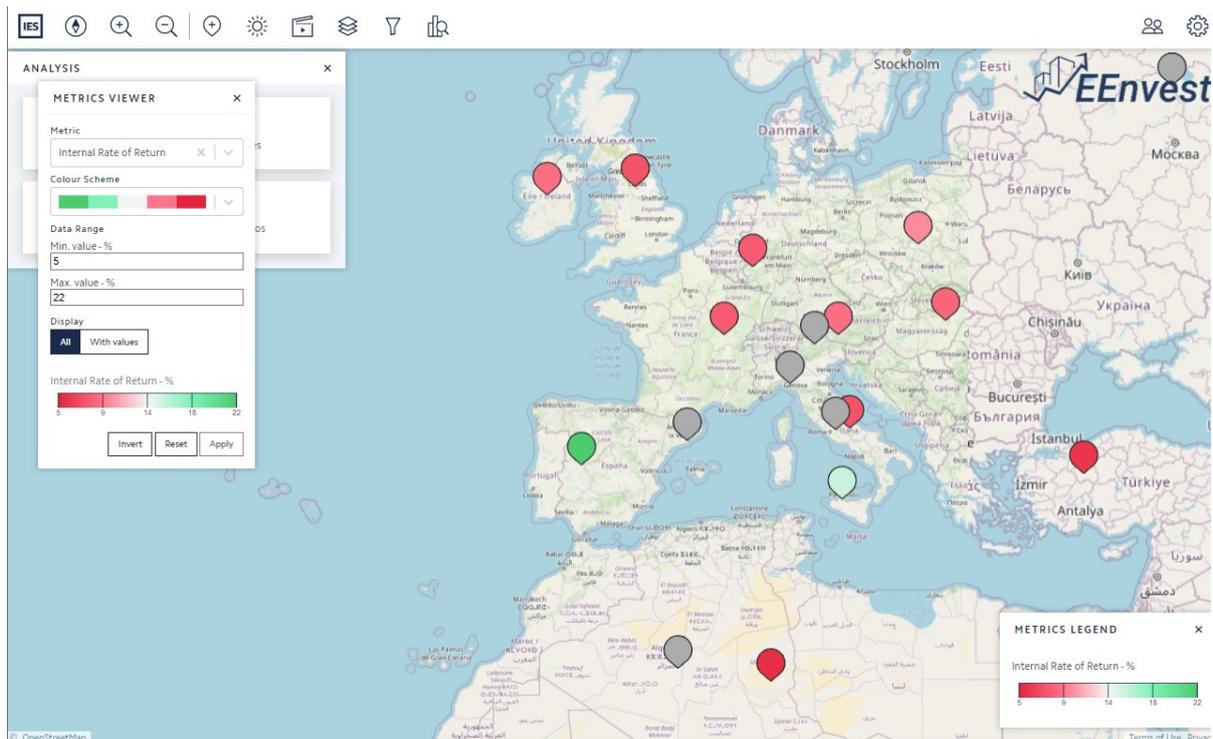
To visualise specific data in the map:

- Select an attribute from the Metric drop-down list  
Choose the Colour Scheme for the visualisation
- If desired, insert the minimum and maximum value (if the attribute value is a number) or leave it blank; this allows to include in the analysis only projects that respect such range of values or to visualise all projects without conditions.
- Click on ‘Apply’ to visualise the analysis results on map.
- Using the invert button, the colours can be inverted.
- The combination with the Filters tool allows to create a more complex and detailed analysis.

The metrics comparison is not functional in this version of the platform but will be activated in the coming versions.

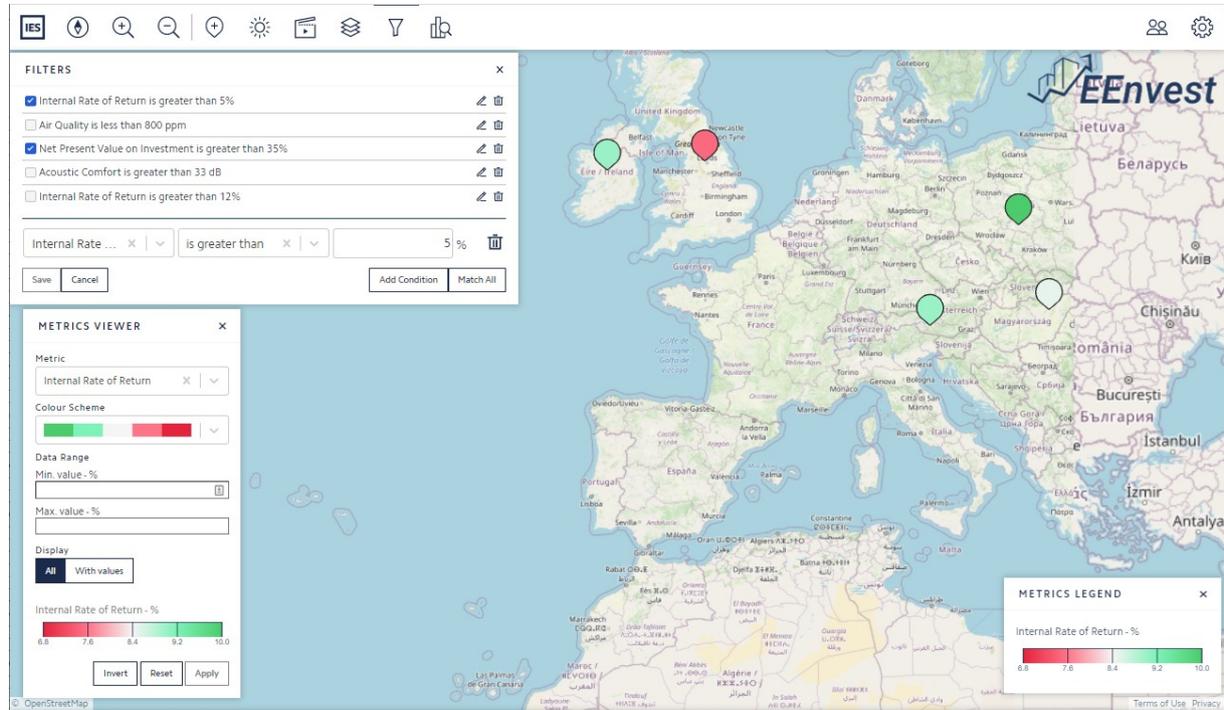
### Example

Th selected attribute is the Internal Rate of Return (IRR). All the values displayed are fictitious and do not represent any real building.



In this example, the platform shows the comparison of Renovation projects based on IRR. The renovation projects with IRR between 5 and 22 are colour coded with the highest value in green colour and red the lowest ones. The projects that remain grey are outside the selected range. This way, you can compare between projects based on the selected EEnvest KPI.

The Metrics Viewer can be used in conjunction with the Filters tool, see below.



## 4.4 CUSTOM SCENES

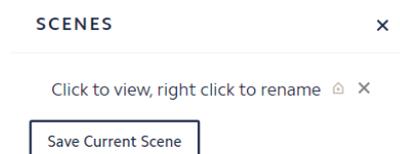
### Scenes

The user can create new scenes based on the way they want to view the model. Any number of scenes can be created and saved for future use.

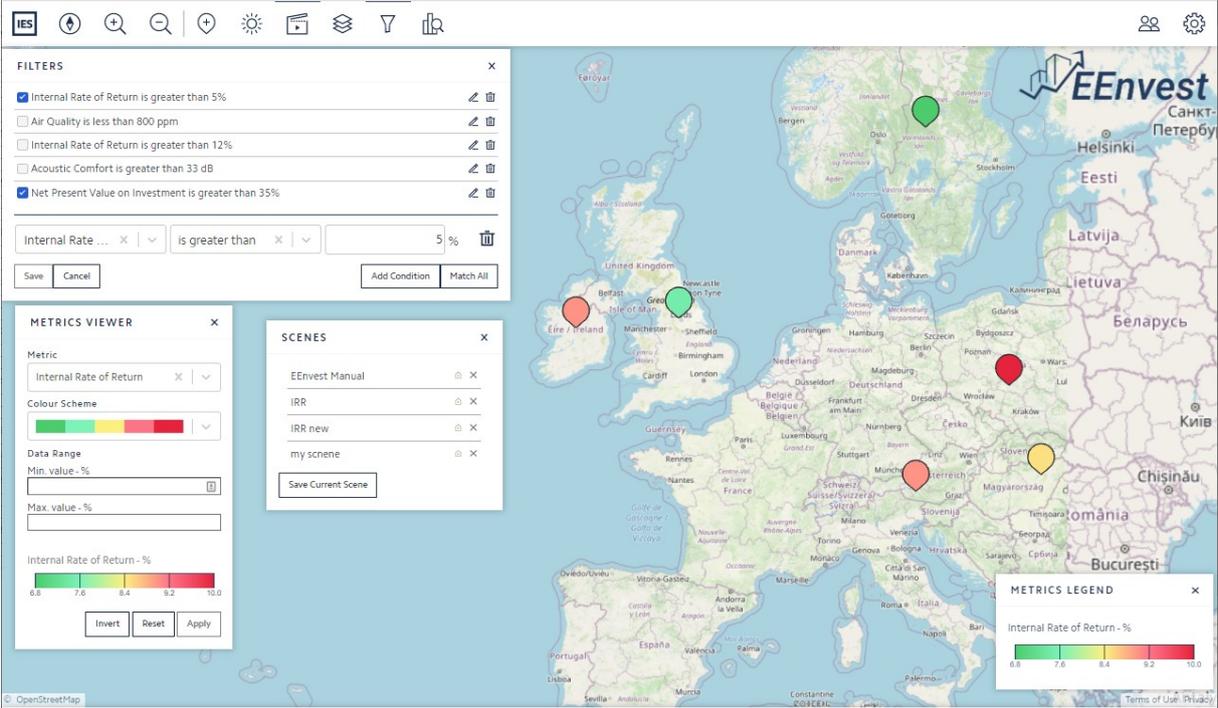
To be able to do so, first adjust the view using the zoom function. Then choose the filters to apply and the data to visualise with the Analysis tool. Click on the Scenes icon and ‘Save current scene’.



Once created, it will be possible to update the name with a right click (as suggested) and finally ‘Enter’.



This function allows to create several personalised views of the projects, with appropriate filters to show and compare the projects data.



