BuiltHub

DELIVERABLE D3.3: Focus group report

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EXECUTIVE SUMMARY

The aim of Task 3.3 (T3.3 – Addressing platform features and amelioration) was to review the features and functionalities of the BuiltHub platform. Collecting feedback about the platform at its early stages of development was fundamental for guiding its subsequent development and the improvement of its functionalities.

As stated by the Grant Agreement[1], the platform evaluation was conducted in the form of a focus group. First, the participants were asked to try the platform and familiarize themselves with its features. Subsequently, the participants' opinions and suggestions were collected using a structured survey. The survey covered all the main aspects of the platform: registration procedure, dashboard design, usability, data representation and download, metadata provision etc. The results were elaborated and forwarded to NTT Data to address possible issues and implement suggested improvements to the platform.

The focus group was structured into two rounds.

- Internal focus group. In the first round, an internal focus group was conducted to collect opinions and suggestions from the members of the consortium. The internal focus group took place at a very early stage of the platform development and the partners' suggestions were crucial in defining the line of development to be followed. During the internal focus group, participants' feedback was collected not only regarding the platform but also on the survey itself to ameliorate the reviewing process for the next round of the focus group.

- External focus group. In the second round, an external focus group was conducted to collect opinions and suggestions from pioneer users of the platform (i.e., external stakeholders). The external focus group took place in a more advanced stage of the platform development, close to its final version. Users' feedback allowed to refine the platform's functionalities and improve its usability.

Overall, positive feedback was received from both, the internal and the external round of the focus group. The results of the focus group clearly highlighted the strengths and weaknesses of the platform allowing NTT Data to address issues and ameliorate the platform features.

In Chapter 1, an introduction is provided regarding the focus group conducted in Task 3.3. In Chapter 2, details about the structure, organization, and workflow of the focus group are provided. In Chapter 3, the list of participants in the internal focus group is presented. In Chapter 4 and Chapter 5, the results of the internal focus group regarding the platform and the survey itself are discussed respectively. In Chapter 6, the results of the external focus group are presented. Finally, in Chapter 7, the conclusions are summarized.

[1] European Commission. BuiltHub Grant Agreement number 957026. 2020.

1. INTRODUCTION

The core of this report is the collection and organization of the feedback provided during the focus groups. Before reporting the results, the aim and the structure of this focus group related to WP3 – Task 3.3 are explained as well.

The focus group has been divided in two main parts: First, an internal focus group has been carried out to collect the feedback and suggestions from internal partners. Next, once already ameliorated the platform, an external focus group (review from external stakeholders) with pioneer users will take place. Note that during the internal focus group, also opinions related to the survey itself has been asked, allowing us to understand how to ameliorate the survey and provide a better one in the external focus group.

The focus group officially started with the meeting held on the 22nd of October 2021. The main scope of this focus group is to collect feedback (both by internal partners and external stakeholders) about the BuiltHub platform under development. The feedback has been collected through surveys. This allowed the platform developers to have a clear picture about the satisfaction degree of the end-users testing the platform, and about the right direction to follow for improving the service they are providing. These surveys also allowed to understand which are the strengths and the weaknesses of the platform at the time of the testing. In order to guarantee freedom in expressing personal opinions, the elaborated report containing the feedbacks ensures anonymity to all participants to the surveys. The questions posed in the surveys are just a general guideline for the platform testers, in order to guide and help them in the provision of feedback. However, space for further feedback integration for covering topics not found in the asked questions has been always given.

In Chapter 2, more details about the timeline, the workflow, and the structure itself of the focus group are provided. In Chapter 3, the list of participants to the internal focus group is presented. Results of the internal focus group regarding the platform and the survey itself are discussed respectively in Chapter 4 and Chapter 5. In Chapter 6, results of the external focus group are presented. Finally, in Chapter 7, conclusions are summarized.

2. WORKFLOW AND TIMELINE

As already mentioned in the introduction, this focus group involves both internal partners and external stakeholders (more specifically, the pioneer users). For this reason, it has been decided to divide the focus group in two different sections. The first is called “internal focus group” and consists in feedback collection and implementation as explained in the next paragraphs and as shown in Figure 1. This internal focus group will allow an improvement of the BuiltHub platform before giving the first external pioneer users access to the platform itself. The second phase of the focus group involves the pioneer users (external stakeholders testing the beta version of the BuiltHub platform for the first time) and is called “external focus group”. In this latter case, training and feedback rounds will be performed.

The following Figure 1 shows the workflow of the internal focus group. The internal partners complete a survey collecting their feedback on both the platform and the survey itself. Their suggestions and opinions about the platform are elaborated and sent in a compact form to the platform developers, who will try to implement the suggestions provided by the testers. On the other hand, their feedback about the survey itself is used to ameliorate the survey used for the external focus group.

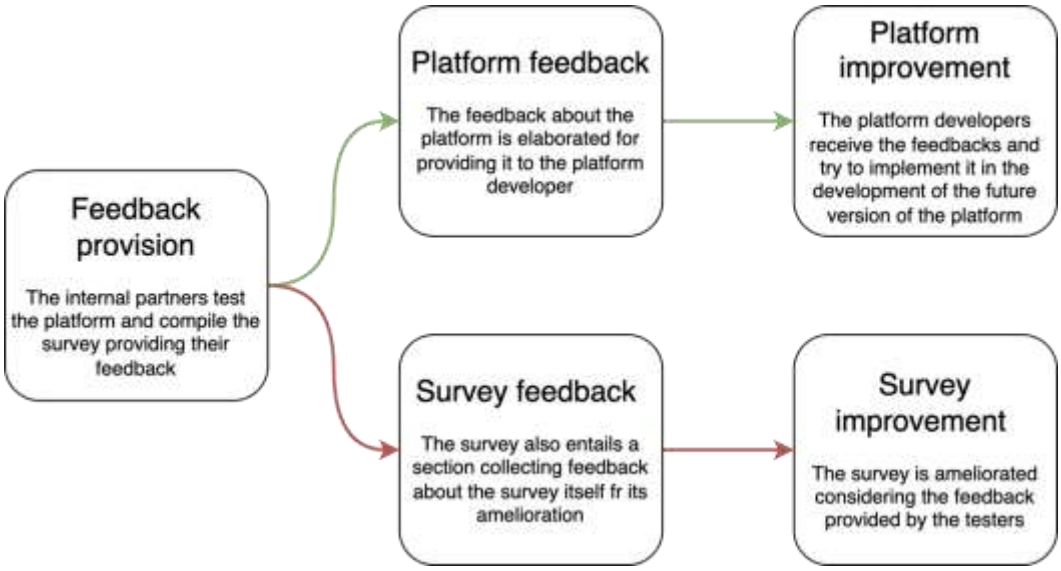

Figure 1: Workflow of the internal focus group

The timeline of the focus group is shown in Figure 2.

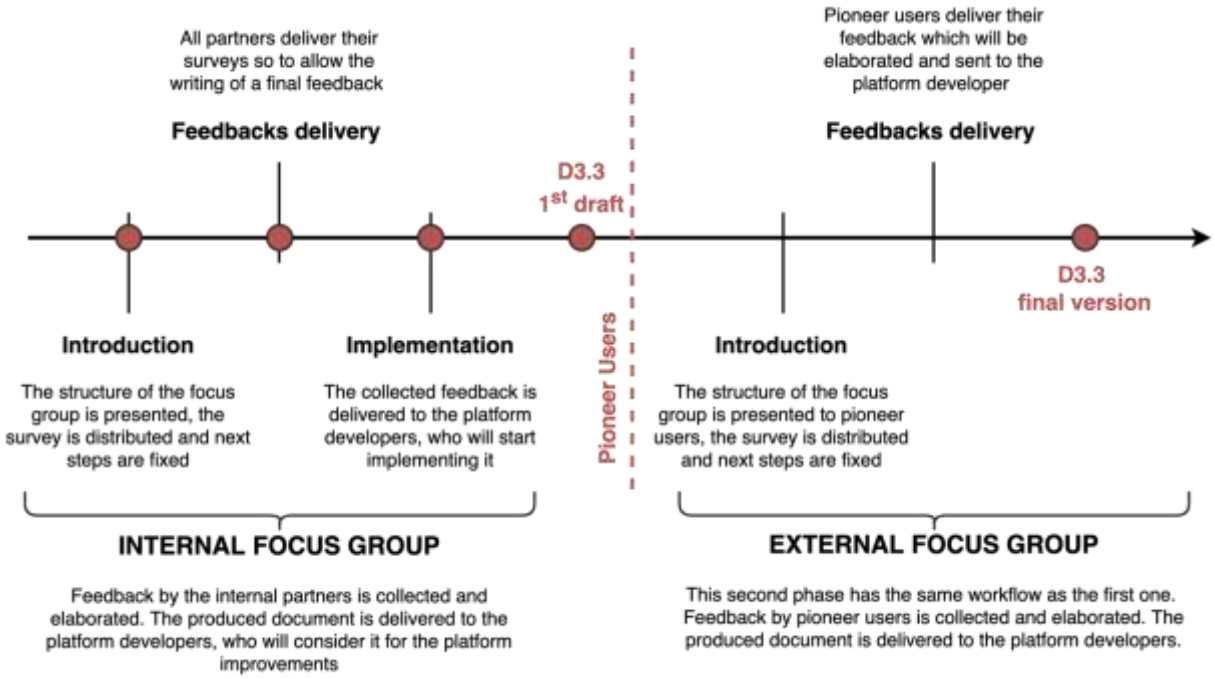

Figure 2: Focus group timeline

3. PARTICIPANTS TO INTERNAL FOCUS GROUP

As required by the Grant Agreement (GA) at least a member of each partner of the BuiltHub consortium has been involved in the internal focus process. In this way, all partners had the possibility to test the platform under development and provide feedback for its amelioration. NTT Data took place to the focus group as responsible for the development of the structure of the platform itself, thus has not been asked to provide feedback concerning the work done till now by themselves. A complete list of participants to the internal round of the focus group has been provided in Table **1**.

Table 1. List of participants to the internal focus group

Name	Institute	Contact
Alexander Deliyannis	SYMPRAXIS	a@sympraxis.eu
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Víctor Iván Serna	CARTIF	vicser@cartif.es
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4. INTERNAL FOCUS GROUP – PLATFORM FEEDBACK

4.1. Introduction to the survey

This first survey aims to collect feedback by the internal partners on two main topics. The first is the alpha-version of the BuiltHub platform developed. Specific feedback concerning all sections of the platform itself are collected. More specifically we set questions for:

- Registration procedure
- Dashboard (data selection, data representation, data download, graphical impact)
- SPARQL section
- Future scenarios section

The kick of meeting for the internal focus group was held on the 22nd of October 2021. Since the platform was in this moment still in an embryonal phase of its development, not all feedbacks collected can be related to actually working functionalities of the platform. Some of them had just the purpose to evaluate users' expectations concerning parts of the platform that still had to be developed. The second part of the survey aimed to collect feedback about the survey itself (see Chapter 5). This feedback has been used to ameliorate the survey for the external focus group.

In the next sub chapters, all answers to the asked questions in the survey have been reported. At the end of each subchapter a short summary and elaboration of the conclusions derived by the answers is presented in the yellow boxes.

4.2. Survey – Registration procedure

The registration phase is the first act in accessing the BuiltHub platform. This procedure will be developed for the external focus group, since at the moment all participants to the internal focus group have been provided with access credentials. However, it will be discussed the working principle and scope of the registration procedure, which will guarantee in the future different access possibilities to different end-users according to the business plan the Consortium will develop (e.g., access to raw data download could be guaranteed only to partners and stakeholders providing data and not only downloading them). This first section of the survey aims to collect short feedback regarding the concept behind the registration and access procedure.

The registration procedure should allow to distinguish among the different end-users, allowing them a limited access to the different sections according to the business plan the Consortium will develop. Do you agree to use a registration for reaching this goal? (yes/no)

100% of participants voted: "yes"

Should there be a link, comment, disclaimer explaining the reasons why for the registration? (yes/no)

80% of participants voted: “yes”

If yes, why, and what should it include? (Please consider that at this time the business model still needs to be defined and clarified)

Table 2: registration procedure - information to give before to complete the registration procedure

Answers	times mentioned
Inform end-users approaching the platform that there are further benefits they could have if they want to share data, explain why registration is needed	3
Before logging onto the platform, a promotion and/or static info screen showing available data, services, screenshots etc. would be excellent to inform stakeholders what they get as an appetizer to register.	2
Both inform end-users and provide them with the necessary data for contacting the consortium for data provision	1
Describe necessary steps for registering, as well as a clear explanation about the different levels of access, avoiding, thus, possible misunderstandings	1
The disclaimer should specify and delimit the scope of rights and obligations that may be applied by the involved parties as a legally recognized relationship.	1
It would be desirable to know the type of users that are interested in consulting the data and maybe the purpose to check these data	1

FINAL CONSIDERATIONS – INTERNAL SURVEY – REGISTRATION PROCEDURE

All partners agree in **using the registration system for allowing end-users to access different levels of functionalities and services** provided by the Platform. This registration procedure will also allow the platform owners to keep track of the use of the platform itself and understand so which services are more used than others. However, about 80% of the participants to the survey thinks that a **disclaimer explaining the purpose of the registration would be needed**. This should be developed in a graphical design allowing the end-users to have an introduction to the data and services they could find in the platform. Before registering it is important to give people an overlook on what they can find on the platform, convincing so them to complete the registration. It should be clear to end users that through the registration they could have access to extra functionalities. Which ones? What are the benefits? …

Box 1: Final considerations – internal survey – registration procedure

4.3. Survey – Dashboard

The dashboard will probably be the most used section of the BuiltHub platform. It is the one entailing the most basic functions and allowing users to select, visualize, and download the data they are interested in. This section needs to be accessible to all type of end-users, thus needs to be as user friendly and eye-catching as possible. This chapter of the survey focuses on collecting feedback related to the most relevant aspects of the dashboard: the graphical impact, the data selection system, the tabular, geographical, and graphical representation, and the download functionality. At the end also general feedback on the dashboard as a whole is collected.

4.3.1. Survey – Dashboard – First Look

Today, more than ever, the eye wants its part. For this reason, short feedback regarding the graphical impact the end-users have in accessing the platform is collected. The feedback could serve for making the platform interface more attractive and eye-catching for the end-users.

