A Digital Mapping Platform For Promoting Social Innovation Initiatives For Carbon Neutrality In Cities:

Prototype design and development

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ABSTRACT ENG

This thesis presents the development of a Digital Mapping Platform prototype designed to allow cities to understand better Social Innovation Ecosystems (SIEs) within urban settings. This prototype aims to facilitate identifying and promoting Social Innovation Initiatives that contribute to carbon neutrality in the context of Net Zero Cities. The platform provides an interactive and user-friendly interface for Municipal Administrators and Social Innovation Initiatives to provide precise and informative visualization of the SIEs.
This research follows the Double Diamond approach with the start of the Define phase investigation, collecting insights from the literature review and case studies and aiming to overcome the addressed issues. Those insights were then carried onto the development of the prototype. However, this was an iterative process. By mapping SIEs, the platform clarifies the complex interrelations between various stakeholders and initiatives. Completing the working prototype and creating its user manual and setup guide brought some insights. The prototype can let Municipal administrators see actors such as initiatives and supporters in SIEs on the interactive map by providing geographical locations. Also, the statistical view provides overall statistics of the SIEs currently observed, which can help users comprehend complex SIE situations easily. At the same time, city administrators can leverage the insights from the prototype to directly contribute to taking more informed action to support and promote SIEs in the city. Moreover, the prototype platform encourages initiatives and supporters to participate in the mapping process by uploading information autonomously. Overall, this study contributes to creating higher dynamics in the SIEs and preparing the ground for future research with an openly distributable prototype.

ABSTRACT

ABSTRACT ITA

Questa tesi presenta lo sviluppo di un prototipo di piattaforma di mappatura digitale progettato per consentire alle città di comprendere meglio i Social Innovation Ecosystems (SIE) all'interno dei contesti urbani. Questo prototipo mira a facilitare l'identificazione e la promozione di iniziative di innovazione sociale che contribuiscono alla decarbonizzazione", nel contesto del progetto NetZeroCities. La piattaforma fornisce un'interfaccia interattiva e di facile utilizzo per gli amministratori comunali e le iniziative di innovazione sociale per fornire una visualizzazione precisa e informativa dei SIE.
Questa ricerca segue l'approccio del Doppio Diamante con l'inizio della fase di definizione dell'indagine, raccogliendo intuizioni dalla revisione della letteratura e dai casi di studio e mirando a superare le questioni affrontate. Queste intuizioni sono state poi trasferite nello sviluppo del prototipo. Tuttavia, si è trattato di un processo iterativo. Mappando le SIE, la piattaforma visualizza le complesse interrelazioni tra le varie parti interessate e le iniziative. Il completamento del prototipo funzionante e la creazione del manuale d'uso e della guida alla configurazione hanno portato alcune intuizioni. Il prototipo può consentire agli amministratori comunali di vedere gli attori come le iniziative e i sostenitori nei SIE sulla mappa interattiva, fornendo la posizione geografica. Inoltre, la vista statistica fornisce statistiche complessive dei SIE attualmente osservati, che possono aiutare gli utenti a comprendere facilmente la complessità degli ecosistemi di innovazione sociale. Allo stesso tempo, gli amministratori della città possono sfruttare le intuizioni del prototipo per contribuire direttamente a intraprendere azioni più informate per sostenere e promuovere i SIE nella città. Inoltre, la piattaforma prototipo incoraggia le iniziative e i sostenitori a partecipare al processo di mappatura condividendo e aricando autonomamente le proprie informazioni. Nel complesso, questo studio contribuisce e a preparare il terreno per ricerche future con un prototipo distribuibile apertamente.

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INTRODCUTION

1.1 What is the theme?

The primary focus of this thesis is to develop a prototype of a digital mapping platform that gives cities an option to map their social innovation ecosystems in the context of Net Zero cities. The project aims to create an interactive and user-friendly digital mapping platform that municipal administrators and social innovation initiatives can utilize.

The design of the digital mapping platform aims to provide a precise and informative visualization of the Social Innovation Ecosystem in urban settings, incorporating Cartographical visualization as well as statistical data visualization that can provide more versatile insights to users and promote informed decision-making for municipal administrators, thus promote initiatives within Social Innovation Ecosystem more effectively. Meanwhile, the platform encourages autonomous participation on the map and collaborations and activities between initiatives as well as cross-sector actors. By facilitating the exchange of information and promoting autonomous collaboration, the platform can contribute to a more fluid and dynamic Social Innovation Ecosystem in cities throughout Europe.

1.2 Why is it relevant

1.2.1 What is a Digital Map

The digital map emerged from the development of computers in the mid-20th century. As Geographic information systems (GIS) emerged, cartography had a paradigm shift since GIS technology separated data and map visualization. Furthermore, it changed the role of the maps to communication tools and not storage media for spatial information (Kainz, 2020). Due to this separation, the digital map can be used with a dynamic database, such as a database that has a continuous update or interacts with specific datasets in real time. In this article, digital maps will be treated as a technology to create maps using computers or any kind of information technology. It will not differentiate with GIS as a separate field.

1.2.2 Why Create a Digital Map

Creating a digital map can provide significant benefits that are not easily obtainable from physical maps or any data tables, such as Overall understanding, which is provided a form of any conventional map incorporated with the interactivity of its characteristic of the digital software. Also, the collaboration and the participatory approach can be enhanced by digitizing the map since the digital, especially the online platform, allows simultaneous modification of data on the map at any moment by any participant with the authority to modify data from who manages the platform.

a: Overall understanding

A digital map can be a powerful tool to provide a comprehensive overview and make informed user decisions. Mapping engages the public in visual mapping, planning, and decision-making in a social context; engaging underrepresented communities can be significantly enhanced through powerful approaches. Decision-making has been used in various disciplines to frame issues such as health, education, and organizational issues concerning spatial information. (DueamS.R et al. 2022)
Graham, S.R et al. conducted a case study of the

application of Geographic Information Systems(GIS) in a community assessment, which shows the usefulness of GIS in mapping community needs by finding the relationship between data and geographical location the map revealed geographic details of the community that had not been identified before such as the beneficiaries of a community-based organization. Also, it points out that there are various tools to gather community data related to geographical location, such as ethnographic observation, key informant interviews, and surveys; however, those data are not easily interpreted by the general public and often fail to reveal the direct correlation between geographical location and health.(S.R. Graham et al 2011) also, he later points out that a limitation of GIS software is that they are costly, as users are required to learn the software.

b: Collaboration and participation

Furthermore, the context of the use of participatory geographic information system(PGIS) contributed to not only linking geographical location and attribute information into a map with various layers of information, which leads to a better understanding of spatial relations of data regarding archaeological research but also the dynamism of the tool allows information to be adjusted when needed. The final map products can act effectively as an intermediary between local and external agents. (also points out that visualized on maps or published on online platforms broaden communication about cultural and archaeological sites in the landscape)(Larraín, A. Á. et al 2018)
Also, the participatory GIS acts as a platform where various stakeholders can collaborate by being a common field/databank and bridge between community and agent and can also serve as a powerful decision-making supporter. Anderson et al. mentioned that Using GIS as a decision-support tool in the grassroots process

has become almost a convention in some communities ([Anderson et al. 2009;](#)). Research by Denwood et al. suggests that including different parties can provide a more comprehensive understanding of the ideas of various stakeholders, which is beneficial to the decision-making process. Participatory Mapping allows stakeholders to share spatial ideas. ([Denwood, T et al. 2022](#))

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As mentioned above, collaborativeness and participative mapping systems support the community and its grassroots initiative, and this appears to be an invaluable asset to cities to push systemic change for sustainability. Wolfram and Frantzeskaki explored the necessity of systemic change in the urban setting for sustainability in an integrated way in their research. This research has identified four prevailing epistemologies that focus on different drivers of change and provide different perspectives on how can city achieve systemic change for sustainability. One of the four epistemologies was the importance of

empowering urban grassroots niches and social innovation. Furthermore, it points out that for community participation and empowerment approach, cities can provide far better opportunities to those grassroots initiatives than smaller villages, especially the capacity to empower communities and leverage their trans-local network and its importance to cities.
([Wolfram and Frantzeskaki 2016](#))

1.2.3 Benefits of the Digital Map

This section will explain main significant factors of this Digital Map platform. In "Visualization and Interactivity" is what kind of visualizations and interactive elements exist in the platform and what kind of benefits users can obtain from those elements. "Bottom-up Approach" section explains the usefulness of the bottom-up and participative governance in the collaborative platform.

a. Visualization and Interactivity

The visualization contains mainly two functionalities: cartographical visualization and statistical data visualization. The cartographical visualization plots each Social Innovation Initiative's geographical locations in the area being observed; the plotted data is then colored according to their type target, and those color codes can be later utilized with a filtering function which users can interactively choose which combination of data to be visualized on the map (which helps to avoid poor user experience by plotting every data on the same map space as [Gayratjon Kholmuradov Habibullayevich et al.](#) mentioned in their research of filtering algorithm), allows more flexibility to the analysis of Social Innovation initiatives in the area.

As another dimension of interactivity, users can see overview information of each initiative in the information section within the digital mapping platform when one of the markers on the interactive map is clicked.

The scope of information presented in the following material is intended to provide a comprehensive understanding of ideas of each initiative in the observed area and connection with supporter which support the specific initiative as well as the opportunity to see their website through this section.

The information will be in the section Name of the initiative, Description of the initiative, Whether the initiative is active or not, when it started, how many people are involved in the initiative, and type of organization such (e.g., NPO NGO), Type of initiative, field of target, and supporters. This map visualization is aided with the statistical data visualization section, which tells the situation in the area currently observed, and contains following statistical information and most of the graphs are interactive, Pie chart for the ratio of(e.g., types of initiative, targets of initiative) against total within the selected area, Area graph with time in x axis, running total of each elements in either "type", "target", and etc to show the growth trend of each category, Sankey diagram to show the flow of data (e.g, supporter, type of initiative, and target in this case the Sankey diagram can provide how the supporter is connected to target in the end or which types of initiatives are more likely to be connected with particular supporter or types of targets) which enable user understand what kind of entities are flowing to other entities with certain mass or volume, Network diagram shows which nodes are connected to another nodes to show the interconnectivity of nodes being observed in this case it would mainly be Social Innovation Initiative and supporters which allows user to understand what kind of supporter has higher interconnectivity with initiatives and this can be enhanced with sorting initiative with type, targets, or focus area to for better insight, numbers of Active initiative and total personnel involved in the social innovation ecosystem(SIE) which are not visualization however, this benefits user to quickly obtain the scale of SIE observing, and lastly density map which is another map based visualization in the statistical part which shows the density of initiatives in each district in the city this map also serves as a filter, when user select specific area or areas rest of the statistic graphs will be filtered to initiative and supporters only exists in those specified areas. This functionality allows users to see statistics in an interactive manner, which allows additional exploration of empirical data compared to a static manner. (Weissgerber, T. L et al 2016)

c. Bottom-Up Approach

A unique aspect of digital mapping is the possibility of Social Innovation itself to upload freely to the map, and there are several benefits regarding letting Social Innovation stakeholders

and initiatives register themselves on the platform freely. First, the participatory governance and social innovation combination is complex; simultaneously, it has the advantage of having a high social impact (Richter, 2018). A Platform that can be joined quickly can marshal stakeholders diverse in background and specific knowledge, and this can lead to better involvement in innovation efforts and can contribute to the impact of social innovation. (Rodan et al 2004, Obstfld et al 2005) Moreover, empowering and ensuring inclusiveness and equality while enhancing proximity among stakeholders is crucial to creating a durable and stable community. A community with a bottom-up component in operation can promote and encourage stakeholders' active engagements, and those engagements can strengthen even multiple development outcomes. (Ricciardelli et al, 2020)

This tells that letting stakeholders register freely to the system is essential to building a high-impact Social Innovation Ecosystem.

1.3 Overview of the NZC project

The NZC (NetZeroCities, or Climate Neutral and Smart Cities) project is part of a larger climate change initiative the European Union (EU) promoted. The project is precisely aligned with the EU's European Green Deal goals. The European Green Deal aims to make the entire EU climate neutral by 2050, with an intermediate goal of reducing emissions by 55% by 2030 compared to 1990. Since cities, according to them, account for about 75% of global emissions, they must play a central role in achieving the climate-neutral goal. The most important objective of the Net Zero Carbon (NZC) project is to aid a serious number of European cities in achieving their goals of the 2030 agenda, so eventually, more cities will reach this neutrality in the next 20 years.

In order to fulfill this goal, it is essential to accelerate the decarbonization of these cities and, consequently, strengthen other significant initiatives. NZC will need to use intelligent solutions and data-sharing technologies to achieve the objective and move forward in other fields, such as sustainable transport, energy-efficient buildings, and water management. Another perspective that addresses this issue is Social innovation, approaching financial and political conditions.

Finally, NZC encourages cities to invest in their citizens, businesses, and other climate-neutral stakeholders. Below is a more detailed introduction to the various structures, platforms, and tools that NZC is creating.

The Climate City Contract (CCC) is a strategic framework to achieve climate-neutral cities by 2030, and it is part of a more expansive purpose promoted by the European Commission. The framework of the CCC was developed on existing projects in Sweden and Spain and implemented in the EU and related countries. The CCC introduces a new governance mode that connects stakeholders from the local to the international scale, such as local governments and businesses. This governance allows cities to take comprehensive and efficient action toward climate neutrality. Multiple cities that already have environmental goals have started working on the CCC framework, and their progress will be tracked through specific monitoring and reporting. It will be evaluated with Impact metrics, which measure the impact of CCC on a city's development. Impact metrics then provide detailed evaluation and MEL framework to the city for urban sustainability and

climate neutrality.

The crucial part of it is to maximize the positive impacts for citizens and governance while regarding the political situation of the region. In order to identify the challenges of the city, data such as GHG emissions, social innovation action plans, and financial needs are collected. The Platform combines online digital services called portals with human support. Some of the features were developed first to make it in time for the project launch, and then the rest of the platforms are still under development. The aim of the Platform's design is to have a great amount of flexibility and expandability, which considers the results of feedback from cities, co-design, collaboration with other city services, and development of future business models.

The Pilot Cities Guidebook is an important document to guide pilot cities that are participating in the NZC program and help them understand the benefits of participating in this project with detailed information. Also, the guide includes a comprehensive explanation of concepts, terms, and core program components of NZC. Call Guidelines will be published, which explains diverse processes and technical information. The Guidebook also provides questions to help cities prepare proposals by clarifying what to consider. This information can help cities understand how to participate in the project. Replication & Upscaling also focuses on inter-city collaboration and scaling to achieve climate neutrality and smart cities. Specifically, several outputs are planned, including replication and Scale-Up Report; a report on best practices and best practices replication and scaling up Twins Call and Selection Criteria: A report on the selection and selection criteria for twin cities Structured Twinning Learning Programme: A learning program between twin cities A report on the progress of the mid-term twinning of pilot cities with one climate action plan roadmap is available, which includes a catalog of cities and 30 case studies. Additionally, there is the multimedia publication of the case studies and reports on regional city collaboration and multi-level governance. Primarily, the "Mapping of National and Regional City Collaboration" report identifies the success factors, challenges, and gaps in city-to-city collaboration in the 27+8 countries of the EU and associated countries to identify the key drivers of success, challenges, and gaps in city-to-city collaboration, as well as the key actions to be taken

by cities to achieve the "100 climate neutral and smart cities" by 2030.

The mapping enhances the support structure and helps the city to understand the current situation of climate action initiatives in the cities. Also, it provides a comprehensive framework to understand the state of climate cooperation between cities. Financing and ambition are extensive and detailed, designed to help cities more effectively finance climate neutrality. Here, we take a multifaceted approach to help cities become more effective at financing, including the current financing state, barriers cities face, technical assistance, EU and regional level funding, innovative financial solutions, and city-specific issues.

The Finance Guidance Tool helps cities efficiently find financing options using a back-end database, decision support algorithms, and a user-friendly interface. The tool strengthens collaboration at the city, regional, national, and EU levels, providing opportunities for more stakeholders to work effectively toward climate neutrality. (WP7 D7.3)

Secondly, Engaging citizens and urban stakeholders is an aspect of the importance of active participation by citizens and urban stakeholders for such projects to be accepted. Social barriers and inequalities, such as those discussed in Engaging Citizens and Urban Stakeholders, also affect funding methods, conditions, and project implementation. Social innovation focuses on how social innovation (SI) can contribute to creating climate-neutral cities. SI is seen as a key enabler of the ambitious goal of creating "100 Climate Neutral and Smart Cities by 2030" (European Commission).

Since SI initiatives result from co-design and co-implementation of community and organization, building sustainable social relationships effectively meets social needs through new ideas and services. In this way, social innovation can be accelerated to achieve climate-neutral goals in the city. Also, advanced expert services on theme provide a comprehensive framework. It serves as a platform to offer expert services in various thematic fields to provide solutions to cities. The framework is not only for climate change but also regards relevant areas. Thereby, cities can maximize the impacts with created synergies. The program also presents several solutions to cities, including 180 solutions across eight major thematic areas: energy efficiency, circular economy, and mobility. Details are explained in fact sheets, and external links are provided.

The High-Level Advisory Board (HLAB) was established to perform a strategic advisory function for NZC projects and is expected to provide advice on a wide range of issues, from overall project strategic direction to specific activities. In particular,

it will be crucial to advise the executive committee and ensure uniformity of NZC's activities with other initiatives. (WP11 D11.11)

The structure and Platform for this are also provided by NZC, as explained above. The Net Zero Cities (NZC) initiative aims to achieve climate neutrality by 2030 through urban missions. This initiative's cornerstone is forming Transition Teams in participating cities.

This multi-actor group will serve as an ecosystem orchestrator to define emissions challenges, identify impact gaps, and co-create a portfolio of actions to achieve climate neutrality. Social innovation will play a pivotal role in this effort.

Social innovation is a bottom-up, collaborative, systematic, people-centered approach; in the NZC framework, social innovation will serve as a cross-cutting component of the Climate Cities Contract (CCC) and the broader transition journey. It accelerates changes, providing a platform for action and building solutions to handle existing and emerging needs stemming from the shift to climate neutrality. NZC's Task 9.5's main objective is to help city transition teams incorporate social innovation initiatives into their climate city contracts and action portfolios. Encouraging experimentation with social innovation is critical to helping cities co-design and co-produce solutions to local emissions challenges. Social innovation is highly context-dependent and aims to meet unmet local needs, develop thrifty solutions, and fill institutional gaps. Local transition teams, therefore, play a key role in providing the conditions for achieving greater collective impact, including capacity building, funding, and network support. This approach will contribute to cities achieving climate neutrality in three key ways: as a lever for change, as a platform for action, and as building solutions to existing and emerging needs arising from the transition and climate change.
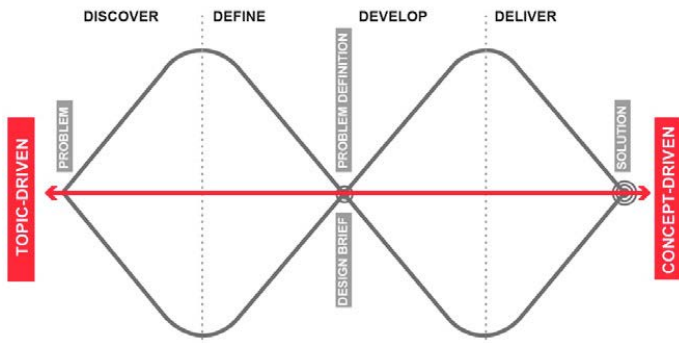
1.4 Methodology

Figure 1-1. Double Diamond from Design Council

Double diamond has been widely used, and according to the Design Council, this framework can be divided into four stages. Discover, Define, Develop, and Deliver as in the Figure 1-1. The initial phase, 'Discover,' involves identifying the cause of the problem by directly interacting and spending time with the people affected. The 'Define' phase serves to redefine the challenge facing from a different perspective with insights from the 'discover' phase. In the 'Develop' phase, stimulate people to give various answers to defined challenges and seeks inspiration from different area and diverse group of people by collaborating. The last phase, 'Deliver,' is testing solutions developed and improving solutions that seem to work well while opt-out solutions that did not perform well. The Design Council mentions that Double Diamond does not occur in a linear manner, meaning four phases do not follow one another in a specific order, as shown in the diagram.

In this research, the first phase was primarily the 'Define' phase to define the challenges with insights gathered through the 'Discovery' phase to gather information regarding Digital Mapping projects, digital platforms, and Social Innovation Ecosystem through case studies and previous research alongside with the insights and solution NZC have gathered and defined. Then, based on insights gained, Prototype development was conducted. During the prototype development, the process of returning to the 'Discover' phase was repeated to refine the direction of the prototype.

1.5 Implications

This research aimed to design a prototype of a digital mapping platform to be utilized in the NZC scenario. This prototype can serve as a starting point for the mapping platform development in NZC. The municipal administrator can see SIE actors on the map that provides the geographical location of initiatives and supporters in the Cartographical section. Moreover, this prototype encourages initiatives and supporters to upload themselves autonomously. Furthermore, the statistics section provides interactive visualization to understand the information surrounding SIEs in the city quickly. This prototype approaches this by enabling Initiatives to upload freely to the platform, and in the case of NZC integration, this will empower initiatives to have a global pipeline freely.

This study contributes to the cities aiming to promote their initiatives within SIEs by providing an option to let municipal administrators gain insights and community-building opportunities/channels for social innovation initiatives. This prototype can be modified and reused for similar purposes or research.

2

CONTEXT AND METHODOLOGY

2.1 Methodology

As mentioned before, this research follows the Double Diamond approach. The Double Diamond approach consists of four main phases: Discover, Define, Develop, and Deliver. However, according to the Design Council, these four phases do not occur linearly. As shown in Figure 1-2, in the case of this research, the whole process primarily started from the 'Define' phase since the development of the mapping platform has already been identified with the 'Discover' side on the Net Zero Cities side. The starting point of the 'Define' phase to define the challenge to tackle, which is also the 'Discovery' phase, was also conducted simultaneously for the investigation to collect insights from the literature review and case studies that can be incorporated with the NZC insights. As more insights were gained, the 'Development' phase moved forward simultaneously, creating a prototype with all required functionalities to actualize the appropriate version based on the insights acquired. In this way, it iterates the process of 'Develop' and 'Define' and keeps improving the prototype based on any new insight gained. After the completion of the functioning prototype, this will converge at the end of the 'Deliver' point. Then, the process will move to the 'Discover' phase for the first time for the test and interview potential users for feedback, which

can be used to modify the prototype to fit actual needs better so that the prototype can potentially be integrated into the Net Zero City platform.
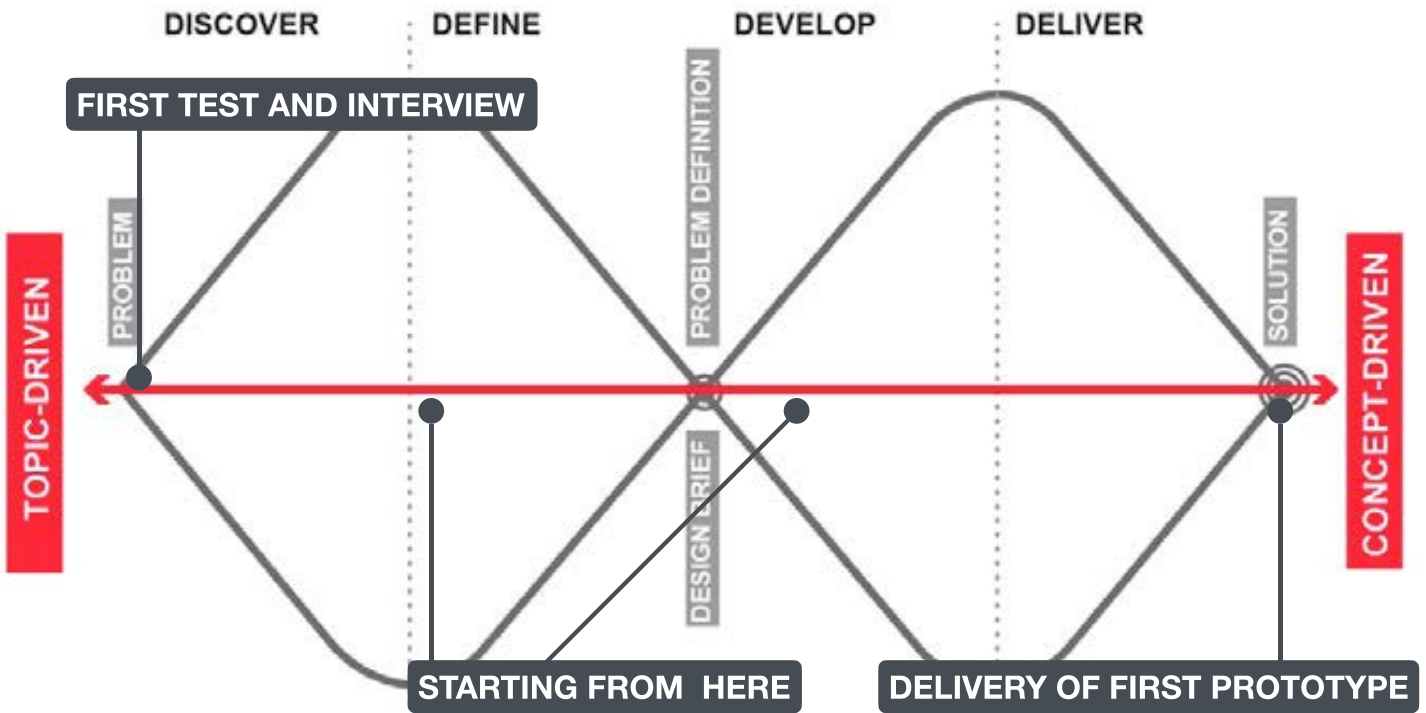
Figure 1-2. Modified Double Diamond from Design Council

2.2 Literature Review

The literature review section investigates existing social innovation mapping projects to understand the current state and tendency regarding the mapping initiative research. Then, the latest research on digital mapping was examined. Moreover, concepts regarding the digital mapping of social innovation research, such as participative governance and social Innovation Ecosystem, were made. Then, to better understand how to convey information to potential users of this platform, a study about information visualization was also investigated.

MAPPING SOCIAL INNOVATION MAPSThe State of Research Practice across Europe (2016)Pelka and Terstriep

According to investigated 17 recent and ongoing projects that map social innovations. These projects include SIMPACT, CrESSI, SI-DRIVE, TRANSIT, IESI, CASI, LIPSE, SEFORÏS, EFESEIIS,

ITSSOIN, SocietY, CITISPYCE, SocietY, ImPRoVE, TEPSIE, DSI. It provides an overview of the project's aim, how social innovation is defined, and their approach to mapping each project. In this paper, the concept of mapping is not limited to geospatial cartography, but also the visualizations of social innovations are included.

The paper aims to illustrate and clarify the shift towards mapping and its implications for future research is the objective of this article. Table 1 is the comprehensive comparison of each project based on the paper presented by Pelka and Terstriep.

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Table 1. Comparison table. Based on: Pelka & Terstrip (2016)

NAME	PROJECT AIM	DEFINITION OF SOCIAL INNOVATION	MAPPING APPROACH
SIMPACT	The project aims to identify the economic factor underpinning Social Innovation's impact and Accelerate Social Innovation's role in empowering vulnerable demography in society.	Social Innovation is creating new ideas and collaboration that go outside the institutional boundaries. This type of Innovation can empower and re-engage vulnerable demography as a process or result of Innovation. (Terstriep et al., 2015: 6, as cited in Pelka & Terstriep, 2016)	A literature review was executed to identify the factors of the social and economic impact of Social Innovation. Case studies of 94 social innovations were collected to identify principles outside the field of action and welfare.
CrESSI	CrESSI investigates the economic underpinnings of Social Innovation, focusing on policy and practice and their effect on vulnerable demography in society.	Social Innovation is creating new ideas and solutions that aim to improve human capability and change the relationship of power and its process. (Houghton Budd, Naastepad & van Beers, 2015: 3 as cited in Pelka & Terstriep, 2016).	Took stock of wide range of time and successful to less successful examples.
SI-DRIVE	It aims to investigate Social Innovation as an innovation paradigm. By analysis and mapping, SI-Drive tries to encourage Social Innovation throughout Europe and the world and identify the success factors.	A new combination of social practices in a specific field of action and context that aims to fulfill or solve social needs and problems of existing practices'(Howaldt et al., 2014, p. 3 as cited in Pelka & Terstriep, 2016).	Desk research to make an initial map by capturing basic information from 1000 initiatives, then case filtering to narrow down to 300 cases. In the end, they analyzed 70 cases with in-depth analysis.
TRANSIT	Aims to develop a Transformative Social Innovation Theory focusing on empowering and societal change, consisting of four semantic areas: governance, social learning, funding, and monitoring.	Transformative social innovation theory is the non-linear interaction between social innovation, system innovation, and exogenous development.	Case studies were analyzed to map interactions between social innovation and transformative change, an in-depth analysis of 20 transnational networks and 40 local initiatives in Europe and Latin America, and a meta-analysis of 200 local TSI cases.
IESI	Support implementation of the EU Social Investment Package(SIP)by discoursing how ICT-enabled social innovation can support Social Investment policies, which helps understand the contribution of ICT-enabled social innovation initiatives for more straightforward administrations of services.	ICT-enabled social innovation uses ICTs to address the needs and challenges of the social protection system through new relationships, collaborations, and public value co-creation and re-allocation of the public. (Misuraca et al.,2015, as cited in Pelka & Terstriep, 2016)	Relevant ICT-enabled initiatives that aim to simplify and modernize social policies and services in EN states were selected, and then data was collected via 44 comprehensive variables. The mapping exercise was conducted in the following four dimensions: typologies of ICT-enabled innovation potential, levels of governance, types of social integration, and elements of social innovation.
CASI	Explore sustainable innovation as a societal phenomenon and development of the Common Framework for Assessment and Management of Sustainable Innovation (CASI), which allows the assessment framework of sustainable innovation practices to be incorporated into the development of public policies.	Conventional model of innovation, where social innovation is classified as one of the seven types of innovation. These distinct innovation types are collectively called 'sustainable innovation.'	Mapping was conducted with a focus on three dimensions. 22 HORIZON 2020 topics, seven types of innovation, and 22 sectors. They started with 500 cases and selected the top six per country. The six cases were mapped in-depth through standardized interviews using a deduced questionnaire.
LIPSE	The project investigates identifying the drivers and barriers to Social Innovation in the public sector, and five essential parts of social innovation in the public sector were investigated.	Social innovation creates novel services that produce social and political outcomes valuable to stakeholders such as citizens(Lewis et al. 2013: 8 as cited in Pelka & Terstriep, 2016).	Conducted social network analysis to map, analyze, and compare public sector innovation capacity. The mapping method was a document analysis of the municipality's organizational structure, an online survey of administrators, and interviews with the innovator. The study collected 845 cases of award-winning public organizations to map their influence on social innovation sustainability in six European countries.
SEFORÏS	The project aims to explore the potential of what social enterprise can do to enhance social inclusion in the EU and more by investigating the essential process of inclusion and Innovation by social enterprise and analyzing formal/informal contexts that support social enterprise.	A social enterprise is an organization that uses market mechanisms to seek a social mission. In the case of SEFORÏS, the country-specific definition of social enterprise.	SEFORÏS used three steps of the mapping process, a combination of 27 in-depth case studies and the standardized survey and telephone interview, and collected 1000 social enterprises. Lastly, it connected those surveys and the dataset.