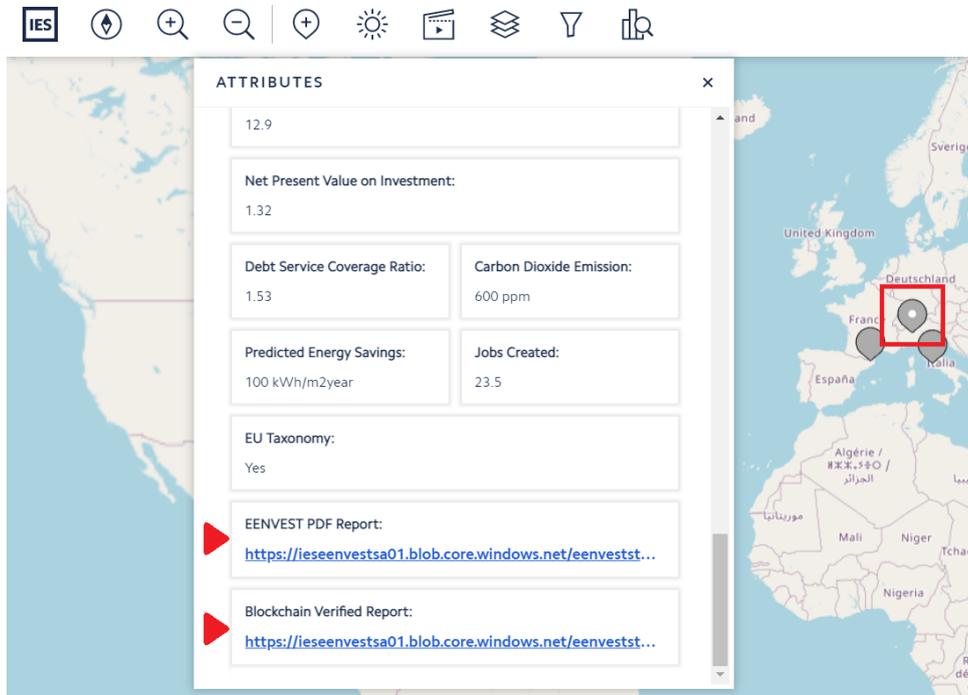
For the purposes of this user manual, the custom scene called “EEnvest Manual” was created, as seen in the screenshot above.

Using all the above analysis tools, the investor can identify the projects of their interests, based on their needs and download the reports to find out more details.

---

## 4.5 DOWNLOADING REPORTS

The EEnvest Risk calculation and the Blockchain verified reports can be found in the Attribute panel. Select the building on map and scroll down. The two reports are generated by the platform and appear in the Attributes panel of every project. To download them, click on the related links, as shown below.

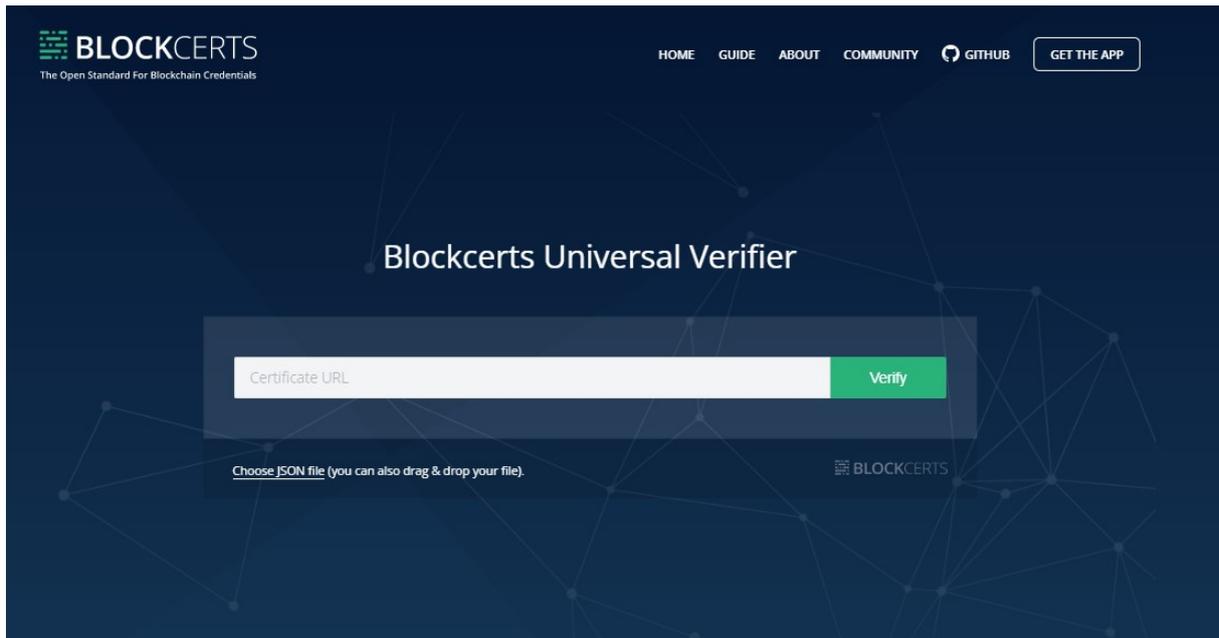


Examples of such reports can be viewed in Annex 2.

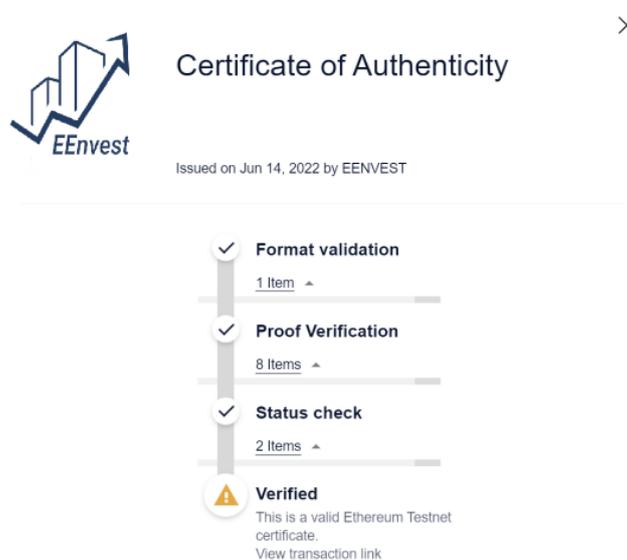
## 4.6 VALIDATING DIGITAL REPORT

The Building Owner has the option to generate a Blockchain validated digital report. This means that an encrypted report is stored in Ethereum blockchain and it is unique. This way, it is a proof that the report has been generated using the calculation model of the EEnvest Search & Match, and the specific data and version of the Risk calculation model.

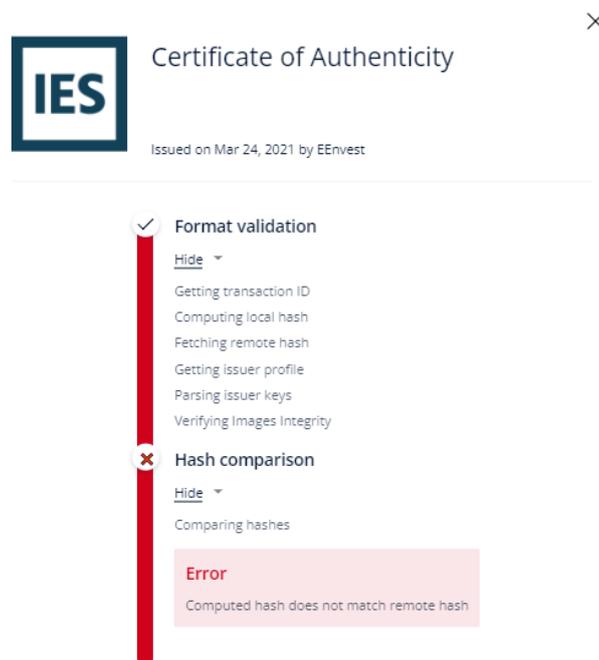
An investor can verify if the Digital Report is valid using a 3<sup>rd</sup> party open source identifier called Blockcerts. These digital records are registered on a blockchain, cryptographically signed, tamper-proof, and shareable. Certificates are immutable and cannot be updated.



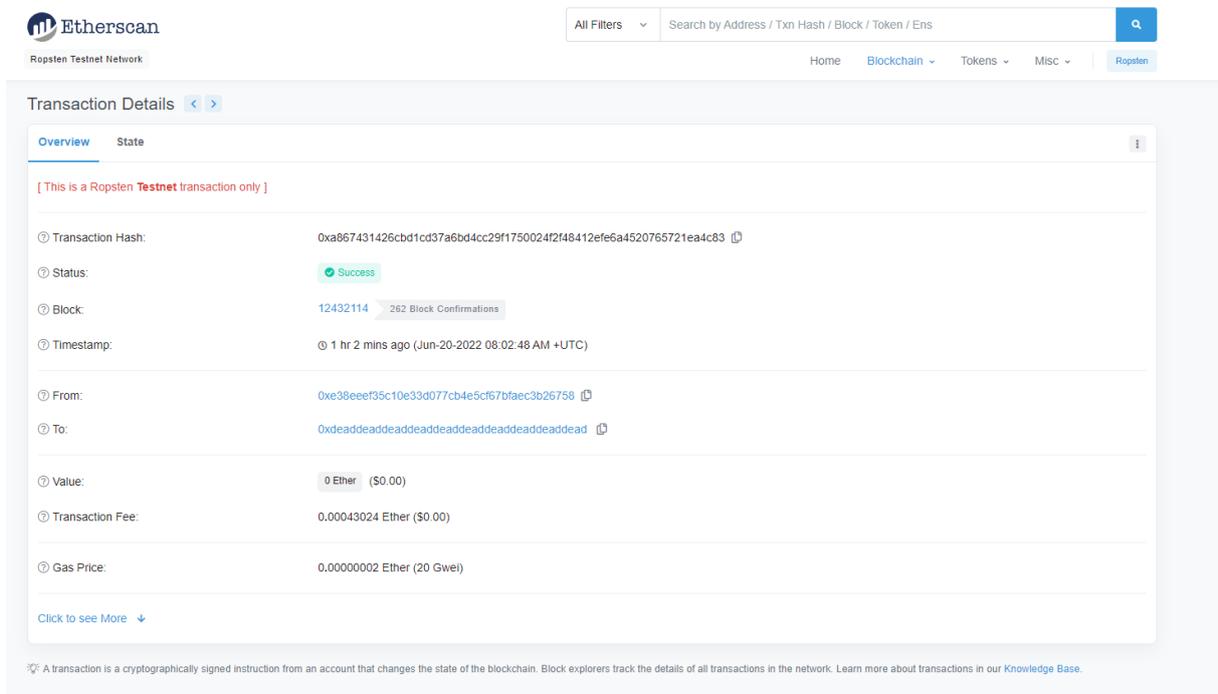
The user can copy paste the URL or choose the Digital report from the hard drive, and click verify. In case of a valid certificate, the Blockcerts tool will show a window with info similar to the screenshot below.



In case of an invalid certificate, it will show the Error as seen below.



