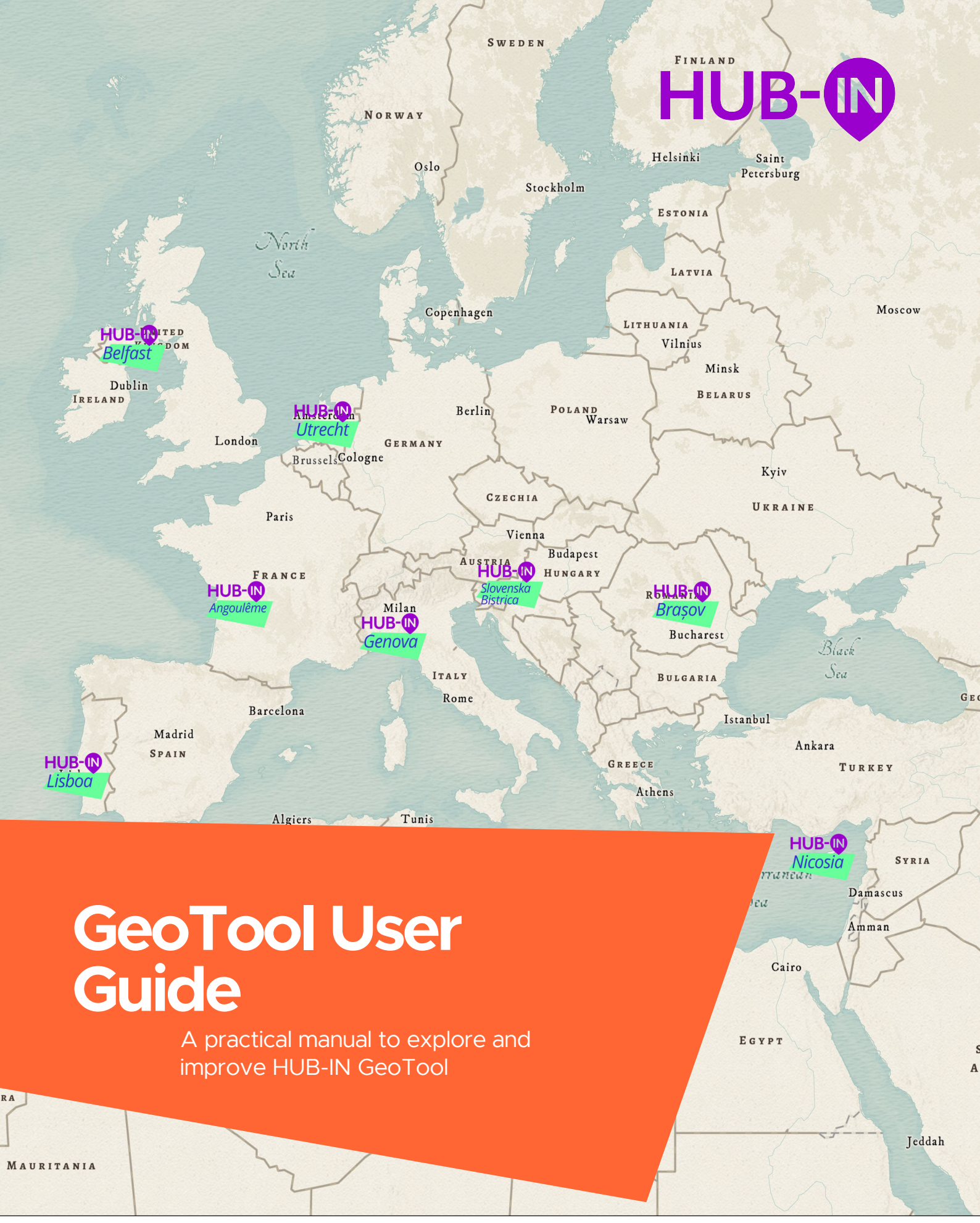

GeoTool User Guide

A practical manual to explore and improve HUB-IN GeoTool

Funded by the Horizon 2020 Framework Programme of the European Union.

V1.1 (Public Version), April 2022

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Project coordinator: Vera Gregório, Agência de energia e ambiente de Lisboa (Lisboa E-Nova)

Address: Rua dos Fanqueiros 38, 1 andar, Lisboa 1100 231, Portugal

Email: veragregorio@lisboaenova.org

DISCLAIMER

STATEMENT OF ORIGINALITY

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation

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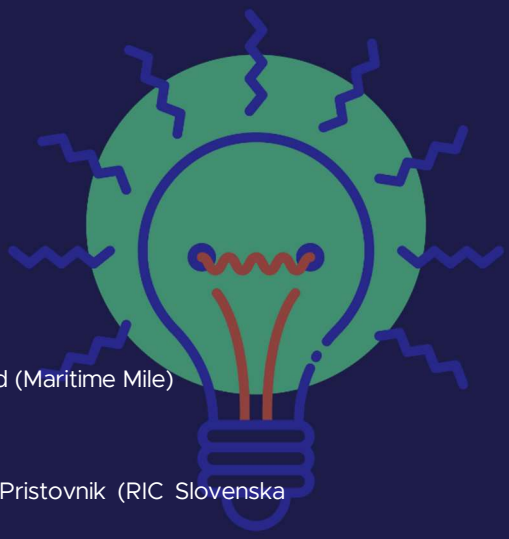
GeoTool User Guide - A practical manual to explore and improve HUB-IN GeoTool (Public Version - 1.1)

GeoTool Link:
https://hubingeotool-lisboaenova.hub.arcgis.com/



HUB-IN GEOTOOL WAS DESIGNED AND DEVELOPED BY

The HUB-IN GeoTool working group, led by Lisboa E-Nova (WP4):
Luís Cruz, Fernando Chacon, Sara Freitas and Vera Gregório (Lisboa E-Nova)

COLLABORATION AND CONTENT CO-DEVELOPMENT

Work package partners and HUB-IN Pilot Cities:
Andrea Thornbury and Gareth Downey (Belfast City Council); Maeve Moreland (Maritime Mile)
Cristina Giusso (Comune di Genova)
Marina Kyriakou (Cyprus Energy Agency CEA)
Ajda Vernik and Nataša Pernat (Municipality of Slovenska Bistrica); Tomaz Pristovnik (RIC Slovenska Bistrica)
Leea Mihaila (ABMEE); Cosmin Radoi (Brasov City)
Laurence Allard and Arnaud Blanchard (GrandAngoulême)
Nanine Lookstra (City of Utrecht)
André Martins, Susana Paulo, Susy Silva and Paula Ribeiro (Lisbon Municipality)

THIS GUIDE WAS PREPARED BY:

THE HUB-IN GEOTOOL WORKING GROUP, LED BY LISBOA E-NOVA (WP4):

Luís Cruz, Fernando Chacon, Vera Gregório, Diana Henriques (Lisboa E-Nova)

WITH CONTRIBUTIONS FROM

HUB-IN pilot cities and work package partners

REVIEWED BY

Andrea Thornbury (Belfast City Council)
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About HUB-IN

Mission

Hubs of Innovation and Entrepreneurship for the Transformation of Historic Urban Areas (HUB-IN) aims to foster innovation and entrepreneurship in Historic Urban Areas (HUA), while preserving their unique social and cultural identity and the environment. The project adopts innovation and entrepreneurship as the main drivers of urban regeneration in HUAs and it is fully aligned with the International agendas for Cultural Sustainable Development (UNESCO) and Cultural Heritage Strategy (Council of Europe). In the first stage of HUB-IN, a network of Hubs of innovation and entrepreneurship will be developed in the HUAs of eight city partners (Lisbon, Slovenska Bistrica, Brasov, Nicosia, Genova, Grand Angoulême, Belfast, Utrecht) and in the second stage, the resulting methods and tools will be scaled up to a global network of HUAs in follower cities and the HUB-IN Alliance. The Hubs of Innovation and Entrepreneurship will test, demonstrate and pilot activities of co-creation and co-design in three main clusters with the potential to deliver sustainable transformation of HUAs: 1) Culture and Creative industries, 2) New Lifestyles and 3) Resilient and Human Connected Places.

Vision

HUB-IN expects to contribute to reverse trends of abandonment and neglect of historic heritage in a systemic way through the creation of networks of Hubs where innovation will be the main driver. The project will also have a direct impact on the creation of new sustainable opportunities for local traditional businesses and for the development of new creative skills and jobs.

The Consortium behind HUB-IN

Contents

Introduction

HUB-IN GeoTool at a glance

HUB-IN GeoTool is a web-based geographic information tool which aims to map the HUB-IN Places[1] in each of the eight partner cities of the project, supporting the interpretation and perception of their existing cultural, social, innovation and entrepreneurship dynamics.

With the already existing knowledge and community cooperation, HUB-IN GeoTool aims to help decision-makers, investors, local stakeholders and visitors to get more informed decisions and creating stronger bonds with the local communities. The local actors and citizens' experiences and feedback will be also captured by HUB-IN GeoTool during the implementation phase of the local hubs.

Overall, the HUB-IN GeoTool supports the project activities, both in the roadmap elaboration for the eight pilot cities and will evolve accordingly to support the development and implementation of each city's Action Plan.

HUB-IN GeoTool's visible part is composed by three tabs:

KNOW

Designed to display geospatial knowledge and interpret geographic information that will support the diagnosis of pilot areas. Relevant subjects are georeferenced and interrelated, among others, related to the socio-economic profile of each city, their environmental assets, cultural heritage, and urban development. The contents of this tab may be improved to reflect the needs of the local hubs´ and are dependent on geographic information availability.

[1] As described in the document HUB-IN Framework Overview (2021), a HUB-IN Place is "A physical or virtual hub of innovation, where cultural wealth and heritage provide a unique competitive advantage – a key resource for enhancing the sustainable regeneration of historic urban areas. HUB-IN Places are distinguished by their local action and their global interconnection. They are local hotspots of creativity, community empowerment and entrepreneurship, bringing together local stakeholders, academia, industry, and local governments. HUB-IN Places are hubs of innovation recognised by their project integrated portfolio approach that blends three HUB-IN clusters of innovation. They are places to co-design, test and develop new solutions, ideas, and creative businesses in a real urban environment. HUB-IN Places are also globally interconnected in a network that favours sharing knowledge, open innovation processes and the development of innovative circular models."

EXPERIENCE

Oriented to share information about the location of local experiences and events linked with each one of eight HUB-IN places. The main purpose of the tab is to engage external participants, public or private, to share their projects and activities and to interlink and foster synergies with relevant local hubs initiatives.

TRANSFORM

People are in the centre of HUB-IN Places transformation! This tab is the active voice of new ideas and suggestions that we want to capture from residents, visitors, workers and lovers of HUB-IN places.

HUB-IN GeoTool is a dynamic and living instrument to be used and improved by HUB-IN cities throughout the entire HUB-IN project and to support the future development of each of their local hubs.

The first stage of GeoTool development, which ran from November 2020 to February 2022, included several key activities: 1) conception and design of the GeoTool, 2) initial collection and preparation of the georeferenced datasets that make up the first version of the tab KNOW for each of the eight cities, 3) several training sessions and continuous technical support of HUB-IN cities' teams for the future autonomous use of the HUB-IN GeoTool during the next HUB-IN stages (See Annex "Support Resources: Training Sessions Recordings").

About HUB-IN GeoTool User Guide

This user guide is primarily targeted to HUB-IN Cities´ partners that will be responsible to carry out the local activities of each Hub. In the context of the future HUB-IN Academy, it is also an inspirational document to HUB-IN follower cities that would aim to follow HUB-IN Places approaches and later will join the HUB-IN project to learn and share processes towards the development of their own local Hubs.

The users of this guide will get a better understanding of the concepts behind the GeoTool, how to identify data needed (as well as its interest and value), and step-by-step product creation (maps, dashboards, website) to ultimately upload information and make it accessible.

The GeoTool can be a powerful communication tool with long-life capability through maintenance and data updates. This user guide will support this continuous and growing process and will walk HUB IN cities through the creation steps, which includes conceptual data framework, collection practices, and display spatial information.

HUB-IN GeoTool User Guide is a living document that will be updated during HUB-IN Project lifespan by incorporating contributions and updates of further developments from the eight-city partners.

This User Guide is organized into three main sections. The first one describes HUB-IN GeoTool environments and functions, the second section provides information about the visual identity of the tool and the third gathers the current main opinions and expectations of HUB-IN cities.

It was assumed in this document that the reader/user knows the basics about GIS, and it is therefore more dedicated to explain the learning process and the visual identity, rather than data analysis itself. For those who are new to the GIS environment we recommend visiting the Esri Academy.

1. HUB-IN GeoTool Environments and Functions

HUB-IN GeoTool is composed by three different "GIS environments" that communicate with each other, with different levels of access and that comprise specific functionalities:

Local desktop - Main BackOffice environment that can work independently of internet access, where the main and most complex geographic information functionalities of editing and spatial analysis could be executed. It is only accessible by the HUB-IN team in each city.

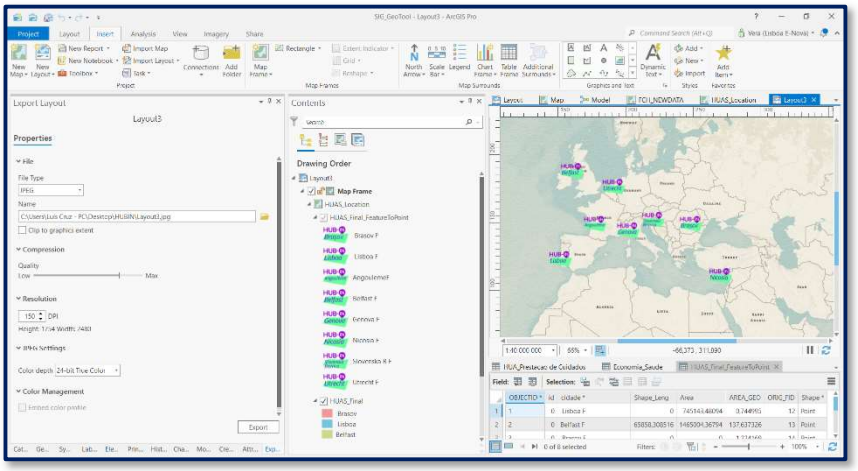


Figure 1 - Local desktop interface

Online Backoffice - Similar to Local desktop, but with limited edition and analysis functionalities. However, to feed new or existing maps, it provides options to display information through dashboards, maps, map storytelling, webpages, and Geosurveys.

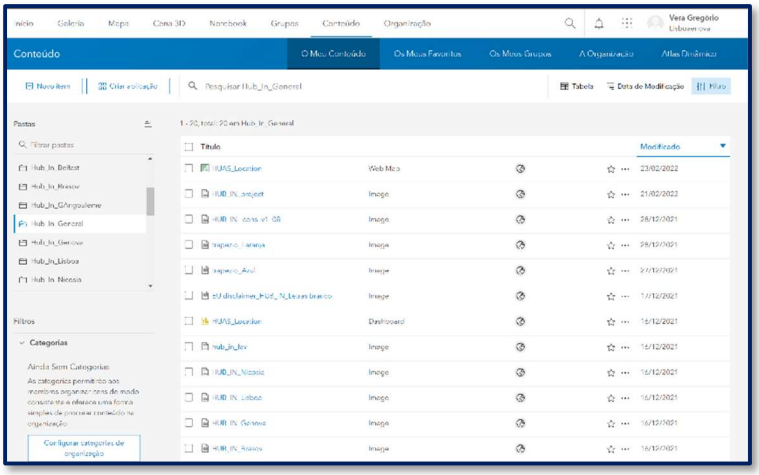


Figure 2 - Online BackOffice interface

Online Front End (website) - The interface that the typical user will see and interact with- the visible end user GeoTool Website. The Front End allows visitors to view the data processed both in the Local desktop and Online BackOffice, but also to interact with them and collect information provided by them.

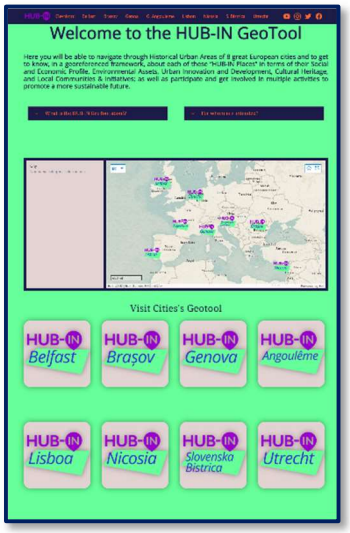


Figure 3 - Front End Interface

The Front End comprises nine websites, one for each city and one general website that aggregates. Each of the nine sites is then divided into three tabs: Know, Experience and Transform.

Tab KNOW:

Dedicated to mapping relevant geographic information that will contribute to increase the knowledge and understand the existent conditions that may leverage innovation in each HUB-IN Place. The data was structured into five main subjects: socio-economic profile, environmental assets, urban innovation and development, cultural heritage, Local communities & initiatives.

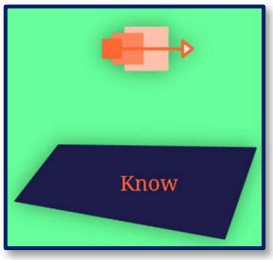


Figure 4 - Tab Know Card

Tab KNOW was designed to support the diagnosis of each pilot area and the initial phases of the HUB-IN places idealization and development: Current landscapes[2] and Roadmaps. It is expected that this tab will facilitate the stakeholder's engagement and support the decision making in terms of activities to be implemented in each place.

