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MAIN SECTION

The Open Society in the Twenty-First Century: Comparative Critical Cartographies for Assessing and Designing in 't Hool, the Netherlands and Montbau, Spain

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ABSTRACT

Today's urbanization pressures present complex challenges in sustainable and socio-ecological transitions. Historical planning tools and theories, such as the Open Society concept, offer alternative approaches to regeneration and inclusivity. Critical mapping is a growing method in urban regeneration. However, we observed that this tool has not been sufficiently explored in a comparative fashion. In this paper, we examine the Open Society concept by comparing and contrasting 't Hool, Eindhoven and Montbau, Barcelona to assess the concept's continuing relevance for the regeneration of Modernist housing in the twenty-first century. We construct a comparative critical cartography using mixed-methods (mostly qualitative) to highlight interspatial relations on both neighborhoods. This method is a tool that aids us to highlight power-knowledge relations and detect spatial patterns from different fields, to extract site-specific lessons that inform urban regeneration. This research bridges the gap between theory, design and practice providing tools and comparative approaches to promote more transdisciplinary and more holistic approach to space and place. Addressing the complexity of space with a creative and systematic approach should address the relativism of site-specific knowledge and turn it into more generalizable lessons for urban regeneration.

KEYWORDS

open society; comparative critical cartography; creative practices; 't Hool (the Netherlands); Montbau (Spain)

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Introduction

The global pressures of urbanization have thrown up complex challenges as we work towards common goals of sustainability. These include climate change and energy transition, housing, migration and social inequality, digitization, etc. These complex and dynamic tasks require the necessity of addressing those research and design challenges with a more multidisciplinary approach, transdisciplinary methods, tools and instruments[1].

The basic need for housing is a cyclical and chronic demand in our cities and informs the concept of the Open City introduced by Richard Sennett in *Building and Dwelling* (2019), which was, in turn, influenced by Jaap Bakema's Open Society, which he introduced in 1959 at the Congrès International d'Architecture Moderne (CIAM) XI in Otterlo, the Netherlands. This concept (further developed by Bakema with Team 10) attempted to create urban conditions for society to prosper[2]. These good intentions did not always successfully translate into practice, however. When Modernist housing estates were built their shortcomings were amplified by multiple and accumulative crises (social, environmental, economic, etc.). Some estates have been demolished. We would argue that under a sustainable development framework this approach should not be the first option. Moreover, Modernism's planning legacy and its experiments should not be forgotten (both successes and failures); we should be trying to regenerate, refurbish, and protect to enrich this historical dimension of our cities.

The socio-ecological transition in these regeneration projects and processes is complex and requires novel approaches that can foster a multidisciplinary approach in researching and designing those spaces. The employment of critical cartographies in urban regeneration processes is a growing field. Yet, we have observed that the potential for comparative research of it has not been explored enough. We hypothesize that critical cartography, used in a comparative fashion, can provide insights beyond traditional methods. Thus, we formulate the following question: to what extent can a comparative approach employing critical cartographies can gain novel insights and generate useful lessons (both site-specific and general) about urban renovations in the twenty-first century?

In this paper, we reappraise the concept of the Open Society by comparing and contrasting 't Hool, Eindhoven and Montbau, Barcelona to assess the concept's continuing relevance for the regeneration of Modernist legacy in the twenty-first century. We construct our comparative critical cartography through mixed-methods (mostly qualitative) to highlight the power-knowledge and interspatial relations of both neighborhoods. We aim to bridge the gap between research and design, and allow for a broader and deeper

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1 Hein & van Mil, 'Towards a Comparative Spatial Analysis for Port City Regions Based on Historical Geo-spatial Mapping', 2; 7.

2 Van den Heuvel, *Jaap Bakema and the Open Society,* 18-19.

understanding of these case studies while also providing tools and comparative approaches that embrace a more cross-cultural exchange of knowledge promoting a transdisciplinary and more holistic approach to space and place. Addressing the complexity of space with a creative and systematic comparative approach should address the relativism of site-specific knowledge and turn it into more generalizable knowledge and transferable principles.

This article begins with a theoretical framework for creative practices and then outlines our comparative critical cartography. The methodology section explains how we proceeded with our on-site inquiries, this is followed by a brief introduction to the two case studies, and a synthesis of our History cartography, with its results. Finally, we draw conclusions on the continued relevance of the Open Society concept today.

Comparative Critical Cartography: A Tool for Creative and Reflexive Professionals

Many scholars from education and practice have called for a novel epistemology for creative and reflexive urban practices (Sennett, Corner, Hein, among others). They call for creative, committed, and reflexive professionals[3] who are striving for high-quality explorations. Those professionals require tools to address the gaps in knowledge of the complexity and multiplicity that enriches our cities[4]. Some see the necessity of addressing those complex research and design challenges with a more transdisciplinary approach, methods, and instruments[5].

We detected little literature on the comparative aspect of critical cartographies on urban regeneration processes. More creative practices and comparative approaches are needed to bring fresh perspectives, methods and tools, and knowledge from different disciplines to address the fluid character of territories and their wicked problems[6]. We are convinced that critical cartography is a powerful tool for exploring and investigating space and for constructing new narratives and imaginaries to enrich places.

Grounded in a solid theoretical framework, critical cartography can be operationalized for different approaches in professional practice[7]. The concept is based on Critical Theory, which promotes analytic tools and methods to free us from power-knowledge relations and structures with the aim of fostering creativity and emancipation through independent thought (critique) and

3 Schön, *The Reflective Practitioner,* 287-290.

4 De Solà-Morales, *A Matter of Things*, 26.

5 Hein & van Mil. 'Towards a Comparative Spatial Analysis for Port City Regions Based on Historical Geo-spatial Mapping'..

6 Nijhuis & de Vries, 'Design as Research in Landscape Architecture', 91.

7 Sanz, Bracken & Muñoz, 'Critical cartographies for assessing and designing with planning legacies', 13.

meaningful experience[8].