The user is also able to verify the transaction in Etherscan as seen below:



In the same website, the user is also able to view the Blockchain verified report:

**ISSUER**  
EENVEST

**DIGITAL SIGNATURE TYPE**  
⚠ MerkleProof2017

**ISSUER'S INFORMATION**  
[raw.githubusercontent.com](http://raw.githubusercontent.com)

**ISSUER'S PUBLIC KEY**  
0xe38eeef35c10e33d077cb4e5cf67bfaec3b26758

**TRANSACTION ID**  
0x398171d540891f6124dfb5683569fd1b99a2f72a3f0e014430aa03f599ac11c

No metadata specified for this record  
[Download Record in PDF Format](#)

**BLOCKCERTS**  
The Open Standard For Blockchain Credentials

[Verify another record](#)

- Energy Efficiency Measures**
- ✓ Energy demand reduction
  - ✓ Cavity insulation
  - ✓ Improved glazing
  - ✓ New Facade
  - ✓ Installation of PV array



**Investment Evaluation**

Financials

FINANCIAL AVERAGE RISK	Low
INVESTMENT COST	1300000 €
PAYBACK TIME	7.6 years
MATURITY	10.25 years
INTERNAL RATE OF RETURN (IRR)	13.33 %
NET PRESENT VALUE (NPV) ON INVESTMENT	1.39 %
DEBT-SERVICE COVERAGE RATIO (DSCR)	3.12

Multi-benefit

**Building Details**

OWNER <b>Building Owner Ltd.</b>	CONTACT <b>01234 56789</b>
CONSTRUCTION YEAR <b>2001</b>	LAST RENOVATION YEAR <b>2019</b>
BUILDING USE/TYPOLGY <b>Office</b>	HEATING DEGREE DAY <b>1415</b>
GROSS FLOOR AREA <b>46000 m<sup>2</sup></b>	GROSS VOLUME <b>0 m<sup>3</sup></b>

**Building's Technical Data**

Technical Details

BUILDING HEIGHT <b>9 m</b>	WINDOWS AREA <b>380 m<sup>2</sup></b>
PV PRODUCTION	SH AR THERMAL PRODUCTION

## 5 EEnvest Building Owner Workflow

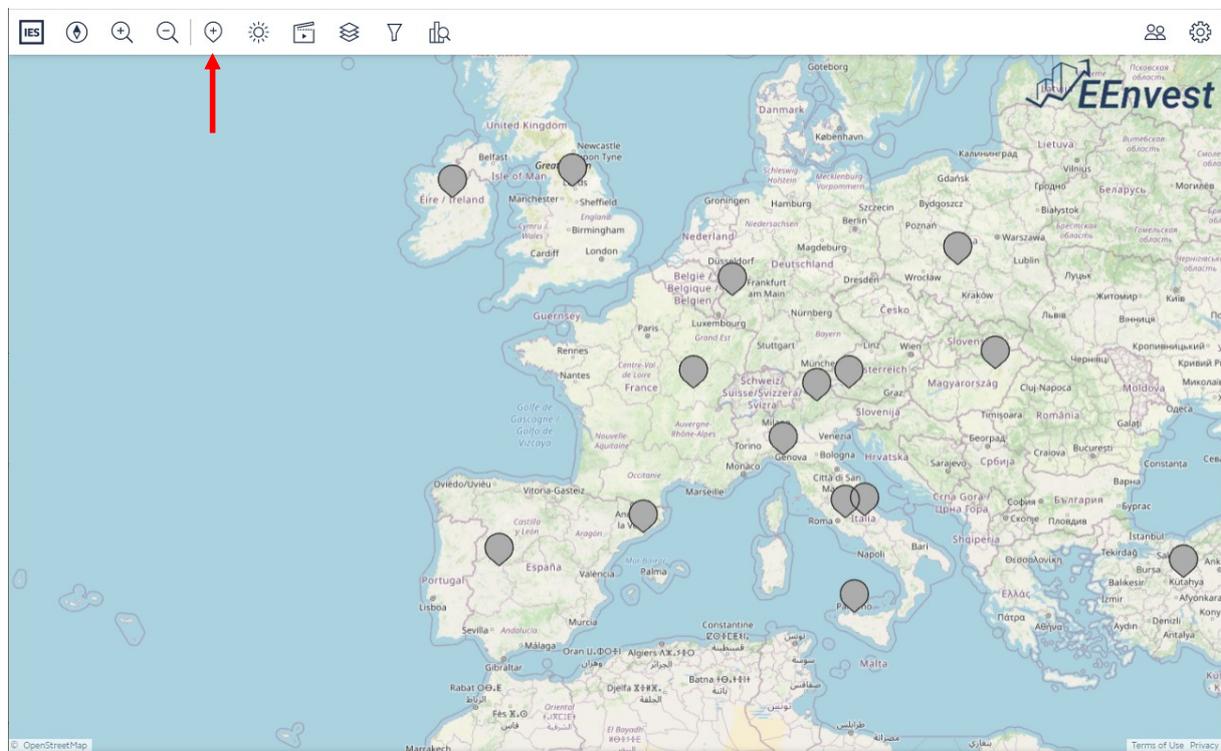
The building owner workflow in the platform is described in detail which includes the following functionalities:

- Create Project;
- Populate Project with values;
- Run Risk Calculation.

The functionalities to visualise and compare results are identical with the ones described in the Investor Workflow section.

### 5.1 CREATE AND POPULATE AN EENVEST PROJECT

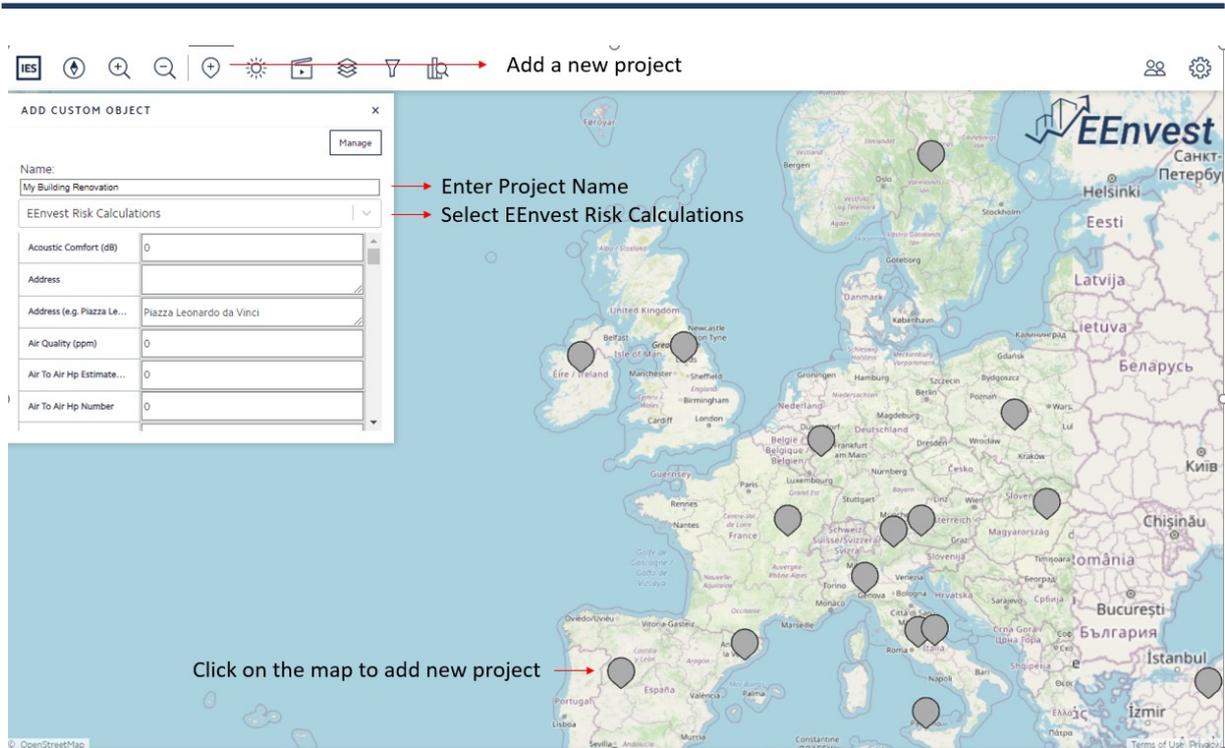
Once logged in to the EEnvest platform as a building owner, the following scene appears on the screen:



On the top left, the button  can be used to create a new EEnvest Risk Calculation Project.

#### 5.1.1 Create the EEnvest Project

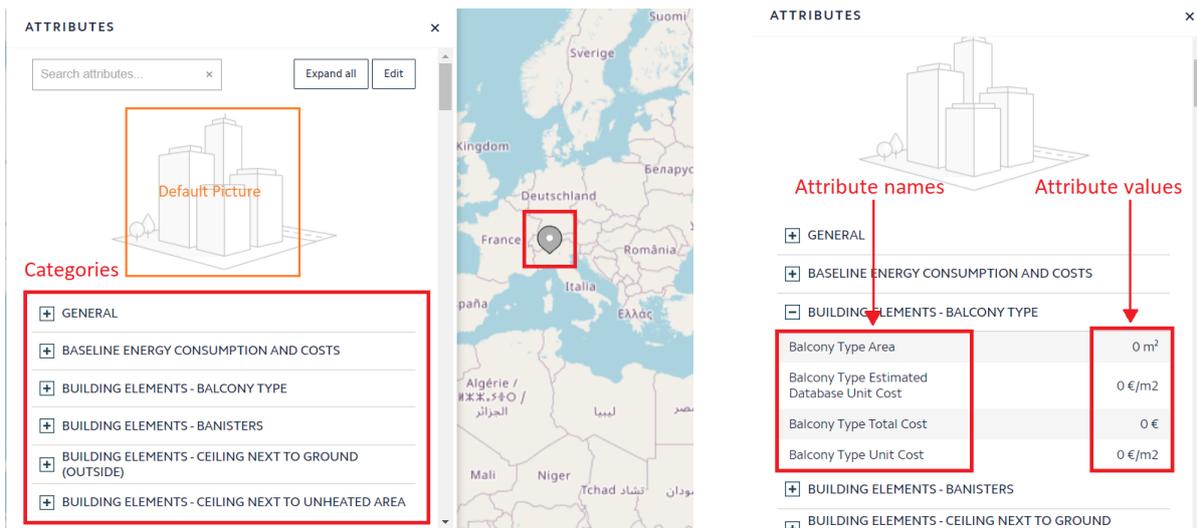
Use the ‘Custom Object’ icon to create a new Project, by inserting the name and choosing the Object Type called “EEnvest Risk Calculation” from the ‘Select’ drop down list. Both the information is mandatory to be able to add a new project in the tool. It is optional in this stage to enter the values for the attributes used in the risk calculation as it can be done in a later stage.



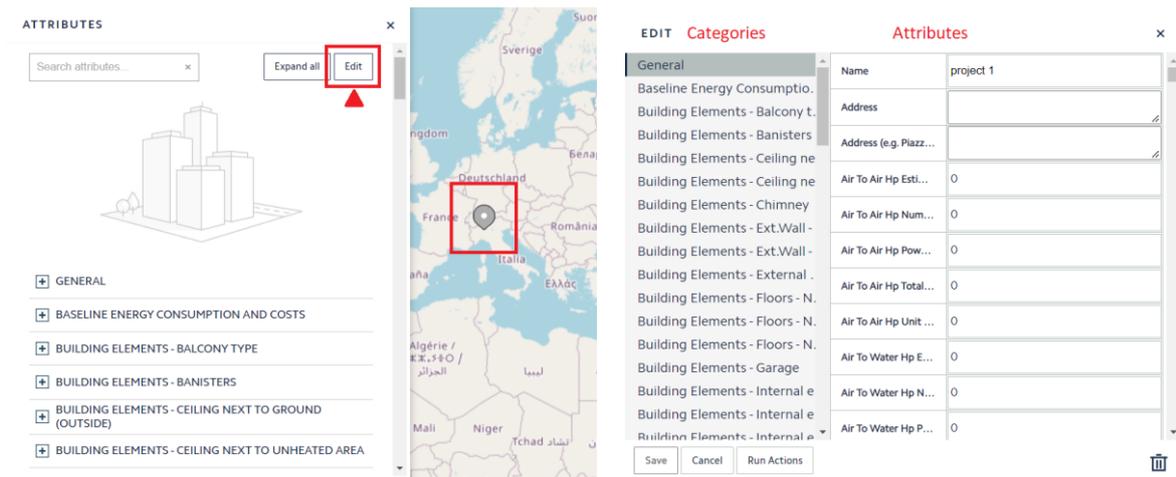
In the current version of the platform, once the pin appears in the map, it means that the project is visible globally for all users.