[2] Dargan L., Fox M., Hartung G. and Herman S., (2021). *Current Landscapes – Eight narratives: Where are the HUB-IN cities now and how did they get there?*, HUB-IN project – Hubs of Innovation and Entrepreneurship for the transformation of Historic Urban Areas H2020-SC5-2019, GA 869429. Available at: <https://hubin-project.eu/library/hub-in-current-landscapes-report/>

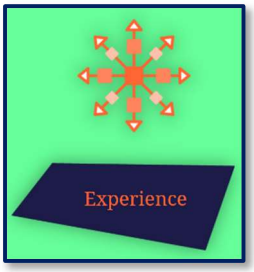


Figure 5 - Tab Experience Card

Tab EXPERIENCE:

Designed to locate and share geographical information about local initiatives developed by citizens or entities, public or private, aiming to create impact in the territory.

This tab will be also oriented to disseminate, geolocate and inventory the activities that will be planned and implemented within each city HUB-IN Action Plan implementation.

Tab TRANSFORM:

Designed to map and accelerate participatory processes and citizen involvement through the collection of contributions and innovative ideas aligned with the priorities of the local Hubs and contextualized by HUB-IN Clusters of Innovation[3]. Making use of geo survey functionalities, each city will use this tool to collect innovative ideas, opinions, suggestions or other form of relevant information captured from residents, visitors or workers in their HUB-IN places.

Figure 6 - Tab Transform Card

Figure 7 displays a diagram which illustrates the relation between the previously described components.

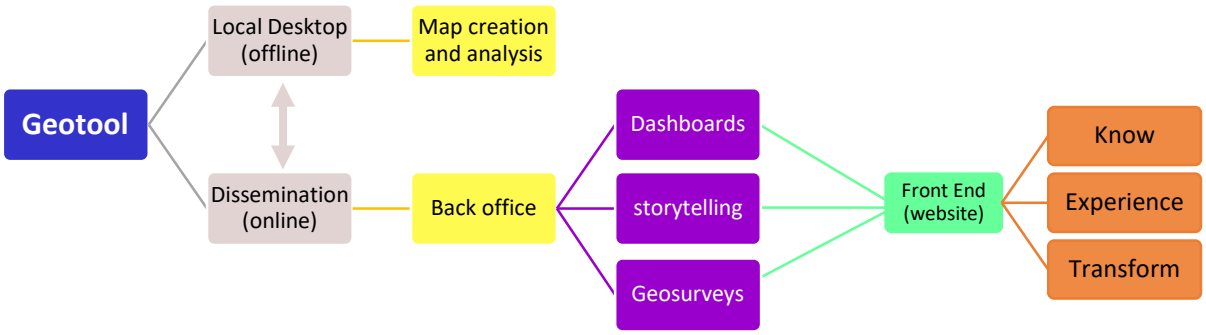


Figure 7 - Visual representation of the GeoTool components and their relationship

[3] Gregorio V., Vieira V., 2021. HUB-IN Clusters of Innovation (The Long Read), part of the HUB-IN Framework: An overview of our shared context, vision and values towards 'HUB-IN Places', HUB-IN project – Hubs of Innovation and Entrepreneurship for the transformation of Historic Urban Areas H2020-SC5-2019, GA 869429. Available at: <https://hubin-project.eu/library/hub-in-clusters-of-innovation-hub-in-framework/>

Learning process and main challenges

The development of the geographic contents of GeoTool is dependent on the available information in each HUB-IN city and has been done hand in hand with the learning processes. In this context, this has been provided by the WP4 coordinator (Lisboa E-Nova) to the HUB-IN teams of the city partners.

This iterative process of GeoTool development and progressive learning carried out is systematized in the following main steps:

1) **Collection and preparation of geographic datasets**

Main goal: Provide the basics about geographical databases, discuss how to create metadata and guide HUB-IN cities to collect their own geographic datasets.

2) **Drawing and Editing features**

Main goal: Give an overview about basic functionalities for design and editing using ArcGIS Online

3) **Creating Geographic Information Databases and Import Tabular data**

Main goal: Experiment and test the preparation of the geographic information. Share knowledge about procedures to prepare GIS databases.

4) **Working in several GeoTool environments – Backoffice to Online**

Main goal: Explain the different GeoTool environments and GIS functionalities

5) **Producing Storymaps and Dashboards**

Main goal: Explore different ways to show GIS data in a web map. Explain how to develop ArcGIS dashboards (maps and interactive data visualization in single screen) and ArcGIS Storymaps (tailored maps, text and multimedia in a narrative context). Showing concrete applied examples.

6) **Hands on sessions for the preparation of Tab KNOW in each HUB-IN city**

Main goal: Practical implementation of acquired knowledge and preparation of the tab KNOW for each HUB-IN city.

It should be noted that the process of collecting and systematizing geographic data in each city was an iterative and progressive process in which the results are very dependent on the quality and quantity of available geographic data in each city. GeoTool is a unique tool with its own visual identity; nevertheless, each HUB-IN city has very distinct characteristics regarding the type and structure of geographic information available and its geographic detail. These conditions drove GeoTool teams

to come across with three different key challenges, since the realities for each country were different, from which we can highlight the following:

- 1st Data protection. Some countries have more restricted policies than others, causing different timings for getting the information and different levels of access to the information.
- 2nd Information availability. Although the information generally existed, sometimes there was no information about a specific topic, or it did but needed to be purchased. For the 1st challenge, there were few options. When the data was required, the city team had the task of creating it. If that was not an option due to the amount of information needed or not enough time to do it, the subject was identified for later review and either collected by Geosurvey or created by other means.
- 3rd Feature topics and types. The third challenge was to know what information to collect so that this information could answer the needs of each city and, at the same time, be comparable with the other cities. In most cases, cities didn't have a clear idea of their specific goal or what questions they needed to be answered to help achieve that goal.

As previously established, data collection and its systematization is amongst the essential parts to ensure a quality GeoTool, and it came with its challenges. The GIS team decided to structure the tab KNOW by creating key components that would be later used to develop datasets and guide the direction of the maps and dashboards to be displayed in the Front End. In the end, these components were defined as Social and Economic Profile, Environmental Assets, Urban Innovation and Development, Cultural Heritage, and Local Communities & Initiatives.

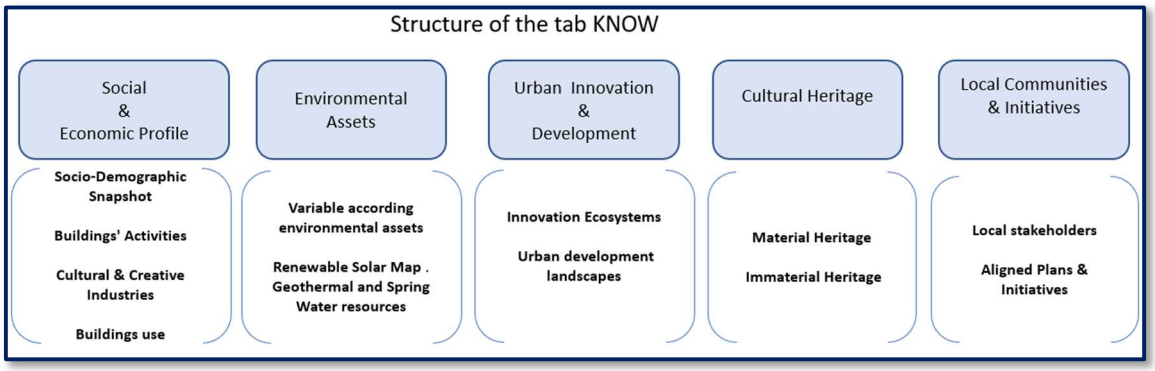


Figure 8 - Thematic structure of the Tab Know

Once a pre-structure was defined, the GIS team engaged with city partners to understand what specific geospatial data could be collected (e.g., for social profile: population, employment information), where can this information be found (municipality repositories, third party websites, ArcGIS Online, direct request to an agency, private companies), and in what format the data be made available (Shapefile, raster, geodatabase, KML). It was also explained that data would be eventually shared with the GIS team; the options presented were either directly via email or using ArcGIS

Online cloud services. Through the process of collecting and analysing the information with the cities that the final structure was established, considering the available information.

2. GeoTool visual identity

Since the GeoTool will be in the hands of the eight cities to grow its content, it is important to establish a visual identity to help maintain consistency of the layout through these eight sites.

In this chapter all the process will be approached, from the map creation to the website and dashboards.

Creating a map

The maps that will feed the GeoTool will have a great impact on the user, therefore it is important to have a general homogenous concept through the eight cities. This section will present the basic layout, colour schemes, and components that might be integrated into a map— but first, a quick interface overview for the map section in ArcGIS Online. Our menu bar will consist of buttons that will allow us to get:

1. "Details" of the project, where we will be able to acquire layer information and legend display the contents where we will spend most of the editing process.
2. "Add" button that will allow us to add layers, tables, and images from our contents or the publicly available ArcGIS Online community.
3. "Basemaps" are the primary layer provided by ESRI, which we will also detail.
4. "Analysis" button provides spatial analysis functions with our data.
5. "Save", because it is very important to save the map while working. There is no "autosave" option.
6. "Share", gives you the option to set who can see the map (and tools associated). From this button there is the option to start creating web applications such as dashboards or storytelling.

The following buttons consist in printing our project, identification and measurement options such as directions and search elements in the project.

NOTE: *the use of the functions "Analysis" will consume resources from ArcGIS online. It is highly recommended that all spatial analysis calculations are performed in ArcGIS Pro or ArcMap.*

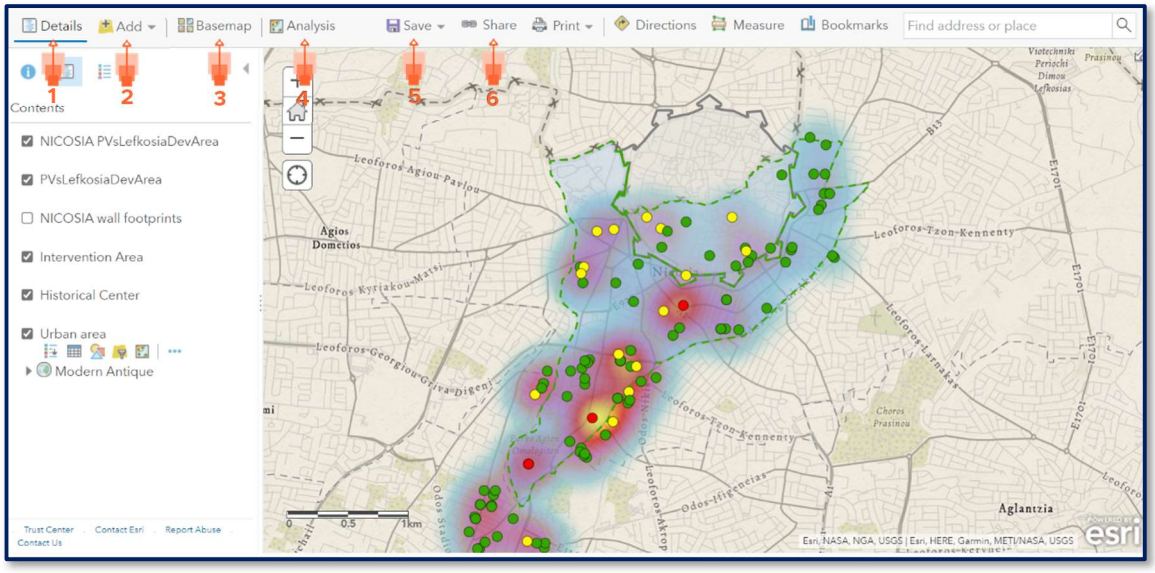


Figure 9 - Online Backoffice, map creation interface and relevant items identification

Base Map

To select the base layer in the project, just click and choose which available layer options suit you the best. Keep in mind that some elements might not be up to date (building, street names), so it is recommended to corroborate with our data. The "Base Map" chosen for this specific project will be the "Contemporary Map"; but the users will be able to change it within the visualization.

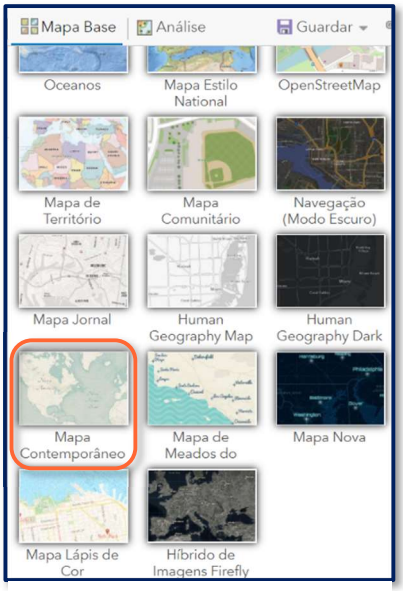


Figure 10 - Map creation: Basemap selection

Adding layers

These functionalities will prompt options for you to decide how and from where you will search the layer. We will mainly use the first options to send us to our content automatically. Other menu options to discuss are "Add a layer from file". This will allow the user to bring its information directly to the project (and automatically store it in its ArcGIS online content); to do this, the layer (shapefile in this case) will need to be in a compressed ZIP file. Once the metadata has been filled in, the layer will be added to the project. The other alternative will be "Add layer from web," where we can provide the source address of a given layer, but this will be rarely used.

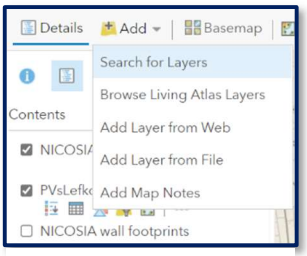


Figure 11 - Map creation: Add layer alternative 1

Going back in detail to our primary option for adding layers. The first source shown to us is "My Content." However, there are other ways to filter the layer search: through Favorites, specific grouping, among the Organization, pre-made Living Atlas, and lastly ArcGIS Online; this last source can be handy as it can allow publicly available data from other sources.

Note: *always check the quality and look to credit the sources.*

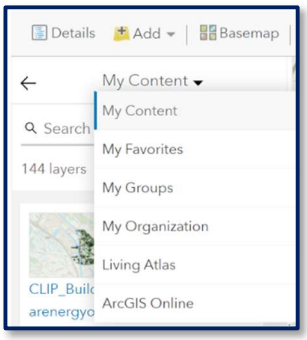


Figure 12 - Map creation: Add layer alternative 2

Setting up the map

The Intervention Area (HUB-IN Place) and political delimitations

Because we want to highlight components and dynamics happening in each Hub-In Place and close by areas, it was decided to use the following representation to set out the boundaries of the pilot area in the city map:

- Colour #9900CC
- Type of line: Dash

To accomplish this, we need to go into "Contents" inside the "Details" menu, where an icon of "Change Style" will be shown once we float the cursor in the layer. It will prompt sub-menus; the goal is to preserve only the outline as a dashed and coloured element. We need to specify that the attribute to be shown will be "Location Only" after clicking on "Options" to set the drawing style. We will also see a transparency calibration that will stay at 0% and a visible range; those two options can be set up to the user's discretion for other layers. Here they will need to be completely visible at any point. Once we go into "Symbols", a palate for fill and outline will appear; the fill palate should be transparent or not coloured. The outline, as previously explained, will give us our final HUB-IN Place delimitation product.

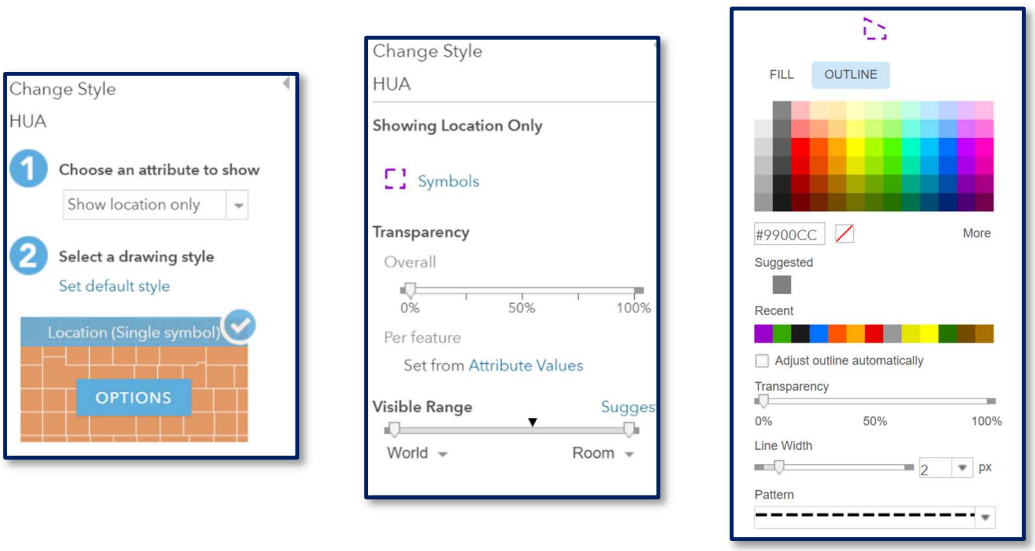


Figure 13 - Map creation: Change layer style

The Hub-In Place might not be the only border layer that will be in the project, and while personal criteria will take place during map construction, here is the first suggested approach to other political delimitations:

- Neighborhoods
  - Colour #FF6633
  - Type of line: Dash-Double Dot
- Municipality or other bigger areas:
  - Colour #1C1C47
  - Type of line: Dash-Dot
- Other limits
  - Colour #FF99FF
  - Type of line: Dots

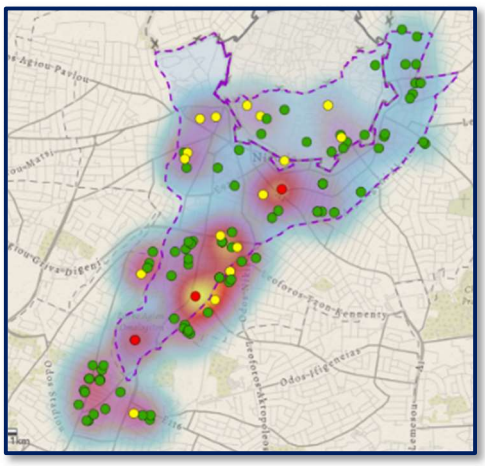


Figure 14 - Map creation: result of Hub-IN Place Border

Information representation

This section will dive into the representations of the themes displayed in the GeoTool. Meaning it will show only the structure without attributes associated. Some examples are water bodies, buildings, green spaces, statistical areas and others. Of course, with the evolution of this tool, new information will probably appear to represent, and that will not be here. In these cases, we hope that the guidelines along the section will help you make similar decisions and improve this document.

