IDEA 2025

SPECIAL EDITION

idea

innovation
design
application
2025 edition

GUD A magazine about Architecture, Design and Cities

IDEA 2025

SPECIAL EDITION

GUD A magazine about Architecture, Design and Cities

INDEX

Part II - Drawing in the fields of: architecture, design, cultural heritage, territory

GIS representation as a drawing technique for data, emotion and culture storytelling

Nicola Valentino Canessa

Università degli Studi di Genova

Abstract

The use of Geographic Information Systems (GIS) in spatial representation is evolving beyond its traditional role as a tool for territorial data analysis and management. Increasingly, GIS is being recognized for its expressive and narrative potential, capable of conveying not only spatial information but also emotional, cultural, and historical depth. This paper explores the dual function of GIS as both a technical tool for spatial planning and an instrument of storytelling and heritage valorization. Through three case studies — the mapping of ecclesiastical assets in the Archdiocese of Genoa, the inventory of fortified heritage in Liguria (Via Patrimonia ACT project), and the drafting of the Municipal Urban Plan for the town of Moconesi — the paper highlights how GIS enables the integration of analytical data with local narratives, historical records, and visual storytelling. By employing GIS technologies such as story maps, 3D modeling, and interactive visualizations, these projects demonstrate how spatial data can be transformed into engaging narratives that foster participation, raise awareness, and enhance identity and memory. The paper ultimately advocates for an expanded understanding of GIS not only as a system for managing space but also as a communicative and interpretative medium capable of connecting communities with their territories in meaningful ways.

1. Territorial mapping

Spatial representation through Geographic Information Systems (GIS) has traditionally been associated with the management and analysis of territorial data, but its expressive potential is becoming increasingly relevant. GIS is no longer limited to providing static and analytical maps; it is now emerging as a medium capable of telling stories, conveying

emotions, and shaping the cultural identity of a place. This transformation stems from an evolution in cartographic thought, which has begun to explore the relationship between space, perception, and narration.

In the realm of cartographic representation, the choice of symbols, colors, and forms is never neutral. The use of mapping to recount subjective experiences and social phenomena is part of a broader tradition that views cartography as a cultural and political act (Harley, 1989). Through GIS, digital cartography opens up to a narrative dimension, allowing the integration of quantitative data with textual elements, images, and even sounds, creating multisensory representations capable of evoking the identity of a place.

A significant example of this approach is the use of story maps—interactive tools that combine spatial data with multimedia content. These platforms make it possible to build geo-localized narratives that give voice to local communities, bringing to light collective memories often overlooked. In urban contexts, GIS has been used to represent residents' lived experiences, mapping emotions and perceptions associated with specific spaces. Recent studies have shown how these maps can enrich planning processes by offering a more nuanced understanding of the territory.

Technological innovation has also enabled the integration of GIS with 3D modeling and animation techniques, further enhancing its ability to dynamically represent space. These developments are particularly useful in illustrating urban transformations over time, allowing the visualization of historical stratifications and changes within cities. The ability to animate geographic data—showing, for example, the evolution of a neighborhood or the gradual erosion of a landscape—makes GIS an effective tool for communicating future scenarios and raising awareness among local communities.

Thus, the use of GIS as a drawing technique is not confined to the objective representation of reality; rather, it opens to an interpretative and communicative dimension. The ability to overlay multiple layers of meaning and to combine quantitative data with subjective narratives transforms the map into a storytelling device. In this context, cartography is not just a technical tool but an expressive medium that can reinforce a sense of belonging and foster critical awareness of the inhabited space (Crampton, 2010).

What follows are three examples of research developed by the GIC-lab[1],

[1]The GIC-lab is a research group on the contemporary city and territory of the Department of Architecture and Design at UniGe, directed by Manuel Gausa and Nicola V. Canessa.

related respectively to a European research project, support provided to a local administration for the drafting of a Municipal Urban Plan (PUC), and a religious institution's efforts in territorial management and planning.

1.1 The Via Patrimonia ACT research

The mapping and cataloging of fortified heritage in the Liguria Region, carried out as part of the Interreg *Via Patrimonia ACT*[2] research (fig.1), offers a significant example of the dual function of GIS — serving both as a tool for heritage management and as a means for tourism promotion. Ligurian fortifications, including coastal towers, urban walls, medieval castles, and modern defense structures, constitute a stratified defensive system developed over centuries and spread across a morphologically complex territory. Digital cartography makes it possible to go beyond the limits of traditional static representations, providing a dynamic picture of these structures and their territorial connections.

