Development of a WebGIS Open Platform to Support Community Resilience

DEVELOPMENT OF A WEBGIS OPEN PLATFORM TO SUPPORT COMMUNITY RESILIENCE

Francesca Abastante [1], Francesco Fiermonte[2]

Abstract
The aim of this paper is to illustrate the construction process of a WebGIS platform aimed at supporting the planning of adaptation strategies for the municipality of Chiomonte (Italy). The WebGIS platform here illustrated is one of the results of two projects named *Chiomonte_2025* and *Chiomonte_SMART*, promoted by the Public Administration (PA) of Chiomonte and the ImprenD'Oc association (visitchiomonte.it) and financed by *Compagnia di San Paolo* and *Comitati Territoriali IREN*. The projects aimed at identifying alternative territorial strategies considering a controversial decision-making process characterized by a high level of uncertainty and guided following a disruptive and divisive event: the realization of the New High Speed Train Line (NHSTL) connecting Turin (Italy) and Lion (France).
The Geographic Information Systems (GIS) are recognized as being key players in the managing of complex and multidimensional decision-making processes since they are able to get the different stakeholders on the same page, visualize on the territory the different alternative strategies and considering both quantitative and qualitative data. The WebGIS platform developed goes in the direction of "sharing information" being conceived as a knowledge base that would provide the definition of alternative actions that may be conflictual. Future development of the work will provide the updating of the platform so to integrate Multicriteria Analyses (MCDA, Abastante et al., 2017; Fregonese et al., 2020) useful to structure real-time decision processes, identify the most important decision criteria to guide the definition of operative projects, identify the impacts of each proposed action and disclose a priority ranking of the different projects.

Keywords: Geographic Information System (GIS), Decision-making processes, community resilience, Web platform, one data

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1. Introduction

"*Urban resilience refers to the ability of an urban system […] to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity*" (Merrow et al., 2016)

The concept of "spatial resilience" is increasingly used in the debate on innovation in models of management, care and maintenance of the social and natural environment and projects of transformation, regeneration, and development of the territory (Abastante et al., 2020). As highlighted by Brunetta and Caldarice (2020) the communities play a key role in the definition of the spatial resilience that can be declined through four types of systems' capabilities: resource development (diversity), communication, institutional competence and social capital (sense of belonging to a community). In this sense, "spatial resilience" depends to the ability of a community (understood as citizens and institutions) of proposing initiatives able to "*positively react to shocks or persistent adverse factors*" (Brunetta et al., 2019).

The concept of "spatial resilience" can be framed into the well-known one of Circular Economy (CE – EllenMcArthur foundation, 2017; European Commission 2020; Lami et al., 2021) since it is demonstrated how the CE increases social-ecological resilience (Van Fan et al., 2019).

Several CE trends can increase resilience being able to implement the diversity of the stock, sharing resources, decentralise activities and improving the participation of the communities.

Those concepts effectively allude to and evokes the change in approach deemed necessary to continue to ensure prospects for sustainability affecting the living environments of communities.

However, when it comes to moving from the rhetorical dimensions of CE and resilience to the construction of projects (tools, solutions, actions), difficulties emerge especially in terms of decision-making processes (Colucci and Cottino, 2015).

The decision-making processes are often conflictual, characterized by the coexistence of multiple aspects and the presence of stakeholders who are the bearers of antithetical instances. Those characters make the sharing information process highly difficult (Huang et al. 2011; Lami et al., 2014; Abastante et al., 2017; Quaglio et al., 2021).

Geographic Information Systems (GIS) are recognized as being key players against those tasks being able to create a bridge toward a share understanding among the stakeholders involved in the decision process (Andrienko et al. 2007) being able to integrate different subsystems and databases.

The aim of the present paper is to illustrate the construction of a WebGIS platform (Lathrop et al., 2014; Randazzo et al., 2021) to support to the planning of resilient action and adaptation strategies for the municipality of Chiomonte (Italy). The platform was realized in the framework of two large projects named *Chiomonte_2025* and *Chiomonte_SMART*, promoted by the Public Administration

(PA) of Chiomonte and the ImprenD'Oc association (visitchiomonte.it) and financed by *Compagnia di San Paolo* and *Comitati Territoriali IREN*. The general aim of the two projects is to depict operative projects able to revitalize the territory following a disruptive event namely the construction of the New High Speed Train Line (HSTL) connecting Turin to Lyon (transpadana.org).
In particular, the DIST department of the Politecnico di Torino, to which the authors of this paper belong, has been called to participate in:

- Verification of the relevance of area-specific activities proposed by ImprenD'Oc in cooperation with different academic and territorial stakeholders (fur further development please refer to the report Chiomonte ImprenD'Oc 2016, 2018);
- Programming of a WebGIS platform containing available data related to 4 territorial development plans of Chiomonte and specific activities derived from previous studies conducted by ImprenD'Oc;
- Conducting proactive analysis in view of a future sustainable development of the municipality of Chiomonte. This step of the research is still ongoing and can not be disclosed.

