

Historical Geography at Large

Bench marks of change: Heritage survival, loss, and the reading of landscape

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ABSTRACT

Ordnance Survey (OS) bench marks are small, chiselled survey marks, typically composed of a horizontal line or indentation above an upward-pointing arrow. Used by the OS to measure height during the nineteenth and twentieth centuries, they shaped topographic knowledge in Ireland, Great Britain and beyond. Despite their ubiquity, they have received little scholarly attention, with recording projects emphasising surviving examples while overlooking the potential significance of those obscured or destroyed. 'Locating Bench Marks, Preserving Heritage' is a digital participatory project that uses the location of bench marks as shown on early OS maps of County Limerick to guide present day field observations recording their survival and loss. Combining participatory methods, archival cartography and GIS, it produces a place-based digital photographic archive of heritage presence and absence, revealing a striking pattern of loss, with over 90 % of bench marks no longer extant or visible. The project demonstrates the value of integrating spatial technologies with academic and public co-creation, the latter essential in drawing on local knowledge. Further, it illustrates how one form of heritage can serve as an indicator of wider transformations in built and natural environments, reframing heritage loss not as absence alone but as new evidence of landscape change.

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Landscapes have long been approached by historical geographers as cultural texts through which we can view and interrogate change, producing a layered biography of place over time.¹ Heritage and landscape are therefore deeply intertwined: surviving heritage marks landscapes, while landscape change, whether natural or anthropogenic, reshapes the visibility of heritage and informs its survival.

Ordnance Survey (OS) bench marks are small, often unnoticed symbols dotted across Ireland's landscape, representing the material traces of the first systematic venture to measure height across an

entire country.² British-led and initiated during the first ordnance survey of Ireland in the late 1830s with 'the principal lines of spirit levelling', the OS established a methodology and framework that was later replicated across other British jurisdictions and colonial domains.³ Most commonly appearing as a straight chiselled line or rounded indentation above an upward-pointing arrow (Fig. 1),

² In historical Ordnance Survey usage, 'bench mark' (two words) is the correct noun for the physical levelling marks, whereas the modern spelling 'benchmark' reflects a later linguistic shift. Trigonometrical points, usually on pillars, differ from bench marks as they were used to fix precise horizontal positions (and occasionally height), while bench marks were employed to measure height above (mean) sea level only.

³ See John H. Andrews, *A Paper Landscape: The Ordnance Survey in Nineteenth-Century Ireland* (Oxford: Oxford University Press, 1975); John H. Andrews, *Maps in Those Days: Cartographic Methods before 1850* (Dublin: Four Courts Press, 2002); Matthew H. Edney, *Mapping an Empire: The Geographical Construction of British India, 1765–1843* (Chicago: University of Chicago Press, 1997). Given the colonial context of the first ordnance survey of Ireland, see J. Brian Harley, 'Maps, knowledge, and power', in *The Iconography of Landscape*, ed. by Denis Cosgrove & Stephen Daniels (Cambridge: Cambridge University Press 1988), pp. 277–312; After partition, the Ordnance Survey became Ordnance Survey Great Britain, Ordnance Survey Northern Ireland and Ordnance Survey Ireland, the latter now known as Tailte Éireann.

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¹ William B. Hoskins, *The Making of the English Landscape* (London: Hodder and Stoughton, 1955); John B. Jackson, *Discovering the Vernacular Landscape* (New Haven: Yale University Press, 1986).

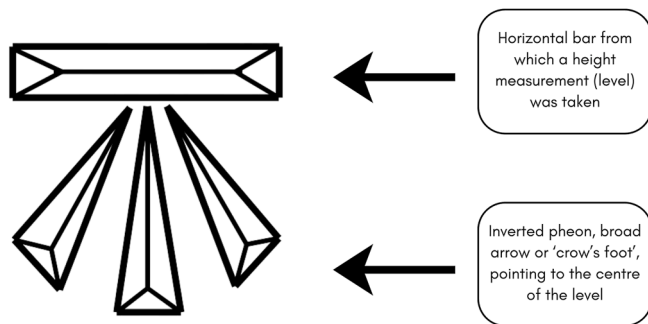


Fig. 1. An illustration of a typical Ordnance Survey 'cut' bench mark.