One of the most relevant aspects of this project is the ability to integrate historical, architectural, and structural data into a single georeferenced platform that can be updated and queried in real time. This approach allows scholars and heritage authorities to analyze the condition of fortified sites, plan restoration work, and monitor changes over time. As noted by Conolly and Lake (2006), the use of GIS in landscape archaeology helps identify spatial correlations between historic sites, improving the understanding of settlement and defensive dynamics throughout the centuries.

Beyond the management aspects, the *Via Patrimonia ACT* project employs GIS to construct a publicly accessible narrative, making the history of fortifications visible through interactive maps and thematic routes. Digital representation does not merely locate these structures but places them within a narrative framework that helps users understand their strategic role and their relationship with the surrounding landscape. This demonstrates how cartography can be used to build visual narratives that go beyond simple spatial representation, transforming maps into tools for cultural communication.

[2] The strategic project VIA PATRIMONIA - ACT, funded by the Interreg IT FR Maritime Program 2021-2027, is the first operational step of the network of accessible cultural routes "Via Patrimonia", formalized by the previous strategic project "GrItAccess" through an agreement that binds the representatives of the five regions of the Program to concretize their willingness to act together for the development of accessible routes. The scientific director for the Liguria Region area is Prof. Nicola V. Canessa (UniGe).

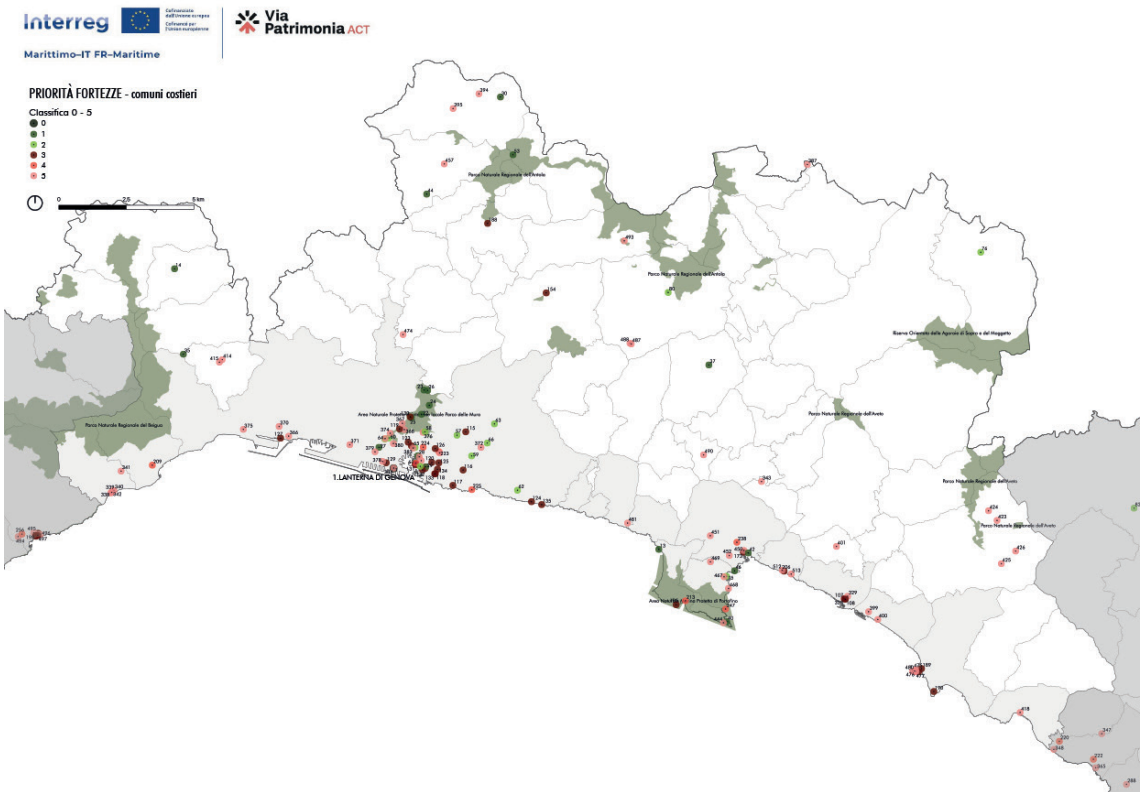

Figure 1 – Spatial mapping forts and established nature systems. Image Surce: Via Patriamonia ACT research.

