

Collaborative Mapping of Endangered Cultural Heritage to Promote Sustainable Cities



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Abstract The preservation of cultural heritage is a crucial component of sustainable urban and territorial development. This study explores the role of collaborative mapping as both a pedagogical and civic tool for raising awareness about heritage conservation and promoting sustainable spatial citizenship. Using a mixed-methods approach, the study evaluates how students and local communities engage with geospatial technologies to document, assess, and propose solutions for at-risk heritage sites. The research is structured at two different scales: a national study across Spain and a localized case study in Zaragoza. The integration of collaborative mapping in educational settings not only enhances spatial and geographic competencies but also fosters a more critical and participatory approach to urban sustainability. This study demonstrates that digital geolocation tools can be leveraged for active heritage conservation, transforming citizens as agents of change. The results underscore the importance of interdisciplinary methodologies that connect geographic education, heritage studies, and civic engagement for the sustainable management of cultural assets.

Keywords Geography education · Geolocation · Heritage · Digital skills · Geographical skills

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Introduction

Since time immemorial, humans have sought to understand their environment in a precise manner to control and manage various aspects of a given territory. This includes natural elements such as rivers, agricultural fields, etc., as well as man-made and social elements such as property boundaries, buildings, and associated cultural heritage (Stamenov and Stamenova 2021).

All these elements, integrated in the perceived landscape, share a common characteristic: their spatial component. This is why everything around us can be georeferenced and cartographically represented, making it possible to first acquire knowledge about it and then incorporate it into decision-making for territorial development. In essence, geoinformation or geographic information is both useful and necessary for understanding and managing a territory. The same applies to cultural heritage, as all types of heritage are linked to specific geographic locations—whether tangible assets, which are tied to a precise point on the map, or intangible assets, which are associated with broader geographical areas (De Miguel 2024).

Heritage knowledge is essential for effective territorial development and its management from a cultural perspective. This approach should be rooted in the local history and traditions of a place, particularly when the aim is to preserve cultural memory and identity.

Collaborative Mapping of Cultural Heritage: Towards the Achievement of SDG 11.4

Aware of this, the preservation of cultural heritage is one of the UN's priority Sustainable Development Goal (SDG) 11.4, adopted in 2015, that emphasizes the need to protect and safeguard the world's cultural and natural heritage. Rural and urban heritage, natural and cultural, plays a fundamental role in shaping identities, preserving collective memory, and fostering social cohesion through the landscape. It includes not only historical monuments and architectural landmarks but also traditional neighborhoods, markets, public spaces, and cultural practices that define the character of a place.

However, urban heritage faces significant challenges due to rapid urbanization, population growth, and economic pressures, giving precedence to pragmatic visions of the territory (Martinez de Pisón 2010). The expansion of modern infrastructure, real estate development, and inadequate urban planning often leads to the destruction or deterioration of historic sites and culturally significant areas. In many cities, gentrification and commercialization threaten the authenticity and accessibility of heritage spaces, displacing local communities and altering the social fabric of historic districts. Additionally, environmental factors such as pollution, climate change, and natural disasters further endanger urban heritage, accelerating its degradation.

Community involvement is a crucial element in the heritage conservation process. Local residents, cultural organizations, and heritage experts should actively participate in decision-making to ensure that preservation efforts align with the needs, values, and identities of the communities that inhabit these spaces. Without this engagement, heritage conservation risks becoming a top-down process disconnected from the lived experiences and priorities of local populations (Bokova 2023).

This paper argues that educational strategies based on collaborative mapping play a key role in fostering a sense of ownership and responsibility among citizens, encouraging them to take an active part in heritage preservation. By providing communities with tools for visualizing heritage, reporting its state of conservation, and advocating for its protection and enhancement, these initiatives promote a more engaged, participatory, and conscious citizenry. This, in turn, strengthens the collective commitment to building more sustainable cities, where cultural and historical assets are valued as integral components of urban identity and development.

Digital Competences on Cultural Heritage Learning and Awareness: Quality Education for Sustainable Cities and Communities (CIVITAS III)

In this sense, geographic education systems are emerging as the best tools because they can be used to acquire both transversal digital and specific geographic competencies and, in addition, to promote a reflective and sustainable spatial citizenship with its environment. Since the early 21st century, the rise of online Geographic Information Systems (GIS), web-based GIS viewers, and digital atlases has revolutionized the way spatial data is accessed, analyzed, and applied. This technological progress has profoundly impacted various fields, including heritage studies, where GIS has become an indispensable tool for documentation, analysis, and preservation. In recent years, research on the use of GIS in heritage conservation has expanded significantly, highlighting its potential for supporting the sustainable management and spatial planning of cultural and historical assets.