ITSSOIN	The project explores the impact on society from the third sector and civic engagement causes.	Social Innovation is one of the contributors to the social impact of the third sector because the creation of Social Innovation itself is the primary social impact of the third sector, and those impacts arise from social Innovation. (ITSSOIN, 2015 as, cited in Pelka & Terstriep, 2016).	20 case studies were analyzed through seven fields to compare roughly 3 countries for predominant social Innovation. "qualitative comparative analysis"(Pelka & Terstriep, 2016 p8) was used to track and compare the emergence of social Innovation and involved elements. To track the emergence of Social Innovation, "process tacing"(Pelka & Terstriep, 2016 p8) was also used when the use of survey data was considered.
BENISI	The project seeks to pinpoint 300 social innovations that are most favorable and create a foundation for the social enterprise to thrive. As well as to create a positive influence on Social Innovation throughout Europe. (BENISI, 2013, as cited in Pelka & Terstriep, 2016).	Social Innovation is a new idea that satisfies the needs of society at the same time as well as generates new collaboration and relationships in society. (BENISI, 2015a, as cited in Pelka & Terstriep, 2016).	Over 300 cases were mapped and categorized into 6 different societal trends. Another significant approach was to four scaling trajectories based on (Weber, Kröger & Lambrich 2012, as cited in Pelka & Terstriep, 2016), which are 'capacity-building,' 'branching,' 'dissmenination of knowledge,' and 'afiliation' (BENISI 2013b, as cited in Pelka & Terstriep, 2016).
EFESEIIS	The project aims to create knowledge that allows the European population to understand how social entrepreneurship helps solve social problems sustainably. (EFESEIIS, 2015, as cited in Pelka & Terstriep, 2016). It also guides those involved on how they can promote social entrepreneurship and social Innovation as well as the development of evolving theory and specify the characteristics of the support ecosystem of social entrepreneurship, in addition to finding the upcoming generation of social entrepreneurs.	It relies on the individual interpretations of the terms in each country.	70 pre-selected Social Entreprises were analyzed in-depth with a narrative approach (Benadusi & Sapi-enca, 2015, as cited in Pelka & Terstriep, 2016), which consists of background information about the person, organizational specs such as revenue structure, level of Innovation, and envisioned future. (Benadusi, 2015, as cited in Pelka & Terstriep, 2016).
Third Sector Impact (TSI)	the project seeks to enhance the third sector contribution to the socio-economic development of Europe by generating knowledge. Moreover, countries were strategically chosen to have a variety of third sectors.	Social Innovation is what Third sector organizations create on the other stakeholders and society as an impact, and social Innovation can contribute to social changes by serving as a way to identify new solutions to forgotten social problems.(TSI, 2014, as cited in Pelka & Terstriep, 2016).	The online survey was conducted to map the problem and chance of the Third Sector organizations. The survey consists of 5 categories: Health and life conditions, regarding social Innovation, community creation, economic effect, and impact of human resources.(TSI, 2014, as cited in Pelka & Terstriep, 2016).
DSI	This project seeks to explore digital social Innovation and create a map of organizations that use technology for good cause—assessing the potential of digital social Innovation's potential impact on society and the economy. (Bria, 2014, as cited in Pelka & Terstriep, 2016).	Digital Social Innovation is Innovation that provides solutions to the needs of society in a collaborative manner utilizing an internet-enabled digital platform that enables a wide range of variety to its solution and collaboration. (Bria, 2014: 5, as cited in Pelka & Terstriep, 2016).	Case studies were analyzed, and 35 of 100 listed cases were analyzed in-depth, and additional data collected through an online survey contributed to the classification organization with its place. The project mapped 1,000 DSI organizations and 630 collaborative projects. (Bria, 2015, as cited in Pelka & Terstriep, 2016).
CITISPYCE	The project investigates the imbalanced impact of the economic crisis that the younger generation faces in Europe and explores social innovations developed by those demographics.	Social Innovation is a practice that deals with inequality by fulfilling needs in society, improving the existing solution, empowering, promoting equity, transforming social challenges into chances, and growing social capital, which affects the young generation. (Grander & Alwall,2014: 3, as cited in Pelka & Terstriep, 2016)	Social structure and infrastructure were mapped in the neighborhood of 10 European cities that manifested the inequality. In each city, 2 neighborhoods were chosen, and a combination of the 146 expert interviews, field research, and document analysis was conducted. Then, young people participated in mapping the perception of social inequality. (Hussain & Higson, 2014, as cited in Pelka & Terstriep, 2016).
SocIEtY	The project seeks to improve life quality and decrease inequality among the younger generation who are disadvantaged, create tools, and establish knowledge to support the 'good life for all' policy.	Social Innovation is new ideas that meet the needs of society and increase social value, which is achieved by the absence of profit-oriented support by volunteers and professionals. (Rosendal Jensen, 2013, as cited in Pelka & Terstriep, 2016)	Socio-economic political context was analyzed through mapping of the process of current policy and social support measurement of 11 countries, and capability-oriented statistical analysis was conducted to measure inequality. Then, local social support networks were investigated by analyzing social practice, gathering young people's aspirations and experiences, and "developing experimental participatory methodology for social innovation." (Pelka & Terstriep, 2016)

Table 1. Comparison table. Based on: Pelka & Terstrip (2016)

ImPRoVE	The project seeks to achieve social cohesion by enhancing the foundation of evidence-based policy-making in the field of deprivation, equity, and Social Innovation in Europe.	Social Innovation refers to innovations that aim for social impact and are achieved through social processes. (Oost-erlynck et al., 2013: 2, as cited in Pelka & Terstriep, 2016).	In order to develop a database of socially innovative policies and practices that manage emerging inequality, an Investigation was conducted on the local scale of Social Innovation and national welfare state's redistributive policies to address governance challenges rooted in interrelationships among stakeholders and goals.
TEPSIE	The project seeks to enhance the basis of Social Innovation for researchers, policymakers, and practitioners to contribute to the development of the field.	Social Innovation is a new solution that satisfies the needs of society while also enhanced capabilities, relationships and optimized use of assets and resources. Essentially, social innovations offers benefits for society and also contribute to society's ability to take action. The Young Foundation, 2012: 18, as cited in Pelka & Terstriep, 2016).	Conducted case study analysis on various themes regarding the state of the social economy, citizen engagement, and the spread and use of online collaboration and networking tools of Social Innovation. Also, citizen engagement was mapped through desk research, case study interviews, and its analysis. For the spread of Social Innovation, in-depth case study was conducted for 8-10 interviews for each case. (Da-vies, 2014, as cited in Pelka & Terstriep, 2016).

Table 1. Comparison table. Based on: Pelka & Terstrip (2016)

In the end, this paper points out that even though the definition of social innovation includes specific demographics as targets, these demographic groups in those particular mapping approaches need to be actively involved in the mapping activities. Following a thorough analysis, the research suggests that in the future, mapping project stakeholders and target groups should be more integrated, and that would contribute to gaining far more insights. Also, it points out the need for impact assessment of social innovations.

Social innovation ecosystems, sustainability, and democratic experimentation: a study in Florianopolis, Brazil (2020)

Carolina Andion [1] Graziela Dias Alperstedt [1] Júlia Furlanetto Graeff [2] et al.

According to Andion 2020, the city plays a crucial role in new approaches to urban development and overcoming various societal challenges. This research aimed to assess the extent to which the Social Innovation Ecosystem (SIE) can effectively address the problems in the public arena.

In the last decades, Florianopolis has become a innovation hub in Brazil, and the research aims to investigate which common actors shape the Sociao-technical network of Florianopolis SIE and how they do they coproduce social innovation by identifying and tackling public problems in the city. Creating an open digital platform using a collaborative approach was the primary strategy to understand the dynamics of SIE.

The research created four interrelated assumptions: Assumption1 Social Innovation Ecosystems (SIEs) are assumed to be integrated within extended pathways of addressing societal issues in particular regions (in both time and physical context). Assumption 2 Social innovation dynamics are interpreted as a process of change that emerges from the interactions between various human and non-human actors in urban settings, resulting in incremental or broader consequences. Assumption 3 The dynamics of social innovation are examined within areas of experities where different audiences resolve problematic situations while engaging in public inquiry. Assumption 4 emphasizes the importance of reconnecting the scope and consequences of social innovation dynamics with the broader processes of social change by assessing the interconnection between macro, meso, and micro dimensions of social reality. Furthermore, maintaining a longitudinal perspective is essential in analysis.

As a primary strategy of this research, creating an open, virtual, and collaborative space for various SIE stakeholders in Florianopolis, Brazil, was called Observatory of Social Innovation of Florianopolis (OBISF).

The platform implementation resulted from a collaborative effort between university researchers and SIE actors. The process involved linking teaching, research, and community service and fostering interdisciplinary dialogue between the public and business administration programs at Santa Catarina State University, both at the undergraduate and graduate levels.

Three aspects played central roles in composite analytical and methodological frameworks are perspective that takes into account multi-scale and multidisciplinary to understand SIE that involves various actors in different spheres such as government and civil society and various causes such as education, health, and environment, Analysis which utilize a combination of multi-scale and multidisciplinary, longitudinal monitoring, and socio-spatial mapping, and a collaborative approach promotes experiential learning It involves creating opportunities for their explanations and theories that value and stimulate public inquiry.

The number of interconnected factors influence Social Innovation dynamics. The mapping of laws and policies that support social innovation was conducted in a multiscale manner, and the result showed that incentive and dissemination were low in laws and policies.

The Cartography part of the platform was initially carried out by exploratory research, and the snowball technique was used; initially, known actors and supporters were interviewed and then indicated other actors on the map through a questionnaire that contains the following section to fill. ("the support organizations: a) contact data; b) role in supporting social innovation, activities performed and target audience; c) supported social innovation initiatives and other partner support organizations."(Andion et al., 2020 p193) This initial information included ten categories of support organizations, which are following "a) training centers; b) promotion of social entrepreneurship;c) research and extension centers; d) funders; e) technical supporters; f) articulators and bridging actors;g) spaces for communication, dialogue, and reflection; h) incubators; i) accelerators; and j) certifiers"(Andion et al., 2020 p193) to build the platform that maps 115 support organizations. The team received 17 questionaries, which indicated 59 social innovations that were later mapped. The following data were extracted from initiatives, and after the extraction, the team started mapping each initiative on the cartography and also started building a network map of supporters and initiatives: "a) contact data; b) type of initiative (legal status); c) cause in which it operates; and d) target audience."(Andion et al., 2020 p193) The dialogue with 11 actors who supported the implementation of the platform and launch has expanded and deepened the cartography of the SIEs in Florianopolis. Also, actors can independently input their details onto the platform via the Internet. 2 years after the launch in 2019.

The platform has 227 support organizations and 307 social innovation initiatives that address the city's public problems. Of the social innovation initiatives, 196 were mapped, and 111 were observed. The theoretical and methodological approach adopted in the study of the SIE of Florianópolis, Brazil, was presented in this research. The complex dynamic of the SIEs in Florianopolis is interconnected in Macro, Meso, and Micro scales, from the Institutional and territorial scales to each actor and creating a network. Those Social innovations emerge from collective action in that network simultaneously, and participation and collaboration produced by it can drive transformation in the city's developmental trajectory.

This implies that the idea of SIE goes beyond the structure and system, which produces a new dynamic that connects social, economic, and cultural aspects to the tradition and collaborative capacity of the actor.

Favourable social innovation ecosystem(s)? – An explorative approach(2020)

Judith Terstriep, Dieter Rehfeld and Maria Kleverbeck

This paper reflects the Social Innovation Ecosystem from the Regional Innovation system(RIS) perspective. Using the RIS perspective to consider the base environment to grow social innovation does not mean adapting Social Innovation to RIS. Still, it is to clarify the environment for social innovation.

Moreover, as other research suggests, the legal framework for Social Innovation is fundamental for growing social innovation.

The research suggests four important assets to configure the Social Innovation Ecosystem. First is integrating social innovation into economic and technical innovation concepts; however, the complexity of the integrated concepts and no suitable governance mode have yet to be made, and these are the challenges of this integration.

Second, when aiming to have a local or regional level of innovation with a policy-driven strategy, it seems promising to integrate different modes of innovation. However, the concept of a " 'smart' or 'green' city" (Terstriep et al,. 2020 p896), which is highly relevant to the NZC scenario, can only be valuable in the true sense when it "involve participative mode of governance, social, economic and technical innovation." (Terstriep et al,. 2020 p896) Third, there are various tools that can be used to create the desired environment for Social Innovation at the

local/regional scale by utilizing "incubators, labs, or experimental space"(Terstriep et al,. 2020 p896) as the foundation. Also, by helping social innovation enterprises grow and scale with support such as funding, they can transfer strategy and knowledge into social innovation aspects.

Fourth, Cultural differences must be considered; the differences in culture, such as responsibility or social capital, influence social innovation. At the same time, it is essential to remember that only beneficiaries and social innovation activists sometimes exist in the same region.

Fifth, Paradoxically to fourth, social innovations are often bound to local or regional. In order to link globally, one of the three dimensions suggested was "The integration of social innovation actors in European or global policy fields" (Terstriep et al,. 2020 p897) in the scenario of NZC is highly relevant. Furthermore, to fully unleash the potential of social innovation for the benefit of society, it is necessary to have a vibrant ecosystem that stimulates, funds, and sustains social innovation.

in those different ways to configure the social innovation ecosystem

The Janus face of participatory governance: How inclusive governance benefits and limits the social innovativeness of social enterprisesA(2018)

Ralph Richter

This study investigated the Collaborative decision-making can either hinder or benefit the development of innovative solutions or social enterprises. To answer this question, they conducted four cross-case analyses. They have analyzed with the qualitative procedure since this allows them to reveal an in-depth analysis of the cause, participatory governance, and innovation process in action. They chose four enterprises with different legal statuses to see the difference in stakeholder participation. there were two 'cooperatives' (SE1 nad SE2), one "SE 3 is a limited company with charity status" (Richter, 2018 p72) (SE3) and 'foundation(SE4)'. The field research was participatory observation of daily practices, expert interviews with stakeholders and managers, and a document analysis was conducted. The analysis of empirical data was done in the following order: reconstruction of the cases separately to countercheck findings, then comparing cases to identify relationship patterns.

Lastly, an in-depth analysis of the cases and their materials was conducted to find evidence to explain the relationship between social innovativeness and innovative governance. While SE1 and SE2 stakeholders comprise the organization, SE3 and nad SE4 stakeholders are external. In the case of SE1, stakeholders are their employee and employer, and SE4 prepare the representative role of stakeholder on the board; however, SE2 and SE3 do not let their member create a decision-making team, but every board member has one vote. This analysis shows the involvement of stakeholders in the decision-making process of social enterprise on the formal organization structure. The research points out the potential difference between formal structure and practice. In Practice SE1, there are some gaps in the formal structure. They observed that 14 informal members can exclusively share information beyond employees. Also, the founder has more influence than the rest of the members even though, on paper, it should be the same right as other employees. In the SE2, there was a significant disagreement of interest on the financial state between the management and members. The form of participatory governance was risky; however, the balance was kept due to the statute of the cooperative and some external stakeholders, such as local authorities, who are part of the members. SE3 board member is involved in the whole decision-making process to provide legitimacy; however, the involvement of the members was limited to daily meeting rather than in the decision-making process. SE4 had the largest gap in structure, and in practice, actual decisions are entirely made by the so-called president. Even the board of stakeholders and executives is fulfilling its task. To show how well these social enterprises are developing solutions, they have created four indicators. 'innovative spirit,' 'proven innovativeness,7 'social mission,' and 'social impact.' and those previously mentioned indicators can be found in the Table 3 (Richter, 2018 p79) from the analysis, SE1 has high innovative spirit and proven innovativeness, and social mission and low in social impact. SE2 has a moderately innovative spirit and proven innovativeness and low social mission and impact. SE3 has no innovative spirit and moderate proven innovativeness and is high in social mission and social impact. SE4 has a moderate innovative spirit, proven innovativeness, high social mission, and moderate social impact. These results show that high innovativeness tends to achieve less social benefit, and high impact tends to have low innovativeness. The research suggests at least

three reasons for both of the tendencies—the reason why the involvement of stakeholders is beneficial for innovation. Firstly, the involvement of the stakeholder in decision-making usually benefits both the enterprise and the stakeholders themselves; second, participative governance often has a flat hierarchy, which motivates internal stakeholders to be responsible for the enterprise and inspires them to contribute to it actively. Third, the legal statute of a cooperative is beneficial to have members' entrepreneurial and innovative spirit that gives a democratic right of decision-making to members. In conclusion, the benefits of participatory governance are "Janus-Faced," (Richter, 2018 p83) having different effects depending on the configuration. It is more beneficial when participatory governance includes internal stakeholders for developing new innovative solutions; however, it needs more social impact. Collaborating closely with external stakeholders, such as local communities, may not help find new trends, ideas, and opportunities. However, involving external stakeholders in the decision-making can protect community interest and the enterprise's legitimacy. Keeping the abovementioned balance of the participation of internal/external stakeholders is the key to enhancing the social innovativeness of the social enterprise.

Enabling Ecosystems for Social Enterprises and Social Innovation: A Capability Approach Perspective (2017)

Biggeri, M., Testi, E., & Bellucci, M.

This research aimed to suggest a policy enabling ecosystem for social enterprises (SEs) and promoting their social Innovation capability.

SEs are considered one of the main actors in the social innovation process because of their characteristics, which can lead to making their products and services social innovation due to their accountability, participation, and democratic nature. However, SEs face various challenges during their operation.

In countries where the concept of SE is not well known, the population faces a lack of legal framework and environment to develop themselves. On the other hand, SEs are very well-known and active areas facing extreme competition with other SEs or other forms of organizations, as well as the high standard requirements from the public sector. SEs innovate their products, services, and processes by overcoming the challenges they are continuously facing by building relationships with other organizations.

The main feature of the enabling ecosystem
Five Essential characteristics of the enabling ecosystem the research mentioned are 1, Diverse resources, access to diverse resources can promote the use of available resources in an efficient manner, enriching resources SEs can use freely, improving the innovation capacities of SEs, and helping various SEs to grow in the ecosystem.

2, It is essential to have relationships between organizations and the capacity to connect with themselves, and thus, human capital is essential because more diverse and interdisciplinary means better networking with other SEs and collaboration within SEs. 3. The following characteristics have positive effects on SEs: "a flexible legal framework; a culture that values improvement and collaboration; strong entrepreneurship levels, minimal fear of failure, and the will to improve Sustainable Human Development" (Biggeri et al.,2017 p302) and institutional innovation, resolving local conflict, and strengthening shared identity can be led by the willingness from political leaders and governance that is conscious. 4. A high level of social capital can positively affect the ecosystem. At the same time, the process of social innovation allows stakeholders to engage and complement social capital. 5, Demand is created by the gap of human development levels that community aims and ecosystem currently reaches. This gap provokes the social Innovation process and SEs capacity and leads to more specific solutions for the ecosystem and community.

These are three key policy challenges. 1, long-term policy: This is difficult to achieve since popular policies are easily understood, and often, effects are visible in the short term. Also, this long-time measure is hard to be understood by citizens as well. To solve this issue SE, friendly policies have to become popular among all political parties. 2, SEs might be seen only in financial terms; however, that may discomfit the innovativeness of the SEs, and they have to be seen as investments. 3. It is necessary to have inclusion, equity, and justice principles to improve human development rather than materialism.

In the end, the study suggests several policy recommendations. Provide a wide range of grants to SEs depending on the size and duration of its projects, Provide unused spaces to organizations such as buildings currently not in use, Provide grants to SEs even if there are failure risks, Bankruptcy law to encourage SEs to try again after failing, Provide physical and digital space to connect Citizens and Organisation, Increase transparency of need, promote training opportunity for employees and volunteers, encourage the accountability measures for sustainability and stakeholder engagement, simplification of legal framework to encourage new SEs, and Promote educational opportunity to make citizens more aware of social and environmental issues.

Representation control increases task efficiency in complex graphical representations (2018)
Moritz, J., Meyerhoff, H. S., Meyer-Dernbecher, C., & Schwan, S.

This study experimented to see whether using digital technology to enable observers to alter the spatial arrangement of the depicted information will have cognitive offloading.

The information they conducted was to show randomly assigned participants (90% of university students who self-reported high use of a computer but low familiarity with the table) given two types of tasks under two types of conditions.
Tasks were to identify specific insights from the map-based infographic, which shows the election result in each German state; there were two sets of the map on the left and right side by side, either the result of different years or the first and second vote.
Tasks were to answer questions by reading those infographics; there were two types of tasks.
One was the matching trials, in which the information to solve the task was visible within one map.

On the other hand, in mismatching trials, information to solve the task was distributed into two maps. Then, participants were separated into two groups; one was called representation control, in which they were allowed to organize maps by switching views and different ways to show the maps, such as different year configurations and first/second vote configurations. On the other hand, static participants did not have access to any interaction feature.

As a result of this experiment, response time and error rate were measured in both matching and mismatching trials. The matching response times were indifferent to the response time, but the mismatch trial response time representation control group had faster results than the static group. The representation control group had a significantly lower rate for the error rate, mismatch, and match trials. In the end, participants of the representation control condition solved the task after and were more accurate in the mismatching trial. The paper suggests that presentation control leads to cognitive offloading, and using well-designed interactive

features may resolve the conflict between ease of use by more user-friendly design and the usefulness of complex graphical representation.

KEY TAKEAWAY FOR PROTOTYPE DEVELOPMENT

Pelka and Terstriep point out that even though the definition of social innovation includes specific demographics as targets, these demographic groups in those particular mapping approaches must be actively involved in the mapping activities. Following a thorough analysis, mapping project stakeholders and target groups in the future should be more integrated, which would contribute to gaining far more insights. Also, it points out the need for impact assessment of social innovations. Andion et al. research complements the gap between Pelka and Terstriep, which is the absence of stakeholders' active involvement by developing a collaborative mapping platform (stakeholders can actively participate in the mapping) to help reveal and observe the social innovation ecosystem in Florianopolis, Brazil. There needed to be more incentives and supporting laws and policies, the importance of the dynamism of social innovation, and the network that creates innovation. In order to investigate further the above concepts, a further literature review of the Influence of participatory governance for social enterprise and Essential assets to configure the Social Innovation Ecosystem was conducted. Richter suggested that developing innovative solutions benefits from the participation of internal stakeholders, but it has little social impact.

Conversely, collaborating closely with external stakeholders like local communities and regional authorities may not help identify new trends, ideas, and opportunities. However, involving external stakeholders in decision-making protects community interests and legitimizes social enterprise activities. The study's findings conclude that a balanced involvement of both internal and external stakeholders would enhance the social innovativeness of social enterprises.

Judith Terstriepet et al. suggested four important assets to configure the Social Innovation Ecosystem from the perspective of the Regional Innovation System. Integrating social innovation with economic and technical innovation is complex and needs a more suitable governance mode. Policy-driven strategy for local innovation requires participative governance. Incubators and funding can support social innovation enterprise growth. Cultural differences influence social innovation. Integrating social innovation into global policy, such as NZC, can give global pipelines to them.

2.3 Existing cases

Case1:Atlas of Social Innovation

Atlas of Social Innovation is a project that aims to provide an extensive overview of the concept of Social Innovation, which has been growing in interest and practice globally.
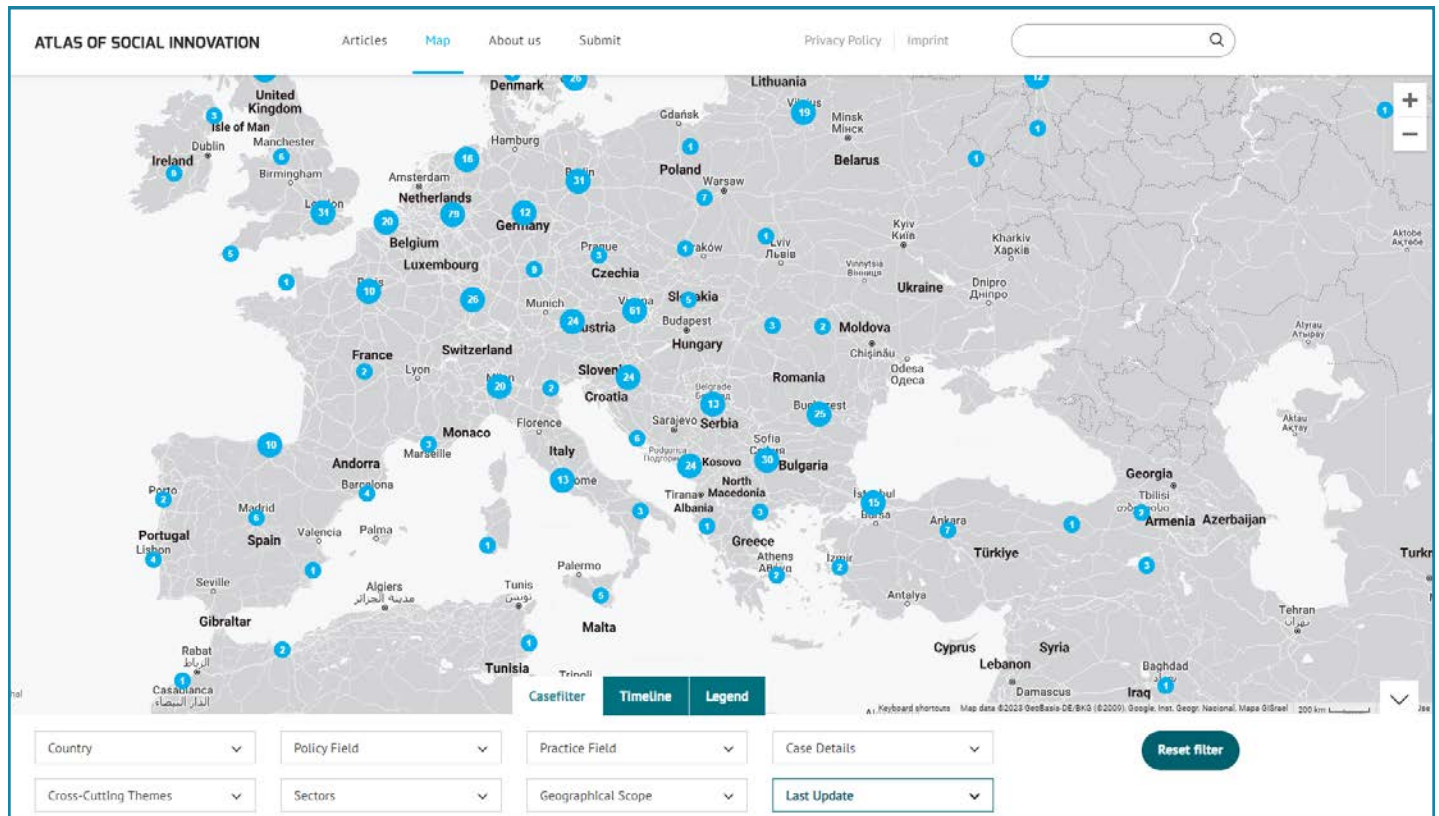
Figure 2-1. Interactive map from Atlas of Social Innovation

Atlas of Social Innovation has a background in SI-Drive and offers mainly two ways of exploiting data: access to the Final delivery of the SI-Drive article or Atlas of Social Innovation interactive map. In this case, only the interactive map part is considered a case study due to its functionality (see Figure 2-1). In the interactive map, user can see over 1000 Social Innovation mapped throughout the world alongside a filter function, which is located at the bottom of the page and provide the following filters: Policy Field, Practice Field, Case Details, Cross Cutting Themes, Sectors, Geographical Scopes, Last Update. Next to the filter is Timeline, a storytelling map that, when the user clicks on the play, will start from 1800, and Icons of social innovation appear on the map until the present time when Social Innovations are located in the world. For the main functionality of the map, when the user clicks on the Social

Innovation icon to see detailed information about each SI, the description overlaps with previously mentioned filters and a short introduction: Year, Policy Field, Country, Practice Field, City, Partners, Website. However, some of the website links are no longer active.

Figure 2-2. Privacy Information from Atlas of Social Innovation

*Figure 2-1,Privacy policy for users of uploaded data process

Figure 2-3. Case Submission from Atlas of Social Innovation

To upload new social Innovation onto the interactive map through a web form (see Figure 2-3) the user has to fill in basic details, case description, Message, and Link to the initiative. Once the form is submitted, it will be reviewed, and if approved, it can be seen on the web as Figure 2-4.

Figure 2-4. Case Example from Atlas of Social Innovation

This project captures various approaches, success stories, actors involved, and societal issues social innovation addresses across different countries and regions. However, as an interactive map, the interactivity is fairly low regarding interacting purely with Social Innovation Initiatives since the upper limitation is looking at the description.

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Case2:Mapping resilient community

Figure 2-5. Interactive map from Mapping resilient community

The map (see Figure 2-5) aims to highlight the dynamic and persistent efforts of public and private institutions, non-profit organizations, and informal civic groups that support concepts, ventures, and undertakings that strongly illustrate resilience in terms of the environment, society, and economy. The mapping exercise aims to pinpoint concrete outcomes derived from experiences related to knowledge transfer, skill-building, and capacity development. This process creates something new by promoting a dynamic and adaptable approach centered on existing know-how and expertise involving local stakeholders.

The mapping viewer categorizes cases into Cultural and Social Innovation, Practice of resilience(bottom-up initiative), and Practice of resilience(top-down public initiatives). When the user clicks on each pin on the map, a text box will appear (see Figure 2-6). In the text box, there is a brief explanation of the practice and a link to the project website. Also, it is possible to access the list of whole names of each Social Innovations divided by the category (see Figure 2-7), and when clicked, the description will show up on the map as clicked on the icon directly. This interactive map uses the open street map to support mapping functions.

Figure 2-6. Case Example from Mapping resilient community

Figure 2-7. Project Search from Mapping resilient community

21
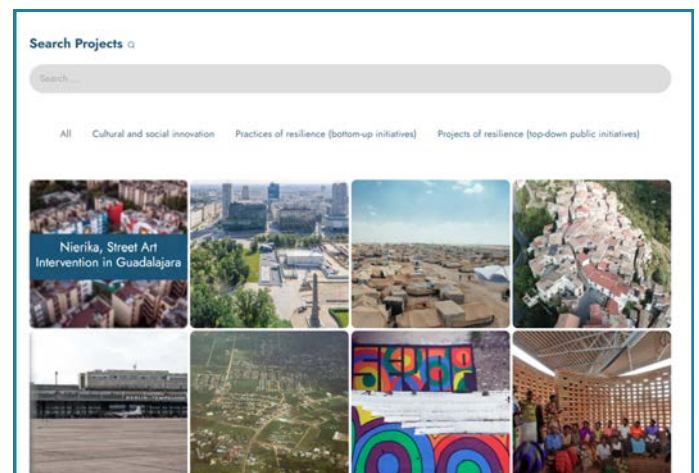
At the bottom of the page is a section where users can nominate resilient communities by inputting the following information. (see Figure 2-8) Name, Where it is located, Website, Full name of the user who is uploading, the e-mail address of the user, and a short description of the community that the user is recommending. Then, this information will be reviewed before being added to the map.