In our opinion, the case study illustrated in the paper is a perfect example of a controverse decision-making process and a bottom-up response by a territory and a community that takes a resilient act to counter the effects of a potentially adverse event
The paper is organized as follows: next section provides an overall territorial framework describing both the Susa Valley and the municipality of Chiomonte. The projects *Chiomonte_2025* and *Chiomonte_SMART* are here presented; section 3 describes the needed step to construct the WebGIS platform while section 4 concludes the paper by reporting some future developments of the research.

2. Framing the case study territory

In order to properly understand the significance of the work carried out by the Politecnico di Torino research group in the definition of a WebGIS platform, it is first necessary to frame the territorial reality of the Susa Valley (Italy) in which the municipality of Chiomonte is located.

2.1 The Susa Valley (Italy)

The Susa Valley (Fig. *1*) is an Alpine valley of about 100,000 inhabitants in 39 municipalities. It is located in the north-west part of the Piedmont Region (Italy) and insisting partly on Italian territory and on French territory.

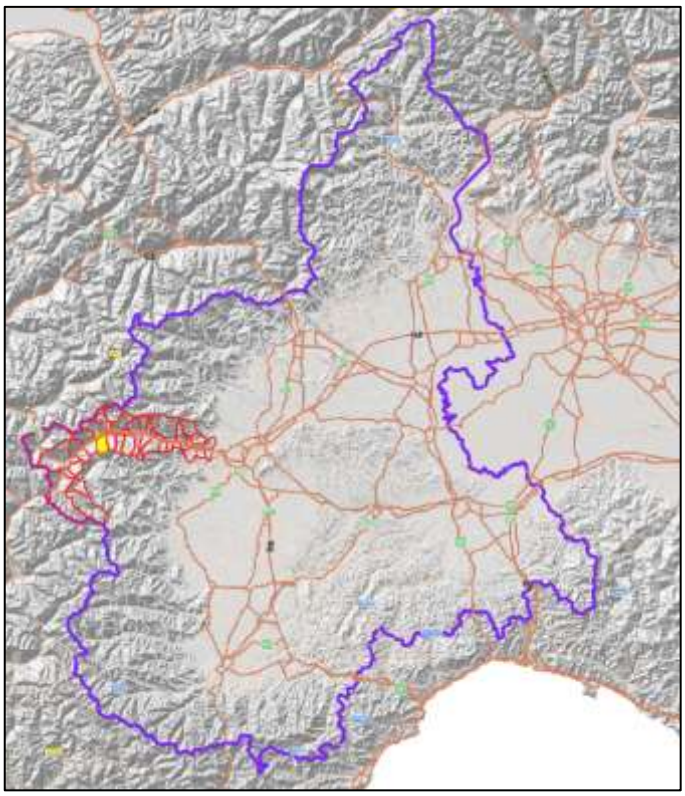

Fig. 1 Territorial frame (Source: own elaboration based on GIS data from Geoportale Regione Piemonte, 2021)

Many valleys on the Italian Alps are facing a radical change. The global economic crisis of 2008 has caused a necessary change in the habits of the population and in the conformation and conception of work. This has contributed to the exacerbation of migration flows towards the cities in search for new opportunities. The valleys of the Alps are therefore grappling with a progressive depopulation that has been going on for a decade (Bonato, 2021). A further element of complexity is linked to climate change and global warming. The economy of the valleys was in fact mainly driven by winter sports which, due to low snowfall, can be practiced only partially causing a lack of revenue.

The Susa Valley perfectly reflects this socio-economic frame, showing a further element of complexity. It is in fact at the center of a national and international debate that has been going on for 30 years concerning the decision-making process of the New High Speed Train Line (HSTL) connecting Turin to Lyon. Despite the strategic relevance for the Mediterranean TEN-T Corridor, this railway project has become the most disruptive example of antagonism to major works in recent decades in Italy (Algostino, 2008).

This is a case of a dispute to a major work derived from an "excess of decision-making" (Bobbio e Dansero, 2008): on the one hand, the project is considered fundamental for the economy; on the other, it is perceived as dangerous and invasive for the territory of the Susa Valley, as well as oversized and expensive. In this case, the excess of decision-making would seem to be determined by the inability of the promoters of the project to listen to the most controversial voices and thus define the general interest in front of public opinion (Fig. *2*).