An added value is the integration of GIS with augmented reality and 3D modeling technologies, enabling visitors to explore fortifications that have disappeared or changed over time. The use of immersive technologies encourages a more engaging experience and makes it possible to visually reconstruct the original appearance of sites that are now partially in ruins. In this context, Gillings' (2012) research on virtual reality applied to archaeological cartography highlights how these tools can enhance the perception of historical spaces and offer new ways of interacting with heritage.

Moreover, the organization of GIS data allows for the development of tourist itineraries that link fortifications according to chronological, typological, or strategic criteria. The creation of georeferenced routes promotes more conscious and sustainable tourism, spreading visitor flows over a wider area and encouraging the discovery of lesser-known sites. This approach aligns with recent theories of experiential tourism, which see digital technologies as tools for enriching the perception of cultural landscapes and encouraging deeper interactions between visitors and territory (Richards, 2021).

The application of GIS in the *Via Patrimonia ACT* project thus demonstrates how digital cartography can be used both for the management of fortified heritage and for its cultural and touristic valorization. On the one hand, it provides a solid informational base for conservation and planning; on the other, it enables the creation of immersive experiences that transform site visits into journeys through history, making fortifications part of a broader narrative about Liguria's past and its connections to the Mediterranean.

1.2 The Urban Plan of Moconesi

The use of GIS in drafting the *Piano Urbanistico Comunale* (Municipal Urban Plan – PUC) of the Municipality of Moconesi[3] is an emblematic case of the dual function of digital cartography, which serves both as a technical tool for spatial planning and as a means of enhancing natural and cultural heritage (fig.2). This approach enables local administrations not only to manage urban development using precise spatial data but also to promote territorial identity by making its landscape and historical resources more accessible and understandable.

From a technical and regulatory standpoint, GIS provides essential support for the urban planning process. The ability to integrate geospatial data with environmental and legal constraints allows planners to obtain a detailed and constantly updated understanding of territorial conditions. In the case of Moconesi—a municipality characterized by a balance of small settlements, wooded areas, and historic rural infrastructure—GIS mapping enables in-depth analysis of the spatial structure, supporting zoning, land use regulations, and environmental protection strategies. The integration of GIS with remote sensing and topographic surveys also makes it possible to create thematic maps highlighting critical issues such as hydrogeological risk, landscape constraints, and the distribution of ecologically significant habitats.

Beyond its regulatory role, GIS cartography plays a central part in the promotion of Moconesi's historical and natural heritage. The municipality, located in an area rich in historic trails, stone villages, and traditional rural landscapes, benefits from a digital approach that renders these features visible and accessible to both residents and visitors. The creation of a GIS-based heritage database allows for the georeferencing of historic buildings, archaeological sites, and landscape features, offering an interactive and dynamic representation of the area's cultural

[3] The strategic structure of the Moconesi PUC was developed by Nicola V. Canessa and Chiara Vaccaro in 2015/2016.