Rate your degree of satisfaction about the visual aspect and first impact the BuiltHub platform gave to you. (1-10)

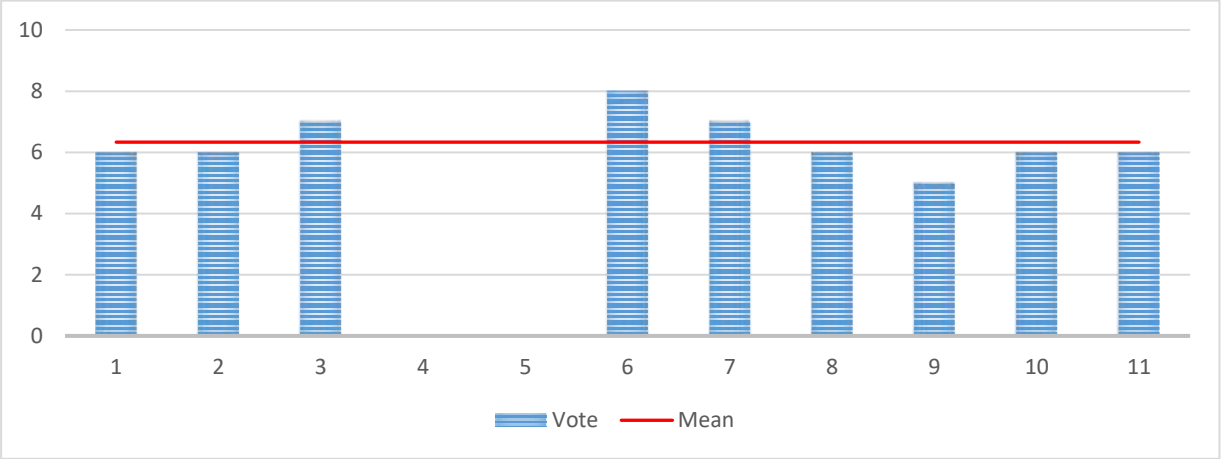


Figure 3: Degree of satisfaction about the visual aspect and first impact the BuiltHub platform. Missing data might be given by not answered questions or not delivered surveys

According to the mark you gave, what are the strengths and weaknesses of the visual impact the platform gives to the users

Table 3: Strengths and weaknesses of the visual impact the platform gives to the users (M. stands for mentioned times)

M.	STRENGTHS
4	The icons are nice and mostly self-explanatory
4	The colours and general aspect are nice
2	Map can be hidden to give tabular/chart view more space

2	Good disposition of buttons, filters, and data
2	Simple
1	You can navigate smoothly
1	Columns' labels seem clear.
1	Simple background
M.	**WEAKNESSES**
5	The dashboard should immediately give visual information for the user to recognize and to trigger him to dive deeper into it.
4	The disclaimer does not have an "accept" button, so the way to remove it is not very intuitive.
4	It would be good to have mouse-over texts which explain the small icons present in the Hub
3	Icons at bottom of screen can get out of view, they should always be visible
3	When the dashboard opens there are already all data displayed even before inserting the filters. I would not let any data appear
2	Column titles are missing
2	Maybe it is something related to the screen resolution I am using, but many times it is necessary to use the horizontal bar to explore the table and to see some buttons.
2	After click on "Dashboard" screen mostly stays blank – immediately show map and default initial query with some data
2	Map button not self-explanatory
2	The disclaimer is hard to remove
1	Maybe the country names can be shown in English in the map display.
1	Map is hidden, it should not be when the
1	The disclaimer appears every time you go to the dashboard page
1	I can close the "data source"-box, but I cannot reopen it. Somehow it would feel more natural to have it smaller and below the Table and in one line.
1	We need consistency in the upper and lower cases. I suggest sentence case, meaning only the first letter should be upper case for all options.

Do you like the disposition of maps/selection system/other buttons? Is there something you would ameliorate in this regard?

Table 4: Suggested ameliorations regarding the disposition of map, tables, filters, etc.

Mentioned	Aspects
5	Map is hidden with not appropriate symbol
3	The button “download plot as a png” on the right is invisible and you do not notice it without going on it with your mouse
2	All buttons could be on top of the table, especially if the bottom of the table cannot be seen
1	For me the maps are one option to visualize and should thus me next to the other graphs
1	I like the data selection system to be on the left. I would maybe divide it in three separated boxes: one with temporal information, one with spatial information and the last with the buttons for the specific indicators. The space dedicated for the data display is instead enough.
1	We don’t need to write “BuiltHub data”, it is just taking space
1	Somehow it would feel more natural to have “data source”-box below the Table, in one line and smaller

Is there something that should be graphically ameliorated? If yes, do you have suggestions/ideas on how to ameliorate it?

Table 5: Possible ameliorations and solutions for the graphical design

Mentioned	Aspects	Possible solutions
5	Unclear how to close the disclaimer	It is not obvious what to do with the Disclaimer, I am always searching an X or an ok button
2	In my opinion, the initial page appearing after the disclaimer could be ameliorated, not letting all data appear before insert the filters.	It could be nice to insert a sort of small tutorial on how to use the platform (e.g., insert here first the temporal range in which you are interested, press here for converting the selected data in graphs, etc.). This small tutorial could be also skipped by pressing a “skip” button and allowing the users to start their research. This solution could solve also other problems such as the not enough clarity of some buttons (which might be not visible or their function not clear)

2	Design is too heavy and playful: colors and round edges don't fit seriousness of datahub for me	The design is very playful with the round boxes and the way the colors are used. As we are showing sophisticated, hard to get data and analysis, I would prefer a more serious design, maybe with clear cut corners. lighter colors or frames
1	In the table the header has no names	
1	The zoom should not affect the navigation line at the top and the bottom line	-
1	The zoom should not affect the filters	-
1	the data selection system could be ameliorated dividing the buttons in sub-sections	I suggest dividing all the filters on the left in 3 different boxes: temporal selection, spatial selection, and indicators choice (or something similar)
1	Font issues	The font needs to be the same: "BuiltHub data" in the middle is written differently. I don't like that font. Also, we don't need to write "BuiltHub data", it is just taking space.

FINAL CONSIDERATIONS – INTERNAL SURVEY – DASHBOARD FIRST LOOK

The **mean vote** given by the participants to the first look (graphical) of the dashboard is **6.3**. Aspects that have been particularly appreciated are the mostly **self-explanatory icons**, the disposition of the buttons and the **simpleness and clearness** of what has been displayed. However, multiple critical points have been arisen: Some of them are related to the disclaimer, which appears every time and for whom it should be given the possibility to close it through a "accept" or "skip" button. Other comments are related to a **request for higher user friendliness**, **introducing small tutorials** on how to use the tools, mouse-over texts explaining the small icons, etc. (more information can be found above). According to most of the participants to the survey, the dashboard should immediately give visual information for the user to recognize and to trigger him to dive deeper into it. In this regard we know that the platform developer and other partners are having meetings to solve this problem. More specifically, it has been decided to **continue with storyboards**, meaning that we define and design the screen that the user sees first and how they can navigate from there. This landing page should not have dropdown filters but be a true dashboard like the one below. The user should then be able to click on different elements to dig into deeper details. This modification should solve most of the problems detected by the platform testers in this section.

Figure 4: mockup of a possible future dashboard introduction page

Box 2: Final considerations – internal survey – dashboard first look

4.3.2. Survey – Dashboard – Data selection system

The way a platform allows the end-users to select the data they are interested in, is one of the core functions affecting the user friendliness of the platform itself. Since providing a user friendly and easy to access platform to the end-users, collecting feedback in order to ameliorate this function is fundamental.

Rate your degree of satisfaction about the smoothness and user friendliness of the data selection system. (1-10)

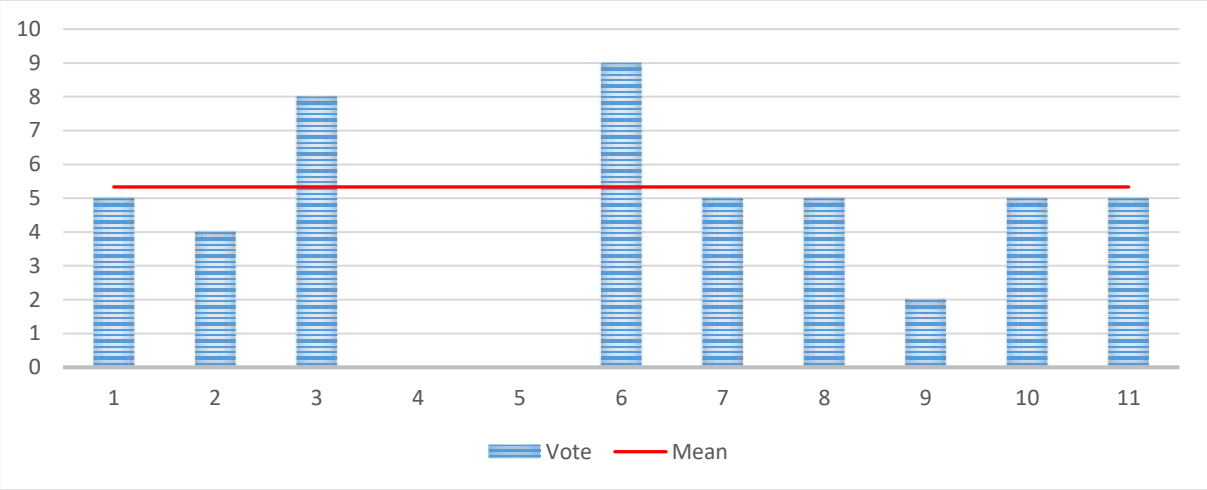


Figure 5: Degree of satisfaction about the smoothness and user friendliness of the data selection system. Missing data might be given by not answered questions or not delivered surveys

According to the mark you gave, what are the strengths and weaknesses of the indicators selection system provided by the platform?

Table 6: Strengths and weaknesses of the indicators selection system provided by the platform. (M. stands for mentioned times)

M	STRENGTHS
4	Nice colours, buttons, interface, position
3	There is a good subdivision by the filters used, but they should be maybe better clarified to the end-users
2	Good “Apply” button
2	Generally easy to understand
1	good reset button
1	It is very comprehensive and allows access to all data in the same way

1	When you consider the user's expectations/needs and the application of the filters, I think they will be met and not cause confusion.
M	**WEAKNESSES**
4	Sometimes filters are unclear. It would be good to allow the reader to know the meaning of the filters (e.g., by giving explanation by moving the mouse on the name of the indicator)
3	It pushes the user into the data lake and asks them to swim. There is no overview of the data and their metadata such as the data structure, the sources, the breakdown options etc.
3	I miss an EU or European filter
2	All possibilities given by the buttons should be divided in boxes so to clarify and better show graphically what the possibilities given by the platform are
2	I assume tooltips could be used to present a brief explanation of every filter.
2	It is not possible to select multiple nations (e.g., Italy, Germany, Spain) for comparing the data. You can only select a single nation or all countries together. This should be changed. This implementation might be added also for the building type.
2	The user does not know what data is available on the platform and how to perform working searches
1	Concerning the available years, there is no range provided. I think that inserting some suggestions on the available years could be interesting
1	Maybe it's just a performance issue, but sometimes when clicking on the drop-down list, the options take a while to appear. This was tested in three different browsers.
1	When doing a search and then displaying it from tabular to graph, it apparently works, once we skip again to the tabular form the filters seem to be reset and the research we did is not saved.
1	Some of the parameter should be multi-choice
1	nice to have the country names by alphabetic order, but there are some in a wrong place
1	Wrong inputs (e.g., text instead of time range) return “No results found”, better to not allow meaningless input
1	Time range selection a bit cumbersome (suggested: slider)
1	Some dropdown list items may be wrong (e.g., Building Type has “Buildings” and “Households” under “Residential”, but they do not return any result)
1	The subdivision of households by type of building is unclear (what does apartment block mean? And multifamily houses? Are them not already included in the apartment blocks?

1	If we want to cover only EU Members State countries, then UK should not be included. Alternatively, EU+UK should be mentioned.
1	filters for “non-residential” or “residential” does not work. For residential ones there are a “total” filter at the end of the list, which is not intuitive. It would be better be able to select the whole category, as well as a “All types” category at the top instead of a blank space. Also, once the selection made, it is not visual to which of them it is referred (non-residential or residential). It could be reflected as well even when the selection list is hidden. Same concept for energy carriers
1	The dropdown design is inflexible. It holds a dropdown for each dataset and their categories, such as “energy consumption end uses” and “energy carrier”. What if we have a new dataset for greenhouse gases, would we then have to add a new dropdown for the types of gases, CO_2, CH_4, N_2O?

Do you feel comfortable with the possibilities given by the filters implemented in the platform? Is there something you would change for ameliorating them?

Table 7: Ameliorations for the filters implemented in the BuiltHub platform

Mentioned	Answers
4	Maybe in a next step, it could be linked some filters to others and that the selection of some parameters blocks the selection of others linked to them (e.g., if we want to see the energy consumption for a certain use, this selection could block the selection of the “Building Shell Performance” parameters, since it cannot be applied to them). Currently, if the selection of several parameters does not work, it simply does not return anything (“No results found”), but there is no notice of what is not compatible of your selection
3	For sure I would implement the possibility to only select certain countries for the data display (not only choosing between a single state or all countries). Furthermore, once set the filters, they should remain unchanged whenever I change from a type of display format to the other.
2	In Building Type, parents’ groups (Non-residential, Residential) should be available
2	Provide a data navigation tree or dictionary of available data
2	Selection of country by clicking on map (connecting selection with filters). Selection of more countries allowed for totals or comparison (e.g., by multiple clicking or by dragging rectangle over them)
2	Generally, the structure of the filters selection system should be deeply modified and made clearer

1	I am not so sure with having “total number of dwellings” under the menu related to energy consumption end-uses.
1	More filters could be added (there are a lot of info in the datasets to filter). For example, there is not filter for energy prices (Dataset 24) and there is no information about energy prices. Or for dataset 27 (cooling and heating degree days) there is no filter and no information.
1	Some filters do not follow the mind maps. For example, energy carriers selection do not follow mind map 0.3 in which more options are available, and the organization is different
1	Use a slider for time parameter selection
1	Filters have default value pre-selected (e.g., “total” on top)
1	Gray out filters producing “No results found.”, so they cannot be selected
1	Warn before performing “heavy” queries about amount of data and that it will take a while. Give possibility to interrupt/reset
1	We would strongly suggest distinguishing the filters (year, country, NUTS level, building type and energy carrier) from the actual data outputs (currently only two: energy consumption end uses, and performance). We would expect to have also a third data output category already, that of “number of buildings”. We assume that this is due to an absence of data.
1	There is the option “other fuels n.e.c.” in the Energy carrier dropdown. We should not use abbreviations. However, we should consider having a glossary explaining all options available in the dropdown menus.
1	In the “energy consumption end uses”, there is an option “Conventional dwellings in non-residential buildings (NRES)”. The options do not seem to belong in this dropdown but maybe rather in the building type. The abbreviation is confusing and should be removed.
1	The dropdown box “Building Shell performance” shows building components, such as Wall, Floor, Windows. The data is dimensionless, and I cannot make sense of what it really is. Either the name of the box needs to be adjusted or the options.