## 5.1.2 Populate the EEnvest Project

To populate the EEnvest Project data, click on the pin on map. The dialog that appears, the Project Dialog, contains the data about that Project. Data are organised in attributes, and all attributes are collected in categories.



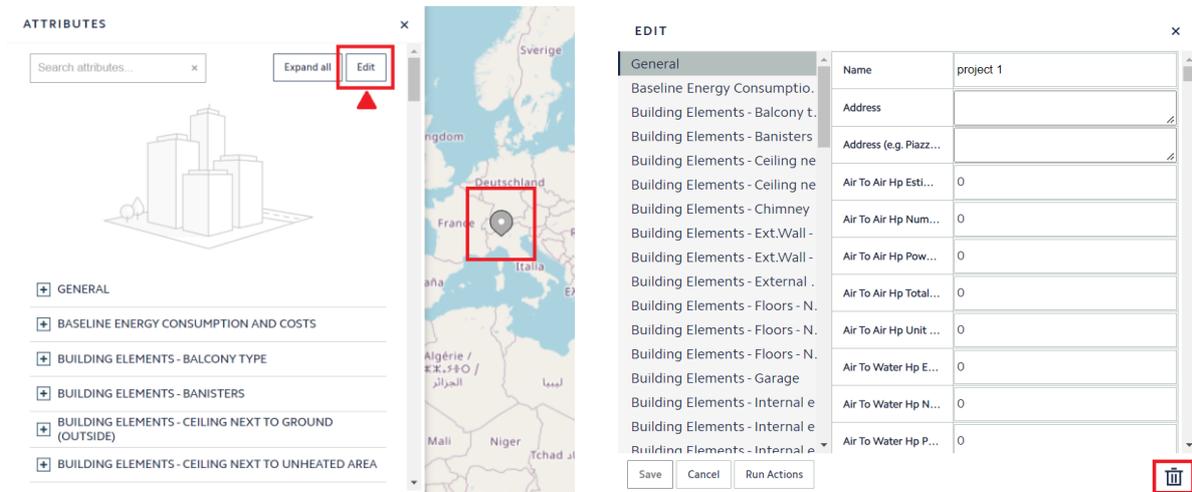
It is possible to insert or update the attribute values by clicking on the 'Edit' button and filling the spaces on the right side of the dialog.



Once entered, the data are visible globally to all users of the platform.

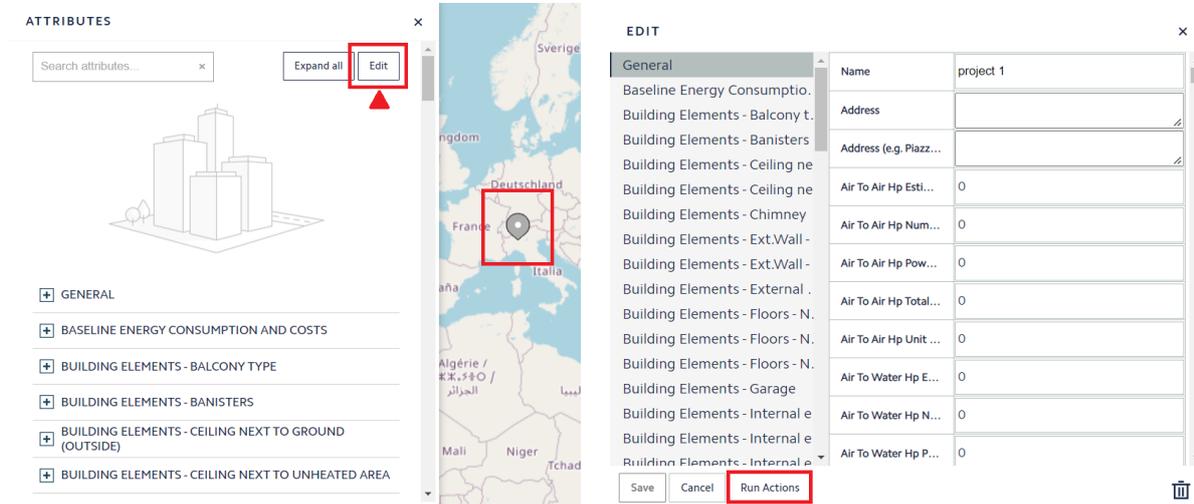
### 5.1.3 Delete Project

It will be always possible to delete the Project by clicking on the pin on map, 'Edit', and then the bin icon, as the pictures below show.



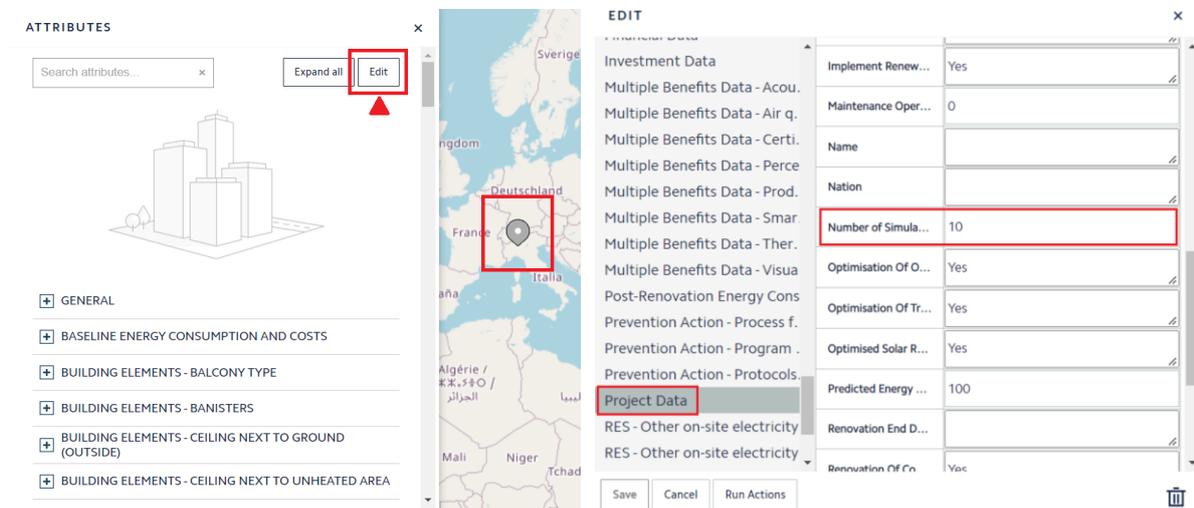
## 5.2 RUN CALCULATIONS

In order to run the EEnvest Risk Calculation and calculate the KPIs, select the project on map, then 'Edit' and 'Run actions'. When the calculation is completed, the output attribute will have the value calculated accordingly.

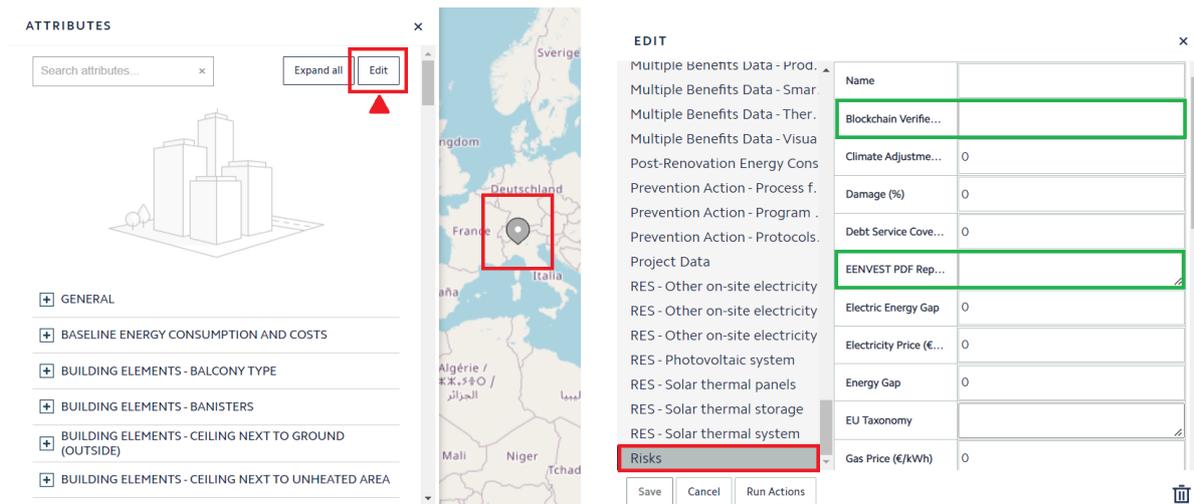


A Building Owner can only EDIT-DELETE-RUN Calculations to the projects they created or were assigned as contributors.

In order to run the calculations, it is mandatory to insert the number of Monte Carlo simulations required. This can be done through the attribute Number of Simulations available in the Project Data category.



Once the calculation finishes, the results will be available in the category named 'Risks', that can be found through the workflow shown in the pictures below. The two attributes highlighted in green will contain the links of the Reports.



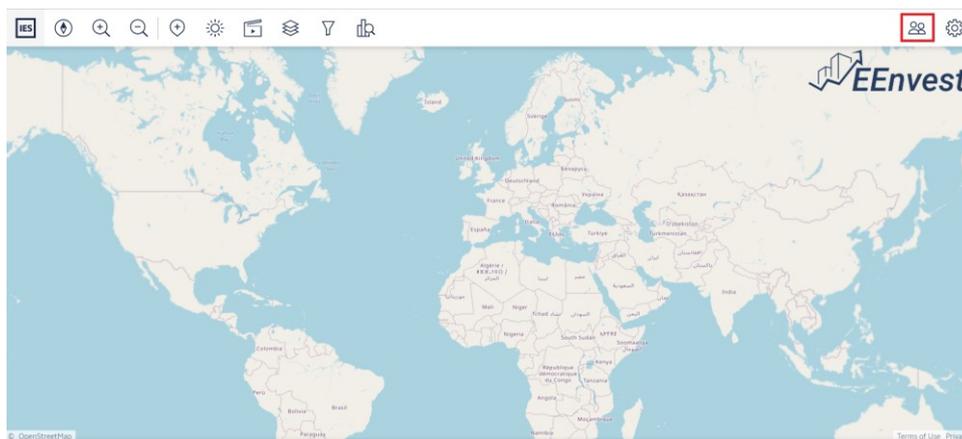
Alternatively, the Risks Calculations results can be accessed by simply clicking on the Building in the map. This will open the Attributes panel visible to all users, as described in paragraph 4.5.

### 5.3 VISUALISE DATA AND RESULTS

See Chapter 4.

### 5.4 MANAGE USERS

A Building Owner can assign EEnvest roles to projects they own using the workflow below. Select the 'Users' icon.



Choose the user ID from the 'Select' drop-down list. The name of the user will appear on the right.

MANAGE USERS x

OBJECT ROLES

Select... ADD

name of the user 

Permissions & Roles on Current Objects

Select... Add to selected objects

Object Selection

Select... v

Select the projects in the **‘Object Selection’** drop-down list. Choose for each project the EEnvest role of the user.