At the same time, there has been an exponential growth in the development of educational resources aimed at integrating GIS into teaching and learning, particularly in the Social Sciences (Álvarez and Lázaro-Torres 2018; Buzo Sánchez et al. 2022, 2023; De Miguel et al. 2019; DeMiguel and Lázaro 2020; De Miguel and Sebastián 2022; Sebastián and De Miguel 2020; Sebastián et al. 2023; Serrano and Sebastián 2024). These resources are designed to enhance transversal, and in particular digital competencies by fostering spatial literacy, critical thinking, and data analysis skills. One of the most effective approaches in this context is collaborative mapping, which enables students, educators, and researchers to engage in participatory heritage documentation, promoting a more inclusive and community-driven approach to its conservation (Giovane di Girasole et al. 2019).

In particular, GIS and collaborative mapping permit to educators and learners to go beyond traditional heritage analysis methods, actively engaging with real-world challenges related to cultural preservation, urban development, and environmental sustainability (Amichai-Hamburger 2008). This approach not only provides to students with some valuable digital and analytical skills but also empowers them to become active participants in heritage protection and spatial justice initiatives.

One example of these strategies is the CIVITAS III project, which has among its primary objectives the analysis of how school communities acquire digital geographic competencies through the use of collaborative mapping. This methodology has been implemented in both lower secondary education students (*Educación Secundaria Obligatoria*) and teacher training students of bachelor's and master's degrees. These teacher education programs are focused on Early Childhood, Primary, and Secondary Education across three Spanish Autonomous Communities: Aragón, Andalucía, and Castilla y León.

Specifically, an ArcGIS Survey123 app has been developed to facilitate an interactive and systematic assessment of cultural heritage sites (Fig. 1), incorporating the nomenclature and analytical guidelines for heritage proposed by UNESCO (2021, 2023). This tool enables participants to:

- (1) Identify and geolocate the heritage asset—Users can pinpoint the exact location of a heritage site, ensuring accurate spatial documentation. In addition, in the case of tangible heritage, it allows them to add a photograph that identifies them.
- (2) Evaluate its significance from a personal and identity-based perspective—Participants reflect on the cultural, historical, and emotional value of the site, linking it to local and collective identity.
- (3) Assess its state of conservation—The app allows for a structured evaluation of the site's physical condition, identifying signs of deterioration, neglect, or potential threats.
- (4) Determine the type of risk it faces—Users classify risks, including environmental hazards (e.g., climate change, pollution), human-induced threats (e.g., vandalism, urban expansion), or structural decay.

By integrating geospatial technology with heritage education, this app promotes active engagement, fosters spatial awareness, and supports data-driven decision-making in cultural heritage conservation.

Objectives

Based on the aforementioned ideas, this study pursues two main objectives, which have been addressed using different methodologies and spatial analyses:

- (1) Identify the types of heritage that are considered most relevant or most easily recognizable by the general population involved in the study (tangible or intangible) and determine which types of threats are most easily identifiable

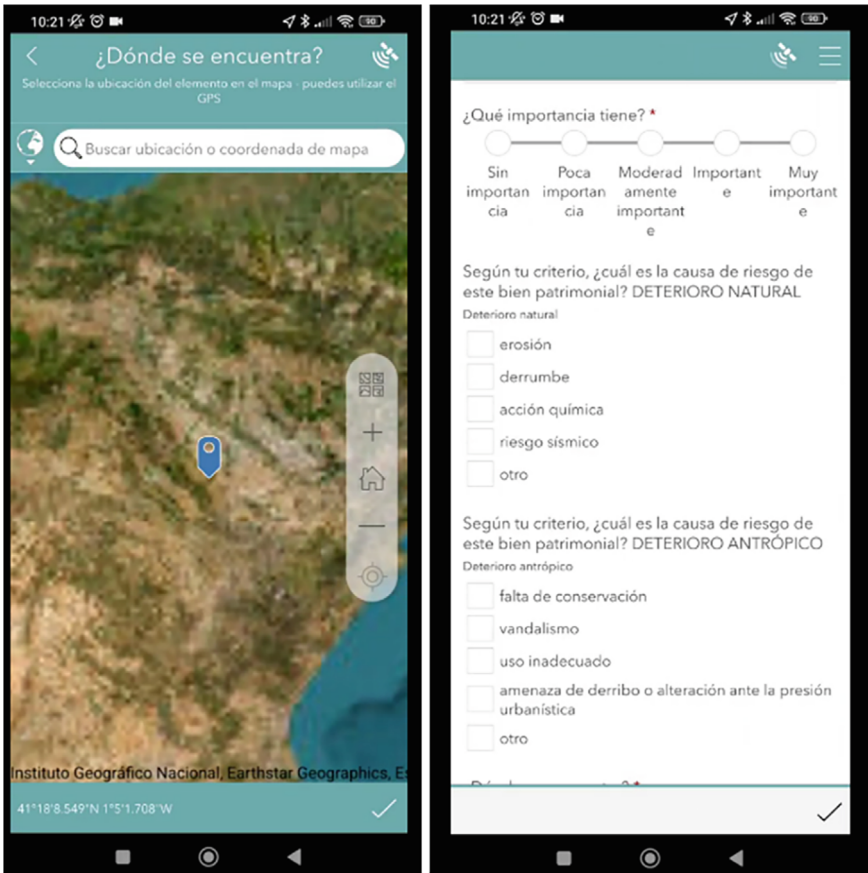


Fig. 1 Screenshots of the ArcGIS Survey123 mobile application and the integrated questionnaire, used for collaborative mapping of endangered cultural heritage