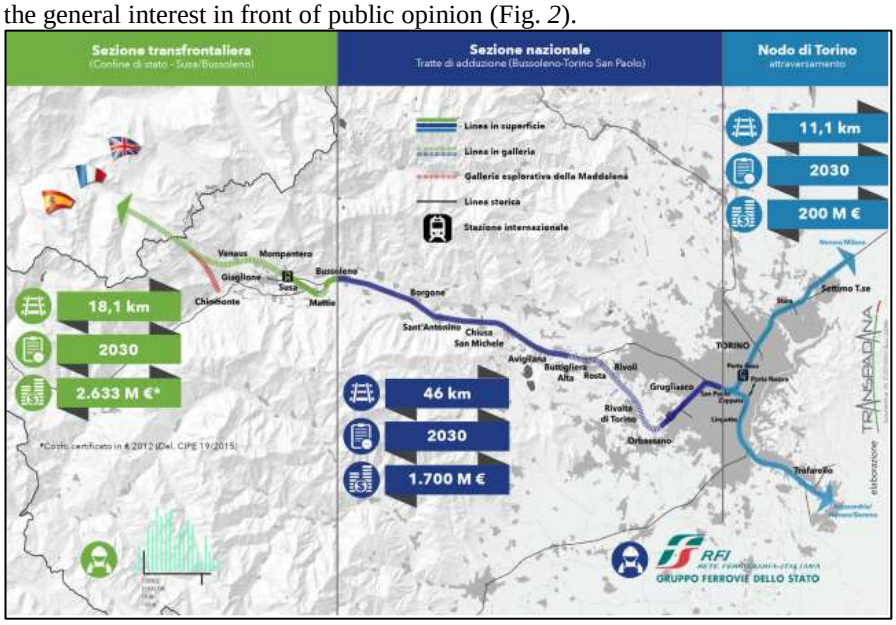

Fig. 2 HSTL Italian section (Source: own elaboration from Transpadana, 2018)

In spite of the long debates in different official and unofficial venues, the construction of the HSTL is slowly proceeding under the guidance of TELT S.A.S (telt-sas.com). The cross-border section of the line is completed as well as the construction of the geognostic tunnel aimed at exploring the mountain and located in the municipality of Chiomonte while feasibility studies are available for the national section and the Turin node.
In conclusion sometimes this project appears as a reality, but sometimes this project appears as an unknown and it is stopped by political conflicts or territorial associations of citizens that are against the project and started bottom-up movements asking for a different development model able to defend their land. The fear of the 39 municipalities living in the Susa Valley is in fact that this project could destroy large portion of the territory having huge impacts on the ecosystems and communities.

Against the planned projects of the HSTL, the Susa Valley is supported by financial incomes in terms of compensation measures of around 112 M of euros provided by a Law objective of 2011 (Camera dei deputati, 2011).

Currently, the amount implemented by the CIPE resolutions is 98M of euros of which 10M have been already destined for the geognostic tunnel while the remain amount should be soon available to implement specific accompanying measures to the planning of the territory with particular reference to:

- Environmental safety and requalification;
- Energy savings, renewable energy, hydroelectric energy;
- Support for tourist and productive agricultural activities;
- Developing tangible and intangible networks;
- Recovery of the public building heritage with reference to the schools.

2.1.1 The Susa Valley strategy

Considered the aforementioned complex, the Susa Valley is trying to run for cover and take advantage of the compensation money established by CIPE (Camera dei deputati, 2011) to define new territorial identities by focusing on the cultural and natural heritage at their disposal.

The *Osservatorio Torino Lione* (osservatorionuovalineatorinolione.it) aims at overcoming the widespread logic of using compensation as a mere financing source for local intervention in order to identify a shared strategy for the entire Susa Valley exploiting the realization of the HSTL as a driver for the launch of sustainable and integrated development processes.

With this regard, the *Osservatorio Torino Lione* published the "Smart Susa Valley report" (Osservatorio Torino-Lione, 2014) which identify 5 main strategic axes: smart mobility; smart energy; smart environment; smart building; smart economy. Each axis is in turn declined into specific measures representing the strategic actions for the 39 municipalities involved (

#	MEASURES
1	Development of tangible communications infrastructure and services
	Development of intangible communication infrastructures and services
2	Development of the energy production system
	Protection and enhancement of agroforestry activities
3	Environmental protection and redevelopment
	Safety of the territory
4	Securing and upgrading of public buildings
	Redevelopment of urban settlements
	Recovery of rural areas and hamlets
5	Strengthening and conversion of manufacturing and economic activities
	Promotion and repositioning of the tourist offer
	Development of innovative technologies

Fig. *3***Errore. L'origine riferimento non è stata trovata.**).

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Fig. 3 Smart Susa Valley main axes (Source: Own elaboration from Osservatorio Torino-Lione, 2014)

The Smart Susa Valley report constitute the needed premise to understand the position and the point of view of Chiomonte in terms of territorial activities proposed by the association ImprenD'Oc (2016, 2018).

2.2 Chiomonte

Chiomonte is one of the most critical and controversial municipalities of the Valley since it is a small but key town assigned as main construction site of the HSTL (telt-sas.com) following the construction of the geognostic tunnel. This has been completed in 2017 to know the structure of the mountain through which the HSTL will pass, and it will be the Italian way of access to the construction site of the base tunnel.
According to the evolution of HSTL works (which are still uncertain), Chiomonte will face the migration of a huge number of workers that will remain there for at least 10 years changing the community structure of this town.
Chiomonte, as many other municipalities of the Alps, is facing also environmental, social and economic crises unrelated to the HSTL. Until 2008, Chiomonte was described as a "*thriving tourist community and [...] an ideal place for family tourism and vacationing*" (ImprenD'Oc, 2018) but now it is showing a breakdown typical of local mountainous systems. The general situation of Chiomonte shows in fact 3 types of dysfunctions (Colucci and Cottino, 2015):

- Functional: it is evident in the progressive loss of importance of the fundamental socio-economic activities, marked by the dismissal of the old building containers and in bad structural conditions of the real estate patrimony. The public heritage of Chiomonte is in decline and many private homes owned by vacationers have been abandoned;
- Relational: it is linked to the loss of importance of traditional forms of social aggregation to which corresponds, tendentially, a growing withdrawal of people from life in public space. The natural balance of

Chiomonte is strongly negative and the people is aging making difficult to maintain the sense of community;

- Environmental: which is manifested by the increasing difficulty of local organizations to control the natural environment and manage it as a resource for local development and quality of life. An example is constituted by the decrease of snowfall which requires a rethinking of sports activities once based on winter tourism.