Do you think it is necessary to add a link or a short explanation on how to use the data search system? (yes/no)

87% of the participants voted “yes”. Who voted “no” stated that a data platform should generally be self-explanatory.

If yes, what should it include?

Table 8: List of proposals for ideas on how to make clearer the selection system

ANSWERS	mentioned
A clear indication on how to use the filters systems, how to convert the data from tabular to graphs, how to download data and so on. This tutorial could be displayed at the opening of the main dashboard page and could be skipped through a “skip” button if the end-user already knows how to use the platform	4
Indicators should be explained, for example by providing information when moving the mouse on the indicator´s name	3
I think having “mouseovers” for critical elements such as the dropdown box headings would be beneficial and increase user-friendliness. These are little boxes that appear when you hover over a specific element and contain background information about this element	3
The links between filters. Explanation could be useful, but by blocking some filters once other are selected could be enough	2
It is important to remember that different levels of users with different expectations and level of knowledge may use the platform.	1
First-time use tutorial, predefined use “stories” with examples	1

FINAL CONSIDERATIONS – INTERNAL SURVEY – DASHBOARD DATA SELECTION SYSTEM

The **mean vote** given by the participants to the dashboard data selection system is **5.3**, indicating a **low degree of satisfaction** and multiple interventions to do to provide a better service.

First, it has been seen that a **multiple choice** for several parameters is not possible (e.g., it is possible to select data for Italy, but if someone wants to extract in a single table/graph data for Italy, Spain, and Germany this seems not to be possible). This functionality should surely be implemented since it allows end-users to make comparisons.

A second problem detected is the insufficient clearness of the data present in the datahub. A clearer scheme of the available datasets/indicators could help the end-user in the navigation (e.g., the system provided by the BSO itself gives to the end-users a clear picture of the available data). The use of such a system decreases however the flexibility of the platform, but on the other side it increases the user friendliness. A clear and definitive **equilibrium between user friendliness and flexibility** should be decided within the consortium. This seems to be the main problem, affecting the section related to the graphical representations. Allowing a too high flexibility in the filtering, leads to the creation of graphical representations, which are in the end not clear and difficult to read. Once again, as already shown in Box 2, the dashboard is probably going to be changed in its introductory part and end-users will be led in navigating the platform in a different way. This could probably solve this problem.

Another problem detected in the filters is the **not clear subdivision in macro-filters**. Instead of having all filters together it would be preferable to have separated boxes for temporal filtering (years), spatial filtering (countries and granularity) and indicators filtering (final names of the chosen indicators). Furthermore, at the moment the platform allows to use filters also in combinations which make no sense, and which will **provide no results**. It would be important to block certain filtering options when other options have been already selected. This problem again could be solved reducing the flexibility of the platform and inserting a structured list of indicators available. Generally, for helping the end-users in their research it could be implemented a sort of tutorial or instruction page on how to use the platform. More requirements and details about this section are reported in the detailed results of this sections' survey.

Box 3: Final considerations – internal survey – dashboard data selection system

4.3.3. Survey – Dashboard – Data tabular representation

The most basic graphical representation a database can provide is the tabular one. Tabular representation should provide to the end-user a clear vision of the data he selected. Of high importance is the clearness of the information provided, which means having a clear correlation between the rows and the columns of the table itself. Metadata provision is a fundamental aspect of this functionality.

Are you satisfied with the way the data is represented and with the information provided? Rate your degree of satisfaction. (1-10)

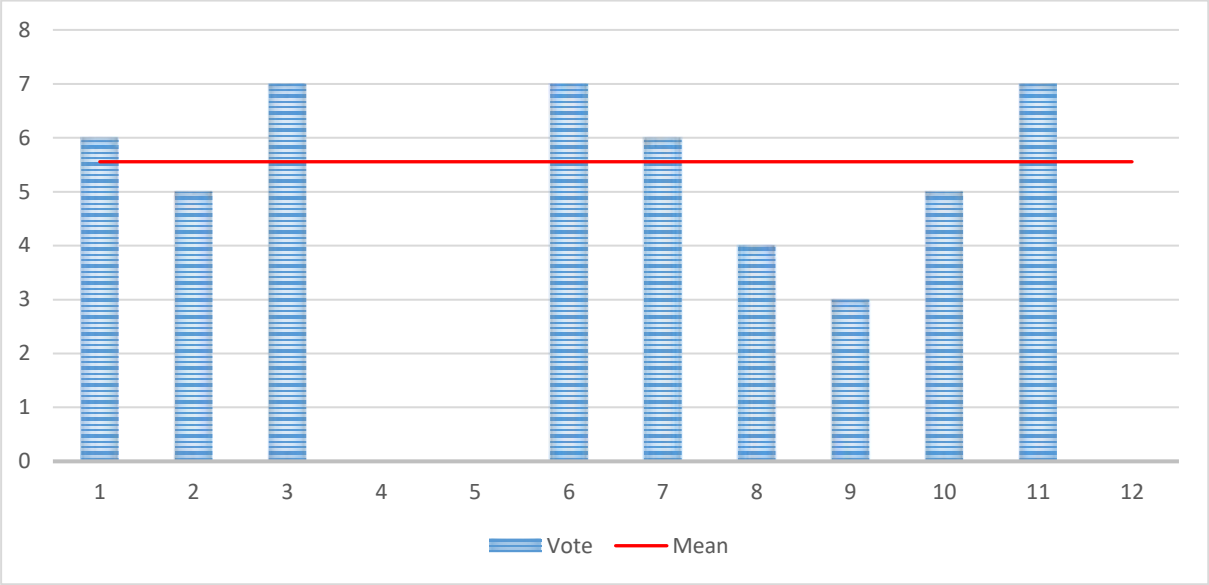


Figure 6: satisfaction degree for the data tabular representation. Missing data might be given by not answered questions or not delivered surveys

According to the mark you gave, what are the strengths and weaknesses of the tabular representation provided by the platform?

Table 9: Strengths and weaknesses related to the tabular data representation. (M. stands for mentioned times)

M.	STRENGTHS
3	I particularly like the possibility to rearrange the columns by dragging-dropping them.
2	The arrangement of the elements is clear, as well as the columns' labels.
2	Date is well presented (can be read well)
1	Nice to see the whole table (all columns) at the same time
1	Clear display of the units of measure and reported values

M.	WEAKNESSES
4	Data in the table could be grouped to be better/easily understood or compared
3	You cannot see the longitude of the table (scrollbar is hidden if you are not in the table)
3	There are no names in the header of the table
3	The font is small and not easy to read
3	Not given the possibility to order alphabetically or by value the different columns
3	Allow selection of columns to appear in tables (right now it seems that all available columns are shown but user might only want a subset)
2	The same data is repeated 4 times.
2	Not sure that displaying the source in this way is effective. There might be values having different sources. It might be better to add the source in a separated column
2	Adapt column size to text length (or allow interactive resizing, as some texts might be very long)
2	avoid the redundant use of “dimensionless”; we would expect that energy consumption and performance are both always expressed in specific units. If a particular value is dimensionless, what does it actually say? Even if it concerns number of buildings, it should state instead “number of buildings”
2	There could be an option to hide columns and to save views
1	More info (columns) could be added to the table (depending on the dataset there are different info to be shown)
1	In terms of performance, I wonder how this tabular representation will be in case the search result is a table with thousands/millions of rows.
1	The parameters in the “Identifier” column does not fit well. The width of the columns needs to better fit in the content
1	The table shown is not beautiful
1	When doing specific research, the values get displayed in strange orders (e.g., you evaluate an indicator for a specific country for all available years and the order of the displayed items is not temporal) – I do not understand the concept behind ordering items
1	The high versability of the tabular representation, which is a great strength, becomes a weakness when there is the need to convert the table into a graph or map
1	Long text is truncated

1	Maybe some part of the desired table can be shown at a time, not the whole table. Or the user can select how many rows that she wants to see at a time. So, there can be multiple tables if the rows are more than 50, for example
1	The Created table can be filtered from the headers like an Excel table. For example, we can select multiple building types and we should be able to filter them in the main table to analyse them easily.

Are you satisfied with the metadata provision? Rate your degree of satisfaction. (1-10)

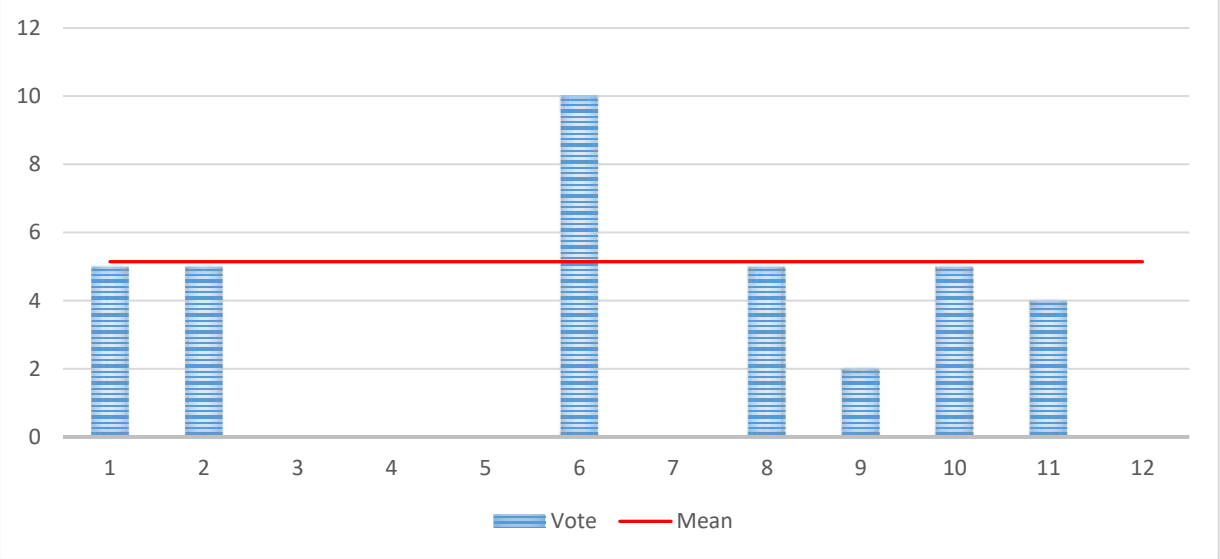


Table 10: degree of satisfaction in the metadata representation related to tabular data provision. Missing data might be given by not answered questions or not delivered surveys

According to the mark you gave to the metadata provision, what should be eventually ameliorated?

Table 11: Suggestions for ameliorating the metadata provision in the tabular data representation

Mentioned	Suggestions
3	I did not spot the data describing the main data points
2	Suggestion is to offer links to metadata code lists and methodology pages.
2	Personally, I do not see a big improvement if I compare the metadata provision of BuiltHub with the one provided by the BSO. The only information appearing is: “SOURCE: Eurostat”. I think that more information should be provided, and this information could be made accessible through a link clicking the source name. Furthermore, there might me the possibility to have multiple sources in the table, so a specific column could be dedicated to report the source of the data.

1	Currently, the metadata given is just the data source

FINAL CONSIDERATIONS – INTERNAL SURVEY – DASHBOARD DATA TABULAR REPRESENTATION

The **mean vote** given by the participants to the data tabular representation is **5.1**, indicating **a low degree of satisfaction**. Among the most appreciated features of the tabular data representation, end-users indicated the possibility to rearrange the columns and the clear and complete representation of data (e.g., reference year, unit of measure, etc.). On the other side the most criticized features are:

- The table cannot be seen all in one time on the screen, it is necessary to zoom out, but the font is already really small
- Some columns should be made more compact and the names on the header of the table no titles are added
- There should be the possibility to decide which columns to show
- There are problems in the data display, where the same data appears multiple times

Further critical points are related to the **metadata provision**, which has been negatively rated with a **mean vote of 5**. In this case some end-users did not find them while others think that a specific column for the metadata could be added (or similar strategies adopted).

Box 4: Final considerations – internal survey – dashboard data tabular representation

4.3.4. Survey – Dashboard – Data geographical distribution (maps)

The geographic representation in a database aims to provide to end-users clear maps of certain geographical regions (e.g., Europe, single Nations, …) describing a number of indicators at different resolution level (e.g., NUTS0, NUTS1, LAU, …). The information can be provided on the maps in different ways, such as colored gradients maps. This type of representation allows the end-users to have a clear idea and an overview on the distribution of the indicators they were searching for. This section aims to provide feedback concerning the geographical representations provided by the BuiltHub platform.

