Case Report

Madrid Nuevo Norte Project: A Case Study about Mega-Project Public-Private Partnerships

Jaime Sánchez Gallego [1], Theodore Metaxas [2,*]

[1] Higher Polytechnic School, Nebrija University, Madrid 28015, Spain
[2] Department of Economics, University of Thessaly, Volos 38333, Greece
* Correspondence: Theodore Metaxas, Email: metaxas@uth.gr.

ABSTRACT

The Madrid Nuevo Norte Project (MNNP) represents one of the largest and most ambitious urban regeneration initiatives in Europe. This case study explores the complex dynamics of public-private partnerships (PPPs) that underpin the project's development, focusing on the challenges and successes encountered during its long gestation period. Spanning over 20 years, the MNNP illustrates how political, social, and economic factors influence large-scale urban projects. The research highlights the importance of stakeholder engagement, sustainable urban planning, and the strategic collaboration between public and private entities. The findings offer valuable insights into the effective management of megaprojects, emphasizing the critical role of integrated planning and public participation in achieving sustainable urban development outcomes. As a flagship project, MNNP sets a benchmark for future urban regeneration efforts, providing a model for balancing economic growth with social equity and environmental sustainability.

KEYWORDS: MNNP; urban regeneration; PPPs; sustainable development; megaproject management; stakeholder engagement

INTRODUCTION

The Madrid Nuevo Norte Project (MNNP) is representing one of the largest urban regeneration projects in Europe that receives recently extensive research interest [1–4]. The MNNP is a large-scale urban development initiative in Madrid, Spain, aimed at transforming the degraded area of the city's northern district into a sustainable and modern urban area that is classified as mega-project [5]. The project is expected to contribute to the local economic development of Madrid, as well as provide social benefits such as the provision of basic civil facilities, positive visual impact, enhanced transportation efficiency and mobility, etc. The MNNP is a public-private partnership (PPP) model, reflecting the collaborative efforts of the public and private sectors in overcoming challenges and driving the project forward [6]. The execution status and the benefits of conducting a case study on the MNNP are essential considerations for understanding the complexities and implications of

Received: 05 February 2025
Accepted: 07 April 2025
Published: 14 May 2025

large-scale urban development projects.

The theoretical underpinning of the research is grounded in the complexities of large-scale urban development programs, particularly those involving public-private collaboration [7–10]. The case study on the MNNP offers several benefits for researchers, practitioners, and stakeholders involved in urban development and public-private partnerships [2]. It provides a platform for understanding the dynamics of stakeholder engagement, regulatory challenges, and the integration of sustainability principles into urban development initiatives. The case study contributes to the generation of knowledge and insights into the complexities of large-scale urban development projects, particularly those involving public-private collaboration. In addition, it contributes to the advancement of sustainable urban development practices and the effective management of public-private collaboration in urban projects [11–14]. The benefits of conducting the case study extend to knowledge generation, identification of best practices, policy implications, and academic and professional development. The insights derived from the case study can inform policy development and decision-making processes related to urban development, public-private partnerships, and sustainable city planning.

In addition, the findings from the case study can added value to the formulation of guidelines and frameworks for future urban development initiatives, thereby enhancing the discipline of mega-project management. The case study highlights the vital importance of MNNP as a flagship sustainable project for the rest of Europe. It meets sustainability criteria for contributing substantially to the improvement of the quality of life of final users and for the community in general [15]. For instance, it contributes to the regeneration of the city's degraded area, to the interconnection of an isolated part of the city and public transportation connection, improving the external image of Madrid. However, there are some challenges that should be carefully managed, such as applying sustainable solutions from other cities not properly tailored to Madrid, housing pricing accessibility increase due to the lack of terrain in Madrid, and the politization of the project as a discussion topic between local parties [16]. In this context, local authorities should give particular emphasis to complying with the principles of sustainability for improving the overall performance of MNNP, ensuring social justice and prosperity for the people of Madrid.