Figure 2-8. Nominate project from Mapping resilient community

Case3: Observatory of Social Innovation of Florianópolis

Figure 2-9. Top page from OBISF

The study presents a cartography of the Florianópolis SIE that permits exploring its configuration and the conditioning factors that facilitate or hinder social innovation and promote (or not) more resilience in the urban ecosystem. The map shows the network of support actors in fostering social innovation in the city, including 220 support actors and 293 social innovation initiatives. The study also highlights the imbalance between the functions that strengthen the SIE.(Andion, C., Alperstedt, G. D., & Graeff, J. F. (2020). Social innovation ecosystems, sustainability, and democratic experimentation: a study in Florianopolis, brazil. Revista De Administração Pública, 54(1), 181-200. https://doi.org/10.1590/0034-761220180418x)

Florianopolis interactive map offers geographical data on Social innovation initiatives and supports actors in fostering social innovation in the city (see Figure 2-9), including 220 support actors and 293 social innovation initiatives. The interactive map offers various functions, starting from the filter, including the initiative and support actors. Initiative filters are Status, Location, Type of Initiative, Type of causes, and Support actors filters are Way of helping(support), Location, and Scale. These filters can be applied on the top part of interactive mapping to search specific initiatives or support actors; although it has mostly the same functionality, the map also offers quick filtering on the right side of the interactive map, which has two main tabs to choose whether looking for an initiative or support actor, in the initiative tab user can select one of the following four categories Mapped, Observed, Accomanied, and Inactive with comprehension guide of each legend, all innovation initiatives that were either indicated or self-registered in the platform have been mapped. The observatory team has validated the complementary information of initiatives that were observed. Team members have systematically followed initiatives that were accompanied. Initiatives that stopped working during the search period have been categorized as inactive and mapped or observed accordingly. (Observatory of Social Innovation of Florianópolis https://observafloripa.com.br/#toppage) For the Support actors, the user can select one of the 14 actors. All those filters have different icon sets; thus, comprehending them is relatively easier, even if no filters are applied. However, when opening the map with a 16x9 ratio standard HD monitor, icons overlap and cause difficulty distinguishing each actor. this can be dealt with by zooming up or applying the filter. Once the icon is clicked, the description page will pop up. (see Figure 2-10)

Figure 2-10. Information panel from OBISF

'Mapped' icons come with a description that has two tabs, which are 'Initiative' and 'Cause,' and 'Initiative' has basic contact information such as an address, e-mail, and link to the website. 'Cause' has Areas of expertise, Target public, Scale, and Public Mobilized. However, if the selected icon is observed, there are two additional tabs, 'Solutions' and 'Supporters,' which 'Solutions' include Major public problems it solves, Answers or solutions put into practice to respond to the public problems, Technologies Used, Methodologies Used, and Incidence in the public sphere 'Supporters' display the name of supporter. These are a full function of the interactive map. However, it also offers a Complete ecosystem page, which includes an entire list of initiatives and supporters, a Chart, and a network. Chart powered by Highchart offers pie and bar charts of the ratio of each filter element, such as Type of initiative. The network offers interactive network nodes that can be clicked to highlight the connection between each actor, although since nodes are moving, it may not be so easy to understand.

Case4: Nappi Naapuri
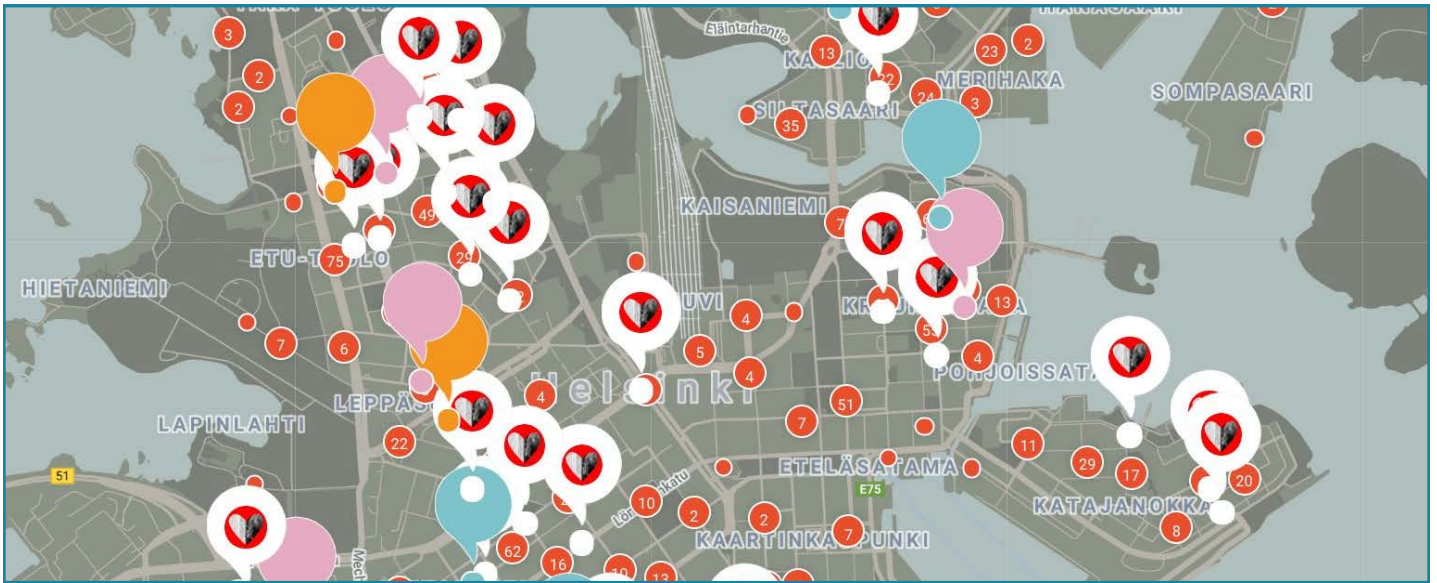
Figure 2-11. Top page from Nappi Naapuri

This initiative started in 2012 and is currently inactive. However, this platform was made to help increase real-life connections with the neighborhood and help each other as a interactive platform based on map (see Figure 2-11).

To start, the user has to register with either Facebook or email. After the registration, the user will create a profile by Filling in the full name, which will remain private, and only the user ID will be visible. Description of the user in a few sentences. Profile picture.

For the addresses, users can create several and activate them manually according to where they need heavier safety measures.

Own Discussion is a thread-like message function that other users can reply to (see Figure 2-13).

Message: In the message function, the user can write a message, select an address, and then send it. Once it is sent, the message will be shown as a speech bubble on the map(see Figure 2-12), and the user can edit or delete it after the message is sent. This message will stay in the Own discussion.

On the map view, when some user posts any message, it will be It is shown in the speech bubble; when other users click, they can reply. Since speech bubbles are on the map, they can be filtered visually by topics and partners. Usual messaging is open to the public, but the user can also send a private message to specific users.

Safety regarding the platform's safety: They state it is safe because the real name is hidden, and only the username is shown. However, they also introduced real-life interactions such as lending expensive items, babysitting, and so on. They recommend asking for an ID for precaution; however, it seems to need heavier safety measures.

2.3 Existing cases

Figure 2-12. Own message from Nappi Naapuri
Figure 2-13. Thread from Nappi Naapuri

Case5: Mapping Initiatives from Light house

Figure 2-14. Banner from LIGHTHOUSE

This case study aimed to give more visibility to each social innovation stakeholder worldwide as introduced in the banner (see Figure 2-14).

Initiative information is collected through the form and saved in the database and a virtual map.

Lighthouse provides visibility and supports each initiative(selected) to create a local and global network. Also, the initiative may be invited to the meetings and other exchange organized by Lighthouse.

Figure 2-15. Questionnaires from Lighthouse

As a process, the initiative can fill out the questionnaire as shown in Figure 2-15 and send it to a designated e-mail. Then, the initiative might meet with the Lighthouse, and if selected, the initiative will be on the virtual interactive map and database. However, in this case, study, the map was no longer active, and no information regarding the map itself was found, so this information can be helpful for the scheme of the projects, such as how they supported initiatives.

3

OPTIONS FOR MAPPING SOCIAL INNOVATION

This section outlines technological options considered for implementing the mapping platform prototype. In this section, the options are purely mapping engine/framework parts that will serve as a backbone of web-based applications with support by complementary functions. By design, those mapping engines primarily operate as a map or map editor, which may not fully support the desired participative and bottom-up approach or provide municipal administrators with comprehensive Spatial Information Environments (SIEs). Hence, this prototype will be an open-source web-based application distributed through GitHub, allowing modification and improvement by other researchers or project teams. Tableau Public has been chosen for statistical visualization for rapid and flexible modifications for this initial stage of the prototype. This capability is essential for testing and changing smoothly.

Nonetheless, once the statistical section of the prototype is stabilized, it should be transitioned to a more integrated solution such as Plotly. Thereby, the advantage of Tableau can be effectively exploited, while the disadvantage can be removed.

Since this prototype is a web-based application, server hosting is necessary for internet access. This involves uploading the application to the server and configuring the database, security, and maintenance- a process known as deployment. Render.com, in the deployment service, was chosen as a deployment option for this prototype since the service has a free option with security and is maintained in the same way as the paid options.

From the subsequent page, this section will introduce options for mapping engines. Each option will be evaluated based on Cost, Functions, Customizability, Usage difficulty, Integration difficulty, and overall review. Cost is the fee or charge for using the service/technology. The function is the functionalities offered by those services. 'Customizability' is how much each service/technology offers or allows to modify the program. 'Usage difficulty' is how challenging it is to operate mapping software. 'Integration difficulty' shows how challenging it is to integrate those options into the platform to achieve the desired mapping platform. Overall, the review provides a holistic evaluation of each option by synthesizing these factors.

1. [Kepler.gl](#)

the Link: [Kepler.gl](#)
Cost: Free

Function: Kepler.gl is a web-based application for large-scale geolocation data visualization, and it provides various interactive functions such as clickable marker plotting and data visualization tools such as heatmap, 3d graph, and Arc map. It also supports embedding features for the web and apps. (see Figure 3-1)

Customizability: Since Kepler.gl is an open source, the user can customize the program to fit the project better. The capability of the team constrains the level of customization.

Usage Difficulty: Moderate: To create datasets, some knowledge about data management (CSV, json, geojson) is required. However, once data has been uploaded, the Interface of the map editor is relatively easy to understand and straightforward.

Implementation Difficulty: Moderate: Kepler.gl support API which is Redux-connected which can be embedded(incorporate) to the React Native application. However, Kepler.gl does not have backend thus Cloud providers has to be set for the use.

Overall Quantitative Review: Free cost infinite customizability with an engineering team to integrate this into the platform is a reasonable option as a potential building piece of a digital mapping platform. Also, the GUI-supported editor is beneficial for the prototyping phase or significant modification phase and can be used to communicate with an engineering team.
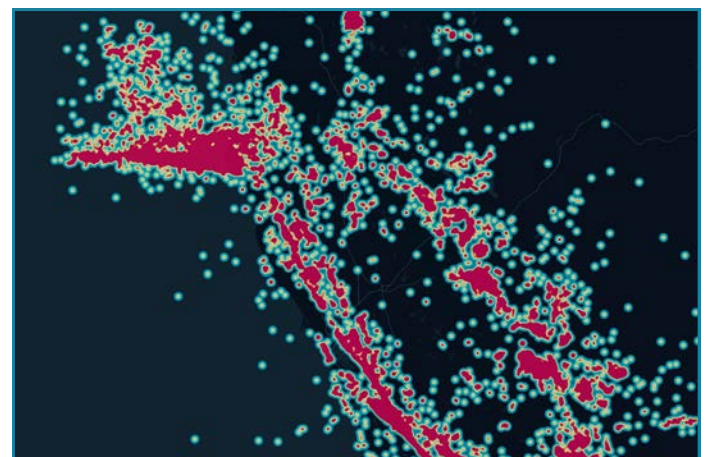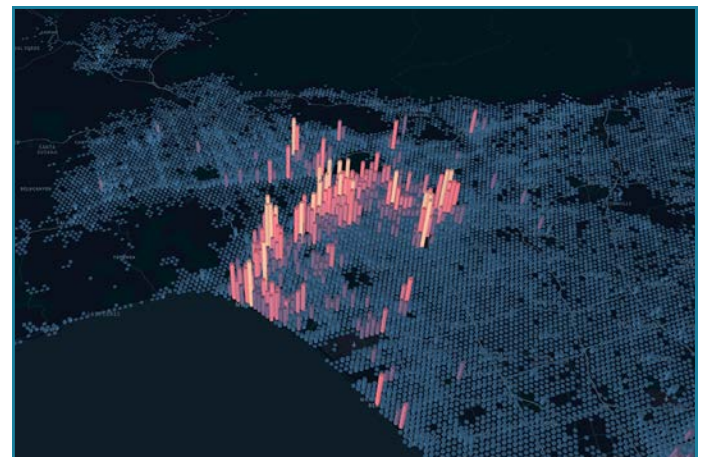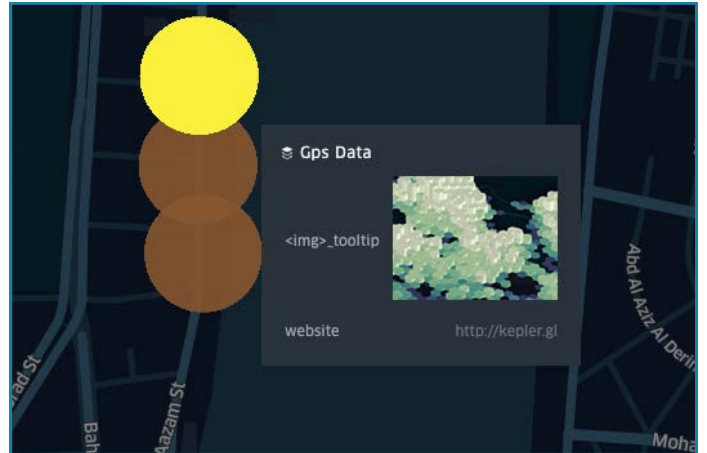
Figure 3-1. Snapshot of Kepler.gl

2. ArcGIS Online

- Link: ArcGIS Online

- Cost: Not available for organizations (need to contact for pricing), but for individual use, it's $100 per year.

- Function: The platform supports various functionalities such as clickable data visualization, web embedding, and collaborative projects, and offers rich templates like Dashboard, Storytelling, Focused app, and SDK/API for app and web apps. (see Figure 3-2)

- Customizability: It offers high customizability, especially with SDK API support and a diverse template library. The team will not constrain the level of customization due to its low/no-code application development features.

- Low:The editor has very user friendly UI and user does not has to deal with writing code. however, in the beginning to create standardized ground where each city can start working require engineering work.

- Integration difficulty: Low, ArcGIS online support Low-code/no-code app builders which enables user to develop integrated app without high IT skills. In case of complex development, ArcGIS supports various resources, such as Python API, SDK for Javascript, and REST API to accelerate and ease the development.

- Overall Quantitative Review: Cost for enterprise version is not shown on the website(need to contact) and individual use is $100/year and not expensive. cost one of the concern. Customization is very high and implementation difficulty is low thanks to rich template and user friendly GUI support. If this price is not expensive this platform can be a strong option.
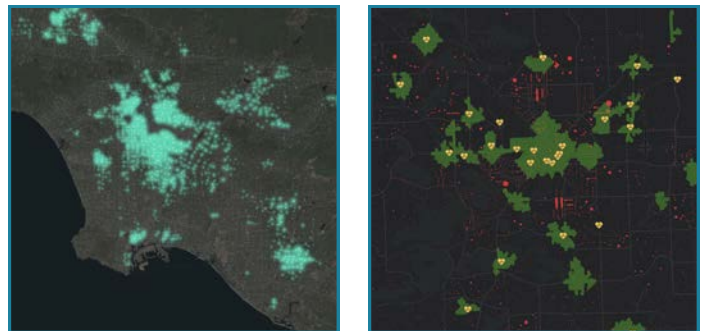
Figure 3-2. Snapshot from ArcGIS online website

3. Mapbox

- Link: Mapbox

- Cost: Free until a limit of 100 monthly active users. From 101 - 20,000 $0.3 per user

- Function: Functions to create Custom map markers, Data visualization tools such as heat maps, arc maps, and 3D representation. Web access within the map. Also, a map can be embedded in a web page. (see Figure 3-3)

- Customizability: High customizability is possible due to hard coding, and API SDK support enhances its expandability.

- Usage difficulty: Moderate: The primary function of the Mapbox studio was as easy as photoshopping the map. However, when it comes to the point of creating a clickable custom marker that can access the web can require IT knowledge.

- Integration Difficulty: Moderate: Mapbox has Javascript liberally called Mapbox GL JS, which supports various functions with documentation, including many example codes to run those functions. However, it is not a low-code editor, which requires a programmer who can understand javascript.

- Overall Review: This seems a reasonable option. The cost is Free until the limit system, and access is free till 25k. There is no distinction between private use and enterprise use. As Kepler.gl, this also can be hard-coded to maximize customizability.
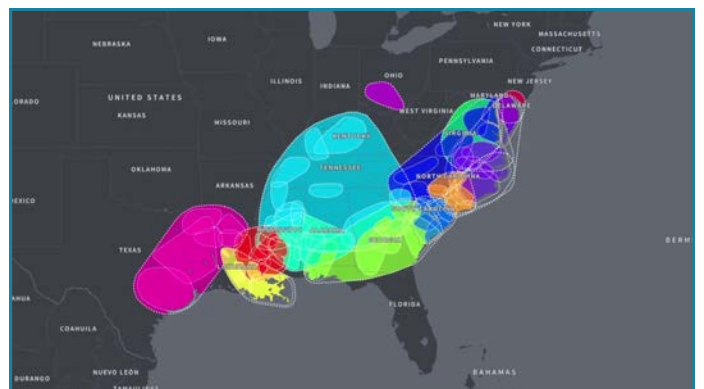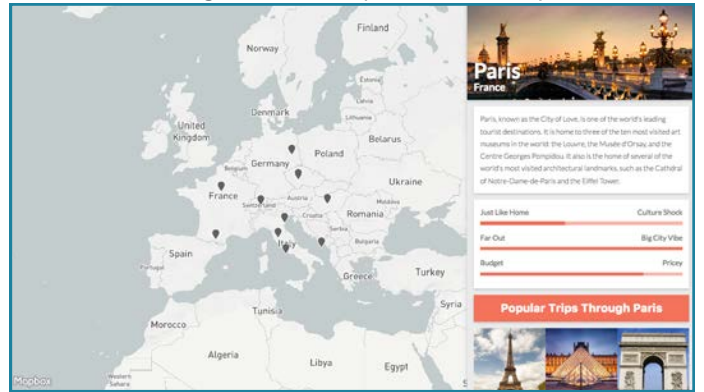
4. Google Map Platform

- Link: Google Map Platform

- Cost: $7 per 1000 requests. However, there is free $200 token will be provided which makes 28571requests for free.

- Function: This platform supports embedding across platforms, data visualization tools, click events, and custom datasets.

Figure 3-3. Snapshot from Mapbox website
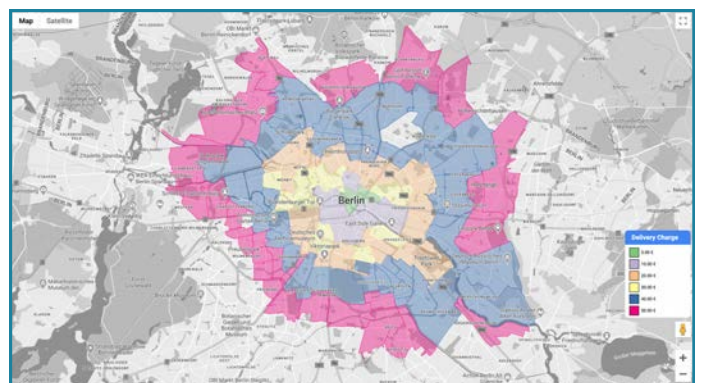
- Customizability: SDKs and APIs, combined with full documentation, enable significant customizability. By hard coding, the platform can be heavily customized. (see Figure 3-4)
- Usage difficulty: Moderate: Some functions can be achieved with no/low-code tools. However, most of the functions require code.

- Integration difficulty: Low: GoogleMapsPlatform has Maps JavaScript API, which supports low-code development of customizable Google maps for specific use. Documentation has a wide range of tutorials for non-professional engineers of JavaScript.

- Overall Quantitative Review: Google Map Platform is a reasonable choice. It may cost once API request exceed the given token amount, especially enterprises. Its customizability is high, but coding is often necessary, potentially complicating implementation.
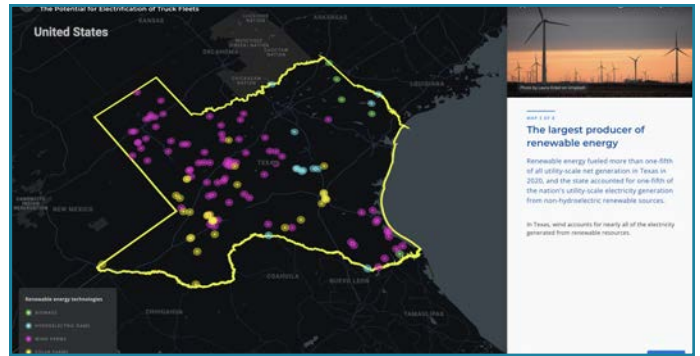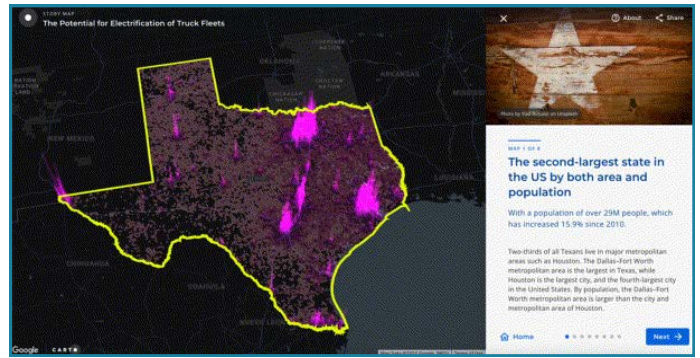
Figure 3-4. Snapshot from Google Maps Platform website

5. Scribble Maps

- Link: Scribble Maps

- Cost: Free version available, with a pro business version priced at $90/month.

- Function: The platform offers place markers, web embedding, and supports collaborative projects. (see Figure 3-5)

Figure 3-5. Cathedral Parking Map (Sunday)

- Customizability: Scribble Maps offers only basic tools for custom map creation, resulting in low customizability.

- Usage Difficulty: Low: The editor has a simple interface with relatively fewer options of tools. It seems to be used intuitively, which is excellent for rapid visualization or small-scale custom maps. (see Figure 3-6)

- High:Scribble Map API does not have well rounded documentation which makes development slower and more difficult.

- Overall Quantitative Review: Despite its ease of use, Scribble Maps might not be highly useful due to its limited customizability.
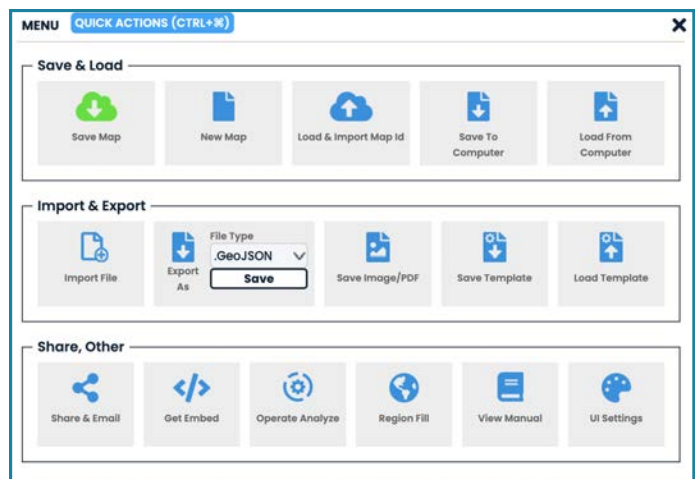
Figure 3-6. Snapshot from Scribble Maps website

Decision Matrix

The weighted decision matrix provides quantified scores of the following criteria: cost, functionality, Customizability, Usability Difficulty, and Integration Difficulty.

Cost is the amount of fee for using software for mapping. Functionalities are functionality offered by the software, which is evaluated by its suitability for platform development. Customizability is the degree to which modifications of the software are allowed.

Usability Difficulty is the difficulty of pure use of the software or platform to create the map(not set up collaborative function), and this exists because of the potential adjustment or change for future development. If the difficulty is lower, it is easier to rapidly modify by a non-IT engineer and hand it to the engineer later for an actual Implementation.

The other one is Integration Difficulty, which is the difficulty of integrating those mapping softwares or platforms to the platform I am developing to have a participative/collaborative function alongside legitimacy control and all those different functions.

The Decision Matrix criteria mentioned earlier are quantified in the following manner: Low: A score of 1-3. Moderate: 4-7, and High: 8-10.

Then those scores will be weighted in the following way: Cost: 25%, Functionality: 20%, Customizability: 15%, Usability: 10%, Integration Difficulty: 30%.

The reason for those proportions is due to the circumstances of the users. Integration Difficulty has the highest weight due to its importance of feasibility for a municipality. If the difficulty is too high, it makes implementation more difficult for them to afford regarding human resources and time; thus, the lower difficulty is better for smooth integration and potential modifications. The second highest weight is Cost; this is a significant factor because of the budget constraint of the municipality, if the platform is costly, it is less likely that the municipality can allocate a budget to the project. The Functionality has a slightly lighter weight; however, it plays a vital role in how many functions the software natively offers; more point functions such as clickable marker function, tagging to marker, and data visualization function can save time and provide more opportunity to expand easily. Customizability is lightweight and can contribute to a more customized look and specific function, which can be helpful for better user interaction as a platform. The lightest weight is the Usability of the software, which is how easy it is to create and modify maps with editor tools offered by the software. Better Usability can contribute to smoother communication with engineers or IT personnel who will conduct the technical part. The reason for the lightweight of this is that the software listed can not create a fully functional participative interactive map with legitimacy control of newly added initiatives.

Table 2 shows Decision Matrix and Table 3 shows Comparison table of each option.

Table 2. Decision Matrix

	A	B	C	D	E	WEIGHTED SCORE
Kepler.gl	10	6	7	5	5	6.75
ArcGIS Online	2	9	8	7	7	6.3
MapBox	7	7	7	5	5	6.2
Google Maps Platform	7	7	5	6	7	6.6
Mapme	6	6	3	7	5	5.35
ScribbleMap	6	5	3	7	2	4.25

A. Cost   B. Functions   C. Customizability   D. Usage Difficulty   E. Integration Difficulty

Kepler.gl has a score of 6.75 in the Decision Matric on the previous page, which is the highest value among other options. Kepler.gl achieved this score due to its variety of functionality offered, its open-source nature, and its free-of-cost availability. In spite of those advantages of Kepler.gl, Google Maps Platform was selected as the mapping engine for this prototype version. This arises from the practical constraint of the prototype development, such as no full-stack engineers being available immediately and rapid development is needed due to time constraints. Google Maps Platform offers low-code development of the fully integrated interactive map, which aligns well with the constraints of the prototype development. The integration of additional technologies, as outlined at the beginning of this chapter, is to enhance the platform to go beyond the basic mapping functions. Tableau Public was chosen to enhance statistical comprehension of the SIEs through visualization and allow agile modification and tests during the testing phase. As previously stated, Tableau Public is intended to be replaced with a solution that is more integrated into the web application, such as Plotly, once a stable configuration of the statistical section has been decided after the iteration of tests. Thereby minimizes the disadvantages and maximizes the advantages of Tableau Public and an integrated solution. Also, Render.com has been chosen as a deployment service due to its high accessibility since it offers a free tier option with the necessary security and maintenance included. These technologies are employed to run this web-based application, which resonates with this multi-technology strategy to have a robust, flexible, and scalable platform, and this prototype will serve as a foundation for all future enhancements and improvements.

Table3. Comparison table of platforms

NAME	LINK	COST	FUNCTION	CUSTOMIZABILITY	USAGE DIFFICULTY	INTEGRATION DIFFICULTY	Over all quantitative review
Kepler.gl	https:/kepler.gl/	Free	Simple point with information attached. Data visualisation tools Embedding to web/app	Since it is open source depending on the technological capability this tool can be fully customizable	Moderate:To create datasets some knowledge about data managing (csv, json, geojson) is required. However, once data has been uploaded Interface of the map editor itself is fairly easy to understand and not complex.	Moderate: Kepler.gl support API which is Redux-connected which can be embedded(incorporate) to the React Native application. However, Kepler.gl does not have backend thus Cloud providers has to be set for the use.	Cost of implementation is free, the customizability is infinite since this platform itself is an open source, (however, when we will change the platform function itself that will require some engineering team) Implementation difficulty is moderate this may require some knowledge about data management(csv,json,geojson),however, other than these dataset it would be GUI supported editor
ArcGIS online	https:// www.arcgis.c om/ index.html	N/A for organization we need to contact to know the pricing. However, for individual use it is 100 usd per year.	Clickable Data visualisation Embedded/ Webapp Collaborative project Rich template to start with such as Dashboard, Storytelling, Focused app, SDK/API for app web app	Very high customisation, since the it support the SDK API for own app/web app. Rich template library can benefit its customisability,	Low:The editor has very user friendly UI and user does not has to deal with writing code. however, in the beginning to create standardized ground where each city can start working require engineering work.	Low: ArcGIS online support Low-code/no-code app builders which enables user to develop integrated app without high IT skills. In case of complex development, ArcGIS supports various resources, such as Python API, SDK for Javascript, and REST API to accelerate and ease the development.	Cost for enterprise version is not shown on the website(need to contact) and individual use is $100/year and not expensive. cost one of the concern. Customization is very high and implementation difficulty is low thanks to rich template and user friendly GUI support. If this price is not expensive this platform can be a strong option.
Mapbox	https:// www.map box.com/	Free until limit of 100 monthly active user. From 101 - 20,000 $0.3 per user	Functions to create Custom map markers, Data visualization tools such as heat maps arc maps, and 3D representation. Web access within the map. Also, a map can be embedded in a web page.	Since it can be hard coded customisability seems to be high. API SDK support to enlarge expandability.	Moderate: The primary function of the Mapbox studio was as easy as photoshopping the map. However, when it comes to the point of creating a clickable custom marker that can access the web can require IT knowledge.	Moderate: Mapbox has Javascript liberally called Mapbox GL JS, which supports various functions with documentation, including many example codes to run those functions. However, it is not a low-code editor, which requires a programmer who can understand javascript.	This seems a reasonable option. The cost is Free until the limit system, and access is free till 25k. There is no distinction between private use and enterprise use. As Kepler.gl, this also can be hard-coded to maximize customizability.
GoogleMapPlatform	https:// mapsplatform.g oogle.com/intl/ en/	$7 per 1000 requests. However, there is free $200 token will be provided which makes 28571requests for free.	Embedding to different platform(app,web) Data visualization tool Click events Custom datasets	SDKs and APIs are available with full documentations. By hard coding the platform should be heavily customisable	Moderate: Some functions can be achieved with no/ low-code tools. However, most of the functions require code.	Low: GoogleMapsPlatform has Maps JavaScript API, which supports low-code development of customizable Google maps for specific use. Documentation has a wide range of tutorials for non-professional engineers of JavaScript.	Google Map Platform is a reasonable choice. It may cost once API request exceed the given token amount, especially enterprises. Its customizability is high, but coding is often necessary, potentially complicating implementation.
Mapme	https:// mapme. com/	Pro+(up to 1000 locations) 99 usd/ month To NGO, charities, and student they will offer spatial plans	Clickable: media gallary, call for action Filters Can be embedded However, there are no data visualisation tool built-in.	Seems low customisation, map editor seems to have limited tool to customise.	Low: Seems to be no specific knowledge about IT is required to use this tool.	Moderate: Mapme has REST API to create or modify interactive map however, API still have fewer functionalities and less informations in the documentation which can make the development slower and more difficult.	This probably ranks low, but kept it as a reference of different platforms. Cost is $99/month but there are some discount for NGO, charities and such. However, the customizability is low, the editor seems to support only simple tools to create maps, this makes implementation difficulty very low. *might be useful for quick prototype for visualization.
ScribbleMaps	https:// www.scribbl emaps.com/	Free version as well as pro business version which is 90 usd per month	Place marker Embedded on web Collaborative project	Low the service offers very basic tool to create custom map.	Low: The editor has a simple interface with relatively fewer options of tools.	High:Scribble Map API does not have well rounded documentation which makes development slower and more difficult.	This one is probably not going to be useful in any way due to its poor customizabilities despite it is easily customizable.