Rate the user friendliness of this section. (1-10)

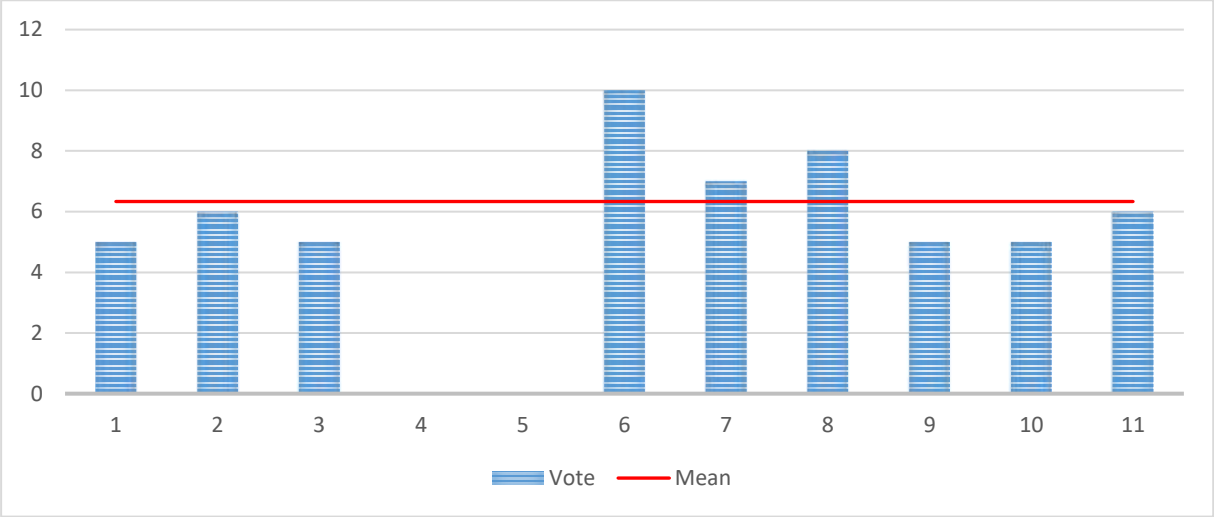


Figure 7: User friendliness of the geographical data representation. Missing data might be given by not answered questions or not delivered surveys

Rate the selection system for the different maps/granularity levels/indicators. (1-10)

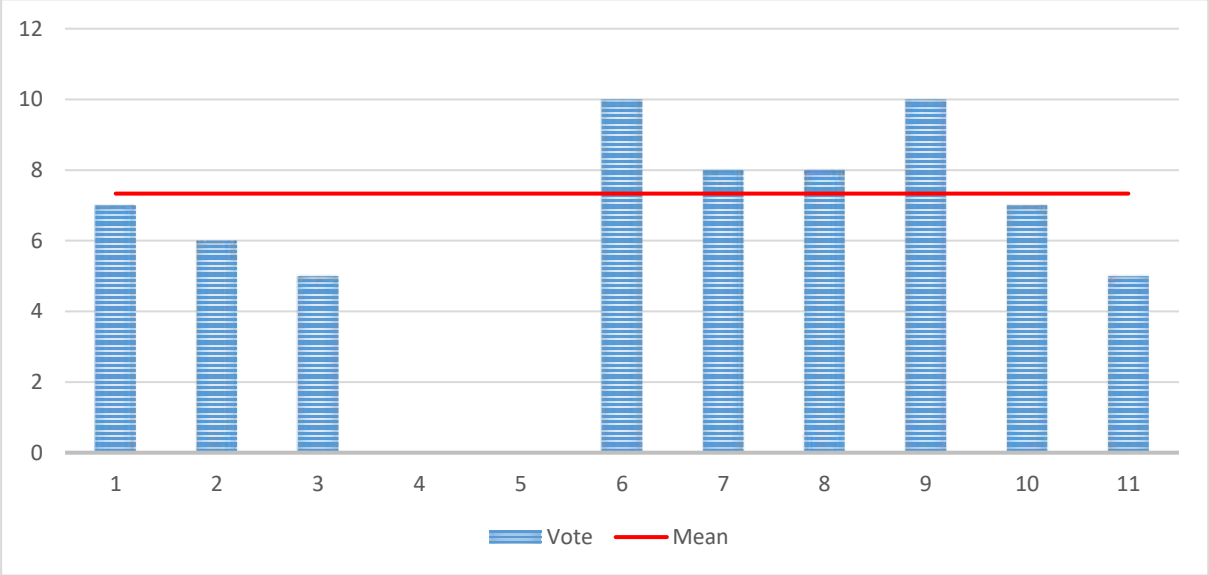


Figure 8: User friendliness of the selection system for the different maps/ granularity levels. Missing data might be given by not answered questions or not delivered surveys

Did you try to download data from this section (yes/no)

All platform testers tried to download the data. However, not all of them have been able to download them.

Did you have any problem in the download phase? (yes/no)

72% of the platform testers incurred in some problems in trying to download the data

If yes, explain.

Table 12: Problems encountered during the download phase of the map geographical data representation

Mentioned	Explanation
6	The function for downloading the data of the map both in tabular and graphical form does not seem to be implemented yet. The only button next to the map (not visible if not going on it with the mouse) allows you to download the data in png format, but the downloaded data is the one of the tables, not the ones of the map (which do not overlap at the moment).
1	The png image downloaded appears to be highly grainy.
2	I did not see a download tool available.
1	Currently, the map seems to be statically linked to the EU population per country. This works fine. However, it seems this data cannot be downloaded. Also, no other data/indicators seem to appear on the map.

What are in your opinion the strengths and the weaknesses of the geographical representation possibilities provided by the BuiltHub platform?

Table 13: Strengths and weaknesses of the geographical data representation (maps). (M. stands for mentioned times)

M	STRENGTHS
4	legend very clear.
4	selection tools very clear.
3	Good the info at the top right when passing the mouse over the different countries
2	Intuitive selection of country/region
2	Dynamic showing info when hovering over a country is a nice feature
1	Smooth transition switching from a NUTS level to the other
1	It is powerful to see one indicator and compare by zones
1	Map for different NUTS levels allows for interesting representations of currently available data and a visual comparison of an indicator among countries

M	WEAKNESSES
3	Not possible to download the data entailed in the map at the moment. Probably because no data a part of the population has been implemented yet
3	The scale used for the gradients should be adjusted according to the maximum and minimum values registered for the filters used. Otherwise, for example, by reducing the granularity to LAU level and reducing so the values for each geographical area for population, the map becomes all light yellow
2	Apart from the possibility to select the country and navigate through the map, no other operation was possible.
2	The button that switches between the tabular data and the map is very small and it was only possible to activate it by intuition, otherwise I believe the user would not find this functionality.
2	Lines that separate countries (or other NUTS levels) could be black instead of red since the legend is already reddish
1	The names of cities and similar on the map appear to be grainy
1	Once selected a NUTS level lower than NUTS0 the national borders are not visible anymore, it would be nice to have them also at lower granularities
1	The map behind could be more attractive
1	It is difficult to put information for more than one indicator at the same time
1	Border of each region is too wide
1	Does not allow selection of multiple countries/regions
1	Indicators do not show dynamically on the map
1	Download of map and related data seems not possible

What should be in your opinion be ameliorated concerning the geographical representation section? How?

Table 14: Critical points related to the geographical representation section

Mentioned	Explanation
2	The gradient colour related to the scale should be based on the evaluation of maximum and minimum values registered for the performed research, otherwise the visual effect of the gradient gets lost
2	Pop-ups to show more information (more than one indicator)

2	The map should implement a download button giving the possibility to download both the map and the information entailed in it in tabular form
1	National borders should be always visible, even if the NUTS level gets lower
1	It would be good to reduce the grainy effect characterizing the map
1	the available subtitles showing the different colours and population in the legend should be ameliorated. You assume it is about population just by intuition, but there is no clear description in the box itself.
1	Allow selection of multiple regions
1	Would be nice to have animation or a slider to show development over time

Are you satisfied with the metadata provision related to the geographical representation? Rate your degree of satisfaction. (1-10)

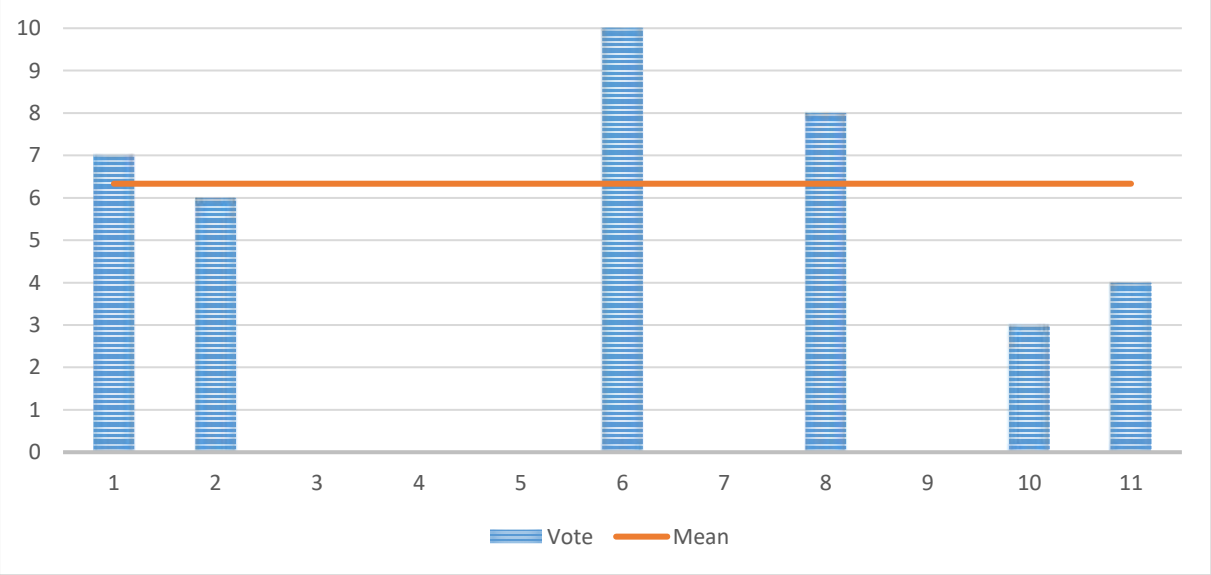


Figure 9: Satistfaction defree of the metadata provision in the geographical data representation. Missing data might be given by not answered questions or not delivered surveys

Here you have the space for providing any other type of feedback. Please let us know what you think

Table 15: Other feedback related to the geographical maps data representation

Mentioned	Explanation
2	I do not see any information related to the source of the data provided when using the map (maybe this information could be implemented under the actual values displayed on the map when moving with the mouse on the map itself?)
1	Currently, metadata is largely missing

FINAL CONSIDERATIONS – INTERNAL SURVEY – DASHBOARD DATA GEOGRAPHICAL DISTRIBUTION (MAPS)

The data geographical representation is clearly on a still early stage of development, since only data related to population is reported. The **user friendliness** of this section has been rated by the end-users with a mean vote of 6.2, while the filters for the maps have been rated with a mean vote of 7.3. However, almost all users had big **issues with the download of data**: The majority of them assessed that the function for downloading the data of the map both in tabular and graphical form does not seem to be implemented yet. The only button next to the map (not visible if not going on it with the mouse) allows you to download the data in png format, but the downloaded data is the one of the tables, not the ones of the map (which do not overlap at the moment). A few others have been able to download the map as png, downloading however a too grainy image.

Concerning the strengths of the map representation, the main points coming from the feedbacks are related to the **parameters selection system**, which is really clear, and to the feature allowing to display info at the top right when passing the mouse over the different countries. On the other hand, some critical points have been highlighted. The main criticalities are:

- The borders between the countries are red, the same color of the reddish legend. These two colors might be changed so to be different.
- The scale used for the gradients should be adjusted according to the maximum and minimum values registered for the filters used. Otherwise, for example, by reducing the granularity to LAU level and reducing so the values for each geographical area for population, the map becomes all light yellow.
- Download should be ameliorated.
- The button that switches between the tabular data and the map is very small and it was only possible to activate it by intuition, otherwise I believe the user would not find this functionality.

Box 5: Final considerations – internal survey – dashboard data geographical distribution (maps)

4.3.5. Survey – Dashboard – Graphical representation

The alpha-version of the BuiltHub platform tested in this moment does not provide yet the possibility to represent the selected data in form of graphs or plots. For this reason, it is not possible to collect feedback regarding the effective work done, but it is only possible to collect information related to the expectations the internal partners testing the platform have.

What do you expect from the graphical representation of the data the BuiltHub platform will provide to the end-users?

Table 16: Main expectations related to the graphical representation of data in the BuiltHub platform

Mentioned	Answer
3	not only provide ready-made graphs and nothing else, but also to allow users to explore the data in the graphs and customise them. A graph is just a graph, but an exploitable graph can be a really powerful tool.
2	Graphs through the filters should be able to present data for a single or even a group of countries (giving the possibility to end-users to choose)
2	Charts to be improved according to T4.5 output
2	Have a comprehensive set of pre-defined use cases and views
1	Many external stakeholders during the interview phase were concerned about visualising the data in an easy and dynamic way.
1	Representing some indicator selecting the parameter to organize the date (comparing for countries, dates, building type, etc.)
1	It would not make sense to be able to see all data in a visual way, it would be nice too than to block some graphical representation if the data selection does not allow to be visualize/compared in a graphical way
1	Interesting would be the provision of a graphical representation (or even a box containing these data) about the mean value of selected values or similar aspects (e.g., collect values for heating consumption per square meter in all EU countries in a bar chart, add than a horizontal line representing the mean value for the EU or the selected countries)
1	I expect to have the possibility to rapidly switching from a tabular to a graphical representation without losing all information done by selecting the proper filters.
1	It would be nice to have the possibility to switch the axes of the plots (e.g., x and y axes)
1	Allow comparison of same indicator available in different datasets (again, e.g., through clustered bar chart)
1	Sections showing multiple graphs and sections showing single plots/graphs

Different graphical representation can be used for different indicators (e.g., bar charts, pie charts, …). Do you think the choice of the graphical representation should be automatic or should be given to the user the possibility to choose the graphical representation they want? Explain

Table 17: Automatic or dynamic customizable types of charts?

Mentioned	Answer
5	Not only bar charts and pie charts but also the stacked bar charts for putting more types of information in the same graphs
2	The types already present are largely ok. How they are employed and tuned should be improved but this is work performed in T4.5
2	Bar charts, pie charts, line charts
1	Based on the information gathered during the interview phase, some stakeholders cited the possibility of graphically visualising data comparisons.
1	Representing some indicator selecting the parameter to organize the date (comparing for countries, dates, building type, etc.)

Which type of plots/graphs should be provided in the platform? (e.g., bar charts, pie charts, …)

Table 18: Types of charts suggested by the participants of the survey

Mentioned	Answer
2	Examples can be found in euCalc, Eurostat, Hotmaps (https://www.hotmaps.eu/map)
1	Particularly, I use a lot this feature of the CDP/ICLEI Unified Reporting System (graph customization). https://data.cdp.net/d/feaz-9v5k/visualization
1	Some of the charts provided by Power BI should be considered
1	Personally I like the format used by the BSO data mapper (https://ec.europa.eu/energy/eu-buildings-datamapper_en), the only thing I would implement in this case is the possibility to switch from a simple bar-chart to other types of graphical representation. Furthermore, I would implement the possibility to switch the axes of the graphical representation

Are there platforms providing plots and graphs which should be taken in your opinion as an example? If yes, why and in which aspects should be taken as an example?

