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DOI
10.1080/02665433.2025.2561881

Publication date
2025

Document Version
Final published version

Published in
Planning Perspectives: an international journal of history, planning and the environment

Citation (APA)
van Mil, Y., Hein, C. M., & Baptist, V. (2025). The potential of geospatial technologies and open data in planning history. *Planning Perspectives: an international journal of history, planning and the environment*, Article 2561881. https://doi.org/10.1080/02665433.2025.2561881

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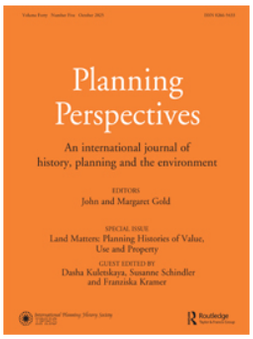

Planning Perspectives

ISSN: 0266-5433 (Print) 1466-4518 (Online) Journal homepage: www.tandfonline.com/journals/rppe20

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To cite this article: Yvonne van Mil, Carola Hein & Vincent Baptist (23 Sep 2025): The potential of geospatial technologies and open data in planning history, Planning Perspectives, DOI: 10.1080/02665433.2025.2561881

To link to this article: https://doi.org/10.1080/02665433.2025.2561881

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PLANNING PERSPECTIVES
https://doi.org/10.1080/02665433.2025.2561881

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The potential of geospatial technologies and open data in planning history

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ABSTRACT

Digital tools and related open datasets, particularly for geospatial analysis, provide an opportunity to connect planning history more closely to the methods of planning practice and heritage itself. While contemporary planners have adopted advanced, data-driven tools to model urban systems and environmental risks, planning historians have largely kept relying on traditional methods, such as static cartography and archival interpretation. This disconnect has contributed to a widening gap between planning practice and its historiography. Drawing on historical examples, such as Maurice Rotival's pioneering use of computers in planning, and recent digital mapping initiatives, this paper argues for a more integrated, interdisciplinary approach to planning history. It examines how digital platforms, datasets and analytical tools can improve spatial and temporal analysis while maintaining critical historical inquiry. The paper discusses practices such as GIS-based analysis, digital inventories and dashboards, and reflects on institutional and methodological barriers to wider adoption. Engaging with the digital turn enables planning history to evolve beyond biographical and text-based traditions, offering richer insights into the urban past and informing more sustainable, just and historically grounded futures.

KEYWORDS

Data visualization and representation; disciplinary innovation; geospatial technology; research methods

Introduction

Planning historians observe transformations over time and rely on the availability of data. They have traced spatial change through archival research, cartographic analysis, and interviews, documenting the ideas of leading planners, schools of thought, and major interventions that shaped the built environment.[1] Alongside narratives of modernity, planning historians have examined the negative impacts of planning and industrialization, including questions of spatial justice, racial discrimination, and financial segregation. The advent of digital tools and large, open datasets provides a novel foundation for planning practices, from new designs to heritage preservation projects. Geospatial Information Science (GIS) and related technologies make it possible to process and analyse large datasets in spatial context. While these tools are now widely established in planning practice, their adoption within planning history has been slower and more uneven. As a result, a methodological gap persists between the disciplines of planning and planning history, limiting opportunities for historical research to inform contemporary spatial debates. This article addresses

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[1]Hein, *The Routledge Handbook of Planning History*.

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this issue by focusing specifically on the potential of digital space-based analysis and other digital tools to advance the study of planning history.

At the same time, it is important to acknowledge that this gap between planning and planning history has already begun to narrow. In recent years, planning historians and scholars in adjacent fields have experimented with machine learning, statistical analysis, and geospatial modelling to revisit historical questions. Xu's work on redlining in the United States, for example, demonstrates how computational methods can reveal the long-term social and spatial effects of institutionalized discrimination, drawing from newly available georeferenced data.[2] Such research, often published in Geography or Housing journals rather than Planning History journals, raises the question of whether planning historians themselves are engaging with these insights or whether the field risks being reshaped primarily by other disciplines. Platforms such as *American Panorama* from the University of Richmond further illustrate how open digital data infrastructures are fuelling new approaches to spatial history in the United States,[3] complementing ongoing European initiatives, such as the *HisGIS* initiative and the *Charles Booth Poverty Map* project.[4] These developments suggest that planning history is at a crossroads: resistance towards digital methods remains, but opportunities for methodological expansion are multiplying, particularly as heritage preservation and digital humanities projects, such as those explored by Ammon and Minner, highlight the intersections of historical inquiry, design, and preservation.[5]

Engagement from planning historians with these tools, already commonplace in planning and heritage practice, would strengthen the field's capacity to contribute long-term, historically grounded perspectives to contemporary design and policy. History is the largest dataset we possess; every transition unfolds over time and is inherently historical. Yet training, disciplinary boundaries, and methodological uncertainty continue to inhibit the integration of digital methods into mainstream planning historiography. While a variety of projects that will be discussed later on, from the new computer vision workflows of *MapReader* to continent-wide archival digitization and modelling efforts of *Time Machine Europe*,[6] demonstrate the promise of big spatial data analysis, they remain exceptions rather than established research models or methods.