thousands of bench marks were cut into stone or brick over more than 150 years, exact points from which height measurements were recorded.⁴ Printed as 'crow's feet' on published OS maps (Fig. 2), they fixed the height of Ireland's landscape relative to the original Ordnance Datum measured at Poolbeg Lighthouse in Dublin. Through height recording, OS maps have therefore provided great utility for generations of professionals in construction, civil engineering, and other sectors that rely on local elevation data.⁵

Though largely superseded by satellite and digital technologies in the late twentieth century, many bench marks remain in the built environment and are today increasingly recognised not only as survey heritage but also as part of Ireland's wider heritage.⁶ Yet their survival is precarious, with many being destroyed, often unknowingly, over time. Scholarship and volunteer recording projects, largely focused on the United Kingdom, have expressed concern over this loss, and yet have tended to focus on untangling survey histories and cataloguing surviving examples, overlooking the potential significance of those that have disappeared.⁷

This emphasis on survival is understandable. Safeguarding extant heritage and maintaining loss registers is essential, but research and policy have nonetheless remained centred on what remains.⁸ For the historical geographer, however, a survival focused approach offers



Fig. 2. The site of four bench marks in Limerick City, as shown on the 25" inch map (courtesy of Tailte Éireann as supplied through the National Mapping Agreement 2019/OSI_NMA_280).

only a partial view of past landscapes. What then can attending to the absence of heritage, as well as its survival, potentially reveal about landscape change over time? This question connects directly to cultural landscape traditions in historical geography, which emphasise both what endures and what has vanished, in shaping the biography of place.⁹ Further, OS bench marks, unlike much tangible heritage, are situated in both rural and urban contexts, offering a view across multiple scales and geographies. In this sense, heritage loss, as much as survival, might become a lens through which to read landscape change in diverse spatial settings.

To explore this, in 2025 the pilot project 'Locating Bench Marks, Preserving Heritage' set out to document OS bench mark survival and loss in County Limerick, Ireland.¹⁰ Using spatial technologies, the project established an interactive infrastructure through which communities can record, access and learn about bench marks as part of their own heritage and local landscape. This required examining three generations of early OS cartography to manually locate the sites of height measurement, marked on the maps as 'crow's feet.' In doing so, the project situates cartographic archives alongside digital approaches and local knowledge, ultimately creating a place-based archive from which to assess heritage survival, absence, and landscape change.

This paper describes the digital infrastructure underpinning the project, the engagement with communities in co-creating the dataset, and reflects on preliminary insights from the project, arguing that heritage loss can itself serve as evidence of broader landscape change and transformation.

The digital infrastructure

Given the thousands of bench marks cut in County Limerick alone, to assess each site required the knowledge and assistance of regional populations in the data collection process. Scholars have long recognised the potential of participatory engagement, crowd sourcing concepts and citizen science, now often termed

⁴ Other forms of bench mark include rivets, bolts and flush brackets and on rare occasions they were cut into timber. Some bench marks, in more remote areas, were also placed into living rock. It is not known how many bench marks were cut in Ireland; however, it is estimated to be in the hundreds of thousands. There is a digitised bench mark location register for Northern Ireland and a more comprehensive one of Great Britain, but they are incomplete.

⁵ The first Irish Ordnance Datum was measured on 8th April 1837. In the 1970s the Datum was moved to Malin Head in County Donegal. For Great Britain, the first Ordnance Datum was established in 1840 in Liverpool before being superseded in 1920 by a new datum at Newlyn, Cornwall; bench marks are also now being used to assess sea level rise.

⁶ See Catherine Porter and Margaret O'Sullivan's writeup on OS bench marks as heritage in Ireland, <https://www.rte.ie/brainstorm/2025/0728/1525673-ordnance-survey-benchmarks-ireland-history-heritage-height-measurements/> (accessed 10 December 2025).