Critical cartography emerged in the late 1980s in opposition to hegemonic definitions of mapping as progressive and emancipating (i.e., value-free) transcriptions of the environment[9]. Since the epistemological break made by Brian Harley (1989), the legitimacy and assumptions of professional cartographic enterprises have been subject to debate by relevant scholars such as Harley, Pickles, Wood and Crampton among others. The conception of maps displaying natural and unchangeable spatial orders used to be a kind of geographical common sense[10] but intensive attacks on the fundamentals of cartographic history, theory, and practice have shown an awareness of both the 'history of critique within the profession of cartography, and such a longer history of critique of critical thinking in mapmaking as a whole'[11]. This critique of the cartographic profession revealed more creative and emancipatory approaches to map-making, as did the emergence of new geospatial technologies, such as Google Earth and OpenStreetMaps. Specifically, some (GIS) platforms saw a potential for 'democratizing' map-making[12]. These two factors have unprecedented value and relevance to map-making and are instrumental in any conversation about exploring and designing space and allows engagement with other disciplines to enrich collaborative conversations when addressing common urban challenges, such as sustainability.

These scholars uncovered the potential for maps to be tools for analysis and critiques of power-knowledge relations and discourse. They highlight the importance of the spatial visualization of complex phenomena to reveal obvious and/or hidden interrelations. Most importantly, they show how maps can be utilized creatively to approach the complexity of space in cities, and landscapes. This creative approach to map-making is relevant for any spatial discipline, such as planning, geography, architecture, landscape, anthropology, sociology, ecology, economy, etc.

What interests us is the strong relationship between knowledge formation in relation to space and how it is stabilized trough power-knowledge relations that can be situated geographically. This allows the concept of critical cartography to be used as a medium contributing to novel perspectives of knowledge in a more inclusive and genealogical way. This genealogical approach to knowledge resonates with James Corner's examination of the agency of mapping and the understanding of map-making as a cultural project[13]. He sheds light on the creative practices of mapping and the potential it holds for enriching experience and diversifying worlds. Mapping can be a very powerful tool for understanding historical transformations of territory and revealing the

8 Crampton, 'An Introduction to Critical Cartography', 14.

9 Wood, *Rethinking the Power of Maps*, 120.

10 Gramsci, *Selections from the Prison Notebooks,* 9.

11 Wood, *Rethinking the Power of Maps*, 120.

12 Bryan, 'Maps and Power', 1.

13 Corner, 'The Agency of Mapping', 89.

intrinsic logic of spatial orders and patterns, which in turn allows for the communication of findings and enables discussions on future development[14].

Critical cartography is an analytical tool that can liberate researchers from existing power-structures and enable them to approach the complexity of space in a creative way[15]. This enables us to address several items relating to space, including the objectification of space from a Eurocentric approach[16]. It also allows us to address space holistically through a multidisciplinary approach and allows for other ways of knowing the characteristics of other cultures (e.g., Asian, indigenous, etc.), ultimately contributing to a more holistic approach to space. The combination of qualitative and quantitative techniques for addressing the complex and dynamic nature of the environment and its wicked problems[17] allows us to be more objective or intersubjective[18]. It can also be a more open-ended instrument allowing for 'reflective conversation with the situation'[19] among diverse actors involved in decision-making and the design of new landscapes.

Our approach to critical cartography departs from Corner's call for more creative mapping processes: 'mapping is perhaps the most formative and creative act of any design process, first revealing and then staging the conditions for the emergence of new realities'[20]. This follows Gilles Deleuze and Félix Guattari's appeal for more open-ended forms of creativity: 'the map it is entirely oriented towards an experimentation in contact with the real(…) it has to do with performance'[21], in which mapping alternates processes of accumulation, de-territorialization, and re-territorialization and allows us to assess built projects from different topics and perspectives. Thus, mapping displays an ambivalent function, it is analytical and projective at the same time[22]. This ambivalent function allows us to utilize the map as a tool for reflection on the research-by-design approach[23] and the practices that form urban proposals. In other words, we consider mapping as an instrument operating between the reality of a territory and its new imaginings; hence it is partly objective and partly subjective[24]. Moreover, this 'in-between' condition allows us to visualize and communicate findings using diverse visual means and languages in addition to the map (pictures, zoomed-in plans, sections, axonometric, pattern language, visual sequences, atmospheres, etc.). This diversity allows us to design for the complex and dynamic nature

14 Hein & van Mil, 'Towards a Comparative', 4.

15 Crampton, 'An Introduction to Critical Cartography', 14.

16 Sanz, Bracken & Muñoz, 'Critical cartographies', 13.

17 Nijhuis & de Vries, 'Design as Research', 91.

18 Zonneveld, 'Visual storytelling: Assessing the power of maps in planning', 220.

19 Schön, *The Reflective Practitioner,* 95.

20 Corner, 'The Agency of Mapping', 89.

21 Deleuze & Guattari, *A Thousand Plateaus,* 12.

22 Zonneveld, 'Visual storytelling', 219.

23 Nijhuis & de Vries, 'Design as Research', 93.

24 Corner 2011; Zonneveld 2022; Sanz, Bracken & Muñoz 2023.

of cities and landscapes. The combination of diverse research techniques and approaches allows us shed light on interspatial relations and flows in a holistic manner.

Our approach to mapping combines the analytical and the critical. Site visits allow us to approach places sensibly, allowing us to see beyond linear discursive approaches and explore more freely. This process work both ways: the critical approach to case studies sheds light on patterns that are not perceived on site. The combination of critique and a close experience of the place finds articulation through complementary media working with the map to describe relations in different scales, disciplines, and times. This understanding of mapping allows us to use it systematically as an analytical and projective instrument. We creatively approach our assessment of the Open Society and its 64 principles by empirically unfolding the diversity of dimensions and perspectives to add depth to our understanding of these different urban renewal projects.

Methodology

In our view, comparative critical cartography can provide a novel systematic processes and approach (e.g., deterritorialization/reterritorialization) for addressing space holistically (through themes, time, and scales). This allows us gain new knowledge, and understand its genealogical formation by engaging in transdisciplinary research and design.