MANAGE USERS x

OBJECT ROLES

Select... ADD

name of the user 

Permissions & Roles on Current Objects

Select... Add to selected objects

**Object Selection**

Project 2 x Project 1 x v

Owner x v Project 1

Editor x v Project 2

If the user has the same role for several projects, then it is possible to assign it faster by selecting the role from the **‘Permissions & Roles on Current Objects’** drop-down list and then ‘Add to selected objects’. CIM roles can be found in Annex 1. The role of project contributor allows another user to contribute to a project already created by another user.

MANAGE USERS x

OBJECT ROLES

Select... ADD

name of the user 

**Permissions & Roles on Current Objects**

Owner x v Add to selected objects

Object Selection

Project 2 x Project 1 x v

Select... v Project 1

Select... v Project 2

---

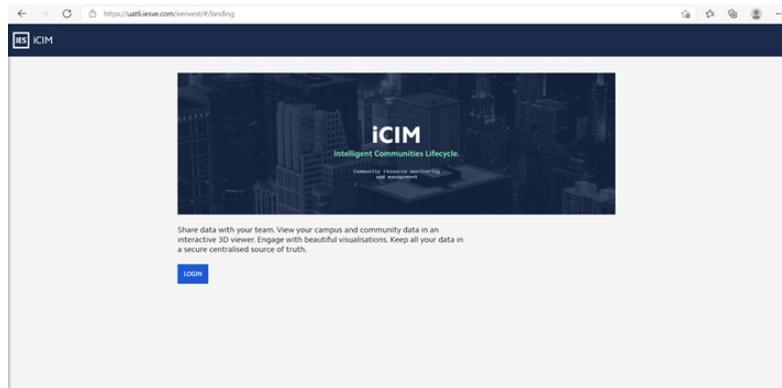
## 6 EEnvest Administrator workflow

This workflow is for website administrators that manage the platform.

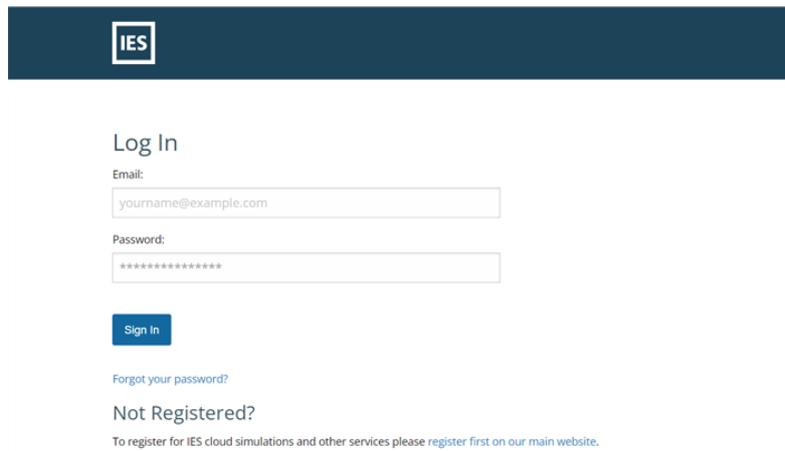
### 6.1 HOW TO SET UP EENVEST PLATFORM

#### 6.1.1 Step 1: Create a new iCIM Project = EEnvest Platform

Open ICIM in the browser.

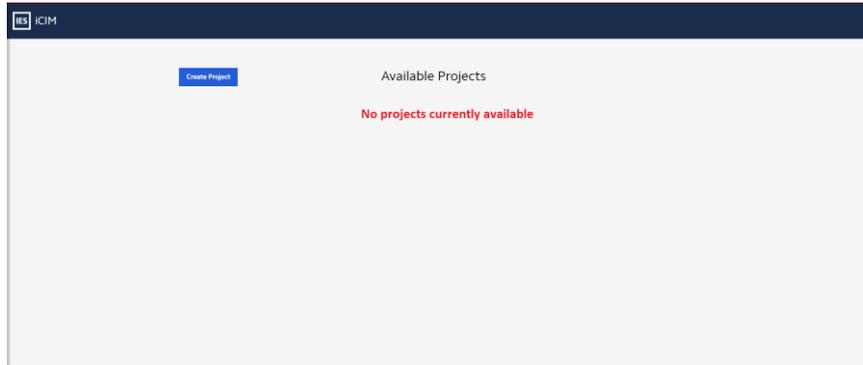


Click on 'Login' and insert email and password of IES account. If not registered yet, see procedure on how to create a new account in paragraph 2.2.



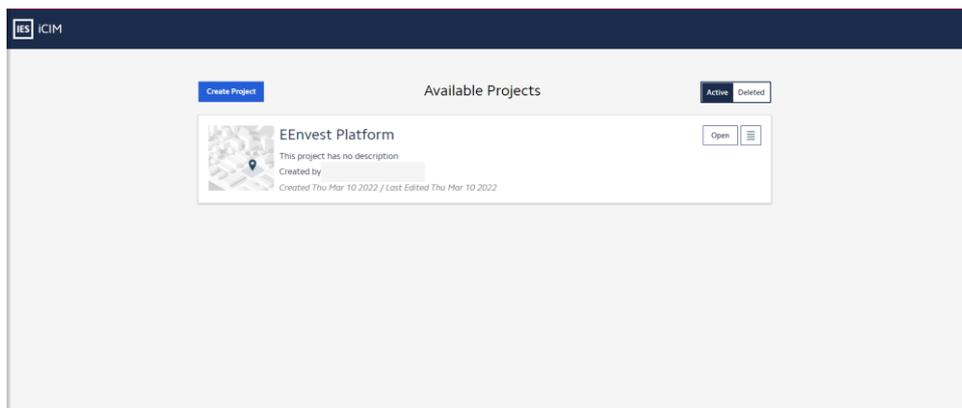
The following procedure that allows to create the EEnvest Platform needs to be done only once.

In the iCIM interface, click on 'New Project'.

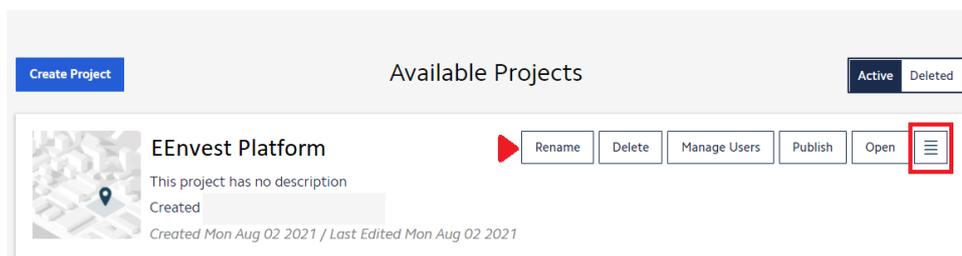


A new window will pop up with the information required for creating a new project. The description is not mandatory and can be added also later (see the instructions below).

Once created, it will be visible in the list of available projects.



It is possible to add the description of the project by clicking on the 4 lines and the on 'Rename'.



It is also possible to 'Restore' or 'Permanently delete' deleted projects by switching to 'Deleted'.

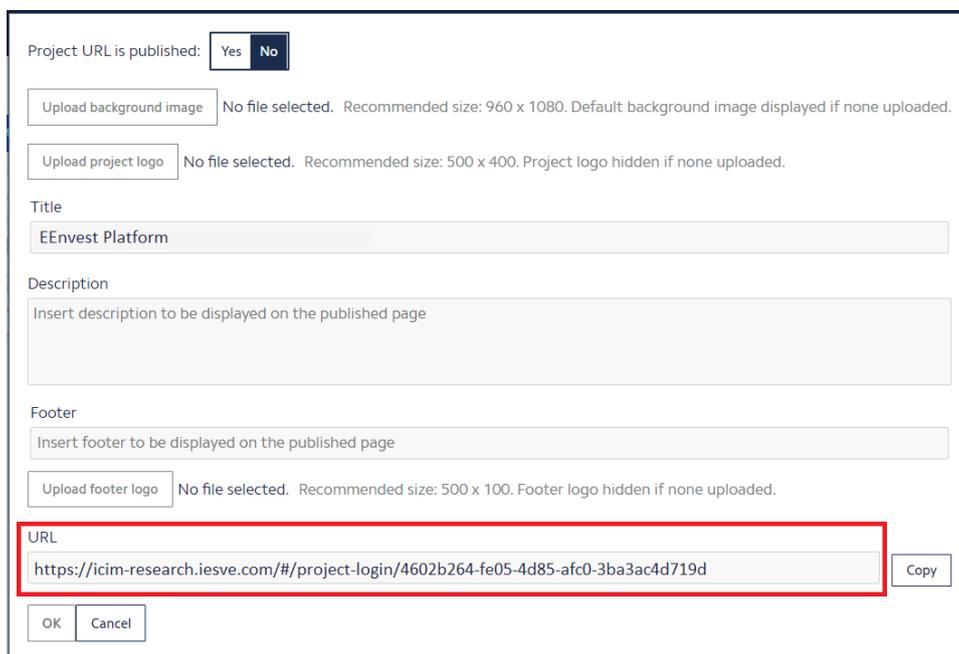


## 6.1.2 Step 2: Publish the Platform in the landing page

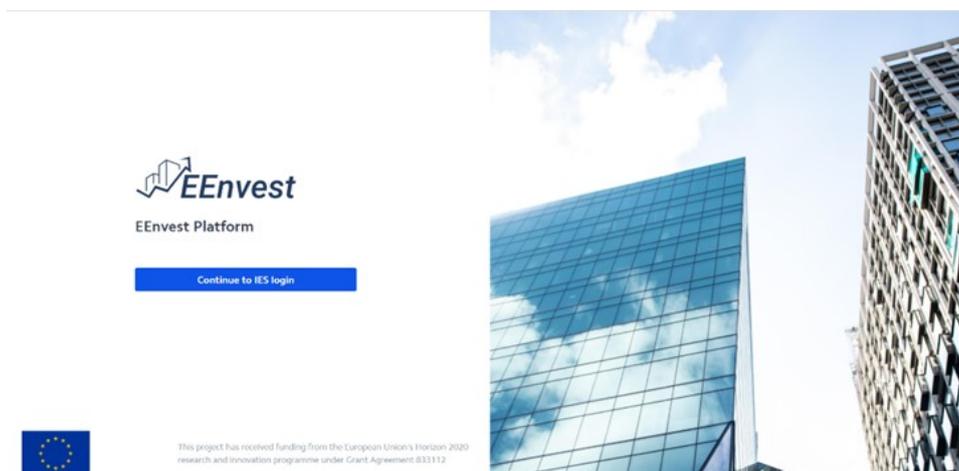
Click on 'Publish'.



Complete the information required. The URL on the bottom correspond to the landing page through which the platform can be directly accessed later on.