Given the situation, the PA of Chiomonte is worried that being the main construction site could lead to the definitive death of a territory already in crisis.

2.2.1 The projects: Chiomonte_2025 and Chiomonte_SMART

In order to access CIPE funds and be able to implement territorial development activities capable of returning Chiomonte to the condition of a flourishing community, the municipality of Chiomonte started the project *Chiomonte_2025* and *Chiomonte_SMART* with the financial support of the bank foundation *Compagnia di San Paolo* and the association *Comitati Territoriali IREN* and the scientific support of the Politecnico di Torino.
The main aim of the two projects is to propose operative territorial actions able to revitalize the territory by declining the strategic measures contained in the Smart Susa Valley report (Osservatorio Torino-Lione, 2014) and considering the UN-Habitat Program (unhabitat.org), which defines directions according to which a territory must evolve to meet the challenges of the 21st century by aiming to achieve fundamental characteristics: productive, green, livable, safe, healthy, resilient and sustainable.
Hence, the main strategic activities identified in *Chiomonte_2025* and *Chiomonte_SMART* are referred to 4 main plans, each of which should focus on specific sectors of socio-territorial interest (Tab.1).

Tab.1. Strategic Plans and socio-territorial sectors

	SECTORS		
STRATEGIC PLANS	**SOCIETY**	**ENVIRONMENT**	**ECONOMY**
Development of the real-estate patrimony (PIRIPIC)	Health and security Social inclusion	Decorum Safeguarding Requalification	Tourism attraction Cultural attraction Sport attraction
Sustainable energy and climate change (PAES-C)			
Agricultural improvement and			

Viticulture recovery (PRAREVIC)	Social services		Economic development
Tourism and economic development (PISTE)			

3. The GIS platform

To operationalize the strategic plans (Tab.1), the projects *Chiomonte_2025* and *Chiomonte_SMART* provide the construction of a WebGIS platform (Abastante et al., 2019, 2020) able to collect all the available information about the Chiomonte territory and to be consulted via Web in an open-source philosophy (Satya et al., 2020). It is important to underline that the platform can be also consulted locally on a standard infrastructure. Before releasing the WebGIS platform, it was in fact necessary to create the "client platform" understood as the entire information base both spatial and quantitative/qualitative. This platform can be consulted and modified only by people familiar with GIS tools and it is mainly used to integrate the data that will be published in the WebGIS platform after a careful check by the researchers involved.

The data involved in the themes dealt with by the 4 strategic plans are multiple and extremely heterogeneous and therefore their consultation and management would be ineffective without an appropriate visualization of the territory and rationalization of the information. The heterogeneity and complexity of the data model developed in this research allows both the integration and the analysis of the data themselves and to derive new information by building new spatial models from the initial data with the possibility of laying the foundations for any analysis related to the transformation scenarios in relation to the aspects of real estate, energy, tourism, agronomic.

In fact, the aim of the WebGIS platform is to create a shared base of discussion among the different stakeholders involved in a decision-making process related to the identification of possible development strategies for the territory.

With this aim, the WebGIS platform integrates the following information related to the 4 strategic plans:

- PIRIPIC with particular reference to the location of public and private buildings and specific information related to the dimensions and state of preservation;
- PAES-C with particular reference to the "Medium Voltage" (MT) and "Low Voltage" (LV) electricity distribution networks located within the municipal territory;
- PRAREVIC understood as the location, dimensions and characters of the vineyards;

- PISTE understood as the location, dimensions and characters of the pedestrian and cycle paths and ski slopes.

It is important to underline that in this paper we will report overall information about the construction of the WebGIS platform in order to deepener the information related to the PIRIPIC plan. The remaining 3 plans are in fact currently bound by secrecy about the information contained and, at the moment, can not be shared.