Our approach is a combination of mixed media (hand and digital drawings) to spatialize and contrast the results of our research into some of the principles of the Open Society in our two case studies, 't Hool in Eindhoven and Montbau in Barcelona. These critical cartographies are used for evaluating but also have potential use in subsequent design strategies and performance assessment[25]. Due to space constrains, we will only display the comparisons of the History cartography[26].

Using qualitative and quantitative mapping techniques, including GIS and Corner's layering strategy[27], we explore and depict different aspects and dimensions of the Open society in our case studies. We mostly use qualitative methods and techniques[28] to highlight knowledge-power relations. These allow us to critically map the complex spatial patterns across disciplines and specific cases with time (e.g., palimpsest analysis (Corboz 1983)) to explore the context sensitivity of the projects for an Open Society. Moreover, we identified hidden blockages (failed causal interrelations across and within topics) that we call 'urgencies' while also

25 Sanz, Bracken & Muñoz, 'Critical cartographies', 3.

26 See Appendix I an overview of all five cartographies in Sanz, Bracken & Muñoz 2023.

27 Corner, 'The Agency of Mapping', 235.

28 In specific cases we use quantitative methods (Space Syntax, spatial and form analysis, catchment areas, etc.).

seeking potentials for spatial, procedural, and programmatic patterns that can unlock those blockages. In this way, we attempt to bridge the methodological gap by providing a visual means for understanding these places and their environments.

The assessment framework for evaluating the case studies combines Bakema's 64 principles[29] with fieldwork [30] (see Appendix I) leading to a new formulation of these principles that enables us to evaluate Bakema's ideas while also providing inspiration and guidance for design strategies[31]. The framework examines the case studies holistically. Diverse topics, fields, and perspectives enrich our understanding of the complexity of urban matters and allow for more multi-disciplinarity in addressing 'wicked or ill-defined issues', i.e., complex urban phenomena that create challenges to future sustainability. We also compare the case studies to highlight similarities and difference so derive lessons and point to general principles that could suit other places.

The case studies of 't Hool in Eindhoven (designed by van den Broek and Bakema) and Montbau in Barcelona (by López-Iñigo, Giráldez & Subías) have the following criteria: they are roughly the same size (c.30 hectares), located in Western Europe, built between the 1950s and 1970s, involve diverse public and private actors, share a willingness to experiment and innovate to foster urban life (e.g., programmatic mix and tenure, diversity in urban typologies, urban configuration that create identity for the communities, innovative typologies and construction systems, etc.), they share common platforms and networks of knowledge[32].

We have to say that being built (being able to measure empirically), the existing conscious/unconscious transfer knowledge and their historic relevance are decisive factors in the selection of these two cases.

Case studies: 't Hool, Eindhoven and Montbau, Barcelona'T Hool

The neighborhood of 't Hool is in the Woensel district of Eindhoven, the Netherlands. Designed by van den Broek and Bakema, Jan Stokla and Gerard Laus, it was completed between 1968 and 197233 (see Figure 1). 'T Hool covers approximately 33 hectares and is home to approximately

29 See in van de Heuvel, *Jaap Bakema,* 280.

30 Sanz, Bracken & Muñoz, 'Critical cartographies', 5.

31 As mentioned in Sanz, Bracken & Muñoz 2023, these principles should be revised using a subaltern framework and a literature review to address their aims for diversity and inclusion in the twenty-first century.

32 While there was a certain degree of knowledge transfer between 't Hool and Montbau, there was no conscious application of the Open Society as a concept in the latter; it landed indirectly due to replication of spatial arrangements.

33 "Achtergrond" SGV 't Hool Foundation, last accessed February 6, 2025, https://www.woonwijkhethool.nl/achtergrond/.

1,000 dwellings[34]. This project allows us to empirically measure several Open Society's principles. It is protected as a national monument[35]. It displays experimentation and innovation in spatial and procedural terms (as seen in Team 10 conversations on growth and change, open forms, grids, user participation, scale association, etc.). This gives a special value to this housing estate because it manifests avant-garde ideas about human-centered in architecture and urban planning in the 1960s[36]. 'T Hool embraces diverse lifestyles and inclusivity through its design process and outcomes. This was achieved by the fact that the proposal was driven by strong residential participation – the architects acted as agents between the diverse stakeholders (cooperatives, housing associations, municipality). The proposal allowed for diverse forms of living with nine house types, and variations that made 12 different types based on residents' requirements[37], combining high-, medium-, and low-rise architecture with urban planning in different configurations, as well as two different types of tenure/ownership[38]. It also strove for a coherent relationship between dwellings and their immediate environment[39] (see Figure 2). New ideas about mobility allowed for a smooth transition between inside and out in each cluster). Centrifugal principles also allowed for more compositional variety, with each cluster addressing transitions in scale across the urban environment. This merging of spatial qualities and principles achieved a smooth transition from private to public[40]. Experimental prototypes called 'growing houses' addressed potential future needs of households[41]. Finally, the relation between urban and architectural scales is masterfully articulated to address qualities of privacy, permeability, safety, etc. These features reflect some of the principles of Bakema's Open Society, especially his search for physical, emotional (social), and spiritual conditions[42] and the fostering of diversity and inclusivity so that individuals and communities can flourish.

Montbau

Montbau is located in the Horta-Ginardó district of Barcelona, Spain, in the foothills of the Collserola mountains (Fig. 1). The project site is 31

34 "De ontstaansgeschiedenis van 't Hool in Eindhoven" SGV 't Hool Foundation, last accessed February 6, 2025, https://www.woonwijkhethool.nl/achtergrond/geschiedenis/.

35 Rijksdienst (RCE), "t Hool Eindhoven', 3-4.

36 Risselada, "t Hool Housing Estate, Eindhoven, 1962-72', 170.

37 "De ontstaansgeschiedenis van 't Hool" SGV 't Hool Foundation, last accessed February 6, 2025, https://www.woonwijkhethool.nl/achtergrond/geschiedenis/.