4

URBAN SOCIAL INNOVATION MAPPING PROTOTYPE

4.1 Persona and Customer Journey Map

This section will introduce personas and customer journey maps created for the prototype to understand users' potential needs better. Personas are Municipal Administrator and Social Innovation Initiative. These two users will have different roles in the same platform. Persona provides various information such as Age, Occupation and position, Needs, Experience, Values and Motivation, Dimensions, Challenges and Concerns, and Technical background, which will then be used to create a customer journey map.

User Persona
Municipality

Photo by Jeremy Bishop on Unsplash

Liam William

Climate Strategy Co-ordinator

Age

40 y.o.

Values and Motivations

Contribution to Community: Driven by a desire to make a positive impact on the local community
Transparency and Fairness: Values open communication and fair treatment of all stakeholders
Sustainability: Interested in long-term solutions that are environmentally and socially responsible

Dimensions

Conservative	● ● ● ● ● ● ● ● ● ●	Innovative
Introvert	● ● ● ● ● ● ● ● ● ●	Extravert
Analytical	● ● ● ● ● ● ● ● ● ●	Intuitive
Individualistic	● ● ● ● ● ● ● ● ● ●	Communal

Needs

Understanding of Local Social Innovation: Wants to identify and support innovative solutions to social challenges in the community
Fair Support Provision: Aims to distribute resources and support fairly among various social innovation initiatives
Promotion of New Innovation: Interested in fostering new ideas and collaborations to enhance the city's social innovation ecosystem

Challenges and Concerns

Information Reliability: Concerned about the accuracy and credibility of data related to social innovation
Data Interpretation: Struggles with translating raw data into actionable insights
Effective Decision Making: Needs to make informed decisions that align with the city's goals and values

Experiences

7 years in **Climate Strategy Co-ordinator**
2 years in **GIS Assets and Inspections Officer**

Bachelor's degree in **Public Administration**, GIS certification

Technical Background

Moderate Computer Operation: Comfortable with standard computer applications,
High GIS skills: Comfortable with GIS from previous position.
Beginner Data Analysis Skills: Has some experience with data visualization tools, but may need support for complex analysis

	AWARENESS					USAGE			EVALUATION			
Customer Actions	Introduced to the department as a part of Net Zero City tool	Read the brief guide to use the website	On the website follow active onboarding guide to learn basics of interfaces	explore the website to grasp data and activities of the Social Innovation Initiative in the area.	regular monitoring of SI in the area. with map, statistic and forum	Export and save some of the data want to compare later	By utilizing insights collected from the website, Administrator can discuss about potential action to promote Social Innovation Ecosystem(SIEs)	Take actions as municipal administrators intend to help promote SIEs	evaluate the service	Suggest improvement, Sending feedback through survey embedded in the website	Evaluate effect of action taken based on the analysis they did with the service.	Create long term plan to promote Social Innovation Ecosystem within the city
Touch Poinst	• Team member • E-mail	• Google doc • PDF	• Website	• Website	• Website • PDF,Excel • Print	• Website • Team member • Saved or Printed statistics	• Team member	• Website	• Website	• Website	• Team member	• Team member
Pain points	Getting to know new tool	Read document to learn functionalities	It can be frustrating to follow step by step tutorials	It could be difficult to get used to even with the interface onboarding	Relevant forum post may get lost in the time line	Exporting as an external file might get convoluted in the local file or physical print	There is no space to continue his information gathered and have to bring it outside from the webapp to prepare the meeting		It is hard to know what exactly he should say to evaluate the site	writing feedbacks	Difficulty of evaluation of the new policy.	Might be not able to decide long term due to local team structure.
Possible Solution	Make onboarding process as easy as possible	Separate the part for quick guidance and detailed information	Provide feedback form to improve onboarding guide	Tool tip or reference guide	With Search, Filter, and Save post function may resolve this	Create a function to save those feature internally in the web	Integration with other tools such as Mural, Miro, Google doc, and Power point		Create Survey with mostly quantitative range questions to get feedbacks	make feedbacks optional to use	Create a function to compare easily with selected target within the specific range of time	Create a function to Show highlight of data that they have been analysing

User Persona
Social Innovation initiative

Photo by Jeremy Bishop on Unsplash

Emily Evans

Manager of Urban Planning Department

Age

32 y.o.

Needs

Better public recognition: Wants to have better recognition to the public in order to scale her initiative team. But only having social media can get only so much exposure.

Connections with investors: Better connection with investor or fund in order to get stable financial resource to run the initiative.

New policy field: New field of innovation has to be included in the government fund

Experiences

- 10 years of experience as renewable energy system analyst.
- Master's degree in Environmental Science
- Bachelor's degree in the Bio Engineering

Values and Motivations

Sustainability : Driven by a desire to make everything as sustainable as possible in the society.
Knowledge and Technology: Wants to utilized knowledge gained from previous highly skilled experiences
Social Impact: Interested in making impact in the society with Social Innovation to raise community's sustainability and climate neutrality

Dimensions

Conservative	● ● ● ● ● ● ● ● ○ ●	Innovative
Introvert	● ● ● ● ● ● ● ● ○ ●	Extravert
Analytical	● ● ○ ○ ○ ○ ○ ○ ○ ●	Intuitive
Individualistic	● ● ● ● ● ● ● ● ○ ●	Communal

Challenges and Concerns

Financial utilization: Concerned if the government fund, new policy is being evaluated right.

Maintain impact: It is challenging to keep the large enough positive impact with current condition and resources.

Stakeholder engagement: Concerned if the initiative can get sufficient number of stakeholder engagement to achieve intended performance in the society

Technical Background

Advanced Computer Operation:
Comfortable with standard computer applications as well an scientific operation
Renewable energy knowledge: Experts in renewable energy technology, and energy efficiency.

	AWARENESS					USAGE			EVALUATION	
Customer Actions	Discover the platform through municipality webiste or referral	Read the guide for the platform	Access to Platform and browse through the guide	Create an account and set up a profile	Complete the initiative information form to showcase their initiative	Post about their initiative, discovery, and difficulty in the forum and engage in discussions	Directly message municipal administrators for specific inquiries	Receive feedback from administrators and other users on their initiative posts	Analyze feedback and forum discussions to evaluate the initiative's impact	Draft a long-term engagement strategy based on platform interactions and feedback
Touch Poinst	• Website, Referral	• website/pdf	• Platform guide on website	• Platform registration page	• Initiative information form on the platform	• Forum on the platform	• Direct messaging on the platform	• Notifications on the platform	• Analytics dasahboard on the platform	• Planning tools on the platform
Pain points	Lack of knowledge about the platform's benefits	Overwhlmed with guide information	Overwhelmed with platform functionalities	Technical glitches during account creation	Difficulty in accurately choosing the initiative's elements in the form	Negative or unconstructive feedback in forum, unstructure imformation may overwhelm	Difficulty in getting responses from municipal administrators	Lack of actionable feedback	Unclear metrics for evaluating impact	Lack of guidance on long-term strategy formulation
Possible Solution	Provide a clear and concise introduction video on the landing page	Create a quick guide section in the be.ggning of the gude	Create a simple, interactive walkthrough of the platform's main features	Ensure a bug-free and user-friendly registration process	Provide a template or guidelines for filling out the initiative information form	Implement a moderation system to ensure constructive discussions, create tag system to make it easier to see data	Introduce a feature for scheduling virtual meetings between initiatives and administrators	Encourage users to provide specific and actionable feedback	Introduce a feature that tracks and visualizes the initiative's engagement and impact on the platform	Offer resources or workshops on long-term planning and sustainability

Use of Persona and Customer Journey Map to develop the prototype

User personas were created for Municipal Administrator as well as social innovation initiatives. Based on those personas, customer journey maps were created and helped to determine the functionalities of the mapping platform. In the interactive map, the implementation of a dynamic filter of initiative types and targets to have a more flexible view to avoid crowded information on the map for both the Municipality administrator and the Social Innovation initiative.

Forum(thread) and other direct communication channel is intended to promote more active and transparent interaction among initiatives. It can be observed to municipal administrators for a better understanding of the Social Innovation Ecosystem in the city.

Once initiatives fill out the form to upload themselves on the interactive map, the Municipal administrator will evaluate the legitimacy of the data from the notification window that provides summarized information on each initiative for better understanding. The core, as mentioned above, features were developed and designed alongside customer journey maps, and both were iteratively modified for improvement.

4.2 Prototype description with images

As previously stated, creating a digital mapping platform can lower the barrier to gathering insights that are more difficult to gather from physical maps or pure data tables such as spreadsheets. An online platform can update the maps anytime, which leads to a database that is more democratically available to a wide range of demography. This chapter will describe what this prototype, a digital mapping platform, is all about and how it is intended to be used by social innovation initiatives and city managers. As explained in the previous chapter, the Google Maps platform was chosen as a mapping program for web app development. The following are reasons regardless of the comparison with Kepler.gl. Firstly, the Google Maps platform has free tokens of up to 200 USD every month, and as for the test development, 800 requests per month to the API made less than 8 USD. For functionality, Google Map Javascript API is helpful due to its low-code options to implement such a robust and optimized digital map of Google. Its API is javascript, which can be easily integrated into the web application on the front end and is heavily customizable. It fits the envisioned platform's primary function of collaboratively plotting clickable markers onto the map, which can expand to show more information. Also, for the user to upload themselves on the map, other APIs within the Google Maps platform can be helpful, such as Geocoding API, which translates given addresses to coordinates. For the above reasons, the Google Maps platform is a reasonable option to develop this prototype version.

This platform can be roughly divided into several sections.
- Top page
  - This section includes interactive maps, statistical views, etc. This is also where the city administrator will operate to manage new initiatives, etc.
- Forum Functionality
  - This is where initiatives can post questions, updates, discoveries, etc. in a threaded format, and others can comment on them. In some cases, city administrators can also contribute.
- Initiative Registration Form
  - The form is a section where initiatives can enter basic information to put themselves on the map.

These sections are not divided into pages but are presented as the most voluminous. We expect that users will spend most of their time on the top page and the form and that the initiative registration form will be the next most time-consuming section due to the number of fields to be filled out. Below is a description of the platform.

Interactive Map

Interactive MapMap is the name of the part that is not grayed out(see Figure 4-1).

The primary function of this part of the map is to allow users to see the initiatives and supporters that have already been added. By clicking on a map that exists here, an overview is displayed in the Infopanel to the right of the map. Another interactive feature of this map is the legend on the left side, which describes the colors of the markers on the map and the filtering function. This filter is activated by the user clicking on it and functions as a multi-selectable filter. In addition to the filtering function, the filter can change the display of initiatives and supporters. For example, initiatives can be plotted on the map in different colors according to their targets or displayed in different colors according to the organizational form or field of the initiative.

Also, there is a limit here on the size that the user can zoom out to so that the city is not smaller than the limit of what will fit on the screen.
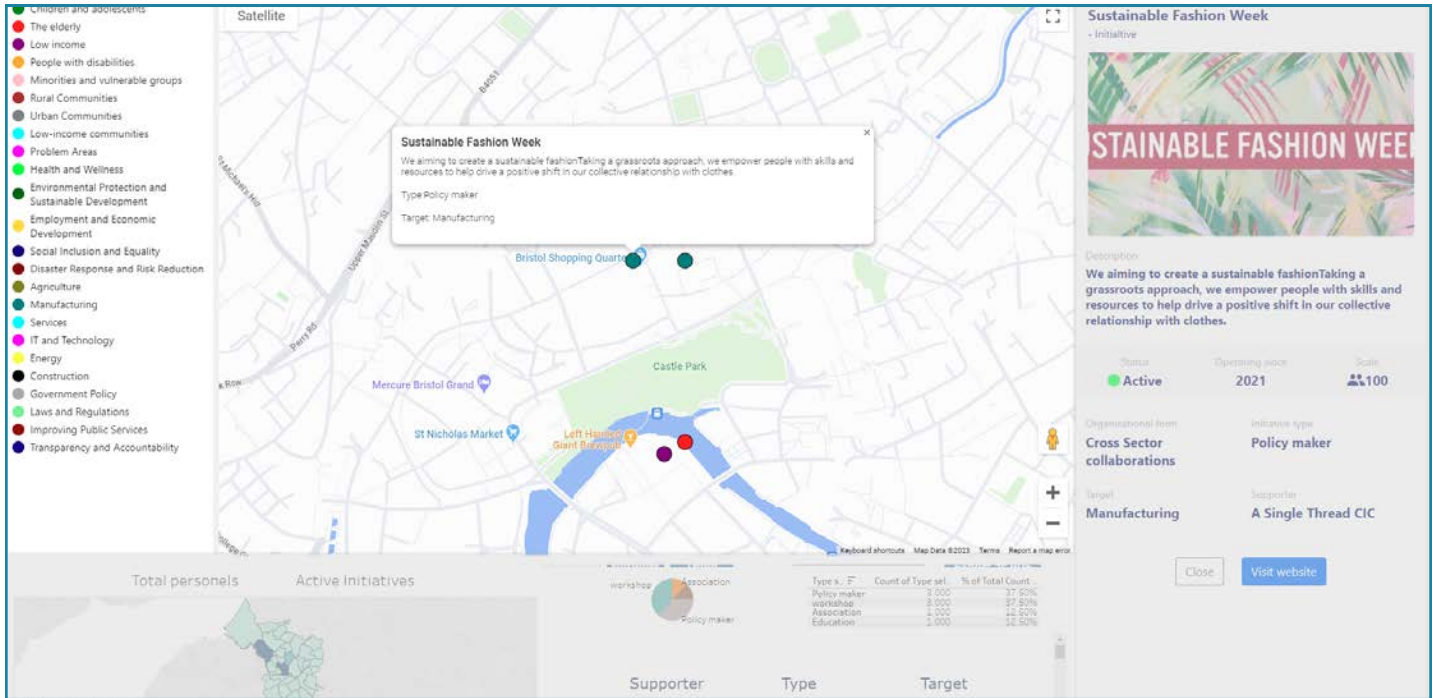
Figure 4-1. Top page of Prototype

Figure 4-2. Infopanel of Prototype
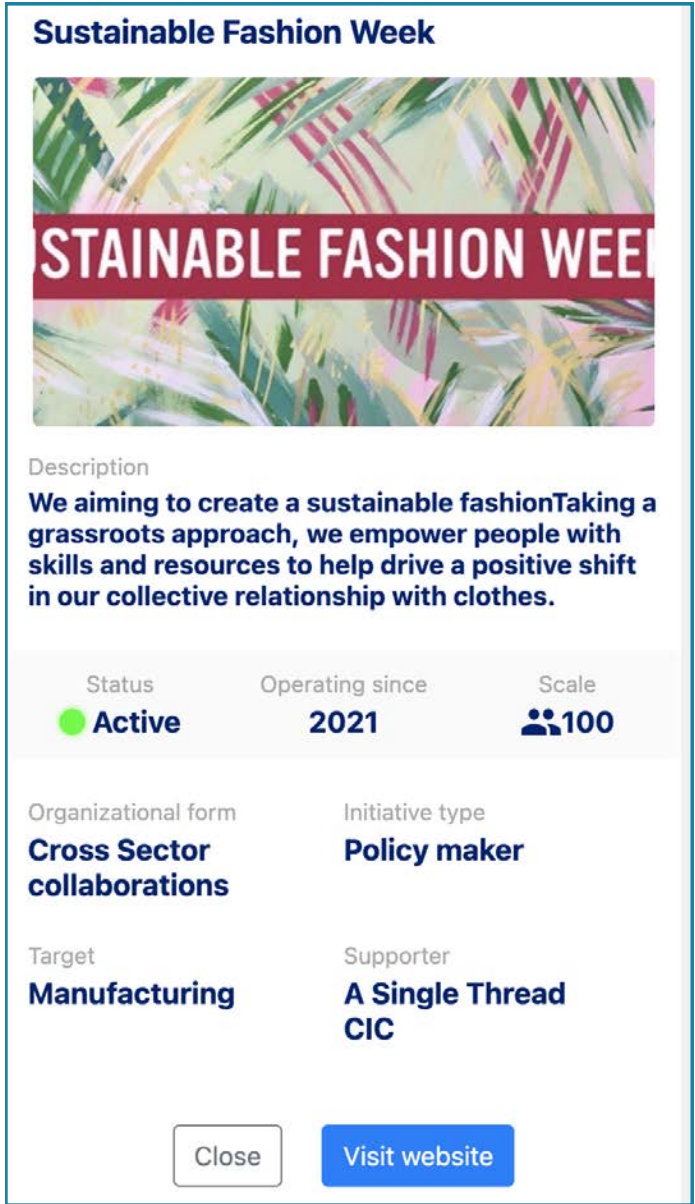
Infopanel

As mentioned in the overview of the interactive map, the Info Panel is a panel that displays basic information about the corresponding initiative when a marker on the map is clicked (see Figure 4-2). This panel is hidden when the platform is loaded and is not displayed until the user first clicks on one of the markers. The basic information about the initiative to be displayed is as follows The following basic information about the initiative is displayed: the name of the initiative, a picture of the initiative, a brief description of the initiative, whether or not the initiative is currently active, when it started, how many people are involved in the initiative, what type of organization this initiative is, what type of activities the initiative is involved in, and how many people are involved in the initiative. What type of organization is the initiative, what type of activities does the initiative do, who is the leading target group, what kind of supporters does the initiative have, and what is a link to the website.

With this information, users can gain an overall understanding, such as statistics and information about each initiative. When the close button is pressed, this section will be hidden, the statistics view will expand at the same time, and the area of the interactive map will narrowed down.

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Figure 4-3. Statistics of Prototype

Statistics View

The Statistics View provides statistical information on the status of social innovation in the city currently under observation. (see Figure 4-3).

These statistics elements help comprehend the following data visually. The pie chart shows the percentage of the type of initiative to population, and to the left, the table shows the number of active initiatives and people involved in social innovations in the observed area. The table to the right of the pie chart shows the actual numbers, and the sorting filter just above it allows the user to change what is displayed. The other map at the bottom left shows the density of initiatives and serves as an interactive statistical filter. This map allows the user to click and drag to change the population of the statistics displayed on the right side, which are only generated based on data in the areas selected in this map. And at the bottom right is the Sankey diagram. This diagram visualizes data flow across categories, in this case, supporters, initiative types, and targets, with the length of the vertical bar in each category increasing with the amount of flow. The length of the vertical bar in each category increases with the amount of flow. It can analyze flow patterns and trends among supporters, initiative types, and targets.

Figure 4-4. Trend graph of Prototype
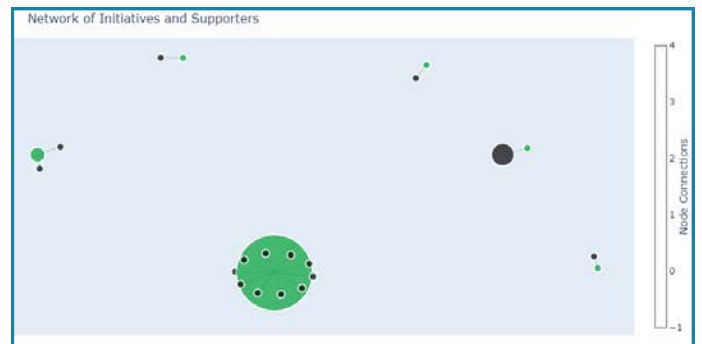
Figure 4-5. Network diagram of Prototype

Figure 4-4 is an area chart showing trends, where the horizontal axis is time and the vertical axis is number, and the colors are the target and initiative types, respectively. This allows the user to analyze trends, such as which initiatives are increasing and at what time of the year, and whether any patterns exist. Figure 4-5 is a network graph showing which initiatives are connected to which supporters, and the size of the nodes varies according to the number of other nodes connected to them. This graph makes it possible to analyze which supporters support which initiatives are connected through supporters, and so on.

Forum Function

The Forum feature allows users to create threaded posts and comment on existing ones (see Figure 4-6). It is used to post questions, updates, issues, and new ideas for the initiative. City administrators may also contribute in some cases, but most of the time, it is assumed that the initiative will do so. This feature serves to promote the creation of the learning community within the initiatives on the platform(mapped).

An API or add-on should be implemented to automatically remove inappropriate content, such as slander and libel, from the submissions. The information gathered here is not only an opportunity for initiatives to exchange information but also for city administrators to observe how initiatives interact and potentially use this information for large-scale analysis, such as reinforcement learning in the future.

Figure 4-6. Forum page of Prototype

Figure 4-7. Registration form of Prototype

Initiative Registration Form

Users can upload themselves to the platform via the Social Innovation Initiative Form. To upload, users must first sign up using the login button on the navigation bar. When signing up, select the Initiative, and users will be redirected to the form.

In the form, users will need to fill in the initiative details, which are as follows:

1 Name of the Initiative,

2 Description: a short description to introduce the Initiative which will be shown in the Info panel as well as in the review panel for the This will be shown in the Info panel as well as the review panel for the administrator

3, the Thumbnail image of the Initiative, upload image that can represent the initiative (e.g., logo, picture in action)

4. A primary activity is a social innovation initiative to tackle climate neutrality.

5.Users can choose a selection from the type of selection

6 Date of the Initiative has started operating

7 Organizational forms of the Organizational forms of Initiative (e.g., NPO, Association)

8. how many people are working for the Initiative,

9. Is there citizen engagement? (Does the main activity of the Initiative involve citizens?)

10:which are the districts where targets are located chosen from the district list

11:what is the target field of the Initiative?

12:what kind of technologies are used?

13.Write the names of the supporters.

14:what kind of funds the Initiative is receiving?

15:what kind of investors are investing in the Initiative?

16:What point at the Initiative regarding funds (%)

17:What kind of challenge is the Initiative facing? The user can write an address if the input box says it is valid with green letters.

19:Which: Which district is the Initiative located in?

20:What is the primary resource of the Initiative to continue its activity?

21:e-mail

22:What kind of resources are in need?

23: Link to the websites of the Initiative that user can write the link to their website if it exists, and this information will be on the info panel.

After filling in the above information, the user can upload the information by clicking the Submit button. The uploaded information will be stored in the database as pending, and the municipal administrator will receive a notification that an initiative has been added and evaluation is needed.

Figure 4-8. Registration management form of Prototype

Initiative Registration Management

The city administrator's account should have as its main task the monitoring of initiatives and the management of registrations. Monitoring of initiatives is mainly done using the interactive map and the statistics view. The management of registration means that initiatives are only reflected in the platform's map and statistics view when the credibility of the information of a newly uploaded initiative is verified and the upload is approved, but not when the initiative is rejected. The initiative's profile, contact information, supporter names, and website link will be provided to the administrator, who will then make a decision based on this information, as shown in the Figure 4-8.

Entity Relationship Diagram

The platform uses PostgreSQL to store data in a database (see Figure 4-9). The database structure ties all data to each user. Each user has a common ID, username, password, and profile picture, and then additional information is added depending on the type of user.

In the case of a municipal administrator, the basic information will be stored first, and then any forum posts and comments will be added and tied to the account. For the initiative account, detailed information about the initiative is stored in addition to the primary account information that will be used

for the statistics and other potential purposes. The technical structure is a one-to-one relationship between the user and the initiative, meaning one user can have only one initiative tied to the account. One-to-many data relationships exist, such as user and forum threads; single users can have multiple forum thread information tied. Also, Thread to Comment is a one-to-many relationship as well as User and Comment; a user can have multiple comments.

Database ER diagram (crow's foot)
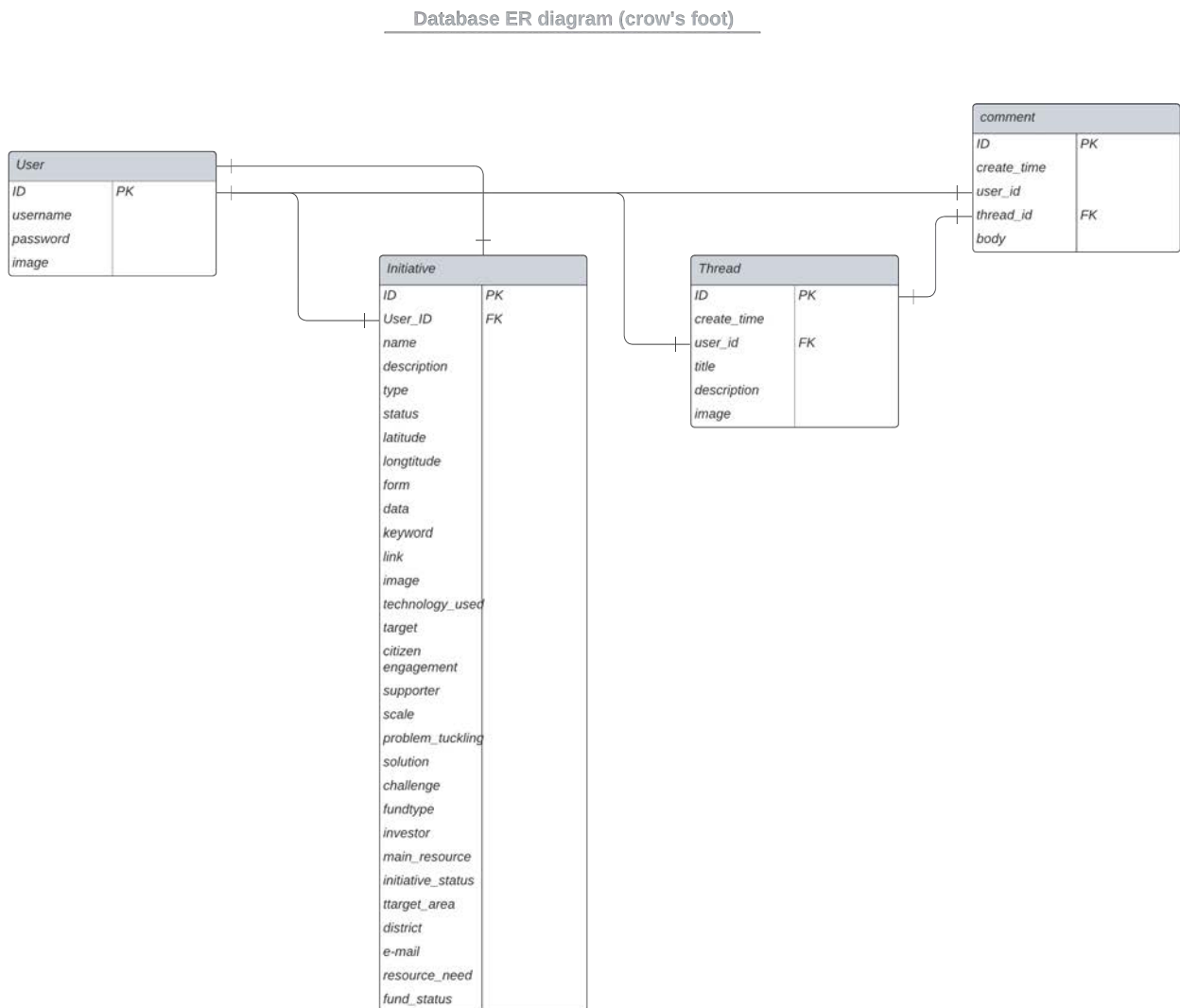
Figure 4-9. Database ER diagram

User Action Flowchart

This simple flowchart focuses on the perspective of user (mainly initiative) actions(see Figure 4-10). The flow of the platform differs depending on whether the user presses the login button or the forum page. However, even in the forum, the user must log in to comment or post, so the user jumps to the login flow,

and if an account does not exist, the flow merges with the same. If the user does not have an account, the user will merge into the signup flow. After that, the user chooses whether to be an initiative or a supporter and then fills in the respective details on the form.
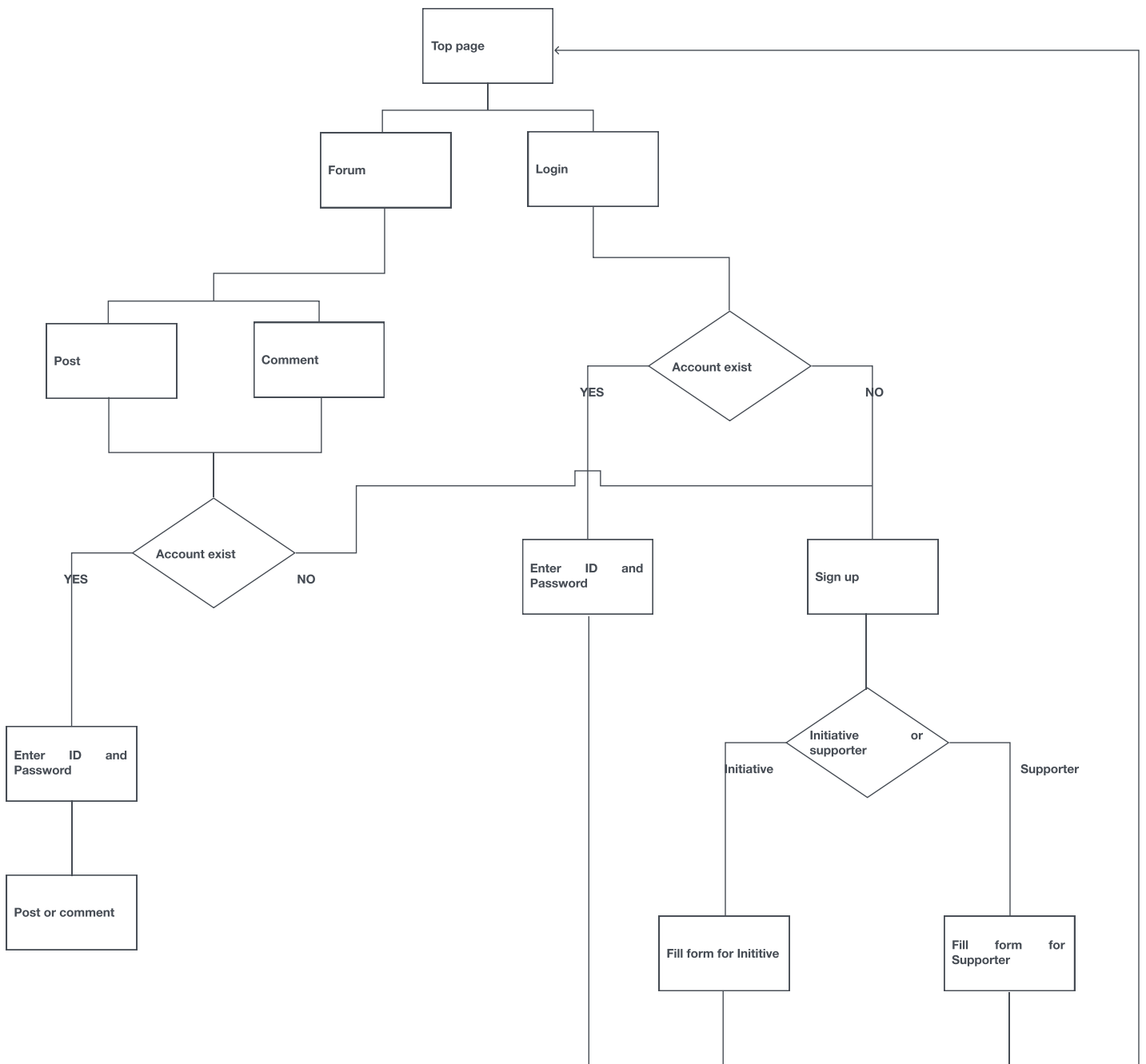
Figure 4-10. User Action Flowchart

