PARKS AND ROADS BUILD THE CITIES: THE M-30 AND MADRID-RÍO PROJECT, BUILDING LANDSCAPE

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Abstract
Public works respond to a function and are linked to the territory where they are located. Its use and connection to the place become hallmarks and generating elements of urban processes. The roads are located close to the rivers where layouts are easier. Its relationship with the city is usually conflictive. River and city are also necessarily linked. The conversion from road to street requires a complex planning process and involves a deep transformation of its environment. Particularly significant is the case of Madrid and the ring road that develops along the Manzanares River, awarded prestigious Harvard prize for best urban design. There is much written about Madrid-River project and the enabling M-30 excavation work. This paper takes technical and architectural references to place them in a political and social process that gave rise and in the urban reality offered today to Madrid citizens. This project is a new landscape for the city where the river becomes a limit to be integrated into the urban area. New uses can be reconciled and linked through multiple paths, and neighborhoods from both sides are connected. Old and new landmarks coexist, viewpoints that overlook new river scenes are created and elements, related to landscape and territory, are incorporated. This corridor seeks ecological rebalance and connects different green spaces in the city.
Public works are not just useful infrastructures in contemporary polis; they have strong influence in social cohesion and urban processes.
Introduction

Madrid-Rio is the most important urban project in recent years in Madrid. It has been developed during 15 years (2003-2018), although most of it was opened in 2011. It covers various scales - regional, metropolitan, urban, local- and 150 different actions. It aims to incorporate elements related to Madrid’s regional landscape creating integration areas with human activity. Starting from an artificial landscape that is the city, it creates a new landscape made of several micro-cityscapes that can be watched and operated.

Madrid and the Manzanares River

The Comunidad de Madrid has a dual territory: a mountainous north area -high, arid, dry- and other south area -low, lush, wet-. River basins cross the province in north-south direction. The Jarama River is the most important river in the region and its tributary, the Manzanares River, rises in the Guadarrama mountain range and crosses Madrid City (Fig.1).

Figure 1. Forming power of hydraulic gradient with dividing and valleys.

Source: Elaborated by the authors and GoogleEarth.

Madrid was settled in the step of the way from Toledo (Toletum) to Alcalá de Henares (Complutum). Its old Arab name, Mayrit or Magderit, means matrix stream, mother river with an abundance of water (Buero,1992,p.181). The first Arab fortress or watchtower stood on top leaving the Manzanares River downstream separated from the settlement. Until the XVII century the city grew eastward opposite to the river. Concentric growth occurred around the citadel but never beyond the walled defensive limits. The river was seen as an element that had to be protected from because of their major floods. Anton Van der Wyngaerde was commissioned by Felipe II to take views of his cities. In his view of Madrid it can be observed the Manzanares River banks in the foreground, crossed by the ancestors of Segovia Bridge (first term), and Toledo Bridge further south (right), monumental built years later. The Alcázar, the highlighted north building (left), is part of the walled circuit and
suffered several fires until the one that destroyed it almost completely in 1734, being replaced by the current Royal Palace (Fig.2).

**Figure 2. View of Madrid from the west, opposite the Vega Gate (A. Van der Wyngaerde, 1562)**

In the XVIII century new lines that extend to the river and connect with the few existing bridges were glimpsed. In the XIX century there is still a high concentration east and a large gap near the river. The Zuazo-Jansen Plan (1929) paid particular attention to roads and on the large ring roads proposed one parallel to the river, conceived as a large green corridor. After the Civil War, the situation changed and the city jumped across the river, overcoming the river barrier. The Bidagor Plan (1941-1946) with a structural point of view was supported by hygienists proposals and put forward a green structure for the Manzanares banks and the Gran Vía del Abroñigal (Fig.3).