38 Van den Heuvel, *Jaap Bakema,* 172-173.

39 Risselada,"t Hool', 170.

40 Rijksdienst (RCE), "t Hool Eindhoven', 3-4.

41 Risselada, "t Hool', 170.

42 Van den Heuvel, *Jaap Bakema,* 123.

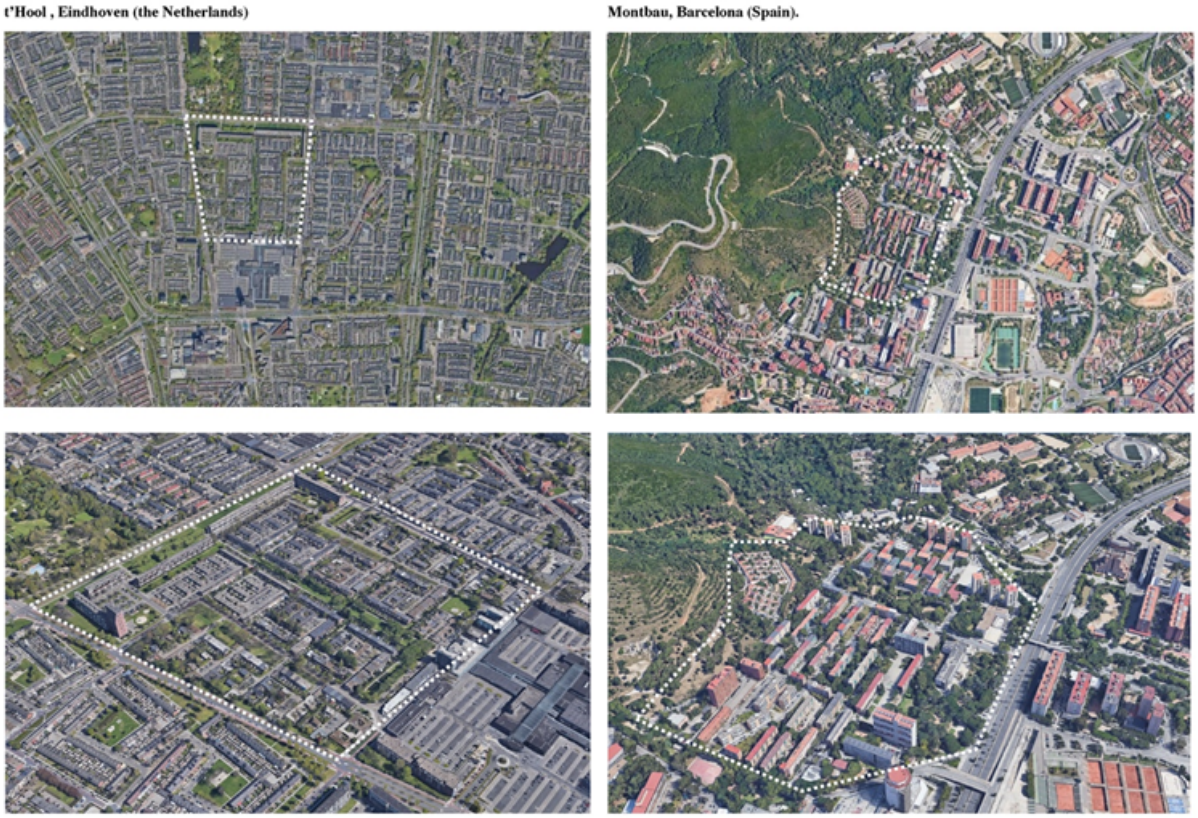

FIG. 1 Bird's eye view of 't Hool and Montbau's top plan and close up. Source: Google Earth.

hectares with 1,890 dwellings[43]. The original proposal by LIGS (López-Iñigo, Giráldez & Subías) was approved in 1957. The project was built between the 1950s and the 1970s but suffered from a number of modifications (densification, altered plans) in later phases. It is protected as a national monument[44] and shows an experimental character (with the application of CIAM principles and Dutch experiments by Opbow and De 8). Its willingness to innovate was inspired by international ideas, like the 'Siedlungen' model[45]. This was all the more remarkable for taking place during the closing phase of Franco's dictatorship. This experimentation aimed at bringing complexity and social diversity. This human-centered approach was central to the proposal. However, due to shortcomings (a too rigid application of CIAM's principles and economic issues, among other things) some of its good intentions failed[46]. Some sociological and anthropological aspects could have performed better (concepts highlighted by Jane Jacobs and James C. Scott, which we will look at in the next section). What did work, however, was the rich experimentation and diversity of housing types, with variations in volume heights and configurations. The central square is a strong urban element; it allows users to visually recognize the space as a center. The relation between the urban

43 DOCOMOMO, 'Redacción de la documentación de 256 elementos del catálogo inicial de edificios del plan nacional del patrimonio del siglo xx', 252-254.

44 Ibid., 252-254.

45 Ferrer, *Polígonos de viviendas en la comarca de Barcelona*, 13.

46 Bohigas, 'El Polígono de Montbau' 22-34.

and architectural scales is well articulated, with good permeability and access oriented towards the square, which helps people feel safe. The articulation of other squares within the complex creates a visually connected landscape. It also experimented with the first prefabricated housing blocks in Spain[47].

Comparative Critical Cartography: History

Both 't Hool and Montbau are protected monuments. This helps our critical cartography to measure and contrast them as well as link them to Bakema's Open Society principles[48]. In our research, we approach the deconstruction and reconstruction of space in a systematic and comprehensive manner. This process enables us to explore the Open Society concept in both case studies. Due to space constraints here, will be only focus on the comparisons of the historical cartography.