DEFINE THE ROLE OF MEGA PROJECTS ON URBAN SUSTAINABLE DEVELOPMENT

Urban areas worldwide are at the forefront of population growth, economic activity, and environmental impact. As cities expand, the challenge of achieving sustainable development becomes increasingly complex. Megaprojects, defined as large-scale, high-investment

undertakings aimed at addressing significant infrastructural or urban needs, play a pivotal role in shaping the trajectory of urban sustainable development. In addition, they characterized by complexity, uncertainty, dynamic interfaces and significant political or external influences [17,18]. Furthermore, all megaprojects strongly related to urban development and competitiveness and consequently they are located in cities or metropolitan regions [19,20]. By leveraging advanced PPPs, and innovative technologies, megaprojects can transform urban landscapes, balancing economic growth, environmental preservation, and social equity [11].

One of the most immediate and visible contributions of megaprojects is their economic impact. Large-scale infrastructure initiatives, such as transport systems, energy networks, and mixed-use developments, are engines of job creation, attracting investment and fostering regional economic growth [21–23]. This economic stimulation not only enhances local economies but also provides a model for sustainable urban regeneration by prioritizing mixed-use developments and affordable housing alongside commercial investments. Furthermore, the financing models for megaprojects, particularly those employing PPP frameworks, facilitate sustainable investment strategies. These partnerships enable the pooling of resources, expertise, and risks across public and private sectors. Private entities bring technical innovation and financial resources, while public institutions ensure that projects align with broader urban and environmental policies. Examples such as Barcelona's L9 Metro Line and the A-7 Highway (Mediterranean Corridor) demonstrate how PPPs can deliver large-scale infrastructure efficiently while maintaining public oversight to ensure alignment with sustainability goals [24].

Megaprojects also play a critical role in addressing environmental challenges in urban areas. By integrating green infrastructure, energy-efficient systems, and sustainable transportation solutions, they contribute to reducing carbon footprints and enhancing urban resilience [25,26]. For instance, the redevelopment of Chamartín Station as part of the MNNP incorporates sustainable design elements, including energy-efficient buildings and extensive public transportation integration [27]. Such initiatives help reduce reliance on private vehicles, which significantly contribute to urban air pollution and greenhouse gas emissions. The emphasis on green spaces within megaprojects further highlights their environmental contributions. Projects like MNNP allocate substantial portions of land to parks, urban gardens, and green belts. These spaces not only improve air quality and biodiversity but also mitigate urban heat island effects, enhancing the overall livability of cities. Additionally, renewable energy integration is increasingly becoming a hallmark of sustainable megaprojects. Solar panels, wind turbines, and energy storage systems are frequently incorporated into

large-scale developments, reducing dependency on non-renewable energy sources [28,29]. For example, Dubai's Masdar City, a megaproject designed to be a fully sustainable urban development, integrates renewable energy sources and advanced waste management systems to minimize its environmental impact [30].

While the economic and environmental benefits of megaprojects are often emphasized, their role in promoting social equity and inclusiveness is equally important. Megaprojects provide opportunities to address urban challenges such as housing shortages, accessibility, and social segregation. The inclusion of affordable housing in projects like MNNP, highlights efforts to mitigate the risk of gentrification and ensure that urban regeneration benefits diverse demographics [31–33]. Urban megaprojects also create public spaces and facilities that enhance community well-being and connectivity. Parks, cultural centers, and recreational areas developed within these projects offer residents improved quality of life and opportunities for social interaction [34,35]. Furthermore, inclusive planning processes that involve community stakeholders ensure that megaproject outcomes reflect the needs and aspirations of the broader population [36,37]. Transport megaprojects such as Barcelona's L9 Metro Line exemplify how infrastructure can enhance social equity by improving mobility and accessibility for underserved areas. By connecting peripheral neighborhoods to city centers and key economic zones, such projects reduce geographic disparities, enabling equitable access to opportunities and services [38].