The growing need for a continuous exchange of information, their updating and implementation, the containment of management costs and free access to databases are in currently widespread needs of citizens, professionals and PAs. In order to cope with these demands, the use of open-source solutions allows to get rid of the limits imposed by proprietary software (i.e., requiring a paid license) and to be more adherent to the possible implementation with databases that allow the analysis of multiple aspects (Oxoli et al., 2020).
In line with recent developments in data retrieval and processing, the platform has been realized using, where possible, free and/or open-source software and tools, consolidated and supported by communities widely present in the area (Oxoli et al., 2020; Abastante et al., 2012). This approach has immediately allowed a "free access" to the platform (as well as maintainable over time) both in consultation and in the activities of "evolutionary maintenance".
The main software used to construct the platform are:
QGIS (qgis.org): it is the most widespread open-source GIS software and it has been used in this research to construct the “client platform” including all the needed information in the attribute table to prepare the environment for the WebGIS interface. For archives and geographic databases, we made use of shapefiles and geopackages (geopackage.org);
Libreoffice (libreoffice.org): it is an open-source office suite useful to support the writing process, preparation of documents and spreadsheets as well as for the formula editing. In the case of this research, it turned out to be fundamental due to the high compatibility with QGIS;
XAMPP (apachefriends.org) is one of the multiple Apache distribution directories and one of the most popular PHP (Hypertext Preprocessor, php.net) language development environments. It allows an easy and intuitive construction of a Web service. As "scripting" languages dedicated to the development environment we made use of JavaScript (javascript.com), HTML (HyperText Markup Language, html.spec.whatwg.org) e PHP (php.org).
In addition to the software part, great attention has been paid to the use of data and information that do not show constraints in the use such as the cartographic geo-referenced background to be used as a basis for the visualization. The "ICE Aerial Shot 2009-2011 Orthophoto RGB", simply called "Orthophoto 2010" represents an excellent compromise among quality, updating and loading speed. Moreover, it is available for free use through the Web Map Services (WMS) exposed by the Piedmont Region Administration (geoportale.piemonte.it).
After having identified the proper software and cartographic background, it has been necessary to organize all the available data on filesystem a group of organized

folders and subfolders, one for each of the 4 strategic projects (PIRIPIC, PAES-C, PRAREVIC, PISTE). Fig. ***4*** shows the filesystem of the PIRIPIC project.

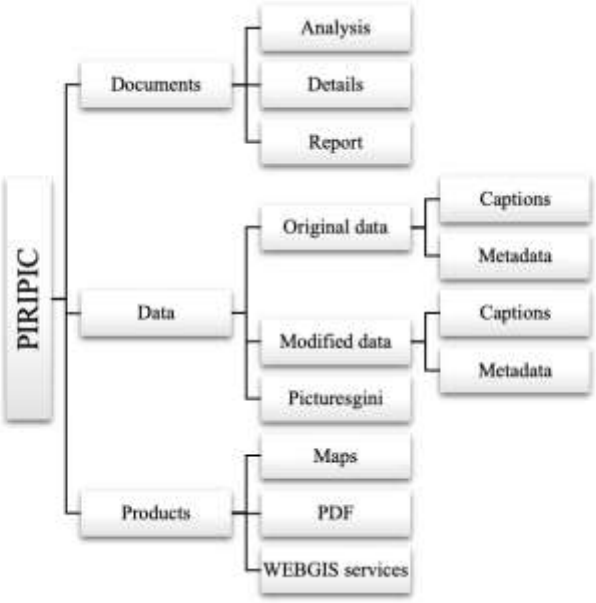

Fig. 4 Filesystem PIRIPIC project

The next step involved the realization of the QGIS projects. Given the need to show the situation of the 4 strategic scenarios for Chiomonte, it seemed appropriate to carry out 4 different QGIS projects: this choice also facilitated the publication of the single WebGIS services (Fig. ***5***).

Fig. 5 Home page of the WEB platform

3.1 The PIRIPIC strategic scenario

The PIRIPIC strategic scenario has been considered the most urgent and important by the Public Administration of Chiomonte becoming the pilot scenario useful to construct the overall WebGIS platform.
The problems related to the poor condition of the buildings, the presence of multiple disused residential buildings, and the concern related to the accommodation of workers makes the disclosing of this scenario preparatory to the pursuit of the others. The acquiring of the numerous data useful for this scenario has been demanding and required a number of interactions with ImprenD'Oc and the PA of Chiomonte in order to properly catalogue 131 residential buildings and 7 public buildings (the kindergarten, the elementary school, a retirement home, the town hall, an art gallery and the bishopric).
The visualization of the unused buildings on the territory through the WebGIS platform allows: i) understanding the potentialities in terms of beds available in residential properties for the accommodation of workers who will work at the site of HSTL; ii) having a complete picture of the buildings that could be destined for future tourists; iii) understanding the state of conservation of the buildings both private and public in order to identify a priority ranking of the buildings to be requalified; iv) knowing the location of public and ecclesiastical buildings of potential historical and touristic interest in order to include them in visitation routes. In the PIRIPIC WebGIS project we decided to also locate the parking lots, functional and strictly related to the strategic projects.
Once created the cartographic geo-referenced background to be used as a basis for the visualization using the "Orthophoto 2010", the research provided the identification and design of the interested buildings on a base map and the collection of the information available for each building using the LibreOffice spreasheed.
The spreadsheet has been organized according to the structuring of functional data for a GIS: one row for each building (record) to which a unique code and an identification number (ID) have been assigned; one column for each character of the building (fields).
For each building, together with ImprenD'Oc, a number of information has been collected (Tab.2).