⁷ Mark Edward Bailey, C. John Butler, James A. Finnegan and Shane T. Kelly, 'A Note on the Cut Benchmarks at Armagh Observatory: Marking Two Hundred years of Ordnance Survey of Ireland', *Irish Geography*, 56 (2) (2023) 123–135, DOI: 10.55650/igc.2023.149; Cormac Bourke, 'The archaeology of the benchmark', *Archaeology Ireland*, Autumn, (2022) 41; Keith D. Lilley, 'Mapping the Nation: Landscapes of Survey and the Material Cultures of the Early Ordnance Survey in Britain and Ireland', *Landscapes*, 18(2) (2017) 178–199, <https://doi.org/10.1080/14662035.2018.1429717>; Peter Wilson, 'Marks of the Ordnance Survey', *Portrush Heritage Group: Heritage Newsletter*, 52 (2021); Peter Wilson and Frances Wilson, 'Benchmarks — a view from up north', *Archaeology Ireland*, 37(2) (2023), 25–29. The project Mapping Monuments is an exception which goes some way to investigating some now hidden or lost landscapes of the early OS in County Derry/Londonderry, <https://experience.arcgis.com/experience/c0fb603a471d4cc5928147a66077fd9c> (accessed 10 December 2025); the leading community bench mark database in Great Britain and Northern Ireland is <https://www.bench-marks.org.uk/> (accessed 9 December 2025).

⁸ OS bench marks are currently not protected through legislation.

⁹ See Hoskins, *English Landscape*, 1955; Carl O. Sauer, 'The Morphology of Landscape', *University of California Publications in Geography*, 2(2)(1925) 19–53; Jackson, *Discovering the Vernacular Landscape*, 1986.

¹⁰ 'Locating Bench Marks, Preserving Heritage: A Community Initiative to Record County Limerick's Ordnance Survey Heritage' was co-funded by the Heritage Council and the Faculty of Arts, Humanities and Social Sciences, University of Limerick, under the Heritage Council's Stewardship scheme. The project website can be accessed at: <https://experience.arcgis.com/experience/d344785a3c7a427eb61607386fd9e745/page/Home> (accessed 12 December 2025).

volunteered geographic information (VGI), to extend spatial datasets through public contribution.¹¹ In a heritage context, participatory mapping has been shown to foster new forms of engagement and reflexivity, situating local knowledge alongside archival and other sources, in what van der Hoeven terms 'people-oriented ... heritage conservation'.¹² Recent research also highlights how Geographic Information Systems (GIS), as applied to cultural heritage conservation, are reshaping methodological practice and public involvement, while digital infrastructures are increasingly understood as disciplinary interventions that mediate between subject and local communities.¹³

By building on the reframing of public history as public historical geography, the project offers a fresh exemplar for connecting historical geographers with place-based, heritage-focused community engagement practices.¹⁴ Its distinctiveness here lies in applying participatory methods not solely to human subjects, though their involvement is central, but to tangible heritage objects, OS bench marks becoming the focal point through which communities engage with their local landscape and heritage. Public participation therefore extends beyond data collection, to support local communities in recognising bench marks as heritage at risk and empowering them to advocate for their protection. From a scholarly perspective, the presence or absence of the bench marks has also provided insights into how the county's landscape has changed since the early nineteenth century. In this way, the project demonstrates how historical geography and heritage can be co-practised as a place-based, knowledge gathering endeavour.

Within this framework, the project required an infrastructure capable of collecting not only evidence of survival and loss but also geographical and contextual information that could be used to interrogate landscape change over space and time. Through a browser based mobile collection application designed in ESRI's ArcGIS platform, participants recorded location, status ('found' or 'not found'), condition, type, and the structure surveyed through a series of closed, single-response multiple-choice questions,

alongside photographic evidence, and an open text box for additional details.¹⁵ The application was deliberately designed to be accessible to non-specialists while still producing data suitable for spatial and historical analysis.

Central to the survey tool application was the creation of a comprehensive digital point layer of OS bench mark locations derived from early OS maps, including associated height data (above the Poolbeg Ordnance Datum) for County Limerick, the most comprehensive dataset of its kind for Ireland. The digitisation process divided the county into 1 km squared grids, and three historic OS map series (the 25-inch, 'last' edition, and town plans) were examined manually to identify individual crow's feet on the maps and digitise bench mark locations, resulting in 5300 individual sites for assessment (Fig. 3).¹⁶ This dataset formed the core cartographic infrastructure for the mobile application, overlaid on a choice of historic and modern maps, to assist community volunteers in locating and recording observations at bench mark sites.