(anthropic or natural). This objective seeks to understand the perception of cultural heritage within communities. Additionally, it examines the extent to which different heritage elements are perceived as endangered, whether due to human actions (urban expansion, pollution, neglect) or natural causes (climate change, erosion, natural disasters, risks, and hazards).

- (2) Assess how collaborative mapping strategies foster a more active, critical, and reflective citizenship that contributes to sustainable cities. This objective explores the role of participatory geospatial technologies in enhancing civic engagement and spatial awareness. It investigates how involving citizens in heritage documentation through digital mapping tools (e.g., GIS-based applications) promotes social responsibility, encourages heritage conservation, and integrates local knowledge into urban sustainability policies.

By addressing these objectives, this research aims to bridge the gap between heritage studies, geospatial analysis, and civic participation, emphasizing the importance of digital literacy in cultural heritage conservation and urban sustainability planning.

Research Approach and Analysis Scales

To efficiently address both objectives, the research has been divided into two levels of analysis:

- (1) **A broad-scale analysis at the national scale (Spain)**—This approach examines the types of heritage mapped by pre-service teachers specializing in Early Childhood, Primary, and Secondary Education. Additionally, it provides the most commonly identified threats to heritage sites, offering insights into the general perception of cultural heritage and the factors contributing to its degradation across different regions of Spain.
- (2) A detailed **case study in the city of Zaragoza (Aragon, Spain)**—This focused analysis explores how collaborative mapping of urban cultural heritage, combined with critical reflection on its state of conservation, can foster spatial awareness and promote an engaged, reflective, and sustainability-oriented citizenship. By assessing participants' interpretation and documentation of heritage in their immediate surroundings, this study aims to highlight the role of digital mapping in shaping spatial literacy, civic responsibility, and sustainable urban development advocacy.

This multi-scale approach allows for both a broad assessment of national trends in heritage perception and conservation challenges, as well as a localized, in-depth exploration of how collaborative mapping methodologies influence citizen engagement and urban sustainability awareness.

Spanish Scale

At this spatial scale, the results obtained by participants in the research project Digital Competences, Learning Processes, and Cultural Heritage Awareness: Quality Education for Sustainable Cities and Communities (PID2020-115288RB-I00), funded by the Spanish State Research Agency and the Ministry of Science and Innovation, are analyzed.

This study does not focus on an educational perspective—already addressed by colleagues in this volume—but rather examines the findings derived from the mapping process conducted using ArcGIS Survey123. The analysis aims to evaluate how geospatial technologies contribute to the documentation, recognition, and

assessment of cultural heritage, offering insights into the types of heritage identified and the perceived threats affecting them.

Field data collection was conducted across the entire Spanish territory from March 2023 to December 2024. A total of 1098 heritage records were obtained, with 91.98% of them corresponding to tangible heritage and only 8.02% to intangible heritage.

Geographically, while the mapping covers all of Spain, a concentration of records is observed in the Aragón and La Rioja (Fig. 2). This distribution suggests a regional bias in data collection, potentially influenced by the location of participating institutions.

As a result of the mapping, both quantitative and qualitative information was obtained for each georeferenced asset: (1) type of heritage (tangible/intangible); (2) degree of importance (likert scale); (3) personal assessment of the heritage asset’s significance; (4) type of deterioration (natural/anthropic); (5) specification of causes of deterioration: natural (erosion, collapse, chemical action, seismic risk, other) or anthropic (lack of conservation, vandalism, inappropriate use, threat of demolition or alteration due to urban pressure, other).

All the information was analyzed through descriptive statistics using SPSS and a qualitative analysis with Atlas.Ti.