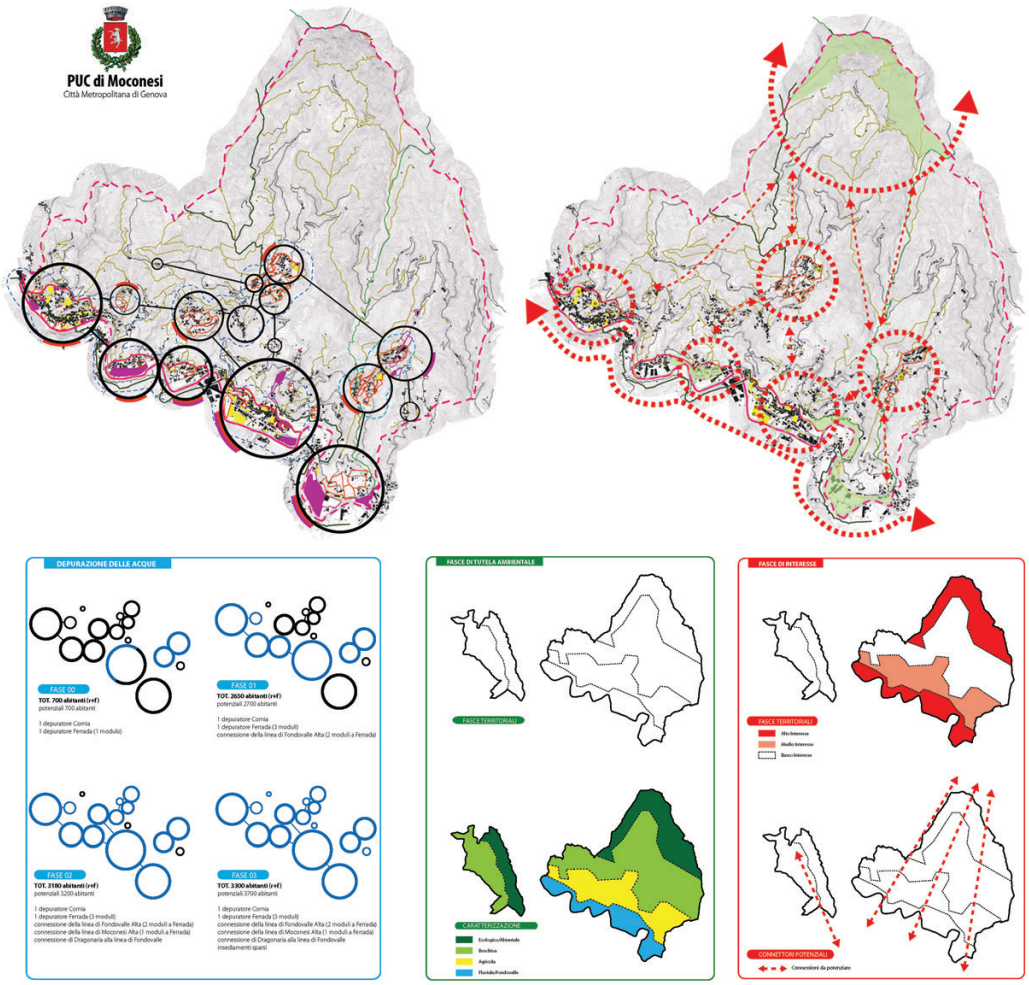

Figure 2 – Territorial strength systems. Image Surce: PUC Moconesi.

structure (Goodchild, 2009). This type of digital mapping opens significant opportunities for tourism and local development. By linking GIS data with narrative and multimedia tools, it becomes possible to design routes that guide visitors through the town's historical and environmental landmarks. Interactive maps, accessible via mobile applications or online platforms, can enrich the exploration experience with contextual information, historical insights, and visual content. Furthermore, the ability to highlight lesser-known areas or less-traveled paths supports forms of slow and sustainable tourism, fostering a more conscious and respectful relationship with the landscape.

An additional benefit of GIS is its ability to visualize historical transformations of the territory by comparing past cartographies with current representations. This historical mapping function is particularly useful for reconstructing the evolution of rural settlements, land use changes, and

the impact of infrastructural development. Such an approach not only supports urban policy but also strengthens collective memory, reinforcing the connection between communities and their territory (Harvey, 2016).

The integration of GIS into the Municipal Urban Plan of Moconesi thus highlights the versatility of digital cartography in combining planned territorial management with the cultural and environmental valorization of place. While on one hand it ensures technical precision and regulatory support, on the other it promotes awareness and appreciation of local identity. This dual role of GIS—as both a framework for territorial governance and a tool for storytelling and transformation—confirms the growing importance of geospatial technologies in contemporary planning and heritage management.

1.3 The CEI_Limit_GE research

The use of GIS for mapping the parish boundaries of the Archdiocese of Genoa and cataloging the ecclesiastical assets within them illustrates how digital cartography can simultaneously function as both an administrative and narrative tool. The *CEI_Limit_GE*[4] research on one hand, the precision and updatability of the data allow for effective management of the territory and ecclesiastical heritage (fig.3). On the other, the integration of historical and cultural information turns the map into a storytelling device, capable of revealing the stratification of the city and the role of parishes in shaping local identity. As De Rosa (2016) notes, the georeferencing of cultural heritage is not merely a technical operation, but a process that enhances the symbolic dimension of territory, making it interpretable through multiple layers of meaning.