Table 19: Possible suggestion and already existing platforms, which could serve as an example in the developing of BuiltHub

Mentioned	Answer
1	Although I can't explore them properly because it's an alpha version, I really liked the options presented to select only the desired data range, reset axes, zoom in, zoom out, etc. Any tool that brings flexibility to users to work with graphs is welcome

Do you have any other comment/feedback you think it is important to share?

Table 20: Other feedback related to the graphical representation of data in the BuiltHub platform

Mentioned	Answer
1	Once using the function “lasso select” there is no way for going back. I do not really understand the function of such a button. What is the added value it can provide and in which cases it could be used? Useful are the buttons for zooming, resetting the axes and rescaling. The others are not so clear to me.
1	The graphical representation is clear in the moment the filters are set for really specific research, otherwise the graphical representation becomes unclear (this is a problem given by the high versatility of the tabular representation). One example is searching for the number of dwellings for all countries for a specific year a bar chart appears. Once adding a further year to the research, the bar chart remains the same but values for different years are represented in bar charts one over the other like if they were summed, which makes no sense. Furthermore, switching to the pie chart representation, the information about the different years gets lost A deep work on the decision on how to represent data in plots should be done.
1	Personally, I think that for a good graphical representation, a solution for reducing the flexibility of the system should be added, otherwise it is difficult to provide proper graphical representations. Here again the problem of not having the possibility to select only certain countries is present

FINAL CONSIDERATIONS – INTERNAL SURVEY – DASHBOARD GRAPHICAL REPRESENTATION

First, it has been clear through the analysis of the answers that asking questions concerning features and services not yet implemented must be avoid if possible. The process of determining which graphical representations to use and how to develop is a process already going on in other work packages (e.g., WP4) and we should try to avoid such overlapping. In this regard, the next steps of the focus group will be only based on features and functionalities already implemented.

Generally, the participants to the survey expressed the desire of having not only ready-made graphs and nothing else, but also to allow users to **explore the data in the graphs** and customize them, obtaining so a really powerful tool. The graphical representation should be as such dynamic as possible but should also entail a sort of **user stories** ready to be explored. The change between tabular representation and the graphical one should be always possible and smooth. Among the possible types of graphs that could be implemented it is worth mentioning bar charts, pie charts, line charts, stacked bar charts, etc. The main objective of this feature should be to allow end-user to compare data for different countries, from different sources, for different years or even different indicators.

This section provides only some general indication about the needs identified by internal partners but should be better and autonomously implemented according to the input and discussions coming from other work packages.

Box 6: Final considerations – internal survey – dashboard graphical representation

4.3.6. Survey – Dashboard – Data download

One of the most important functionalities related to a database is the possibility to download the data entailed in it. The BuiltHub platform offers the possibility to download the selected data in different formats. This section aims to collect feedback concerning the download section.

Did you try to download the data in all available formats? (yes/no)

70% of the participants to the survey tried to download data

Did you find any problem in downloading the data? (yes/no)

50% of the end-users, who tried to download data, had some issues in doing it.

If yes, please explain.

Table 21: Problems that end-users had in downloading the data

Mentioned	Problems had in downloading data
2	I don't know what the available formats are. Data downloading is Ok, but I have only been able to download it in CSV format. Maybe more options could be added (at least XLSX format)
2	Allow dynamic layout selection of downloaded data (what factors are shown as rows, columns, and as separate 2-D tables)
1	The button representing a photo camera on the right is not visible. I casually found out about its presence by randomly going on it with the mouse
1	Downloading the files as png (e.g., plots) the image is a little bit grainy if increasing the zoom
1	Downloading the png no information about the unit of measure and about the indicator evaluated is provided. Concerning the tabular one instead, no information about the source is provided.
1	If more data is available should be also downloaded
1	Sometimes, when clicking on the download icon (the cloud with the downward arrow) with data shown on the map, nothing seems to happen. User should get some feedback.

Do you think the output results provided through the download are exhaustive? (e.g., provide more information in the output file, provide the possibility to download the data in a different layout, metadata provision …)

Table 22: Feedback about the quality of the information provided during the download

Mentioned	Answer
3	I think it is enough with being able to download the data you are seeing in the table in csv and xlsx formats.
1	Concerning the png format: the output is in my opinion not enough. No information about the selected indicator and about the unit of measure and sources is provided
1	Concerning the csv format: the platform should give the possibility to give a representation by row or column (e.g., by year or by country) according to the preference of the end-user. This is a service already proposed by the BSO database (https://ec.europa.eu/energy/eu-buildings-database_en) dividing the download in "by country" or "by item". Also in the tabular representation,

	using two axes (rows and column representation) the results displayed seem to be clearer.
1	More emphasis should be set on name of the indicator, year, unit of measure and value data. All other elements present in the list should be written but with lower emphasis
1	I only tested the functions to download the table data in CSV format and the plot as a PNG. I had no issues with these two functionalities.
1	Give possibility to download metadata along with data

Do you have any other comment/feedback concerning the download? Is there something that in your opinion should be ameliorated?

Table 23: Further additional feedback concerning the download of data

Mentioned	Answer
3	Maybe the possibility to download the data not only in CSV format, but also in XLSX (because of different levels of users; maybe they are not familiar with CSV, line-delimiters, etc.).
1	The BSO already provides the possibility to download data in jpg, csv, pdf, png, svg. The BuiltHub platform at the moment gives through the dashboard the possibility to have a download in png or in csv. Shouldn´t more options be implemented?
1	In the SPARQL section, data can be download in JSON format. I don't know if it is possible to have the same for the dashboard (just a suggestion).

FINAL CONSIDERATIONS – INTERNAL SURVEY – DASHBOARD DATA DOWNLOAD

The download of data can be divided and evaluated separately for the section related to graphs and tables, and the one related to the geographical map. In relation to the download of geographical data, more details are given in Box 5. Generally, almost no user has been able to download the geographical map, and the only one who did it reported about some problems in the graphical resolution of the png downloaded (grainy map). Concerning instead the download of data, it seems that the majority of the users was satisfied, but some critical points could however be ameliorated:

- Provide more download formats (e.g., XLSX, etc.)
- Give the possibility to order the downloaded data by nation, item, year. This has been developed for example in the European database for the Census 2011. Please for more information see the following link: https://ec.europa.eu/CensusHub2/query.do?step=selectHyperCube&qhc=false

Box 7: Final considerations – internal survey – dashboard data download

4.4. Survey – SPARQL Entry point

The SPARQL entry point is an added functionality allowing to the end-users to easily access the database through a method which is not the classic selection system. For using this functionality some basic knowledge in coding is required. This allows however to perform personalized queries and displaying specific data in the format the end-user wants. This section of the survey aims to collect feedback regarding the SPARQL functionality.

Have you been able to use the SPARQL entry point according to your technical competences? (yes/no)

Only 20% of the testers has been able to work in the SPARQL entry point thanks to his/her technical competences. 50% of the testers stated to be able to use it only partly, while the remaining 30% has not been able to use it.

If no, explain why

Table 24: Problems related to the use of the SPARQL entry point

Mentioned	Answer
3	I have tested the functionality only with the queries examples
1	Technical background not enough for coding a query

1	I have been able to code simple queries, even if I'm more used to SQL and relational databases, more complex actions would be not possible for me
1	I would need other example queries and a guideline how to formulate queries Even if a user knows the correct syntax, how can the user know what schemas are used? Or is this not necessary to know?
1	Clicking the gear icon, a difficult-to-read white text I shown

Rate how much you appreciated the integration of this function in the BuiltHub platform (1-10)

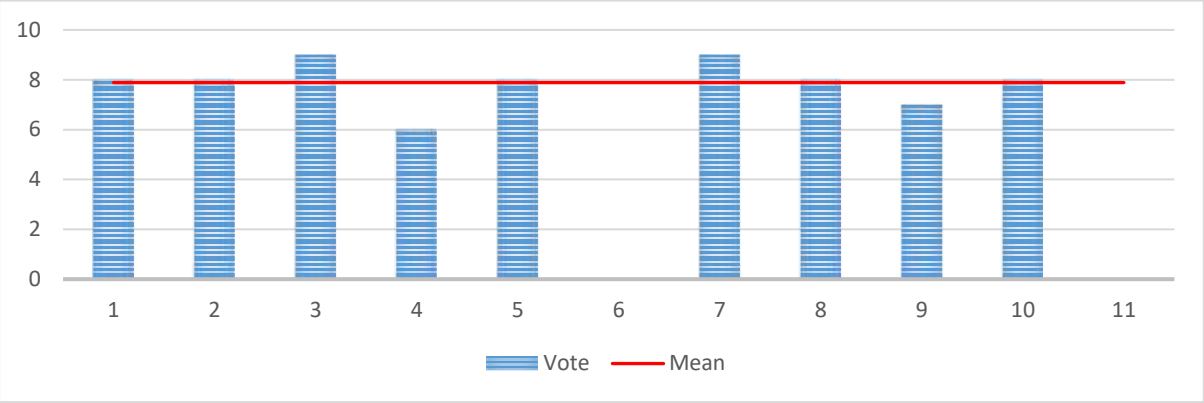


Figure 10: Degree of satisfaction related to the SPARQL entry point. Missing data might be given by not answered questions or not delivered surveys

Is the use of the SPARQL clear enough? Is there something that should in your opinion be implemented for making its use easier to the end-users?

Table 25: Comments about the SPARQL entry point

Mentioned	Answer
3	Indicate parameters to be changed (library of available data and codes)
2	Indicate ranges
2	Obviously, the aim of the BuiltHub platform is not to present tutorials on how to use SPARQL, but perhaps it could be interesting to add links to pages where the user could have more information about it and/or tutorials from official sources.
1	If you have knowledge of SPARQL, it is of course clear.
1	If the user has at least basic/medium-level knowledge of SQL, it might be possible to encourage the user to learn SPARQL, depending on the user's interest.

1	I think this part of the platform (or at least communicating with it through an API) is important. However, I would need guidance on how to use it. Example queries and a list of available schemas/fields or whatever is needed would probably suffice. A query builder could be very nice. The purpose of the form popping up when selecting the gear icon is not clear to me (is this a kind of query builder?).

Which are the biggest strengths and weaknesses of this section? (Explain why)

Table 26: Strengths and weaknesses of the SPARQL entry point. (M. stands for mentioned times)

M.	STRENGTHS	M.	WEAKNESSES
2	More flexible	3	Difficult to know the language to create the query
1	innovative for a data platform	3	Difficult to know the different parameters you can indicate in the query, the ranges or how to indicate them (the date for example)
1	Downloading in json and csv is much appreciated.	1	As in the dashboard there is a problem regards to the results (each value is repeated in 4 rows)
1	Possibility of generating your own queries; not limited to the dashboard features.	1	This environment might only be used by individuals familiar with SPARQL.
2	Possibility to save queries, share them and download the results.	1	Only one example query, which is too simple to understand how to do others
1	Possibility to develop queries for other platforms		

Do you have an idea on how to ameliorate it?
Are there functionalities you would like to be implemented in this section?

Table 27: Possible ameliorations suggested for the SPARQL entry point

Mentioned	Answer
3	Including information to help (instructions, ranges, etc.)
2	Provide list of prefixes, fields, ... that can be used, basically, an API use manual
1	More example queries showing the different possibilities
2	A dynamic query builder would be nice

FINAL CONSIDERATIONS – INTERNAL SURVEY – SPARQL ENTRY POINT

This section is the one that has been appreciated the most by the participants to the internal focus group, rating the section with a **mean vote of almost 8/10**. One of the most common points provided by the users is that this section is one of the functionalities distinguishing at the moment the platform among other similar services. One of the biggest problems of this functionality is however the fact that it is **difficult to use for not so skilled users**. The majority of the suggestions provided for ameliorating these services are in fact oriented in the development of a **more user-friendly section**. More specifically:

- Use of link redirecting the user to pages where the user could have more information about it and/or tutorials from official sources.
- Creation of a sort of library where the end-user can consult and understand which are the codes, he has to use for completing the queries (a sort of vocabulary translating the names of the available indicators in codes and similar tools).
- Provide list of prefixes, fields, ... that can be used, basically, an API use manual
- Develop maybe a dynamic query builder.

Even if the users provided a lot of good inputs for the improvement of this section, it is important once again to underline how much this section has been appreciated by them.

Box 8: Final considerations – internal survey – SPARQL entry point

4.5. Survey – Scenarios and plans section

The scenarios section has not been developed yet, thus cannot be subjected to direct feedback. However, this section of the survey aims to collect information about what the partners expect from this feature and how important they think it should be for the platform. Your feedback might help the platform developer in proceeding in the right direction.

Please rate how important this feature for the whole BuiltHub platform would be (1-10)

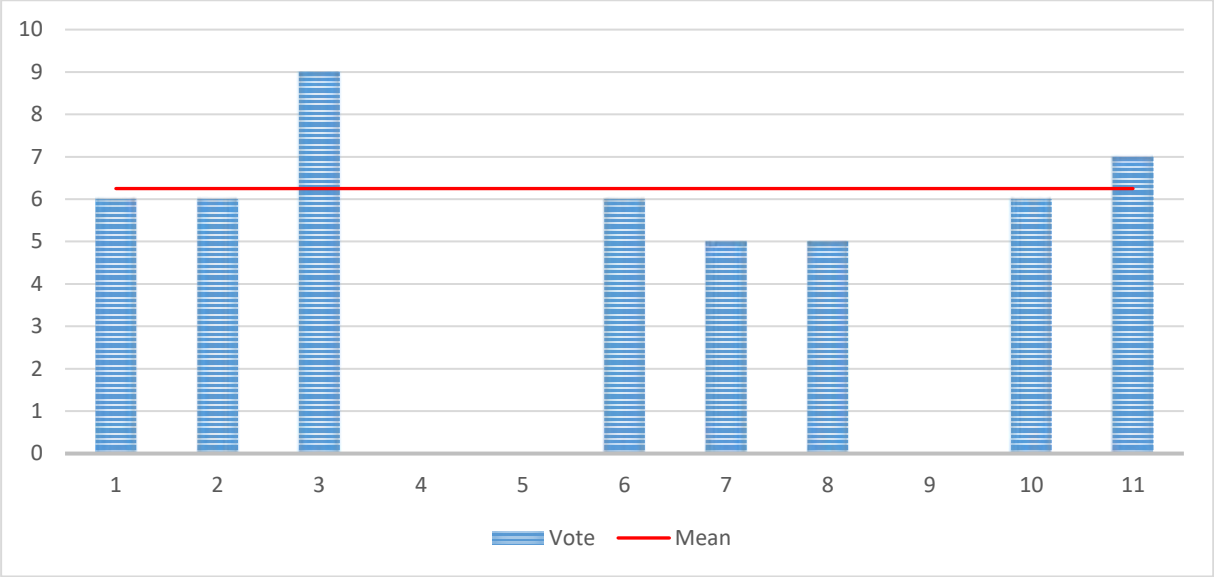


Figure 11: Importance of the scenarios and plans section for the future of the BuiltHub platform. Missing data might be given by not answered questions or not delivered surveys

What do you expect this section should do? Which is the mechanism you are expecting it to be based on? (e.g., already developed algorithms to be used by end-users just inserting the input data they are interested in? the possibility to generate own algorithms to provide to the BuiltHub community? …).