Data that can be represented by points or polygons

The following elements should use these colours preferably:

Trees/green Spaces

1. #66FF99

Water elements

1. #3333CC
2. #C9C9F7
3. #1C1C47

Buildings

1. #1C1C47
2. #E2D3D3

Statistical areas:

1. #EF8A45

Points representation: iconography

Even if we just presented a couple of examples to define points, we will go into more cases where the definition goes beyond colours. In other words, some can have specific symbols, and others are better to classify or create heatmaps. We need to follow a similar path explained in border layers to get to the shape library. The difference will be automatic as the system identifies that we are working with points; then, the galleries will be shown. Each category will be presented according to topics (government, transportation, shapes, and other symbology); most are prefix iconography (outdoor recreation, government, transportation), except icons found in the category "Basic" here. We will find circles, squares, and different shapes that allow us to modify the fill and outline.

The first five symbols of the "Basic" theme are the ones most used when we need to classify general information or create colour schemes. In this case, the symbol size is 8px.

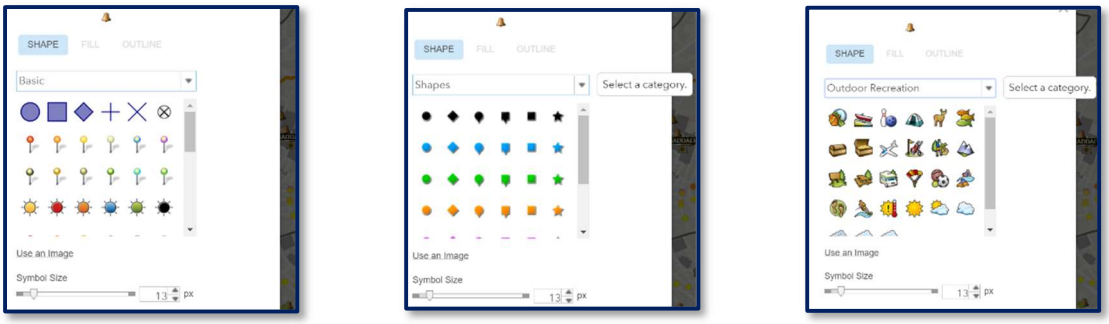


Figure 15 - Map creation: Point symbol representation alternatives

Another option is to use a specific custom image. We only recommend this in very specific cases, in order to maintain as possible the visual coherence of the GeoTool maps. In this scenario the best image to use must have 120x120 pixels and must be accessible by link.

Figure 16 - Map creation: use personal image as point symbol

Sometimes, the map can be overcrowded of points, increasing the difficulty on reading the map. In these cases, we set the layer to cluster the points. This will create points with different sizes, representing the number of points clustered. When doing zoom-in, the map will adjust automatically the number of points showed.

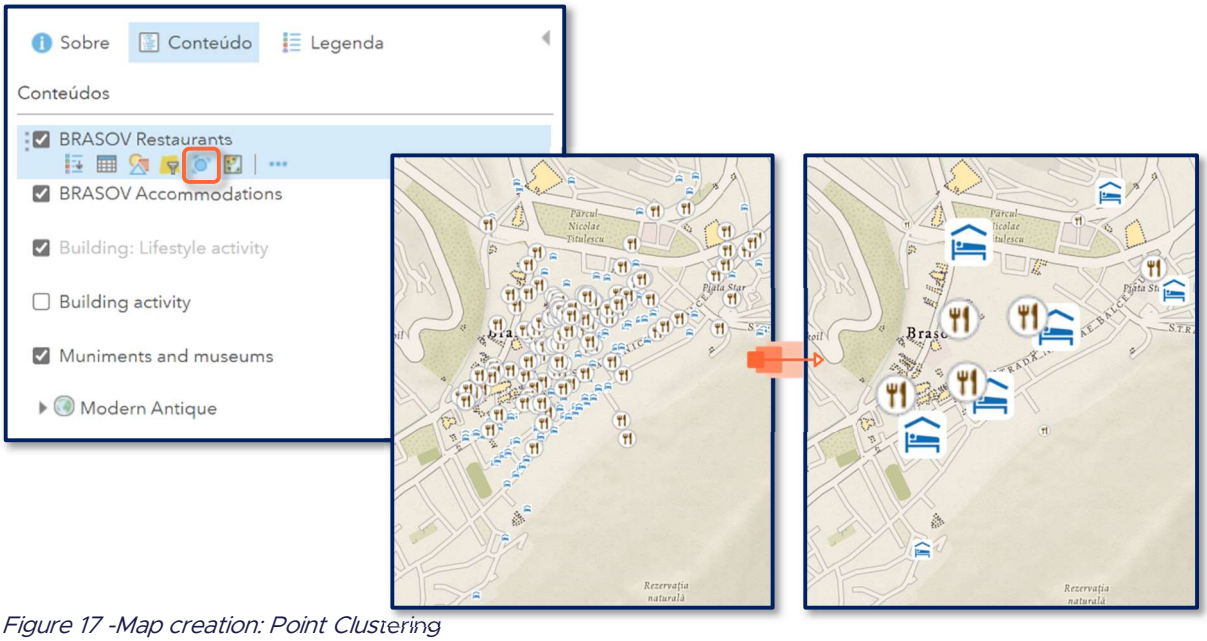


Figure 17 -Map creation: Point Clustering

We started using the following symbols in the Hub-In project, which will increase once datasets grow. When using these symbols, the size of the image is 15px.

Table 1 - Map creation: Specific point symbols

Public transport		***Cultural & Creative***	
Tram/Bus		*Monuments*	
Train		*Cultural centers*	
Metropolitan		*Libraries*	
Boat		*Amphitheater*	
Bike station			
Lifts			
Escalator			
eCharger			

Points and polygons representation: heatmaps, categories

Points can also be represented by heat maps, and such representation can be for concentration density or using values from an attribute.

In this case, the colour scheme can be:

1. 2nd row 6th column
2. 3rd-row 4th column

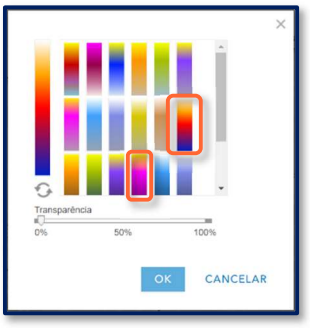


Figure 18 - Map creation: Point & Polygon Colour schemes - colour scheme

And for categorization by unique characteristic:

1. 3rd row 2nd column
2. 1st row 3rd column
3. 1st row 6th column

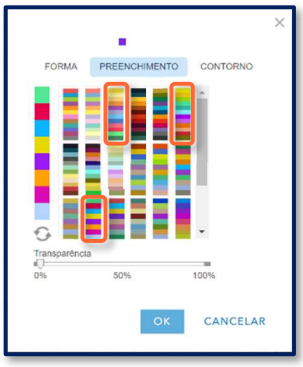


Figure 19- Map creation: Point & Polygon Colour schemes - unique characteristic

In categorization by a scale, try to use one of the following colour schemes, depending on the type of information you are showing and if it can be classified.

Classified:

1. Last row 3rd column
2. 1st row 1st column

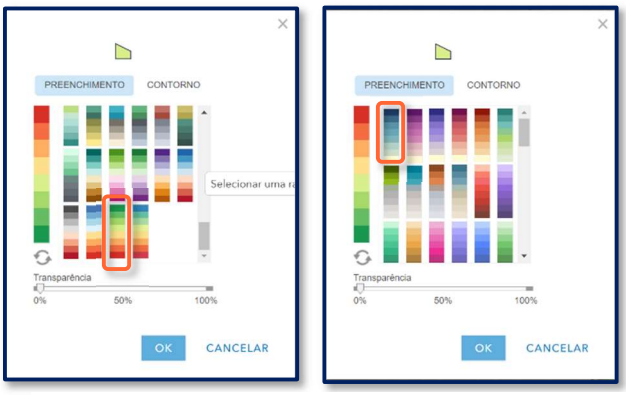


Figure 20- Map creation: Point & Polygon Colour schemes - colour categorization by scale

Gradient:

1st row 1st column

4th row 5th column

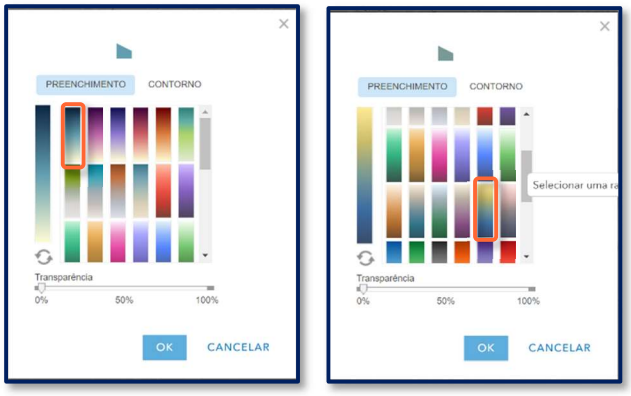


Figure 21 - Map creation: Point & Polygon Colour schemes - colour gradients

In either points and polygons, sometimes there is the need to classify or create gradients inside specific thematic, such as green spaces or socio demographic profile. In this scenario, to create a connection with the type of information people are seeing, the outline must be the colour of the information theme you are showing. The outline thickness should be between 1 and 1,5px.

Figure 22 - Map creation: Point & Polygon outline scheme

Layer names, Legend and Pop-Ups

In the process of creating information, it is usual to give short names to the layers or the attributes. These names are not intelligible for most of the current users; therefore, it is important to change these settings in this phase of the process to facilitate the future processes, as creating dashboards or Storymaps.

It is also in this phase that is defined the Pop-ups, and what are showed. Remember that fields, with terms that user cannot understand will be seen as visual pollution for them.

Web-Site Front End

Colour scheme

Building the HUB-IN GeoTool Frontpage needed its own visual identity to keep the eight cities visually consistent. The point of reference was the established visual identity of the Main project, HUB-IN (hubin-project.eu). This was the basis which helped to create the colour scheme for the GeoTool site, which will eventually be used for other products within the GeoTool.

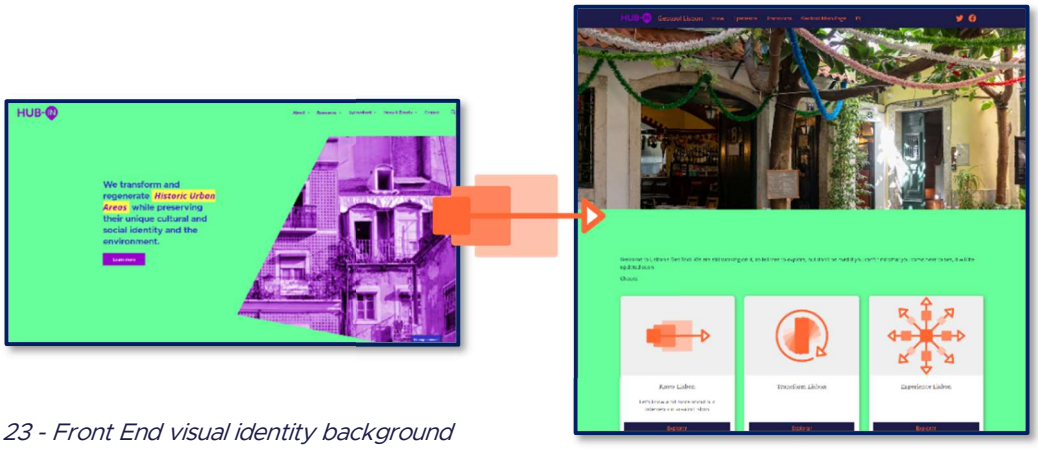


Figure 23 - Front End visual identity background

The palate used with the respective colour codes is as followed.

Table 2 - Front End Theme Colour scheme and codes

TRANSLATION	
Header	**Body text**
#1C1C47	**#1C1C47**
Header text	**Hyperlink**
#FF6633	**#FF6633**
Body	**Button**
#66FF99	**#1C1C47**
Button text	
#FF6633	

Figure 24 - Front End theme colour scheme and codes

Cards and HTML codes

Tabs Cards

The GeoTool is divided into three modules or tabs, each one will be dedicated to show information that will give a landscape overview, present a platform for interaction, and get involved in data creation. Three cards were developed, each with its own HTML code and distinctive images. In order to maintain the same logic in all of the 9 sites, the following images shouldn't be used for any other purpose, since they have the following association:

- **Know -** HUB-IN_icons_v1-04
- **Transform -** HUB-IN_icons_v1-02
- **Experience -** HUB-IN_icons_v1-03

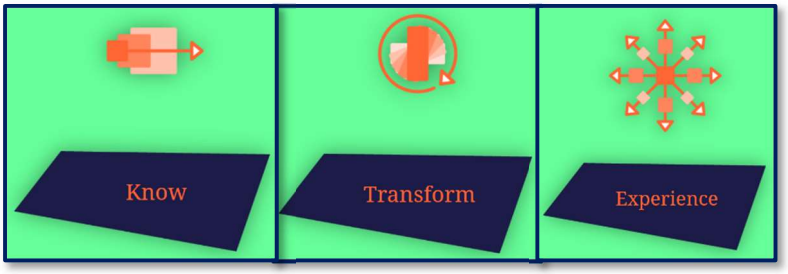


Figure 25 - Tab Know, Experience and Transform Iconography

Tab Know themes cards

The main components of the tab KNOW are also divided in cards according to each theme. These cards were created in HTML; each city has its own file. For each theme a specific icon was selected and, as stated above, these icons should not be used in the GeoTool for another purpose.

Social & Economic Profile - HUB-IN_icons_v1-11

Environmental Assets - HUB-IN_icons_v1-10

Cultural Heritage - HUB-IN_icons_v1-12

Urban Innovation & Development - HUB-IN_icons_v1-06

Local Community & Initiatives - HUB-IN_icons_v1-08

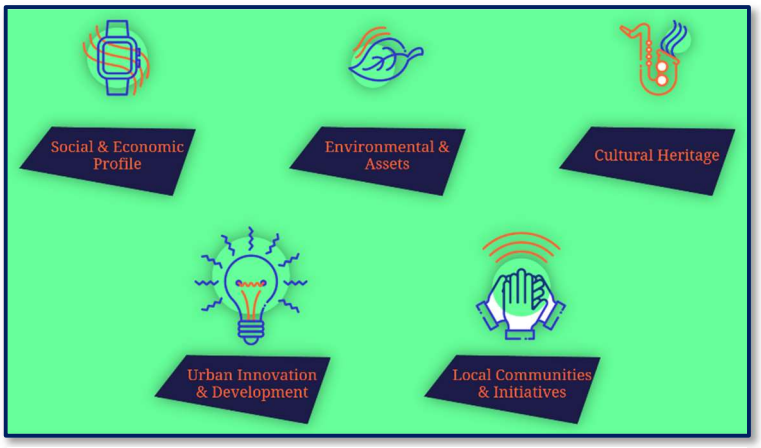


Figure 26 - Tab Know themes iconography

For both, main cards and Tab Know theme cards, the procedure to use the HTML code is similar.

When setting the page layout (1) insert a text box and (2) chose Edit HTML. (3) Then paste there the code for one card. When adding multiple cards, each card must be in a different text box. We can have a maximum of 3 text box in the same row, and we can have multiple lines. Between each text box we must (4) add a spacer line (5) with 100 px of height, when dividing vertically, and 130px when dividing horizontally. This last part will ensure that the cards will automatically adjust to different screens.