From an administrative perspective, a well-structured GIS makes it possible to precisely define parish boundaries, facilitating the organization of pastoral activities and the allocation of resources. The ability to cross-reference geographic data with demographic and cadastral records provides a detailed picture of the diocese's territorial structure, improving planning and the effectiveness of interventions. This decision-making support function is widely recognized in geographic and cartographic literature, which highlights how GIS enables the clear and immediate management and visualization of complex data, enhancing spatial analysis capabilities.

At the same time, GIS offers a unique opportunity to tell the story of parishes and ecclesiastical heritage. The use of cartography to reconstruct territorial transformations of parishes over time makes it possible to

[4] The CEI_Limit_GE project started in 2024 under the scientific direction of Nicola V. Canessa.

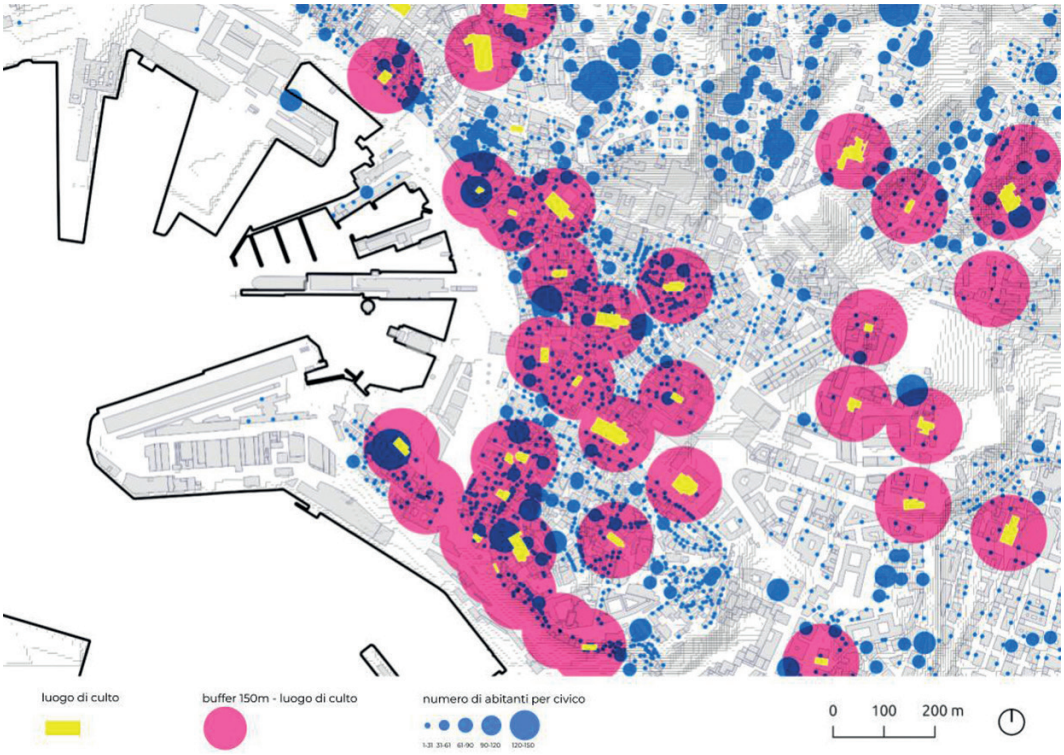

Figure 3 – Ratio of resident inhabitants to places of religious practice Image Surce: CEI_Limit_Research.

illustrate the relationship between urban growth and ecclesiastical organization. Historical maps, when integrated with GIS data, can show the evolution of boundaries, architectural modifications of sacred buildings, and changes in the social fabric of parish communities (Campana, 2018). This approach makes the Church's process of adaptation to urban transformations visible, offering a dynamic view of the territory.

Integrating the inventory of ecclesiastical assets with GIS tools also allows for the cultural and artistic heritage of the diocese to be enhanced. Each church, convent, or significant building can be georeferenced and linked to a detailed record describing its history, artistic features, and any modifications over time. This method of representation aligns with what Wood (2010) suggests about participatory GIS, which can promote the creation of maps enriched by collective content, combining institutional data with local narratives and testimonies.

Another important application is thematic mapping of ecclesiastical heritage. The ability to create maps showing the distribution of sacred artworks, the architectural typology of buildings, or historical events related to specific locations enables a complex and meaningful understanding of the area's cultural wealth. As Boria (2017) suggests, cartography is

illustrate the relationship between urban growth and ecclesiastical organization. Historical maps, when integrated with GIS data, can show the evolution of boundaries, architectural modifications of sacred buildings, and changes in the social fabric of parish communities (Campana, 2018). This approach makes the Church's process of adaptation to urban transformations visible, offering a dynamic view of the territory.