4.3 Service Blueprint

	Exploration	
Customer Actions	Check placeholder page	Read documentation
Touch point	place holder page	Google doc or PDF
Line of interaction		
Front stage	User look through the placeholder page(Bristol)	Google Doc or PDF
Line of visibility		
Backstage	Serve web page	Serve web page
Line of internal interaction		
Support Process	Render.com will serve webpage via Python Flask	

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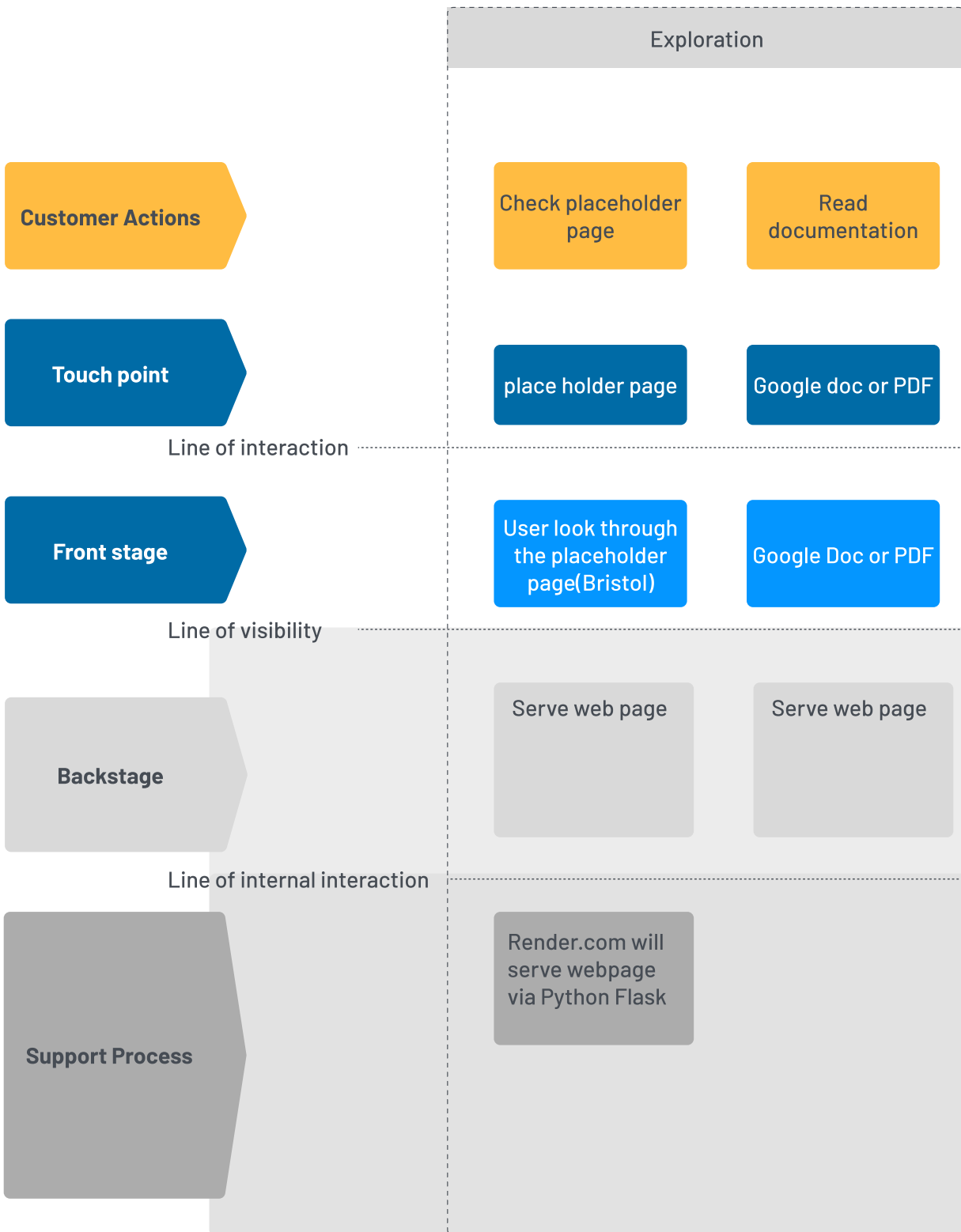
IMPLEMENTATION PHASE(REQUIRES IT KNOWLEDGE)

Required Third party account setup

Create GitHub account	Fork repository	Create Google Map Platform Account	Create Tableau Public Account
GitHub Documentation	GitHub Documentation	Google Map Platform Documentation	Tableau Public Documentation
User sign up for GitHub.com	User fork repository to their GitHub account	Create Google Map Platform Account or connect existing google account	Sign up for Tableau Public

4.3 Service Blueprint

IMPLEMENTATION PHASE(REQUIRES IT KNOWLEDGE)

Technical Setup

Look for Tableau workbook	Copy Tableau public workbook	Set up Tableau data	Fetch Shape file for Tableau	SQL database setup
Documenttation	Tableau Public Documentation	Tableau Public Documentation	EU open data Documentation	Documentation Terminal or Render.com
Navigate to the link of Tableau workbook prepared for cities	Copy Tableau Public workbook to their own Tableau Public account	Set up Tableau data as it is written in the documentation	Follow Documentation to get geography file to import in tableau	User connect or create database by following documentation

IMPLEMENTATION PHASE (REQUIRES IT KNOWLEDGE)

If user use Render.com to deploy web app

Access to Render.com

Deploy at Render.com

Render.com Documentation

Render.com GitHub Documentation

Follow documentation to create account of render.com

Follow Documentation to Deploy on Render.com from GitHub

Web Application in Action

Load Website

External link

Click on a link to visit the platform

4.3 Service Blueprint

Web Application in Action

| Landing page | Sign up | Fill form | Click on the initiative marker on the map |

| | Sign up page | Form page | Top page |

| | User navigate and click on log in | User Fill form after choosing initiative or supporter | user click on the initiative marker on the map |

| | Signing up process, Writing account information to the SQL | All the required field has to be filled otherwise return error + Geo location API will check if the address is valid | Showing specific initiative which has been clicked on information on the info panel |

| | Flask will encrypt password info and store is to Database | Flask will hand information to SQL | Fetching data of what is clicked on Google Map Javascript API |

| | | | Hand those information to infopanel html |

Click to see the statistic panel	Go see a Forum	Post on Forum	Comment on the post(forum)
Top page	Top page	Forum page	Forum page
User click to see the statistic panel	User click on a Forum in Nav bar	User post in forum	User comment on the other post by clicking comment button

Showing initiative statistic information via Tableau public Embedded with iframe	Navigate page form original page where user was to the forum page.	When post button is clicked, show post content input form	When comment button is clicked, show comment input form

Load forum data from SQL

Send those data to SQL

| See info panel | click initiative website | Send message to Administrator | Export statistic panel |

| Top page | Top page | Top page | Top page |

| User navigate to info panel in the top page | User click on "visit initiative" button on infopanel in top page | User send message to administrator from nav bar | User click on export button in the statistic panel(tableau) in the top page |

| | When Visit initiative button is clicked open the link in new tab | When send message button is clicked open the message editor pop up | When export button is clicked tableau will download pdf of the dashboard |

| | | When the send button is clicked Server will store those values to SQL and treated as Pending information in for Admin account | Tableau iframe function "export" button will export it to local computer |

User login	User login	User login

Top page to Login page	Login page	Login page

User click on login button in the Navbar page will navigate to Login page	User fill Username and Password and click login	Login result

When login information will be given Flask will look for if the combination exist

if the combination matches page will be navigated back to Top page with logged in state.
If not page will show message that the password is not correct

Flask login will check SQL

Service blueprint

This Service Blueprint is divided into several different sections. First, as a vertical layer, there are 'Customer actions,' which is a layer that shows what the user is doing. 'Touch Points' tells what is the physical or digital touchpoints to do the customer action. 'Front stage' is a more detailed explanation of user action. 'Backstage' explains what is happening to process each user's actions and 'Support Process.' shows interactions between the backstage process and support employees. Then, for the horizontal section, there is 'exploration,' which is a stage when users explore the information of the platform before starting to interact with it. The 'required third party account setup' is where the user will prepare to set the platform in their city context. Then, 'Technical setup' is a stage where the user will set up the platform. Then, 'Deploy' is where the user will deploy the service online. Then, finally, 'Web Application in Action' is where the platform is up and running in the field .

The Service blueprint shows the actions of both 'Municipal Administrator' and 'Social Innovation Initiatives' and how those actions are processed before and beyond the 'line of visibility.' The creation of the Service Blueprint provides significant insights to revise. It improves the platform by balancing the interactivity of the statistic section, a more accessible Approval control page for City administrators by improving UI, and a better user experience on the Forum page by managing the comment system and onboarding process. Also, more potential issues emerged, such as security protocol for user information and harmful comment detection. For the cartography section, the service blueprint could reveal room to improve map visualization and the need for a better filter function to implement from the first model of the prototype to ensure better usability to get insight into the Social Innovation Ecosystem in the area. .

Points to be considered for future updates

A few things should be updated as part of this update. However, they are mainly in terms of one to improve the functionality of the digital mapping platform itself, and the other is to integrate it with the NetZeroCities platform.

The first part of the functional improvement is to move away from third-party components. For example, the prototype currently uses TableauPublic for data visualization in most of the statistical views. The advantage of this is that it can instantly test new data presentations and new graphs without any code when tests will run repeatedly in the future, and the advantage of embedding is that we do not have to change any source code. The advantage of embedding is that no changes are made to the source code, so the team can freely conduct various experiments without worrying about bugs. However, once the team verifies what kind of data visualization is necessary, Tableau Public will be replaced with a more integrated solution. Because there are adequate choices than loading TableauPublic from the outside in terms of user experience, even considering the speed reduction caused by loading from the outside, it would be preferable to use an integrated solution such as Plotly, which is currently used to display Sankey diagrams and other data visualizations such as network graph and can be implemented in a relatively low-code environment. In addition, deep learning analysis on a global or national scale can discover patterns by using a common database structure in each city. In addition, since current databases are stored on servers, security measures will vary depending on the status of each server. However, it is necessary to maintain security in terms of software.

For the integration with the NZC platform, integration is also connected to security measures, as the current IDs can be modified to use those of the NetZeroCities platform, and the forums and other functions can be added by using the infrastructure of the NetZeroCities platform, which will provide the platform higher security while maintaining the current functionality. In addition, account information management will be more straightforward, and users can log in directly from the NetZeroCities platform instead of having to deploy in each city, as is the current case, significantly reducing the hindrance on users.

Technical Configuration

This prototype works by utilizing the following technologies. First, the interactive map uses GoogleMapJavascriptAPI. The statistical views are mainly running in TableauPublic, and the Sankey diagram and network graphs are created using Python's Plotly library, which uses information stored in the database. The database uses PostgreSQL to store the information. Python and its Flask liberally are used to host a server for the backend part. The server will execute most of the 'requested tasks,' from users through their web browser, such as adding new initiative and plot initiative markers on the map. Thereby, demands on the user's local devices have less from the platform. In order to run a server constantly, it requires a 24/7 operating computer with enough computational power and an internet connection.

Nevertheless, building a server system is unreasonable for financial and technical reasons. Therefore, a third-party server operates in this prototype. More specifically, Render.com is used to deploy the web application for free.

5

A GUIDE FOR CITIES TO MAP SOCIAL INNOVATIONS

This chapter introduces a complete guide to the platform. This guide consists of two main sections: the Usage guide and the Set-up guide. The usage guide will explain how to operate the platform by reading the guide, and this is intended to be read by the Municipal administrator, who will use the platform to map initiatives and Social Innovation Initiatives to upload themselves on the platform. The Set-up guide, on the other hand, will explain how to implement the platform in each municipality with technical details explained, as well as its expandability. Due to its technical complexity, this documentation is intended to be read by an engineer or person with IT skill sets. By reading this documentation, municipalities can implement the platform with modifications to better-suited use. This web platform aims to help promote initiatives within a social innovation ecosystem in the observed area by providing interactive functions to both Social Innovation Initiatives (SI) and Municipal Administrators(Administrators).

USAGE GUIDE

The usage guide is documentation for Users, and this will explain the platform's functions for more effective use to promote initiatives within the Social Innovation Ecosystem in the City.

The visualization contains mainly two functionalities: cartographical visualization(1) and statistical data visualization (3). As an informational aid, an "info panel" includes a comprehensive overview of the selected initiative. Finally, the Navigation bar(4) can guide a user to the desired section of this platform.
The above-mentioned sections are explained in the following sections.

Each Screen section will be explained in the following order.

1 .... **Interactive Map**

2 .... **Infopanel**

3 .... **Statistical Panel**

4 .... **Navigation bar**

5 .... **Login page**

6 .... **Sign up page**

7 .... **Initiative form**

8 .... **Forum**

9 .... **Notification**
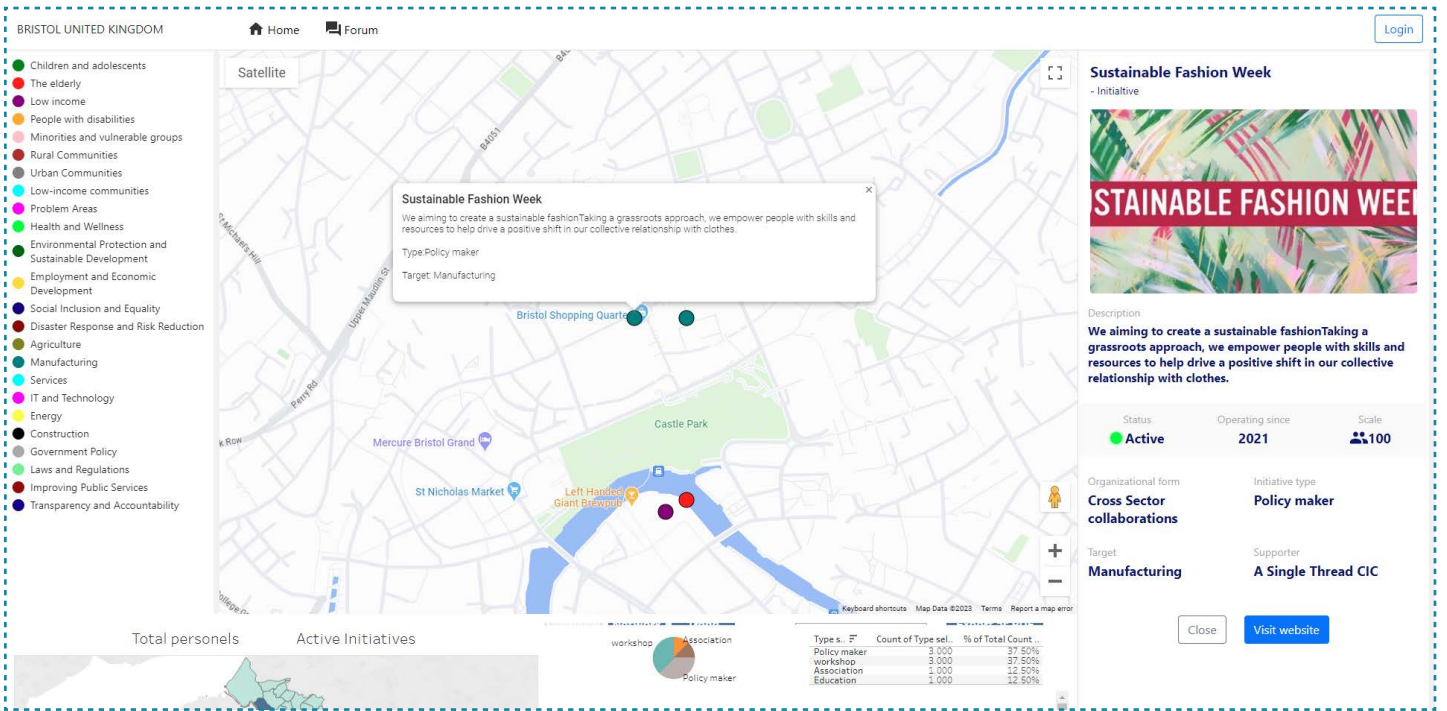
Figure 5-1. Top page of Platform

Figure 5-2. Navbar of Platform
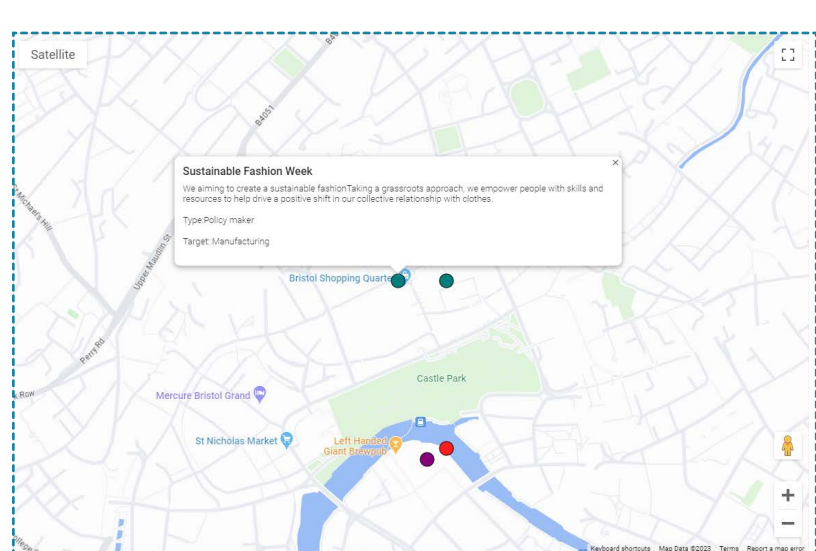
Figure 5-3. Interactive Map of Platform
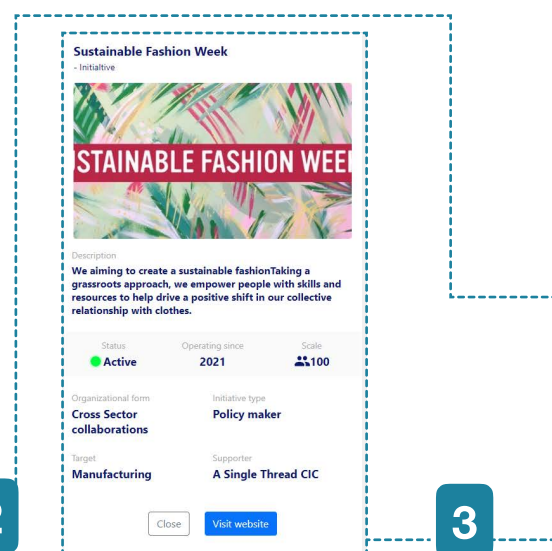
Figure 5-4. Infopanel of Platform

Figure 5-5. Statistic of Platform

1 A navigation bar that can navigate to different pages (see Figure 5-2).

2 The Map viewer. Here, the user can see where each initiative and supporter are located. Clicking each marker on the map info panel (see Figure 5-4) will show detailed information on each initiative (see Figure 5-3).

3 The info panel, where users can see detailed information on each initiative (see Figure 5-4).

4 A statistic panel that offers statistical information on initiatives in the area (see Figure 5-5).

INTERACTIVE MAP
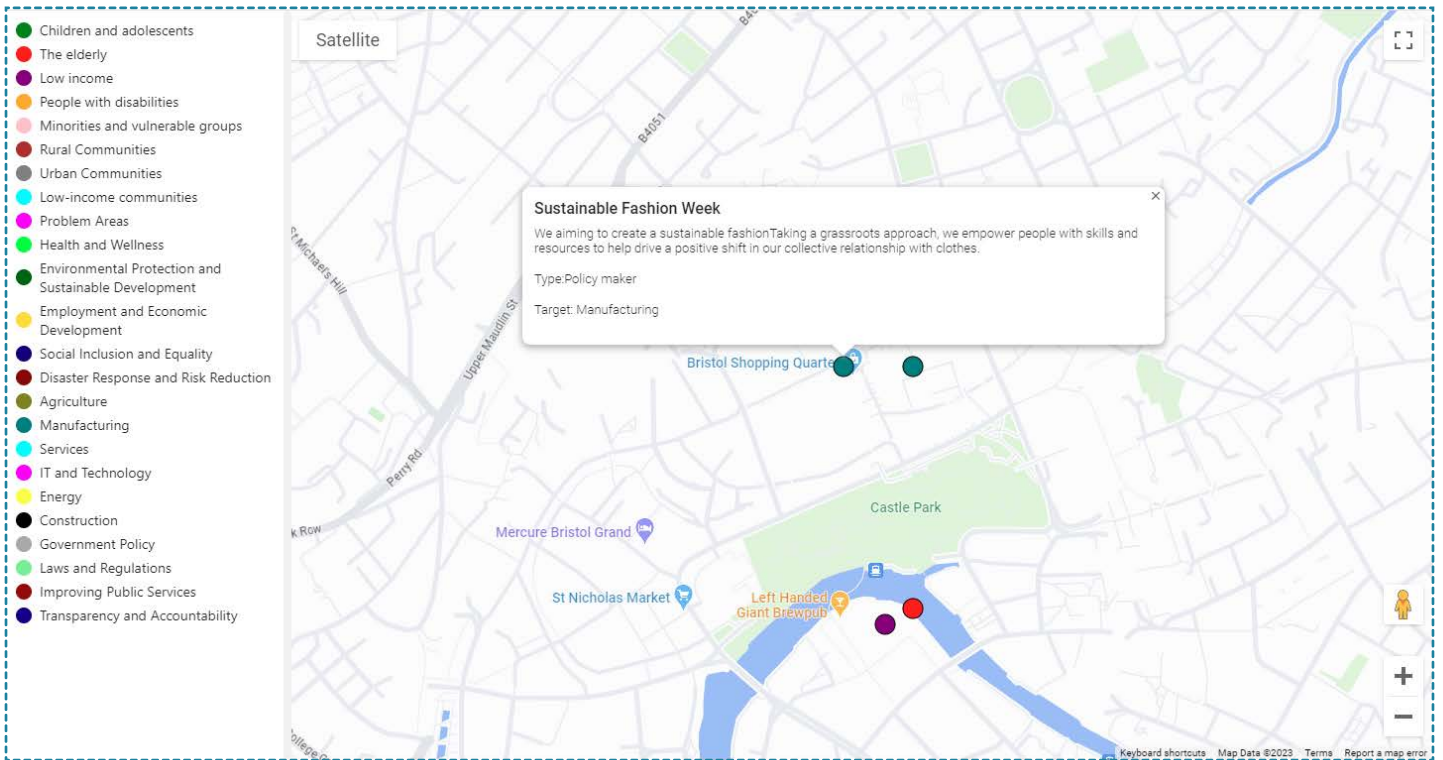
Figure 5-6. Interactive Map of Platform

The interactive map (see Figure 5-6) will provide users with comprehensive data on the Initiative and supporter's geolocational data. These markers are color-coded according to the characteristics of each marker (e.g., initiative type, target). On the left side is a list of critical legends and their explanation. This section on the screen can also act as a filter function for this interactive map; in this example, markers are color-coded by the target of each initiative; however, this can be modified to different characteristics as the user prefers (e.g., initiative type, organizational form) also since the filter is a multiple selection style users are allowed to have a preferred combination of data to see on the interactive map at the same time.

INFO PANEL

A navigation bar that can navigate to different pages.

Login

Sustainable Fashion Week
- Initialtive

Name

Thumbnail image

STAINABLE FASHION WEE

Description

We aiming to create a sustainable fashionTaking a grassroots approach, we empower people with skills and resources to help drive a positive shift in our collective relationship with clothes.

Description

Status	Operating since	Scale
● Active	2021	👥100

Status, Start date, Scale

Organizational form
Cross Sector collaborations

Initiative type
Policy maker

Initiative type

Organizational form

Target
Manufacturing

Supporter
A Single Thread CIC

Target   **Supporter**

Close   Visit website

Figure 5-4. Infopanel of Platform

The info panel shows detailed information on each initiative (see Figure 5-7). Starting from the top **Name** of initiatives, if it is an initiative or supporter, a **thumbnail picture** of each initiative, a Short **description** of the initiative, **status** of the initiative such as Active, Inactive, and Completed, Operation started the year, **scale** of initiative as in the number of people, **Organizational form** such as NPO, Initiative type is what kind of action they are taking as an initiative, the target is a sector of the **target** the supporter is names of **supporter** supporting the initiative, Close button when clicked it will close info panel and raise the statistic panel, visit the website when clicked the website of the initiative will be opened in new tab.

STATISTIC PANEL
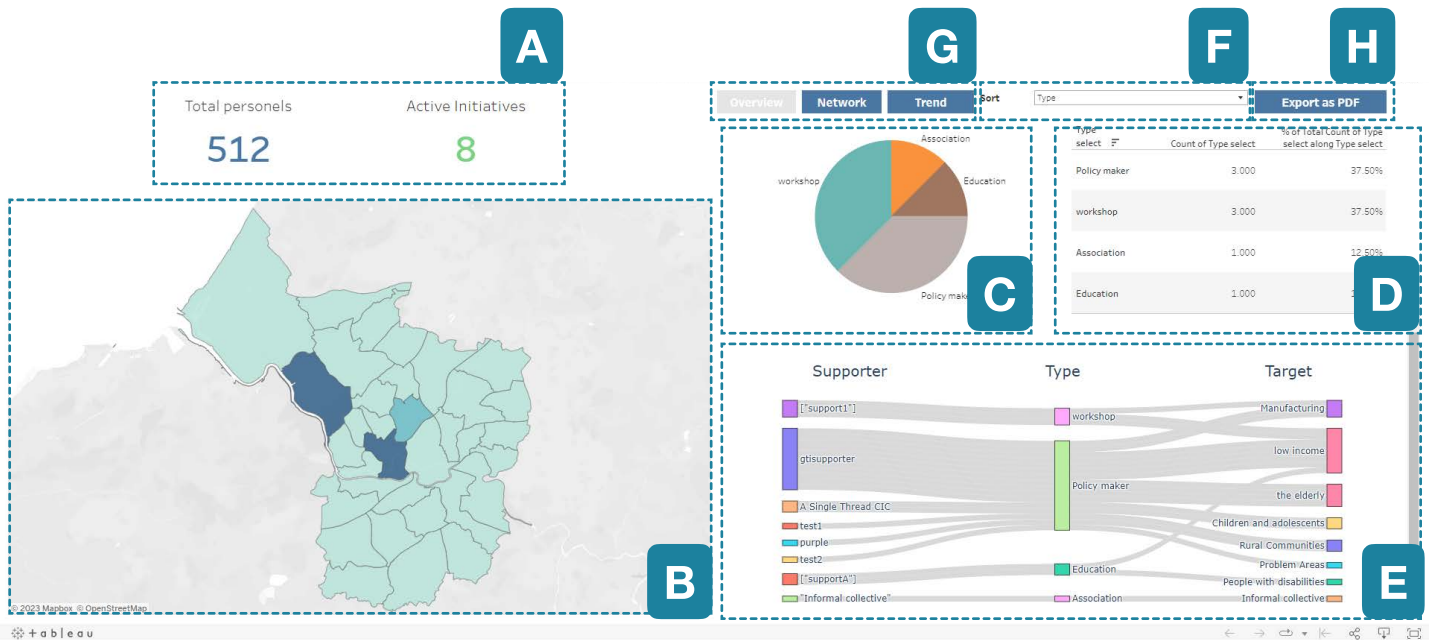
Figure 5-8. Statistic of Platform

This map visualization is aided by the statistical data visualization section, which tells the situation in the area currently observed and contains the following statistical information and most of the graphs are interactive (see Figure 5-8).

Figure 5-9. Statistic A

This section provides the total number of personnel involved in the Social Innovation Ecosystem in the city being observed; it shows the number of active initiatives currently operating in the city. This information helps users quickly grasp the Social Innovation ecosystem's current scale (see Figure 5-9).

B
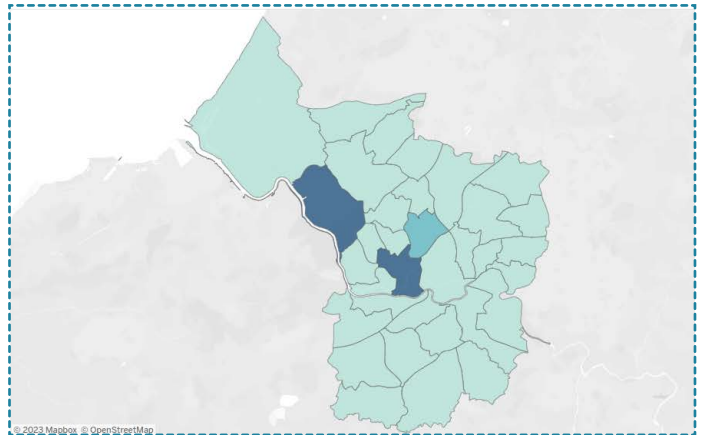
Figure 5-10. Statistic B

This is another interactive map for this statistical section that serves a couple of functionalities (see Figure 5-10). As a visual representation, this shows the density of social innovation initiatives in each district. However, this can also be used as an interactive filter for the rest of the data visualizations.

Users can select each district by clicking or dragging to select multiple districts to have a specified dataset to visualize in the rest of the data except the Sankey diagram and Network graph to allow users more flexibility to compare different data.

C
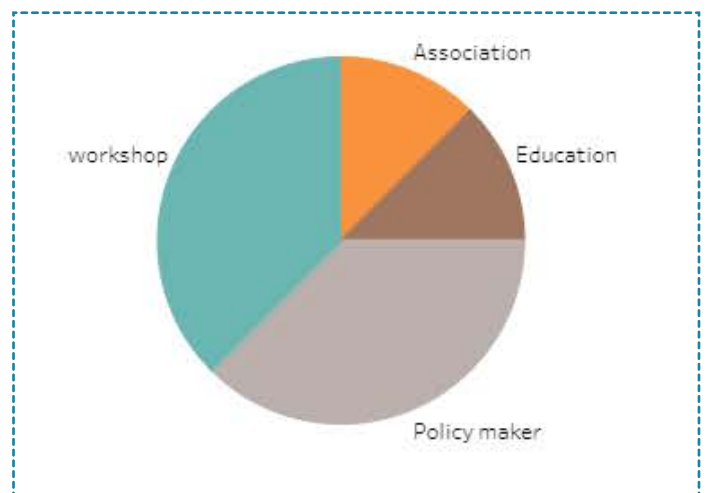
Figure 5-11. Statistic C

This is a pie chart (see Figure 5-11) to display the ratio against a total of different types of initiatives or targets of initiatives based on the selection of sort filter (see Figure 5-14). This tells the user to know the composition of entities

D

Type select $\overline{\mathsf{F}}$	Count of Type select	% of Total Count of Type select along Type select
Policy maker	3.000	37.50%
workshop	3.000	37.50%
Association	1.000	12.50%
Education	1.000	12.50%

Figure 5-12. Statistic D

As shown in the Figure 5-12 this data table shows the top 3 of selected data with a sort filter allowing the user to access a raw number of selected data for further comparison.