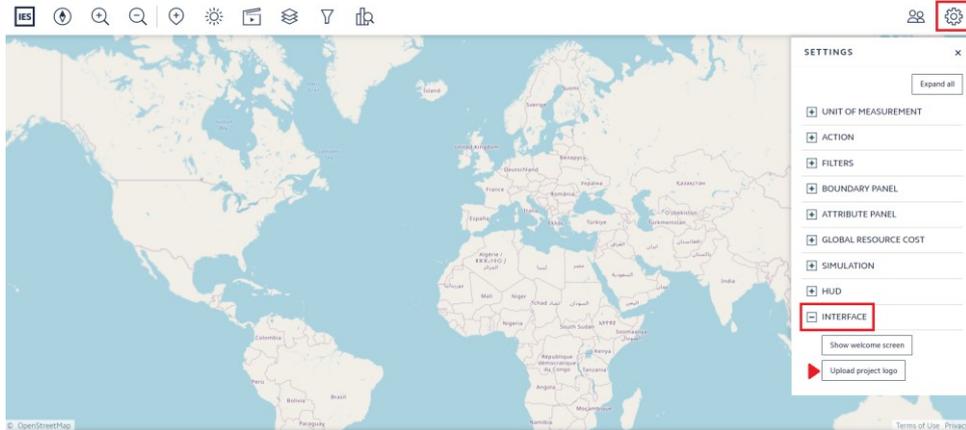
A screenshot of a configuration form for publishing a project. It includes several sections: 'Project URL is published:' with 'Yes' and 'No' radio buttons; 'Upload background image' and 'Upload project logo' with 'No file selected' messages; 'Title' with the text 'EInvest Platform'; 'Description' with the placeholder 'Insert description to be displayed on the published page'; 'Footer' with the placeholder 'Insert footer to be displayed on the published page'; 'Upload footer logo' with 'No file selected' message; and 'URL' with the text 'https://icim-research.iesve.com/#/project-login/4602b264-fe05-4d85-afc0-3ba3ac4d719d' and a 'Copy' button. The 'URL' field is highlighted with a red border. At the bottom are 'OK' and 'Cancel' buttons.

This is the landing page the Administrator and all other users will have access to.

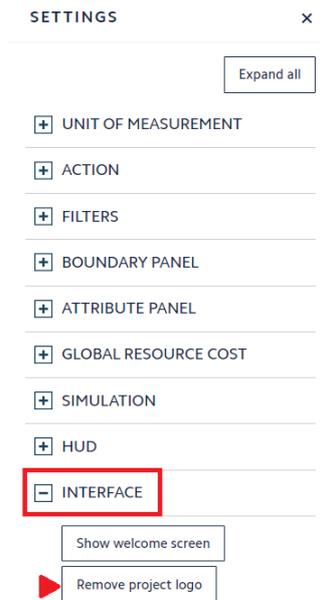


### 6.1.3 Step 3: Add EEnvest Logo

Click on the 'Settings' icon on the top right and select 'Interface' > 'Upload project logo'. Then pick the image in your folders.

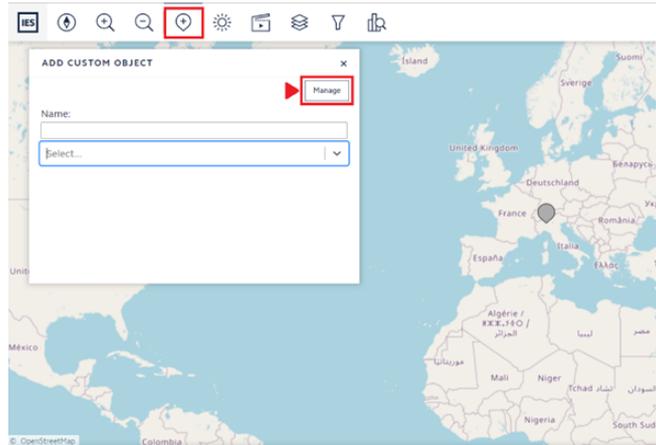


It will always be possible to remove it by clicking on 'Interface' > 'Remove project logo', which appears instead of 'Upload project logo' if the logo is already uploaded.



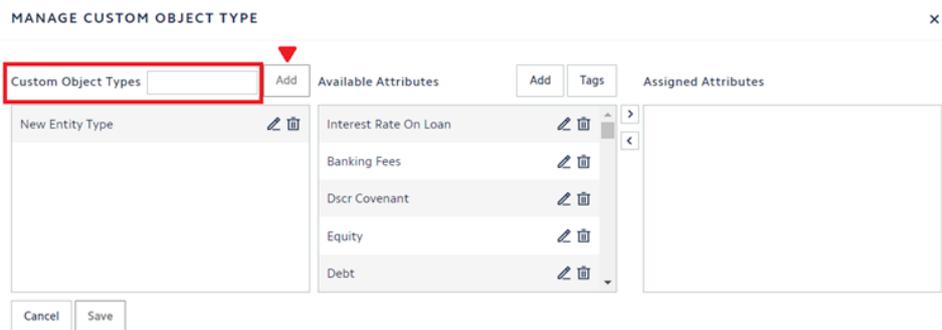
## 6.2 HOW TO SET UP EENVEST OBJECT TYPES, CATEGORIES, AND ATTRIBUTES

Click on 'Custom Object' icon and 'Manage'.



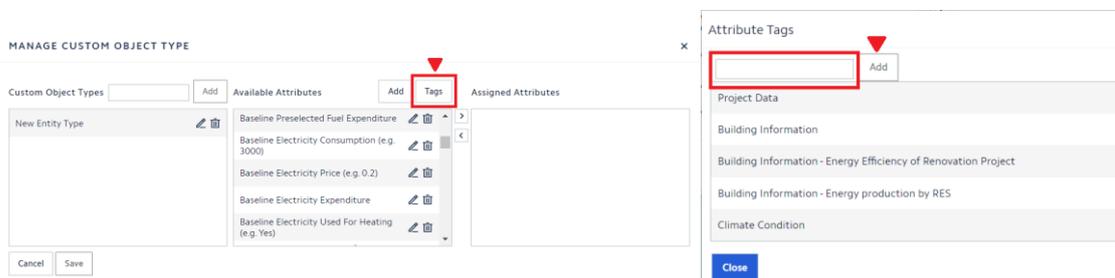
## 6.2.1 Create Object types

Insert the name of the new Object Type and then press 'Add' and save. It will appear in the list of object types below. It is possible to edit and delete the object types by clicking on the buttons next to their names.



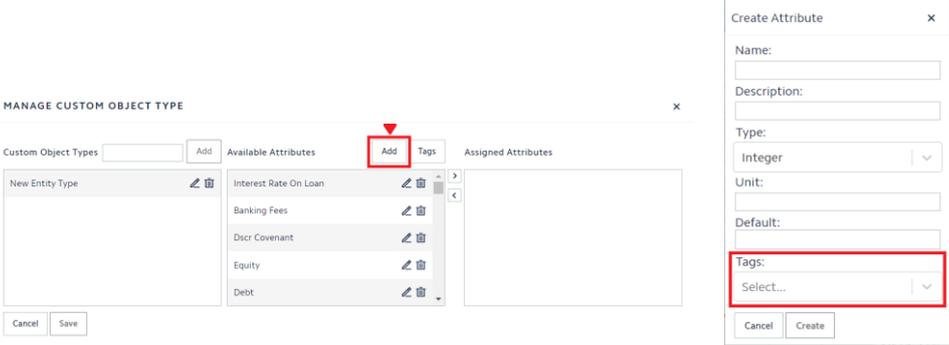
## 6.2.2 Create Categories or tags

Click on 'Tags', write the name of the new tag and 'Add' it.



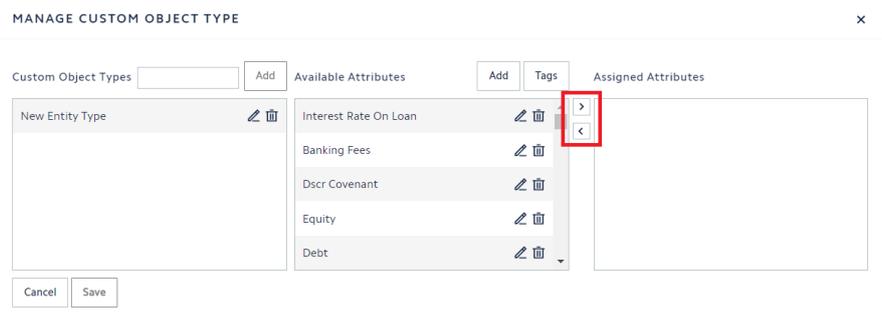
### 6.2.3 Create Attributes

Click on 'Add' and fill the information required. Choose under which categories (or tags) the new attributes must appear. Every attribute can appear in multiple tags.



### 6.2.4 Assign attributes to Object types

Select the Object Type and the attributes desired from the first and second column and then use the arrows to move such attributes to the third column.



## 6.3 HOW TO MANAGE USERS

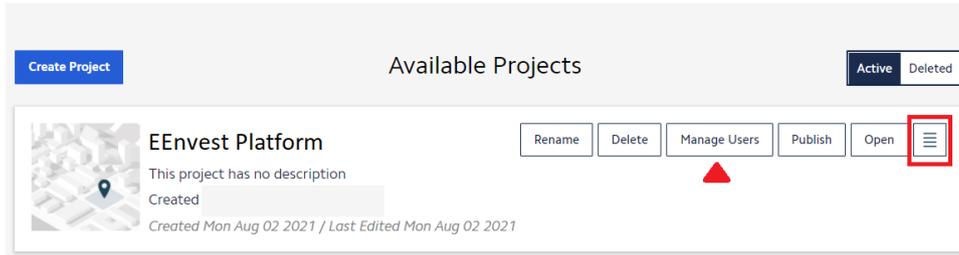
Updates of this section will always be allowed; therefore, it will always be possible to add and delete users, and change their role(s).

See Chapter 4 – Annex 1 User Permissions for description of the roles.

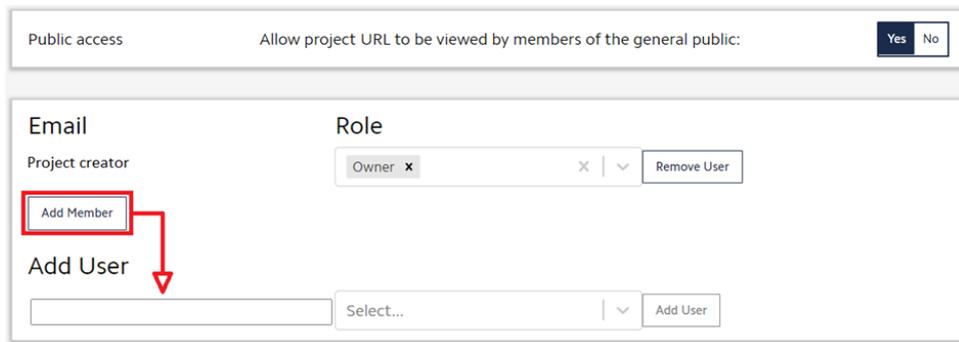
---

### 6.3.1 How to assign iCIM Roles

From the iCIM interface, click on ‘Manage Users’.

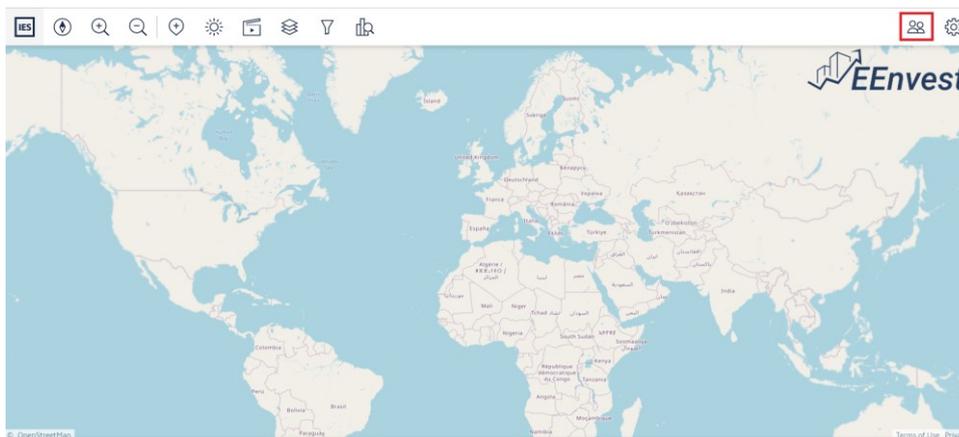


One user is already present and correspond to the Administrator. Click on ‘Add Member’ and insert the email of the new Project user, choosing their role from the ‘select’ drop down list.