Integrating the inventory of ecclesiastical assets with GIS tools also allows for the cultural and artistic heritage of the diocese to be enhanced. Each church, convent, or significant building can be georeferenced and linked to a detailed record describing its history, artistic features, and any modifications over time. This method of representation aligns with what Wood (2010) suggests about participatory GIS, which can promote the creation of maps enriched by collective content, combining institutional data with local narratives and testimonies.

Another important application is thematic mapping of ecclesiastical heritage. The ability to create maps showing the distribution of sacred artworks, the architectural typology of buildings, or historical events related to specific locations enables a complex and meaningful understanding of the area's cultural wealth. As Boria (2017) suggests, cartography is always a cultural and political construct, and in the case of ecclesiastical heritage, it can become a means of strengthening community belonging and historical awareness.

The creation of GIS-based interactive digital platforms further expands the possibilities for accessing and disseminating this information. Online navigable maps, enriched with images, archival documents, and oral histories, can become educational tools and vehicles for cultural tourism, offering immediate access to the history and identity of ecclesiastical territories. From this perspective, GIS is not merely a management instrument, but a communication medium that bridges past and present through the spatial representation of collective memory.

2. Conclusions

The use of Geographic Information Systems (GIS) in territorial representation is progressively moving beyond its traditional technical role as a support tool for spatial planning and data management. It is emerging as an expressive medium capable of conveying the historical, cultural, and emotional complexity of places. The case studies analyzed—the mapping of parish boundaries in the Archdiocese of Genoa and the inventory of fortified heritage in Liguria within the framework of the Interreg Via Patrimonia ACT project—demonstrate how GIS can operate on multiple levels, combining scientific rigor with narrative capacity.

In the context of ecclesiastical cartography, GIS has proven to be a fundamental tool for the administrative management of the diocese, allowing for the precise delineation of parish boundaries and the creation of a digital archive useful for pastoral planning and heritage preservation. At the same time, the ability to associate spatial data with historical information, architectural details, and oral testimonies has transformed mapping into a visual narrative of the role of parishes within the city and their transformations over time. This dual use illustrates how digital cartography can serve as a bridge between institutional needs and identity enhancement, contributing to the construction of a georeferenced collective memory.

A similar principle applies to the mapping of Liguria's fortified heritage, where GIS has enabled the systematic organization of a historically rich yet complex and fragmented territorial asset. The georeferenced cataloging not only provides a knowledge base for the protection and management of these sites but also lends itself to new forms of storytelling and tourist engagement. Through interactive maps, 3D models, and thematic itineraries, GIS becomes a vehicle for disseminating cultural heritage, promoting experiential and sustainable tourism. Its integration with advanced digital tools—such as augmented reality and historical modeling—further expands the potential of cartography, making it not only a support for conservation but also a means of rediscovery and promotion.

These experiences demonstrate that digital cartography is no longer merely a technical support but a true language capable of dynamically and interactively telling the story of place. The evolution of geospatial technologies, combined with interdisciplinary approaches that blend geography, history, and visual communication, opens new perspectives for the use of GIS in both research and planning. The ability to represent space not just as geographic data but as a lived, interpreted, and narrated place transforms maps into tools capable of revealing relationships, meanings, and evolutionary processes that would otherwise be difficult to access through traditional forms of representation.

The application of these methodologies across different contexts—such as ecclesiastical and fortified heritage—highlights GIS's versatility and its ability to adapt to varied needs without compromising scientific integrity. The challenge ahead lies in further developing these techniques, refining representation models, and expanding information accessibility so that GIS can increasingly become a shared knowledge tool capable of engaging not only experts but also local communities and visitors.

References

Conolly, J., & Lake, M. (2006). *Geographical Information Systems in Archaeology*. Cambridge University Press.

Crampton, J. W. (2010). *Mapping: A Critical Introduction to Cartography and GIS*. Hoboken, NJ: Wiley-Blackwell.

De Rosa, F. (2016). *GIS e patrimonio culturale: Metodi e applicazioni per la valorizzazione territoriale*. Milano: FrancoAngeli.