COLLABORATIVE MAPPING OF ENDANGERED CULTURAL HERITAGE CIVITAS III

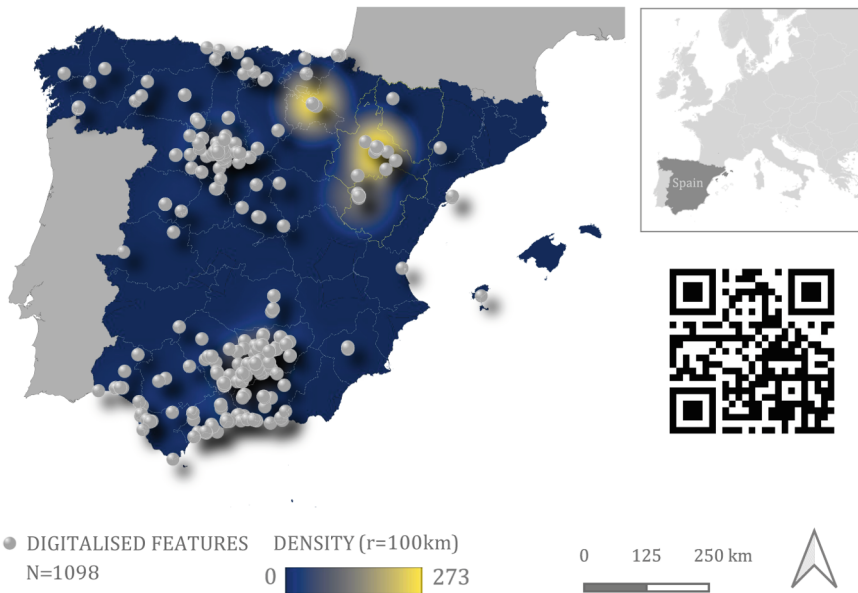


Fig. 2 Georeferenced cultural heritage location map

Local Scale: Zaragoza City

To evaluate whether the implementation of collaborative cultural heritage mapping in the classroom facilitates the acquisition of digital geographic competencies and fosters a more critical and sustainable citizenship in relation to its environment—specifically in the city of Zaragoza—three structured educational experiences were designed (Fig. 3). These experiences were developed to integrate both pedagogical and methodological approaches that align with competency-based learning and geographic literacy.

The design of the educational interventions considered multiple dimensions:

- (1) Educational levels: The study encompassed different stages of formal education to evaluate the impact of collaborative mapping across various cognitive and formative levels. The selected groups included: (1) 1st-year lower secondary education (K7): early-stage learners developing foundational geographic skills; (2) 3rd-year lower secondary education (K9): intermediate learners with a broader conceptual understanding of spatial relationships and urban dynamics; (3) Future secondary school teachers (Master's in Geography and History Teacher Education): advanced learners engaging with pedagogical strategies for implementing digital geographic tools in educational settings.
- (2) Heritage typologies: The mapping activities were structured around distinct types of cultural heritage to analyze how different heritage contexts influence geographic learning and critical thinking: (1) Contemporary heritage: The legacy of the International Exhibition *Expo Zaragoza 2008*, representing contemporary urban transformations and their socio-environmental impact with iconic architecture integrated in the river banks and a new suburban park; (2) Consolidated natural heritage inside built environment: José Antonio Laborleta Park, created in the third decade of the twentieth century, as an example of green spaces within urban environments, fostering discussions on sustainability, public space, and urban ecology; (3) Consolidated cultural heritage: Zaragoza's Historic Center, a case study in urban history, landmark conservation, and cultural identity of the middle age and early modern period buildings (churches and convents, palaces...) and urban scene.

For the analysis of teaching praxis, a mixed-methods approach was used, combining quantitative evaluation rubrics with a qualitative analysis of student responses. The rubrics (based on a scale of 1–5), aligned with competency-based learning models, allowed for an objective measurement of students' acquisition of digital geographic skills and critical citizenship competencies. Statistical techniques were applied to assess trends in learning outcomes, while teachers' prior evaluations provided additional validation. The qualitative analysis examined students' reflections to assess their critical thinking, spatial citizenship awareness, and understanding of sustainable development (De Miguel 2021, 2025). This approach provided insights into students' engagement with collaborative mapping, the challenges they faced, and their perspectives on urban sustainability and heritage conservation.

