

City thresholds. The role of urban green infrastructures in Madrid

Umbrales en la ciudad. El papel de las infraestructuras verdes urbanas en Madrid

ROCÍO SANTO-TOMÁS MURO

EVA J. RODRÍGUEZ ROMERO

Rocío Santo-Tomás Muro, Eva J. Rodríguez Romero, "City thresholds. The role of urban green infrastructures in Madrid", *ZARCH* 14 (junio 2020): 176-187. ISSN versión impresa: 2341-0531 / ISSN versión digital: 2387-0346. https://doi.org/10.26754/ojs_zarch/zarch.2020144289

Recibido: 28-11-2019 / **Aceptado:** 12-05-2020

Abstract

This paper presents an exploration of the thresholds of the city, embodying the concept of Urban Green Infrastructure. In particular, it is a journey through the urban fringe of Madrid, where these green infrastructures, due to their form and history, achieve the sense of urban threshold and act as identity generators of the city. We examine the concept of peri-urban landscape in relation to nowadays challenges of sustainable development, as well as the benefits of Urban Green Infrastructures in the contour of the city. We then take a brief tour through the peripheral landscape of the city of Madrid, where we analyse metropolitan parks and historical green areas that comply its proximity image. After identifying the green infrastructures acting as thresholds in the city of Madrid, we focus on the south-east diagonal of the capital in order to reaffirm its importance in the construction of the image and identity of the city. We defend the importance of Urban Green Infrastructure to and from the city, suggesting the necessity of a supra-municipal planning tool to take change of the peri-urban landscape, usually perceived as subsidiary, to deem the proximity visions of the city as relevant for its design.

Keywords

Threshold, fringe, peri-urban landscape, urban green infrastructure, urban form, Madrid.

Resumen

Este artículo plantea una exploración de los umbrales de la ciudad, incorporando el concepto de infraestructura verde urbana. Es un recorrido por los bordes de la ciudad de Madrid en particular, donde esas infraestructuras verdes, por su forma y por su historia, adquieren el sentido de umbral urbano y actúan como elemento generador de identidad de la ciudad. Se revisa el concepto de paisaje periurbano en relación con los actuales desafíos de desarrollo sostenible, así como los beneficios que aportan las infraestructuras verdes urbanas en el contorno de una ciudad, para después recorrer brevemente el paisaje periférico de la ciudad de Madrid. A continuación, se analizan los parques metropolitanos y zonas verdes históricas que conforman la imagen de aproximación a la misma. Se identifican las infraestructuras verdes que actúan como umbral, centrándose en las que se encuentran en el sureste de la capital, para ratificar su importancia en la construcción de su imagen e identidad. Se defiende la importancia de las infraestructuras verdes urbanas desde y hacia la ciudad, sugiriendo la necesidad de un instrumento supramunicipal de planeamiento que se ocupe del paisaje periurbano, habitualmente entendido como subsidiario, por considerar las visiones de acercamiento a la ciudad como relevantes para su diseño.

Palabras clave

Umbral, límite, paisaje periurbano, infraestructura verde urbana, forma urbana, Madrid.

Rocío Santo-Tomás Muro. Architect by San Pablo-CEU University, Madrid (2016). She has a predoctoral contract FPI (Research Staff Training Fellowship) from University Foundation San Pablo-CEU, where she is also a member of the *Heritage, Architecture & Landscape (Patrimonio, Arquitectura y Paisaje)* Research Group since 2016. So far, she has been involved in four research projects, two of which funded by state programs. She is collaborating with Newcastle University on a project focused on Green Infrastructure Stewardship and has contributed to the Laboratory of Somatics for Architecture and Landscape of San Pablo CEU University's Institute of Technology. Her Phd thesis focuses on Green Infrastructures and Tools for the study of perception in Madrid, with published results in indexed journals, book chapters and communications to associated international conferences. <https://orcid.org/0000-0002-8577-7008>. roc.santotomas.ce@ceindo.ceu.es

Eva J. Rodríguez Romero. Architect by the UPM School of Architecture, Madrid (1994) and PhD in Architecture in 1999 by the aforementioned University. She is an Associate Professor at San Pablo-CEU University, CEU Universities. Since 2006, she has led the *Heritage, Architecture & Landscape (Patrimonio, Arquitectura y Paisaje)* Research Group at San Pablo-CEU University, where she has so far developed seven research projects, four of them funded by state programs. Her field of study is History of the Spanish Landscape and Garden, and she is also developing other research lines in Urban Form, Landscape Perception and Heritage Restoration. She is the author of 5 books, 36 book chapters and 19 scientific articles, many of them indexed in WoS, A&HCI, Scopus and Latindex. She has participated in 29 national and international conferences and is a collaborating member of the Institute of Madrid Studies. <https://orcid.org/0000-0003-2550-3774>. rodrom@ceu.es

Landscape and the Contour of the city

- 1 Beatriz Fernández Águeda, "Del límite de la urbanización al límite de lo urbano: la construcción territorial del Gran París y el Gran Madrid (1910-1939)", *Ciudades* 19 (2017): 31 <https://doi.org/10.24197/ciudades.19.2016.31-56>
- 2 This research is part of the project "The periurban landscape in Madrid: visions from memory to the new city" (funded by the V Call for Projects CEU-Banco de Santander 2018-19 Bridge and by the Secretary of State for Research of the Spanish Ministry of Science and Innovation, code PID2019-110693RB-I00).
- 3 This model of city begins with the Hygienist Model, whose maximum exponent is Georges-Eugène Haussmann, with the remodelling of Paris, which pledged better health, security and transport. Marc Dilet, "Haussmann, Georges Eugène, Baron", *Oxford Art Online* (Oxford: Oxford University Press, 2003), <https://doi.org/10.1093/gao/9781884446054.article.T036932>.
- 4 In American cities, for example, this rapid growth of suburban housing without clear planning was known as *Urban Sprawl*, referring to the dispersed spread of housing in suburban and rural areas.
- 5 Cfr. Vittorio Magnago Lampugnani, '¿Ciudad o Suburbio? Reflexiones sobre construir en la periferia', *ZARCH, Journal of Interdisciplinary Studies in Architecture and Urbanism* 3 (2014): 1–11. Eva M^a Fernández Pablos and Esther Yañez Conde, "El valor de las áreas periurbanas como espacios multifuncionales en el suroeste de Madrid", *Tecnología y desarrollo* 13 (2015).
- 6 "Landscape" means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors". Consejo de Europa, 'Convenio Europeo Del Paisaje', in *Report and Convention Florence*, 2000, <https://doi.org/http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm>.
- 7 In 1959, Gordon Cullen's publication of *The Urban Landscape* implied the application to the city of the perceptual analysis procedures derived from picturesqueness, as well as the operating methods developed in the English Landscape Architecture, now transferred to urban design. Other authors like Kevin Lynch have also studied the importance of the image of the city and the urban landscape. See also the bibliography of Javier Maderuelo, in particular Javier Maderuelo, *El paisaje: génesis de un concepto* (Madrid: Abada, 2005).
- 8 *Hábitat III*. UN, 'Proyecto de documento final de la Conferencia de las Naciones Unidas sobre la Vivienda y el Desarrollo Urbano Sostenible (Hábitat III)', *Hábitat III* 10631 (2016): 1–25.
- 9 United Nations, *World Urbanization Prospects: The 2018 Revision, World Urbanization Prospects: The 2018 Revision*, 2019, <https://doi.org/10.18356/b9e995fe-en>.
- 10 Goal 11: Making cities and human settlements inclusive, safe, resilient and sustainable. Other related goals are Goal 13: Climate Action, and Goal 15: Life of Terrestrial Ecosystems.