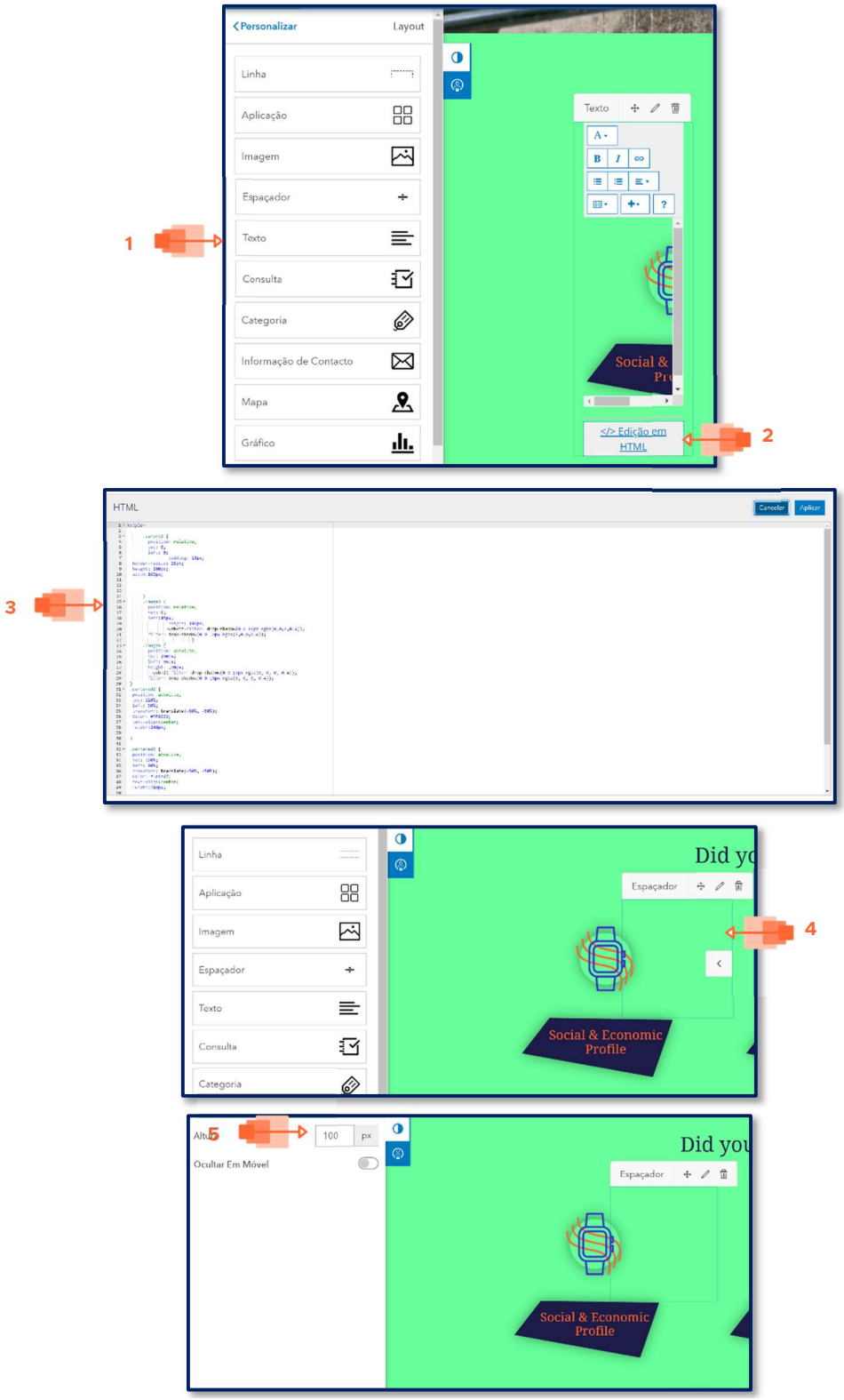


Figure 27 - Cards Set up

Footer

Another fixed element across the website will be the footer (1), which will dedicate its space to display social media contacts, organizations, and stakeholders involved. This could vary from city to city, depending on the organizations involved. To make it accessible, an HTML (2) code was made available to the city partners; this way, modifications can be made without compromising the footer's format.

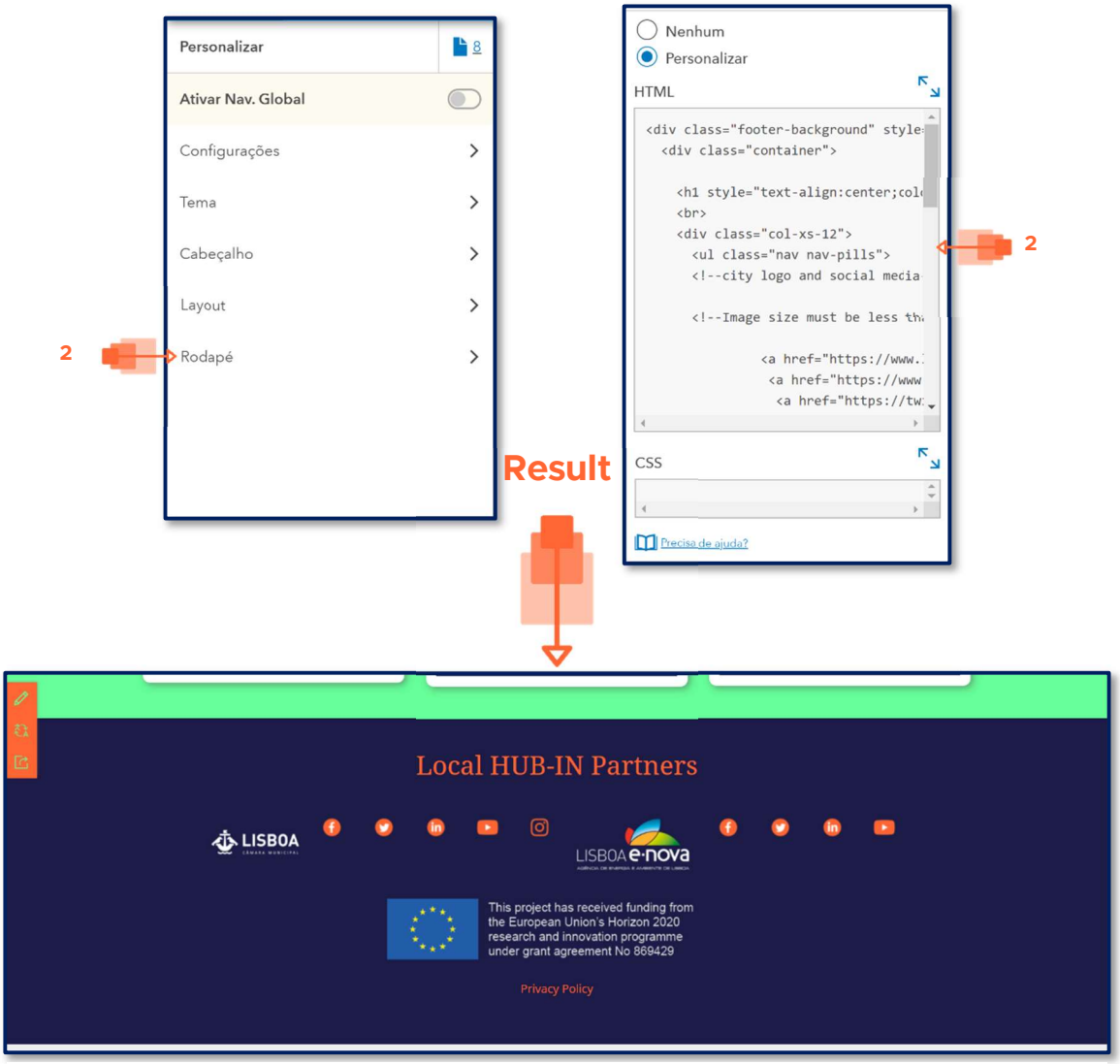


Figure 28 - Footer set-up and final visual shape

Website GeoTool: Elements

Because the website will contain multiple elements (text, images, dashboards, multimedia, and others), it is necessary to be careful with the space those given elements might require. Here we propose to keep them within 500 px height and 700px dimensions wide. The sizes can be reconsidered depending on what information has been represented.

Figure 29 - Dashboard example for the visual identity of the site's elements

Cards display

To support the user navigation, display cards will link to the information based on the five clusters set in the GeoTool: Social & Economic Profile, Environmental Assets, Urban Innovation & Development, Cultural Heritage, and Local Communities & Initiatives. The cards must be on the top of each page.

Figure 30 - Example of cards display

Dashboards

As one of the applications within ArcGIS Online, Dashboards allow you to display location based statistics for a case of interest and interactively present the data (charts, graphics, indicators, and more). They will also help to give more context and better communication of spatialized information. More information can be found here: ArcGIS Dashboards | Data Dashboards: Operational, Strategic, Tactical, Informational (esri.com).

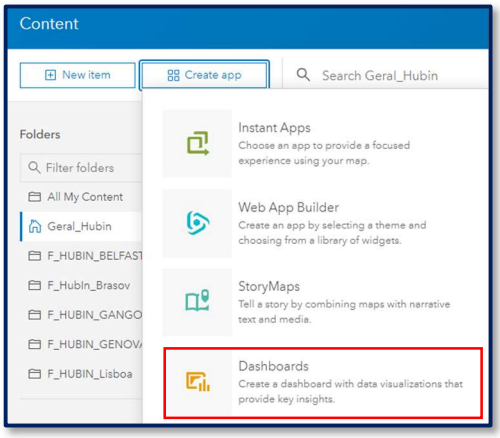


Figure 31 - Dashboard Creation - 1st step

It is essential to say that the interactive information feeds from ArcGIS maps online. So, it is recommended that the data quality found in the attribute table of the layers is in the right conditions.

Configuration

Once we have selected the dashboard application, we will be asked to give it a name, description, tags, and folder location where to save it. Because this will be the determinant factor that identifies the product, it is crucial that:

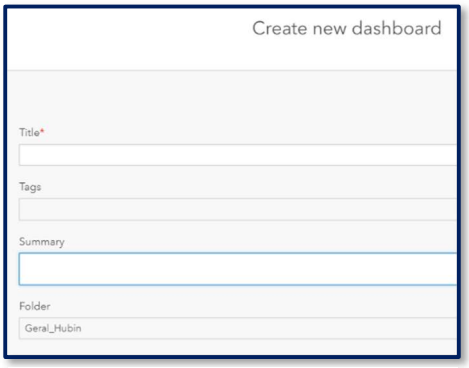


Figure 32 - Dashboard Creation - 2na step

- The title is self-explanatory and gives us a sense of what to expect.
- Tags are related to the dashboard and consistent across the project; please always include HUBIN, HUB_IN, HUB-IN, the name of your city, words used in the title, and other keyboards related to the dashboard (layer names, essential concepts). This will highly improve search capabilities in the long run.
- Description: While we can go into great detail, it is preferable to be concise and have between 50 and 200 words.
- The folder will store your projects, which is preferable to have a systematic structure, as the default content view is without form.

Once we have created a dashboard, we can first configure the default colour scheme of preference. For the HUB-IN project, we will keep the scheme below. We recommend creating a "format dashboard". This is an open application with a predefined colour scheme and can be used for the rest of the applications needed.

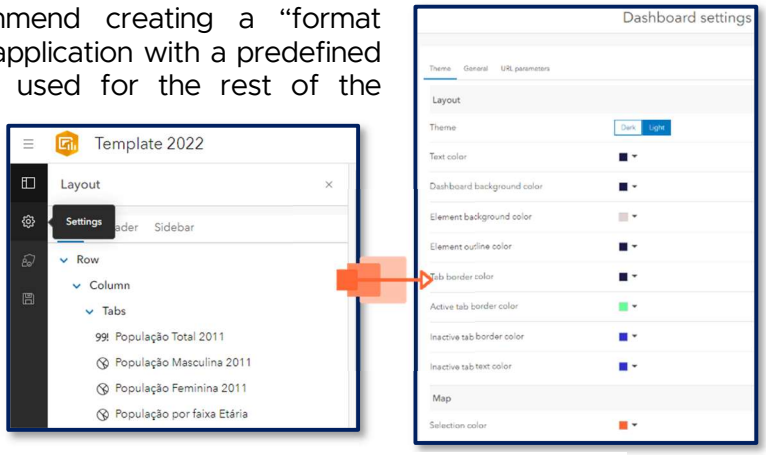


Figure 33 - Dashboard Creation - 3rd step

For better detail, we display an example here (keep in mind that the interface you might have will be in your native language if supported).

Table 3 - Dashboard Theme Colour scheme and codes

TRANSLATION	
Text color	**Active Separator limit**
#1C1C47	**#66FF99**
Background Color	**Inactive Separator limit**
#1C1C47	**#66FF99**
Element color	**Inactive Separator text**
#E2D3D3	**#FF6633**
Element contour	**Selection Color**
#1C1C47	**#FF6633**
Separator limit	
#1C1C47	

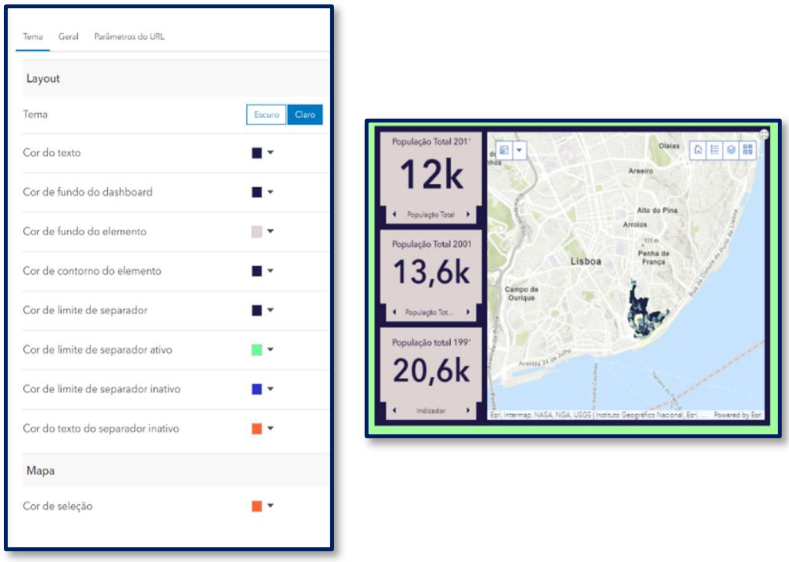


Figure 34 - Front End Theme Colour scheme and codes and the result

Space distribution

When we work in dashboards, the interface in which we will work allows us to distribute elements within the dashboard. But we need to be careful; what we see during our dashboard creation will not necessarily look the same when we bring the application to the main GeoTool. Different factors will influence the elements' distribution and might require constant recalibration. For the best resolution and reading purposes (pop-ups map elements), it is recommended the use of the following sizes:

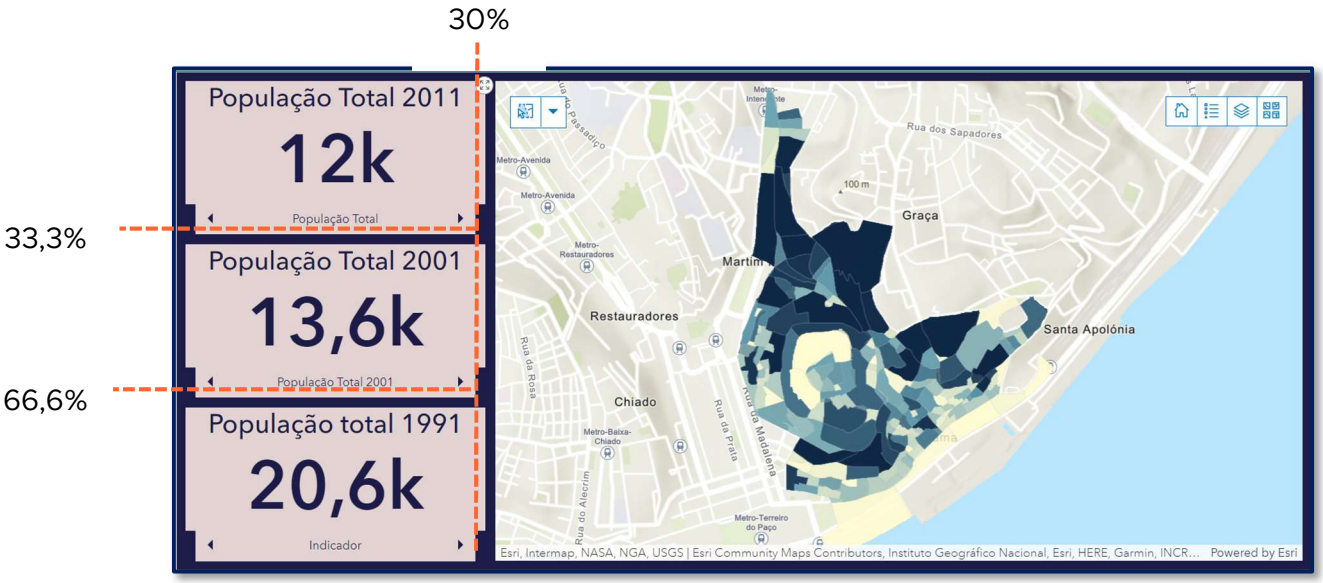


Figure 35 - Example of space distribution in dashboard with side indicators/charts

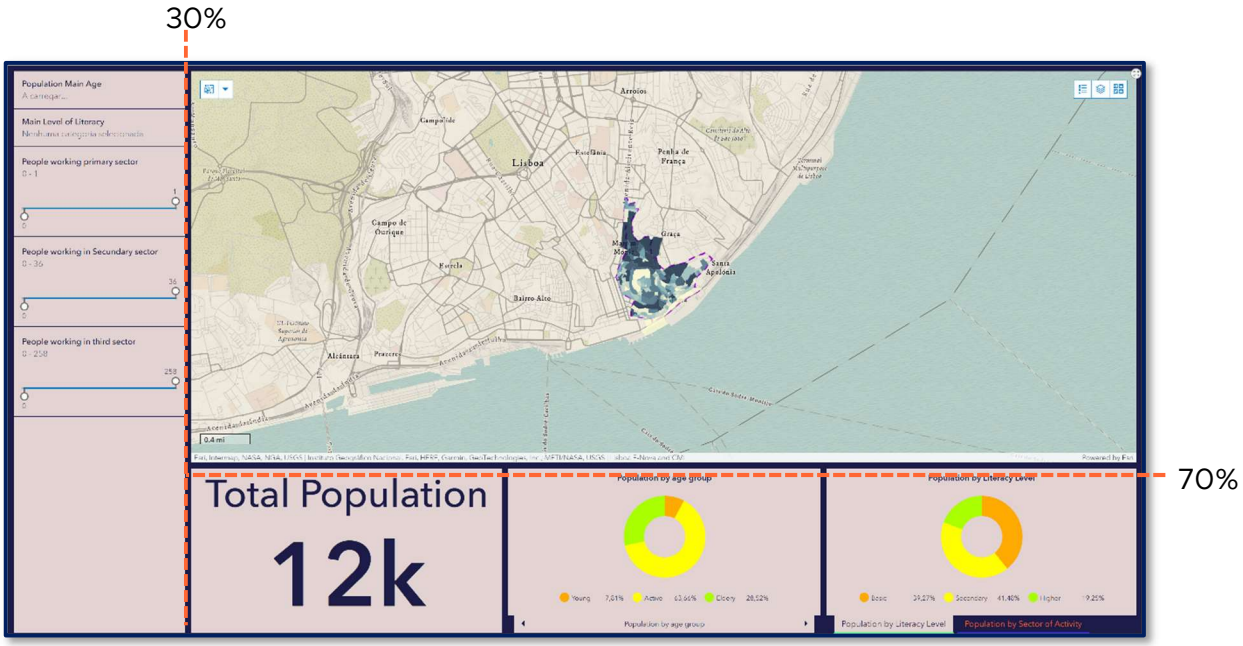


Figure 36 - Example of space distribution in dashboard with side panel, and below indicators/charts