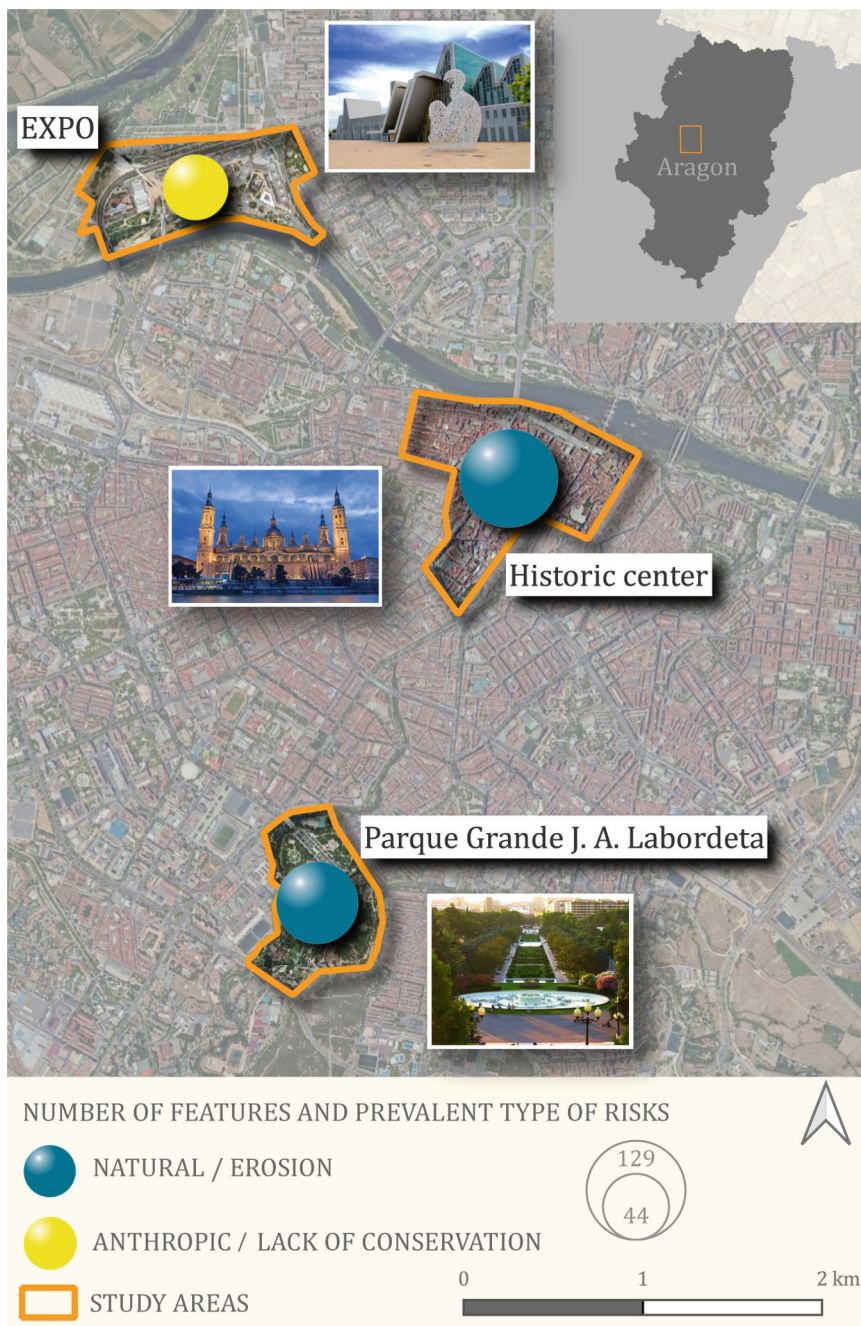


Fig. 3 Map of the educational field trips in Zaragoza

In all cases, an activity was designed based on educational itineraries, following a structured approach that encouraged both guided and autonomous learning (Fuller et al. 2006; Souto 2018; Morote Seguido 2019). The structure consisted of three key phases:

- (1) Pre-fieldwork sessions: Before the on-site activity, students attended introductory sessions covering the necessary theoretical and methodological framework. These sessions explained the objectives of the activity, the significance of place and space, and the use of digital mapping tools.
- (2) Semi-guided mapping during the fieldwork: The on-site activity was designed as a pseudo-guided mapping experience, balancing structured exploration with autonomous student participation. While facilitators provided initial guidance, students were encouraged to engage actively, document observations, and critically assess the heritage sites' conditions, fostering independent inquiry and spatial awareness.
- (3) Post-fieldwork data processing and analysis: After the fieldwork, students engaged in data analysis and reflection, evaluating the condition of the mapped heritage sites. This phase included discussions on heritage conservation strategies and revalorization proposals, where students formulated solutions for sustainable heritage management based on their field observations (Table 1).

Results

This section presents the results obtained, structured around the two main objectives that guide the study, each analyzed at two different scales. First, the typology and valuation of heritage elements by users of ArcGIS Survey123 are examined, combining quantitative and qualitative approaches. Second, the participants' outcomes after the educational intervention are explored, focusing on the acquisition of spatial competencies, awareness of cultural heritage, and the promotion of sustainable spatial citizenship.

Mapping Spain's Cultural Heritage

A quantitative classification of 1098 heritage elements reveals a significant predominance of tangible heritage (Table 2), which constitutes 91.98% (1010) of the total dataset. In contrast, intangible heritage accounts for only 8.02% (88), indicating that heritage classification is largely oriented towards material aspects. This distribution suggests a potential bias in heritage recognition, where physical structures and artifacts receive greater emphasis compared to cultural practices, traditions, and oral expressions.

Regarding the perceived importance of heritage elements (Table 3), the majority were classified as either "important" (35.52%) or "very important" (32.60%), while

Table 1 Summary table of the three collaborative mapping educational interventions

<p>Expo Zaragoza 2008 Number of students: 18 Average age of students: 14 years Number of georeferenced heritage assets: 44</p>	
<p>José Antonio Labordeta Park Number of students: 20 Average age of students: 15 years Number of georeferenced heritage assets: 87</p>	
<p>Historic Center Number of students: 60 Average age of students: 25 years Number of georeferenced heritage assets: 129</p>	

Table 2 Georeferenced tangible and intangible heritage in the project

	N	%
Tangible heritage	1010	91.98
Intangible heritage	88	8.02
Total	1098	100

an additional 22.59% were considered “moderately important.” In contrast, 9.29% of participants selected heritage elements that they personally regarded as “of little importance” or “not important at all.”