The open text box proved crucial for capturing community observations, enabling the collection of qualitative insights specific to each site. For example, one submission marked 'not found' explained that a bench mark once sited on a gate pillar had been demolished in the 1980s to build a new roadside frontage to a domestic property. Co-creation was thus embedded in the architecture of the project, ensuring that localised landscape knowledge was not supplementary but central to the dataset.

Community workshops

Community workshops introduced participants to the history of OS bench marks and trained them in the use of the mobile application. These sessions, combined with the mobile application, became spaces of dialogue where survey histories were enriched by lived experience and collective memory. One participant recalled a bench mark on the window sill of his childhood home, since demolished and replaced by a modern dwelling. Another submitted a photograph of an extant bench mark on a gate post at his family farm, accompanied by an anecdote about its importance to his family, which had ensured its continued survival (Fig. 4).¹⁷ A further volunteer provided a photograph of an unusual bench mark, and recounted how her late husband, when rendering a gatepost at their home, carefully reinstated his own version of the crow's foot at the exact location of the original (Fig. 5).

¹¹ Michael F. Goodchild, 'Citizens as sensors: the world of volunteered geography', *GeoJournal*, 69(4) (2007) 211–221; Michael F. Goodchild and Linna Li, 'Assessing the quality of volunteered geographic information', *Spatial Statistics*, 1(1) (2012) 110–120, <https://doi.org/10.1016/j.spatsta.2012.03.002>.

¹² Alina Álvarez Larrain and Michael McCall, 'Participatory mapping and participatory GIS for historical and archaeological landscape studies: a critical review', *Journal of Archaeological Method and Theory*, 26 (2019) 643–678, DOI: 10.1007/s10816-018-9385-z; Hamid Salimi, Somayeh Fadaei Nezhad Bahramjerd and Rana Tootoonchi, 'The role of Geographic Information Systems (GIS) in participatory conservation of heritage areas', *European Journal of Geography*, 16(1) (2025) s11–s11, <https://doi.org/10.48088/ejg.si.spat.hum.h.sal.1.11>; Arno van der Hoeven, 'Valuing Urban Heritage Through Participatory Heritage Websites: Citizen Perceptions of Historic Urban Landscapes', *Space and Culture*, 23(2) (2018) 129–148, <https://doi.org/10.1177/1206331218797038>.

¹³ Beibei Liu, Cong Wu, Weixing Xu, Yingning Shen and Fengliang Tang, 'Emerging trends in GIS application on cultural heritage conservation: a review', *Heritage Science*, 12(1) (2024) 1–14, <https://doi.org/10.1186/s40494-024-01265-7>. Jake Hodder and David Beckingham, 'Digital archives and recombinant historical geographies', *Progress in Human Geography*, 46(6) (2022) 1298–1310; Jen J. Gieseke, 'Where are we? The method of mapping with GIS in digital humanities', *American Quarterly*, 71(4) (2019) 1075–1099.

¹⁴ Felix Driver, 'Historical geography at large: towards public historical geographies', *Journal of Historical Geography*, 46 (2014) 9, <https://doi.org/10.1016/j.jhig.2010.06.003>; Dydia Delyser, 'Towards a participatory historical geography: archival interventions, volunteer service, and public outreach in research on early women pilots', *Journal of Historical Geography*, 46 (2014) 93–98, <https://doi.org/10.1016/j.jhig.2014.05.028>; Caroline Bressey, 'Archival interventions: participatory research and public historical geographies', *Journal of Historical Geography*, 46 (2014) 102–104, <https://doi.org/10.1016/j.jhig.2014.07.001>; Hilary Geoghegan, 'A new pattern for historical geography: working with enthusiast communities and public history', *Journal of Historical Geography*, 46 (2014) 105–107, <https://doi.org/10.1016/j.jhig.2014.07.002>.