Map options

We can enable some options to facilitate understanding the meaning and which layers are present and enhance the map visual experience. We suggest having at least the following set up:

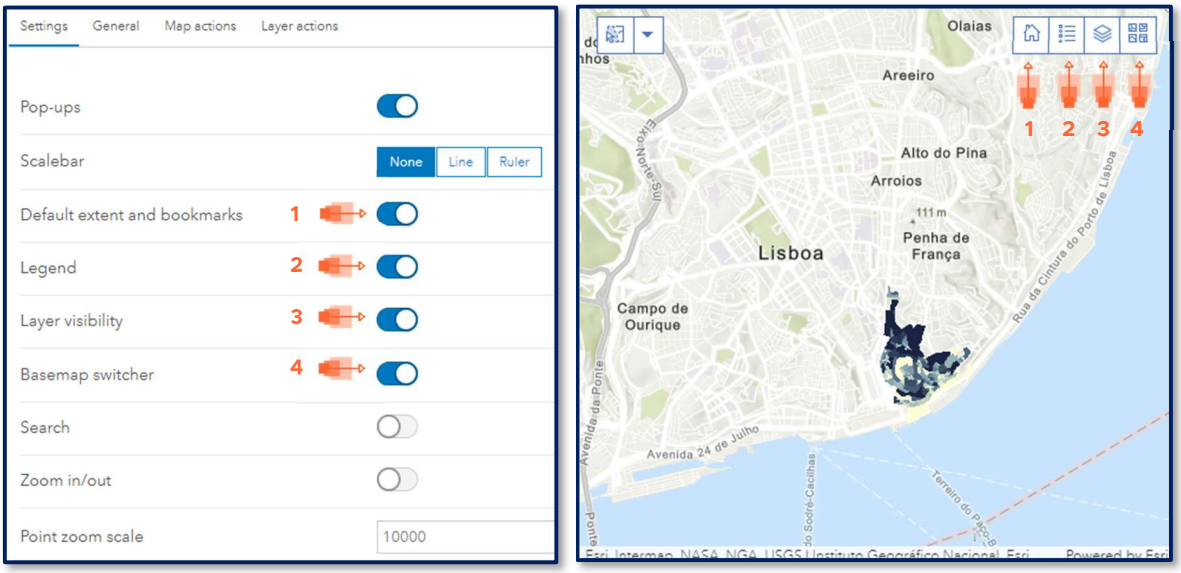


Figure 37 - Dashboard Maps configuration, and button correspondence

1. Default extent and bookmarks: take you to the map's initial visible area. It is associated to the map's last saved extent.
2. Legend: shows the layers we are working with. NOTE: If we set up a layer to show or disappear in the map project, depending on the extent, the legend will also be affected by it.
3. Layer visibility: will turn on and off layers from the map.
4. Basemap switcher: it will change the base layer in the map, the options presented here will depend on the availability from the ESRI service.

Dashboard elements

Once we have added a map, we can include multiple elements that will help us to show and interact with our information. We can see that more maps can be added to the dashboard among the options. In that case, keeping track of elements and map association is crucial. Other elements are:

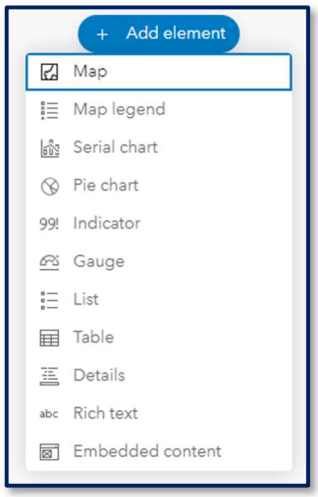


Figure 38 - Dashboard Menu for adding new elements

Permanent map legend.

Serial chart, ideal for time series or continuous data.

The pie chart shows categorical data.

Indicators are mainly used to display an element's quantity to the map's extent.

Gauge is similar to the pie chart but mainly expresses the proportion or totality of data in the display.

The list shows detailed information of elements on display on the map.

The table shows the attribute table from a given layer.

Details display information on an object clicked on the map.

Rich text is a user-defined text, which can be programmed in HTML.

Embedded content shows information about an imported site.

When we have one of these elements, we can include options that will make them more interactive, inside the configurations of the element or from the map configuration. This second one will allow that the information displayed in the graph or table added to the dashboard updates itself according to the extent and location in the map. To enable this, we need to go into: map configure > map actions > add action > filter > set up a target (the element you want to be updated constantly).

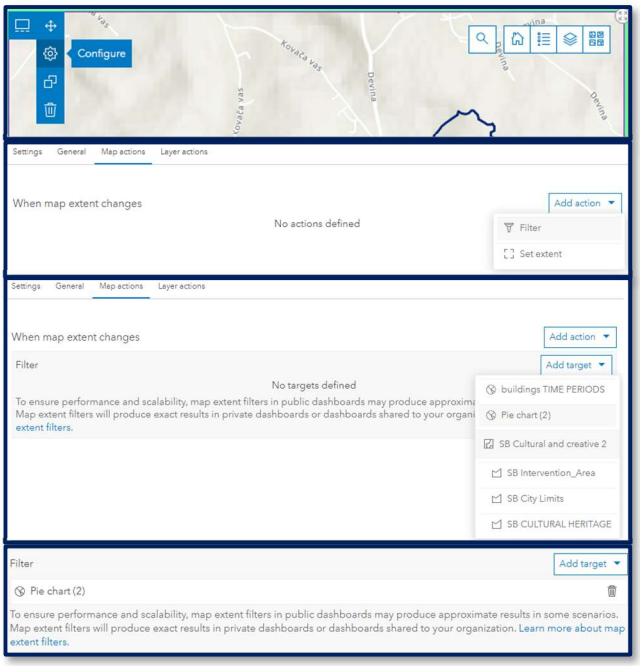


Figure 39 - Dashboard's map/element interaction configuration

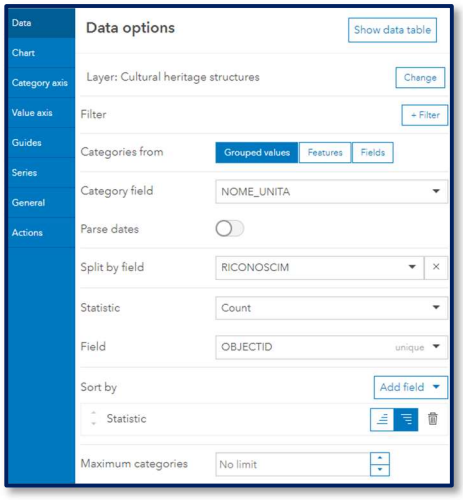
Next, we will explain the functionality and configuration of the listed elements to guide the overall approach taken for the GeoTool.

Elements: Serial chart

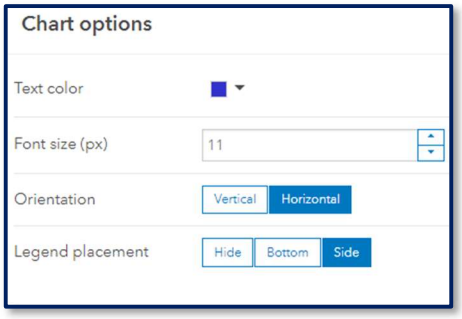
This type of chart is more beneficial for cases where we want to show continuous data; simultaneously, it can complement categorical data. We will show progress, distribution, or comparisons across groups or time. The first is the **data option** interface, where we need to associate to a map layer

1. where we indicate which layer attribute
2. will be used and under what kind of statistic
3. It will require a categorical attribute
4. we can group our data into categories

Note: *we will see this interface in other elements.*

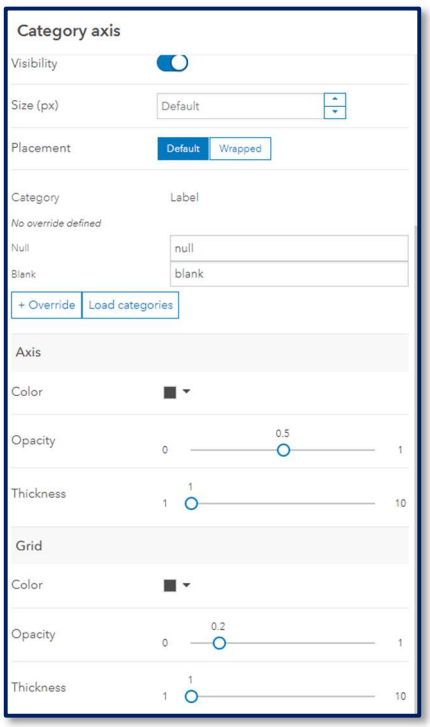


If we want one, the following **chart options** will correspond to some visual setup of the chart, orientation, and legend positions.



Next is the **category axis;** here, we will give names to our axis, format the text, include scrolling elements and set up grid components. For the GeoTool, we leave this as the default unless we need to configure the space in the graph. Similarly, the value axis will have options that will allow configuring the X-axis. Once again, this is usually used with its default settings; if we need to calibrate space or data needs to be recalibrated, we will work on it here.

Figure 40 - Element's configuration: Serial chart 1



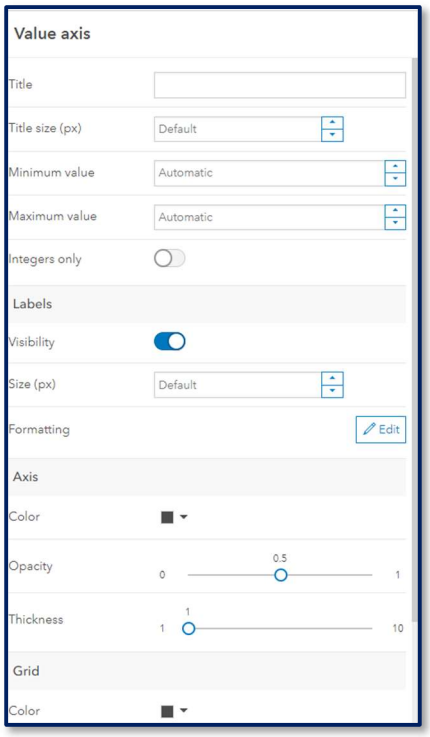


Figure 41 - Element's configuration: Serial chart 2

Here we will not use the options **Guides**. Instead, we continue configuring the **series options**; here, we can decide the main aspects of the chart looks. Stacking refers to the method group when we work with columns, and it is defined from the beginning (when we add the element). The second variant of this option comes in percentile information, which allows us to create comparative charts. The following option is the type of serial chart we want; the columns will enable the stacking to strategy, and lines or smoothed lines will provide better visualization to progressive information.

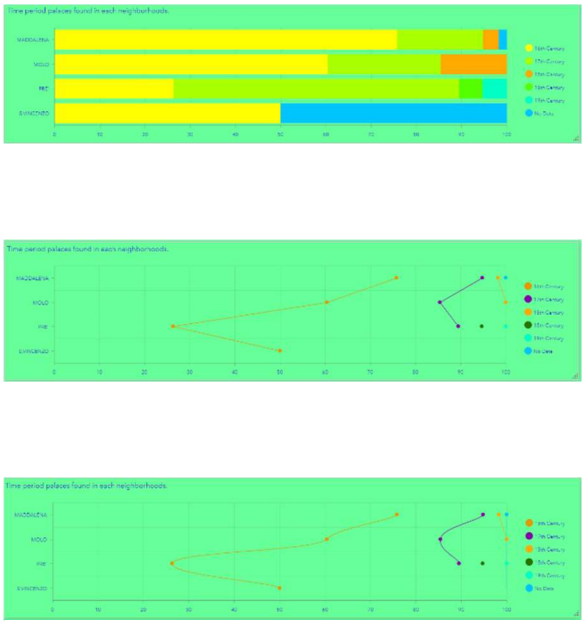


Figure 43 - Element's configuration: Serial chart 3; chart options, 1- Bar chart, 2- Line chart, 3- Smooth line chart

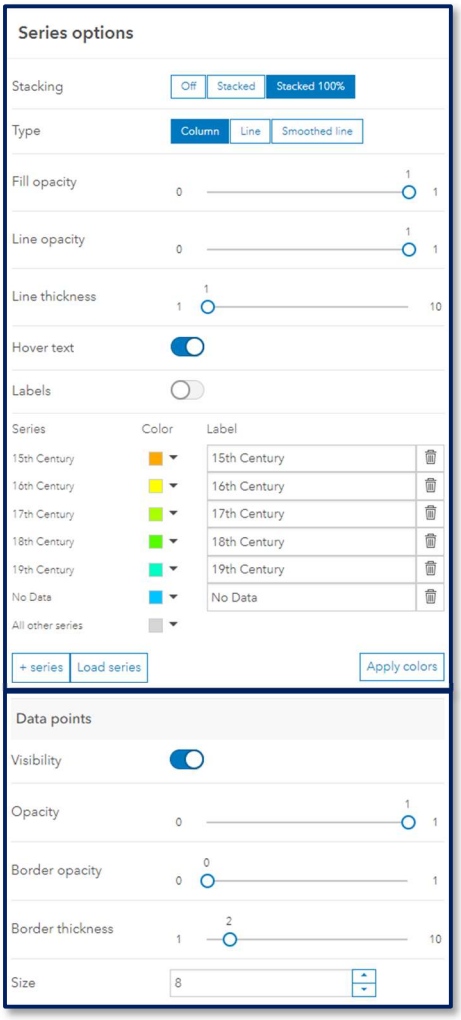


Figure 42 - Element's configuration: Seria chart 3

An essential consideration is that the colours, thickness, and transparency of the elements in the chart should match the elements in the map.

"General" options will allow us to name and describe the chart we are currently working in. Remember that the colour scheme will be based on the default setting we had assigned and needs to be preserved, so you might want to change something in special locations.

In this section, "actions" are configurations that can reflect interaction with the map. First, to assign a target layer (ideally, it will be the layer associated with the chart, but you can associate it to another if applicable), you can identify such layer with the following icon ( ). Second, define the interaction "filter." In practice, this means that when you click on one of the chart sections, it will display only those elements in the map.

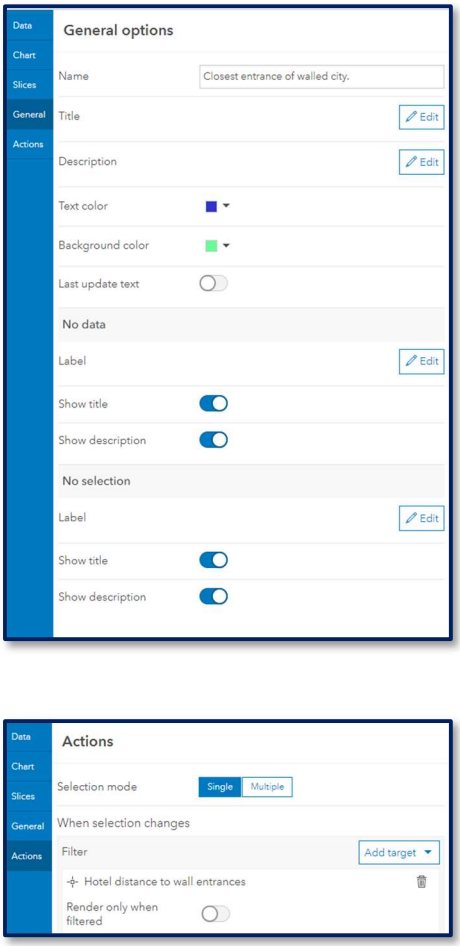


Figure 44 - Element's configuration: Seria chart 4

Note: *These settings will repeat over the following elements.*

Elements: Pie chart

It is ideal for showing the distribution of categorical information; we can add them by clicking the blue button "add element." We will have to associate to a layer in the map we want to show in the dashboard (but we will have more options, as we can associate information from outside sources to our map. We will stick with the HUB-IN project the map we are working on).

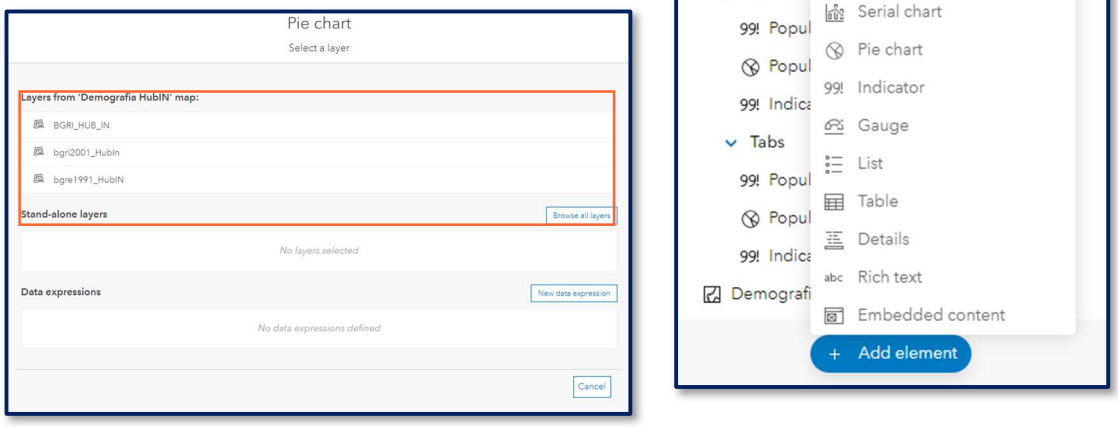


Figure 45 - Element's configuration: Pie chart 1, Data selection

Once we select the layer, it will read the attribute table of the layer and will allow us to work with it. The options presented here will initially determine what we want and wish to display in the information. We can filter specific details and values; this can become useful when the data has NA/NO DATA. We can select how to group the information but use the option "grouped values" for simplicity. Then we choose the field/attribute/column of the layer we will work with containing the categorical information. "Statistic" is the method in which the data will be processed; that is why we need to select the general parameter that will be "Field" based on the categorical information (by default will be OBJECTID, as it counts each one of the components of the layer). e.g., if we have 100 points in the map layer, 50 are blue buildings and 50 are red buildings, selecting the statistic Count will produce a pie chart with a 50% - 50% distribution.