Tab.2 Information collected

INFORMATION	**DESCRIPTION**	**INFORMATION**	**DESCRIPTION**
Building typology	condominium, villa, townhouse, detached house	Accessibility for disabled	Yes/No
Location	Address	Heating system	Centralized, autonomous, pellet or wood boiler
Owner information	Name, surname, telephone and email address	Rooms	Number and sqm
Floors	Number	Bathrooms	Number

Available apartments in the building	Number	Home furnishing	Yes/No
Dimension of each apartment	Sqm	Garden	Private/Shared
Elevator	Yes/No	Parking	Yes/No
Cellar	Yes/No	Pictures	Images of the available apartments and of the building
Tv antenna and phone jack	Yes/No	Hot water	Yes/No
Kitchen	Yes/No	**Category**	**A, A1, A2, A2, B, C**

The information "category" refers to the current state of preservation of the buildings/apartments and to the necessary adaptation works. It is a composite indicator provided by ImprenD'Oc basing on the following information: Result of the Energy Performance Certificate (EPC); Certificate of ownership; Cadastral survey; Planimetry; Year of renovation; Conformity of the hydraulic system; Compliance of electrical system.
The identified categories are 3:

- A: the apartment is immediately available without any adaptation or restoration work. This category provides the following 3 sub-categories;
    - A1: the apartment is immediately available but requires quick replacement of items that do not preclude the safety or use of the apartment;
    - A2: the apartment is available in 15 days maximum since it needs for replacement of items that preclude the safety;
    - A3: the apartment is available in 60 days maximum since fundamental items are missing;
- B: the apartment is available in 6 months maximum. In this case plant adjustments are required;
- C: it is not possible to estimate the time needed to carry out the adaptation works.

The spreadsheet containing all the aforementioned information has been used to construct the attribute table (Fig. ***6***) which was then related/joined to the polygonal geometries representing the buildings mapped. This step has been carried out with QGIS representing the working project.

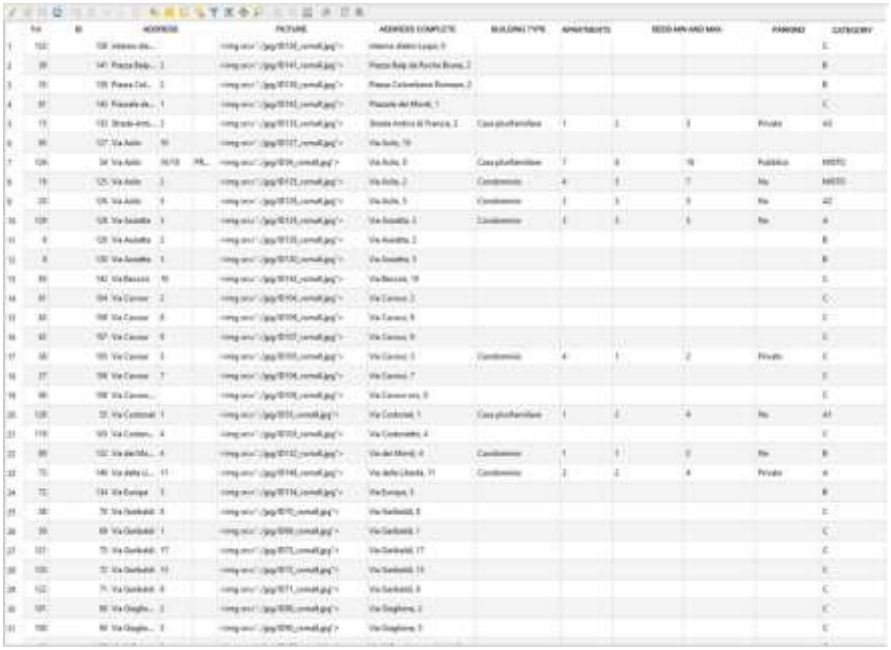

Fig. 6 Excerpt of the attribute table

After collecting all the data and preparing the attribute table, the next step involved the geolocation of the buildings (Fig.7**Errore. L'origine riferimento non è stata trovata.**). Each building was then redrawn on the basis of the Orthophoto 2010 and geometrically validated with respect to the geographical reference base in the coordinate system of the Piedmont Region (WGS1984, Spindle 32N, EPSG 32632).

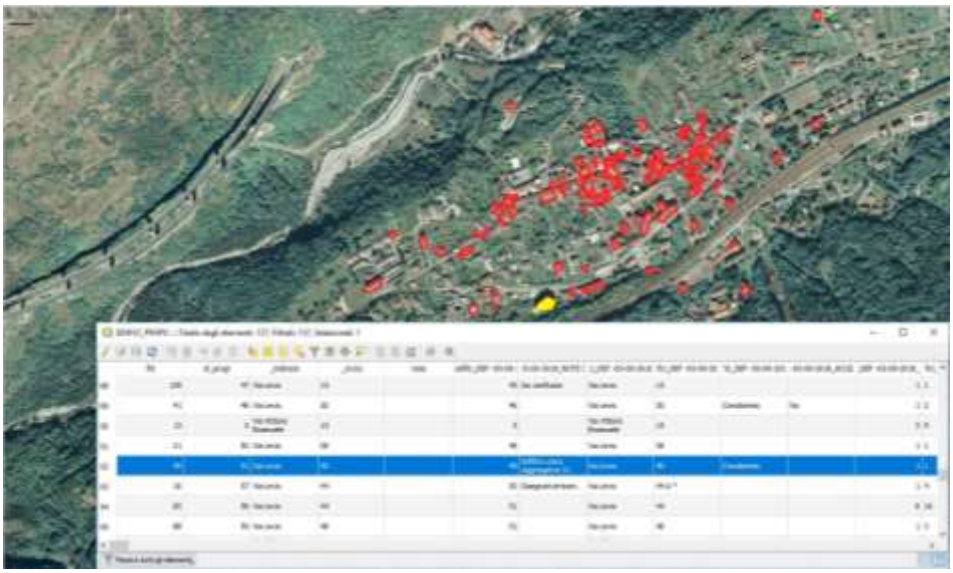

Fig.7 Interface of QGIS and Attribute Table

Accordingly, it is possible to question the platform by selecting each single building and visualizing the information available.