Throughout history, the image of the city contour has been linked to the image of its infrastructure. Even though green spaces have always been present, to a greater or lesser extent, in the design of the growth and edge of the city, in recent years we are paying special attention to the concept of Urban Green Infrastructure (UGI). UGI is defined by its connectivity, multifunctionality and accessibility and can alter and enrich the peri-urban space.

Within contemporary processes of metropolitan growth many spaces remain unresolved, generating voids and geographical and sociological disconnections which condition the character of the city's edge and alter the traditional transition between city and countryside. The complex morphology of the contemporary city, in contrast to delusive administrative borders, reveals the idea that the urban limit is not defined by its urbanization but by its area of influence,¹ meaning Green Infrastructure located in the periphery acquires a valuable role in understanding the identity of the city's contour, from the point of view of the landscape, and not only by the limits of artificial land.

This article proposes a morphological analysis of the contour of the city of Madrid based on the Green Infrastructure that encircles it, enhancing the dialogue between nature and the city, especially from its impact on perceptive aspects.² We emphasize the importance of the metropolitan parks built in recent decades, specifically on the southeast diagonal of the capital, when characterizing the entrance to the city, which generates threshold spaces. Spaces that make more amiable areas more initially neglected in their design, when compared to the equivalent areas in the northwest of the city.

The landscape of the Contemporary City: The Peri-urban environment and the challenges of Sustainable Development

After the industrial revolution and with the rise of the bourgeoisie in the 19th century, a new model of city emerged, "the contemporary city"³ which, among other aspects, reconsidered its relationship with nature. The city was defined by its urban centre and by the concentration of workers and consumers. After the political, economic and social changes of the 20th and 21st centuries, the importance of both the centre and the peri-urban space was established.⁴

It is this diffuse, transitional space that we refer to what we refer to with the concept 'peri-urban environment'. This interstitial space between urban and rural, with a fragmented and hybrid character, is often forgotten and lacks an overview when it comes to planning the city.⁵

The European Landscape Convention defines the contemporary concept of landscape,⁶ highlighting both natural and cultural heritage as the basis of its identity. It also defines the meaning of "landscape management", as actions from a perspective in line with Sustainable Development, as well as the "types of landscape" among which is the urban landscape.⁷

Thus, with the increase of population, climate change and the various challenges raised by the New Urban Agenda,⁸ the United Nations is promoting the implementation of a series of sustainable development objectives within the framework of Horizon 2030. By 2050, it is expected that more than 70% of the world's population will live in cities.⁹ Therefore, Goal 11¹⁰ refers to cities and communities to preserve their natural and cultural heritage. One of the measures is the provision of universally accessible and inclusive green and public spaces in cities, considering the economic, social and ecological links between urban and

peri-urban space and areas of influence, which leads us to link it directly to Urban Green Infrastructures.

Green Infrastructure in the edges of the city

As well as, on an architectural scale, patios or galleries act as a filter between the interior and exterior of a building, at an urban scale we find other transitional elements. *Proximity Landscapes*¹¹ of the city are those perceived when the city is a point of destination or departure. Hence, the city contour and its threshold spaces become a fundamental factor when defining its entrance and exit character. In this context, the Urban Green Infrastructures (UGI) stand out as “buffer areas” for the effects of urbanization, favouring sustainable development, as they provide territorial cohesion.¹²

Historically, the infrastructure network of a city, understood as the set of elements, equipment or services needed for its proper functioning, has been linked to the edge of the city.¹³ Typically, the landscape around a city was defined by its productive or rural appearance, yet since the late 19th century some projects have understood the latent role of green areas in changing the dynamics of the city on its urban edge.¹⁴

Some recent policies, like the ‘Green Belts’ in England, executed metropolitan green belts to control growth, for example, the Metropolitan Green Belt in London (1935). In Spain, the ‘Turia Garden’ in Valencia (1986), the Green Belt in Vitoria-Gasteiz (1993) or the Green Belt in Zaragoza (2008) are recent examples of projects employing green infrastructure in urban design.

Nowadays, we refer to UGI as: “*the resilient landscape that supports ecological, economic and human interests by maintaining its integrity and promoting landscape connectivity, while enhancing the quality of life and sense of place of the environment across different landscape boundaries*”.¹⁵ In contrast to UGI, “grey infrastructure” connects spaces and serves the city but fragments the territory and leaves areas that are difficult to integrate within the urban fabric.¹⁶

Natural spaces that comprise Green Infrastructure act as a response to this growing fragmentation of the landscape,¹⁷ linking urban and natural spaces. Connectivity between ecosystems and citizens is, therefore, one of the main characteristics of these spaces, along with multifunctionality or capacity to house different activities, and accessibility from different points. The advantage of Green Infrastructure in the peri-urban space is its influence from and towards the city, as well as its enormous capacity to improve formal and perceptive aspects of that often forgotten space. Thus, interstitial spaces found on the urban edge play a fundamental role and can be incorporated into the existing UGI.

UGI benefits range from environmental¹⁸ (they promote the principles of ecology, increase biodiversity, mitigate the effects of climate change, etc.), to economic (they help to reduce costs, attract tourism, encourage entrepreneurship, etc.) and to social factors (they improve physical and mental health, allow contact with the community, improve the sense of place, etc.) In short, they are areas with a distinct identity that directly affect people’s quality of life and their perception of the city.

In Spain, UGI have been designed independently and as complementary tools compared to the overall strategies of “grey infrastructure”. Although many cities already have Green Zone Strategic Plans, they do not always involve planning around existing structures, and therefore do not fully achieve their potential as