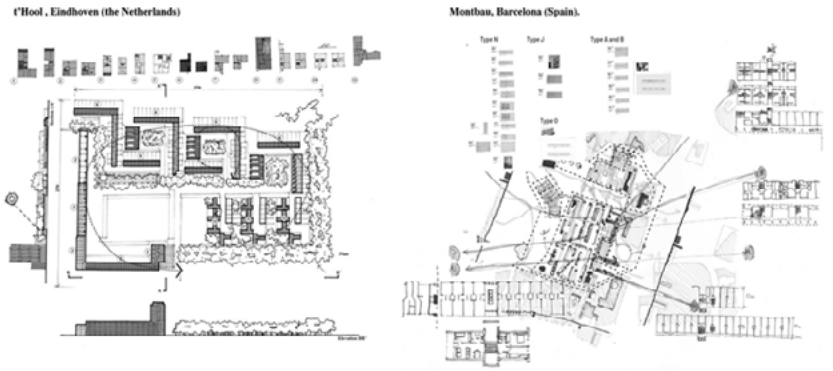

FIG. 2 High diversity of housing typologies and variations and centrifugal configuration of the urban centers within both case studies. Source: Made by authors (based on plans from HNI and COAC archive).

As previously mentioned, we construct each critical cartography by employing diverse methods[49] and techniques (e.g., literature review, site visits, spatial analysis), which provides us with a framework for incorporating diverse knowledge and dimensions. This helps us to visualize, analyze, assess, and contrast the case studies and also Jaap Bakema's 64 principles for an Open Society.[50] This systematic approach to deconstructing and reconstructing space allowed us to detect complex spatial interrelations among topics, times, and the urban and architectural scales (Fig. 3). With a further comparative analysis of the results from both cases we extracted insights on specific urgencies in addition to the sites' intrinsic and extrinsic potentials (Fig. 4). Reading forms as a pattern language acted as a common spatial language to allow for knowledge and

47 DOCOMOMO, 'Redacción', 252-254.

48 Van den Heuvel, *Jaap Bakema,* 280.

49 Mostly qualitative but with some quantitative in specific cases.

50 For a description of the deconstruction process carried out in 't Hool see Sanz, Bracken & Muñoz 'Critical Cartographies' 4; 8-10.

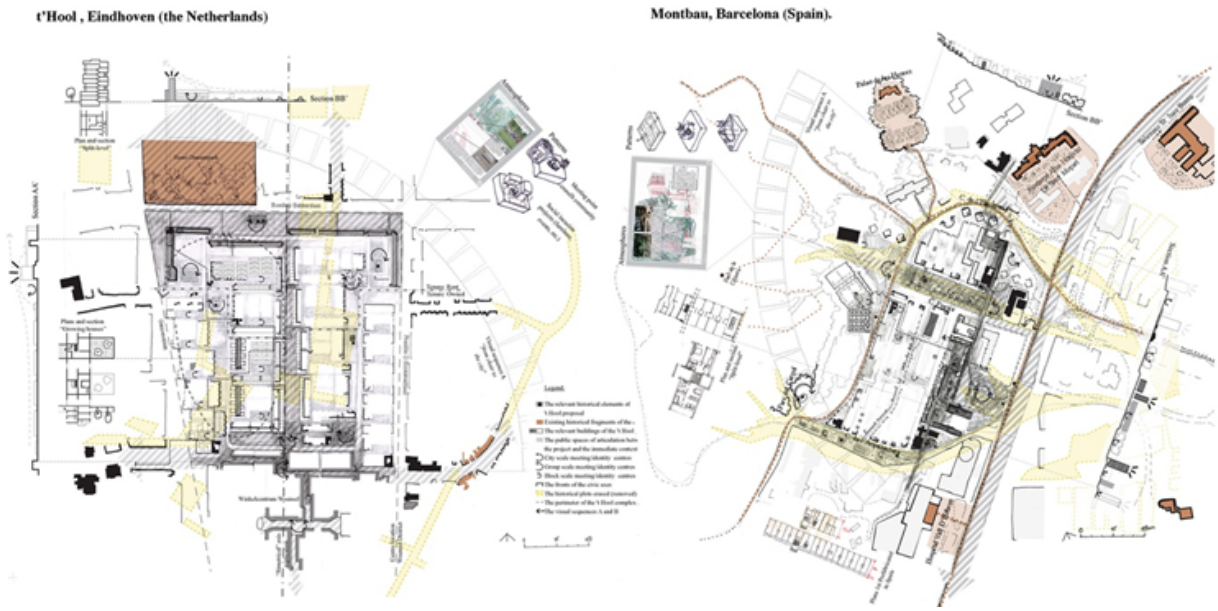

FIG. 3 Historical cartographies of ´t Hool and Montbau in a comparative fashion. Source: Made by authors.

lessons that were site specific but where we could also find similarities and differences allowing us to draw potentially transferable knowledge and lessons.

Here, we show one cluster of principles that relate to the experimental nature of the case studies (Appendix 1 shows full comparisons and observations for the History cartography). This has been done systematically for each cartography, where we observe some interrelation of spatial and procedural patterns coming from different disciplines (see Table 1). In the History cartography, we cluster principles under four topics for presenting and comparing results: 1) experimental character fostering urban life – sociological approach, 2) context sensitivity and dealing intelligently with site conditions, 3) housing crisis, political agenda and social movement, 4) growth in human beings – between survival and transcendence. We focus on the experimental characteristics (see Table 1)[51].