E
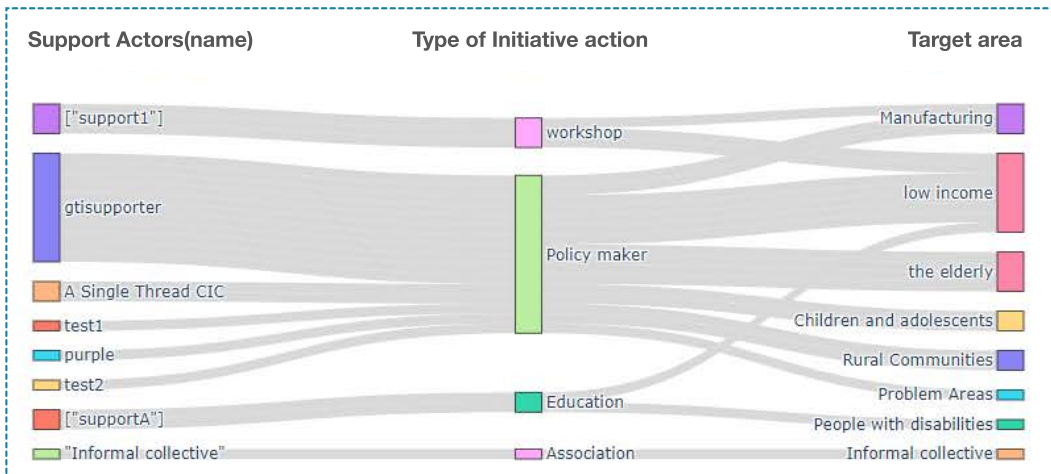
Figure 5-13. Statistic E

As shown in the Figure 5-13 this is a Sankey diagram to show the flow of data (e.g., supporter, Type of initiative, and target, in this case, the Sankey diagram can provide how the supporter is connected to the target in the end or which types of initiatives are more likely to be connected with specific supporter or types of targets) which enable user understand what kind of entities are flowing to other entities with certain mass or volume,

F

Figure 5-14. Statistic F

This is a Sort filter that allows the user to select which data to display on the statistics (see Figure 5-14).

Figure 5-15. Statistic G

This navigation switch allows users to change the data visualization set to explore this statistical section further (see Figure 5-15). "Overview" is the current section shown in the figure. The "Network" page has a Network graph, and the "Trend" page has Area Graphs, where the user can see the total running data with time.

Figure 5-16. Statistic H

As show in Figure 5-16 this is an Export as PDF button when clicked this statistical section will be exported as a PDF.

Network Diagram
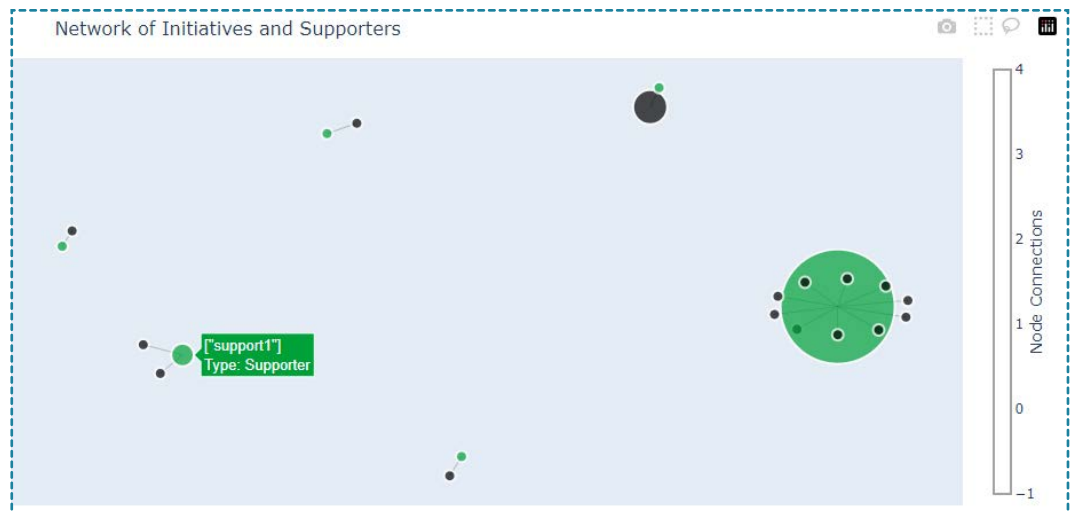
Figure 5-17. Statistic Network Diagram

This is a Network Graph of Initiative and Supporter which represents interconnectivity of those actors (see Figure 5-17). More initiatives are connected to the supporter the supporter will have larger node size in this graph. On mouse hover, user can see the name of each initiative or supporter.

Trend Chart

Figure 5-18. Trend chart

This is an Area graph with time in x axis, running total of each elements in either "type", "target", and etc to show the growth trend of each category (see Figure 5-18).

NAVIGATION BAR

The Figure 5-19 is an edited image of the navigation bar. From the left, there are "Home," "Forum," and "Log in" buttons.
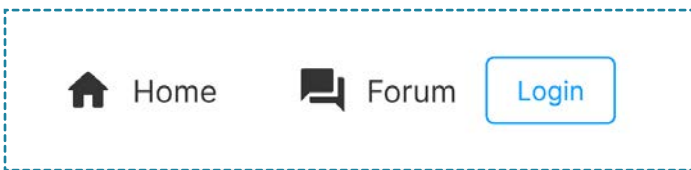
Figure 5-19. Navigation bar
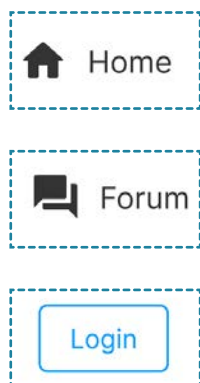
The home button will navigate the user to the top page, the same page as the first page of the Quick Guide to the Platform explanation.

The Forum button will navigate users to the forum page, a page both initiative and administrators can post in the thread for their questions, problems, and new ideas.

Finally, the Login button navigates users to the login page, where the already signed-up user will log in, and new users will go to the sign-up section.

LOGIN

Figure 5-20. Login page

On the login page (see Figure 5-20), if the user has an account, the user will have to enter their Username and Password and then press the Login button on the bottom to log in; after lying on the page, will navigate to the top page with a logged-in state, when the user does not have an account user can click on Sign up to create a new account.

SIGN-UP

Figure 5-21. signup page

This is a sign-up page when a user is new to this platform and has to create a new account (see Figure 5-21).

The user will enter the preferred Username and Password and the profile picture. However, if the profile picture is not selected, the platform will choose the default profile picture.

After filling in that information, the user will click register to proceed to the new step, "Form."

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INITIATIVE FORM

In this section, users (new initiative users) will fill out the following form, which will be saved to the database and applied to the interactive map and statistic section once city administrators have approved their data (see Figure 5-22 and 5-23).
In this form page, the initiative user will fill out their initiative information.
A brief explanation will follow.

Name of initiative [1]

name

Description [2]

Describe briefly about your Social Innovation Initiative

Image [3]

Choose File   No file chosen

Initiative status [4]   **Initiative Type** [5]

Active   Policy maker

Starting date [6]   **Organizational form** [7]

dd/mm/yyyy   Cross Sector coll

Scale of Initiative (people) [8]   **Citizen engagement** [9]

○ Yes ○ No

Target area [10]   **Target** [11]

Ashley
Avonmouth and La
Bedminster
Bishopston and Asl

Children and adole
the elderly
low income
People with disabili

[1] Name of the initiative

[2] Description: write a short description to introduce the initiative. This will be shown in the Info panel as well as the review panel for the administrator

[3] the Thumbnail image of the Initiative, upload image that can represent the initiative (e.g., logo, picture in action)

[4] If the initiative is operative, not operating, or has completed its goal.

[5] types of Initiatives. A primary activity is a social innovation initiative to tackle climate neutrality. Users can choose a selection from the type of selection

[6] Date of the initiative has started operating

[7] Organizational forms of the initiative (e.g., NPO, Association)

[8] how many people are working for the initiative,

[9] Is there citizen engagement? (Does the main activity of the initiative involves citizen?)

[10] which are the districts where targets are located chosen from the district list

[11] what is the target field of the initiative? Choose from the target list.

Figure 5-22. Initiative form

Technology used [12]

Bio Technology
Renewable energy
Sustainable Agricul
Communications

Supporter [13]

name1,name2, ...

Funding type [14]

Donation
Grants
Crowdfunding
Sponsorship

Investor [15]

Government and Pu
Social Investment fi
Crowdfunding platf
Social Enterprise

Funded status [16]

50

Challenge facing [17]

Non-sufficient fu ⌄

Address [18]

Address

District [19]

Ashley ⌄

Main Resource [20]

Cash Funds ⌄

E-mail [21]

example@mail.com

Resource in Needs [22]

Cash Funds ⌄

Website (optional [23]

example.com

CANCEL [24]　　SUBMIT [25]

Figure 5-23. Initiative form

[12] :what kind of technologies are used? Choose from the technology list.

[13] :which: Which are the supporters of the initiative? Write the names of the supporters.

[14] :what kind of funds the initiative is receiving? Choose from the fund type.

[15] :what kind of investors are investing in the initiative? Choose from the investor list.

[16] :What point at the initiative in terms of funds (%)

[17] : What kind of challenge is the initiative facing? Choose from the challenge list.

[18] :Where is the Initiative located? The user can write an address if the input box says it is valid with green letters.

[19] :Which: Which district is the initiative located in? Choose from the district list.

[20] :what is the primary resource of the initiative to continue its activity? Choose from the primary resource list.

[21] :e-mail

[22] :What kind of resources are in need? (or facing shortage)

[23] websites of the initiative, user can write the link to their website if it exists, and this information will be on the info panel.

[24] :Cancel filling out the form

[25] :Submit this form

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FORUM

This is a forum page where users can post their questions, challenges, and new ideas to share within the platform (see Figure 5-24).
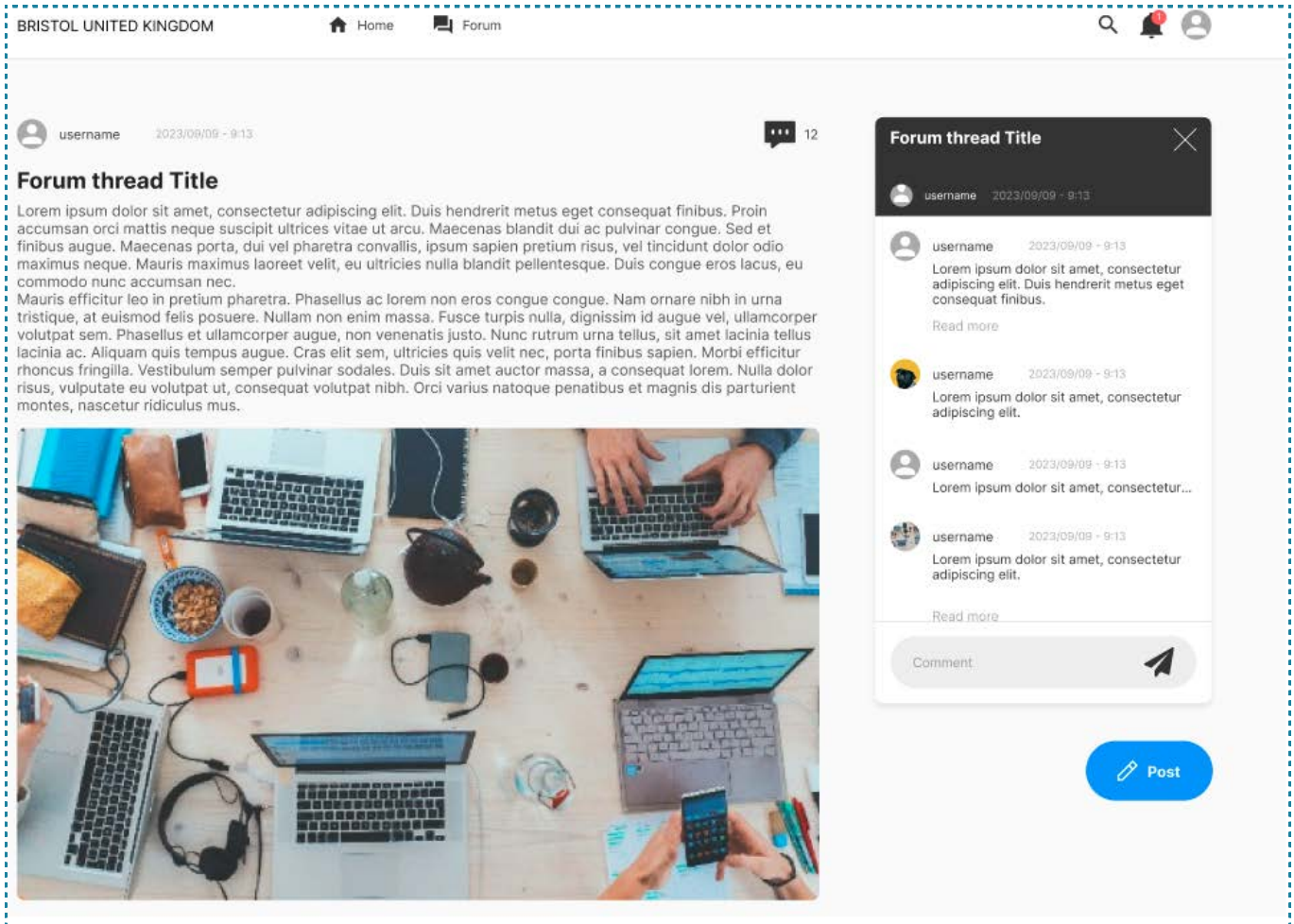
Users must be logged in to create a post and post it on the forum. Then, click the "Post" button on the right bottom. After clicking the post button, a post creation window will appear on the screen, which would look like the following figure.

Figure 5-24. Forum page

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Figure 5-25. Forum post

As shown in Figure 5-25 The "Title" section will be filled with the post's title, and then the description will be filled with the content the user wants to share. Lastly, the "image" will also allow users to post images.

Figure 5-26. Forum comment

The comment panel shows comments sent to the post as a reaction, answer, and more (see Figure 5-26).

To comment, the user must be logged in and click on the comment input box [Comment] to start typing.
After finishing writing the comment, press the send button to send the comment.

NOTIFICATION

If the user is already logged in, the user will see this notification badge in the navigation bar.

ADMINISTRATORS ONLY The following function is for administrator accounts only.

As shown in Figure 5-27 once the user clicks the bell icon, an administrator window will appear. Then, an administrator can look at the overview of the new initiative information, which has not been approved by the city administrator yet.

Figure 5-27. Notification

Initiative A1Initiative A1Initiative A1Initiative A1
- Initialtive

Description

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Mauris vel nunc dictum, porttitor odio non, egestas lectus. Sed at odio ut diam bibendum convallis nec nec magna.

Status	Operating since	Scale
🟢 **Active**	**2015**	👥 **30**

Organizational form
Community based organization

Initiative type
Technology driven

Target
Agriculture Agriculture Agriculture Agriculture

Supportor
Ex fundation
the SI funds
Good coop

E-mail
Example@initiative.com

Website
Website link

Deny	Approve

Figure 5-28. Registration management

Once the user clicks on manage, this new initiative management window will appear (see figure 5-28). Unless the user "denies" or "approves," the initiative information will be put on hold. Hence, municipal administrators have enough time to investigate the legitimacy of the new initiative waiting to be approved.

Users can scan basic information on the panel during the check to see what they are. Also, the information can be triangulated by checking with the supporter the initiative is mentioning and the website, or can directly contact with the email if follow-up questions are needed.

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SETUP GUIDE

IT KNOWLEDGE REQUIRED

This setup guide requires a person with moderate IT knowledge (i.e., use of command prompt, basic GUI-based application, and server). The setup guide will explain from required third-party account preparation to deployment of the web app, as well as the custom setup of the server.

In this guide, following are needed: System with stable Internet Connection. Tableau Public Desktop edition.

Figure 5-29. tableau logo
Figure 5-30. Render.com logo

For, custom setup, Server will require python

Figure 5-31. python logo

and its following liberally.

1. Python3.12,
2. Flask==2.2.5
3. Flask-Migrate==4.0.5
4. requests==2.31.0
5. pandas==2.1.1
6. psycopg2==2.9.7
7. gunicorn==21.2.0
8. googlemaps==4.10.0
9. SQLAlchemy==2.0.21
10. Flask-SQLAlchemy==3.1.1
11. Flask-login==0.6.2
12. Werkzeug==2.2.2
13. flask-wtf==1.2.1
14. plotly==5.17.0
15. networkx==3.1

Quick Set-up using Render.com
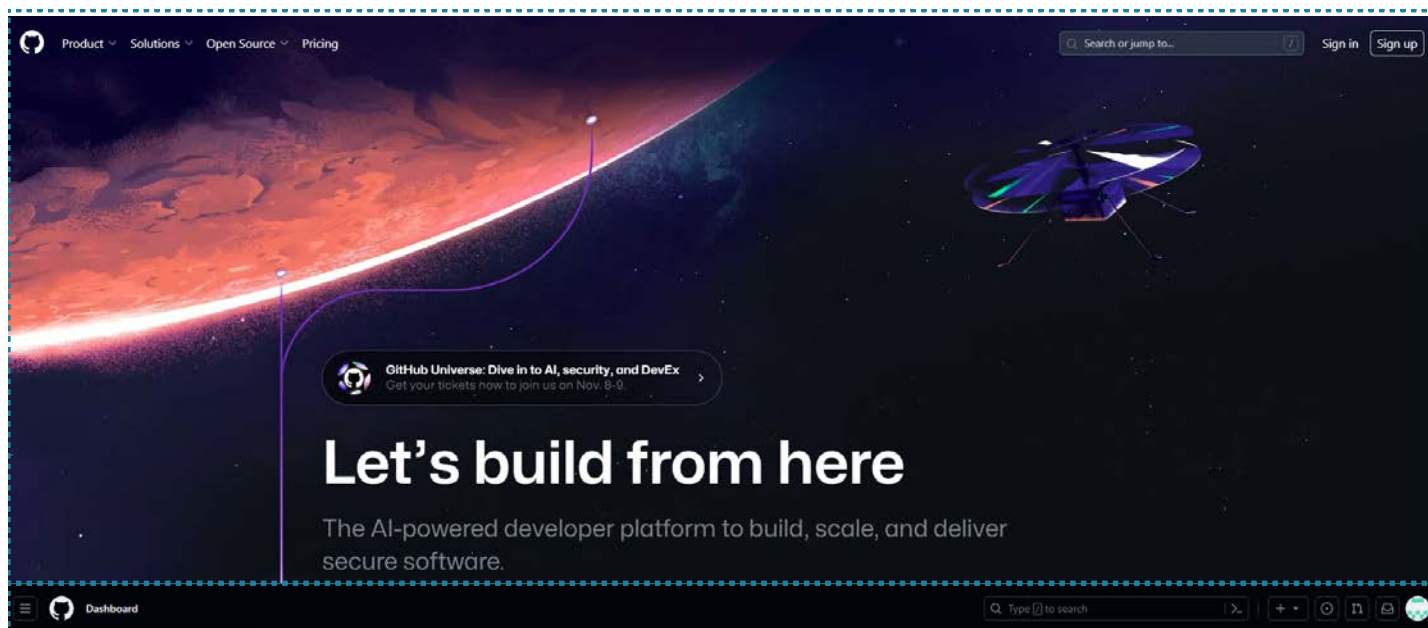
Figure 5-32. GitHub

After signing up to GitHub (see Figure 5-32), access the repository with the following link: Repository Then, Click on fork to copy the repository files to your account. (GitHub Official Guide of Fork) then the GitHub setting is finished

Google Map API

To use this platform Google Map Javascript API is needed. To gain access to Google Map Javascript API, Accessing Google Map Platform is required which can be accessed from the following link:https://mapsplatform.google.com/

After the account is set up the dashboard should look like the Figure 5-33.

Figure 5-33. Google Maps Platform

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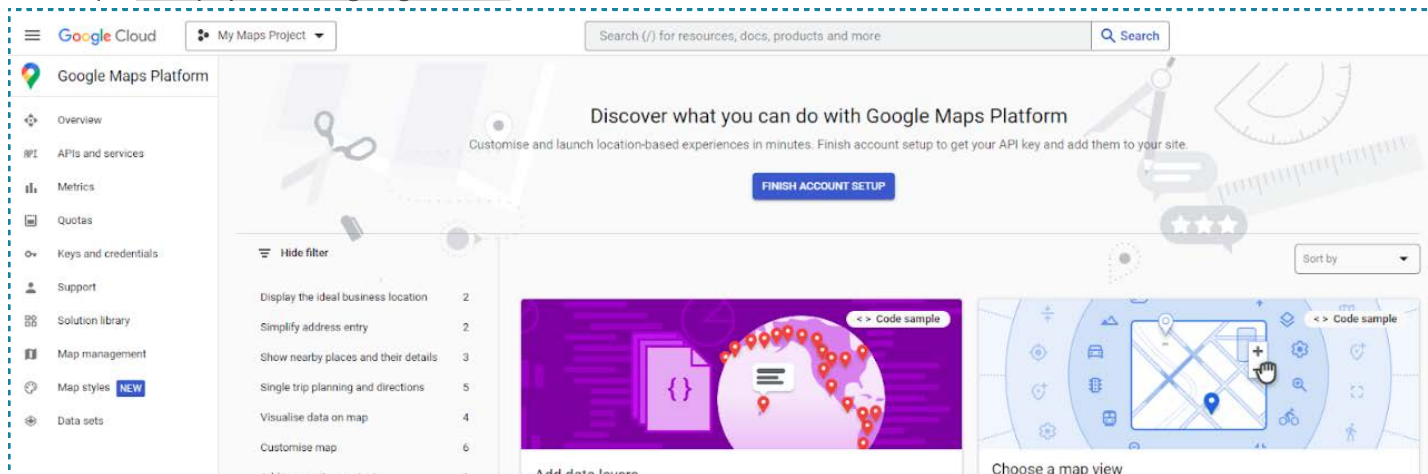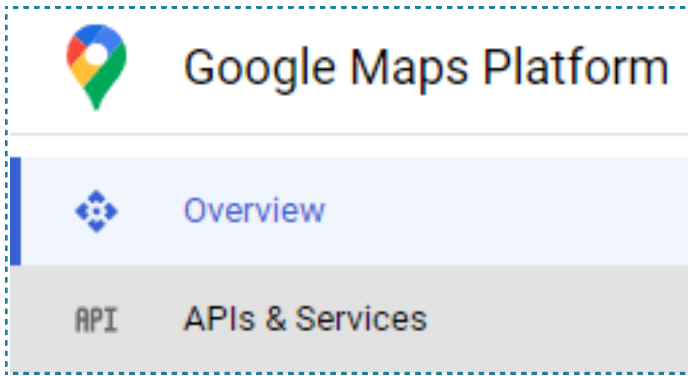
Then Click on the "APIs and services." (see Figure 5-34) There will be a more detailed account setup. After that, those set-up API activations should be available.

Figure 5-34. Google Maps Platform

API dashboard should look like the Figure 5-35 On this page scroll to find the API called "Map Javascript API."

Figure 5-35. API list
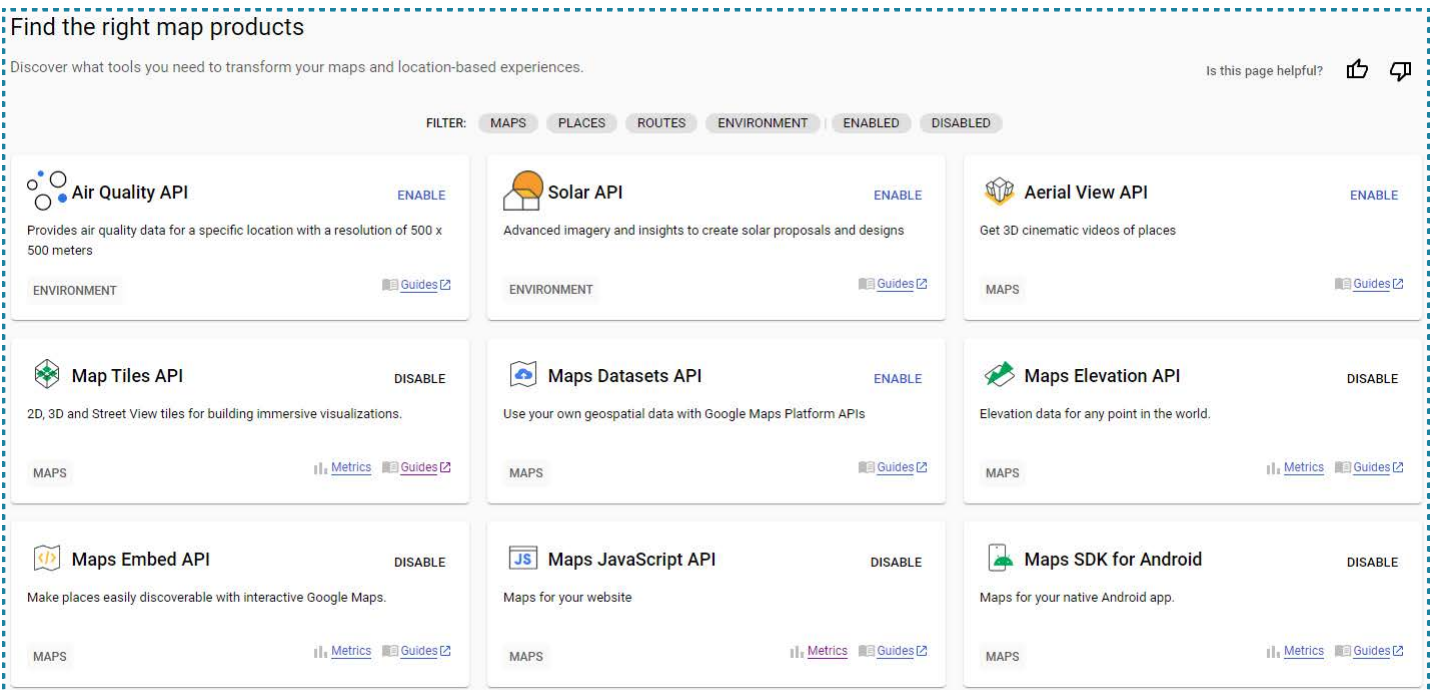
Figure 5-36. Maps JavaScript API
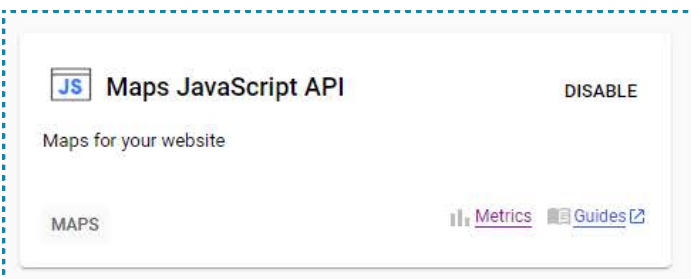
Then click on "enable" to activate Maps Javascript API, next navigate to Keys & Credentials to get the API key, which will be used in the environmental variable later on (see Figure 5-36).

In the Keys & Credentials section if there is already an API key, it should look like the Figure 5-37.
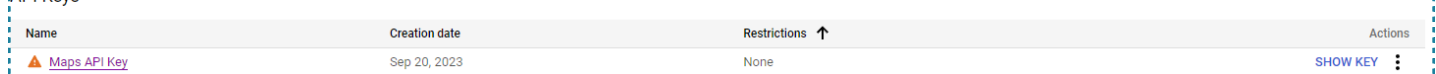
Figure 5-37. API keys

If that is the case, click on "SHOW KEY" to show the API key, copy the API key, and copy it somewhere the same since this key will be used later in the guide. If there is no API key available, Click

"CREATE CREDENTIALS" to create a new credential however, before clicking please make sure that the current selection is "Maps JavaScript API" as the figure below."
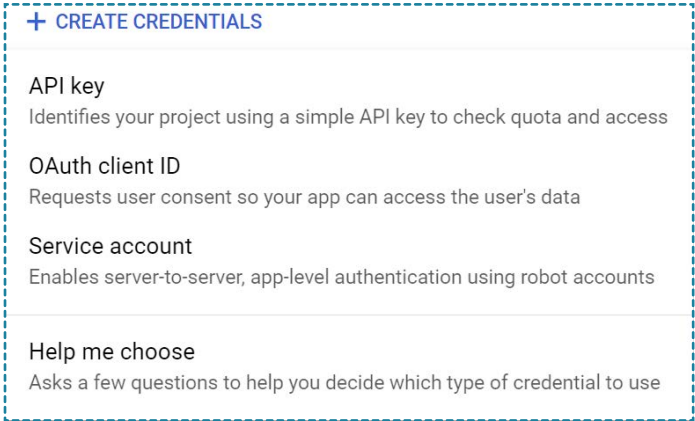
After clicking on "CREATE CREDENTIALS" select "API key" then the "API key created" window will appear (see Figure 5-38).

Figure 5-38. Credential Creation
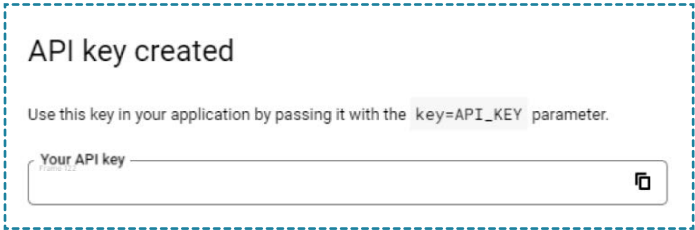
In this window "Your API key" is the API key which has to be stored somewhere safe until the environmental variable section (see Figure 5-39).

Figure 5-39. API key Creation
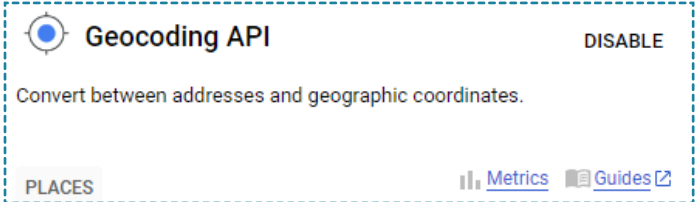
After creating this key, enable "Geo coding" APIs as well (see Figure 5-40). This will be used to convert the user input address to coordinates.