- 11 Cfr. Eva J. Rodríguez Romero (dir), *Paisajes de aproximación a la ciudad de Madrid* (Madrid: Conarquitectura Ediciones, 2018). This book contains a detailed account of the results of the project with the same name (code HAR2014-57843-R), which established a characterisation of Madrid’s periurban landscape based on the most significant territorial elements such as its relief, hydrography, vegetation and productive spaces. Within this previous conceptual framework, this article focuses on the UGIs.
- 12 M.A. Benedict and E.D. McMahon, *Green Infrastructure: Linking Landscapes and Communities*, ed. Island Press (Washington, DC, 2006). In this article we focus on metropolitan-scale UGI. However, UGI also exists on a smaller scale, like in green roofs or porous pavements.
- 13 Such as the railway network, the energy transport system, etc. Cfr. Carlota Sáenz de Tejada Granados, “Energía, ciudad y los paisajes cotidianos. Percepciones en el espacio periurbano de Madrid.” (Doctoral Thesis, Universidad San Pablo-CEU, 2019).
- 14 Since the definition of the term ‘Landscape Architecture’ by Gilbert Lang Meason in 1828, projects focused on individual examples. The first project to be considered as ‘Landscape Architecture’ Central Park (Frederick Law Olmsted and Calverd Vaux, 1860-1873). The Emerald Necklace project by Frederick Law Olmsted (1894) involved a new relationship between urban structure and nature, creating a system of existing parks and new connected designs in the city of Boston that contributed to the renaturation of the city. Also, Howard’s Garden City (1898) tried to counteract the phenomenon of the periphery by mixing building and nature. Many cities in America and Europe were regenerated internally and transformed their periphery with the movement of public walks and parks.
- 15 Ian C. Mell, “Green infrastructure: concepts, perceptions and its use in spatial planning”, *Landscape*, 2010.
- 16 Paula Kapstein López and Miguel Ángel Gálvez Huerta, “Identificación de una franja de periferias interiores de escala metropolitana en el sur de Madrid”, *ZARCH, Journal of Interdisciplinary Studies in Architecture and Urbanism* 8 (2017): 118, https://doi.org/10.26754/ojs_zarch/zarch.201782150.
- 17 Clive Davies et al., ‘Green Infrastructure Planning Guide’, *Strategic Green Infrastructure Planning*, 2006, https://doi.org/10.5822/978-1-61091-693-6_1.
- 18 The European Environment Commission focuses on these factors when defining Green Infrastructures as “a strategically planned network of high quality natural and semi-natural areas with other environmental elements, designed and managed to provide a wide range of ecosystem services and protect biodiversity in both rural and urban settlements”. Comisión Europea, *Construir Una Infraestructura Verde Para Europa* (Belgium 2014), <https://doi.org/10.2779/2738>.

a networked system.¹⁹ Although there are different types of UGI according to their scale and form, this article focuses on the analysis of urban green systems, which affect the urban contour in its role of visually improving the experience when approaching a city.

Journey through Madrid's peri-urban landscape and the character of its green spaces

Madrid's urban development has historically been linked to the natural environment where the city was located and to the mainly rural landscape surrounding the capital. The powerful geomorphological support of its location (topography, hydrography, vegetation, etc.) has defined its image for centuries and, alongside other historical and economic factors, has led to the fact that, after the immense growth of the late 19th and mid-20th centuries, in the formalisation and functions of the peri-urban space, two opposing types of landscape can be distinguished: a *naturalistic* type (northwest) and an *industrial-productive* type (southeast) that lies under the northeast-southwest diagonal.²⁰

Thus, the types of soil with its associated plant variants, the valleys dug by the rivers Manzanares and Jarama, as well as the streams and the marked relief of the land, determined over the centuries not only the initial settlement of the population centre but also its subsequent growth and initial evolution of the urban form [Fig. 1]. This northeast-southwest diagonal was present in the urban development but also in the landscape outside the city, as the types of soil and the orography conditioned the types of crops, the areas of pastures, meadows or vegetable gardens, as well as the location of the suburban villas in the contour of the Villa. All of this determined the rural character of the city boundary,²¹ which during the 18th and 19th centuries was a fairly well-defined border, until the demolition of the Felipe IV fence in 1868, when the surface area of the city increased exponentially towards the north and east. The southern area began to show an industrial character, especially with the construction of the railway stations and their interconnecting corridors. Despite the new urbanized extensions, both 'Casa de Campo' and 'Monte de El Pardo' were preserved, bringing this protection to the present day, with consequences that are reflected in the naturalistic character of the northwest access to Madrid.

Another determining element of the peri-urban landscape of Madrid are road accesses, characterised by the eminently geocentric character of the city [Fig. 1]. Between them, there are segments that present different identities according to the diagonal that marks the two major types of peri-urban landscape mentioned, also reflected in the historical sectorization of urban uses. The urban edge is no longer a clear-cut line with marked doors, as it might have been in the past, it is now a diffuse strip where there are no doors but wide transition areas, places where one recognizes that one has entered the city and left the countryside behind; *urban thresholds*. Among different places which may act as urban thresholds, the role played by urban green infrastructure stands out, especially given its power to produce visual connectivity between the environment and the city, as well as its ability to improve in various aspects the materialisation of urban borders and influence the perceived image of the city as we approach it.

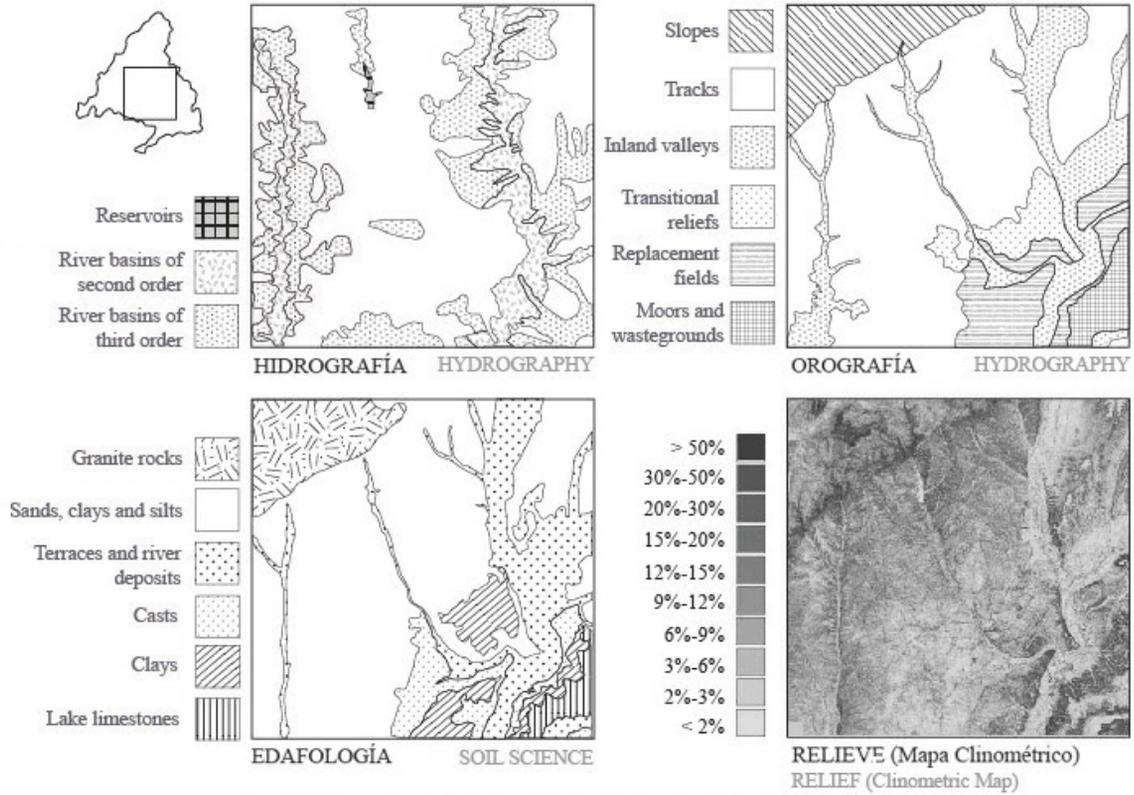
Consequently, the large transport infrastructures such as radial and ring roads, railways or Barajas airport, due to their large extension over the territory, are elements which also define the character of the urban fringe, in dialogue with UGI. However, while the latter visually connect the peri-urban landscape with the urban one, the transport infrastructures fragment the territory and focus the access experience on a determined point.