**Figure 3. Growth of Madrid. Scale model, León Gil de Palacio, 1830. Municipal Museum of Madrid. General Management Zuazo-Jansen (1929) and Bidagor (1946) Plan.**

After a first river channeling (1914-1925) to contain its floods, a second one is carried out in 1943 by civil engineer, Carlos Mendoza, including its urban section (Fig.4). Natural river becomes artificial channel element outside the city, with concrete and granite walls and seven dams. This enabled the quick development of new neighborhoods on the river banks since the 1950s.
The right bank had buildings arranged in a narrow rigid and linear strip close to the border; while the left bank contained the historic city separated leaving spaces in slope to buildings.

Figure 4. Madrid, river channeling, around 1920. State before Madrid-Río project

Source: Fundación Miguel Aguiló and the authors.

Madrid recovers a river and builds its landscape

In 1970 the western branch of the M-30 was built: third ring road of the capital along the avenues of Manzanares and ancient Abroñigal stream (Fernández-Casado,1974,p.849). This large ring infrastructure followed American models avoiding the city center and redistributing traffic to improve the connection with the periphery. This highway ran between buildings and the riverbed leaving the river hidden and concealed. The bank became an area exclusive for road traffic, almost inaccessible with very limited footpaths since the destruction of the riverbanks. Its intense circulation made it an impenetrable aggressive barrier causing the river to remain completely isolated and disconnected from the city. This became a segregating element of central and southwest neighborhoods. Over time, this complicated accessibility and crating produced by the highway on the west bank, and the lack of security and attractiveness on the east bank, turned it into an area frequented by criminals and away from the everyday use of residents.

In 2003 the municipality decided to remodel the M-30 highway and its junctions to reconnect the river to the city center. The western branch was built underground with a long tunnel from the A4 junction in the South interchange to the A5 junction. The complex network of 30 kilometers underground roads frees space around the river and shows a new opportunity, after the previous experience of subway extensions (1996-2002). Completed the works four years later, an area of 120 hectares, equivalent to Retiro Park -great historic park center of the capital- was cleared, and provide new green areas to recover the natural landscape lost. These tunnels with an enlarged section of three lanes plus continuous input-output branches -instead of two lanes in surface- coexist with subway and other services, as the new sewerage margin that collects wastewater disposals by reducing the discharge of previous collectors¹ (AA.VV,2007,p.178). This drop in traffic carried a significant reduction in noise pollution and emissions, increasing the environmental quality of the area and the river water itself (Fig.5).

¹ Within the Integrated Sanitation Plan of Madrid PSIM (1980-1984) Viveros treatment plant and the first collectors of the riverbanks were held, being mayor Tierno Galván.
Figure 5. M-30 tunnels

Madrid-Río an urban transformation project

In 2005, Madrid City Council tendered an international competition that would bring innovative ideas to design and project the new free spaces around the river. The winning proposal was led by three architecture studios –Burgos & Garrido, Porras & La Casta y Rubio & Álvarez-Sala- and the Dutch landscape study West8. A multidisciplinary team with various professionals involved -engineers, architects, landscape designers, biologists, sociologists, artists, etc.- was established, contributing each one with his vision of the city and the territory.

The Manzanares River becomes the great axis of the city, the link between the urban interior and territorial outside. It aims to restore the river banks and incorporate elements related to landscape and territory, always looking for continuity and permeability of both sides. The river runs through many diverse biotopes: snowy mountains-city-fertile valleys. It tries to recognize all the natural elements of the river basin to incorporate them into the project. The river instead of being a barrier element balances the city center.

It starts a new green network connecting the city with other green spaces. It becomes a link of an environmental corridor of nearly 3,000 hectares within the municipality, from El Pardo to Getafe, connecting important green areas -Casa de Campo, Arganzuela Park, and South Manzanares Park-. This new project contributes to ecological balance with its 429 hectares of new green areas: 33,623 trees -47 different species, mainly pine, ginkgo biloba, plane tree, ash and horse chestnut-, 470,844 shrubs -38 species especially aromatic and climbing plants-, and 210,898 square meters low water demand meadow. The river also becomes a migratory wildlife corridor which moves between the northwest parks -Casa de Campo, Parque del Oeste and El Pardo- and large southeast parks -South Manzanares and Tierno Galván-, acting as open and peaceful axis of communication for birds and night shift animals (Fig.6).
Six landscapes are designed and executed that make a unitary whole (Burgos, 2014, p.114):