Despite their potential, megaprojects often face significant challenges that can hinder their contributions to sustainable development. Cost overruns, delays, and governance issues are common in these large-scale initiatives [39–42]. Moreover, megaprojects can sometimes exacerbate social and environmental issues if not carefully managed. Gentrification, displacement of local communities, and environmental degradation are potential risks associated with poorly planned developments [43–45]. For example, debates over land use and housing affordability in projects like MNNP illustrate the importance of balancing economic growth with social equity. The integration of sustainability principles requires deliberate planning and enforcement of policies that prioritize long-term outcomes over short-term gains. Stakeholder engagement, transparent governance, and adaptive project management are essential to navigating these challenges and ensuring that megaprojects contribute positively to urban sustainable development [46,47].

When well-executed, megaprojects serve as catalysts for urban transformation, aligning with global sustainable development goals (SDGs). They provide cities with the infrastructure and resources needed to address challenges such as rapid urbanization, climate change, and social inequality. Projects like the A-7 Highway in Spain, which improves connectivity along the Mediterranean Corridor while incorporating sustainability measures, illustrate the transformative potential of

megaprojects in fostering regional integration and economic resilience [48]. Additionally, megaprojects often become iconic representations of a city's commitment to sustainability and innovation [1,49]. Examples such as Singapore's Marina Bay Sands and London's Crossrail demonstrate how large-scale developments can enhance a city's global standing while addressing local challenges [50].

SOME PREVIOUS STUDIES IN BRIEF

Numerous studies have analyzed the dynamics and implications of PPPs in urban megaprojects, offering valuable insights into their successes, challenges, and broader impact [51–53]. These studies provide a robust theoretical and empirical foundation for understanding the complexities of projects like MNNP, while highlighting best practices and common pitfalls.

Flyvbjerg [11] highlights the prevalence of cost overruns and delays in megaprojects, emphasizing the need for accurate forecasting and robust risk management. His analysis across multiple projects demonstrates that while PPPs can mobilize significant resources, their success is often contingent on aligning public and private interests, managing stakeholder expectations, and maintaining political stability. Similarly, Dimitriou et al. [24] explore the "iron triangle" of cost, time, and quality in transport megaprojects, identifying key factors that influence project outcomes. Their work on transport corridors, including the A-7 Highway, underscores the importance of adaptive management and stakeholder engagement in addressing environmental and social concerns. From their point of view, Leung and Hui [54], examine the case of Canary Wharf project in London that serves as a case study of PPPs driving urban regeneration. Fainstein [55] analyses how public and private sectors collaborated to transform an underutilized area into a major financial hub. This success hinged on strategic investments, government incentives, and effective planning. Cervero and Murakami [27], examine the Hong Kong's "Rail plus Property" model, where the MTR Corporation integrates transport and urban development to generate sustainable revenue streams. These cases demonstrate how innovative PPP models can align infrastructure development with urban growth and sustainability goals. In addition, Grimsey and Lewis [56] discuss governance challenges in PPPs, noting that unclear roles and inadequate contractual frameworks often lead to disputes and inefficiencies. In the Ciudad de la Justicia in Madrid, for example, political changes and legal disputes delayed implementation, highlighting the need for clear governance structures and long-term planning [31]. Similar issues were observed in Barcelona's L9 Metro Line, where cost escalations resulted from underestimated risks and technical challenges.

These studies collectively underscore that while PPPs are instrumental in mobilizing resources and expertise for urban megaprojects, their success depends on careful planning, transparent governance, and the

integration of social, economic, and environmental objectives.

Recent studies [36,47,57] emphasize evolving frameworks for understanding megaproject management, specifically highlighting how sustainable outcomes are achieved in contemporary urban regeneration projects. For instance, Casady et al. [57] explore how PPP frameworks can systematically incorporate sustainability principles, offering a robust perspective that aligns with the MNNP case. Similarly, Busco et al. [36] emphasize contemporary challenges of stakeholder engagement within PPPs, providing insights into best practices that can mitigate risks and conflicts common in large-scale infrastructure projects. Moreover, recent studies on sustainable urban development, such as Metaxas [47], underline the role of megaprojects as catalysts for urban branding, economic resilience, and social inclusivity. These insights expand upon earlier research by incorporating updated empirical evidence from current European and global urban initiatives, enabling a more accurate benchmarking of MNNP's sustainability strategies and stakeholder management practices.