19 In Spain, the regulatory framework is the State Strategy for Green Infrastructure, Connectivity and Ecological Restoration. See Dionisio Fernández de Gatta Sánchez, "La Estrategia Estatal de Infraestructura Verde y de la Conectividad y Restauración Ecológicas: Un nuevo instrumento para proteger la Biodiversidad", *Actualidad Jurídica Ambiental* 81 (2018): 1–62.

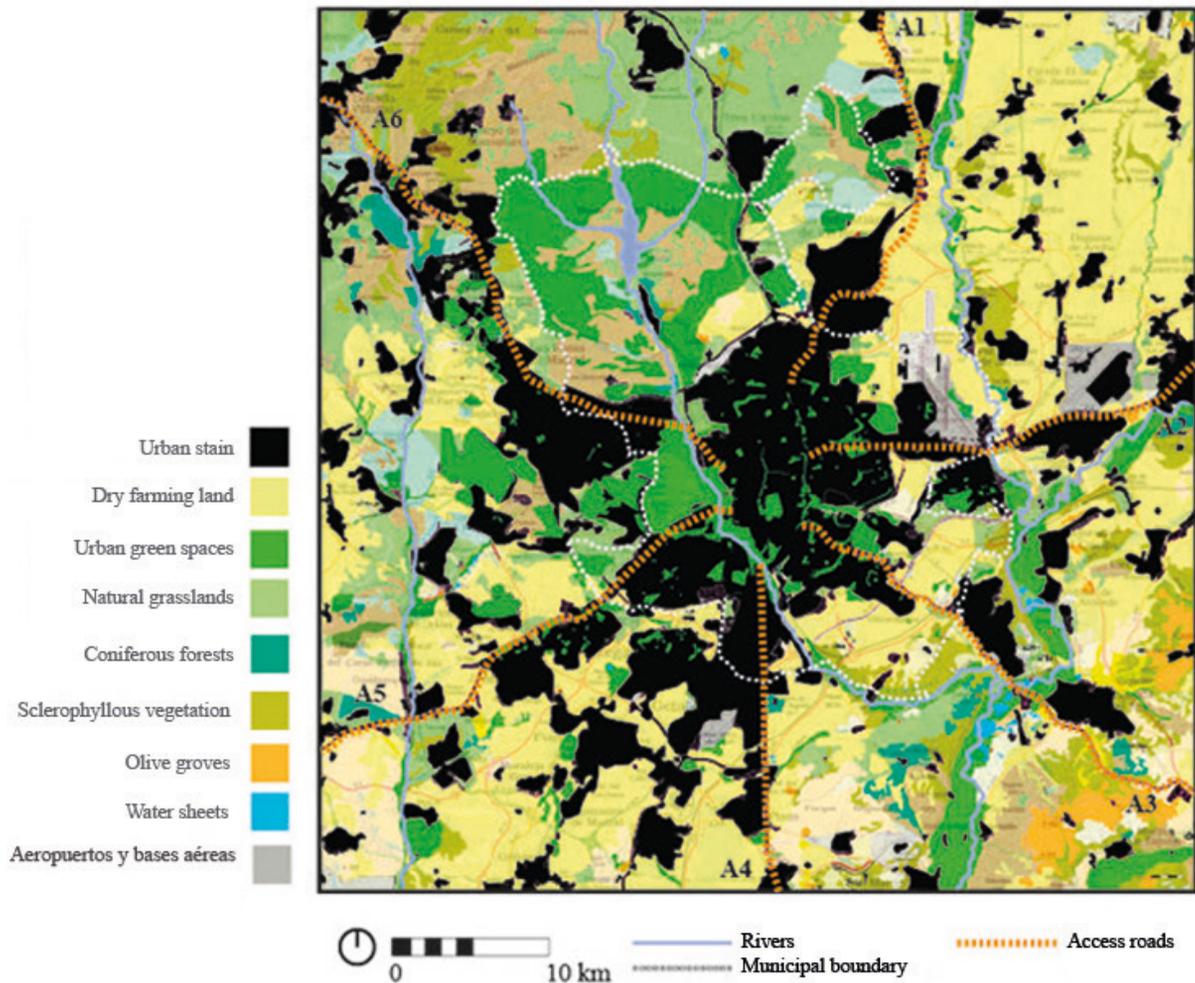
20 Eva J. Rodríguez Romero, Carlota Sáenz de Tejada Granados, and Rocio Santo-Tomas Muro, "Landscape Perception in Peri-Urban Areas: An Expert-Based Methodological Approach", *Landscape Online* 75 (4 October 2019): 1–22, <https://doi.org/10.3097/LO.201975>. In the research project "Proximity Landscapes of Madrid: from the 19th century to the present day", we established three types of landscape in the surroundings of Madrid: the naturalistic, the industrial-productive and the historical, the latter corresponding to the so-called "Cornice of Madrid", which is perceptible from a much closer scale to the city centre than the other two (cfr. Rodríguez Romero, *Paisajes de Aproximación a La Ciudad de Madrid*). Therefore, this article only considers two types of periurban landscape in Madrid: the naturalistic and the industrial-productive, in order to focus the analysis of UGI only on the industrial-productive, in which they play a relevant role as urban thresholds.

21 Eva J. Rodríguez Romero, Carlota Sáenz de Tejada Granados, and Rocio Santo-Tomás Muro, "The Role of Historical Green Spaces in the Identity and Image of Today's Cities: The Case of Madrid", in *24th ISUF International Conference: City and Territory in the Globalization Age*, 2018, <https://doi.org/10.4995/isuf2017.2017.5340>.

ESTRUCTURAS NATURALES NATURAL STRUCTURES



ESTRUCTURAS ANTRÓPICAS Y VEGETACIÓN ANTHROPIC STRUCTURES AND VEGETATION



[Fig. 1]. Natural and anthropic structures that generate the character of Madrid's periurban landscape. Source: prepared by the authors based on plans from 'Visor Planea': Land Occupation 2000 (CLC), Environmental Cartography of the Community of Madrid (Physiography and Slopes Map, Lithology Map, Hydrography Map, Clinometric Map).