Table 3 Degree of importance of georeferenced heritage

	N	%
Very important	358	32.60
Important	390	35.52
Moderately important	248	22.59
Slightly important	90	8.20
Not important	12	1.09
Total	1098	100

Table 4 Analysis of the open-ended response: why is this heritage asset important?

	N
Others	9146
Symbolic/social value	65
Historical value	56
Cultural value	44
Natural value	31
Identity value	21
Economic	13
Total	9376

From a scientific perspective, the classification was conducted through quantitative content analysis, systematically grouping terms based on predefined heritage value categories. The dataset contained a total of 9376 occurrences, which were assigned to their respective categories using keyword matching and semantic association techniques. The frequency distribution was then analyzed to determine the relative importance of each category (Table 4).

The analysis of heritage value categorization reveals that the majority of terms fall under the “Others” category, indicating a diverse range of concepts not specifically tied to a particular value classification. Among the defined categories, “Symbolic/Social Value” holds the highest frequency, highlighting the significance of heritage as a representation of collective meaning and identity. “Historical Value” follows closely, emphasizing the importance of historical elements in patrimonial recognition. “Cultural Value” and “Natural Value” also play notable roles, reflecting the relevance of cultural heritage and environmental aspects. Lastly, while less frequent, the “Identity Value” category reinforces heritage’s role in fostering a sense of belonging and connection to traditions. This classification provides insight into how different heritage dimensions contribute to its broader societal significance.

The quantitative analysis of risk natural factors affecting heritage sites (Table 5), reveals that erosion (36.16%) and landslides (30.87%) are the predominant threats. Chemical action (11.84%) and seismic risk (3.73%) represent secondary hazards, while other factors (17.40%) contribute to additional degradation. This distribution may be influenced by a bias in participants’ perception or even by a lack of clarity in

Table 5 Natural factors affecting heritage sites

	N	%
Erosion	397	36.16
Landslide	339	30.87
Chemical action	130	11.84
Seismic risk	41	3.73
Other	191	17.40
Total	1098	100

the survey design, which could affect the accurate identification of risk factors. Such limitations highlight the importance of refining assessment methodologies to ensure a more objective and comprehensive evaluation of heritage threats.

The quantitative analysis of anthropic risk factors affecting heritage preservation (Table 6) indicates that lack of conservation (44.26%) is the primary threat, followed by vandalism (21.95%). Inappropriate use (11.66%) and the threat of demolition or alteration due to urban pressure (10.20%) also pose significant risks. Additionally, other factors (11.93%) contribute to the degradation of heritage assets.

The quantitative and qualitative assessment of heritage elements underscores the predominance of tangible heritage in classification processes, revealing potential biases in recognition and conservation efforts. The varying degrees of perceived importance highlight the diverse ways in which communities value heritage, emphasizing the need for inclusive preservation strategies. Moreover, the identification of both natural and anthropic threats—particularly erosion, lack of conservation, and urban pressure—demonstrates the urgency of implementing targeted management policies. These findings call for a more comprehensive and interdisciplinary approach that integrates cultural, historical, environmental, and social dimensions to ensure the sustainable protection of heritage assets.

Table 6 Anthropic factors affecting heritage sites

	N	%
Lack of conservation	486	44.26
Vandalism	241	21.95
Inappropriate use	128	11.66
Threat of demolition or alteration due to urban pressure	112	10.20
Other	131	11.93
Total	1098	100

Towards a Sustainable Citizenship: The Case Study of Zaragoza

This section presents the results obtained regarding the acquisition of: (i) spatial and geographic competencies; (ii) awareness of cultural heritage; and (iii) sustainable spatial citizenship. A pretest-post-test design was used with natural groups, without the presence of a control group. The procedure was primarily based on three actions: first, an initial evaluation was conducted by the teaching staff to determine the baseline level; second, an educational intervention was carried out using collaborative mapping; and finally, after the completion of the courses, a post-test evaluation was also conducted by the teaching staff to assess the students’ progress and final status.

The study results show that each intervention had a differential impact on the competencies evaluated, depending on the context in which it was conducted.