**Landscape 1 – Mountain range: Pine Hall.** This green corridor is an element of continuity on the right bank for 6 kilometers and average width of 30 meters. A landscape on the large deck of the tunnel is built, dense topsoil with almost forest character. Vegetation is used as the main structural component. One species is chosen: Aleppo pine (*Pinus Halepensis*), and 9,000 specimens are selected with natural morphologies. It is intended to give the city a piece of the mountains with its pine forests. On an underground inert substrate, modified and excavated for the car, a landscape with living matter is made. The park is attached to the construction of the underground infrastructure; for implantation takes into account irrigation, anchoring the trees to the tunnels concrete slab by steel cables and biodegradable flanges. This band of woodland walk, in addition to the central pedestrian avenue, it has a bike lane; both link the various activities promoting continuity of routes. It connects different types of riverside gardens with leisure areas, equipment and natural forms playground with sustainable materials emphasizing its forest character.
Landscape 2 - Travel to Lisbon: Portuguese pavement. The paved boulevard of Portugal Avenue acts as a filter between La Latina dense neighborhood and Casa de Campo Park. Various elements are taken to evoke the trip: Portuguese pavements -executed by Portuguese craftsmen-, four species of cherry trees from the west valleys (*Prunus avium*, *P. avium* ‘Plena’, *P.yedoensis*, *P.padus*), and the cherry blossom drawn on the pavement itself (Fig.7).

![Figure 7. Travel to Lisbon: Portuguese pavement](image)

Landscape 3 - Line in History: Monumental scene. It aims to give a new scenic background to existing heritage elements creating a new urban landscape. Interventions take on the monumental and scenic character. The project intends to link the historic center and recover the imposing image of the Royal Palace on the high ledge of the city. Several restore operations of heritage elements are performed and surroundings are recovered -Segovia and Rey Bridge, Huerta de la Partida, Virgen del Puerto hermitage, etc.- (Fig.8).

![Figure 8. Pine Hall and Segovia Bridge (J. Herrera, 1582-1584)](image)

Landscape 4 - Meeting with the bank: Toledo Bridge. The baroque language of this bridge of the XVIII century is recovered. It is transferred to the ground through the drawn or graphing landscape, performing a figurative contemporary interpretation of Madrid language hedges. A stands allows a closer approach to the river and to contemplate the bridge.

Landscape 5 – River remains: Arganzuela Park. It is the greater unity and dimension intervention with 33 hectares. It is made on the old Arganzuela Park (1968-1969), along the left bank of the river Manzanares from Toledo Bridge to the old municipal abattoirs in Legazpi.
Square, on a flat rectangular surface. References to place where there was an old farmstead date back to the XV century (Fernández, 1876, p. 397). The Catholic Kings gave license to the Villa de Madrid to form a pasture with walks buying vineyard and grass land from several private individuals. In 1819 one of the headwaters of the Manzanares Channel and one of the piers were built. After the failed attempt in 1860 to turn it into a plant nursery because of the irregularity of the terrain and its large influx of visitors as part of popular celebrations, City Council formed small forests in which resting squares were opened. Gradually the various pieces were built – slaughterhouse, workshops, etc. –, becoming one of the green areas projected on the riverbanks, contemplated by the 1941 General Plan, to form the current Manzanares Linear Park.