- 22 One of the first projects to understand green infrastructure as a system, the 'Suburbs Development Plan' by Nuñez Granés, proposed a green belt around the city, providing service and connecting the workers' centres on the outskirts of the city. However, it was never carried out. Another project on the edge of the city, following hygienist theories, was 'Lineal City' by Arturo Soria. Cfr. Virgilio Pinto Crespo and Santos Madrazo, *Madrid. Atlas Histórico de La Ciudad. Vol. 1* (Madrid: Lunwerg Editores and Fundación Caja de Madrid 1995).
- 23 Cfr. Eva J. Rodríguez Romero and Carlota Sáenz de Tejada Granados, "Paisajes de aproximación a Madrid entre 1939 y 1959: accesos, núcleos periféricos y espacios verdes", in VV.AA., *Represión, exilio y posguerras. Las consecuencias de las guerras contemporáneas en el arte español* (Madrid: CSIC, 2019). The International Urban Planning Competition of 1929 promoted the expansion of the city to the north, and the industrial area to the south, proposing the conservation of "the charm of the city in this area" in the southwest and west, with the construction of promenades with plantations and the conservation of the views towards the valley, advocating a system of free spaces "with a certain law". This exploration of the limit was present in the project of Zuazo-Jansen, finalists of said competition. It focused on the dialogue between satellite populations, the centre, and the possibilities of growth of the city, trying to order the urban areas that had emerged spontaneously on the edge of the city.
- 24 The limitations and deviations from the Plan are set out in the review of the Plan carried out by the City Council's Urban Planning and Housing Area in 2012. It proposed actions that materialized in the eastern zone of the city: Valdebebas Park, Airport City, reforestation of the southeast zone of the municipality, areas of the Manzanares Linear Park and the Regional Park in the lower courses of the Manzanares and Jarama rivers and the Gavia Park.
- 25 Ayuntamiento de Madrid, 'Plan de infraestructura verde y biodiversidad. Resumen ejecutivo del diagnóstico de situación del plan estratégico' (Madrid, 2018).
- 26 Documents such as the City of Madrid's *Urban Landscape Quality Plan* (2009) have addressed the issue of the city from the point of view of the European Landscape Convention, representing an advancement in the methodology of urban landscape study. However, as it is limited to the municipality it greatly restricts the holistic understanding of the landscape at the edge of the city. The document itself acknowledges "the scant attention paid to the management of borderline spaces".
- 27 *Urban parks*: "Parks included within the urban fabric that present a singularity regarding their historical character or facilities, which determine a sphere of influence at the city level". *Metropolitan parks*: "Areas with a predominantly forest character, which offer the citizen a wide range of cultural, recreational and leisure activities, which can be integrated into the natural environment, as well as in relation to the knowledge and enjoyment of it within the metropolitan framework".

The Metropolitan Parks in the peri-urban landscape of Madrid

Despite the fact that during the 19th century the construction of parks or green areas for recreation was one of the main urban development goals [Fig. 2], they were not designed from a strategic point of view until the first half of the 20th century,²² when the city expanded once again, immersed in the turbulences and socio-political circumstances of the time.²³ This process finally led to the idea of 'Gran Madrid', annexing the cores distributed throughout the periphery of the capital that, together with the later demographic growth, generated the Plan of Arrangement of the Metropolitan Area of 1963.

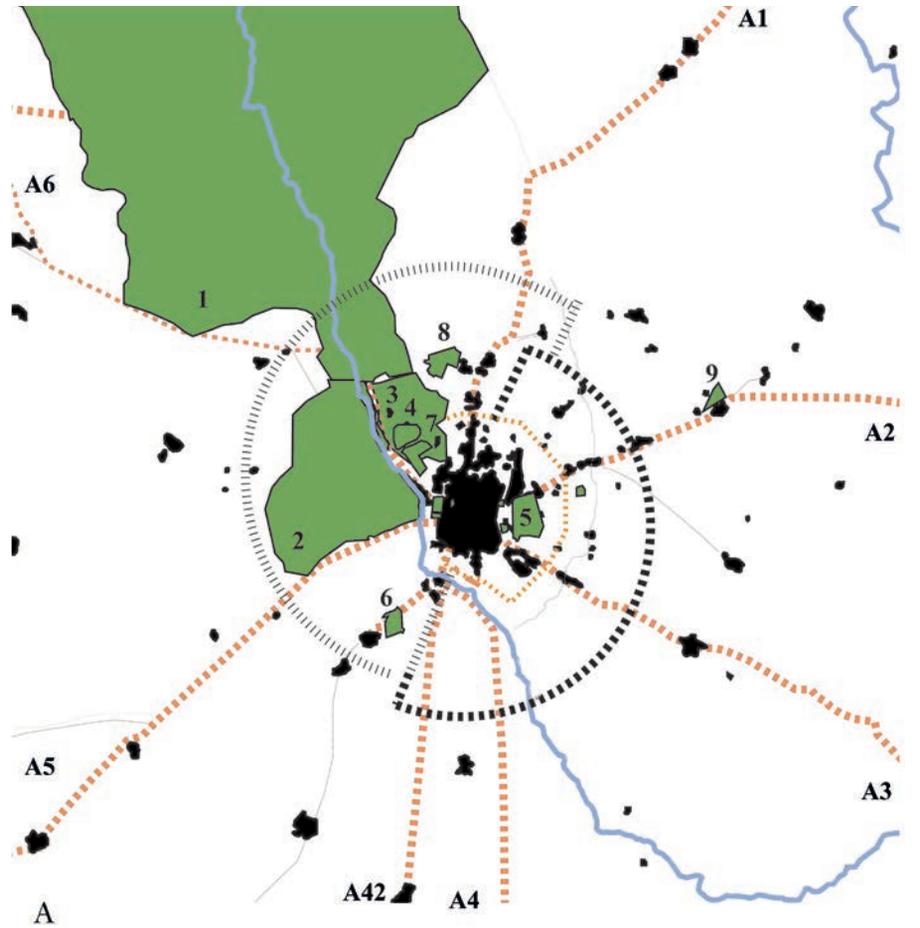
Later on, the 1985 General Plan for Urban Planning (GPUP) proposed to reach a continuity of the parts of the city, consolidating the fabric of the Metropolitan Area and proposing the creation of large-scale parks. The 1997 GPUP was supposed to put an end to the inherited social imbalances and defined the instrumental nature of green areas as part of the heritage and a public service, but speculative pressures led to a change in the classification of protected non-building land into building land,²⁴ greatly affecting the continuity of Green Infrastructure.

Recently, the European initiative Red Natura 2000 promoted the creation of a European ecological network of biodiversity conservation areas, which for the Community of Madrid meant the protection of 39.85% of its territory. In the last few years, the Green Infrastructure and Biodiversity Plan (2018) aims to address green structures and their biodiversity as a whole²⁵ and expects to be reflected in urban planning in the coming years. Due to the administrative complexity of the periphery, its study has always been fairly fragmented, as there is no supra-municipal planning instrument that deals with the city's peri-urban landscape, when understood as a space that borders on municipalities.²⁶

Our purpose is precisely to carry out a study of the green systems that form the current contour of Madrid, examples of UGI that originally were degraded areas, but ended up being incorporated by planning as a way of sewing fabrics, generating a network, although with some limitations as they still do not manage to configure a real system. We focus on green structures of singular level: urban and metropolitan parks²⁷ of the type of *industrial-productive* landscape mentioned above, between the A1 and A4 access roads and the M-40 ring road [Fig. 3]. This landscape has undergone a major transformation in recent years, and its urban green infrastructure (UGI) acts as a gateway between the city and the countryside. The boundaries of this area are the Jarama Natural Park, the I Henares Corridor, the towns of Getafe, Rivas-Vaciamadrid and the Marañosa hills.²⁸ The area lacked a system of quality green spaces, unlike the *naturalistic* landscape to the northwest. In order to create a system, interstitial spaces would play a fundamental role as a possible reinforcement to the existing structures. The open spaces, the agricultural soil, the cultivation areas, etc., act as opportunity areas to be considered in future projects