¹⁵ A user guide for the mobile application, along with the application itself, can be accessed through the project website: <https://experience.arcgis.com/experience/d344785a3c7a427eb61607386fd9e745/page/Resources-%26-Outputs> (accessed 12 December 2025); ArcGIS Experience Builder was used to construct the website and ArcGIS Survey123 to create the bespoke mobile application; The category, 'Structure' surveyed instructs the user to record what they observe, for example, where a bench mark was most likely placed on a stone wall, but this wall is now overgrown with hedging, 'Hedge' should be chosen from the options, not 'Wall'.

¹⁶ Sources differ in their interpretation of the map dates, largely because different parts of the country were mapped at different times and map revisions did not always cover every county. According to the University College Dublin online Map Library the 25" maps date from between 1897 and 1913 and the last edition 6" maps from 1910s–1950s, while the 5 foot town plans for County Limerick date to 1870. Note that while some projects are currently extracting information from early maps using artificial intelligence (see ARCHA: <https://www.archai.io/> (accessed 10 December 2025); Machines Reading Maps: <https://machines-reading-maps.github.io/> (accessed 10 December 2025), this was outside of the remit of this project. Further, given the poor resolution of some map sheets, computer models would struggle to identify many of the bench mark locations from the maps.

¹⁷ Note the modern steel pillar added to the right of the post to support a new gate to the field, and a modern wooden post installed for barbed wire fencing to the left.

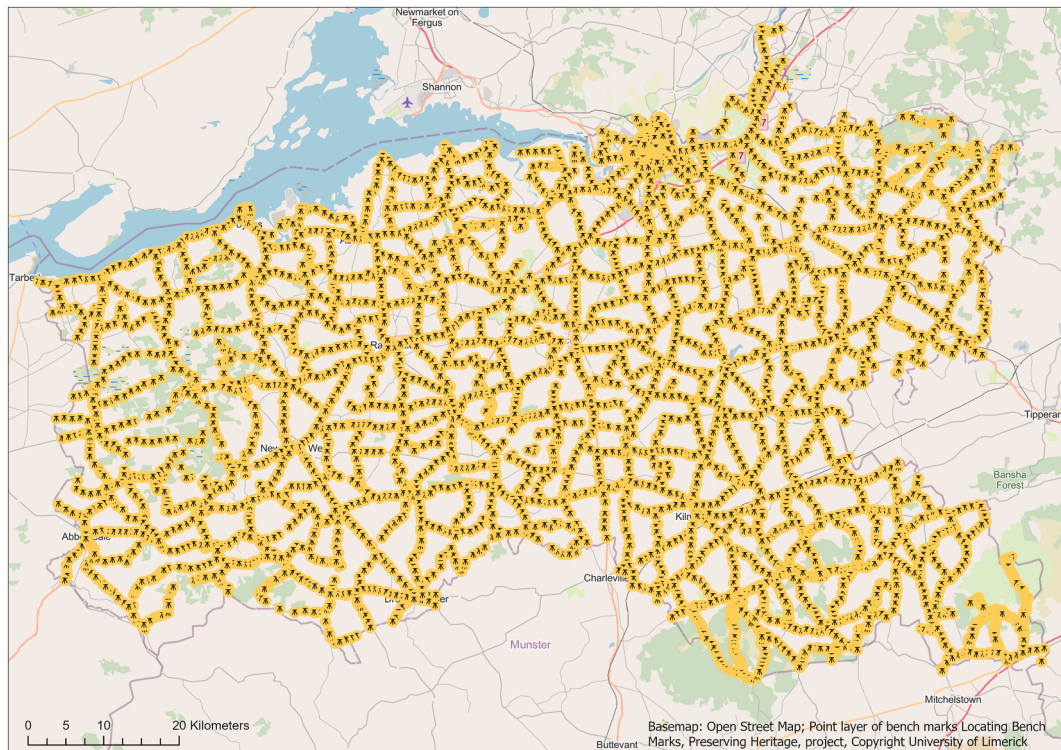


Fig. 3. The point layer of 5300 bench marks in County Limerick digitised according to the historic Ordnance Survey maps (25", 'last' edition and town plans).