Figure 5-40. Geocoding API

Deploy with Render.com.
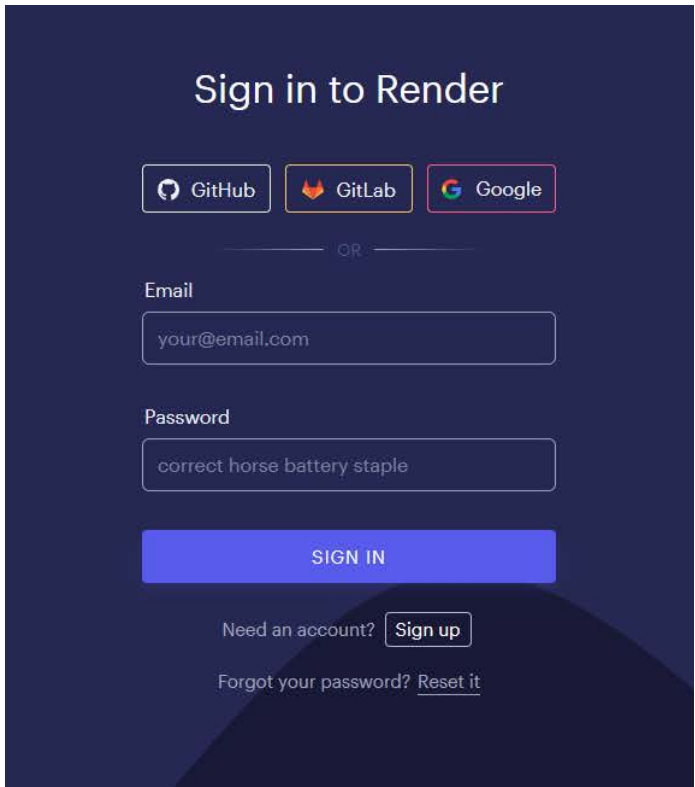
After accessing render.com, choose the sign-in or sign-up method to create a render account (see Figure 5-41).

Figure 5-41. Render.com signup

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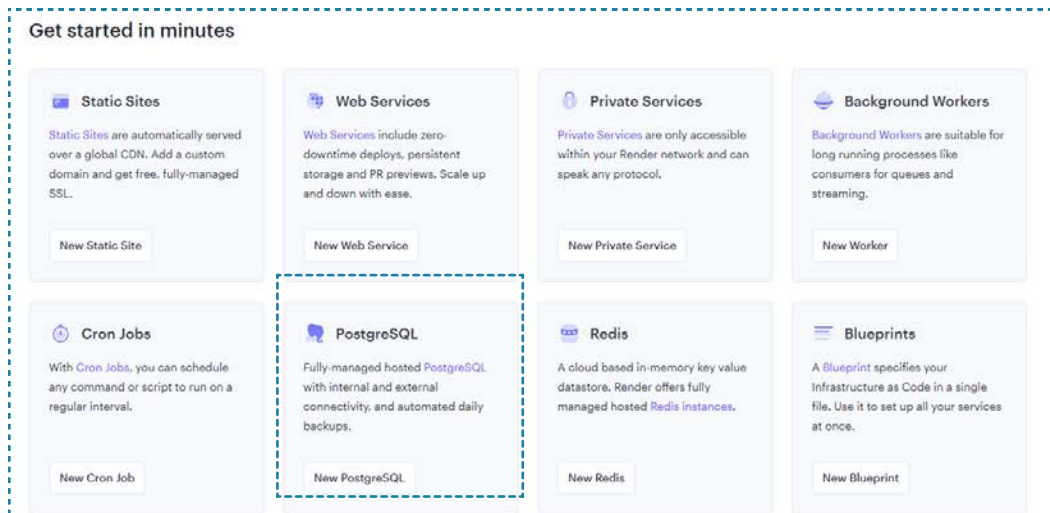
Figure 5-42. Render.com start

After the end of the account creation, the screen should look like the figure above. Click on "PostgreSQL" (see Figure 5-42).

PostgreSQL setting-Render
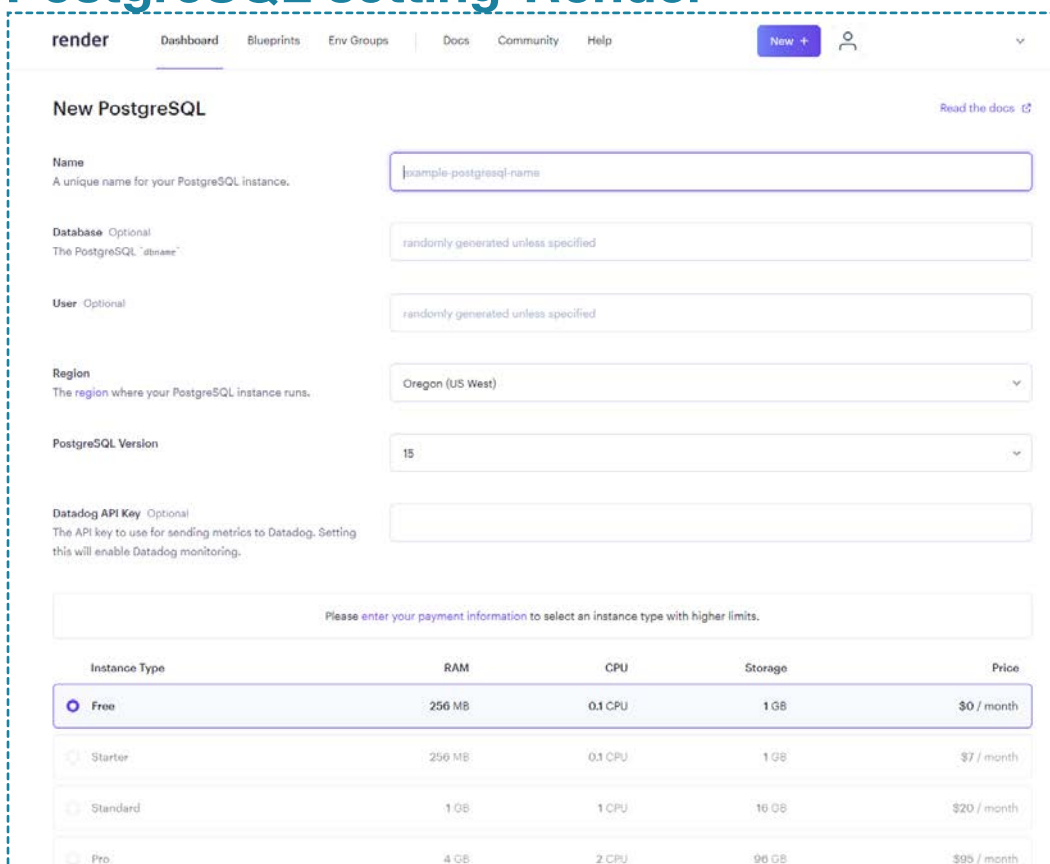
Figure 5-43. Render.com SQL

After Clicking PostgreSQL, Fill in this information, Name of the database, then on "Region setting," choose the closest region (in the case of EU, choose Frankfurt), and For version, choose "15"(default).
After filling in the above information, click "create database" to finish this process (see Figure 5-43).
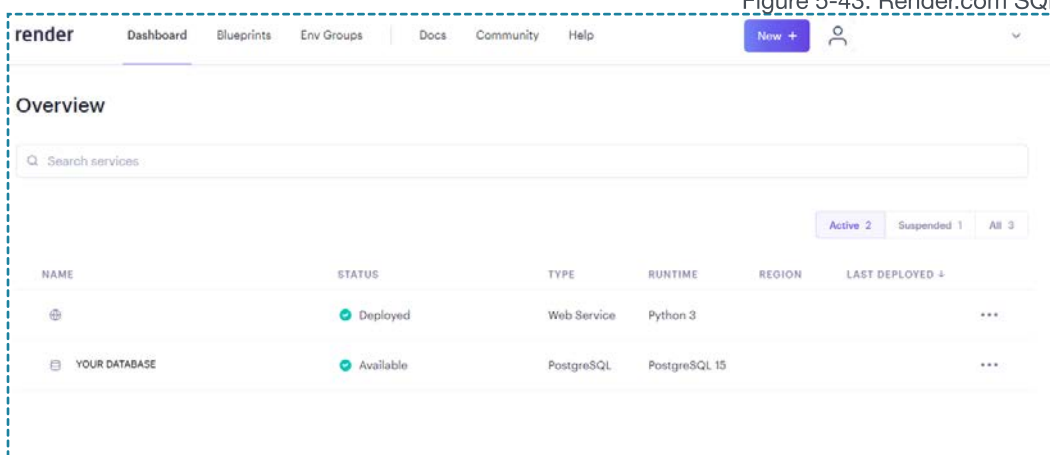
Figure 5-44. Render.com overview

After creating a database, the dashboard of render should look like the figure above. then click on the database to see specific information in the database (see Figure 5-44).
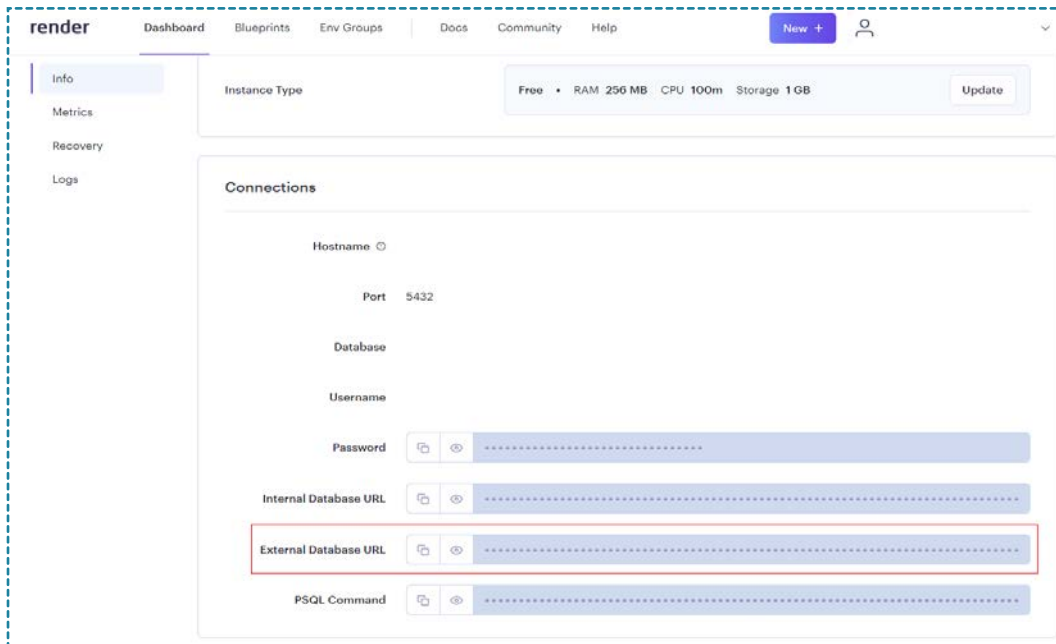
As shown in the Figure 5-46 In the info tab of the database menu, scroll down to find the "Connections" section and copy "External Database URL.

Figure 5-46. Render.com SQL info
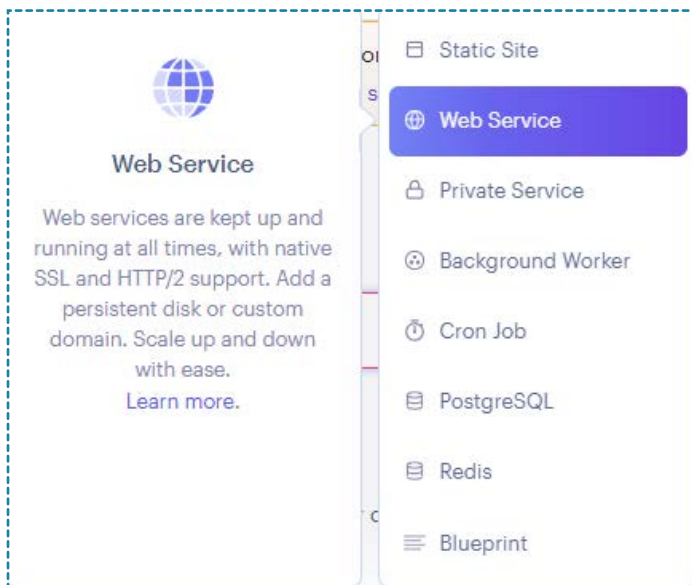
Figure 5-47. Render.com Web Service

Then press [New +] nd click on "Web Service." (see Figure 5-47)
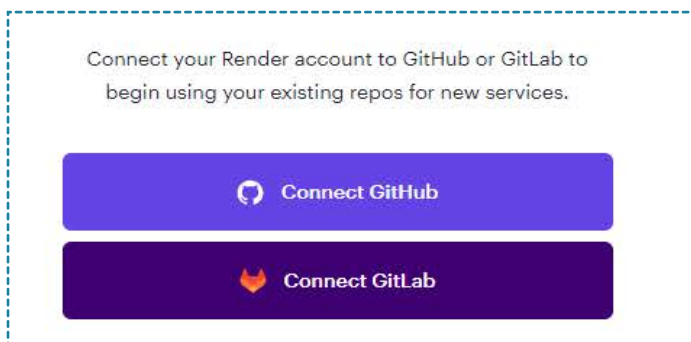
Figure 5-48. Render.com GitHub connection

Click on Connect GitHub (see Figure 5-48).

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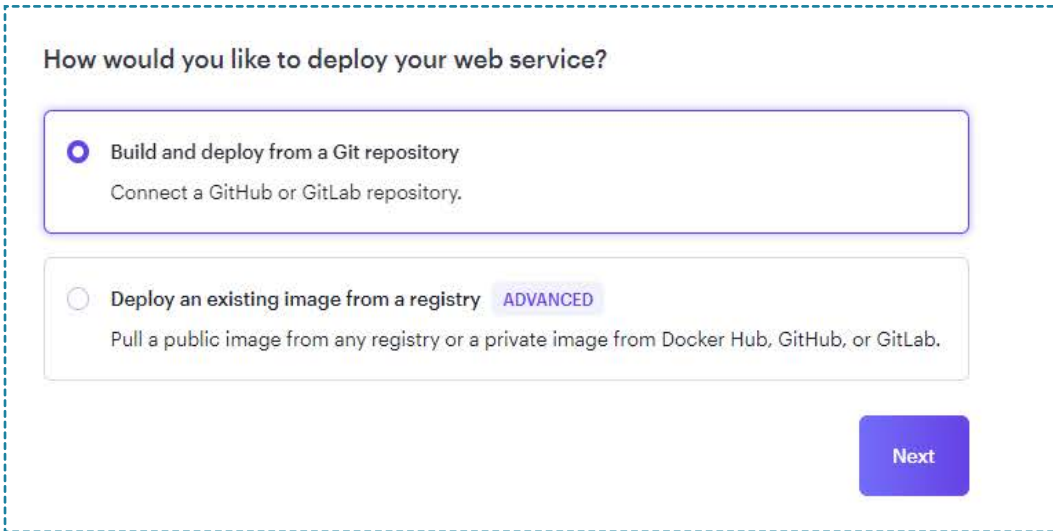
Figure 5-49. Render.com deploy setting

Then, choose build and deploy from the Git repository (see Figure 5-49).
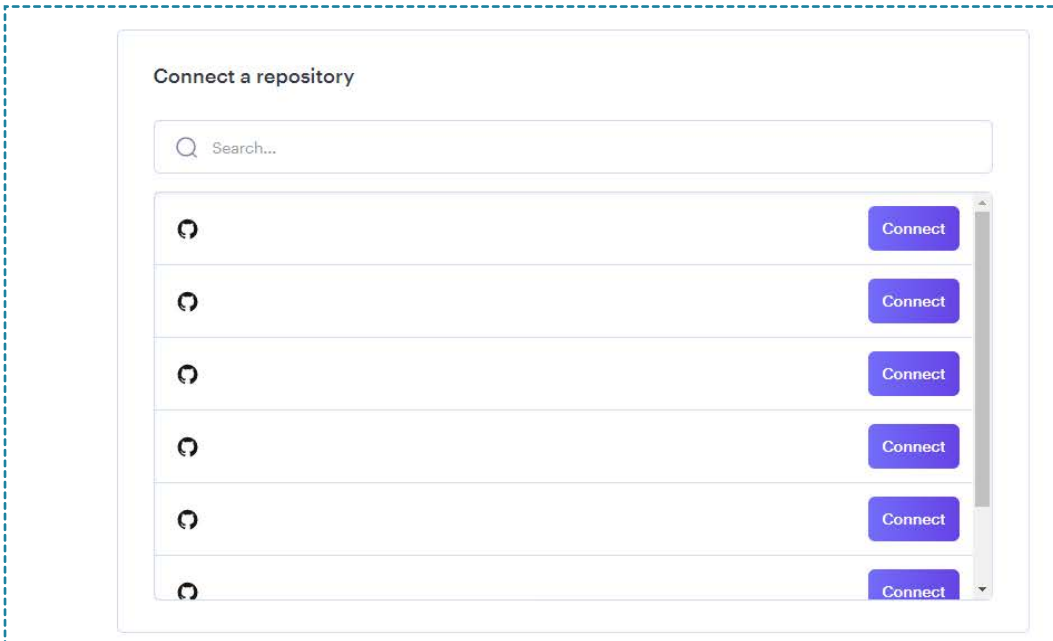
Figure 5-50. Render.com repository connection

Then, choose the repository forked before by clicking "Connect." (see Figure 5-50).
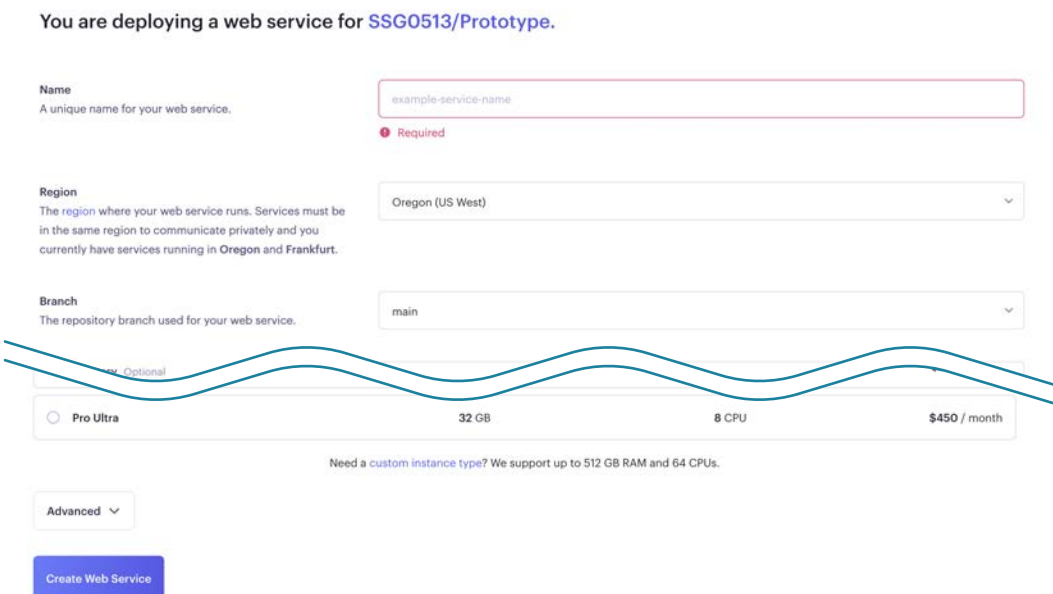
Figure 5-51. Render.com deploy

After clicking connect, an initial setting window will appear, and Type website's name(this will be the name of the platform) . Another required part is the start command and type "gunicorn app:app." Then click "Advanced" and look for "add secret file." (see Figure 5-51).

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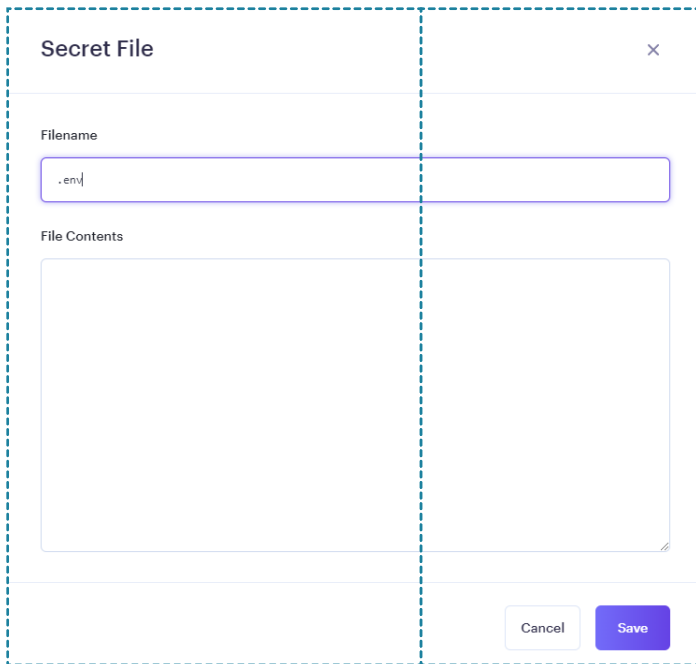
Figure 5-52. Render.com secret file

Click on "add secret file" to add the ".env" file in order to store informations such as API key safely (see Figure 5-52).

The .env file contains environmental variables, which are the variables that must not be leaked or have to be modified according to the city, such as the API key, name of the city, and coordinates of the city.
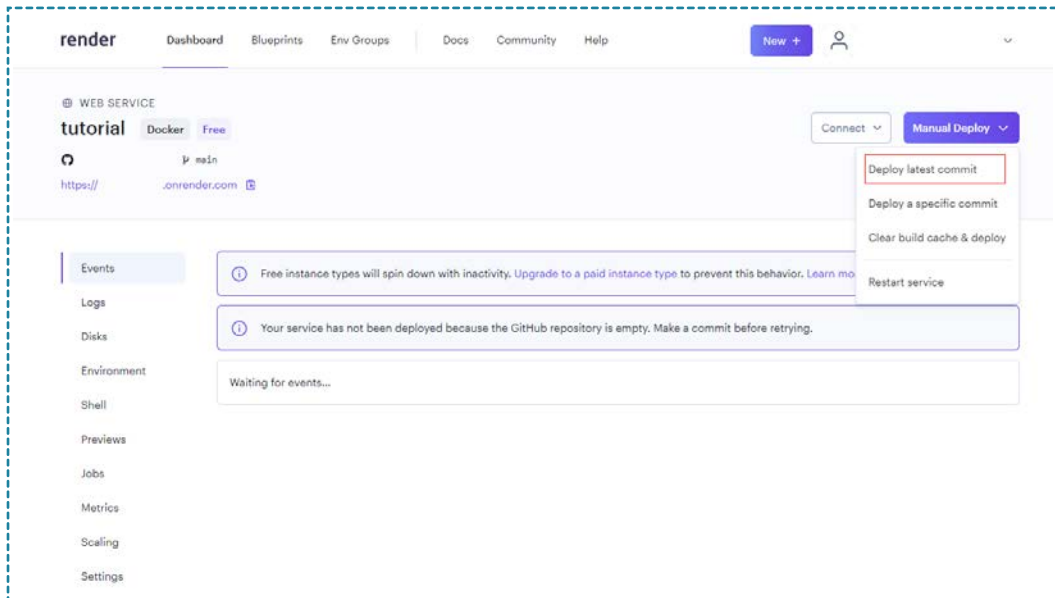
Figure 5-53. Render.com platform deploy

After filling in the secret file on the WEB SERVICE setting page, Look for "Manual Deploy" on the top right, then choose to Deploy the latest commit. (see Figure 5-53).
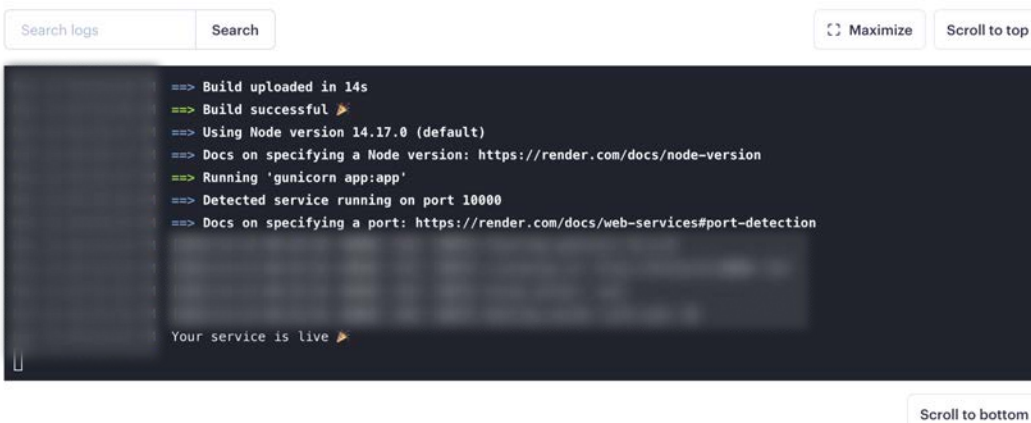
Figure 5-54. Render.com log

Then, once the Logs show "your service is now Live!" the platform is online and ready to use (see Figure 5-54).

PostgreSQL setting-Tableau

use Tableau Desktop Public Edition. If a "Tableau Desktop" account or "Tableau Server" account exists, setup is relatively simpler.
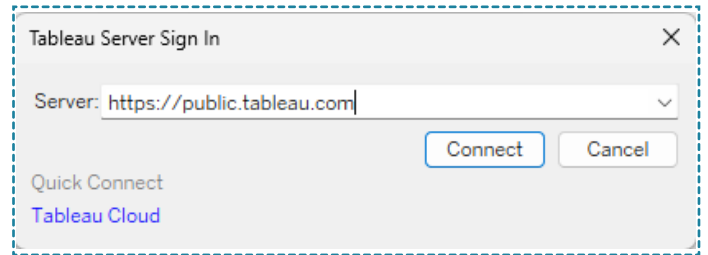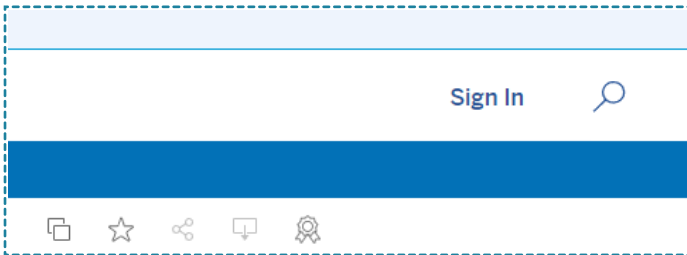
Figure 5-55. Tableau Sign in

Click on Make a Copy to create a copy of this dashboard. Then open the copied dashboard from Tableau Desktop via the Tableau Public Server(see Figure 5-55).

A GeoJson, shapefile, or any spatial file must be fed into Tableau. Those spatial files are generally available on the city's open data liberally
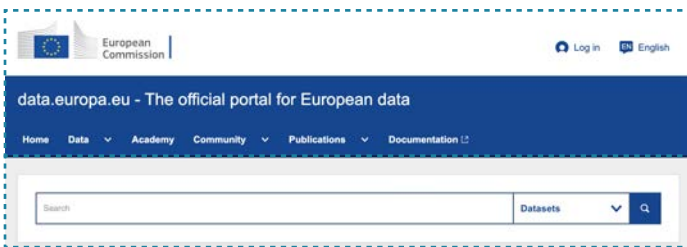
Figure 5-56. EU data portal

If there is difficulty finding specific data, The Official Portal For European Data can be a useful tool to find the desired shapefile (see Figure 5-56).
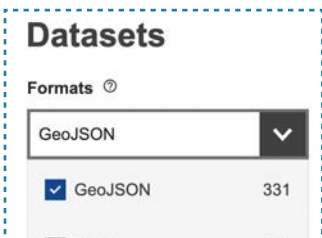
Figure 5-57. Filter

Figure 5-58. result

Once the portal page is opened, type the city name and click on the search button. Then, in the search result filter, the results datasets are based on the "Formats." in this case, GeoJSON is ideal since it is usually the point data or shapefile (see Figure 5-57). After finding a suitable result,

click Preview to check if the data is shapefile, not points. Finally, check the license to see if it has to be credited and download the file to the designated directly (see Figure 5-58).
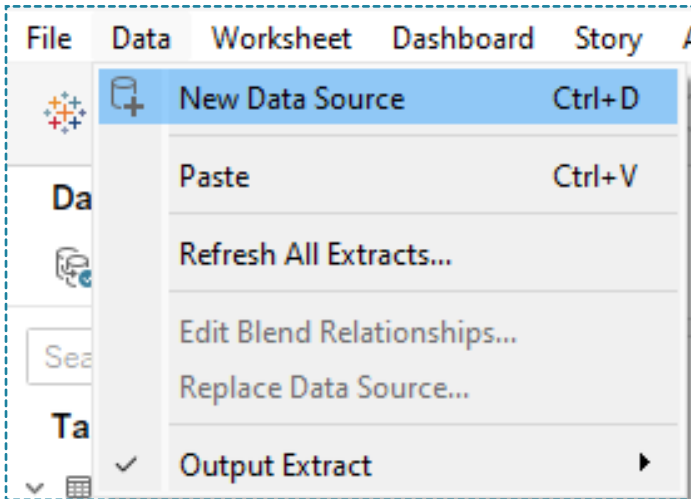
Figure 5-59. New data source
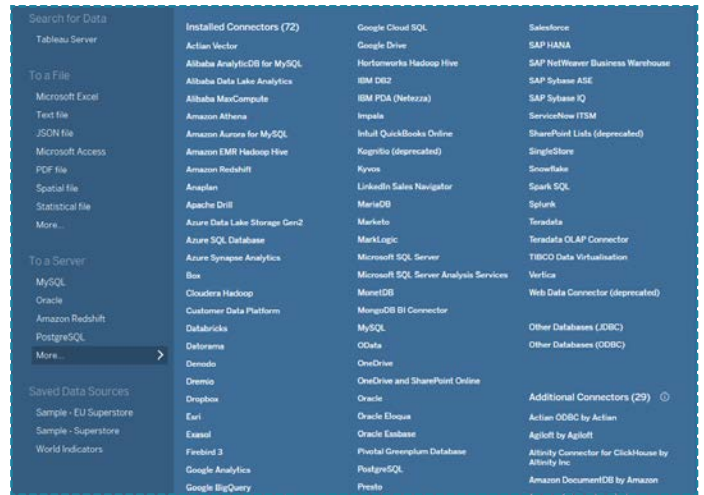
Figure 5-60. search for data

After downloading the spatial data go back to Tableau Desktop and click "New Data Source" (see Figure 5-59) then choose spatial data in the selection (see Figure 5-60).

Figure 5-61. data table

In this example, the GeoJson data has been downloaded through The official portal for European data (see Figure 5-61). At this point, some data can be modified according to the administrator's needs, such as specific names of columns or data inside.

*"District" always has to be defined

In this case, the Municipio column is equivalent to "District" in the SQL database. To modify the name right-click on the Municipio header.

Figure 5-62. rename data

Then, click on "Rename" to change "District" from "Municipio".
After the renaming, click "#" to change the data type to "string".
If the header looks like the Figure 5-62, data adjustment is complete.

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Figure 5-63. data connection
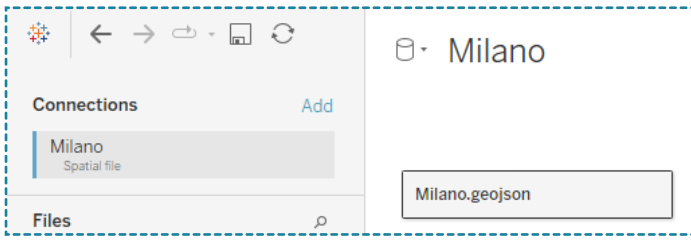
Figure 5-64. data source connection

The graph of data source relation should be as shown in the Figure 5-63. Now, on the left part "Add" next to "Connections" click on "Add" to open the Data source connection menu (see Figure 5-64).On this window Click on PostgreSQL.
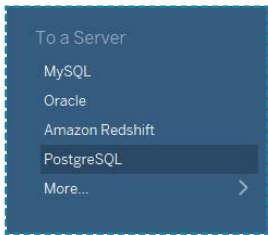
Then click on "Data Source" to connect to your PostgreSQL to let Tableau access to the database.