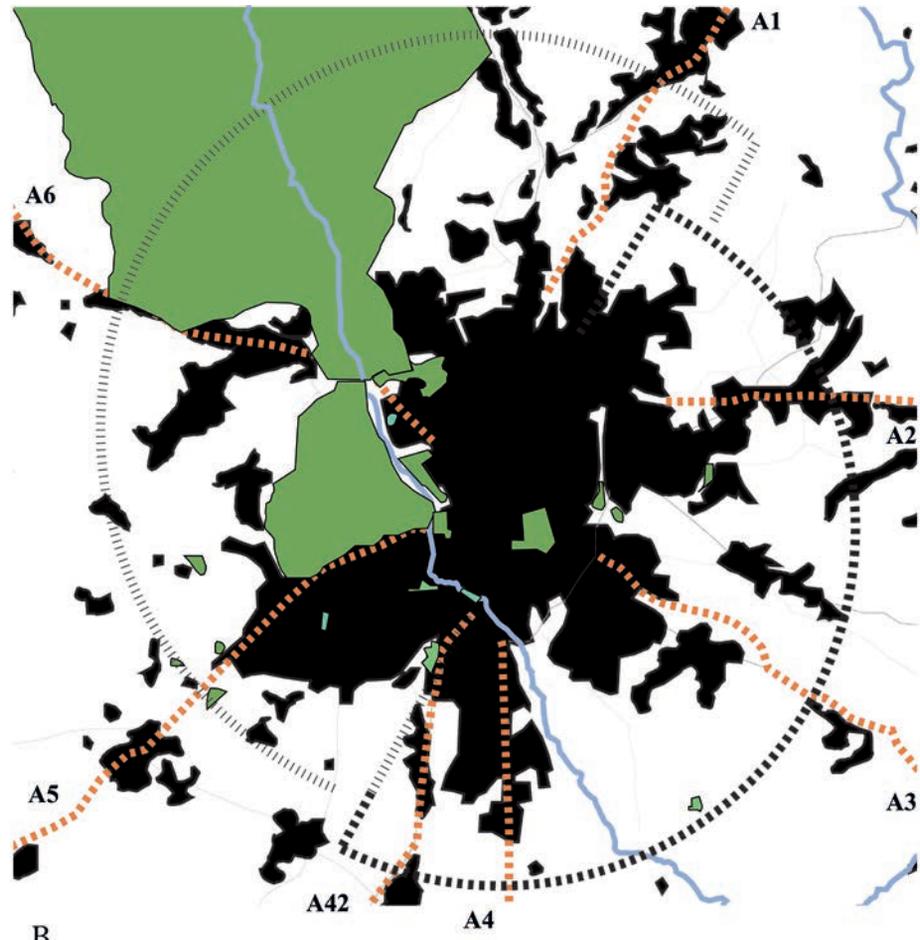
In order to achieve a quality green infrastructure network there must be two types of elements: nodes and corridors.²⁹ Nodes act as anchors for the network, defined by continuous land and with the power to improve the biodiversity of the environment, while corridors are linear elements that allow them to be linked. In Madrid, most of the proposals from the late 20th and early 21st centuries have focused on the creation of nodes (urban and metropolitan parks), among which we find Valdebebas Forest Park or Juan Carlos I Park. However, the most ambitious urban green infrastructure project, built between 2006 and 2012, is a corridor. This is Madrid-Rio, the largest green area connectivity intervention in the city. This project, which continues towards the south with Manzanares Linear Park, acts as a link between

[Fig. 2]. Historical green infrastructure that characterized the peri-urban landscape of Madrid along with river elements and radial roads. **A.** 19th century (1880). **B.** 20th century (1976). Source: prepared by the authors.

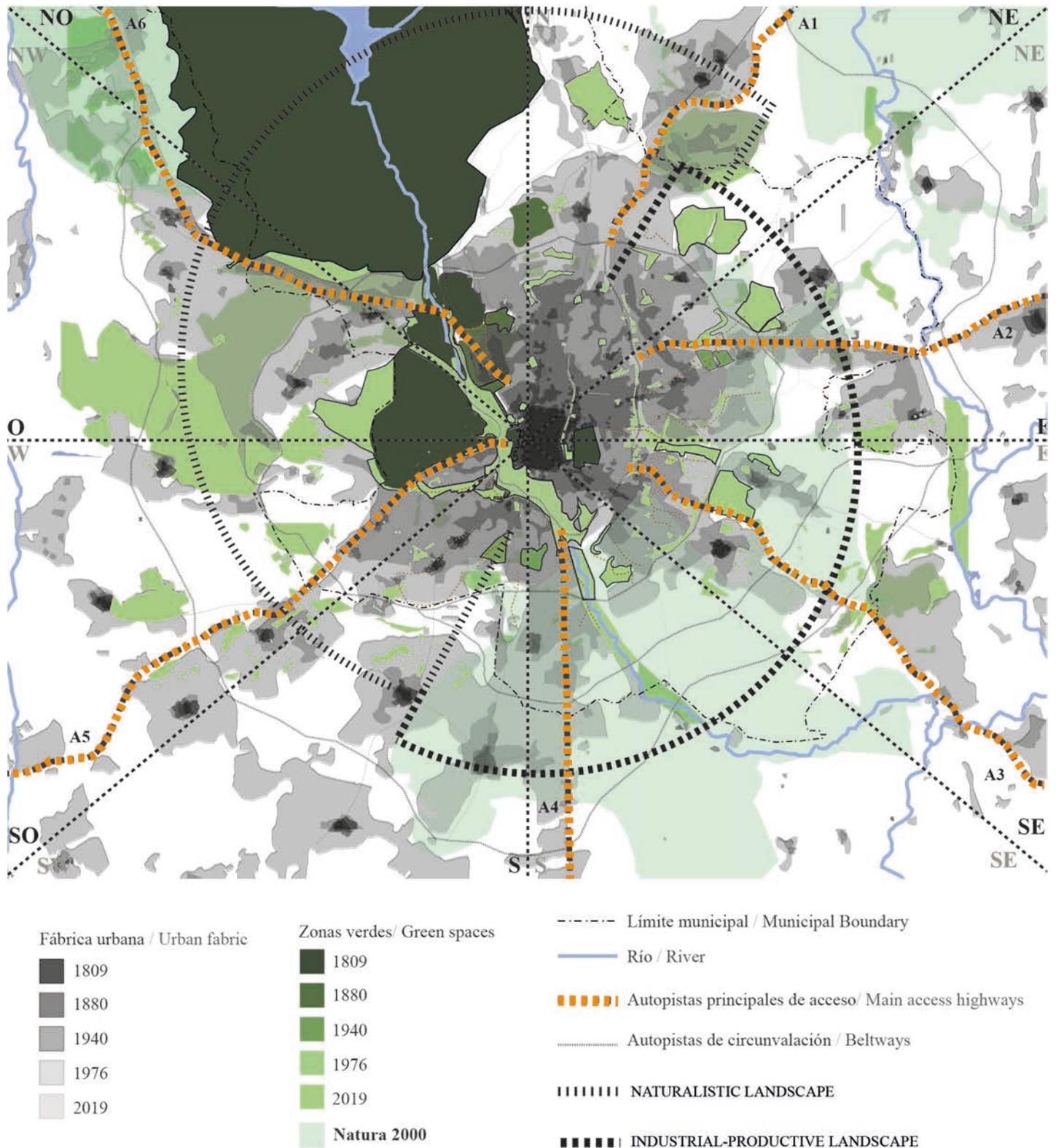


■■■■■ NATURALISTIC LANDSCAPE ■■■ INDUSTRIAL-PRODUCTIVE LANDSCAPE — RIVER
 - - - - - ACCESS ROADS ■ URBAN FABRIC ····· Urban Expansion Plan (Project)

1. El Pardo 2. Casa de Campo 3. La Florida-Moncloa 4. Montaña del Príncipe Pío
5. El Retiro 6. Vista Alegre 7. Parque del Oeste 8. Dehesa de la Villa 9. El Capricho



■■■■■ NATURALISTIC LANDSCAPE ■■■ INDUSTRIAL-PRODUCTIVE LANDSCAPE — RIVER
 - - - - - ACCESS ROADS ■ URBAN FABRIC ····· Urban Expansion Plan (Project)



[Fig. 3]. The role of green infrastructure in the current peri-urban landscape of Madrid. Source: prepared by the authors.