In the experimental and innovative character of the proposal, we select Principles 33, 40, and 62 from the History category and detect crossovers from other topics, such as socio-economics and form-scale (density) (which relate to Principles 1, 2, 7, 34, and 44). These principles interrelate because of the innovative approach of the case studies' urban and architectural design, e.g., with sociological studies and human-centered proposals, engagement of future residents in design decision-making, innovative typologies, and construction methods. To explore those principles in the case studies we deployed different approaches to sources, such as Andreas Faludi's method of 'performance in spatial planning'[52], as well as other literature reviews, archival processing, and the examination

51 For more information and other compared results, see Sanz, Bracken & Muñoz, 'Critical cartographies', 793.

52 Faludi, 'The Performance of Spatial Planning', 299-318.

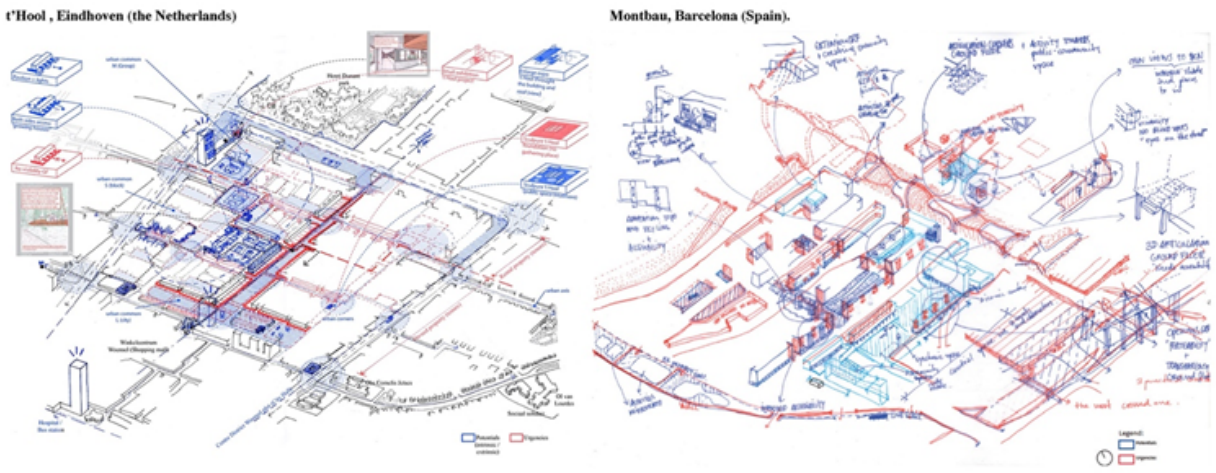

FIG. 4 Urgencies and Potentials from historical cartographies of ´t Hool and Montbau in a comparative fashion. Source: Made by authors

of morphological urban elements (Esteban 2009).

While deconstructing the accumulation of operations to reconstruct this cartographic angle, we provide a description of all layers relating to the History cartography (see Table 1).

The results obtained from the comparisons of the History cartography of 't Hool and Montbau allow us to empirically assess the Open Society in both. In the interests of clarity, the exposition and discussion on our results uses the above-mentioned categories but focusses on the most relevant innovative characteristics relating to human-centered design. We further subdivide the experimental and innovative characteristics into urban planning and architecture.

Firstly, we see the introduction of sociological and anthropological dimensions to urban planning and design. Both case studies attempt to address the urban project through human-centered approaches (Principles 1, 7, 33, 34, 62) to find common ground for fostering a diverse and inclusive Open Society. This search for diversity and inclusion is addressed by providing different conditions within the proposal (spatial, programmatic, ownership and tenure, and procedural). Some similarities highlight the sociological dimension that were incorporated into the urban proposal. We noted, however, that the methodological and operational steps were diametrically different: in 't Hool the process was more bottom-up; it was initiated by a social movement (from the Philips engineers who formed a cooperative[53]). In Montbau, the process was more top-down, initiated by a public institution initiative, *Patronato de Vivienda* (PMV), under a program of private incentives[54] which tried to create conditions for urban diversity. In both cases, however, diverse stakeholders wanted to provide high quality urban space. We can see that 't Hool performed better

53 "De ontstaansgeschiedenis van 't Hool" SGV 't Hool Foundation, last accessed February 6, 2025, https://www.woonwijkhethool.nl/achtergrond/geschiedenis/.

54 Ferrer, *Polígonos,* 10-11.

Theme: Experimental character and innovative approaches

Similarities	Differences	Comparison
Users were part of the process: in 't Hool, participating during the entire decision-making process; in Montbau, during the construction phase.	The proposal processes were different: 't Hool bottom-up; Montbau was top-down.	Experimentation in typological diversity shows correlation with topographic complexity, with minimal or no topography (Possibility of very diverse combination due to easy construction that is related to economic viability); In places with accentuated topography, the possibility of typological combination is more limited due to the high spatial and technical complexity that results in a higher cost making it more affordable. The use of prefabricated construction systems facilitates subsequent modification, allowing flexibility of uses and distributions. This prefabricated construction system reduces the time and cost of the work. The configuration of centers through centrifugal forms allows the creation of identity centers of social interrelation or encounter that, depending on the position in the central plaza, creates conditions for different activities (e.g. open areas, sculptures, meeting places, unscheduled and ambiguous spaces, recreational and sports activities, etc.; intimate areas (not totally closed, living spaces, with trees, relaxation, etc.). ´t Hool seems to follow a fractal formation creates gradients and articulations between the different scales (type, block, group, place) and articulating the parts and whole. It has proven to be more effective to incorporate the sociological study at the beginning of the design and then transpose it to the place, adjusting it to its limitations. Always keeping the user in mind throughout the design process, (if possible, interacting with them). The different approaches in the urban development process (top-down / bottom-up) are approaches that show benefits in both cases and their combination shows very effective and efficient process opportunities, included from the beginning to the end. The attitude and motivation in participation, design and agreements is a key element to give vision to interested parties and foster common commitment to address today's challenge "sustainable growth" and socio-ecological transition. Promotion of good practices and selection of socially and environmentally committed teams. Promotion of urban experiments and innovative models in City making and Construction. The feeling of belonging to the place and community favors bottom-up community projects that solve local and global challenges on a small scale. We observe that this is the result of the programmatic mix of options for different typologies and ways of living, mix of tenure and property, diversity in housing sizes and variations, and diverse meeting spaces (interior and exterior of buildings) that vary. in its social function (public, collective, etc.)
Willingness to incorporate the sociological dimension in the urban development process.	In 't Hool, Bakema dealt directly with user-clients and adapted the scheme to their needs and the demands of the Municipality; in Montbau the Public Administration was the client and the LIGS architecture team relied on studies (interviews, programmatic schemes, etc.) (Bohigas, 1965) to determine the type of user to whom the action is directed.	
Experimental centrifugal composition of urban form configuring centers as well as spatial repertoire on how to deal spatially on the transitions between public and private using thresholds among other strategies (topfic: form, scale (density), matter)	In 't Hool the centrifugal composition of the urban form that adjusts such with displacement in plan seeking diagonal views to create connections and feeling of expansion, is a geometric pattern that seems that follows a fractal formation.	
Pioneering types and construction methods. (e.g. growing-houses, workshop-houses, prefabrication, split-level, etc.	In 't Hool is evident resulting from the avant-garde implementations with growing houses, split-level and prefabrication that allow for adaptation latter by the user.	
There was enthusiasm and a desire for experimentation and innovation, with a commitment from professionals to society and in promoting high quality of urban space.	In 't Hool was through application of the spatial repertoire accumulated (during the CIAM experiments) as well as the direct implementation of the discussions on growth and change in the avant-garde (Team 10) and against the CIAM model of Mass Housing development. In Montbau was through the application of "sociological parameters such as: diverse percentage of socio-economical profiles, introduction of cooperatives (economic model) to develop the proposal, and trips to Europe for learning the latest trends and solutions". Started applying the CIAM (Mass housing development principles) and it evolve along with the discourse and architectural trends and knowledge acquired in the global discussions within the network Modern Architecture and CIAM.	