1. Expo Zaragoza 2008 (Table 7): the competency with the greatest variation was cultural heritage awareness, showing a significant increase in the post-test (2.8 → 4.6, $p = 0.0005$). This indicates that the setting of an expository event and access to informational materials facilitated an understanding of the heritage value of modern urban spaces. A notable improvement was also observed in spatial-geographic skills (3.2 → 4.5, $p = 0.001$), suggesting that collaborative mapping helped strengthen orientation and environmental analysis skills.
2. *Parque Grande José Antonio Labordeta* Park (Table 8): the competency that improved the most was sustainable spatial citizenship, with a remarkable increase (3.3 → 4.7, $p = 0.0001$), indicating that the relationship with the park’s natural and cultural environment allowed students to reflect on sustainability and public space management. Cultural heritage awareness also showed a significant improvement (2.9 → 4.5, $p = 0.001$), suggesting that the combination of historical and natural elements in the park helped reinforce the perception of heritage value.
3. Historic Center (Table 9): the competency with the greatest variation was spatial-geographic skills, with a significant increase (3.0 → 4.3, $p = 0.001$). This suggests that the complexity of the urban layout and the rich heritage of the historic center favored the development of spatial skills. A significant growth was also observed in cultural heritage awareness (3.0 → 4.4, $p = 0.002$), indicating that

Table 7 Adjusted summary table of interventions and competencies

Expo Zaragoza 2008	Pre-test mean score	Post-test mean score	Significance level (p -value)
Spatial-geographic skills	3.2	4.5	0.001
Cultural heritage awareness	2.8	4.6	0.0005
Sustainable spatial citizenship	3.3	4.7	0.0001

Table 8 Adjusted summary table of interventions and competencies

Parque Grande José Antonio Labordeta Park	Pre-test mean score	Post-test mean score	Significance level (<i>p</i> -value)
Spatial-geographic skills	3.1	4.4	0.001
Cultural heritage awareness	2.9	4.5	0.002
Sustainable spatial citizenship	3.2	4.6	0.0005

immersion in a dense heritage context facilitated the appreciation of the historical and architectural value of the environment.

In addition to these competencies, detailed descriptive analyses have been conducted on the previous scale. However, we would also like to present the map showing the types of risks detected in each study area during the Zaragoza experiences $N = 260$ (Fig. 4). The map analysis reveals that natural and anthropic risks are simultaneously represented across all areas, suggesting a complex interaction between environmental and human factors. There are 33 features where natural risks outweigh anthropic ones, whereas in 32 cases, anthropic risks are more significant. Finally, 195 items present an equal distribution of natural and anthropic risks. This combination is not random but rather a result of territorial, urban, and environmental dynamics that amplify the vulnerability of heritage assets and urban spaces. Furthermore, from an educational perspective, this may contribute to the acquisition of spatial citizenship by fostering an understanding of the intricate relationship between environmental processes and human actions.

Last, it is important to highlight that the teachers involved in the Expo 2008 and *Parque Grande J.A. Labordeta* Park experiences emphasized the high level of student engagement during the session following the fieldwork. Secondary education students were able to develop their own critical thinking regarding the state of conservation of the mapped heritage assets and, at the same time, felt empowered to propose solutions. For example, they suggested the reuse of public space within the International Expo site or the creation of tourist itineraries through the cultural heritage assets of the park.

Table 9 Adjusted summary table of interventions and competencies

Historic Center	Pre-test mean score	Post-test mean score	Significance level (<i>p</i> -value)
Spatial-geographic skills	3.0	4.3	0.001
Cultural heritage awareness	3.0	4.4	0.002
Sustainable spatial citizenship	3.1	4.5	0.001