28 Located within the Southeast Regional Park.

29 See the bibliography of Benedict y McMahon, in particular *Green Infrastructure: linking landscapes and communities*.

30 In the southeast landscape (industrial-productive type), the metropolitan parks act as a link with the Special Areas of Conservation (SACs) of the Guadarrama River Basin and the Jarama and Henares River Basin, which in turn are considered Special Protection Areas for birds (SPAs).

the industrial-productive area of the city and the historical green spaces of the northwest.

This new large green infrastructure network is characterized by the proximity and connection of its elements with the green cycling ring of Madrid, the M-40 and the Natura 2000 network.³⁰ The new nodes, mostly in run-down areas, have helped regenerate social life in public space, creating new relationships between city and nature. The area on which the ‘Valdebebas Forest Park’ was built was an illegal landfill, as was the current ‘Cuña Verde de Moratalaz’. The area around ‘Madrid-Río’ and the Manzanares Linear Park has changed the city’s relationship with the river, which historically the city had turned its back on, to integrate and overcome the role of urban boundary that it has had for centuries. The area now

covered by 'Juan Carlos I Park' was the former 'Olivar de la Hinojos'a, mostly rural and deteriorated by lack of maintenance. In other words, the interventions have been undertaken on degraded areas which, through their transformation, have contributed to the landscape and social improvement of the south-eastern Madrid periphery [Fig. 4].

These metropolitan parks are located next to the main access roads to the east of the city (between the A1 and the A5), entrances which, unlike those in the north-west, are characterized by the strong presence of advertising and electrical facilities. In the northwest access, the presence of historical Green Infrastructures such as 'El Pardo' or the 'Casa de Campo' work as a base which preserves the views of the city. This urban threshold has a highly defined historical character. In the east, accesses are not very well-kept, so the new UGIs represent a great opportunity for creating new urban quality thresholds.

In addition, the new UGIs are largely defined by their orography and have viewpoints, accessible to the general public, from which the city can be seen. Thus, they act as focal points of intensity, from which the most significant elements of the city's identity can be appreciated: parks of the *industrial-productive half* look at the architectural landmarks of the 20th and 21st centuries, while from 'Madrid-Río' one can contemplate the 'Cornice' of Madrid and other elements of the historical centre.

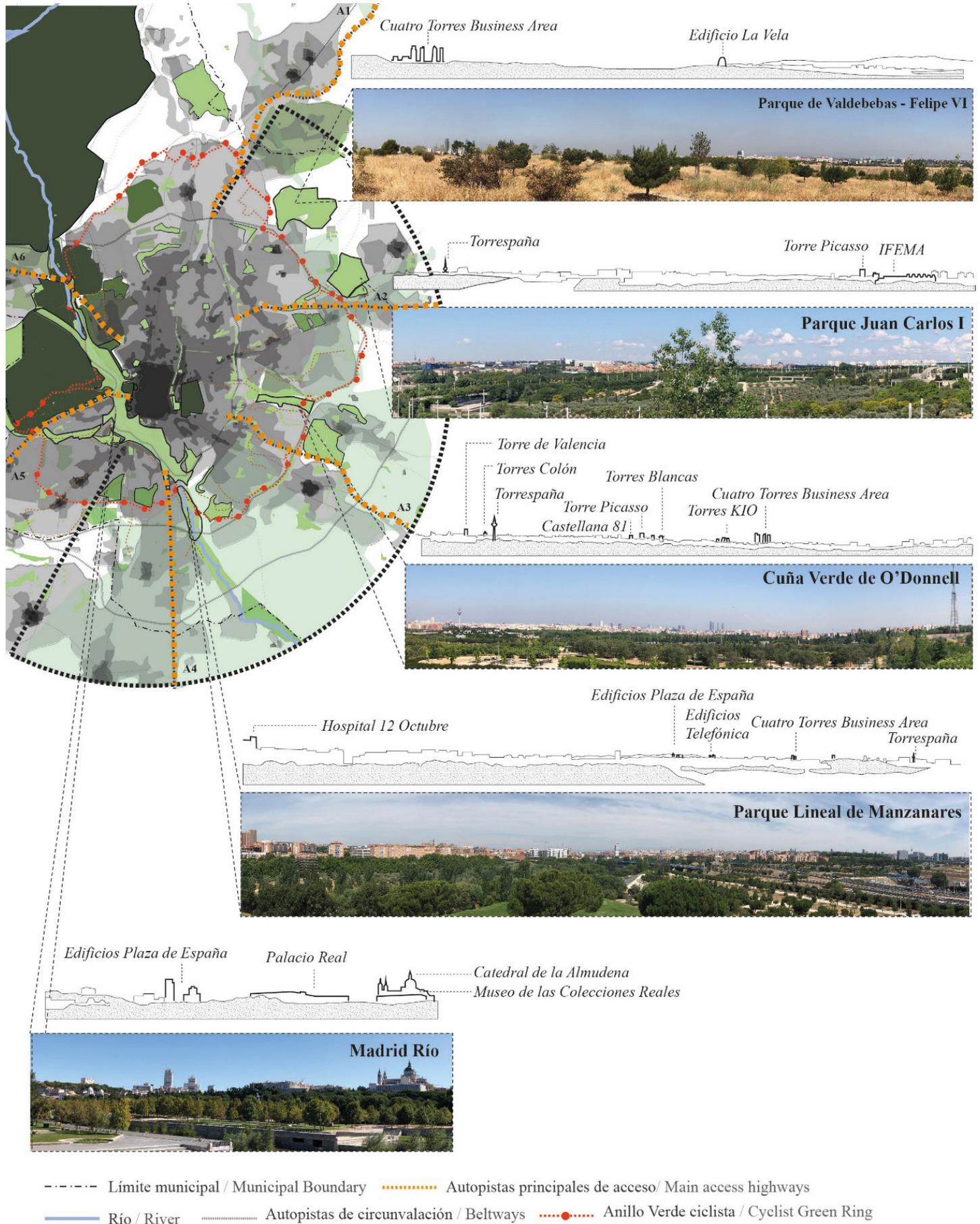
Green Infrastructures as landscape thresholds of the city

Based on the study of the metropolitan parks that conform the periphery of Madrid's *industrial-productive* landscape, we have confirmed the importance of incorporating a coherent network of Urban Green Infrastructures (UGI) on the urban fringe and in new developments, according to the characteristics of the place, which provide cohesion and visual quality, and act as urban thresholds. Understanding how these UGIs have evolved historically and what their function is today is essential when making decisions for the future of the city, in order for these new developments to enrich the peri-urban space.