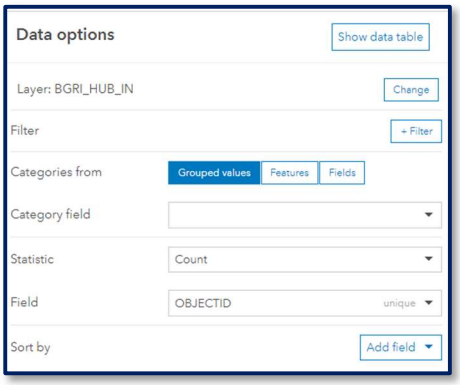


Figure 46 - Element's configuration: Pie chart 2

In the menu "chart," we can decide if we want the chart to be in pie or doughnut shape. We will use the second one; therefore, we will set up the "ratio interior" to 50% and enable "hover text."

We also can decide if we want to have "labels" and "legend"; you can determine the form it is more beneficial to be shown. Be aware of space distribution, as having both elements could be too crowded; alternatively, you can use a minimalistic approach and leave only the shape with hovering text.

Figure 47 - Element's configuration: Pie chart 3

We will define colours in the option "Slices", rename elements (usually used when we have the information coded), and other esthetic options. While sometimes we might have multiple categories, it is ideal for homogenizing the chart's colours with the colours of the elements in the map.

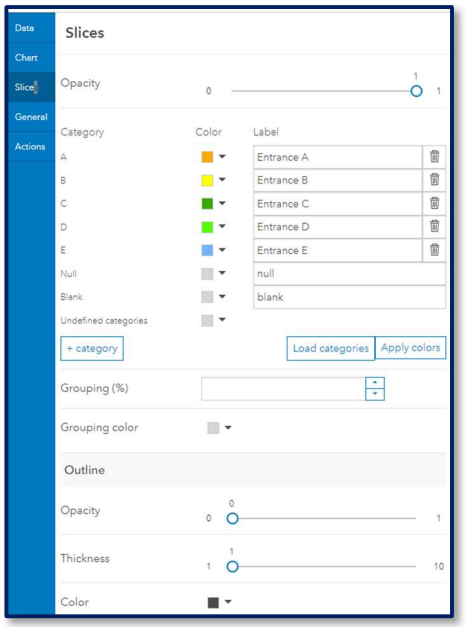


Figure 48 - Element's configuration: Pie chart 4

Elements: indicator

If we want to create a counter or show the value of a given index, this is an excellent element to include. Its configuration depends on the statistic we decide to use (average, minimum, maximum, sum, standard variation and percentile) and the type of value (numerical or categorical); once that is understood, we will need to select the field's name from the table of attributes from the option "Field". The following primary setting will be at the "Indicator" tab, where we can have text in three positions. By default, the value to be displayed will be in the "middle text", but this can be changed. Also, other information (fields) can be added by clicking in Fields: {}.

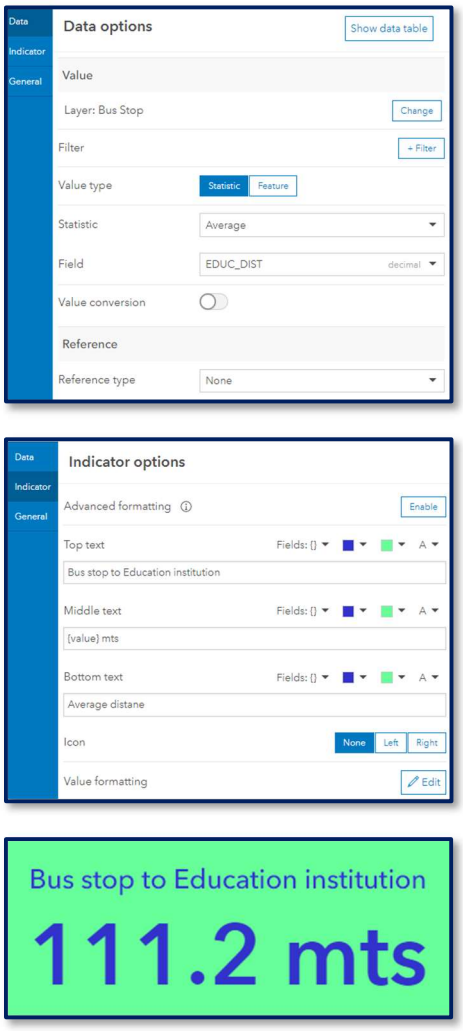


Figure 49 - Element's configuration: Indicator

Elements: Gauge

Useful to display a single layer attribute with a quantity characteristic. It can show the total number of a given type of object categories of tolerance or quality, among other uses. Like the other elements, what matters the most here is the field that will contain the continuous data and the statistic that will be used. The limit of the data shown can be defined manually, which can help if our data has samples with a high difference from the normal distribution.

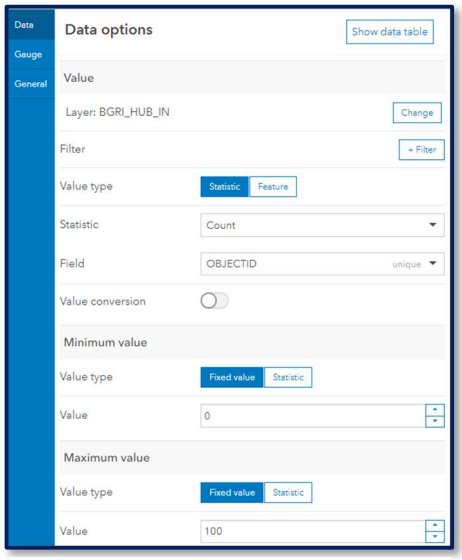


Figure 50 - Element's configuration: Gauge

In the Gauge tab, we can configure the esthetic of the graph. The style can be a progressive chart that fills, empties, or a meter with % information. This second one can be enhanced in the "guides" option, where it is possible to set up colours to symbolize a given level of intensity; unfortunately, text cannot be added to complement, but symbology specifications can be added in the "general" tab.

The next two colour schemes were used in the Gauge. In the future it might be needed to adjust some of colours.

Table 4- Gauge Theme Colour scheme and codes

Text color
#1C1C47
Band
#EF8A45
Band Background
#C9C9F7

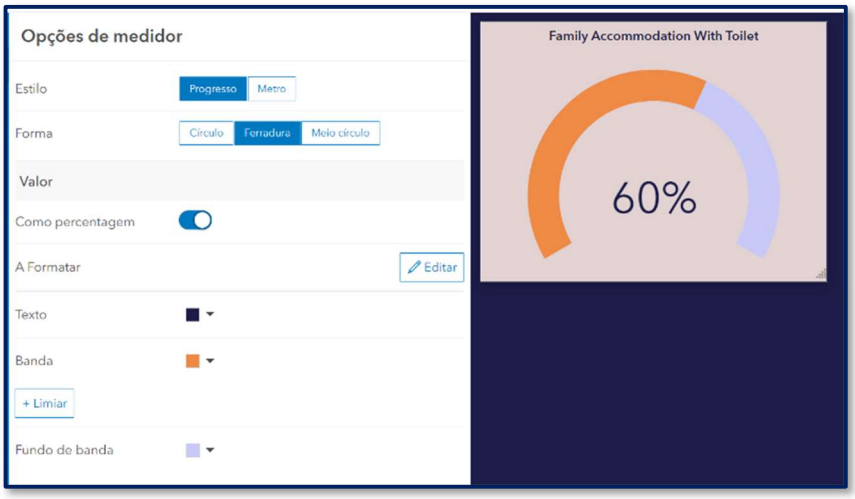


Figure 51 - Element's configuration; Gauge Colour scheme

Table 5 - Leveled Gauge Theme Colour scheme and codes

25%	100%
#66FF99	#FF6633
50%	Band Background
# FFFA50	#C9C9F7
75%	Text
# EF8A45	#1C1C47

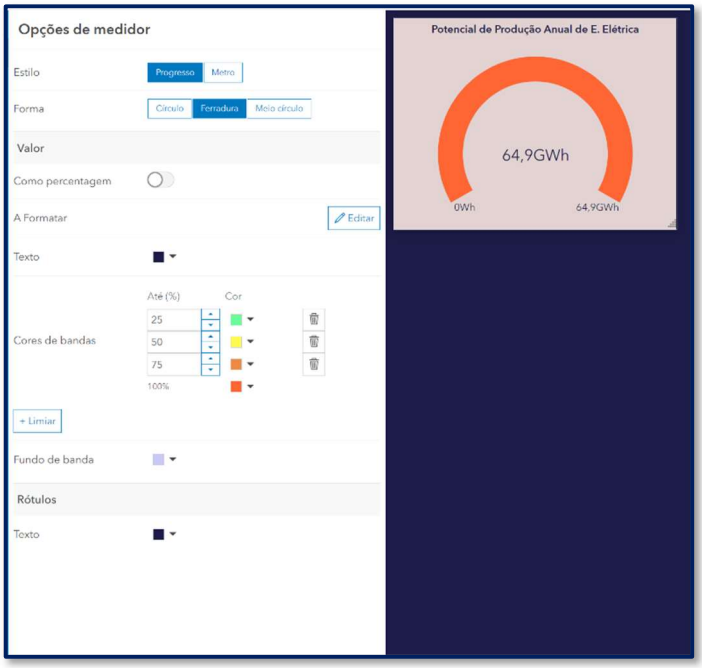


Figure 52 - Element's configuration; Leveled Gauge Colour scheme

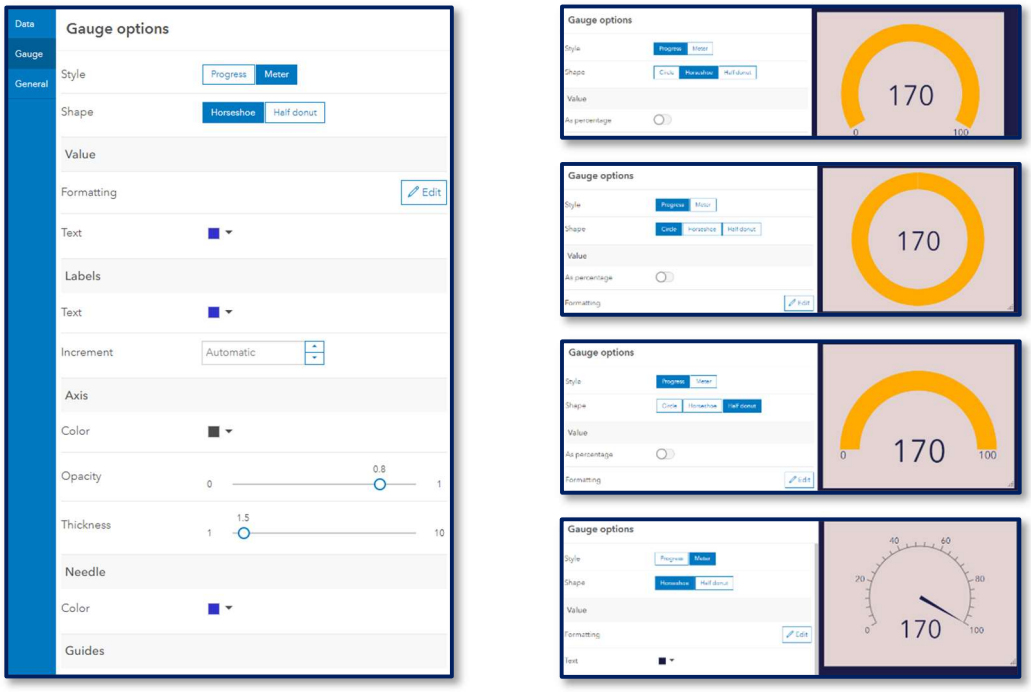


Figure 53 - Element's configuration; Gauge examples

Elements: List

"List" will show all or partial fields' values and components in a map layer. Helpful when we provide quick access to point or polygon information. When we add this element, we will decide which field of the map layer we want to use, the maximum number of values in the list and if we're going to include the icon that represents it. By default, the "List" tab has only the field we will be working with, but we can add more information by writing it or including more fields when clicking on {.}. The interaction with "Lists" can be enhanced if we enable "A" actions; for the GeoTool, "Flash" and "Pan" actions have been the most frequent, but you can decide which suits you best.

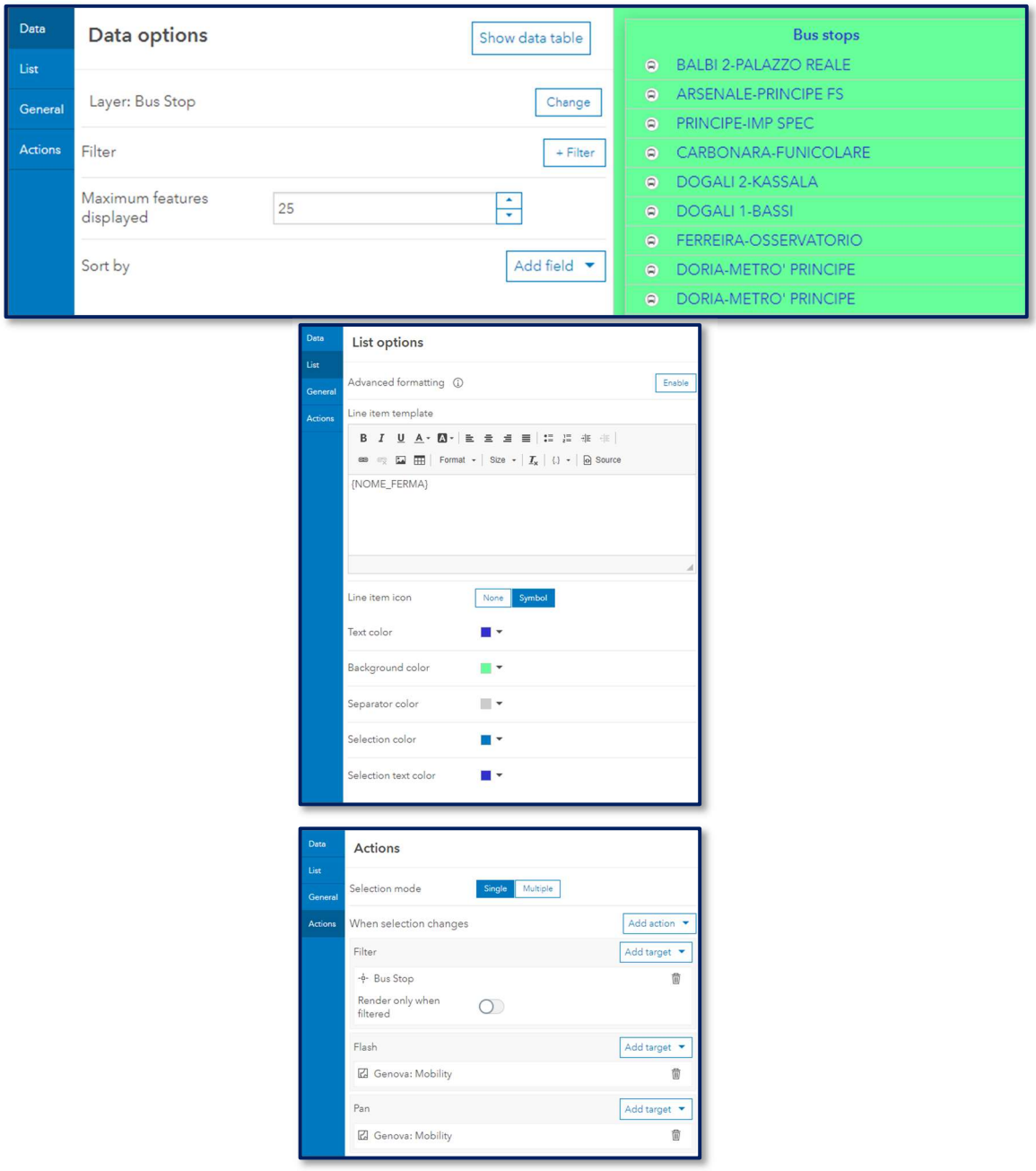


Figure 54 - Element's Configuration: Lists

Elements: Table

"Tables" are similar to "Lists" with the advantage of including more characteristics or a given object in the map. To add multiple fields, first, you need to define the main category; after that, you can add more; you can also have a simple statistic about the added fields if it suits the case. The following configurations have to do with formatting headers and values; if you decide to enable the summary tab, it will show the total results at the top of the table. Finally, "Actions" are also available in the same way as "List".