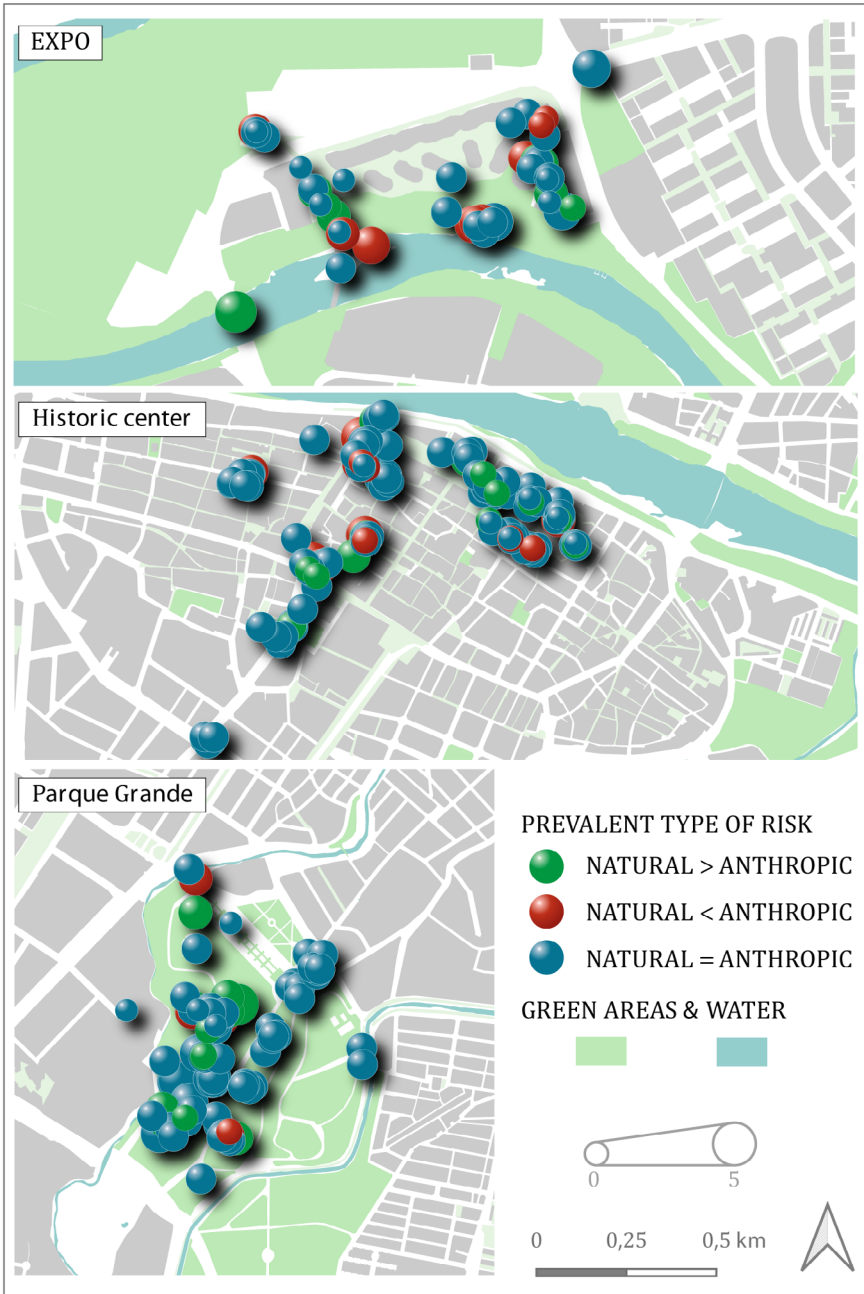


Fig. 4 Map of the educational field trip in Zaragoza

Discussion and Conclusions

This study reaffirms that Geography, History, and Heritage are not only taught in the classroom but are better. Their integrated and interdisciplinary nature enhances comprehension and engagement. Specifically, the main conclusions drawn from this research are: This study reaffirms that Geography, History, and Heritage are not only taught in the classroom but are better understood and internalized through experiential learning beyond it. Their integrated and interdisciplinary nature as school subjects enhances deeper comprehension and engagement. Specifically, the main conclusions drawn from this research are.

- (a) Collaborative mapping fosters spatial citizenship and civic engagement. The use of geospatial tools in heritage education facilitates a deeper understanding of cultural landscapes and empowers citizens to actively participate in heritage conservation. Students and local communities develop a sense of spatial responsibility, recognizing the significance of preserving historical and cultural assets.
- (b) There is a bias towards tangible heritage, highlighting the need for a broader recognition of heritage. The predominance of tangible over intangible heritage (91.98 vs. 8.02%) in the mapping process suggests that built heritage receives greater attention than oral traditions, folklore, and cultural practices. This highlights the need for more inclusive approaches to ensure a balanced representation of all forms of heritage.
- (c) Educational interventions strengthen digital geographic competencies. The CIVITAS III project and related initiatives demonstrate that integrating GIS-based collaborative mapping into educational curricula enhances students' spatial literacy, critical thinking, and problem-solving skills. This interdisciplinary approach aligns with competency-based learning models and promotes sustainable citizenship practices.
- (d) Heritage conservation should be embedded in sustainable urban planning practices. Cultural heritage goes beyond being a historical object or mere memory; it is an essential part of everyday life in modern society. The findings emphasize the need to incorporate heritage management into territorial development policies, ensuring that cities balance modernization with historical preservation to promote inclusive, resilient, and culturally enriched urban environments.

Incorporating cultural heritage into territorial development is not merely about preserving the past but also shaping the future. By combining historical and geographical knowledge with modern tools such as geospatial technology, societies can foster more inclusive, informed, and culturally enriched urban and rural environments. In this way, cultural heritage becomes not just a relic of history but a dynamic and integral element of contemporary life and sustainable development.

This chapter highlights the crucial role of collaborative mapping in the preservation of endangered cultural heritage and its integration into sustainable urban development. By engaging students and local communities in geospatial documentation

and analysis, the research demonstrates how digital tools can enhance spatial awareness, foster civic participation, and promote informed decision-making for heritage conservation. The findings reinforce the idea that Geography, History, and Heritage are best understood through geo-inquiry learning, bridging the gap between theoretical knowledge and practical application. Additionally, the categorization of heritage values underscores the diverse ways in which cultural assets contribute to collective identity, historical continuity, and environmental awareness. Ultimately, this study reaffirms that cultural heritage is not just a legacy of the past but a key driver of sustainable and inclusive urban and territorial planning for the future.

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