Other volunteers contributed examples of bench marks no longer in situ but, recognising their significance, had repurposed them as garden ornaments. Local farmers, meanwhile, often possessed detailed knowledge of where bench marks had once been visible along rural roadsides, recalling stories of surveyors visiting these locations, knowledge often passed through generations of the same family. Such exchanges resonate with wider traditions of citizen science, where semi-structured, in-person participation expands knowledge production and sharing. Yet they also extend beyond this by reframing heritage, whether surviving or lost, as evidence of landscape change: a stone wall, becomes a brick wall or a hedge; a property frontage is demolished and its materials reused elsewhere.

By situating local experience alongside the digital infrastructure and in-person workshops then, the project emphasises the interpretive value of community expertise in reading and reporting transformation to the landscape. Methodologically, this co-creation challenges boundaries between academic research and public involvement, engaging with critical debates on participation, heritage recognition, and the democratisation of knowledge.¹⁸

Preliminary data

At the time of writing, almost half of all known bench mark sites in County Limerick have been visited and assessed (2515 of 5298, or

~48 %). The emerging dataset reveals the spatial distribution of extant and destroyed bench marks across the county in both urban and rural contexts. Strikingly, 92 % of all submissions to date are classed as 'not found'. This alone highlights the stark reality of this heritage loss across time, and the need for deeper investigation into its cause, as well as strategies for future mitigation and protection.

Analysis of the collected attributes provides a more detailed picture of bench mark survival and loss. 'Structure' type shows that walls, bridges and gateposts in urban environments account for the majority of surviving marks, while agricultural buildings, churches and boundary markers (also milestones), many in rural contexts, exhibit higher rates of loss.¹⁹ Particularly notable is the high proportion of sites recorded as 'hedge' (36 %), with photographs pointing to the complete removal of vernacular stone walls and their replacement with modern hedging, or the gradual environmental erasure of these boundaries through natural vegetation growth.

The 'Condition' category is also revealing.²⁰ Over three quarters of surviving bench marks are classed as 'clearly visible', most often on bridges, gate posts and walls. The remainder of surviving marks are in 'poor' condition, attributed to erosion (especially in softer stone such as sandstone), deliberate damage suggesting attempted heritage erasure, or obscuration through the natural growth of moss or lichen, or renovation works such as painting, lime wash, or rendering. Those deemed 'destroyed' make up 25 % of submissions, most commonly due to road infrastructure and built development, bridge maintenance and reconstruction, and the demolition or replacement of vernacular buildings and boundary walls in rural and urban contexts.

¹⁸ Andrea Cornwall, 'Unpacking 'Participation': models, meanings and practices', *Community Development Journal*, 43(3) (2008) 269–283, <https://doi.org/10.1093/cdj/bsn010>; Emma Waterton and Laurajane Smith, 'The recognition of heritage: the politics of heritage and the public', *International Journal of Heritage Studies*, 16(1–2) (2010) 4–15, <https://doi.org/10.1080/13527250903441671>; Nina Simon, *The Participatory Museum*. (California: Museum 2.0, 2010), <https://participatorymuseum.org/> (accessed 5 December 2025); Niamh NicGhabhann-Coleman, Zenobie Garrett and Francis Kane, 'That's a powerful map' – shared authority, public engagement, and archives of the first Ordnance Survey of Ireland', *Journal of Historical Geography*, 88 (2024) 65–73, <https://doi.org/10.1016/j.jhig.2024.12.006>.

¹⁹ Structure indicates the visible structure surveyed, not necessarily the structure into which the bench mark was originally cut.

²⁰ The 'Condition' menu choices in the app include Clearly Visible, Destroyed, Lost to Nature, Lost to Renovation Works, Poor, Unknown and Other.



Fig. 4. An example of a 'cut' bench mark chiselled into an upright sandstone pillar (gate post), in Coole East townland, south west of Athea.



Fig. 5. An example of a modern interpretation of a bench mark, the original of which is lost to renovation at the same site.