It was designed in two phases, in line with the projects for new roads for traffic and junctions: the first phase in 1968 with 12 hectares (from Toledo Bridge to Praga Bridge) and the second in the 1980’s with an expansion of 25 hectares, resulting from the transfer of Madrid’s old Markets to the Entrevías area. Its author, Herrero Palacios, architect Director of Parks and Gardens at that time, seeks to "get a park with a concept different to others recently projected, as site characteristics so indicate, and the arrangement between the river and the Paseo de Yeserías made it possible to obtain a park of a type less landscaped and composed around a very important central element" (Herrero, 1969). This central element, wherein the main paths converge, was an elliptical lake – 110x60 meters – with water features and fountains. Placed at its centre was the obelisk – previously located in the Plaza de Roma and before that in the Paseo de la Castellana – commemorating the birth of Queen Isabel II, the work of F.J. Mariátegui and J. Tomás. “From the pond, surrounded by a skating rink, and beautiful iron lampposts with five arms, depart, to the north and south, four straight paved walks and flanked by trimmed yew trees and magnolias arranged divergently, leaving among them lawns with roses. The rest of the woodland consists of white poplars, pines, cedars, cypresses, cherry plums, etc., many of them placed on green screen formed by the M-30” (Ariza, 2001, p. 118). In this first phase an area was also designed passing over the gardens in the form of a boulevard made up of four parallel rows of wild plane trees to the Paseo de Yeserías, at a total length of 450 meters with 350 trees (Jiménez, 1977, p. 176). The Paseo connects to the gardens by means of ramps and stairs and its high level allows you to look over the lake and the bushy, floral groups of the composition. Once resolved parking problems out of the main traffic street, the first phase was inaugurated in 1969 by the then Mayor, Carlos Arias Navarro (Hernández-Lamas, 2016) (Fig.9).

Figure 9. Old Arganzuela Park. Plant and perspective

Source: Herrero Palacios, 1969.
The new Arganzuela Park intends to evoke the natural mountain landscape, bringing stones as if they had been rolling down from the mountains. Water appears and disappears retaking the idea of wet and dry which characterizes the basin center. The river is the park builder, drawing the ground with meanders that create spaces, even an urban beach, consists of three ovals 500 meters long with water surface of 3 centimeters deep, accompanied by jets games and vaporized water clouds to cool. Three longitudinal paths run through the spaces: Slow path - sinuous and variable slope-, Fast path -plane and wide-, and Dry Stream -cobbled strip with leafy margins, backbone of the park center-. This patch of the river basin has three botanical areas: Mediterranean forest, Atlantic forest and riverside frond. The wooded texture with variety of species, heights and densities, is interspersed with aromatic surfaces, orchards and meadows slopes inclined towards the water. This large grove contains several natural and built landscapes, interspersed with recreational facilities and sports -football field, two skating rinks and three children's areas-. Old ornamental fountains intermingle with new water games where the observer interacts inside (Fig.10).

**Figure 10. New Arganzuela Park**

*Landscape 6 - Water and blood: Matadero*. The complex of old slaughterhouse (1907-1925) was made by the municipal architect Luis Bellido, with the collaboration of engineer J. Eugenio Ribera. It followed the German system of isolated pavilions -48 buildings, employee housing and chapel linked by roads and its own railway-, to mitigate the health problems and accommodate industrial and commercial activities. This isolated and obsolete whole is incorporated in the park as a new great cultural resource for the city: *Nuevo Centro para la Creación Contemporánea* (2005). Old buildings are recovered to turn them into new visual landmarks, as the high water tank; and gradually old pavilions restored, chaired by the administrative building of the Casa del Reloj -current Municipal District of Arganzuela headquarters (R. Fernández-Rañada, 1983-1984)- in the composite main axis (AAVV, 2003, p.126). The removal of physical barriers like part of the slaughterhouse ancient wall, along with new green areas, allow connection between the urban grid and river landscape, between old and reused. This is helped by ground work, meaning the built elements and

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incorporating everything needed for new uses and proper operation. Treatment of dry soil - without vegetation- uses connecting itineraries promoting permeability and forming a continuum between the river and the city. In this landscape the large outdoor open and empty spaces are of great importance incorporating the cultural center with activities and outdoor events: concerts, exhibitions, fairs, etc. Thus a new sociocultural highly active focus within the capital arises (Fig.11).