3.2 The WebGIS

The next step involved the publication of the QGIS platform via web so to be consulted also by non-GIS experts through a dynamic and interactive map that each interested user can explore by a web browser.
This has made be possible thanks to the QGIS plugin called qgis2web (plugins.qgis.org/plugins/qgis2web) that allowed inserting all the information available in a thematic portal accessible by the web (Fig.8).
The qgis2web plugin is a QGIS add-on module, which allows the publication and sharing of geospatial data, with customizable maps with respect to the various layers produced, and exportable in HTML format. In this way it can also be integrated into a web page.

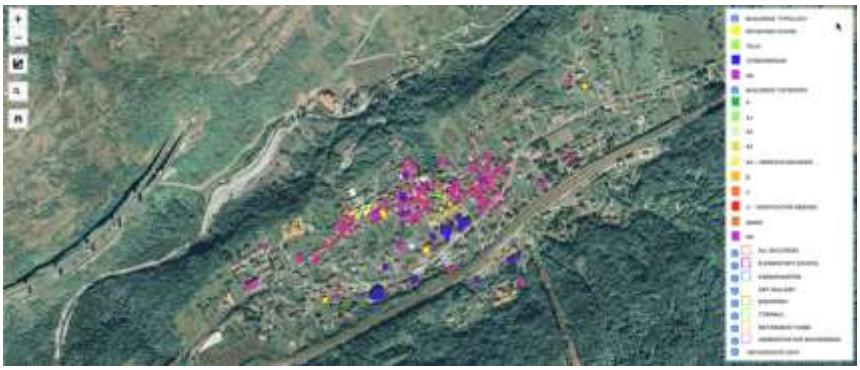

Fig.8 PIRIPIC WebGIS interface

Thanks to the qgis2web plugin, it is possible to select the analysis tools that the user can perform on the map thus giving life to the WebGIS service. Currently, the analysis tools available for the WebGIS platform of Chiomonte are: zoom in/out; identify feature; calculate distance; map overlay; layer browser; print.
As it is showed in Fig.8, a colored legend helps the users in filtering the information available. Each building has been in fact themed to allow a quick understanding and querying of the tool basing on the building typology, building category, or selecting the public buildings.
To improve the communication of the WebGIS platform, for each geometry a popup management system lets the user to click on the mapped features getting a brief description of the building selected (
Fig. ***9***).
Therefore, each popup contains the image of the building (if available) the address, the type of building, the number of apartments available, the maximum and minimum number of beds, the availability of parking and the category of the building.
The popup has been considered very useful from the PA of Chiomonte and ImprenD'Oc since it allows a quick and immediate view of the most important characters of each building supporting the discussion around the planning actions and speeding up the decision-making process.

Fig. 9 Popup example

Moreover, each popup contains a link to a PDF sheet reporting all the available information about the building and the apartments.

3.3 The building and apartment sheets

The PDF sheets, one for each building, are accessible directly from the popups by clicking on the link “Click here to visualize the complete sheet”. It is important to underline that the information contained in the building sheet are identical to the one of the popup. However, the building sheets can be downloaded and printed constituting a resume of the main characters of the building as a whole and containing a map excerpt as well as an external image of the building (
Fig. ***10***).