Finally, to improve theoretical alignment, the discussion has incorporated recent reviews on megaproject management [42,58], which highlight critical contemporary aspects such as risk assessment, cost overruns, and governance complexities within the latest generation of PPP megaprojects.

PPPs AND MEGA PROJECTS IN SPAIN

PPPs have been a fundamental mechanism in the development and implementation of mega-projects in Spain, allowing for the distribution of financial risk, pooling of expertise, and the achievement of large-scale infrastructure goals [7,59,60]. Mega-projects, due to their size, complexity, and extended duration, often require substantial resources, which are best delivered through a partnership between the public sector and private stakeholders. There are examples of previous mega-projects in Spain: Barcelona's L9 Metro Line, Ciudad de la Justicia in Madrid, and the A-7 Highway (Mediterranean Corridor). The discussion focuses on the main stakeholders involved, the actions undertaken, and the results achieved, emphasizing the role of PPPs in transforming Spain's infrastructure landscape.

The Barcelona L9 Metro Line is a flagship project designed to connect various key points of the metropolitan area, including the city centre, airport, and peripheral districts. This metro line is considered one of the longest in Europe, with a total length of 47.8 kilometers, making it a significant undertaking within Spain's transport infrastructure. The main stakeholders in the L9 project include the Generalitat de Catalunya, the regional government of Catalonia, alongside several private construction firms such as Ferrovial, FCC (Fomento de Construcciones y Contratas), and ACS Group [61]. These private entities were responsible for designing, financing, and constructing major portions of the line under a PPP

framework. Work on the L9 began in 2002, with the project divided into different sections, with each section being tendered to different private contractors. These contractors were tasked with both construction and future maintenance responsibilities, aligning with the private sector's strength in delivering technical expertise and operational efficiencies [62]. The funding model included public investment supplemented by private capital, which was guaranteed against future revenues from the metro's operations. However, the project has faced significant delays and cost overruns, largely attributed to the complexity of tunnelling and constructing metro stations in urban areas. Initially budgeted at €2.6 billion, the final cost of the project is projected to exceed €6.8 billion [24]. Despite these challenges, the completed portions of the L9 have already enhanced public transportation options in Barcelona, reducing road traffic and contributing to the city's broader environmental and mobility goals.

Another significant PPP in Spain is the Ciudad de la Justicia (Justice City) project in Madrid. Conceived as a mega-project aimed at consolidating various judicial offices and courthouses into one centralized location, the Ciudad de la Justicia was expected to enhance efficiency within the city's judicial system [63]. The primary stakeholders include the regional government of Madrid, which oversees the project, alongside private companies such as Acciona and Dragados, both of which played key roles in the construction and design of the judicial complex. The Ciudad de la Justicia was initially proposed in the early 2000s, with a PPP model that tasked the private sector with financing, constructing, and maintaining the judicial complex over a long-term concession period. In exchange, private partners were granted the right to recoup their investment through long-term lease agreements and management fees. The project was budgeted at approximately €1.7 billion but has since been delayed multiple times due to political changes and legal disputes over contract tenders. The most significant delay occurred during Madrid's regional elections, which resulted in a shift in political priorities and led to renegotiations between the public and private stakeholders. Despite the setbacks, parts of the Ciudad de la Justicia are already operational, offering more streamlined judicial services and reducing the inefficiencies caused by the dispersion of courthouses throughout Madrid. The project is expected to be completed in phases, and once fully operational, it is anticipated to enhance the city's legal infrastructure significantly. However, the initial delays have resulted in budget increases, with the final cost now projected to exceed €2.3 billion [31]. The PPP model, despite its difficulties, remains central to the project, allowing the regional government to leverage private capital to complete such a large-scale development.