**Figure 11. Matadero: central plaza and connection to the park**

**Living the river**

The city is understood as an organism where there is an interaction based on coexistence. As the road is the collective housing (Benjamin,1940,p.871) with pedestrians and cyclists flows, the river becomes a place of cohabitation. In this set of green spaces that infiltrate the city, various compatible river uses are integrated, highlighting the recreational: cultural, educational, sports - football pitches; basketball, handball, paddle and tennis courts; skatepark and roller skating; climbing wall; bike circuit; canoeing channel; petanque and fitness areas for the elderly-. Children also have their space with 17 children's areas highlighting Arganzuela with zip line, giant slides and pirate ship.

The network of pedestrian paths and 30 kilometers of bike lanes that link to the Green Cycling Belt -on the north by Casa de Campo and on the south by Manzanares linear park to Getafe- are not only infrastructure for leisure but they cover the common needs of mobility and accessibility, reducing private traffic and increasing the urban integration and quality of neighboring districts. In a metropolitan scale it is part of the GR 124 -Gran Recorrido of the European Trails Network, from Manzanares el Real to Aranjuez-. Another major operation has been renewing streets and sidewalks of the riverfront, built with poor quality standards and damaged by the M-30 effect; a predominance of granite brings unity to the complex.

The river is incorporated as an unprecedented double facade; the city no longer lives back to the river. The riverscape is an edge stage fragmented into two landscapes. There is a dialogue between the two sides: two landscapes that look each other from side to side in an open space to the visual (Español,2008,p.172). It has a linear arrangement with reduced dimensions and affordable to the observer. In Madrid-Rio vegetation marks the character of the two banks: the right, -more dry, evoking the landscape of the northern mountains with pine trees that provide shade all the year- and the left -more wet, connected with the river and with more fountains, with deciduous trees and large grasslands-. 
In this riverscape the scenic role of the bridge is highlighted. In addition to enabling better connection between both sides, they become new landmarks of the landscape, screen in front of the observer’s views and objects that can be viewed from various angles and distances. Old is recovered, and pedestrian access is improved in historic bridges by reforming widening sidewalks, introducing bike lanes and improving their railings. Two bridges are restored - Segovia and Toledo Bridge-, and Rey Bridge is recovered exclusively for pedestrians and cyclists. 32 new bridges and footbridges for pedestrians and cyclist are created, including the conversion of Herrera-style historical dams into pedestrian walkways. All these new elements become part of the Manzanares cultural heritage. The new meanings are welded or overlapping the previous and witness to the past, building the character of the city and becoming part of its unitary image collectively taken by citizens (Aguiló,2013,p.244) (Fig.12).

**Figure 12. Arganzuela Bridge and Invernadero & Matadero twin bridges, decorated with recycled glass mosaics by Daniel Canogar**

The project pays special attention to visual enclaves performing viewpoints: Huerta de la Partida, San Vicente and South Viewpoint. These scenically strategic points or panoramic points are enabled to observe the landscape: the accesses are arranged and railings and interpretive panels are introduced. Also many bridges -Segovia Bridge and Arganzuela Bridge- offer the function of viewpoint from which to contemplate the other bridges and landscape (Fig.13). In turn, the network of pedestrian paths and bike lanes is a scenic route as the preferred route from which the landscape is seen in a cadence or special series of views.

**Figure 13. Monumentsl Arganzuela Bridge (Dominique Perrault, 2010-2011) viewed from another footbridge.**
This project is able to recover the image of Goya painting *La pradera de San Isidro*, where the city appears view from the southwest, and something different from A.Wyngaerde two hundred years ago. The Alcázar has been replaced by the Bourbon palace, Segovia Bridge (left) is the current, and the profile of the huge dome of San Francisco el Grande dominates the rest of churches of the town; north (left) mountain Príncipe Pío is perceptible (Fig.14). Today people come down the river and turn it into a real landscape: life experience, in the same way as they used to be in the Manzanares traditional bathrooms. Special importance is given to the dissemination and participation involving citizens in the project. Two websites were created, one of Madrid City Council -www.madrid.es- and one of the park itself -www.parquelineal.es- to provide information and collect different opinions and suggestions from residents of various neighborhoods and districts affected.