Gillings, M. (2012). Landscape phenomenology, GIS and the role of affordance. *Journal of Archaeological Method and Theory*, 19(4), 601-611.

Goodchild, M. F. (2009). Geographic Information Systems and Science: Today and Tomorrow. *Annals of the Association of American Geographers*, 100(6), 1107-1119.

Harvey, F. (2016). *A Primer of GIS: Fundamental Geographic and Cartographic Concepts*. New York City: Guilford Press.

Richards, G. (2021). *Rethinking Cultural Tourism: Theories and Practices*. Cheltenham: Edward Elgar Publishing.

Sieber, R. (2006). Public participation geographic information systems: A literature review and framework. *Annals of the Association of American Geographers*, 96(3), 491-507.

Wood, D. (2010). *Rethinking the Power of Maps*. New York City: Guilford Press.

GUD

A magazine about
Architecture, Design and Cities

Curatore GUD Special Edition 2025 / Editor GUD Special Edition 2025
Gaia Leandri

Direttore responsabile / Editor in chief
Stefano Termanini

Editore / Publisher
Stefano Termanini Editore,
Via Domenico Fiasella, 3
16121 Genova

The following issue gathers the international conference results

"DRAWING AS A TOOL TO INVESTIGATE, COMMUNICATE AND EXPRESS EMOTIONS"

Scientific committee

Marco Giorgio Bevilacqua, Department of Energy, Systems, Territory and Construction Engineering (DESTEC), University of Pisa, Italy

Enrica Bistagnino, Department of Architecture and Design (dAD), Polytechnic School, University of Genoa, Italy

Elisabetta Canepa, Department of Architecture and Design (dAD), Polytechnic School, University of Genoa, Italy

Maria Linda Falcidieno, Department of Architecture and Design (dAD), Polytechnic School, University of Genoa, Italy

Carmen Llinares Millan, Institute for Research and Innovation in Bioengineering, Polytechnic University of Valencia, Spain

Maria Luisa Nolè, Department of Business Organization, Polytechnic University of Valencia, Spain

Giulia Pellegri, Department of Architecture and Design (dAD), Polytechnic School, University of Genoa, Italy

Giulio Sandini, Department of Robotics, Brain and Cognitive Sciences (RBCS), Italian Institute of Technology (IIT), Italy

Angelo Schenone, Department of Neurosciences, Rehabilitation, Ophthalmology, Genetics, and Maternal-Infant Sciences (DINOGMI), University of Genoa, Italy

Roberta Spallone, Department of Architecture and Design (DAD), Polytechnic University of Turin, Italy

Lucilla Vestito, Department of Neurosciences, Rehabilitation, Ophthalmology, Genetics, and Maternal-Infant Sciences (DINOGMI), University of Genoa, Italy / IRCCS San Martino Hospital, Genoa, Italy

Scientific supervisor

Gaia Leandri, Department of Architecture and Design (dAD), Polytechnic School, University of Genoa, Italy

Organizing committee

Elisabetta Canepa, Department of Architecture and Design (dAD), Polytechnic School, University of Genoa, Italy

Martina Castaldi, Department of Architecture and Design (dAD), Polytechnic School, University of Genoa, Italy

Simone Dragone, Department of Cultural Heritage, University of Salento, Italy

Monica Gori, Italian Institute of Technology (IIT)

Lucio Marinelli, Department of Neurosciences, Rehabilitation, Ophthalmology, Genetics, and Maternal-Infant Sciences (DINOGMI), University of Genoa, Italy

Maria Luisa Nolè, Department of Business Organization, Polytechnic University of Valencia, Spain

Enrico Pupi, Department of Architecture and Design (DAD), Polytechnic University of Turin, Italy

Piergiuseppe Rechichi, Department of Energy, Systems, Territory and Construction Engineering (DESTEC), University of Pisa, Italy

Angela Zinno, Department of Italian Studies, Roman Studies, Antiquities, Arts, and Performing Arts (DIRAAS), University of Genoa, Italy / Il Falcone – University of Genoa Theatre

GUD - IDEA 2025
numero speciale
Stefano Termanini Editore, maggio 2025
www.stefanotermanineditore.it

ISSN 1720-075X

Immagine di copertina
G. Leandri, IDEA 2025

ISSN 1720-075X

€ 30,00

GUD A magazine about Architecture, Design and Cities