### 6.3.2 How to assign EEnvest Roles

Select the ‘Users’ icon.



Choose the user ID from the ‘Select’ drop-down list. Then the name of the user will appear on the right.

MANAGE USERS ×

OBJECT ROLES

Select... ADD

name of the user 

Permissions & Roles on Current Objects

Select... Add to selected objects

Object Selection

Select... ADD

Select the projects in the **‘Object Selection’** drop-down list. Then choose for each project the role of the user.

MANAGE USERS ×

OBJECT ROLES

Select... ADD

name of the user 

Permissions & Roles on Current Objects

Select... Add to selected objects

Object Selection

Project 2 X Project 1 X X v

Owner X X v Project 1

Editor X X v Project 2

If the user has the same role(s) for each project, then it is possible to assign them faster by selecting the role(s) from the **‘Permissions & Roles on Current Objects’** drop-down list and then ‘Add to selected objects’.

MANAGE USERS ×

OBJECT ROLES

Select... ADD

name of the user 

Permissions & Roles on Current Objects

Owner X Editor X | X v Add to selected objects

Object Selection

Project 2 X Project 1 X X v

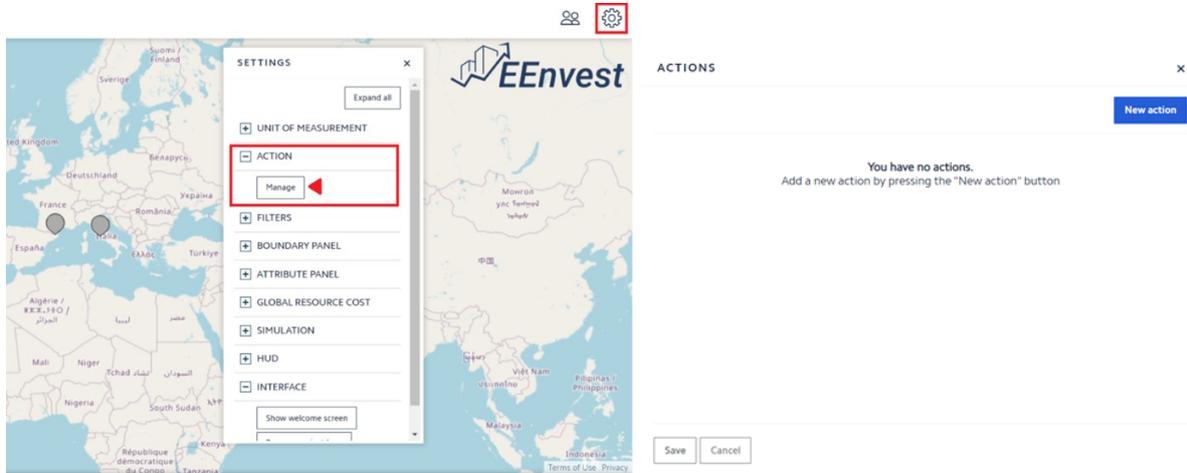
Select... v Project 1

Select... v Project 2

## 6.4 HOW TO SET UP THE ACTIONS

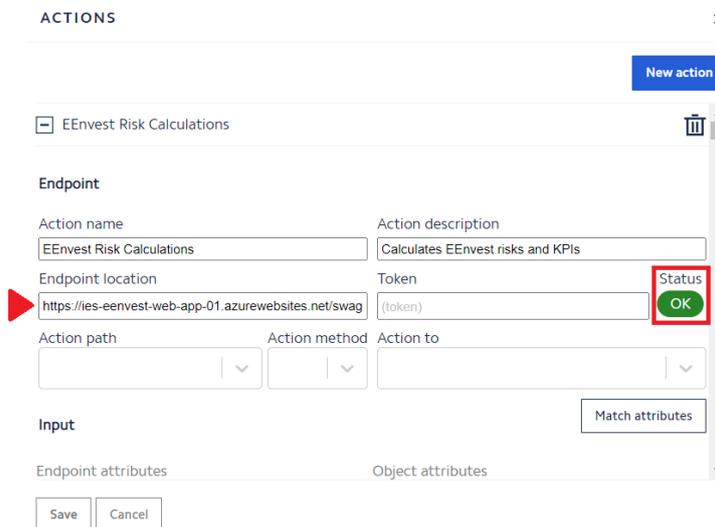
The calculations are named actions. Only the administrators can set them up.

Click on Settings, open the actions through Action > Manage, and finally, select 'New Action'.



### 6.4.1 How to set up the Risk calculations action

Insert the name and the description of the action. Then, paste the json file containing the script. The token status will change to 'OK'.

The image shows a screenshot of the 'ACTIONS' panel in the EInvest application. A 'New action' button is visible at the top right. Below it, the 'EInvest Risk Calculations' action is being configured. The form has the following fields:

- Endpoint**
  - Action name: EInvest Risk Calculations
  - Action description: Calculates EInvest risks and KPIs
  - Endpoint location: https://ies-eeinvest-web-app-01.azurewebsites.net/swagger
  - Token: (token)
  - Status: OK (highlighted with a red box)
- Action path**: [Empty field]
- Action method**: [Dropdown menu]
- Action to**: [Dropdown menu]

Below the form, there is an 'Input' section with 'Endpoint attributes' and 'Object attributes' fields, and a 'Match attributes' button. At the bottom, there are 'Save' and 'Cancel' buttons.

Select the correct path, as shown in the picture below, and choose the entity type from the 'Action to' drop-down list. Finally, hit 'Match attributes'.

ACTIONS
×

New action

[-] EInvest Risk Calculations [+] [trash]

**Endpoint**

Action name EInvest Risk Calculations	Action description Calculates EInvest risks and KPIs
Endpoint location https://ies-eeinvest-web-app-01.azurewebsites.net/swagger	Token {token} <span style="float: right; color: green; font-weight: bold;">OK</span>
Action path ▶ /api/v1/run_script	Action method POST
Action to EInvest Calculations	

**Input**

Endpoint attributes	Object attributes
---------------------	-------------------

Match attributes

Save Cancel

This is how the attributes must look like once they are correctly matched.

ACTIONS
×

New action

Endpoint attributes

Address	Address <span style="float: right;">X   ▾</span>
Air To Air Hp Number *	Air To Air Hp Number   ▾
Air To Air Hp Power *	Air To Air Hp Power   ▾
Air To Air Hp Total Cost *	Air To Air Hp Total Cost   ▾
Air To Water Hp Number *	Air To Water Hp Number   ▾
Air To Water Hp Power *	Air To Water Hp Power   ▾
Air To Water Hp Total Cost *	Air To Water Hp Total Cost   ▾

Save Cancel

It is important to remember that the attribute 'callback\_url' needs to be matched manually with '(Flag as Callback)'. Then save the action.

The screenshot shows a dialog box titled 'ACTIONS' with a close button (X) in the top right corner. A blue button labeled 'New action' is in the top right. Below it is a list of actions, each with a name and a dropdown menu. The 'callback\_url \*' action is highlighted with a red border and contains the text '(Flag As Callback)'. Below the list are two buttons: 'Save' and 'Cancel', both highlighted with red boxes. A red arrow points to the 'Save' button.

Check Paragraph 5.2 For the description of how to run the action, what are the outputs generated, and where to find the link of the report in the Building dialog.

An example of the EEnvest Risk Assessment Report can be viewed in Annex 2.

## 6.4.2 How to set up the Blockchain action

Insert the name and the description of the action.

Paste the json file containing the script, which is the same used for the Risks Calculations action.

The token status will change to 'OK'.

The screenshot shows the 'ACTIONS' dialog box with a close button (X) in the top right. A blue button labeled 'New action' is in the top right. Below it are two actions: 'EEnvest Risk Calculations' and 'Blockchain Validation'. The 'Blockchain Validation' action is expanded, showing its configuration. The 'Endpoint location' field is highlighted with a red box and contains the URL 'https://ies-eeinvest-web-app-01.azurewebsites.net/swagger'. The 'Token' field contains '(token)'. To the right of the 'Token' field is a 'Status' field with a green 'OK' button, also highlighted with a red box. Below the 'Endpoint location' and 'Token' fields are three fields: 'Action path', 'Action method', and 'Action to', each with a dropdown menu. At the bottom right is a 'Match attributes' button. At the bottom left are 'Save' and 'Cancel' buttons.

Select the correct path, as shown in the picture below, and choose the entity type from the 'Action to' drop-down list. Finally, hit 'Match attributes'.

ACTIONS
×

New action

+ EInvest Risk Calculations
 🗑️

[-] Blockchain Validation
 🗑️

**Endpoint**

Action name	Action description
Blockchain Validation	
Endpoint location	Token
https://ies-eeinvest-web-app-01.azurewebsites.net/swagger	(token)
Action path	Action method
/blockchain/{job_uuid}	GET
Action to	EInvest Calculations

Status OK

**Input**

Match attributes

Save
Cancel

This is how the action must look like once the input and output are correctly matched. Save the action.

ACTIONS
×

New action

https://ies-eeinvest-web-app-01.azurewebsites.net/swagger
(token)
OK

Action path	Action method	Action to
/blockchain/{job_uuid}	GET	EInvest Calculations

**Input**

Match attributes

Endpoint attributes	Object attributes
job_uuid *	job_uuid

**Output**

Endpoint attributes	Object attributes
blockchain_verified_report	Blockchain Verified Report

Save
Cancel

After the actions are run by users (see procedure in chapter ) the attribute 'Blockchain Verified Report' shown below will be populated with the link of the report generated by the script.

---

**ACTIONS** x

[New action](#)

https://ies-eeinvest-web-app-01.azurewebsites.net/swagger (token) OK

Action path: /blockchain/{job\_uuid} | Action method: GET | Action to: EInvest Calculations

**Input** Match attributes

Endpoint attributes	Object attributes
job_uuid *	job_uuid

**Output**

Endpoint attributes	Object attributes
blockchain_verified_report	Blockchain Verified Report <span style="float: right;">x   v</span>

[Save](#) [Cancel](#)

Check Paragraph 5.2 for the description of how to run the actions and where to find the link of the report in the Building dialog.

An example of the report can be viewed in Annex 2.