Digital spatial tools present new opportunities for planning historians to bridge past and present in innovative ways. Today, planners routinely use such technologies to model land use, evaluate environmental risks, and inform policy decisions. While planners engage with new data-driven tools, such as GIS, planning historians have tended to rely on more traditional research methods, such as static cartography, textual interpretation, and narrative reconstruction, often excluding the underlying data, processes, and alternatives shaping past decisions. This situation leads to two shortcomings in the field of planning history. On the one hand, the role of computers in planning remains underexplored in planning history; on the other hand, planning historians fail to benefit from the existing, powerful and advanced digital methodologies available today. However, digital tools would allow for research through data-driven questions relating to infrastructure, the environment, and social change from a historical perspective. This creates a methodological gap between contemporary planning and its historiography, limiting the ways in which historical planning decisions can be analysed or connected to today's spatial challenges. Yet by incorporating spatial analysis, digital platforms, and interdisciplinary approaches, the field of planning history could evolve beyond traditional humanities and social science-based research methods and case

[2]Xu, "Legacies of Institutionalized Redlining"; Xu, "Where Did Redlining Matter?"
[3]Digital Scholarship Lab, *American Panorama*.
[4]Stapel and Vermaut, *HisGIS.nl*; London School of Economics and Political Science, *Charles Booth's London*.
[5]Ammon, "Digital Humanities and the Urban Built Environment"; Minner, "Open Data Flows, Spatial Histories."
[6]Hosseini et al., "MapReader"; Noordegraaf et al., "Semantic Deep Mapping in the Amsterdam Time Machine."

study fragmentation. Such developments could also foster a more dynamic engagement with the spatial, social, and environmental complexities of urban transformation, both past and present.

This article focuses on the second highlighted aspect – the use of digital tools for planning history – exploring how geospatial technologies, digital datasets, big data, and other analytical digital tools have begun to transform planning history as a discipline and our understanding of historical planning practice. It considers how these tools can further reshape the field in the future. By critically examining the opportunities and limitations of traditional research methods, this paper explores the potential of interdisciplinary approaches that combine new technologies and diverse sources to broaden and enrich the field. While these tools offer exciting opportunities, they also present challenges, including developing new analytical frameworks, securing access to digital archives, and transforming complex datasets into engaging and accessible narratives. Solutions such as repositories, dashboards, inventories, and visualizations complement historical archives and other paper-based collections. This article explores their role in making planning history not only more innovative for researchers, but also more accessible to a wider audience.

This paper outlines key themes, including the emergence of geospatial technologies in planning history, the growing availability of digital tools and methods, and examples of innovative, data-driven research that push the boundaries of traditional historiography. It also addresses ongoing challenges – such as access to data, analytical frameworks, and disciplinary divides – and suggests future directions for integrating digital innovation with interdisciplinary research. To illustrate the potential of geospatial technologies and open data in planning history, the article focuses on European examples and case studies due to the familiarity of the authors. Other explorations are simultaneously happening around the world and merit closer attention. The paper starts by outlining some of the discussions on new methodological aspirations for planning history. It then traces the historical emergence of digital tools and geospatial analysis techniques in this field, highlighting the gradual shift from singular case studies to broader, data-driven approaches. Having explored current research methods and examples, including inventory and dashboard techniques, GIS-based analysis and recent applications of automated methods, the paper concludes with a consideration of how the field might evolve into a more collaborative, interdisciplinary and integrated discipline. Reflecting on the implications of these shifts, it proposes pathways for future research that combine technological innovation with the critical inquiry central to planning history.

New methodological aspirations for planning history

The historically often romanticized role of planners, as master builders and artists, finds its visual counterpart in images of individuals looking or pointing at maps.[7] Planning history has been fascinated with processes of personal interpretation, imagination and translation: how does the planner in charge interpret the spatial layout of a given environment, to then reimagine it for the future and translate this vision onto a new map and into reality? While contemporary planning scholarship thoroughly engages with notions of collaboration, mediation and networking to characterize and understand contemporary changes in the profession (e.g. [8]), an individualistic focus in planning history studies still endures, as for instance illustrated through biographical monographs or republications of key texts by historically important figures.[9] Can planning history shift focus

[7]Barr, "The Professional Urban Planner."
[8]Sehested, "Urban Planners as Network Managers and Metagovernors"; Metspalu, *The Changing Role of the Planner*; Keunen and Ruijsink, "Planning for All?".
[9]Meller and Hein, *Studies in International Planning History*.

from the individual planner and their personal ideas to insights on how ideas actually take shape, and on what information personal visions are based?

'Planning history is "in full swing",' Stephen Ramos writes in the concluding chapter of *The Routledge Handbook of Planning History*.[10] For Ramos, this vitality stems from the field's expanding scope and its openness to critique, innovation and interdisciplinary transformation. At the heart of this transformation lies the growing influence of digital technologies – tools that enable dynamic representation, comparative analysis, as well as new modes of authorship and collaboration. Planning history plays a crucial role in understanding how past decisions have shaped cities, regions, and nations, and in informing the future of planning as a professional practice. As Ramos suggests, this role must now be reimagined in light of the digital turn.[11] However, these opportunities are matched by significant challenges, including how well algorithmic research methods are accepted in academia, the need to critically examine the underlying methods being used, and the fact that planning history has traditionally relied on interpretative and experience-based approaches. Ramos's message is clear: planning history must evolve with the digital scholarly turn while maintaining its core questions and critical depth.