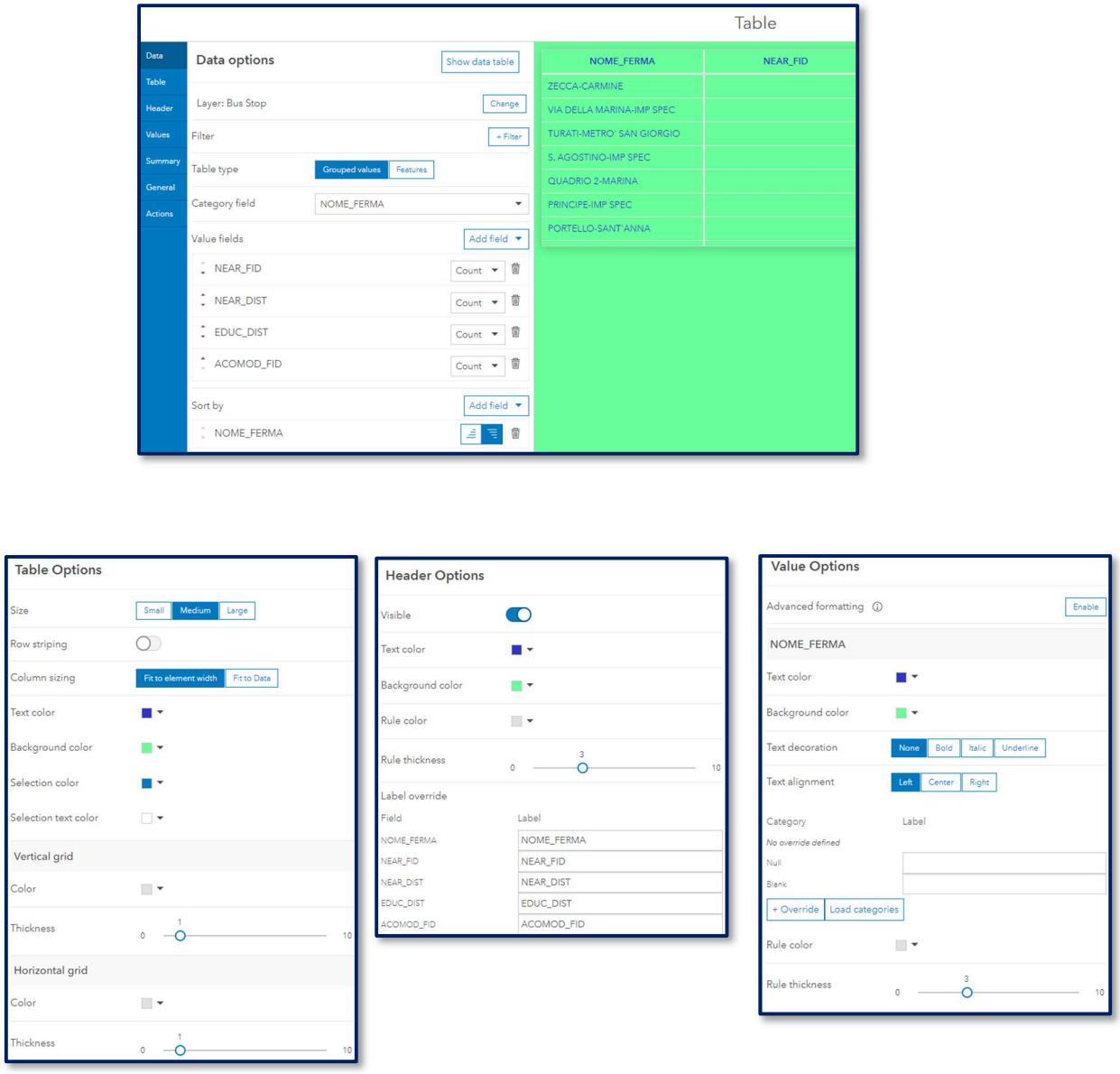


Figure 55 - Element's Configuration: Table

Elements: Details

This will display the attribute "Table" from the map layer; it will "stack" the visible components of the layer (polygon or point) in a single card. The number of fields shown here will be based on how the map layer and the pop-up were set up. This type of element benefits if filtering is also enabled in the dashboard's map configuration.

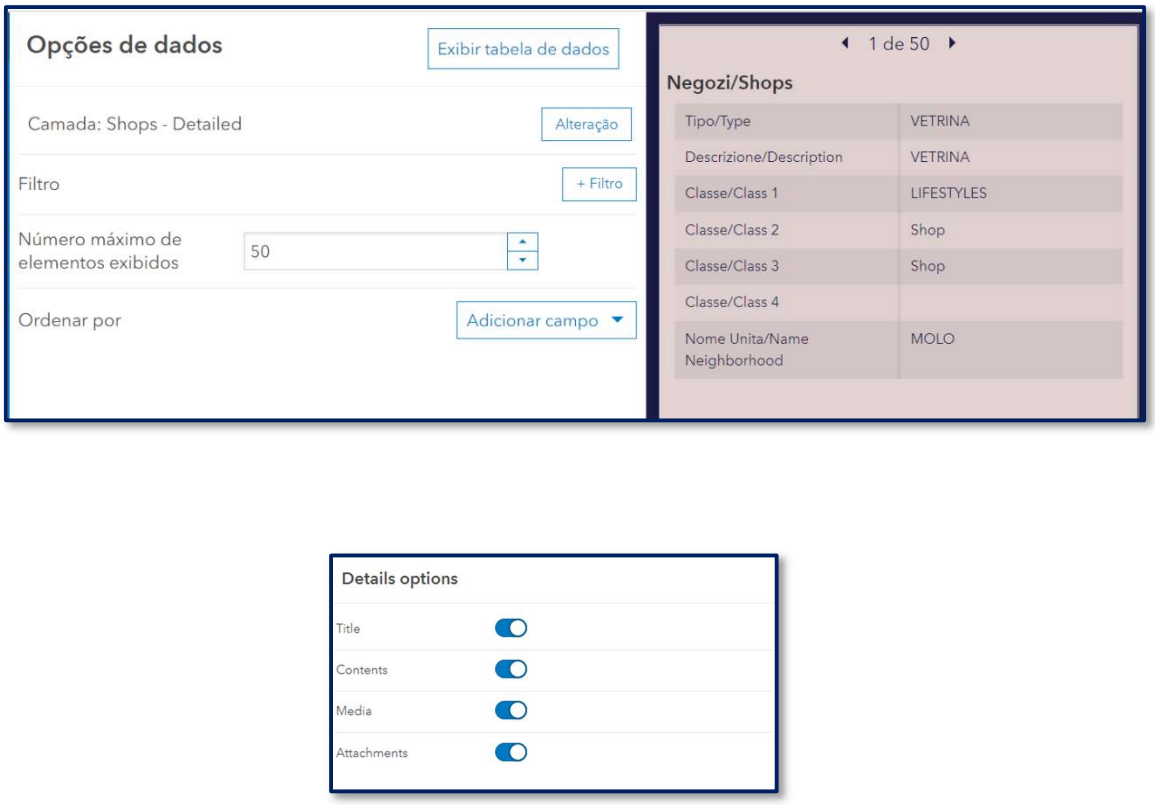


Figure 56 - Element's Configuration: Details

Elements: Rich text and embedded content

Rich texts can expand the context of the information in the dashboard, explain the focus, give more context to certain information and more. If we include this element, it is recommended to keep the text brief (150 to 200 words), size 10, paragraph justify; the rest can remain as default.

With embedded content, we can bring **an external site to the dashboards**. We recommend using this element to have related information websites with projects that complement and enrich the GeoTool. To accomplish this, we need to insert the web address to specify if it is a specific multimedia element or a website (Document).

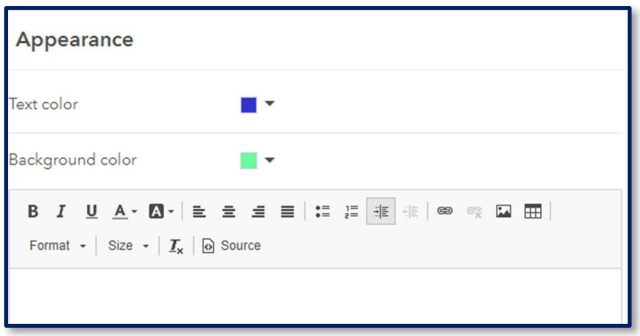


Figure 57 - Element's Configuration: Rich Text

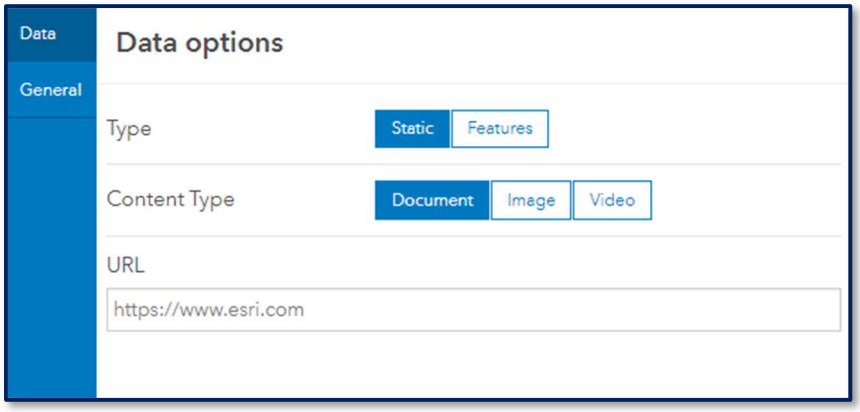


Figure 58 - Element's Configuration: Embeded ContentFigure

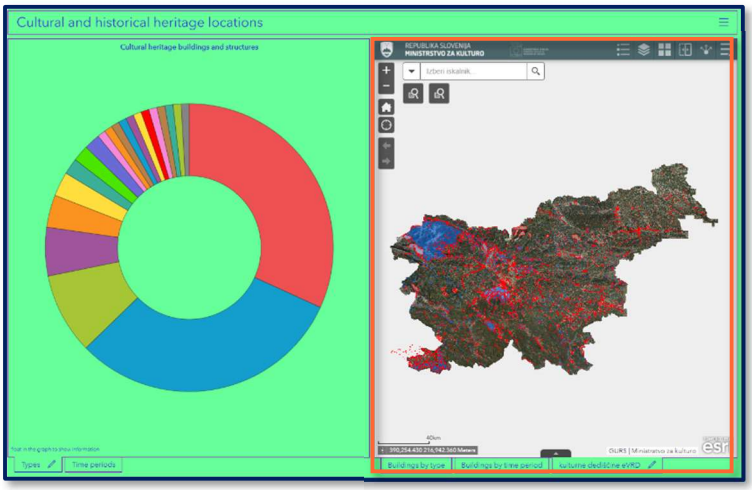


Figure 59 - Element's Configuration: Embedded Content

Updating the GeoTool

The objective is to ensure having a linked layer between a city partner and the GeoTool. This practice intends to:

- Give city partners the ownership of their data and the quality of such.
- Allow them to enrich, update and correct the data contained in the layer at their own pace.
- Having a layer linked to the GeoTool Maps and dashboards will show updates and corrections faster and efficiently.

This process can be achieved as a two-parter:

1st Partner city:

Update process: share and overwrite

All data used in the project is initially used in ArcGIS Pro (The back end). Here the team will have its data within a project, and the selected layers will need to be uploaded to their folder in ArcGIS Online. This can be done by right-clicking in the layer, going to "sharing", and selecting "Share Layer As Web Layer". This will prompt a wide window with options to be filled in.

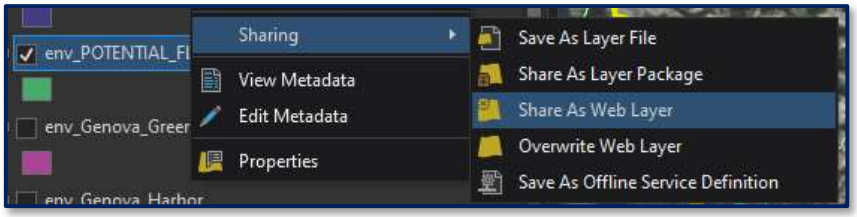


Figure 60 - Share a Web layer 1st step

Here it is where the metadata needs to be documented, "Name" needs to be clear, "Summary" can be a detailed description that includes a reference to the source material, and "Tags" will help ArcGIS Online search engine to find our data. Layer Type will be set as "Feature", location should be direct to the city partners folder (unless instructed differently), and "share" should be set up for everyone. Once everything is set, you can test the upload with "Analyse" or directly "Publish". Keep in mind that sometimes you might encounter errors. Some solutions can be done by clicking now on the icon error, and others require web research.

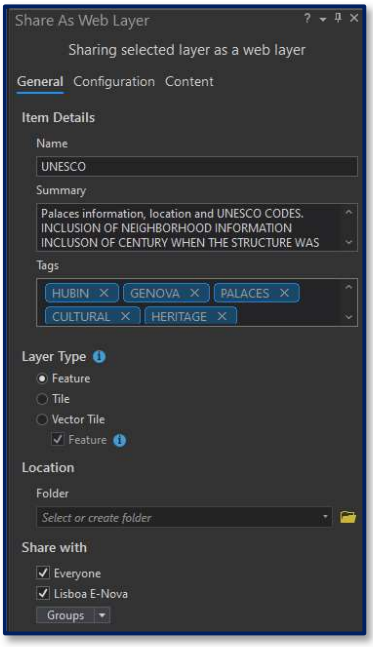


Figure 61 - Share a Web layer 2nd step

Now, let us pretend some modifications have been done to the layer (which will be explained later in this chapter), and now we need to send those updates. We will need to overwrite the layer, and this option will be found in the same place as before when right-clicking the layer under the option “overwrite web layer”.

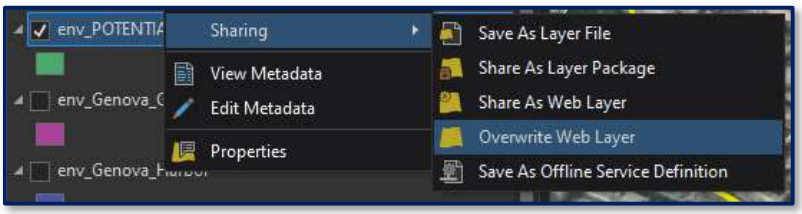


Figure 62 - Overwrite a Web layer 1st step

We need to redirect and select the layer in ArcGIS online to which we will act (the layer’s location will depend on how each user has organized its data). This example shows the layer from the original project and the window where we have found the web layer we wish to overwrite.

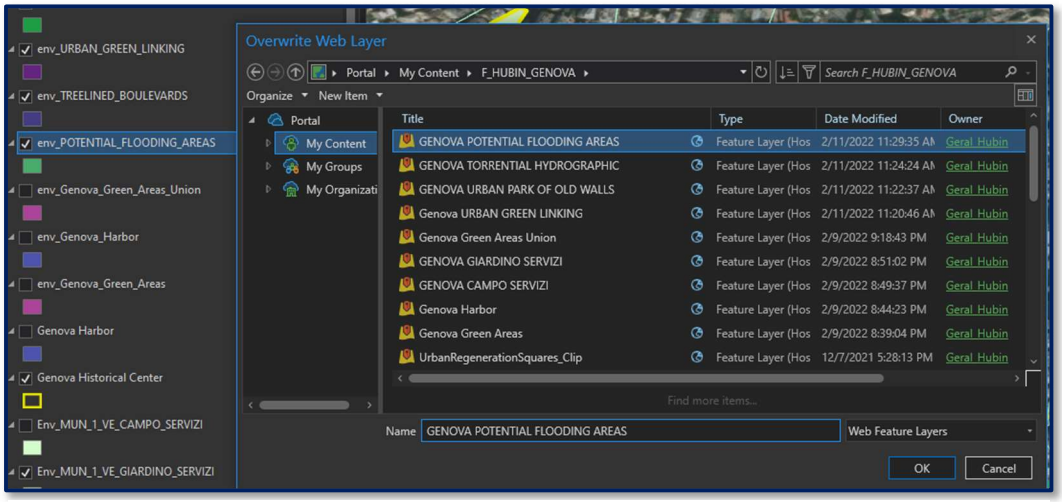


Figure 63 - Overwrite a Web layer 2nd step

After selecting the web layer, it will prompt a warning explaining the consequences of the overwrite. Once we click the warning, it prompts a similar metadata window; here, we can modify metadata by adding more descriptions, tags, and other information of your preference. Once ready, click “publish” to upload the changes.

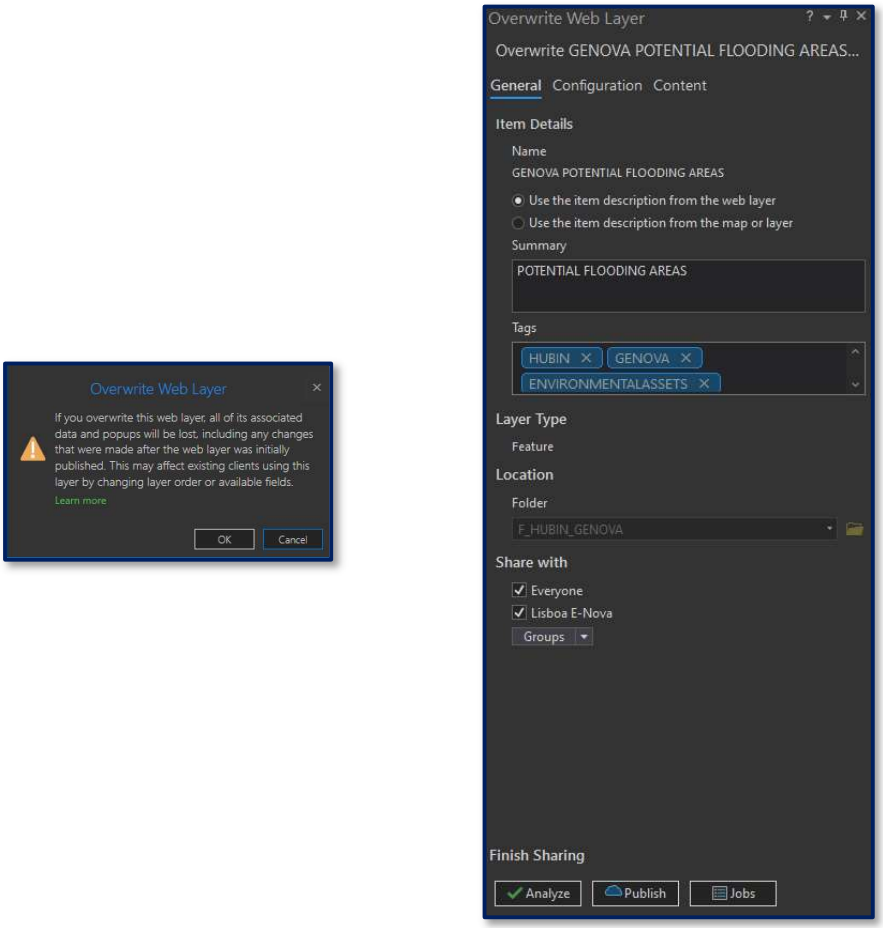


Figure 64 - Overwrite a Web layer last

Update process: editing data

Table of attributes: edit & join

In this scenario, we want to update the table of attributes, either because we want to add a new column or correct something wrongly written. The first step is to export the layer's table, which can be found in the Data > Export table after right-clicking in the layer.