FIG. 1 Comparison results of ´t Hool and Montbau and lessons. Source: Made by authors based on literature review, spatial analysis, empirical observations from site visits.

than Montbau according to Jane Jacobs' reading of urban life and its bottom-up approach[55]. James C. Scott warns against the imposition of schemes through legislative and programmatic apparatuses that result in social engineering[56]. Professional experts have specific knowledge and tools for operating in such a complex design process. However, they need to be aware of power-knowledge relations when mapping to incorporate more angles and voices for common understanding and agreement.

Secondly, we see experiments and innovations in construction methods, innovative dwelling typologies and configuration of urban ensembles, and spaces fostering urban life and a sense of community (as well as programmatic and ownership schemes to increase complexity and diversity). We observed that in both cases there was a large reservoir of housing types responding to things like different residents' needs, engagement in the process, types of tenure and ownership, and with different self-organizing entities such as cooperatives. This resulted in a certain degree of success in creating community identity. Also, innovative dwelling typologies, such as the 'growing houses'[57] and pioneering prefabricated construction systems used in combination with craftmanship and local materials and construction techniques led to what is perhaps the biggest achievement, which is the configuration of the central open spaces which are easy to identify through their centrifugal composition which is used to articulate space.

In this comparison, we speculate on some causal relationships. For example, one that seems clear to us is the richness of experimentation in the mix of housing types. 'T Hool shows better configurations and has more types and variations than Montbau, which seems to have several restricting factors, the most defining one would be that the topographic conditions of the hilly site which required complex and expensive solutions. These were not considered feasible at the time because these projects were meant to be affordable.

Discussion and Conclusions

We would like to reiterate here some of the aspects that make critical cartography such a useful way of conducting comparative research into specific sites to identify potential transferable knowledge. Insights gained from using historical tools for comparative analysis could serve to enrich at a global scale the collective cultural projects and processes of housing estate regeneration by embracing their historical legacies and providing the historical background and meaning to their spaces, we can better understand what goes into creating them.

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55 Jacobs, *The Death and Life of Great American Cities*, 422-423.

56 Scott, *Seeing Like a State*, 91-93.

57 Risselada, "t Hool', 170.

Using comparative critical cartography as a theory-practice tool can link generations of knowledge about space[58]. This tool also shows great capacity for communicating its findings effectively to inform design process. This holistic approach, with its objectivation and awareness of the intersubjectivity of space, provides a valuable tool for approaching knowledge in a genealogical way, which means it can be a good fit for cross-pollination between co-creative process, such as living labs, and urban laboratories. We are aware that there are limitations regarding these processes, especially when complexity or the number of stakeholders increases, which might require more effort from the designers. We recognize the crucial role of those creative, committed, and reflexive professionals to inspire and guide the spatial design towards inclusive, just, and sustainable development.

Our method also allows us to enrich knowledge within 'other' perspectives (e.g., subaltern) as well as contribute to trans-cultural knowledge exchange since maps are used as means of visual communication. In that regard, we need to warn about three limitations: 1) maps are constructed by power-knowledge dynamics between the map-maker and the map, 2) the increase in the necessity to generate systematic approaches to protocols and indicators for integrating diverse knowledge that incorporate values as well as data-driven processes, with advanced protocols and feedback loops operating in an iterative process, 3) there are material and user experiences (perceptions) to take into account and these are not always possible to communicate via a map.

Comparative critical cartography is proving to be a powerful tool for spatial exploration since it is objective and subjective at the same time, allowing for analysis and exploration simultaneously. This fits well with the reflective practices outlined by Donald A. Schön. To generate novel interspatial insights, relations need to be approached holistically, creatively and systematically. Comparative critical cartography allows us to detect interdependencies and serves as an effective method for contrasting case studies to identify urgencies as well as potentials (i.e., design strategies or principles in the form of patterns). This comparative analysis is somewhat brief, so it is only after a large number of inquiries into other case studies worldwide could we draw more decisive conclusions and make more definitive statements about these cases and this approach.

We observed that each place has its own idiosyncrasies in responding to its context (social, political, economic, environmental, etc.). From similarities observed in both case studies we identified potential causal relations between spatial elements, in the form of spatial patterns and spatial structures that connect across diverse fields and disciplines. After extensive study, the description and explanation of these casual relations can generate new knowledge. In other words, spatial design principles and

58 Sanz, Bracken & Muñoz, 'Critical cartographies', 13.

design process protocols can be transferred for more general use.