## Annex 1 – User permissions

Roles	Permissions
<p>EEnvest role: <b><i>Building Owner</i></b> through CIM role: <b><i>Project contributor</i></b></p> <p>See Chapter 4 for the workflow</p>	<p>As <b><i>Object Owner</i></b> can:</p> <ul style="list-style-type: none"> <li>• Create projects;</li> <li>• Delete projects they own;</li> <li>• Write project data (update attribute values of the projects they own)</li> <li>• Read platform (read data and attributes of projects they do not own);</li> </ul> <p>As <b><i>Object Editor</i></b> can:</p> <ul style="list-style-type: none"> <li>• Write project data (update attribute values of the projects they can edit);</li> <li>• Read platform (read data and attributes of projects they do not own);</li> </ul> <p>Permissions are granted by the Administrator.</p>
<p>EEnvest role: <b><i>Investor</i></b> through CIM role: <b><i>Project Viewer</i></b></p> <p>See Chapter 3 for the workflow</p>	<ul style="list-style-type: none"> <li>• Read platform (read data and attributes of projects of the platform)</li> </ul>
<p>EEnvest role: <b><i>Administrator</i></b> through CIM role: <b><i>Project Owner</i></b></p> <p>See Chapter 5 for the workflow</p>	<ul style="list-style-type: none"> <li>• Add user (EEnvest and CIM roles);</li> <li>• Delete platform;</li> <li>• Write platform (edit platform definition);</li> <li>• Read platform (read projects, data, attributes in the platform);</li> <li>• Create projects;</li> <li>• Delete projects;</li> <li>• Write data (edit attribute data on projects of the platform);</li> <li>• Write attributes (create/edit/delete attributes for projects in the platform).</li> </ul>

---

## Annex 2 – Example of the Reports

### EEnvest Risk Assessment Report





GENERAL DATA

Name: Politecnico di Milano
Address: Piazza Leonardo da Vinci, Milan, Italy
Building use/hypology: Office
Owner: Building Owner Ltd.
Contact: 01234 56789

TECHNICAL DATA

Construction year: 1972
Last renovation year: 2015
Gross floor area: 759 m²
Gross volume: 2530 m³
HDD: 2400



Investment cost: 1306009 €/m²
Financing amount requested: 1000000 €
Expected maintenance and operation costs: 0 €/m²

Energy savings ambition: 31%
PV production: 43200 kWh/y
Solar thermal panels production: 10000 kWh/y

Expected start date of the renovation: May
Expected end date of the renovation: May
Renovation and mitigation measures adopted: Energy demand reduction, Cavity insulation, Improved glazing, New Facade, Installation of PV

Project ambition: Renovate the building to achieve a 31% reduction in total energy usage

Project Quality Self-Assessment score: High probability of reliable, consistent and achievable energy savings. 0



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement n° 833112



TECHNICAL RISKS

DAMAGE

The Damage indicator quantifies the investment deviation due to possible malfunctioning or failures of the energy renovation measures adopted in the renovation project. Such deviation is expressed as a percentage of the planned investment.

0.00051

For this specific project, the Damage indicator has been estimated as:

ENERGY GAP

On the other hand, the Energy gap indicator quantifies the energy performance deviation. It is expressed as a percentage of the calculated energy performance after the renovation project.

0.0%

For this specific project, the estimated Energy gap is:

FINANCIAL RISKS

PAYBACK TIME

The Payback time is the amount of time that the investment will take to recover the initial cost when the length of the investment time reaches a breakeven point.

7.76 years

For this specific project, the estimated Payback time is:

MATURITY

The Maturity is defined as the total duration of the project needed to achieve a zero NPV (IRR equal to cost of capital).

10.25

For this specific project, the estimated Maturity is:

INTERNAL RATE OF RETURN (IRR)

The Internal Rate of Return (IRR) is the discount rate that makes the net present value (NPV) of a specific project equal to zero.

0.13%

For this specific project, the Internal Rate of Return is:

NET PRESENT VALUE ON INVESTMENT (NPV/investment)

The Net Present Value (NPV) is the value of all future cash flows (positive and negative) over the entire life of an investment discounted to the present. The NPV/investment ratio gives a measure of profitability of the project.

1.32%

For this project, the estimated NPV/investment is:

DEBT-SERVICE COVERAGE RATIO (DSCR)

The Debt-Service Coverage Ratio (DSCR) is an indicator of the project's ability to repay a debt. It is calculated as the ratio between the operative cash flows generated by the project and the cash flows for debt, lease, or other obligations (debt service, both for interests and principal payment) due in one year.

1.53

For this project, the DSCR has been estimated equal to

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Graph n.1 - Cumulated cash flows
This graph shows the cumulated cash flows generated by the project over time. The value for each one of the years is calculated as the simple sum of the cash flow of that year and all the previous cash flows. The graph down below provides a quick view of the time needed to payback the initial investment cost.

Graph n.2 - Project IRR Distribution
This graph shows the probability distribution of IRR. Each value on the horizontal axis has a probability value. The area underneath the curve sums up to 100% probability. The blue curve includes all risks, so it's more extended to the left, meaning that there is higher probability that the IRR is low. The orange curve includes only financial risks, so it's more concentrated around the expected value.

MULTI-BENEFIT PERFORMANCE

CO2 EMISSION REDUCTION

The CO2 Emission Reduction Indicator estimates the decrease of the CO2 emissions as result of undertaking the renovation project. It's derived from the predicted energy savings, and it's applied a conversion factor that varies from country to country as well as the type of energy used in the building.

XX kg/m²y

PREDICTED ENERGY SAVINGS

The Predicted Energy Savings indicator is the difference between the actual energy consumption of the building (baseline) and the estimated energy consumption after the renovation project. It includes heating, cooling, lighting and ventilation.

100 kWh/m²y

NUMBER OF JOBS CREATED

The Number of Jobs Created metric refers to new jobs created as a result of the investment. This KPI is based on a proclaimed BIPE study that states that per 1 million euro invested on energy efficiency projects, 15 new jobs on average are created. It depends on the location of the building (for example, country) and the amount of the investment.

23.50816

For this specific project, the number of jobs created is:

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EU TAXONOMY COMPLIANCE

The EU Taxonomy Compliance indicator defines whether or not the investment complies with the minimum requirements defined by the EU Taxonomy. In specific, whether the project being assessed has a minimum of 30% energy consumption reduction. Therefore, it's a binary metric.

Yes

PROPERTY VALUE INCREASE

The Property Value Increase indicator brings light to the possible increment on the value of the asset after the renovation project. This is also referred as the 'greenium'. In practical terms, it's not possible to predict this increase before the renovation project. Therefore, this metric is qualitative, and it provides a range of possible value increase backed-up by literature.

Rental price:

2-5%

Sale price:

10-20%

For this specific project, the Property Value Increase is:

LINK TO SUSTAINABLE DEVELOPMENT GOALS (SDGs)

The Link to SDGs indicator depicts to which specific SDGs the project contributes to. It's a qualitative indicators that showcases the non-financial benefits of investing in the renovation project.



Technical recommendations: A well-done renovation project reduces the difference between real energy consumption and estimated energy demand... Financial recommendations: In general terms, the financial performance of the investment can be improved by: - revising the mix of energy conservation measures... Multi-benefit recommendations: The multi-benefit performance of the project can be improved by:

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# EEnvest Blockchain Verified Report

## EENVEST DIGITAL

### Italian case study - IFAD

#### Energy Efficiency Measures

- ✓ Energy demand reduction
- ✓ Cavity insulation
- ✓ Improved glazing
- ✓ New Facade
- ✓ Installation of PV array
- ✓



### Investment Evaluation

#### Financials

FINANCIAL AVERAGE RISK	Low
INVESTMENT COST	1300000 €
PAYBACK TIME	7.6 years
MATURITY	10.25 years
INTERNAL RATE OF RETURN (IRR)	13.33 %
NET PRESENT VALUE (NPV) ON INVESTMENT	1.39 %
DEBT-SERVICE COVERAGE RATIO (DSCR)	3.12

#### Multi-benefit

MULTI-BENEFIT AVERAGE RISK	Medium
CO2 EMISSION REDUCTION	1,234 kg/kWhm <sup>2</sup>
CO2 EMISSION REDUCTION COST	12,345 €/m <sup>2</sup> y
PREDICTED ENERGY SAVINGS	98,765 kWh/m <sup>2</sup> y
PREDICTED ENERGY COST SAVINGS	100 €/m <sup>2</sup> y
NUMBER OF JOBS CREATED	23.4 jobs / €1,000,000
EU TAXONOMY COMPLIANCE	Yes

#### Technical

TECHNICAL AVERAGE RISK	171411.42
DAMAGE	0.0 %
ENERGY GAP	44 %

### Building Details

OWNER <b>Building Owner Ltd.</b>	CONTACT <b>01234 56789</b>
CONSTRUCTION YEAR <b>2001</b>	LAST RENOVATION YEAR <b>2019</b>
BUILDING USE/TIPOLOGY <b>Office</b>	HEATING DEGREE DAY <b>1415</b>
GROSS FLOOR AREA <b>46000 m<sup>2</sup></b>	GROSS VOLUME <b>0 m<sup>3</sup></b>

### Building's Technical Data

#### Technical Details

BUILDING HEIGHT <b>9 m</b>	WINDOWS AREA <b>380 m<sup>2</sup></b>
PV PRODUCTION <b>43200 kWh/y</b>	SOLAR THERMAL PRODUCTION <b>0 kWh/y</b>
CO2 EMISSION REDUCTION <b>1234 kg/m<sup>2</sup>y</b>	ENERGY SAVINGS AMBITION <b>31 %</b>
MAINTENANCE/OPERATIONS COSTS <b>0 €/m<sup>2</sup>y</b>	PROJECT QUALITY SCORE <b>75/400</b>

#### Renovation & Mitigation Measures

RENOVATION START DATE <b>May</b>	RENOVATION END DATE <b>May</b>
ENERGY PERFORMANCE CERTIFICATE <b>Yes</b>	FINANCING AMOUNT REQUESTED <b>€ 500000</b>
ENERGY PERFORMANCE MONITORING <b>Yes</b>	IAQ & COMFORT MONITORING <b>Yes</b>
RENOVATION OF HEATING SYSTEM <b>Yes</b>	RENOVATION OF COOLING SYSTEM <b>Yes</b>
RENOVATION OF DHW SYSTEM <b>Yes</b>	RENOVATION OF VENTILATION SYSTEM <b>Yes</b>
RENOVATION OF LIGHTING SYSTEM <b>Yes</b>	IMPLEMENT RENEWABLE ENERGY <b>Yes</b>
OPTIMISED OPAQUE COMPONENTS <b>Yes</b>	OPTIMISED TRANSPARENT COMPONENTS <b>Yes</b>
OPTIMISED SOLAR RADIATION <b>Yes</b>	MAINTENANCE PROGRAMS <b>Yes</b>



This report is certified using blockchain and can be verified easily using [www.Blockcert.org](http://www.Blockcert.org)

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## **Annex 3 - Privacy Policy**

At the bottom right hand corner, there is the Privacy policy, it is the link to the IES Privacy Policy which is also the same one that is covered under 2.1.3.

Clicking on the policy it redirects to the IES website (<https://www.iesve.com/legal/privacy>) wherein our privacy policy is explained in detail.

The user is advised to read and understand the IES Privacy Policy.

Any queries about these Terms and Conditions, contact IES by emailing [enquiries@iesve.com](mailto:enquiries@iesve.com).

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## **Annex 4 - Terms of use**

If not already read, we would advise the user to read and understand the iCIM License Agreement before starting to use the iCIM project, found in:

<https://www.iesve.com/legal/terms>

Any queries about these Terms and Conditions, contact IES by emailing [enquiries@iesve.com](mailto:enquiries@iesve.com).