The third example is the A-7 Highway, also known as the Mediterranean Corridor, a vital infrastructure project designed to enhance regional connectivity along Spain's southern coast. The highway

connects key commercial ports, industrial hubs, and tourist areas from the French border down to Algeciras [64]. The Spanish Ministry of Transport, in collaboration with private construction companies such as Sacyr, OHL Group, and Ferrovial, initiated the project under a PPP framework. This allowed the private sector to finance and construct segments of the highway, with revenue generated from tolls being used to recoup the initial investment. The A-7 project, which began in the late 1990s, was seen as critical to improving Spain's transportation infrastructure, facilitating the movement of goods and passengers while promoting economic development in under-served areas. Private companies were given long-term concessions to operate the highway's toll segments, which provided them with an ongoing revenue stream while the state retained overall control of the highway network. The success of the project is evident in the significant reduction of traffic congestion along Spain's southern coast and the enhanced efficiency of freight movement, particularly in connection with Mediterranean ports [65]. Despite the overall success, the A-7 project has not been without its controversies. Environmental groups raised concerns about the impact of highway construction on coastal ecosystems, and there were debates over the equity of toll pricing, particularly for local residents who rely on the highway for daily commutes. Nonetheless, the A-7 is widely considered a successful example of a PPP mega-project, demonstrating the benefits of private sector involvement in financing and managing large-scale infrastructure projects [48].

To further clarify the complexities of governance in mega-projects such as MNNP, we integrate the theoretical perspectives of Institutional Change [66], the Iron Triangle [24], and Stakeholder Theory [67]. According to North's [68] institutional change framework, the prolonged 20-year approval delay of MNNP can be analyzed through the lens of institutional inertia, where persistent political shifts and entrenched informal norms impede efficient decision-making and implementation. Dimitriou et al.'s [24] Iron Triangle (cost, time, quality) further illustrates how conflicting political priorities (time), financial constraints (cost), and sustainability standards (quality) created persistent tensions that influenced management strategies and outcomes. Finally, employing stakeholder theory, we emphasize how PPPs in the MNNP context reconciled diverse stakeholder interests, underscoring the importance of effectively integrating public demands and private objectives to navigate institutional complexity [9,52,69].

METHODOLOGY AND RESEARCH QUESTIONS

The research design involves a comprehensive case study approach, focusing on the organizational and process aspects established to deliver the MNNP construction program. The case study methodology includes a wide set of data collection through interviews, official documents, presentations, contracts, baseline reports, and relevant literature [70].

The engagement with informants and practitioners involved in the research is based on an engaged scholarship approach, where the researchers participate in workshops and meetings to explore the research problem, review relevant literature, and identify the concepts required to understand how an organization can be established to deal with complexity.

The case study on the MNNP is based on a qualitative approach using existing semi-structured interviews with experts, such as Madrid's town hall, Madrid State, the program management office, and other external stakeholders from previous research strongly related to MNNP [2]. Additionally, the classical case study method is applied, where multiple data sources are analysed to comprehensively explain the reality of the subject matter, allowing for better comprehension of PPP issues through open-ended conclusions [57,71]. In the case of MNNP, private-public collaboration was necessitated by regulation and land ownership, with much of the analysis focusing on how this cooperation was structured and how the megaproject was planned prior to the execution phase.

Building on Hollweck [70] foundational model, this case study methodology also draws upon the approaches of Eisenhardt [72], who emphasizes the importance of theory-building in case study research. The iterative process of comparing data, forming hypotheses, and refining the analysis enables greater flexibility and responsiveness in understanding complex phenomena, such as megaproject management and PPP dynamics. In addition, Flyvbjerg [73] argues that case studies provide valuable insights into the practicalities of large-scale projects by enabling researchers to focus on real-life contexts and derive lessons from actual practices rather than abstract theories. This approach is particularly suited to the MNNP, where political, economic, and social factors intertwine, making it essential to examine real-world interactions between stakeholders and decision-makers. Furthermore, Stake [74] contributes to the case study methodology by highlighting the importance of understanding the uniqueness of each case and recognizing that case studies allow researchers to capture the intricate details and nuances of specific contexts. For the MNNP, Stake's emphasis on the richness of qualitative data complements the use of interviews and document analysis to uncover the complexity of stakeholder relationships and regulatory challenges. This methodological framework allows for a thorough examination of both the macro and micro dimensions of the MNNP's development and its implications for future PPP projects.