As global challenges, such as rising sea levels, mass migration, pollution, and water scarcity, put earlier spatial planning achievements to the test, and as digital technologies transform how we examine historical urban development, it becomes essential to reassess and innovate the methodological foundations of planning history. Traditionally, the field has focused on documenting and analysing the evolution of cities through doctrines, plans, and ideologies, grounded in archival research and specific case studies that highlight the influence of individuals, institutions, and political processes. Today, however, the growing availability of datasets and advanced digital tools is broadening disciplinary methodological horizons. Technologies such as GIS and remote sensing now allow historians to reconstruct urban transformations, visualize spatial dynamics, and trace long-term patterns of change.

This shift towards digital, data-driven approaches not only addresses this methodological gap but also reflects a broader evolution within the discipline. As Kwak argues, planning history has long been shaped by interdisciplinary influences, borrowing from the social sciences and the humanities.[12] In her contribution to *The Routledge Handbook of Planning History*, Kwak outlines the field's transition from a focus on the emergence of planning as a profession – rooted in coherent historical narratives of plans and planners – to more critical interpretations of planning as a contested, potentially problematic and often uneven process, and eventually to the challenge of key terms themselves, with scholars critically examining the core notions of 'planning' and 'plans', asking how these practices have historically legitimized certain visions of space while marginalizing others.[13] In this context, understanding how digital tools are transforming planning histories as a discipline requires a critical, interdisciplinary lens as well as technological adaptation. Freestone extends this idea by arguing that research methods used in planning history are often rather uncritically adopted from neighbouring disciplines.[14] While digital tools such as GIS offer new possibilities, their integration into planning history has sometimes lacked the theoretical reflection necessary to ensure its direct relevance to the core questions of the discipline. Indeed, the increasing

[10]*Ramos*, "Future Narratives for Planning History."
[11]Warf and Santa, The Spatial Turn; Presner and Shepard, "Mapping the Geospatial Turn."
[12]Kwak, "Interdisciplinarity in Planning History."
[13]Ibid.
[14]Freestone, "Biographical Method."

use of digital tools invites us to question not only what we study, but also how we study it – and what is at stake in this methodological reorientation.

This observation echoes the concerns of Southall, who distinguishes between the real-time, observational data used by contemporary spatial researchers and the indirect, often fragmentary sources – such as historical maps, registers and archival documents – relied upon by historical geographers and planning historians for heuristic interpretation.[15] Although Southall's focus is on historical geography, the challenges he outlines are equally relevant to planning history. Traditionally, the field has relied on archival research; today, digitization has made many more historical sources more widely available, opening up access to previously remote or restricted materials.[16] However, institutional priorities and practical barriers such as licensing or paywalls still influence the selection of digitized resources. Examples include the georeferenced historical vector data of the EURatlas,[17] and the Historical Land Use in the Netherlands database from Wageningen University and Research,[18] which notably also provides a wide range of data freely accessible to the public. Moreover, digitization enables not only access but also analysis: from the replication of archival formats in early computerization to today's spatial reinterpretations enabled by GIS, digital tools offer new and increasingly more complex ways of reconstructing and analysing urban and planning history.

Building on the forward-looking perspectives of Ramos, this paper aims to offer a more in-depth, methodologically focused analysis on what an increased uptake of digital tools and datasets can mean for planning history.

An historical overview of the emergence and use of digital tools for planning history

Planning history has traditionally relied on policy documents, master plans, biographies of planners, and theoretical narratives. Foundational works such as Mumford's text and plan analyses in *The City in History*[19] or Hall's intellectual overviews in *Cities of Tomorrow*[20] present critical and global histories of urban planning and design in the twentieth century. In more recent decades, themes such as the interaction between historical ideals, state formation and urban development have received more attention, as evidenced in the case of the Netherlands by books such as *Rule and Order: Dutch Planning Doctrine in the Twentieth Century*[21] by Faludi and Van der Valk, or *Town Planning in the Netherlands Since 1800*[22] by Wagenaar (Figure 1). Simultaneously, a wide range of biographical studies on key spatial planners – such as De Casseres,[23] Witteveen,[24] Rotival,[25] and many others – examine how personal visions and ideological beliefs shaped spatial organization of Europe but also help establish which figures are seen as particularly influential or representative in the history of spatial planning. These intellectual histories broaden our understanding of planning as an ongoing dialogue between ideas, context and practice, but often still

[15]Southall, "Digital Data."
[16]Ibid.
[17]Nüssli, *Euratlas Georeferenced Historical Vector Data*.
[18]Knol, et al., *Historisch Grondgebruik Nederland, 1900–1990*.
[19]Mumford, *The City in History*.
[20]Hall, *Cities of Tomorrow*.
[21]Faludi and Van der Valk, *Rule and Order*.
[22]Wagenaar, *Town Planning in the Netherlands Since 1800*.
[23]Bosma, *J.M. de Casseres; Bosma, Principles of Planology*.
[24]Mens, *W.G. Witteveen en Rotterdam*.
[25]Hein, "Maurice Rotival: French Planning on a World-Scale."