In densified cities like Madrid, the need for UGIs for development is essential for building cities in accordance with the postulates of sustainable development, as they provide economic, social and environmental benefits. Furthermore, the location of this network of metropolitan parks in Madrid's peri-urban environment enables the lookouts establish connections of identity with the city from their views, bringing it closer to neighbourhoods that would otherwise be isolated, thus fostering their sense of belonging.

However, despite the opportunities this network of green infrastructure offers, there is a need to improve aspects of design, accessibility and connectivity. For example, new developments like 'Valdebebas Park' need more time to grow their trees in order to favour a more intensified use of the park, given its large scale. An increase in UGIs along the Cycling Green Belt would densify the network and provide support to a greater number of neighbourhoods, currently degraded, by creating a real network of interconnected green infrastructure, where unresolved interstitial spaces become areas of opportunity.

There is a need of an overview of the city's periphery when tackling Madrid's urban planning, considering the city's threshold spaces and its image in a holistic way, starting, for example, with a supra-municipal body. In this context, the peri-urban environment acts as a space of opportunity for future global developments, which



[Fig. 4]. The industrial-productive landscape type, with the corresponding system of green spaces and their role as viewpoints towards the city. Source: prepared by the authors.

must be planned and properly addressed, as they are the welcoming landscapes of the city.

The daily use of these spaces by neighbours becomes especially relevant when assessing their role in the city. Therefore, we need an in-depth study of the perception of these places to provide new data on the impact they have on people's quality

of life. New lines of research would address the potential for comparing UGIs with “grey infrastructures”.

In short, the urban planning of the contemporary city and its peri-urban space should benefit from UGI for designing a strategic consistent network, especially in the most degraded areas, to offset the existing land fragmentation. Thus, instead of generating limits that act as barriers, the thresholds will be transitional spaces that dialogue with nature and with the recognisable image of the city as we approach it.

References

- Área de Gobierno de Urbanismo y Vivienda. 1997. ‘Plan General de Ordenación Urbana de Madrid 1997. Compendio de Las Normas Urbanísticas’. Madrid.
- Ayuntamiento de Madrid. 2018. Plan de infraestructura verde y biodiversidad. Resumen ejecutivo del diagnóstico de situación del Plan Estratégico’. Madrid.
- Benedict, M.A., and E.D. McMahon. 2016. *Green Infrastructure: Linking Landscapes and Communities*. Edited by Island Press. Washington, DC.
- Comisión Europea. 2014. *Construir una infraestructura verde para Europa*. Bélgica. <https://doi.org/10.2779/2738>.
- Consejo de Europa. 2000. ‘Convenio Europeo del Paisaje’. In *Report and Convention Florence* <https://doi.org/http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm>.
- Davies, Clive, R. MacFarlane, C McGloin, and Maggie Roe. 2006. Green Infrastructure Planning Guide. *Strategic Green Infrastructure Planning*. https://doi.org/10.5822/978-1-61091-693-6_1.
- Dilet, Marc. 2003. Haussmann, Georges Eugène, Baron. *Oxford Art Online*. Oxford: Oxford University Press. <https://doi.org/10.1093/gao/9781884446054.article.T036932>.
- Fernández Águeda, Beatriz. 2017. Del límite de la urbanización al límite de lo urbano: La construcción territorial del Gran París y el Gran Madrid (1910-1939). *Ciudades* 19: 31-56. <https://doi.org/10.24197/ciudades.19.2016.31-56>.
- Fernández Pablos, Eva M^a. and Esther Yañez Conde. 2015. El valor de las áreas periurbanas como espacios multifuncionales en el suroeste de Madrid. *Tecnología y Desarrollo* 13.
- García González, María. 2011. César Cort y la cultura urbanística de su tiempo. Doctoral thesis. Department of Urbanism and Regional Planning. Escuela Técnica Superior de Arquitectura de Madrid.
- Gatta Sánchez, Dionisio Fernández de. 2018. La estrategia estatal de Infraestructura Verde y de la conectividad y restauración ecológicas: un nuevo instrumento para proteger la biodiversidad. *Actualidad Jurídica Ambiental* 81: 1–62.
- Kapstein López, Paula, and Miguel Ángel Gálvez Huerta. 2017. Identificación de una franja de periferias interiores de escala metropolitana en el sur de Madrid. *ZARCH, Journal of Interdisciplinary Studies in Architecture and Urbanism* 8: 118-131. https://doi.org/10.26754/ojs_zarch/zarch.201782150.
- Lampugnani, Vittorio Magnago. 2014. ¿Ciudad o suburbio? Reflexiones sobre construir en la periferia. *ZARCH, Journal of Interdisciplinary Studies in Architecture and Urbanism* 3: 1–11.
- Maderuelo, Javier. 2005. *El paisaje: génesis de un concepto*. Madrid: Abada Editores.
- Mell, Ian C. 2010. Green Infrastructure : Concepts , Perceptions and Its Use in Spatial Planning. *Landscape*.
- Pinto Crespo, Virgilio, and Santos Madrazo Madrazo. 1995. *Madrid. Atlas Histórico de la Ciudad. Vol. 1*. Madrid: Lunweg Editores and Fundación Caja de Madrid.
- Rodríguez Romero, Eva J. (dir). 2018. *Paisajes de Aproximación a La Ciudad de Madrid*. Madrid: Conarquitectura Ediciones.
- Rodríguez Romero, Eva J., Carlota Sáenz de Tejada Granados, and Rocio Santo-Tomas Muro. 2019. Landscape Perception in Peri-Urban Areas: An Expert-Based Methodological Approach. *Landscape Online* 75 (4 October): 1–22. <https://doi.org/10.3097/LO.201975>.
- Rodríguez Romero, Eva J., and Carlota Sáenz de Tejada Granados. 2019. Paisajes de Aproximación a Madrid Entre 1939 y 1959: Accesos, Núcleos Periféricos y Espacios Verdes. In *Represión*,

Exilio y Posguerras. Las Consecuencias de Las Guerras Contemporáneas En El Arte Español. Madrid: CSIC.

Rodríguez Romero, Eva J., Carlota Sáenz de Tejada Granados, and Rocío Santo-Tomás Muro. 2018. The Role of Historical Green Spaces in the Identity and Image of Today's Cities: The Case of Madrid. In *24th ISUF International Conference: City and Territory in the Globalization Age*. <https://doi.org/10.4995/isuf2017.2017.5340>.

Sáenz de Tejada Granados, Carlota. 2019. Energía, ciudad y los paisajes cotidianos. Percepciones en el espacio periurbano de Madrid. Doctoral thesis. Universidad San Pablo-CEU.

United Nations. 2016. Proyecto de documento final de la conferencia de Las Naciones Unidas sobre la vivienda y el Desarrollo Urbano Sostenible (Hábitat III). *Habitat III* 10631: 1–25.

_____. 2019. *World Urbanization Prospects: The 2018 Revision*. *World Urbanization Prospects: The 2018 Revision*. <https://doi.org/10.18356/b9e995fe-en>.