The 'Lost to Nature' category (37 %) emerges as especially telling. As with the 'hedge' classification, it signals that the dry stone walls once lining Ireland's roads and demarcating the landscape, are now, in many parts of the county, heavily subsumed by vegetation growth. Many of these bench marks may still exist physically, but they are no longer visible in the changed landscape

(Fig. 6).²¹ This finding is particularly significant considering UNESCO's 2024 inscription of Ireland's dry stone construction on the Representative List of the Intangible Cultural Heritage of Humanity, highlighting the urgency of recognising and documenting

²¹ The project was careful not to encourage any detrimental damage to the natural environment.



Fig. 6. An example of a 'pivot' bench mark revealed from hedging on a road side near Bilboa in the townland of Clooteen. The contextual image also shows the extent of overgrowth on a typical roadside dry stone wall whereby 37 % of bench marks are classed as 'Lost to nature'.

this heritage and demonstrating how the bench mark database can serve as an indicator of changes to these structures over time.²²

Conclusions and future directions

The findings to date help to quantify the dominant forces driving this form of heritage loss. With an approximate loss of 90 % already recorded in the county, bench mark disappearance signals an urgent need for wider discussion on heritage neglect and care. Yet the implications extend further. OS bench marks, typically approached as artefacts of survey history, can be read not only as heritage in their own right but as indicators of wider transformations in the built and natural environment. Their loss therefore presents a paradox for researchers in our concern for heritage loss alongside the recognition that this very absence might assist us in learning more about landscape change.

Documenting spatially the presence *and* absence of heritage therefore offers significant potential for assessing landscape change more broadly, while also confronting scholars with a further tension between contemporary ecological priorities, such as hedgerow preservation and biodiversity, and the survival of built heritage objects. These preliminary findings remind us how different value systems and policies shape what endures and what is erased.

The project, as was its remit, has also begun to inform heritage and planning policy. Researchers are in discussions with Limerick City and County Council to formally recognise bench marks within planning workflows, a move that would set national and international precedent. The digitised point layer of bench mark sites in the county has also been shared with a current major road construction project, enabling contractors to survey each site for bench marks during the preparation phase. The ongoing Active Travel Limerick scheme has also collaborated with the project to assess for bench marks on their planned development routes.²³ Further, a planning observation submitted by the project in

relation to a proposed housing development in Limerick City has also led to the successful determination that a nearby bench mark be retained in situ.²⁴ Such measures and collaborations with local authorities further situate this heritage within wider narratives of landscape transformation, planning, development, and heritage management, reinforcing the project's impact beyond academia.

At the same time, a growing community of enthusiasts is contributing records beyond County Limerick, signalling the clear appetite for national expansion. Scaling the project and integrating with other heritage datasets will extend its reach to other geographies, enabling the assessment of landscape change across the island.

While this paper has focused on how place-based participatory methods, combined with one form of heritage, can reframe loss as a gain in investigating landscape change, future research will examine more closely the spatial dimensions of the dataset to better quantify the patterns of bench mark survival and loss, and to gather further evidence to inform their protection. By mobilising digital participatory infrastructures to document both presence and absence of heritage, historical geographers are uniquely positioned to advance debates on heritage studies and material landscape transformation over time, demonstrating that what has been lost can be as revealing as what remains.

Data availability

A record of the extant bench marks has been ingested open access into the Digital Repository of Ireland: <https://doi.org/10.7486/DRI.4742qc33r>. Collected data can also be viewed through the project website: <https://experience.arcgis.com/experience/d344785a3c7a427eb61607386fd9e745/page/Home>. A full layer of known bench mark locations for County Limerick and their height above sea level is available from the authors on request.

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²² See the press release from the Department of Culture, Communications and Sport, 5th December 2024. <https://www.gov.ie/en/department-of-culture-communications-and-sport/press-releases/irelands-dry-stone-construction-receives-unesco-recognition/> (accessed 10 December 2025).

²³ Details of Active Travel Limerick, including ongoing and planned schemes can be viewed here: <https://www.limerick.ie/council/services/roads-and-travel/active-travel/active-travel-limerick> (accessed 9 December 2025).

²⁴ See Limerick City and County Council Planning Register Reference Number 25/60780 for details of the decision.