By incorporating these additional views on case study methods, the research on the MNNP is enriched, offering a multi-faceted understanding of how PPPs are managed in large-scale urban developments. So, considering the scope and method of research, the main research questions to be foreseen in this case study are:

a) How has the public-private partnership model shaped the planning and execution of the MNNP?

b) What are the main challenges faced by the MNNP, and how have political and regulatory factors influenced its progress?
c) How does the MNNP integrate sustainability principles, and what impact is expected on the city's economic and social landscape?

The method followed to create this case study can be summarized as follows:

a) Participant Selection: Participants were purposefully selected based on their direct involvement in or expert knowledge of the MNNP. A purposive sampling strategy aimed at balanced representation was used, ensuring insights from various perspectives. Approximately 40% of respondents were city or regional officials involved in urban planning, policymaking, or regulatory oversight; another 40% represented the private consortium Distrito Castellana Norte (DCN); and the remaining 20% included external stakeholders such as local community representatives, sustainability experts, and academics.
b) Interview Design: Interview questions were developed through an extensive literature review on PPP governance, urban megaproject management, sustainability practices, and stakeholder theory. The questions specifically targeted governance dynamics, sustainability integration, stakeholder relations, and the political and regulatory challenges faced throughout the project. The interview protocol was pilot-tested with two domain experts involved in urban PPP projects to ensure clarity, relevance, and comprehensiveness.
c) Data Collection and Analysis: Interviews were semi-structured, allowing for in-depth exploration and follow-up on specific topics. Interviews lasted between 45 and 90 minutes and were recorded with participant consent, transcribed verbatim, and systematically coded using thematic analysis. Document analysis, involving official planning documents, regulatory filings, project reports, and relevant archival material, complemented and cross-validated the interview data, enhancing analytical rigor and ensuring accuracy.

Data triangulation between interview responses and document review allowed for the verification and strengthening of research findings, ensuring the credibility and validity of conclusions derived from this research.

CASE STUDY

Overview of the Mega-Project Scope

MNNP, as indicated before, embodies a multifaceted approach to urban regeneration, aiming to balance economic growth with social equity and environmental sustainability [75]. Its successful implementation is anticipated to serve as a model for future mega-projects, demonstrating the critical role of integrated planning and stakeholder engagement in achieving sustainable urban development

outcomes. MNNP represents one of the most ambitious urban transformation initiatives in Europe [76], aimed at revitalizing a significant portion of the northern area of Madrid city, Spain (Figure 1).