Table 28: Working ideas for the scenarios section

Mentioned	Answer
1	I believe that these functionalities should be aligned with the stakeholders' expectations and needs, according to information collected during the application the surveys and interviews conducted in WP2.
1	I believe that the scenarios and plans session could be a real differentiator of the platform, as long as the features are correctly aligned with the requirements raised in WP2.
1	It is difficult to imagine the potential of this part from my point of view.
1	It could be interesting to have already implemented algorithms only requiring data input chosen by the end-users and providing as a data output some possible future scenarios. These black boxes could serve as an example for developers willing to create some other algorithms basing on the database already provided. A business system guaranteeing some benefits to algorithms implemented should be developed, so to stimulate people to create added value to the platform itself. The new developed scenarios should be than available to all other end-users, maybe indicating the name of the developer

2	The scenario could be implemented by showing historic data and then offer different predictions based on a prediction model. However, this requires models. The platform could offer some basic predefined example models and then offer the user the possibility to define their own model and then show the scenario after executing the model (is it possible to perform calculations on the data?). Basic prediction easy to implement would be a linear, or exponential trend.
1	The creation of an implementation plan is even more difficult, BuiltHub could just provide some static, precalculated examples and guidance how to create such plans. In this sense, the functionality to be offered by the platform becomes the same as for the scenario.

Should this function be available only for a restricted category of users? (yes/no) Partners of the consortium, end-users paying for this service, end-users also providing data, …

20% of the testers stated to agree with the accessibility to this functionality only by paying an access registration, while the remaining 80% agrees with this statement only partly.

Please explain the reasons of this choice.

Table 29: Reasons for allowing/not allowing the free use of the scenarios section

Mentioned	Answer
1	Perhaps this can be a function that requires a higher level of control and moderation, but as a defender of free information I am generally against the insertion of paid services that end up scaring away platform users.
2	This is a high value and advance feature and with a lot of knowledge about the data. This is result of the project that should not be open
1	If this is an added value which allow additional and personalized options to the user, for me it makes totally sense that the user has to be registered and pay or provide data in exchange (be a stakeholder but in both directions…)
1	Not at least the part related to scenarios creation. It might be possible to give access to basic scenarios to all users and then a restricted access to some more complex scenarios to some partners or developers

FINAL CONSIDERATIONS – INTERNAL SURVEY – SCENARIOS AND PLANS SECTION

The survey developed for this section, according to what has been reported by the participants to the survey, should not have been proposed yet. The survey in fact works for already developed sections and functionalities. This is something that will be kept in mind in the development of the next steps of the focus group (T3.3). However, here are reported the main outcomes of the survey related to the scenarios section.

First, better to give a clarification about what it is intended for plans and scenarios:

SCENARIO: A "scenario" is the development over the years of one or more indicators (e.g., energy consumption, GHG emissions, U-values), which will develop differently depending on input assumptions (list of parameters influencing the scenario and historic data). Under this definition, the euCalc platform shows scenarios. Input assumptions could be the retrofit rate or annual investment.

PLAN: A "plan" would be an implementation strategy of the scenario. For example, if the scenario is linear GHG emissions reduction to zero by 2050, the plan could state the annual retrofit rate, annual investment, or even the detailed retrofit actions in sequence

According to the majority of the participants to the survey, this section should entail both pre-set scenarios, which might be interesting in relation to user stories and useful for end-users for understanding the working principle of this section itself. The service related to the scenarios creation could be restricted to certain users, according to the business plan the platform will follow. Generally, testers stated they would prefer to keep the service for free, since we should defend free information and the insertion of paid services might end up scaring away platform users. However, this decision should be taken according to the business plan the consortium will implement.

New evaluation and feedback could be asked once this section will be available for the testing phase.

Box 9: Final considerations – internal survey – scenarios and plans section

5. INTERNAL FOCUS GROUP FEEDBACK - SELF-AMELIORATION PROCESS

This last section of the survey has been added in regard to a self-amelioration process. The internal focus group feedback will be used to provide a better service for the external focus group (external stakeholders). All the provided information/suggestions will be indeed taken into account in the writing of the survey for the external focus group. Please remember that your contribution is of high relevance in the provision of a better service.

Rate the rate of efficacy this survey has in your opinion to provide to the platform developer an indication of the status of the platform. (1-10)

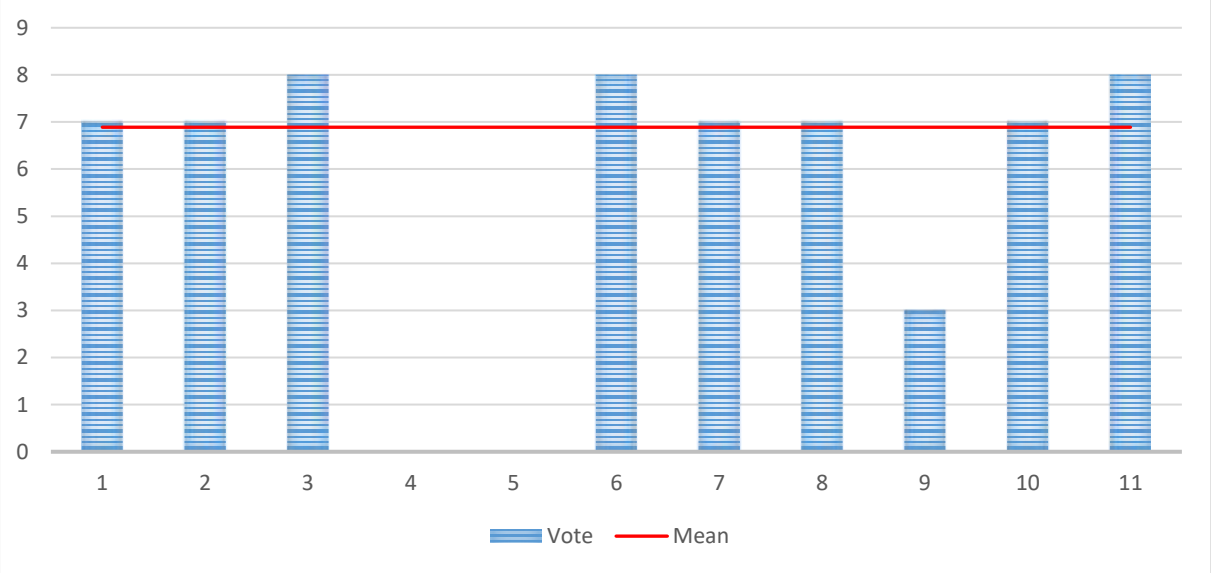


Figure 12: Degree of efficacy of the survey. Missing data might be given by not answered questions or not delivered surveys

What are in your opinion the strengths and the weaknesses of this survey?

Table 30: Strengths and weaknesses of the survey. (M. stands for mentioned times)

M.	STRENGTHS
3	The survey is clear and has an easy-to-understand structure. It will be probably easy for the consortium to understand the feedback provided by the focus group.
3	I like the idea to have not only closed, but also open questions.
2	Provides much feedback on how to improve the platform
1	All the important information is query

M.	WEAKNESSES
3	Too long
2	Some questions are almost repeated (e.g., in some cases I already did the feedback in the Weaknesses box and then it is asked again for things to improve)
2	Do not ask to single persons to provide feedback but ask one feedback per institution
1	The questionnaire asks for evaluation of functionalities that are not yet fully ready in the platform.
1	In my version of word, the questions are not well organized (the box are below or above the questions).
1	Some questions are not well placed.
1	The survey seems very huge due to the long empty space
1	Sometimes is difficult to move along the survey

Do you have a proposal on how to ameliorate it? (Please, remember that this feedback is VERY IMPORTANT for us in order to provide a better service and provide in the next focus group round a better feedback service to the platform developers!)

Table 31: Possible ameliorations for the next survey

Mentioned	Answer
1	At the end of the process, I would also like to have access to the feedback provided by the external focus group, just for the sake of comparing the visions.
1	The survey should be more compact
1	I would add a general question about what the use is expecting about the platform, and why/for what he/she will use the platform
1	Remove redundancies or add explanations to understand where seemingly equal questions are different.
1	Providing relevant screen shots from the platform makes it easier to experience it for the beginners.

FINAL CONSIDERATIONS – INTERNAL SURVEY – SELF-AMELIORATION FEEDBACK

The survey has generally been appreciated (**mean vote of almost 7**), but some important critical points and problems have been underlined by the participants. The detection of these problems will allow us to prepare the next survey providing a better result. More specifically we will take care of developing the new surveys according to the following main points:

- The survey will be divided in subchapters, as it has been done in this one, but we will take particular care on not writing redundant questions.
- The survey will be shorter, so to allow the end-user to complete it in a couple of hours maximum.
- The graphical structure of the survey will be different: no boxes will be inserted, so not to cause any problem in the visualization for different users. The question will be written one after the other, keeping so the survey also more compact.
- The survey will not be addressed to more people of the same institution, but one compiled by one or more person of the same institute will be enough.
- The questions asked will be ONLY related to already implemented functionalities, allowing the end-users to provide solid feedback on something they can have a look to and not just imagining how it could be.
- The survey might be written in a form of guided process in which we ask to the tester to perform some actions and to give feedback on what they did.

Box 10: Final considerations – internal survey – self amelioration feedback

6. EXTERNAL FOCUS GROUP – RESULTS OF THE SURVEY

In this chapter, the results of the external round of the focus group involving external pioneer users are collected. The collection of this feedback is the result of the testing of the beta version of the platform by 11 external stakeholders between the months of July and September 2022. Their feedback has been divided into five main subchapters, respectively evaluating: Platform registration, graphical design, data representation (tabular, graphical, and geographical representation), metadata provision and download, SPARQL entry point, and finally future scenarios.

6.1. Survey – Platform registration

The registration phase is the first act in accessing the BuiltHub platform. This first section of the survey aims to collect short feedback regarding the concept behind the registration and access procedure.

Did you find any difficulties in registering to the platform (yes=1/no=0)?

55% of the participants to the survey did not have any problem during the registration procedure. The remaining 45% of the participants reported issues in receiving the confirmation email required to complete the registration procedure. Only after multiple attempts, they were able receive the confirmation email and validate their account.

How would you rate from 1 to 10 the registration procedure?

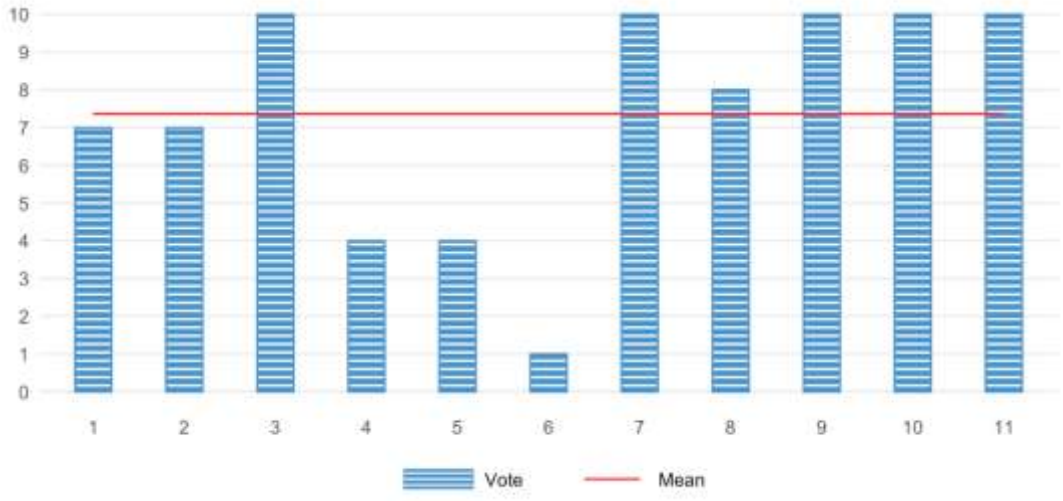


Figure 13: Degree of satisfaction regarding the registration procedure by external stakeholders

In your opinion, which are the strengths and the weaknesses of the registration phase?

Table 32: Strengths and weaknesses of the registration procedure according to external stakeholders

M.	STRENGTHS	M.	WEAKNESSES
9	User-friendly	3	Slow process
5	Rapid process	2	Poorly designed
5	Easy to understand		
2	Clear instructions		

FINAL CONSIDERATIONS – EXTERNAL SURVEY – PLATFORM REGISTRATION

Overall, platform registration procedure was positively rated by the participants (mean vote of 7.4). Participants found the registration procedure intuitive and easy to follow. They were able to follow all the instructions and rapidly register to the platform.

However, a relevant part of the participants found some issues during the registration process. Only after multiple attempts, they could receive the verification email and complete the registration procedure. These issues clearly affected participants evaluation of the registration procedure. Participants who had problems receiving the validation email rated the registration procedure much less positively than other participants.

Box 11: Final considerations – external survey – platform registration

6.2. Survey – Graphical design

The dashboard is probably the most used section of the BuiltHub platform. It is the one entailing the most basic functions and allowing users to select, visualize, and download the data they are interested in. This section needs to be accessible to all type of end-users, thus needs to be as user friendly and eye-catching as possible. This chapter of the survey focuses on collecting feedback related to the most impacting aspect of the dashboard: the graphical impact.