Figure 5-65. SQL connection
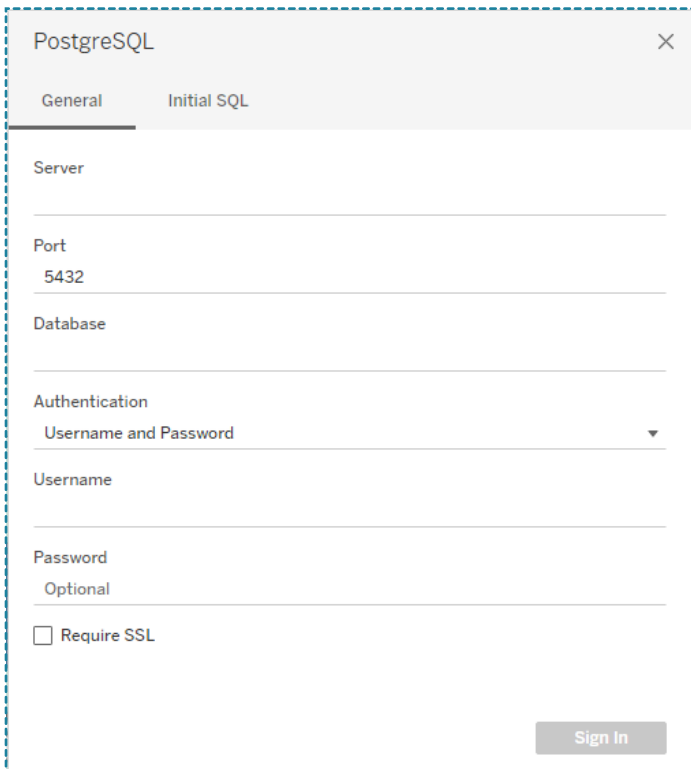
Figure 5-66. connection view

As shown in the Figure 5-65, for the Server, Type in the "external database url"
The port will stay as "5432" unless there is a change in the Render.com database setting.
The rest of the information can be found on the Render.com SQL setting page, especially in the connection view(see Figure 5-66). Then click on Sign in.

"Hostname" is the "Server" in the Tableau setting, the rest of the part syncs with the Tableau setting such as "Database." "Username" and "Password"

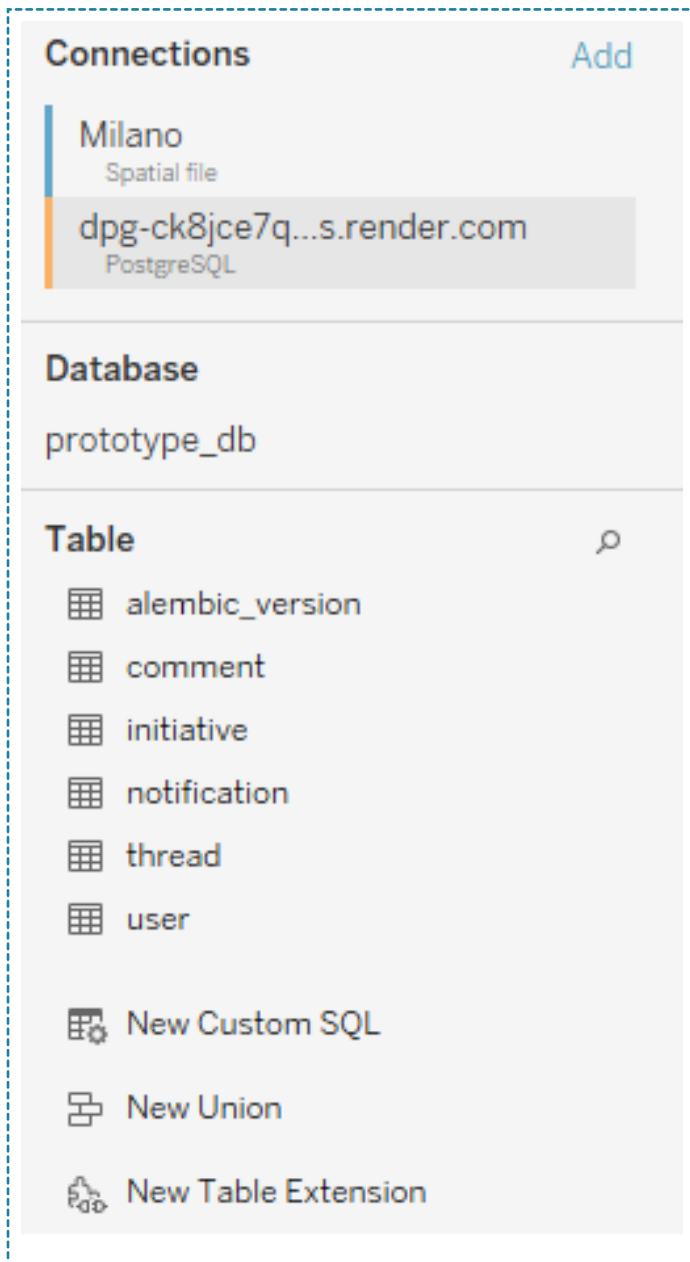After the successful data connection with SQL, the left panel should look like the Figure 5-67.
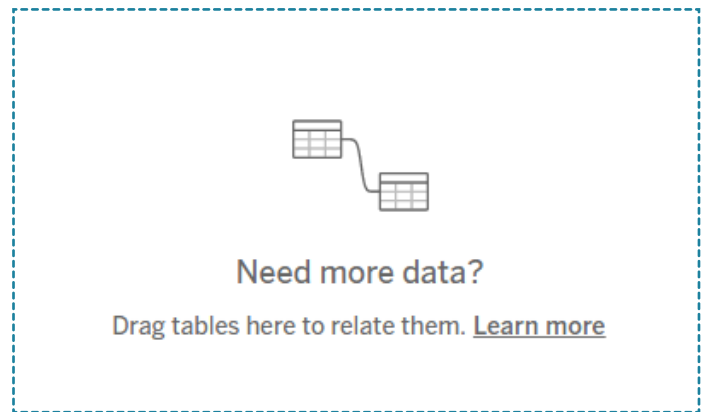

Figure 5-67. data connection

Figure 5-68. data relation

The Orange one written PostgreSQL below the server name
is the database just added. 2 sections below, in the "Table"
section, look for "initiative."
This has to establish a relationship with the spatial data to
create an interactive link between these 2 files.
To establish a relationship, "initiative" has to be dragged and
dropped onto the section with "Need more data?" writing is
on (see Figure 5-68).

After dropping "initiative," a relationship line will be created and should look like the Figure 5-69.

Figure 5-69. data relation

To solve this error, we must specify what can be connected in the relationship panel and select the proper connection with "initiative."
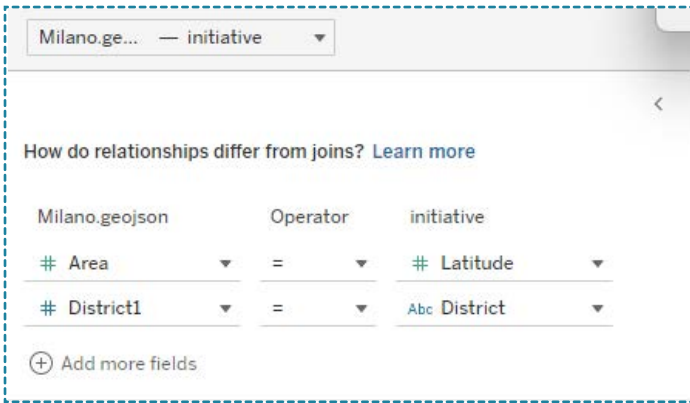
Figure 5-70. data relationship

Make sure the data type is aligned with each other unless it will cause an issue in the relationship of data.
If the Figure 5-70 has the wrong data types, one on the left is "whole number," and one on the right is "string." These 2 values both have to be the same value type to prevent this kind of error, Environmental variables can fix this.
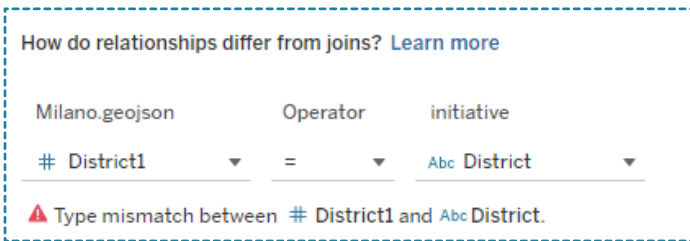

Figure 5-71. data relationship

If the relationship can not be established due to its datatype mismatch, even though following the steps above carefully, visit the Troubleshoot section at the end of this document (see Figure 5-71).
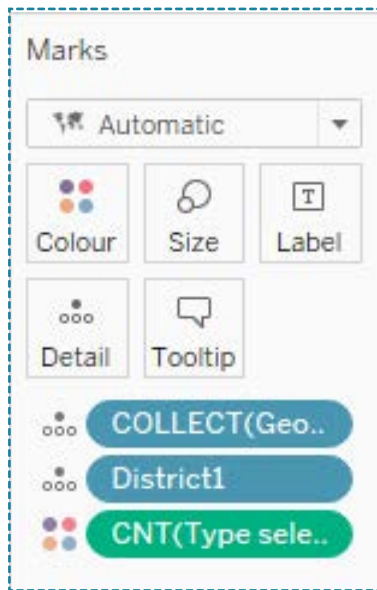

Figure 5-72. data table

After adjusting the data table, navigate to "sheet3" and look for "Geometry" in the data table, then remove all elements(COLLECTION(Geometry), (District1) in the Mark tab, this would change the placeholder map view to the custom map view.
If all those dashboards are functioning as they should be, then it is the end of the database adjustment of Tableau (see Figure 5-72).
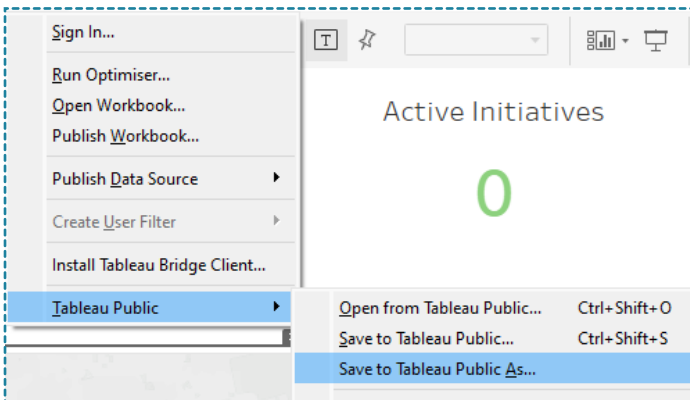

Figure 5-73. save

To save this dashboard as a Tableau public board, Click "Server/Tableau Public/Save to Tableau Public As…) and then save it as any preferred name (see Figure 5-73).
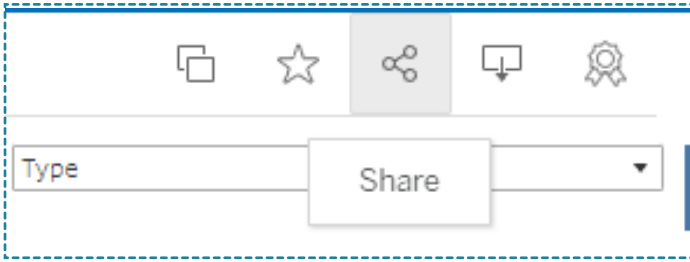
Figure 5-74. share

Then, once completed, Tableau Public will open on the default browser. On the page, click on "Share" shown as the Figure 5-74.
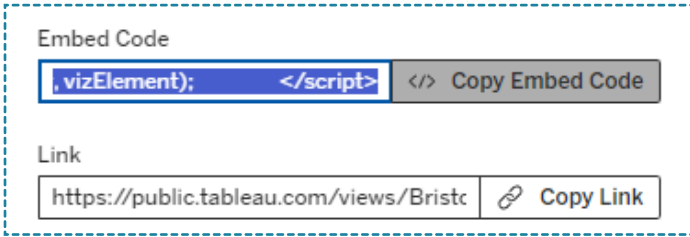

Figure 5-75. embedding

Then in the share menu, click on the "</> Copy Embed Code" to get the embed code (see Figure 5-75).

After copying the embed code, move to the environment variable in render, then paste it.
The embed code should look like the code below.

```
"<div class='tableauPlaceholder' id='viz1697398662794' style='position: relative'><noscript><a href='#'><img
alt='Master2 (2) '
src='https:&#47;&#47;public.tableau.com&#47;static&#47;images&#47;Br&#47;Bristol_16968408303960&#47;Master22
&#47;1_rss.
png' style='border: none' /></a></noscript><object class='tableauViz' style='display:none;'><param
name='host_url'
value='https%3A%2F%2Fpublic.tableau.com%2F' /> <param name='embed_code_version' value='3' /> <param
name='site_root'
value='' /><param name='name' value='Bristol_16968408303960&#47;Master22' /><param name='tabs' value='no' /
><param
name='toolbar' value='yes' /><param name='static_image'
value='https:&#47;&#47;public.tableau.com&#47;static&#47;images&#47;Br&#47;Bristol_16968408303960&#47;Master
22&#47;1.p
ng' /> <param name='animate_transition' value='yes' /><param name='display_static_image' value='yes' /
><param
name='display_spinner' value='yes' /><param name='display_overlay' value='yes' /><param name='display_count'
value='yes'
/><param name='language' value='en-US' /></object></div> <script type='text/javascript'> var divElement =
document.getElementById('viz1697398662794'); var vizElement = divElement.getElementsByTagName('object')[0];
if ( divElement.offsetWidth > 800 ) {
vizElement.style.width='100%';vizElement.style.height=(divElement.offsetWidth*0.75)+'px';}
else if ( divElement.offsetWidth > 500 ) {
vizElement.style.width='100%';vizElement.style.height=(divElement.offsetWidth*0.75)+'px';} else {
vizElement.style.width='100%';vizElement.style.height='2127px';} var scriptElement =
document.createElement('script');
scriptElement.src = 'https://public.tableau.com/javascripts/api/viz_v1.js';
vizElement.parentNode.insertBefore(scriptElement, vizElement); </script>"
```

Some part of this code has to be modified in the environmental variable. In the above code, all the red parts have to be replaced with "100%" and then the Tableau setup is completed.

Set up with Render.com is completed
Custom set up and Trouble shooting follows

Custom setup (Advanced)

First, this platform used SQL accessible database to store all the information treated within the server. what is an SQL database, and how to implement it? SQL stands for Structure Query Language, a language for manipulating relational databases. A relational database is a type of database that can organize data in rows and columns.
In this platform, the server uses SQLAlchemy to handle the database. The database must be relational and can be manipulated with SQL. Databases that can be used are MySQL., MariaDB., Oracle., PostgreSQL., MSSQL., and SQLite. And more.

*PostgreSQL has been tested with this platform, and it is recommended to use it unless there are specific technical reasons behind it. Guide for local PostgreSQL custom installation, *advanced.

1. Installation
PostgreSQL is available on various platforms

- Windows: Download the installer from the official website

- Mac: Download from the official website or use homebrew

  "`brew install postgresql`"

- Linux: There are official package managers in most of the distributions.

2. Launch

- Windows: It will be activated automatically

- Mac (Homebrew):
  "`brew services start postgresql`"

- Linux: Depending on the system, but generally the following command

Clone or Fork project from GitHub

As the quick setup guide explains, Fork or clone repository to create a copy of the digital mapping platform data.
After cloning the repository to the local file system, set up the required system to run the server in the local environment.

Local environment setup

This project uses Flask for Python3 to run a server. The first installation of Python is required if it is not installed on the local machine. The Python version used in this project is Python 3.12.2, and after the installation of Python, in the terminal or command prompt, run "requirement.txt" to installed all the liberally needed to run this program.

The content of the requirement text is below

```
Flask==2.2.5
Flask-Migrate==4.0.5
requests==2.31.0
pandas==2.1.1
psycopg2==2.9.7
gunicorn==21.2.0
googlemaps==4.10.0
SQLAlchemy==2.0.21
Flask-SQLAlchemy==3.1.1
Flask-login==0.6.2
Werkzeug==2.2.2
flask-wtf==1.2.1
plotly==5.17.0
networkx==3.1
```

To install all the libraries in the requirement text execute "pip install -r requirements.txt" in the terminal or command prompt. *Make sure that you're in the root directory of the project file before executing the command

Troubleshoot:

Can not align data type in Tableau

When creating a relationship between 2 data tables in Tableau, sometimes it won't allow the user to change correctly. There are 2 different ways that this issue can be solved.
1. Use Tableau Prep Builder (This requires Tableau Prep Builder)
2. Use Converter tool

1:Tableau Prep Builder.

Figure 5-76. connect data

First, Click on "Connect to Data."(see Figure 5-76). Then, choose spatial data in the file selection (see Figure 5-77).
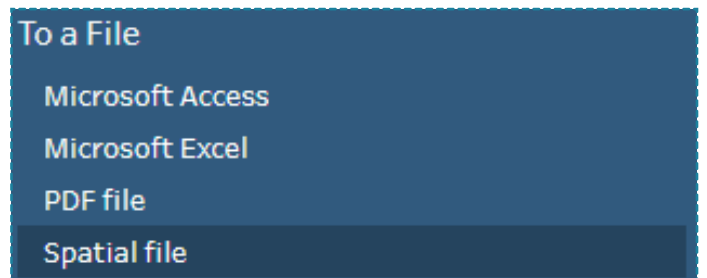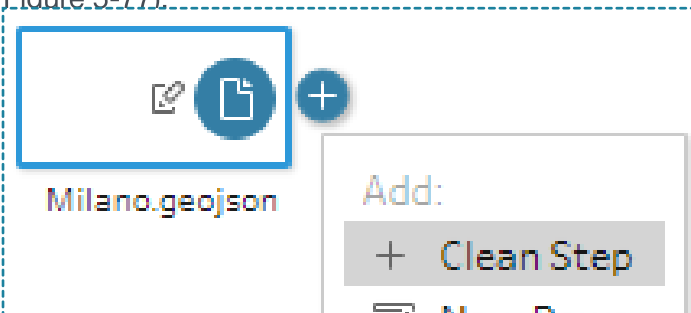

Figure 5-77. file selection

Figure 5-78. clean up

Once the file is connected, Click on the "+" icon to add, then select "Clean Step" for the cleanup process(see Figure 5-78).
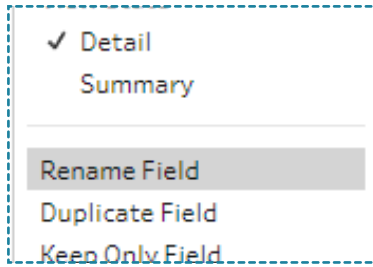
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Figure 5-79. rename field

Then Right-click on the header of the District equivalent data field, and select Rename field to rename as "District (see Figure 5-79).
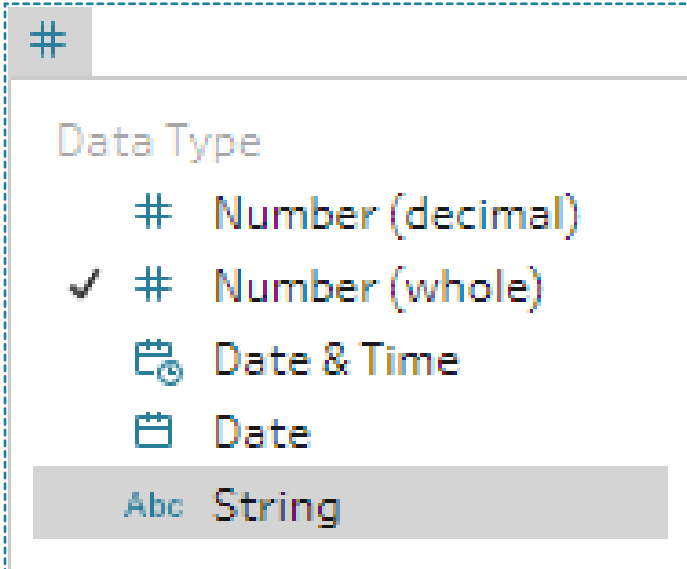
Figure 5-80. change data type

Then, Click on the data type(in this case, "#") to change the data type to String as the figure on the left (see Figure 5-80).

Figure 5-81. output

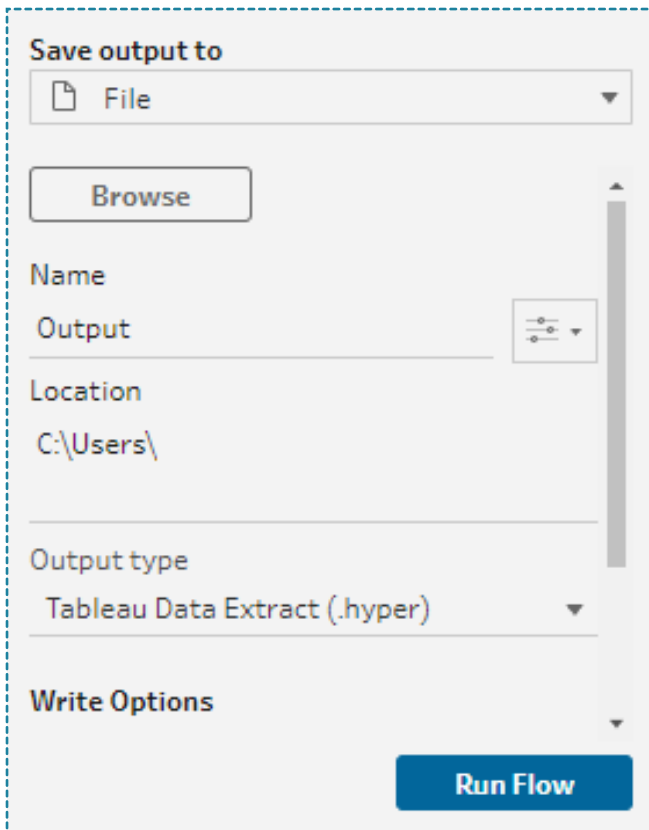Then click on the "+" sign in the "clean setup" node then look for "Output"(see Figure 5-81).

Figure 5-82. output setup

After adding the "Output" node, the output setup should be shown as the Figure 5-81.
Click on "Browse" to set the location where this file will be saved (Recommend: Set to same folder where the original spatial data is saved)
Then set the file name (this name will be shown on the Tableau desktop; make the name distinguishable)
*Output can stay as "File" and Output type as ".hyper" as default.
After finishing the above process, click "Run Flow". When it is done, the new file should appear in the folder.

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Import to Tableau Desktop:
Go back to the Tableau desktop, add new data by
clicking "Add" in the data Connection, and
choose more to open the ".hyper" file just created in
the previous section (see Figure 5-83).
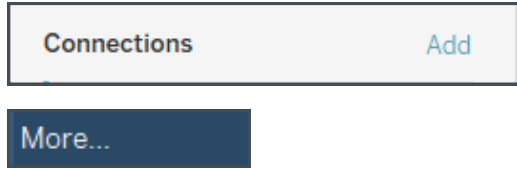
Connections	Add

More...

Figure 5-83. data connection

Check if all the change made in Tableau Prep is
present in the newly imported data.
Drag and drop "initiative" from SQL (see Figure 5-84).

Figure 5-84. data import

In the relationship setting, set "District" to "District"
with an operator "=" (see Figure 5-85).

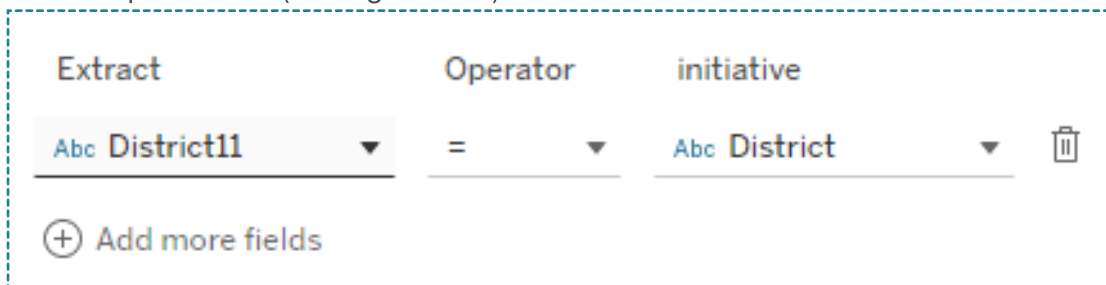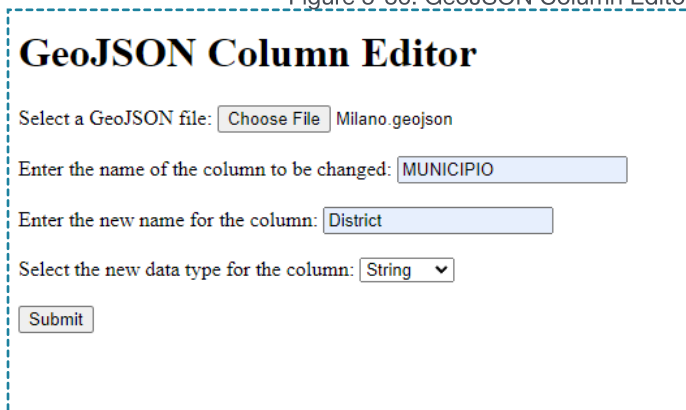Now these 2 data tables are successfully connected,
Go back to Tableau Setup to continue.

Figure 5-85. data relationship

2. Use converter *this converter web app is an early version.

Access the following link: https://
geojsoneditor.onrender.com

Figure 5-86. GeoJSON Column Editor

GeoJSON Column Editor

Select a GeoJSON file: [Choose File] Milano.geojson

Enter the name of the column to be changed: MUNICIPIO

Enter the new name for the column: District

Select the new data type for the column: String ▾

[Submit]

The Column Editor (see Figure 5-86).
Click on "Choose File" and upload the GeoJson file
that needs to be modified.
Then, enter the column name that has to be
modified (in this case, "MUNICIPIO")
Then, enter the new name of the column.
Select the column's data type to the required type (
in this case, "String").
*This is case-sensitive; make sure to write those
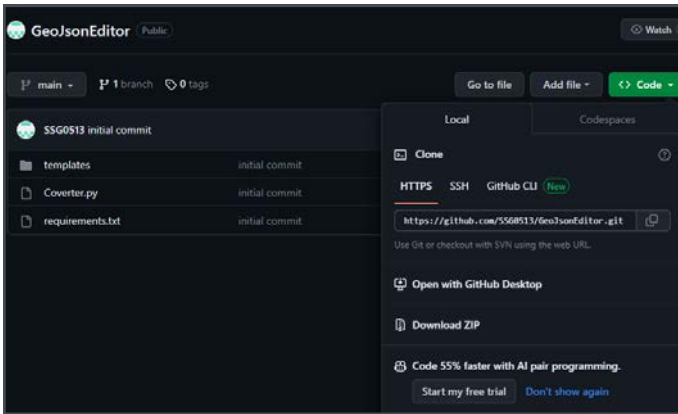names EXACTLY the same as the original.

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Figure 5-87. GitHub

After finishing the above process, click "Submit," the new data download will automatically start. This open-source program can be downloaded and modified freely from Github. (see Figure 5-87).

Click on "Download ZIP" to download or clone the repository.

END OF SETUP GUIDE

6

IMPLICATION AND CONCLUSION

6.1 Implications for theory and for practice

This research aimed to design a prototype of a digital mapping platform to be utilized in the NZC scenario. The prototype was developed in a way that seamlessly integrates with the context of NZC; the research started by reviewing existing studies regarding digital mapping platforms, the Social Innovation Ecosystem, and relevant fields, and analysis of case studies, which are Digital Mapping platforms.

This prototype can serve as a starting point for the mapping platform development in NZC. The prototype can be distributed to anyone to test and function as a digital mapping platform. The municipal administrator can see SIE actors on the map that provides the geographical location of initiatives and supporters in the Cartographical section. Moreover, this prototype encourages initiatives and supporters to upload themselves autonomously, which tackles the limits mentioned by Pelka and Terstriep(2016) and later covered by Andion et al.(2020) in their study. That is the need for more active involvement of the stakeholders being mapped. This prototype goes beyond the cartography and aims to seamlessly integrate into communication channels to interact with other mapping actors by creating a thread-like interactive forum section. Furthermore, the statistics section provides interactive statistics visualization of the initiative and supporters and network in the city, as Moritz et al.(2018) suggested the usefulness of representation control to allow users to quickly understand the complex graphical representation of SIEs in the city. Likewise, while Judith Terstripet et al.(2020) suggested four important assets to configure SIEs with the context of RIS, one of the assets was integrating social innovation into global policy to create global pipelines. This prototype approaches this by enabling Initiatives to upload freely to the platform, and in the case of NZC integration, this will empower initiatives to have a global pipeline freely.

Overall, this study contributes to the city's obtaining higher dynamics in its SIEs. At the same time, city administrators can leverage the insights from the prototype to directly contribute to taking more informed action to support and promote initiatives within SIEs in the city that are crucial to the carbon neutrality.

6.2 Limitations of the research and directions for future research

During the development of the prototype, due to technical difficulties, data analysis needed to be more sophisticated as a commercial data analysis application. The use of Tableau Public gives several advantages in the early stage of development, such as quick data visualization change from one to another to seek more efficient options. Since it is a separate system from the rest of the platform, this will not affect or create bugs when changed. However, the visualization it can provide is still limited to the application.

Likewise, Forum page message functions were still only working in development with core functions. Also, from the user experience perspective, distribution methods are still scattered to different services such as GitHub then Tableau accounts are required; thus, to have a smoother experience, sign up with third-party accounts, such as Google or Facebook, in case the platform is integrated to NZC platform it should let user login with a single account. Moreover, not only the login method to set up the platform but also lighter, more manual approaches can still be explored, such as excluding non-mapping functions from the platform to have a more straightforward setup or use of already made mapping service that support collaborative functionalities. However, the problem is that those will not have statistical reports or functions to evaluate the newly mapped initiative's legitimacy; hence, some features will have to be considered and overcome to compensate for those challenges.

At this stage, no test with potential users has been made as a part of field research. However, it is essential to have feedback from real users to identify further needs and lacking elements in the platform. Moreover, focus groups to understand the collective behavior of city administrators and Social Innovation initiatives alongside roleplaying of the platform to identify and expose the potential frustration between those actors.

For future work, after iterations of testing and roleplaying to solidify the final form of the platform and launch, regional and global scale analysis, incorporate deep learning technology to identify hidden patterns of SIEs in cities to empower stakeholders by feeding accumulated information into the platform. In that way, more users give more data to train the models so that more patterns can be detected and used to find hidden needs; however, hardware and privacy limitations can be overcome to implement such features.

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d=7013y000002aJhmAAE&utm_campaign=Prospect ing-CORE-ALL-ALL-ALL-ALL&utm_medium=Paid+Search&utm_source=Goog le+Search&utm_campaign_id=2017049&utm_langua ge=EN&utm_country=SoEUR-IT&adgroup=&adused=STAT&creative=&gclid=Cj0K CQiA6vaqBhCbARIsACF9M6lA_5XQ8XVD-1_wgTU0 PKRScYmQkGOEPfsqF07j326tvd-VS6ulGogaAk2cEALw_wcB&gclsrc=aw.ds

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