Figure 1. Selected examples of book covers from the field of planning history. Over the past decades,: the discipline has produced a substantial body of literature exploring the evolution of planning ideas, practices, and the roles of planners (source: Mumford, , *The City in History*; Hall, *Cities of Tomorrow*; Wagenaar, *Town Planning in the Netherlands since 1800*; Faludi and Van der Valk, *Rule and Order*).

underplay spatial causality, i.e. how planning decisions shaped urban form, and how spatial configurations in turn influenced planning discourse.

One of the first types of digital tools that offered the potential to analyse and spatialize large data sets were Geographic Information Systems (GIS). Although GIS was developed in the 1960s, it remained confined to government and engineering purposes for several decades. With the rise of commercial GIS software in the 1990s, followed by more widespread adoption in the early 2000s, geospatial technologies began to influence planning practice and, increasingly, spatial history and the digital humanities. These developments created new methodological possibilities for visualizing and analysing spatial logics. Books such as *Toward Spatial Humanities*[26] and *The Routledge Companion to Spatial History*[27] document the rise and legitimization of GIS. As Gregory and Geddes argue, GIS offers four key benefits for historical research: it structures data spatially; enables dynamic visualization; supports spatial analytical analysis; and integrates diverse, even previously incompatible, sources.[28] These capacities are especially relevant for planning history, which deals with the intersection of ideas, institutions, and physical space. Mapping political zoning, transport corridors, land ownership or development patterns over time can yield insights that are not accessible through text-based sources alone. However, as Hillier observed in 2010, urban and planning historians rarely employed GIS to systematically trace spatial transformations, relying instead on historical maps to more statically illustrate patterns such as migration, segregation, or gentrification.[29]

This gap between the potential of GIS and its limited use in planning history has gradually begun to narrow. Recent methodological innovations have begun to expand the scale, speed, and reproducibility of historical research, particularly within urban history, where scholars have increasingly embraced spatial analysis tools. These approaches also foster new ways of bridging quantitative spatial analysis with qualitative historical interpretation, as further exemplified and advocated by

[26]Gregory and Geddes, *Toward Spatial Humanities*.
[27]Gregory, et al., *The Routledge Companion to Spatial History*.
[28]Gregory and Geddes, *Toward Spatial Humanities*.
[29]Hillier, "Invitation to Mapping."

Bodenhamer, Corrigan, and Harris in *The Spatial Humanities*.[30] They have used GIS as a research tool to gain advanced understanding of historic processes and to visualize historic transformations. In the Netherlands, urban historians such as Rutte have begun incorporating GIS techniques to trace the historical development of Dutch cities and landscapes, as seen in publications such as *OverHolland 10/11*,[31] which visualizes the spatial development of the Dutch lowlands and the interaction between landscape, infrastructural interventions and urbanization over time, and, together with Abrahamse, the *Atlas of the Dutch Urban Landscape*,[32] which presents a comprehensive cartographic overview of the historical evolution of urbanization in the Netherlands, revealing how geography and planning have shaped the built environment over centuries.

Although GIS has become a dominant digital tool in planning and historical research, earlier examples of computational planning already foreshadowed this development. One notable figure in this respect is the French planner Maurice Rotival, who used computers for planning since World War II, while serving in the Free French Forces. Starting in the 1950s, he became one of the first planners to use computers to calculate the flux of cities and regions. For Rotival, planning was a science that could help forecast future developments and meaningfully design them.[33] In his approach, people and their values played a key role in spatial planning and had to be included in planning. With the goal to achieve equilibrium, Rotival developed a planning theory that placed the region in the centre of development, stating that this would be the best unit for moulding the environment to people's needs. In his study *The Case for Regional Planning* with special reference to New England by the Directive Committee on Regional Planning Yale University, published by Yale University in 1947, he used New England to illustrate the analysis. In later years, he developed complex analytical systems that would translate the various layers of impact into spatial projects as exemplified through a project for what he called 'organic planning' for New Haven. Rotival's way of connecting values, computers and space is just one example of the ways in which planners have used innovative tools. Nowadays, planners continue to use digital tools to simulate land use, analyse environmental risks, and model urban systems.