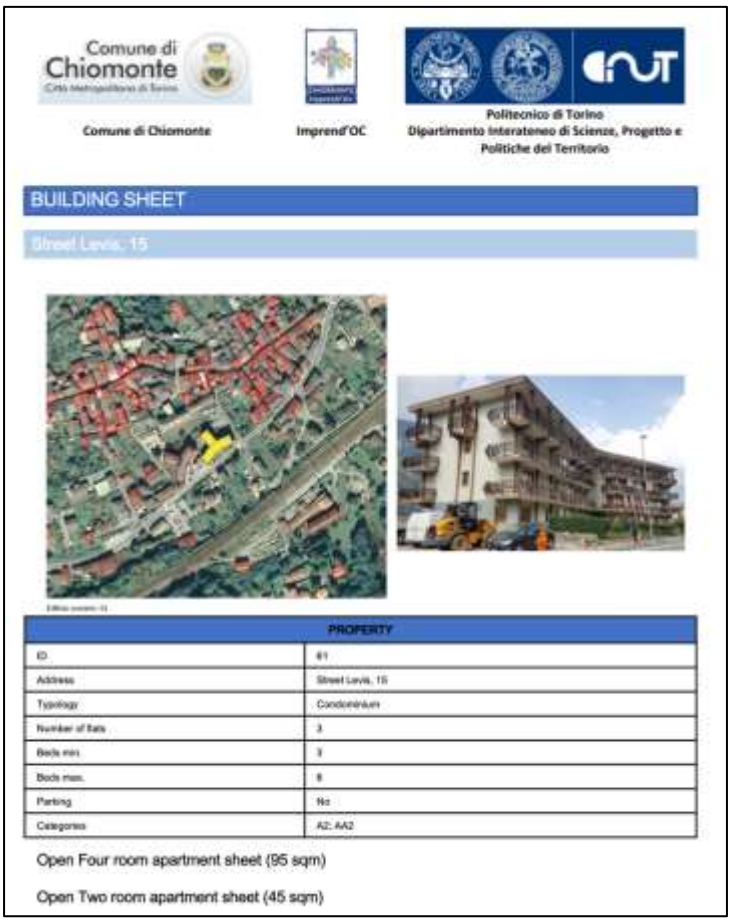

Fig. 10 Building sheet example

At the bottom of the building sheet, more links are showed, one for each available apartment inside the building. Each link allows opening an apartment sheet containing detailed information for the apartment selected.

The construction of the apartment sheets has been time consuming requiring multiple interactions with the PA of Chiomonte and ImprenD'Oc in order to decide the amount and nature of the information to be inserted. Moreover, due to privacy constrictions it was not possible to report in the free available sheets the overall information collected. Since some information can not publicly display (i.e., data about the owner and images of the interior of the houses), two different versions of the apartment sheets have been provided, one for the public exposure through the WebGIS platform and the other available to system administrators, the working group and selected users through a login and password system.

Analogously to the building sheets, the apartment sheets can be downloaded and printed (Fig. ***11***).

Comune di Chiomonte

Comune di Chiomonte | Chiomonte ImprenD'Oc | Politecnico di Torino, Dipartimento Interateneo di Scienze, Progetto e Politiche del Territorio

PICTURES OF THE APARTMENT

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PROPERTY		
ID	48	
Address	Via Levis 1	
Owner	***	
Residence	***	
Phone	***	
E-mail	***	
Building typology	Condominium	
Floor	1	
CHARACTERS		
General characters	Two-room apartment	Single rooms: 0
	Sqm: 50	Beds: 2
	Double rooms: 2	Kitchen: yes
	Living room: yes	Bathroom: wih shower
Fornitures	Yes	
Cellar	No	
Garden	No	
Parking	No	
Heating system typology	Semi-autonomous with thermostatic valves; Diesel	
Elevator	No	
Disable accessibility	No	
Hot water	Si	
Tv antenna and phone jack	No phone jack	
NORMATIVE ASSESSMENT		
Category	A5	
Needed works	***	
Useful documentation for rental purposes	EPC	***
	Certificate of ownership	***
	Cadastral survey	***
	Planimetry	***
	Year of renovation	***
Other	Conformity of the hydraulic system;	***
	Compliance of electrical system	***
	Other	***

Fig. 11 Apartment sheet example (information that cannot be disseminated has been marked with ***)

As it is possible to see from Fig. ***11***, the complete apartment sheet contains all the available information. Due to privacy constriction, the sensible information has been hidden in the figure.

Both buildings and apartment sheets allow the PA of Chiomonte to have a detailed catalog of the accommodations available to future workers and tourists and consequently a useful information base for the determination of intervention strategies.

4. Conclusions and future developments

This paper shows the construction of a WebGIS open platform useful to collect multiple qualitative and quantitative information about the specific territory of Chiomonte (Italy). It is important to underline that, although the strong effort, we have been able to pursue an open philosophy in terms of software involved but not in terms of data. In fact, due to the social nature of the *Chiomonte_2025* and *Chiomonte_SMART* projects, the majority of the data were related to personal information of people and therefore the work presented cannot be fully considered in the open data research strand (Hampson, 2011).
The WebGIS platform goes in the direction of "sharing information" and supporting complex decision-making processes being conceived as a knowledge base that would provide the definition of alternative actions that may be conflictual. It could be useful to deeply discuss about future development scenarios for Chiomonte marked by a significant degree of uncertainty with respect to possible prospects for innovation. The WebGIS platform allows having a complete panorama of the territory immediately consultable online by each stakeholder that will be involved in the process.
Accordingly, the concept of resilience is in this research used to evoke the effort required to address the complexity and multidimensionality of the issues that mark the lives of communities in territories strongly characterized by degenerative dynamics and for which regeneration prospects must be identified so to interrupt the neglect spiral exacerbated by an adverse event (Colucci, Cottino 2015).
The future development of the work will provide the adaptation of the platform to accommodate the remaining 3 development scenarios: PAES-C, PRAREVIC and PISTE. The same logics and structure explained in this paper in relation to the PIRIPIC scenario will be applied for the others. Moreover, the platform will be updated in order to consider the possibility of constructing new spatial models starting from the available data and to conduct analysis and assessments. In this perspective, the research will provide the integration of multicriteria analyses (MCDA, Abastante et al., 2017) useful to structure real-time decision processes, identify the most important decision criteria able to guide the definition of operative projects, identify the impacts of each proposed action and disclose a priority ranking of the different projects.

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