Rate your degree of satisfaction with the visual aspect and the first impact the BuiltHub platform gave to you. (1-10)

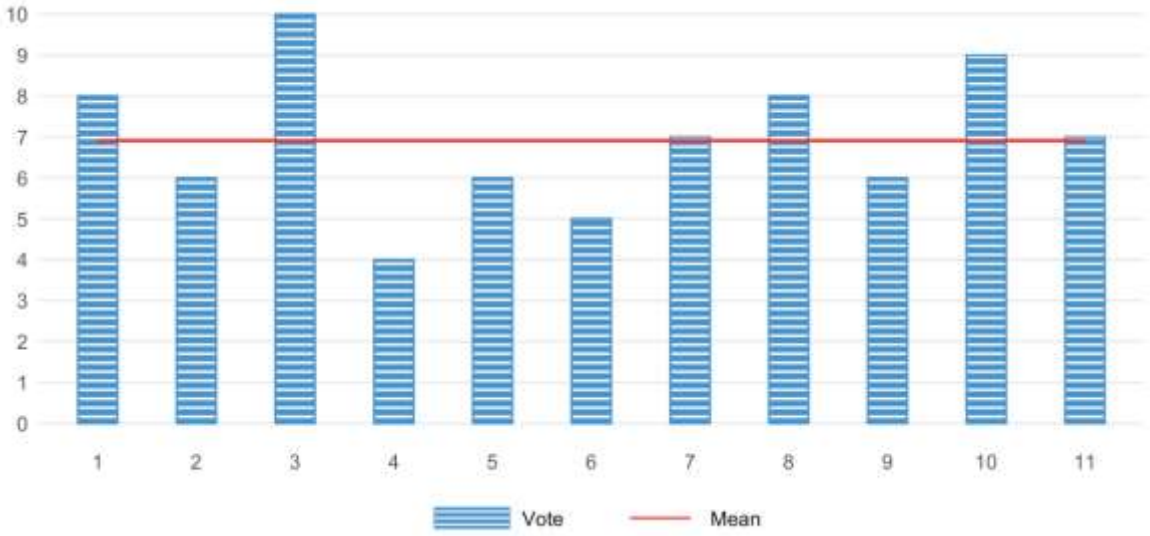


Figure 14: Degree of satisfaction of the visual impact of the dashboard by external stakeholders

According to the mark you gave, what are the strengths and weaknesses of the visual impact the platform gives to the users?

Table 33: Strengths and weaknesses of the BuiltHub platform dashboard according to external stakeholders

M.	STRENGTHS	M.	WEAKNESSES
6	Easy to understand and navigate	3	Chaotic design
6	Modern layout	2	Not eye catching enough
2	Linear and clean design	2	Unattractive layout
2	Nice-looking color patterns		

Rate from 1 to 10 the user-friendliness of the dashboard (how easy it is to understand its functioning, how easy it is to insert and obtain data, ...).

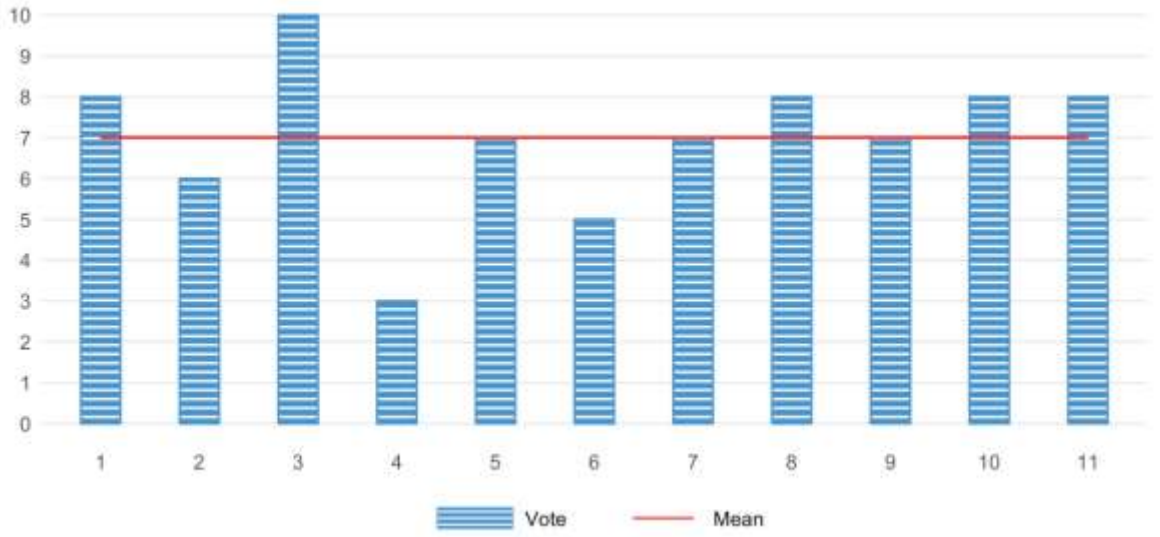


Figure 15: Degree of satisfaction by external stakeholders about the user-friendliness of the BuiltHub platform dashboard

Did you have any problem using the selection system for searching data on the platform? (yes/no)

73% of the participants had no problems in using the selection system for filtering the data in the platform. However, 27% (n = 3) of the participants found some issues or were not satisfied with the selection system. In particular, they pointed out that the terminology should follow standard definitions and that some information are still missing. Moreover, the system is difficult to use on mobile devices.

What are the strengths and weaknesses of the indicators selection system provided by the platform?

Table 34: Strengths and weaknesses of the indicators selection system (filtering) provided by the dashboard of the BuiltHub platform

M.	STRENGTHS	M.	WEAKNESSES
3	Filter labels meaning is clear	3	Data updating is slow
3	Filter system is clear	3	Filter system is difficult to use
3	Filter system is easy to use	1	Filter options are limited

1	Data updating is fast		
1	Filter options are exhaustive		

FINAL CONSIDERATIONS – EXTERNAL SURVEY – GRAPHICAL DESIGN

The platform graphical design received a positive evaluation (mean vote of almost 7). The majority of participants found the dashboard easy to understand and navigate. Moreover, they appreciated the platform modern layout characterized by a clear and linear design.

However, part of the participants pointed out some negative aspects as well. In particular, the absence of a clear hierarchical structure in the platform dashboard sometimes leads to a chaotic and difficult navigation experience. In addition, the navigation through the different platform sections and panels occasionally requires some long loading times preventing a smooth user experience.

Concerning the platform selection system, participants rated positively the use of the platform (mean vote of 7). Almost all participants could select and filter the data without any issue. They appreciated the clear and user-friendly filtering system and considered the available options exhaustive.

In a limited number of cases, however, participants where not satisfied with the filtering system. They pointed that the terminology should follow standard definitions and that some information are still missing. Moreover, they highlighted how the system is difficult to use on mobile devices.

Box 12: Final considerations – external survey – graphical design

6.3. Survey – Data representation

The BuiltHub platform allows different visualization options for the data entailed in the data hub. We divided them in three main subcategories: tabular representation, graphical representation, and geographical representation. Feedback for each of the above-mentioned data representation options has been collected.

6.3.1. Survey – Data representation – Tabular representation

This is the most basic function of the BuiltHub platform and allows the representation, according to the imposed filters, of the desired data in a tabular form.

Are you satisfied with the way the data is represented and with the information provided in the *tables*? Please rate your degree of satisfaction. (1-10)

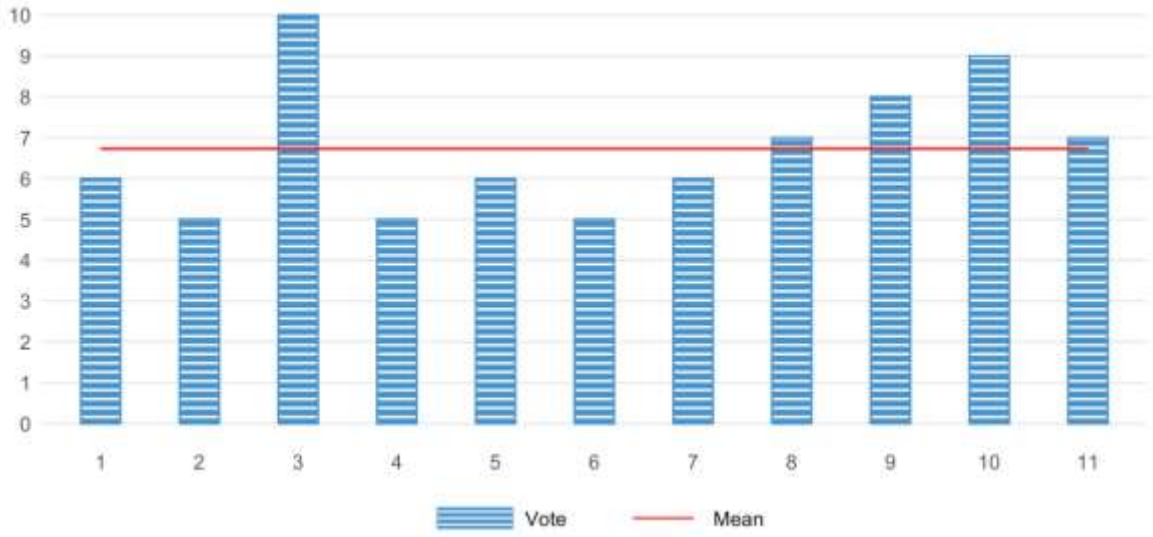


Figure 16: Degree of satisfaction concerning the tabular data representation according to external stakeholders

Which are in your opinion the weaknesses and the strengths of the *tables* provided by the BuiltHub platform?

Table 35: Strengths and weaknesses of the tabular representation

M.	STRENGTHS	M.	WEAKNESSES
4	Easy to navigate	2	Difficult to navigate
4	Easy to understand	2	Limited data
3	Comprehensive data	1	Difficult to understand
3	Sorting columns is useful	1	Poor metadata and details
2	Font size is appropriate	1	Sorting columns is not useful
1	Metadata and details are clear		

Are there any functionalities you think we should add so to provide a better service?

Table 36: Possible functionalities to add to the tabular representation provided by the platform

Functionalities that could be added
Facilitate the comparison of different measures in the tables by showing values in multiple columns.
Improve the location of tables to facilitate filtering and referencing between data displayed in tables and plots.

6.3.2. Survey – Data representation – Graphical representation

The graphical representation allows end-users to have a clearer picture of the data they selected. It is possible first to make research collecting data in tabular form and to transpose them in different graphical layouts in a second moment. This feature is particularly useful for understanding large datasets or to compare different indicators/nations/years.

Are you satisfied with the way the data is represented and with the information provided in the *plots*? Please rate your degree of satisfaction. (1-10)

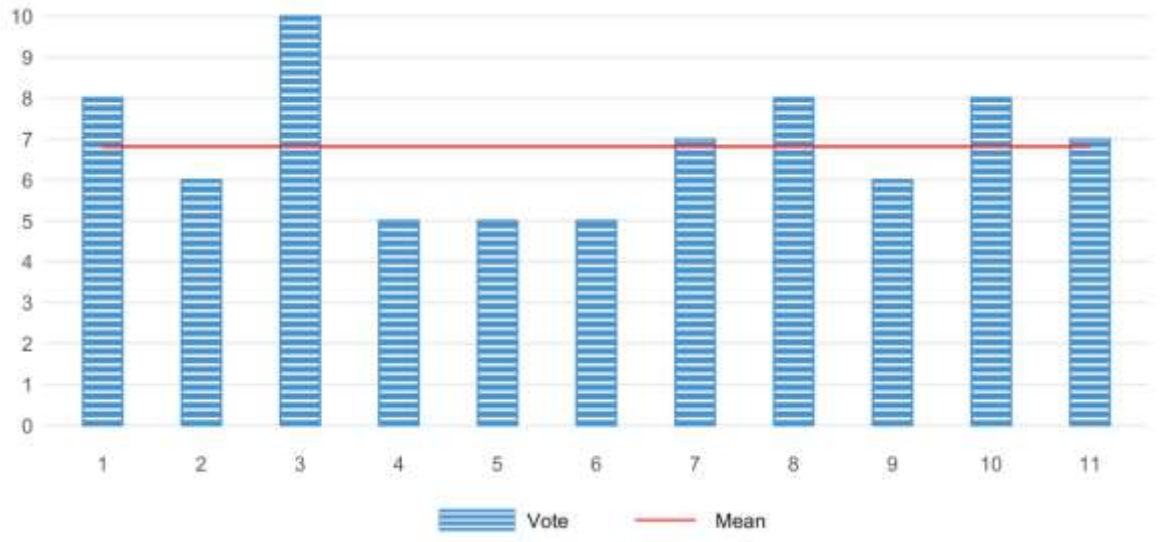


Figure 17: Degree of satisfaction about the graphical representation provided by the BuiltHub platform

Which are in your opinion the weaknesses and the strengths of the *plots* provided by the BuiltHub platform?

Table 37: Weaknesses and strengths of the graphical representation provided by the BuiltHub platform

M.	STRENGTHS	M.	WEAKNESSES
7	Easy to understand	4	Unpleasant color palette
4	Useful multiple graph/plot display possibilities	3	Limited data
2	Smooth selection procedure	1	Complex selection procedure
1	Comprehensive data	1	Difficult to understand
		1	Poor metadata and details
		1	Unhelpful multiple graph/plot display possibilities

Are there any functionalities you think we should add so to provide a better service?

Table 38: Possible functionalities to add to the graphical representation provided by the platform

Functionalities that could be added
Allow different colours (legend should be provided) to compare between different data at the same time. For example, we can have the options to present 2 different charts from 2 different periods.
Increment the display of data and plots, emphasize more on the results, and decrease the Menu on top of the page.
Please, take as an example of a well-established page "Electricitymap", which is pleasant to use, fast, nice to navigate, catchy colors and intuitive.

6.3.3. Survey – Data representation – Geographical representation

The geographical representation allows a graphical view of the data selected on an interactive map. The map allows end-users to move on it, select specific spatial granularities and more actions in order to make the service as user-friendly as possible.