This shift from early computational experiments to large-scale, longitudinal and comparative studies marks a crucial turning point, driven by open access data and the availability of user-friendly, open-source software such as QGIS. Historical GIS (HGIS) now enables historians to reconstruct past urban environments, analyse historical land use, and track changes in infrastructure over time (Figure 2). Large-scale projects such as the HisGIS initiative,[34] which digitizes historical cadastral maps and integrates them with spatial data to support long-term socio-economic research in the Netherlands, have embraced Open Access principles to broaden their impact. Similarly, the Charles Booth Poverty Map Project has digitized famous nineteenth-century hand-drawn maps of poverty in London,[35] offering researchers more accessible source material to analyse socio-economic patterns through GIS overlays (Figure 3). Hein's analysis of the petroleumscape of the Dutch Randstad, for example, also benefited from GIS-based analysis in multiple ways. Using a mixed methods approach to find and map locations of gas stations in the Randstad, allowed her, among others, to demonstrate the relationship between the construction of gas stations, car use

[30]Bodenhamer et al., *The Spatial Humanities*.
[31]Borger et al., "Twelve centuries of spatial transformation."
[32]Rutte and Abrahamse, *Atlas of the Dutch Urban Landscape*.
[33]Hein, "Maurice Rotival."
[34]Stapel and Vermaut, *HisGIS.nl*
[35]London School of Economics and Political Science, *Charles Booth's London*.

Figure 2. Screenshot from HisGIS.nl showing georeferenced cadastral data for nineteenth-century Netherlands. Source: KNAW Humanities Cluster, HisGIS project (Source: Stapel and Vermaut, *HisGIS.nl*).

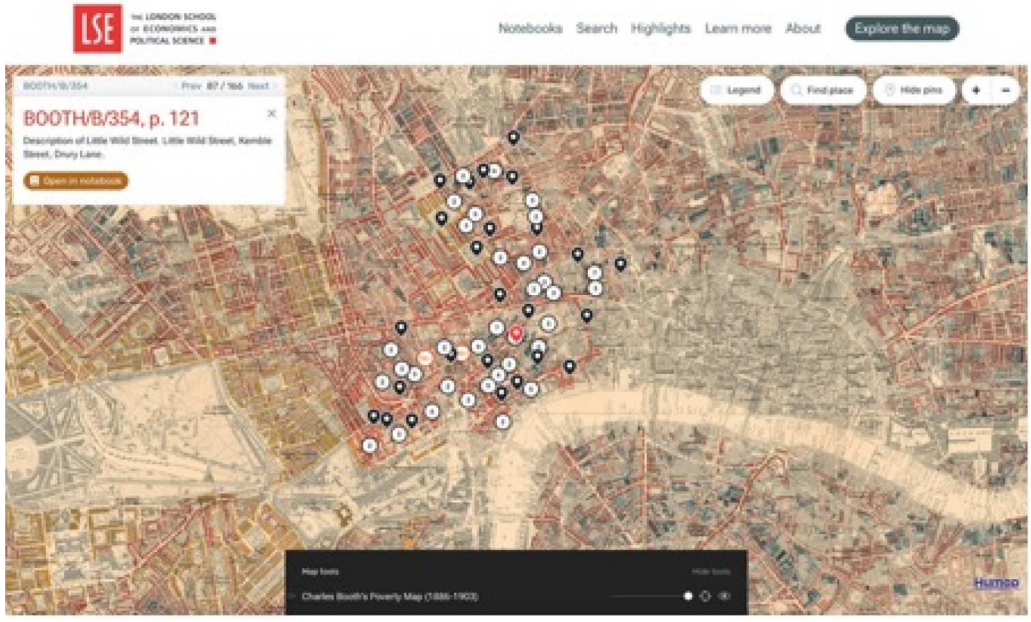

Figure 3. Screenshot of Charles Booth's Poverty Map of London (1898–1899), showing classified income levels by street. Source: London School of Economics Library, Charles Booth Online Archive (source: London School of Economics and Political Science, 2025).

and high-income areas starting in the 1940s and how it translated later into the advent of electric charging stations for cars.[36]

Indeed, since Hillier's observation in 2010 that urban and planning historians rarely use GIS, historians have begun to address the digitization of data and the application of digital datasets and tools. However, progress, especially in planning history, remains limited and the full potential of these technologies – discussed further in the following section – is still largely untapped. This is evidenced, among others, by the recently published edited volume *European Planning History in the twentieth Century*,[37] where only one of the many contributions – by Hein – employs digital tools and data in a way that is integral to the research approach. This indicates that a methodological gap persists between contemporary, data-driven planning practices and the historical study of planning. While this gap partly reflects the traditionally narrative and descriptive orientation of planning history, it also points to a clear opportunity to broaden the discipline's methodological repertoire, particularly at a time when digital tools and data are playing an increasingly significant role in academic research.

This raises a key question: could the growing use of digital tools and methods move planning history beyond its conventional frameworks, typically shaped by individual, case-based narratives, towards broader, more comparative, and analytical approaches? According to Hillier, the answer to this question ultimately depends on how the discipline of planning history is conceptualized.[38] The role of cities and the built environment more generally, as spaces of human activity is not new, nor is the need to understand their historical development. What matters now is how historians choose to engage with digital technologies to expand their analytical capabilities, not merely as a technical exercise, but as a means of thinking critically about spatial development, representation, and governance over time.