On the other hand, this method can be constructed using mixed methods to produce qualitative and quantitative results while noting similarities and differences in order to evaluate and draw initial conclusions while also generating site-specific and generalized (i.e., transferable) knowledge and, to a certain extent, draw conclusive lessons. The use of different techniques and sources has proved effective in describing and assessing the diverse aspects and dimensions of complementary spaces in relation to the assessment framework (i.e., Bakema's 64 Open Society principles). We had some limitations regarding performance, availability, and compatibility of some open-source data or because of the different climate conditions (these latter could be solved by using sensors to gather data; however, there could be limitations to this because of data and privacy protection). We agree with Carola Hein and Yvonne van Mill (2019) that the comparison of geo-spatial mapping of big data sets can potentially provide valuable insights in approaching space holistically and that go beyond traditional methods. This offers many possibilities but also some challenges, like those just mentioned.

Finally, we aim to contribute to our common pool of knowledge on methods and techniques that are available to modern housing estates for regeneration programs. In addition, we aim to shed light on knowledges and the lessons that can inform the stakeholders and decision-makers who are providing the strategies for addressing socio-ecological transitions in these case studies with potential design frameworks and principles in Modernist urban regeneration processes. Finally, to enrich the discussion and narrative on the cultural project of the Open Society and its legacy in twenty-first century.

Apendix I

	´t Hool , Eindhoven, the Netherlands.	Montbau, Barcelona, Spain.
1.- The relevant historical elements of the proposal.	Compiled from site visits, archival and cataloguing process. Data source from the platform pdok (set: pand) 2020.	Compiled from site visits, archival and cataloguing process. Data source from the platform ICGC (set: constructions) 2020.
2.- Existing historical fragments of the city.	Produced by examination of maps and palimpsest analysis (1930, 1970, and 2020). Data from the platform pdok and geofabriek (set: pand, openruimte, weg), official documents, and Historical Atlas of Eindhoven	Produced by examination of maps and palimpsest analysis (1940, 1970, and 2020). Data from the platform ICGC and geofabriek (set: construccions, transport, cobertes, relleu and hidrologia), official documents, and Carta Històrica de Barcelona (MUHBA)[1]
3.- The relevant buildings of the project.	This layer has been produced with a historical archival of literature reference (Forum text, CIAM congress text, HNI archive, etc.) and cataloguing during the site visits. The data source used was open data from the platform pdok (set: pand) 2020 and personal data produced from the site visits.	This layer has been produced with a historical archival of literature reference (Forum text, CIAM congress text, HNI archive, etc.) and cataloguing during the site visits. The data source used was open data from the platform platform ICGC and geofabriek (set: cobertes) 2020 and personal data produced from the site visits.
4.- The public spaces of articulation between the project and the immediate environment.	Produced using historical maps and a morphological analysis of the urban structure. Data from the platform pdok (set: pand, open ruimte) 2020.	Produced using historical maps and a morphological analysis of the urban structure. Data from the platform ICGC and geofabriek (set: cobertes, relleu and hidrologia), 2020.
5.- Group identity centres.	Produced via a morphological analysis of type/block/group units. Compiled using archival study of CIAM and Team 10 identity configurations in urban form thought-out the scales and observations during site visits. Data from the platform pdok (set: pand) 2020.	Produced via a morphological analysis of type/block/group units. Compiled using archival study of CIAM and Team 10 identity configurations in urban form thought-out the scales and observations during site visits. Data from the platform ICGC (set: cobertes) 2020.
6.- The centres of identity of the blocks.	Produced via a morphological analysis of type/block/group units. Compiled using archival study of CIAM and Team 10 identity configurations in urban form thought-out the scales and observations during site visits. Data from the platform pdok (set: pand) 2020.	Produced via a morphological analysis of type/block/group units. Compiled using archival study of CIAM and Team 10 identity configurations in urban form thought-out the scales and observations during site visits. Data from the platform ICGC (set: construccions, cobertes, relleu) 2020.
7.- The fronts of the civic axes.	Produced via morphological analysis of urban structure through a palimpsest analysis (using maps from 1930, 1970, and 2020) official documents, and Historical Atlas of Eindhoven. Data from the platform pdok (set: pand) 2020.	Produced via morphological analysis of urban structure through a palimpsest analysis (using maps from 1940, 1970, and 2020) official documents, and Historical Atlas of Eindhoven. Data from the platform pdok (set: pand) 2020.
8.- The historical plots eliminated.	Produced via a palimpsest analysis (using maps from 1930, 1970, and 2020) official documents, and Historical Atlas of Eindhoven. Data from the platform pdok (set: pand) 2020.	Produced via a palimpsest analysis 1940, 1970, and 2020). Data from the platform ICGC and geofabriek (set: construccions, cobertes, relleu), official documents, and Carta Històrica de Barcelona (MUHBA)[2]
9.- The perimeter of the ´t Hool complex (Place-group-block-type):	Compiled using information on municipal boundaries, land use from City Hall open data, and refined using a methodological analysis of the configuration of urban form (type/block/group/place). Data from the platform pdok 2020.	Compiled using information on municipal boundaries, land use from City Hall open data, and refined using a methodological analysis of the configuration of urban form (type/block/group/place). Data from the platform ICGC and geofabriek 2020.
10.- The visual sequences A and B, (From the chair to the city and viceversa).	Conducted using Gordon Cullens' cognitive approach to spatial patterns called serial vision and adapted to the detection of 'Atmospheric intensity' points that allows us to extract spatial patterns (to be address in following articles). Data source: photography from the authors during site visits.	Conducted using Gordon Cullens' cognitive approach to spatial patterns called serial vision and adapted to the detection of 'Atmospheric intensity' points that allows us to extract spatial patterns (to be address in following articles). Data source: photography from the authors during site visits.

TABLE 2 Layers and data set that construct Historical cartographies of ´t Hool and Montbau in a comparative approach. Source: Made by authors

1 https://www.barcelona.cat/museuhistoria/cartahistorica/index.html?lang=en#map=14/242185/5070759/2010//0/0/0/0

2 https://www.barcelona.cat/museuhistoria/cartahistorica/index.html?lang=en#map=14/242185/5070759/2010//0/0/0/0

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