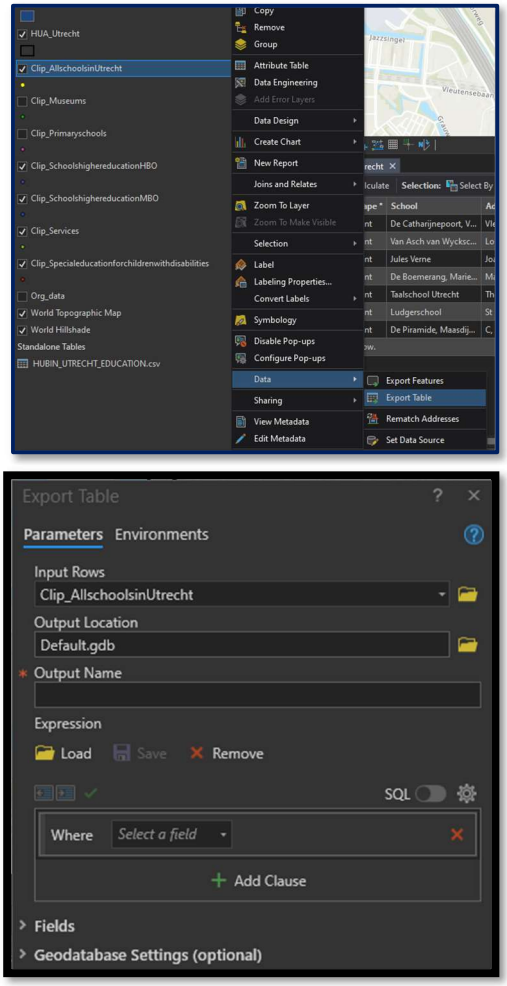
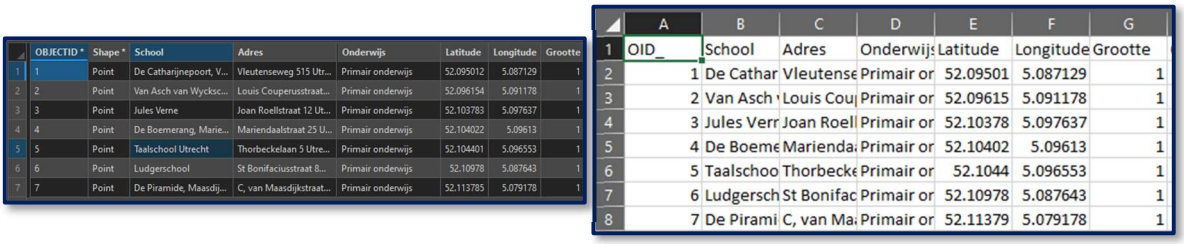


Figure 65 - Export attribute table process

It will prompt a window to set up where we want to export the table. "Input Rows" refers to the layers table of attributes. "Output location" is the place we want to save the file, by default, and is directed to the ArcGIS Pro Geodatabase project (here the name "default.gdb"). We will need to move from this location to the desirable folder of the user. Moreover, "Output Name" is self-explanatory. Regardless of the name it will be assigned, it is essential to write the extension file ".csv" (comma separate values) to be accessible in platforms like Excel. There are other options in this window, but these steps should be enough for the sake of simplicity.

The final product should look similar to what we see in the ArcGIS Pro attributes table. From here, we can edit the table at will; we need **to keep at least the first column intact and preserved**, as it will be used to join our new information. Another strategy we can implement is to eliminate all the columns that will not be edited and change the names of the columns; this will help us understand where the columns will be added to the table.



OBJECTID *	Shape *	School	Adres	Onderwijs	Latitude	Longitude	Grootte
1	Point	De Catharijnepoort, V...	Vleutenseweg 515 Utr...	Primair onderwijs	52.095012	5.087129	1
2	Point	Van Asch van Wycksc...	Louis Couperusstraat...	Primair onderwijs	52.096154	5.091178	1
3	Point	Jules Verne	Joan Roellstraat 12 Ut...	Primair onderwijs	52.103783	5.097637	1
4	Point	De Boemerang, Marie...	Mariendaalstraat 25 U...	Primair onderwijs	52.104022	5.09613	1
5	Point	Taalschool Utrecht	Thorbeckelaan 5 Utre...	Primair onderwijs	52.104401	5.096553	1
6	Point	Ludgerschool	St Bonifaciusstraat 8...	Primair onderwijs	52.10978	5.087643	1
7	Point	De Piramide, Maasdij...	C, van Maasdijkstraat...	Primair onderwijs	52.113785	5.079178	1

	A	B	C	D	E	F	G
1	OID_	School	Adres	Onderwijs	Latitude	Longitude	Grootte
2	1	De Cathar	Vleutense	Primair or	52.09501	5.087129	1
3	2	Van Asch	Louis Cou	Primair or	52.09615	5.091178	1
4	3	Jules Verr	Joan Roell	Primair or	52.10378	5.097637	1
5	4	De Boeme	Marienda	Primair or	52.10402	5.09613	1
6	5	Taalschoo	Thorbecke	Primair or	52.1044	5.096553	1
7	6	Ludgersch	St Bonifac	Primair or	52.10978	5.087643	1
8	7	De Pirami	C, van Ma	Primair or	52.11379	5.079178	1

Figure 66 - Comparison between Arcgis table and Excel

Once we have the table with the desirable information, we need to add it to our ArcGIS Pro project from the menu 

.After opening our table to see that it was properly imported, we can use the function "Add Join" from the Joins and Related in the layer of interest.

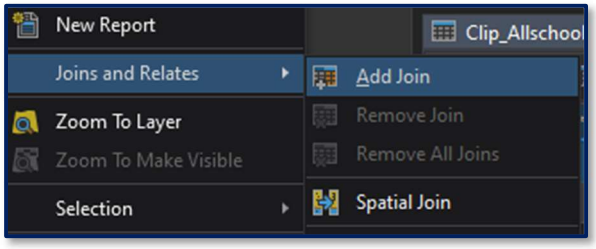


Figure 67 - Arcgis Join and Relate Menu

Here we will need to associate the layer (Input table) with our attributes/column of reference (input join field), which can be the first column (OBJECTID), but it can be another one that we know is consistent (written the same, equal numbers or categories, etc.) for both tables. From the side of the table we worked in (join table), we will also use the first ID column (OID_). After that, we can validate the join or just run it. Our new information usually will be placed at the end of the attribute table.

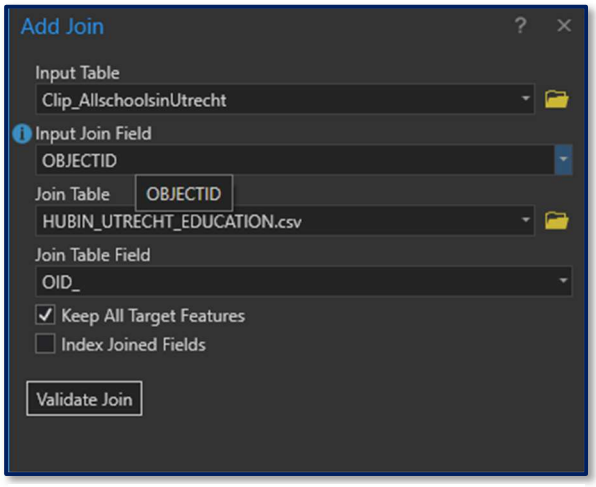


Figure 68 - Arcgis Join form

To consolidate the join, we still need to export (or re-save) the layer in question, which right-clicking > Data > Export Features can easily do.

Features: Creation and edition.

While this manual is intended to guide you to enrich the HUB-IN GeoTool, the creation and edition of features is a complex process that can be better assisted through a session with the HUB-IN team or ESRI support. These processes are vital as we might see a location wrongly reported or want to increase the detail in a layer. This is part of data validation when each city team has the layers available, and we encourage this practice as it is an essential part of any geospatial project.

2nd HUB-IN GIS Team:

The last step to create the connection will be in the hands of the GIS team. It needs to ensure that the layer is in the appropriate city folder and that the updates have taken place. Because as simple as the process seems, there can be challenges and calibrations.

The first thing that needs to happen is to add the layer from the partner city into a map. As it has been described, we can start by going to Add > Search for Layer, but instead of looking in “My content”, we will do this using “My Organization”. Here we can either enter the name of the layer of search by keywords associated with the tags written in the metadata. Once added, work in the representation of the element, and do the same drill like any other layer when using it in the dashboards.

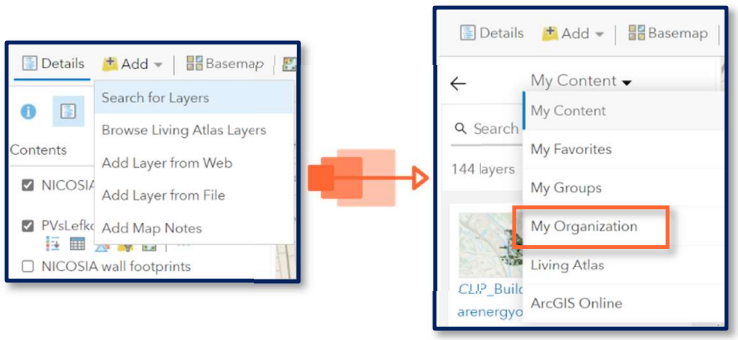


Figure 69 - Search Web Layer from the organization

3. HUB-IN GeoTool and the cities

What are the partner cities saying about HUB-IN GeoTool? Here are some examples...

How can it be useful for the Project?

"The tool will be useful for the analysis and representation of data to make us understand the situation and make targeted interventions."

(Cristina Giusso, Genova City)

"It can be useful as a tool for participation, visualization and decision making, either for the city teams as well as for the citizens that can benefit from HUB-IN project transformations."

(Diana Henriques, Lisbon City)

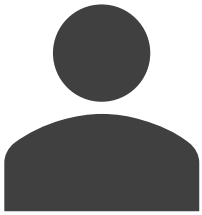
"To be able to introduce new sets of data once our HUB-IN studies will be ready, in order to see how the project implementation could influence the reality of Brasov."
(Leea Mihaila, Brasov City)

"To focus on the most important information of the pilot area and support the Pilot's activities to make improvements."

(Cristina Giusso, Genova City)

"The fact that we can start explaining the current situation in the city through maps and that the Nicosia Municipality can start developing a structured database around the Historic Centre of Nicosia."
(Marina Kyriakou, Nicosia City)

"To display information about the current state of the innovation ecosystem graphically in a meaningful way and to enable network building for future collaborations."
(Nina Taylor, Slovenska Bistrica City)



What are their hopes and expectations for this Tool?

"We would like for the GeoTool to help the local administration take the best decisions for the urban regeneration of the Historical Centre of Brasov. Thus, we hope the Geotool will point out some of the pressing issues over the quality of Brasov citizens's life, over the creative and cultural environment, over the heritage and local identity, in order to support the decision-making process towards a resilient regenerated Historical Centre."
(Leea Mihaila, Brasov City)

"We hope to see that the HUB-IN GeoTool will contribute to the development of the historical urban area, giving relevant insights in the development of and existing assets in the area." *(Nanine Koolstra, Utrecht City)*

"To present spatially organized information on the current situation in Nicosia on different levels (infrastructure, environmental, society, culture, economic ecosystems, etc.) and allow stakeholders and citizens to get inspired, reveal gaps and opportunities for enhancing the role of the Historic Centre of Nicosia as a HUB of innovation and entrepreneurship" *(Marina Kyriakou, Nicosia City)*

"To geospatially tell the story of the Maritime Mile" *(Andrea Thornbury, Belfast City)*

What kind of knowledge are cities most looking forward to see reflected in this Tool?

"Visual display of information usually seen in spreadsheets."
(Nina Taylor, Slovenka Bistrica City)

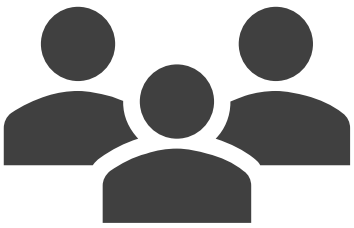
"To visualize for the first time some key figures, numbers, maps, locations in Nicosia in an interactive way"
(Marina Kyriakou, Nicosia City)

"To map the local initiatives which are dispersed and scattered throughout the territory, involve them and to promote citizen participation through the use of surveys."
(Diana Henriques, Lisbon City)

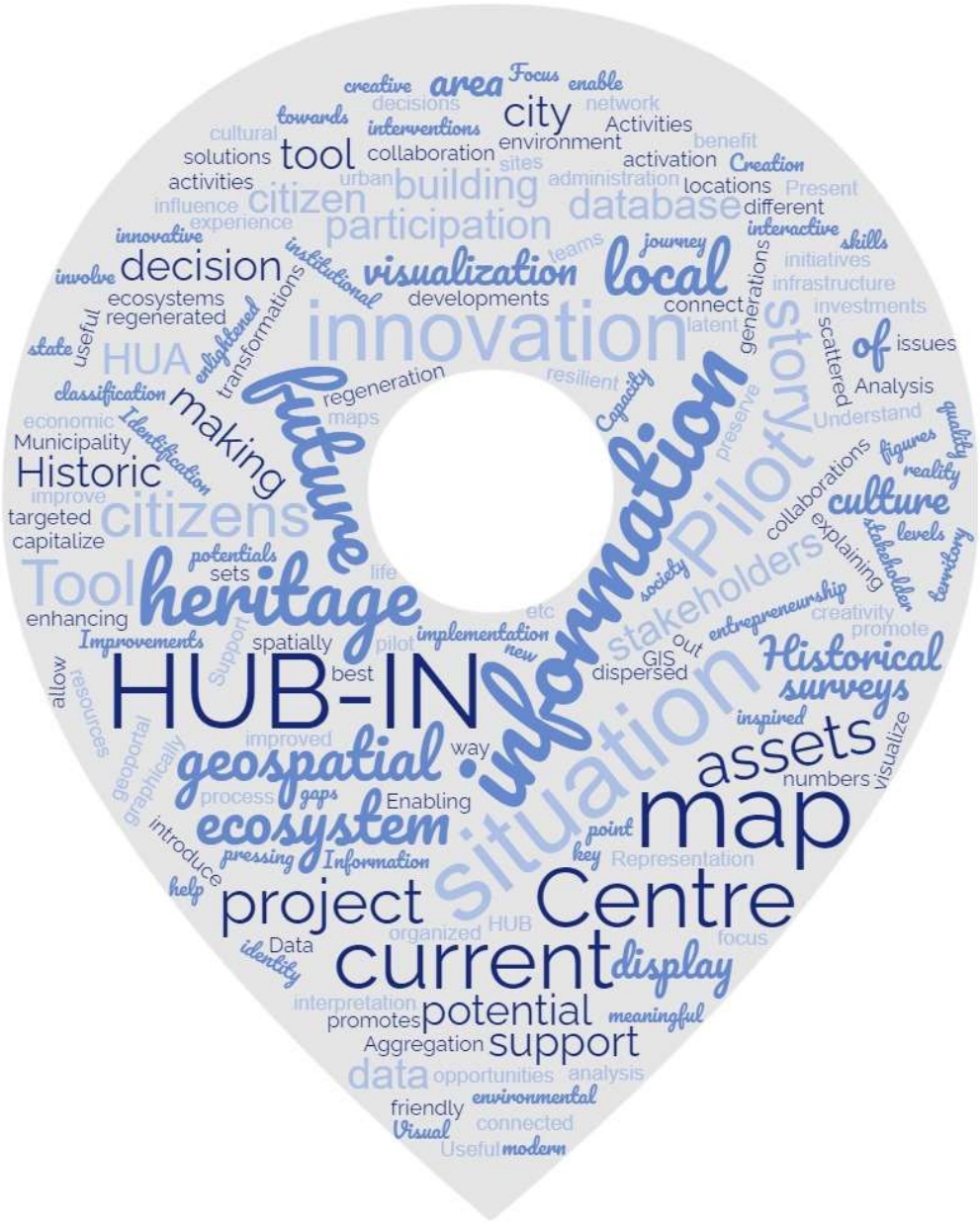
"Supporting the classification of heritage sites to other more modern assets – to geo spatially classify assets in the HUA."
(Andrea Thornbury, Belfast City)

"Identification of latent and/or not connected assets and their activation through the HUB IN activities."
(Nina Taylor, Slovenka Bistrica City)

"To map future investments and developments."
(Andrea Thornbury, Belfast City)



Or in other words…



A big thank you to everyone who contributed to this User Guide.

For more information on HUB-IN GeoTool, please contact Diana Henriques or Luís Cruz, WP4 lead and GeoTool coordinator, at Lisboa E-Nova

Diana Henriques: dianahenriques@lisboaenova.org

Luís Cruz: luiscruz@lisboaenova.org

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