Contemporary digital tools and methods and their potential for planning history

Planning history's uptake of digital methods and tools has remained rather tentative and mostly centred on exploring GIS possibilities over the past few decades. Meanwhile, the field of digital humanities has established a new research paradigm, pairing increased data availability with methodological innovation. Developments of data-driven research in the humanities and social sciences throughout the twenty-first century started from large-scale digitization efforts of archival source material, resulting in an increased availability of research data, particularly for historical inquiry. In line with the previously highlighted benefits of GIS,[39] this enables new research pathways that are based on new structuring and presentation possibilities of data, as well as its compatibility and subsequent analysis with other sources. Such approaches can enrich existing methods, though they are not a solution in themselves.

What is surprising about the limited engagement of planning history with digital research methods so far is that planning itself finds rather clear equivalents in data structures, representations and operations. Both as an intellectual activity and a specific profession, planning entails collecting and aggregating disparate information sources, tracing and representing developments of spatial territories over time, as well as practical decision-making in light of future challenges. The act of planning moves from spatial bird's-eye views of the built environment to highly complex

[36]Hein, *Oil Spaces*.
[37]Welch Guerra et al., *European Planning History in the 20th Century*.
[38]Hillier, "Making Sense of Cities."
[39]Gregory and Geddes, *Toward Spatial Humanities*.

and context-specific interventions. This section illustrates specific connections between planning and its equivalents in terms of digital scholarship. Planning history has yet to reflect on planning's engagement with data-driven approaches. Through a cascading overview with links to relevant research projects and methodological developments, this section further explores the potential of digital research methods for planning history and to engage more with planning as an activity that comprises data literacy and information representation, put to use for spatial thinking and analysis.

Shifting the focus of planning history, from the planner as decision maker to the data that decisions are based on, is particularly relevant in a time when the built environment itself has become an increasingly data-intensive and networked object of inquiry.[40] Digitization and automation processes have led to smart city models and digital twins, but urban environments have historically always generated data on their development and functioning. Before discussing how historical data layers can be combined in spatially meaningful ways for digital scholarship, it is worth paying attention first to how data can be more generally presented for planning and decision-making purposes. The discipline of planning history can learn from this by thinking with what kind of overviews and visualizations planners have historically been confronted in their practice, and how these can potentially be reproduced or reimagined by presenting historical data in now increasingly customary ways. Hillier has previously argued how maps have been the dominant form of information transfer for planners, and how maps will continue to act as such in digitally augmented ways in the future.[41] Digital mapping happens through data inventorization, and intuitively and comprehensively visualizing collected information.

In the fields of urban studies, data science and media studies, scholars have investigated the emergence of dashboards, interfaces, and data inventories in urban settings (e.g.[42]). The logic of a 'control room' is often mentioned here:[43] a highly mediatized environment seemingly providing a total information overview for decision makers. We can make analogies with historical planning endeavours: how did planners collect and organize information in such ways as to create new spatial visions? The dashboard or interface format can be adopted to study planning history, by inventorizing and organizing historical information in such a way to make historical planning processes more visible and comprehensible. Mattern details how the term 'dashboard' originally related to a piece of leather from horse carriages that would protect against mud.[44] Within planning history, can we further find out not who planners were, but how they 'filtered out the mud' and constructed their dashboards of spatial information?

Various spatial research projects and networks currently already produce dashboards that integrate data on comparable territories, and can thus be linked to historical planning analysis. This can take different forms, starting with purely descriptive overviews, such as the *GO Projectenkaart* that inventorizes past and present spatial redevelopment projects in the Netherlands,[45] for professionals and scholars to simply get an overview of recent planning interventions. Other platforms use spatial inventorization for the creation of collective bottom-up histories. The *Contested Ports* project for instance connects disparate port territories across the world through documentation of shared

[40]Batty, *The New Science of Cities*.
[41]*Hillier*, "Invitation to Mapping."
[42]Kitchin et al., "Knowing and Governing Cities through Urban Indicators"; Mattern, "Mission Control"; Verhoeff and Wilmott, "Curating the City"; Rae and Wong, *Applied Data Analysis for Urban Planning and Management*.
[43]Mattern, "Mission Control."
[44]Ibid.
[45]*Gebiedsontwikkeling.nu., GO Projectenkaart*.

struggles against maritime corporatization and for local community engagement.[46] This example shows how a rather straightforward kind of digital overview can already help in advancing objectives that have been previously raised to invigorate the planning history field, such as enabling more grassroots and 'history-from-below' perspectives, collecting previously marginalized sources, and establishing broader socio-political analyses.[47]

Other projects push data overviews further, by not merely displaying collected information, but also organizing this according to analytical categories and with an eye on data reuse and spatial storytelling. The recent *Port City Atlas*[48] created new spatial data layers from openly available European data repositories, including statistical data from *Eurostat*,[49] satellite-based Earth observation data from *Copernicus*,[50] and marine and coastal data from *EMODnet*,[51] to establish a uniform mapping method for port city territories across the continent. Planning historians can thus also become more aware of where new large-scale data can potentially be collected from. Big historical data can increasingly be harvested from institutional sources that have a long trajectory of documenting global human activities and environmental interactions.[52] The *Port City Atlas* resulted from the limited availability of historic data. Georeferencing historical maps and developing a comparative mapping method, as was initially done for London, Hamburg and Rotterdam,[53] proved extremely time-consuming as data remained scarce and not yet readily prepared in a comparable fashion. The results of the *Port City Atlas* offer ground to compare ports' spatial planning developments back in time, potentially linking them to more locally collected historical data, as well as into the future, as the original European datasets continue to grow. The *Port City Atlas* remained limited by its paper format, raising interest for a web platform to display the map materials.