Are you satisfied with the way the data is represented and with the information provided in the *maps*? Please rate your degree of satisfaction. (1-10)

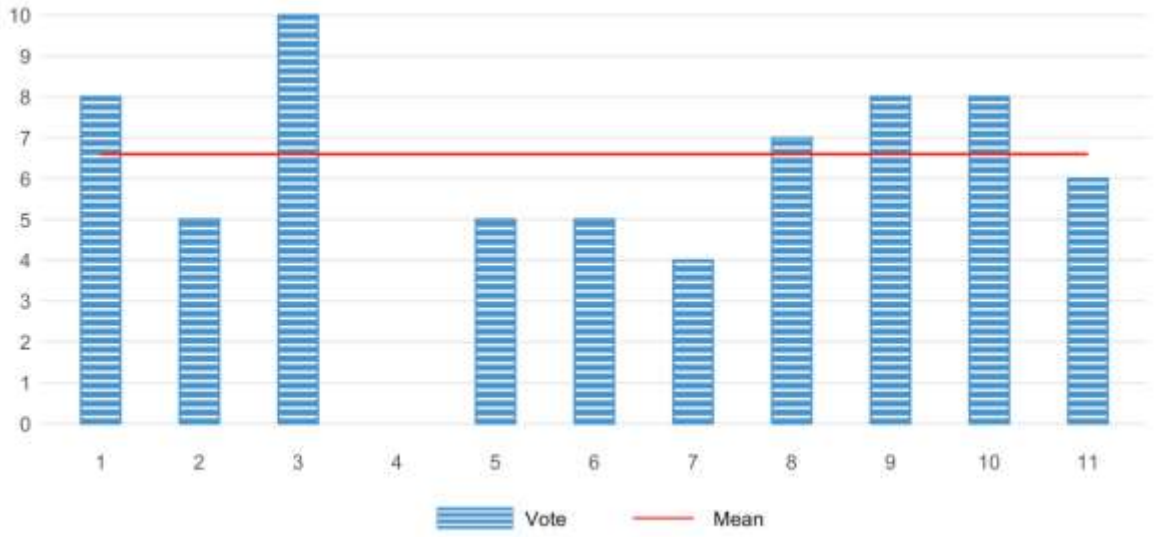


Figure 18: Degree of satisfaction related to the geographical representation provided by the BuiltHub platform

Which are in your opinion the weaknesses and the strengths of the *maps* provided by the BuiltHub platform?

Table 39: Strengths and weaknesses of the geographical representation provided by the BuiltHub service

M.	STRENGTHS	M.	WEAKNESSES
4	Data on the map is useful	3	Unpleasant color palette
3	Data on the map is clear	2	Complex selection procedure
1	Appropriate color palette	2	Data on the map is difficult to understand
1	Metadata and details are clear	1	Limited data
1	Smooth selection procedure	1	Poor metadata and details
1	Useful multiple graph/plot display possibilities	1	Unhelpful multiple graph/plot display possibilities

Are there any functionalities you think we should add so to provide a better service?

Table 40: Possible extra functionalities to provide for the geographical representation

Functionalities that could be added
Improve maps interactivity by showing further information when clicking on the map.
Improve the zooming and country selection system.
Selecting new filters should not require eliminating active filters first.

FINAL CONSIDERATIONS – EXTERNAL SURVEY – DATA REPRESENTATION

Overall, participants provided positive feedback regarding the data representation in the platform (mean vote of 6.7). Data were presented in a clear and easy to navigate way. Useful and comprehensive information was provided, and several options for representing the data were offered. However, participants also highlighted some weaknesses, such as limited data availability and poor metadata provision.

Regarding each specific data representation typology, we obtained the following results:

- Tabular representation (mean vote of 6.7): Tables were easy to navigate and to understand. In some cases, however, data were limited, and the unit of measures were missing. Participants suggested to facilitate the comparison of different measures by reporting values on separate columns.

- Graphical representation (mean vote of 6.8): Plots were considered particularly effective and easy to understand. Participants appreciated the multiple display possibilities, but they also pointed out the limited data availability and the unpleasant color palette. Allowing using different colors to display different measures was suggested to facilitate the comparison of different indicators.

- Geographical representation (mean vote of 6.6): Maps were also considered very useful and easy to understand. However, participants criticized the complex selection procedure and the used color palette. Participants suggested to increase the map interactivity and to improve the zooming and filtering system.

Box 13: Final considerations – external survey – data representation

6.4. Survey – Metadata provision and download

Metadata provision, as already explained, was one of the most critical points identified in the analysis of the BSO. Thus, providing clear and reliable metadata for the data collected in the platform was a fundamental goal of the project. Moreover, one of the fundamental points and features for a data platform, is the download option. Here it follows the feedback about both metadata provision and data download.

Did you try to download the data you selected in all available formats? (yes/no)

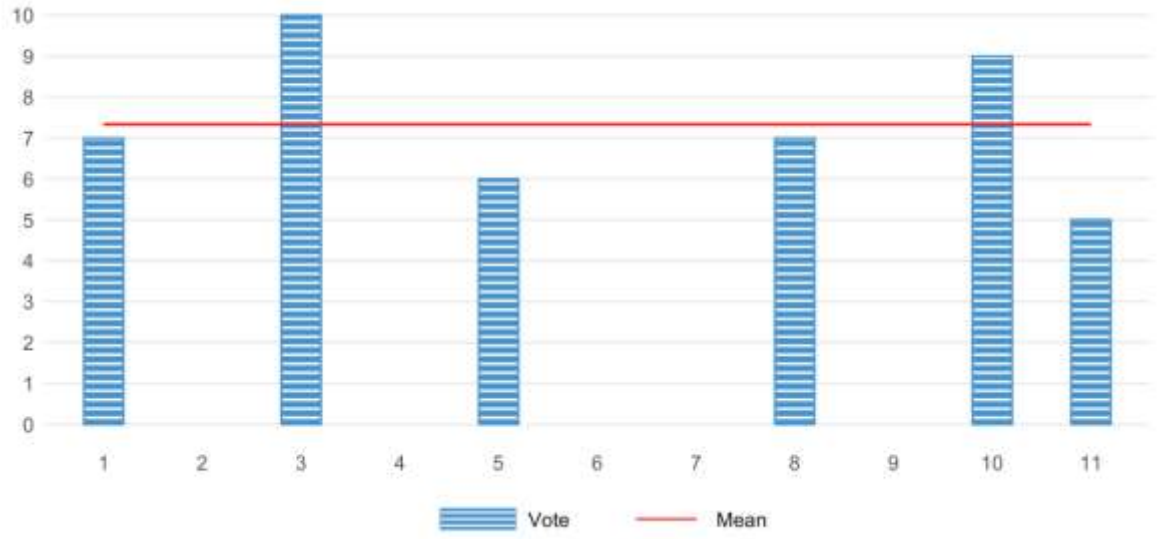
Only 3 participants tried to download the data in all the different available formats, whereas 7 others did not, and one participant did not answer to this question.

Did you have any problem during the downloading phase? (yes/no)

Only 6 participants answered to this question. Among them, four participants could download the data without issues, whereas two participants had problems during the download phase. They reported that they could not find the download button, or they could find it only after a long time pointing out that the button is not very visible.

Are you satisfied with the way the data is represented during the download? Please rate 1 to 10

Table 41: Degree of satisfaction of the downloaded data



Are there any ameliorations you would suggest for the download?

Table 42: Possible ameliorations to the download phase of the BuiltHub platform

Possible ameliorations to the download phase
I would suggest making the download option more clearly visible

Are there any other formats you would like to be available for download?

No participant suggested other formats for the data download.

Are you satisfied with the metadata provision? Please rate 1 to 10

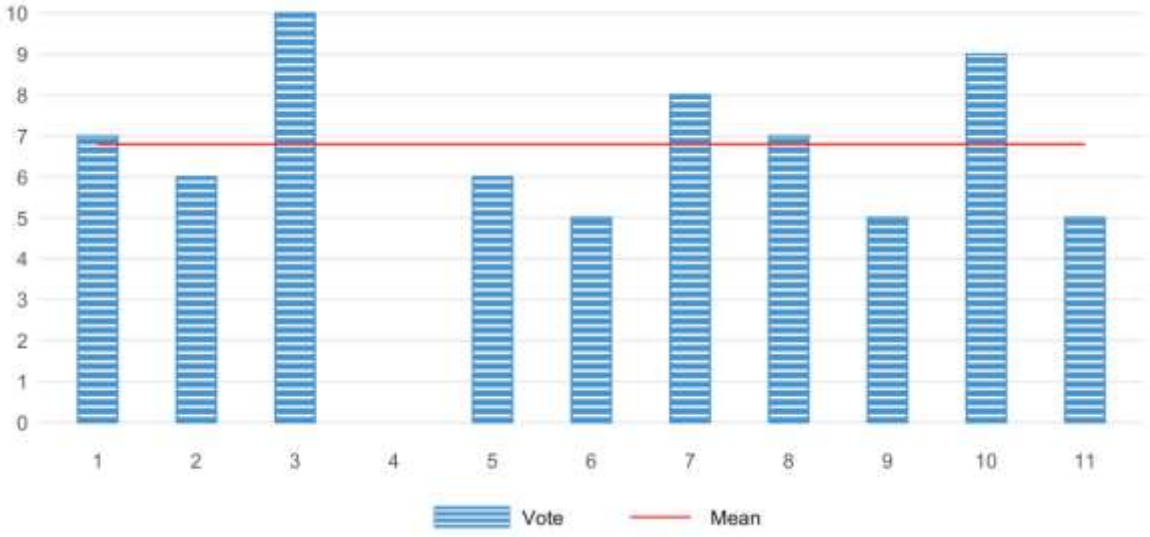


Figure 19: Degree of satisfaction about the metadata provision

Here you have the space for providing any other type of feedback related to metadata provision (e.g., metadata missing, other form required, …). Please let us know what you think so to improve the platform.

No participant provided suggestions on how to improve the metadata provision in the platform.

FINAL CONSIDERATIONS – EXTERNAL SURVEY – METADATA PROVISION AND DOWNLOAD

The possibility to download the data was positively rated by the participants (mean vote of 7.3). However, a critical issue was highlighted, that is, the download button is not clearly visible. Participants struggled to find the button and, in some cases, they could not find it at all. This is the main critical weaknesses and changes are required to improve the button visibility. Apart from this, participants considered the download options as exhaustive and did not require other download formats.

Concerning metadata provision, participants were satisfied with the provided information (mean vote of 6.8), and they did not specify any other request.

Box 14: Final considerations – external survey – metadata provision and download

6.5. Survey – SPARQL entry point

The SPARQL entry point is an added functionality allowing to the end-users to easily access the database through a method which is not the classic selection system. For using this functionality some basic knowledge in coding is required. This allows however to perform personalized queries and displaying specific data in the format the end-user wants. This section of the survey aims to collect feedback regarding the SPARQL functionality.

Have you been able to use the SPARQL entry point according to your technical competences? (yes/no)

Only 4 participants were able to use the SPARQL entry point, whereas the other 6 were not able to use this feature and one participant did not answer to this question. The main issue was the participants' lack of coding experience that prevent them to understand how to create personalized queries.

Rate how much you appreciated the integration of this function in the BuiltHub platform (1-10)

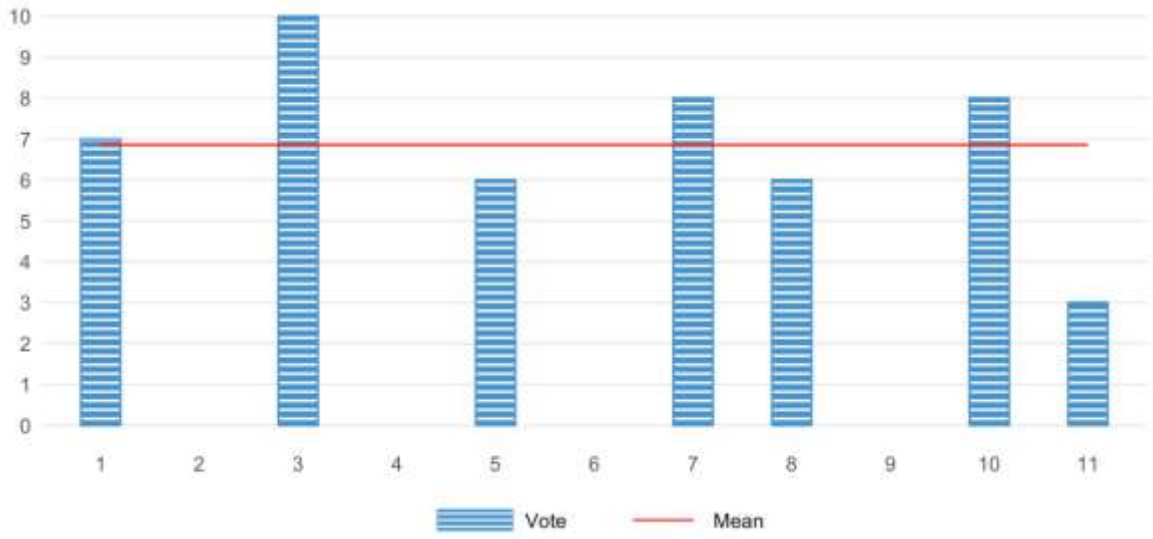


Figure 20: Degree of satisfaction for external stakeholders in the use of the SPARQL entry point

Is the use of the SPARQL clear enough? Is there something that should in your opinion be implemented for making its use easier to the end-users?

Table 43: Possible implementations in the SPARQL entry point

Clearness of the SPARQL entry point
No, it should be explained how to use it

Which are the biggest strength and weaknesses of this section?

Table 44: Strengths and weaknesses of the SPARQL entry point

M.	STRENGTHS	M.	WEAKNESSES
3	Examples are clear	2	Difficult to understand
2	Easy to understand	1	Limited level of flexibility
2	Great level of flexibility	1	Queries are difficult to create
1	Easy access to data		

Are there functionalities you would like to be implemented in this section?

Table 45: Extra functionalities to implement in the SPARQL entry point

Extra functionalities
A guide on how to use it should be provided

FINAL CONSIDERATIONS – EXTERNAL SURVEY – SPARQL ENTRY POINT

The possibility to create personalized queries using the SPARQL entry point was positively rated by the participants (mean vote of 6.9). Participants appreciated the great level of flexibility this tool provides for accessing the data.

However, this tool requires some basic knowledge in coding and thus its use is limited to more expert users. The majority of participants found this tool difficult to understand and they were not able to create personalized queries. Participants suggested to provide a more detailed guide describing how to use it.

Box 15: Final considerations – external survey – SPARQL entry point

7. CONCLUSIONS

Collecting the feedback about the BuiltHub platform during its development is fundamental for understanding its strengths and improve its weaknesses. Results of the internal focus group allowed to direct the development of the platform in the early stages of the development. Whereas results of the external focus group were useful to refine the platform functionalities and improving its usability. Overall, positive evaluations were provided by both, the internal and the external rounds of the focus group.

All answers provided by the participants, both in the internal and the external focus group, are reported in the subchapters of this report. For each question, participants' responses are presented using graphical representations or they are collected in tables. Moreover, at the end of each section, main results are summarized in the orange boxes. The results and main indications of the internal and external focus group were delivered to the platform developers, who could then implement them for providing the best possible service.

BuiltHub