**Figure 14. La pradera de San Isidro** (Francisco de Goya, 1788). **Playa de Madrid** with San Fernando Bridge, 1932. Madrid-Río nowadays

*Source: Fundación Miguel Aguiló and the authors*

**Discussion**

This compromised operation was promoted by Mayor Ruiz-Gallardón for two terms. He turned "his dream" real and defended the plan as "an example of the transformative power of politics" (Ortega, 2008). The project has been politically and socially controversial, because of the duration of the works and high investment, -3,688 million in the undergrounding and 410 million Euros linearly park-, more than double the amount budgeted. In turn he defended the creation of 94,000 jobs during construction reaching 32,000 jobs in the long-term impact on the
production structure of the city (Díaz, 2011) and the revaluation of all houses in the area doubling its value thanks to the project.

Motorway networks improve the connection, but also act as barriers demarcating land use. Madrid-Rio project is one of the largest urban transformations that has lived Madrid, an international example of recovery of public space for citizens, without losing the traffic capacity of the large underground ring road M-30. This type of major project and complex operations keeps similarity to other made in large metropolises that defend the public and the collective benefit. Urban transformations that are committed to the pedestrian and public space with large parks and waterfronts built on the freed space by burying or demolish old infrastructure -the Embarcadero Freeway was taken down (San Francisco, 1989), Cheonggyecheon Stream (Seoul, 2002-2005), destruction of the Park East freeway spur (Milwaukee, 2002-2003), Rose Fitzgerald Kennedy Greenway from demolition of the J.F. Fitzgerald Expressway under the Big Dig (Boston, 1982-2007), the dismantling of railways for Millennium Park (Chicago, 1990-2004), the next largest urban park in the United States: 140,000-acre Millennium Reserve (Chicago, 2011), etc.- (Kimmelman, 2011).

Comparing Madrid-Rio with the linear park High Line in New York on an old freight railway, both projects are linear stage scenes that get a new urban image; recover landscapes and create new landmarks, uses and activities allowing the regeneration of the area and a more social approach. However, there are differences; while the High Line is made on an obsolete infrastructure, and it is a private initiative, management and maintenance -Association Friends of the Highline with the support of Mayor Michael Bloomberg- (Hernández-Lamas, 2014, p.366); Madrid-Rio project is carried out on an active infrastructure, and its initiative, management and maintenance are public.

The city is understood as a system of places that specify the relationship between man and territory. Madrid-Rio project evokes Guadarrama mountain range, main natural public place in Madrid which is associated with water. Water is presented as a vehicle of nature itself (Aguiló, 2013, p.93), brings mountains to the city. The presence of public works brings the territory to the city.

The different interventions can transform the city landscape getting a new image by incorporating the Manzanares River in the new, more sustainable and balanced urban setting. This river is perceived as closer element allowing to connect the two banks. It protects and adds value to the historical and artistic heritage joining the city. This initiative of great social success improves the quality of life of citizens by creating new leisure areas and incorporating flora and fauna, along with new sensations (colors, smells, sounds...) and souvenirs. It increases the supply of recreational, sports and cultural activities, promoting social relations and meetings between residents. It establishes an integral mobility and accessibility system, allowing interconnections between different urban pattern and promoting cross-connectivity. It has been awarded with the recent Harvard Prize in Urban Design for its great work in the city repair and regeneration (ABC, 10-11-2015).

However nowadays one of the great criticism from environmentalists is that there is little river in Madrid-Rio. It has recovered M-30 space but has not intervened in the channel, bypassing the current environmental regulations of the river as safe protected space except in its urban...
A new project to "re-naturalize" the river is proposed, by cleaning up and restoring its banks with riparian understory, and so make it a living element.

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