The recently developed geospatial platform of the *Bauhaus of the Seas Sails* (BoSS) project builds on this comparative, data-driven approach (Figure 4).[54] The BoSSplatform was initially envisioned to compare the development of the project's pilot cities and assess the impact of specific interventions – called 'drops' – over time. It was originally inspired by the interactive weather mapping tool windy.com,[55] designed to provide surfers with real-time weather data, and since expanded to include diverse layers of open-access environmental information. For example, its NO_2 layer offers insights into air pollution from shipping and industrial zones, and how this pollution evolves spatially and temporally. This kind of layered environmental data offers planning historians new ways to study how specific forms of planning – such as the design and operation of major port areas – affect surrounding cities and ecosystems. The BoSSplatform similarly visualizes multiple spatial and societal layers – including ports, the built environment, infrastructure, population density, age structure, and land use – to support comparison across sites. These datasets serve as a foundation for analysing how specific interventions, such as tidal architecture, regenerative food systems, or cultural programming, interact with local environmental and social conditions. The platform offers a user-friendly interface and open access data, but the responsibility for interpreting

[46]Savoldi, *Contested Ports*.
[47]Sevilla-Buitrago, "What Is Radical Planning History?"; Gimeno-Sánchez, "Urbanism of Zines."
[48]Hein, *Van Mil and Ažman Momirski, Port City Atlas*.
[49]European Commission, *Eurostat*.
[50]European Environment Agency, *Copernicus Land Monitoring Service*.
[51]EMODnet Map Viewer.
[52]Herold, "Big Historical Geodata for Urban and Environmental Research."
[53]Hein and Van Mil. "Towards a Comparative Spatial Analysis."
[54]Bauhaus Seas Consortium. Bauhaus of the Seas SAILS Geospatial Platform.
[55]Windy.com. *Wind Map and Weather Forecast*.

Figure 4. Screenshot of the Bauhaus of the Seas Sails geospatial platform, illustrating spatial visualizations of pilot projects using multidisciplinary data to support participatory design processes aimed at fostering climate-neutral, sustainable coastal development in line with the New European Bauhaus initiative (source: Bauhaus Seas Consortium, 2025).

and analysing these layers still lies with the researcher. Platforms like *Bauhaus of the Seas* show how open-source mapping and open data can support the collaborative generation of knowledge.

Both the analytical and narrative potential in geospatial technologies has previously been theorized by Bodenhamer, Corrigan and Harris when they introduced the concept of 'deep mapping' a decade ago,[56] and subsequently defined its hybrid, collaborative methodological potential.[57] Data aggregation can go further than mere visual display via digital research interfaces and dashboards. On a next level, it can allow for comparative analysis through spatial layering. In the Dutch research context, the previously mentioned *HisGIS* project has pioneered large-scale availability of historical cadastral data.[58] As such, *HisGIS* has been providing foundational base layers of data for other research projects to further enrich with discipline-specific case study data.

The increased availability of digital datasets, from historical census records to land cover data, can further enrich planning history research too. Digital data enables historians to analyse urban transformations on unprecedented scales, merging qualitative and quantitative research methods, and to reconstruct and compare built environments over longer periods of time. The *Amsterdam Time Machine* project was for instance piloted from the wider European Time Machine idea that newly digitized 'big data of the past' can help reconstruct past urban environments in greater detail.[59] The Amsterdam project notably combined newly collected data on urban culture, language use and socio-economic status to *HisGIS*'s cadastral mappings.[60] Similarly, the *Venice Time Machine* project has provided access to huge, digitized datasets for large-scale cross-connection

[56]Bodenhamer et al., *Deep Maps and Spatial Narratives*.
[57]Bodenhamer et al., *Making Deep Maps*.
[58]Stapel and Vermaut, *HisGIS.nl*.
[59]Kaplan and Lenardo, "Big Data of the Past."
[60]Noordegraaf et al., "Semantic Deep Mapping in the Amsterdam Time Machine."

of archival data,[61] for example from the historical records of land ownership to marriage status and financial capability of Venetian families. But again, what kind of lessons are being drawn from these cross-connections remains the interpretive task of the researcher. Layering different sets of spatial data provides the researcher with an opportunity to draw new insights on spatial development in diverse places, at analytical scales that previously remained out of reach.

From the level of data collection and comparison, planning history can dive deeper by considering how to further analyse aggregated data according to new computational means. The key difference with previously described efforts of layering and comparing spatial data lies in the scale of the research endeavour: computational analysis benefits increasingly large datasets, with the aim to predict and recognize patterns in automated ways, rather than simply describing comparisons. With a focus on maps and spatial data, planning history can thoroughly benefit from such approaches. Because of the particular visual nature of spatial data and cartographic material, the first research cases in this direction have been focusing on urban form analysis (e.g. [62]).

Predictive modelling capabilities can also enable historians to uncover or reaffirm large-scale patterns in urban evolution. Consider for instance *MapReader*, a recently developed open-source software library that allows for large-scale analysis of maps, based on a visual annotation workflow.[63] The researchers developing *MapReader* put it to use to, among other goals, reconceptualize and identify 'railspace' across thousands of British Ordnance Survey maps.[64] This shows the possibility not just of writing new planning histories, but also of re-examining established ones. Through scaled-up analysis of maps and spatial data, previously undetected comparisons and differences can come to light, such as more fine-grained distinctions between railroad spaces across urban and rural settings covering an entire country. This incites a rewriting of traditional histories, for instance on railroad planning, or even replications of previous studies, which could reconfirm or add important nuances to established theories within planning history.

Future challenges and setting the agenda for digital planning history

The gap between the potential of digital tools – particularly GIS – and their limited application in the study of historical planning is beginning to narrow. A new generation of scholars is embracing these technologies, enhancing both the spatial and temporal analysis of historical planning processes. While this shift opens up exciting opportunities for the field, it also brings pressing challenges that must be addressed if the transformative promise of digital planning history is to be realized. These challenges range from material availability and methodological complexity to the need for interdisciplinary collaboration, digital literacy, and institutional support.

Digital tools offer planning historians powerful means to process, visualize, and interpret large datasets. Sources such as visual archives, textual records, and statistical repositories can now be explored through interactive mapping, modelling, and temporal analysis. However, the selection and availability of materials to visualize is key for achieving meaningful impact. Not all historical data is digitized, and what exists is often still fragmented, inconsistent, or not readily comparable across regions or time periods. Preparing, visualizing, and interpreting such data requires

[61]Kaplan and Lenardo, "Big Data of the Past."
[62]Boeing, "Spatial Information and the Legibility of Urban Form"; Chen, Zheng and Zheng, "The Correlation Between Asian Port Cities and Traditional Portuguese Urban Forms."
[63]Hosseini et al., "MapReader."
[64]Ibid.; Hosseini et al., "Maps of a Nation?".

specialized skills and significant time, resources that are often scarce in both academic and professional settings.

One project that demonstrates both the promise and the demands of such digital methods is the *UNESCO Urban Heritage Atlas*.[65] This atlas provides a compelling example of how digital tools can support the intersection of planning, planning history, and heritage preservation. By combining descriptions of architectural and urban elements with GIS, the platform enables users to visualize the relationships between World Heritage properties and their broader urban and environmental contexts. This approach supports planning initiatives that protect historic structures, adapt cities to climate change, and promote community-based conservation. Yet such innovations also illustrate the demands placed on historians and planners: expertise in digital methods, access to relevant datasets, and the ability to translate historical insight into practical planning strategies.

At the same time, the methodological and institutional gap between contemporary planning practice and planning history continues to widen. Planners increasingly rely on advanced tools like digital twins, sensors, satellite data, and automated analysis to identify climate risks, improve energy efficiency, and optimize urban systems. In contrast, planning historians have largely remained grounded in traditional interpretive methods, and the disciplines of planning and planning history risk drifting further apart. Yet, at a moment of profound transition – marked by climate crisis, digital transformation, and shifting urban dynamics – historical knowledge is more essential than ever. Without embedding historical insights into contemporary planning discourse, we lose a crucial lens for evaluating both past achievements and future possibilities. As Silver has argued,[66] the lack of historical education in many planning schools is a structural challenge. But bridging this divide is not solely the responsibility of planners. Planning historians must also engage more proactively with digital methods, both as a topic of research and as a set of tools for their own inquiry. Doing so can reveal new patterns, expand comparative frameworks, and foster interdisciplinary collaboration.

To guide the future of digital planning history, several interrelated priorities emerge:

1. Foster interdisciplinary collaboration between historians, planners, data scientists, and designers to co-produce research that bridges methodological divides.
2. Invest in digital training for historians to enable the effective use of spatial analysis, GIS, remote sensing, and other data-driven methods.
3. Expand access to open-source data and tools, including the creation of shared repositories, platforms, and standards that promote reuse, transparency, and scalability.
4. Critically assess digital sources, acknowledging and addressing the biases, gaps, and limitations in digitized historical records.
5. Embed history more deeply in planning education and practice, ensuring that digital planning efforts are informed by critical historical reflection.
6. Promote institutional support and funding for digital history initiatives that bridge the gap between research, education, and professional practice.

Historians have a crucial role in providing reflective insights from the past to contextualize today's planning decisions. Combining digital innovation with critical interpretive methods at the heart of the discipline can transform planning history into a more collaborative, integrated and forward-

[65]UNESCO World Heritage Centre. "Urban Heritage Atlas."
[66]Silver, "Educating Planners in History: A Global Perspective."

looking field. Capacity building, digital access and open collaboration are essential to ensuring broad participation in this evolution. Ultimately, the future of planning history depends on its ability to adapt to the digital age while remaining true to its core mission of showing how past planning decisions have shaped urban and regional landscapes, critically assessing their legacies and informing more just, resilient and sustainable futures.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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