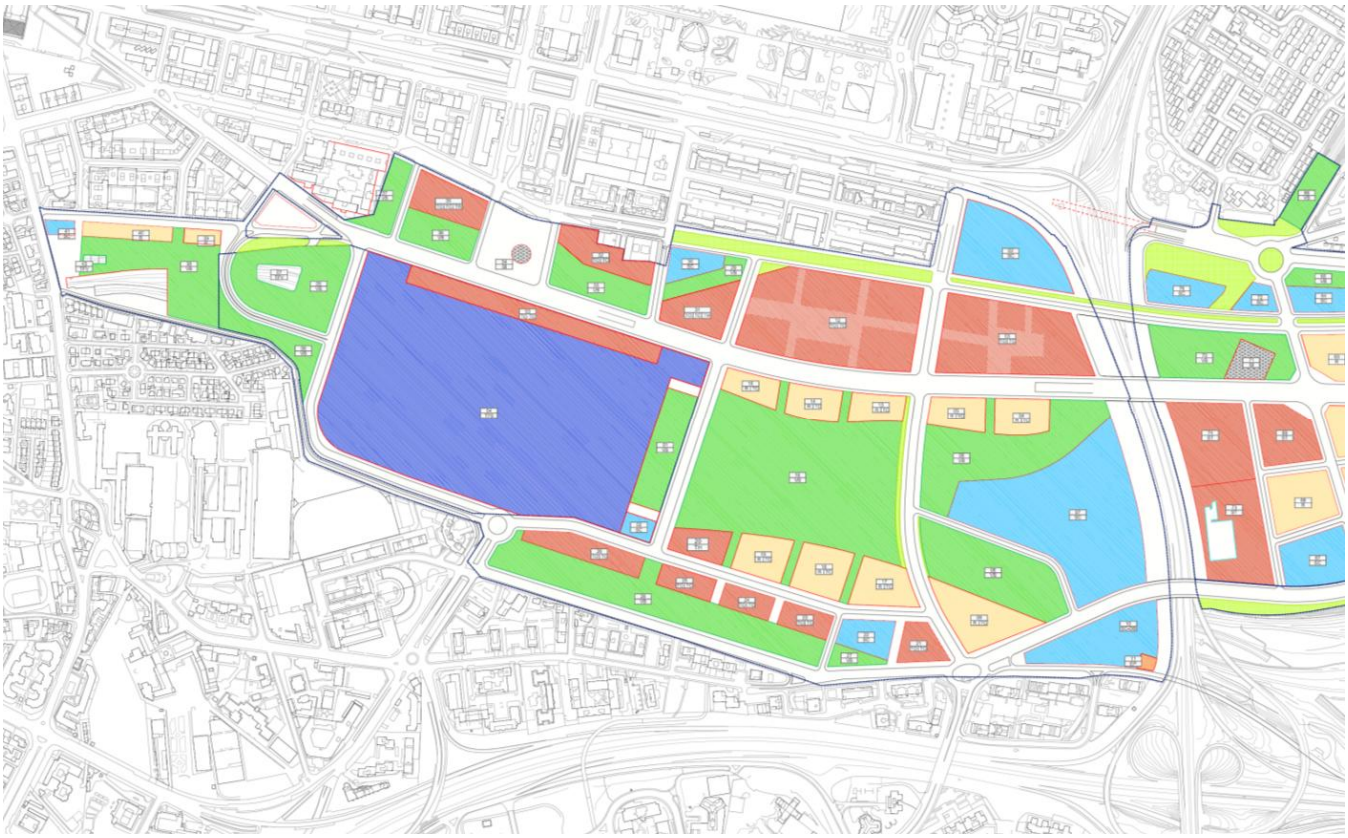

Figure 1. MNNP overview map [76].

Spanning approximately 3.3 million square meters, the project is designed to integrate a diverse matrix of urban functions, including residential, commercial, and public spaces, while enhancing the upgrade and extension of transportation infrastructure and promoting sustainability. Central to the MNNP is the redevelopment of the Chamartín train station, which is envisioned to become a pivotal hub within the Spanish high-speed rail network, facilitating improved connectivity and mobility for both local residents and visitors.

The scope of MNNP encompasses the creation of new public spaces, green areas, and civic facilities [76,77], with an emphasis on fostering social interaction and community engagement. Approximately 76% of the total area is designated for public use, reflecting a commitment to enhancing the quality of life for residents and ensuring accessibility to essential services. The project aims to address critical urban challenges, such as the regeneration of degraded urban areas, the promotion of sustainable transportation options, and the integration of green infrastructure to mitigate environmental impacts. Moreover, MNNP is positioned as a catalyst for economic development, with the potential to attract foreign investment and stimulate local job creation. The

mega-projects are planned to facilitate the implementation of Madrid city marketing and image strategies that enhance Madrid's competitiveness on a global scale. However, the realization of MNNP's objectives is contingent upon navigating a complex landscape of political, social, and environmental considerations [78]. The project has faced scrutiny regarding its potential social impacts, including concerns about gentrification and the preservation of local cultural heritage, as well as sustainability impacts, such as green urban areas, regeneration of degraded areas and removal of old industries (Table 1).

Table 1. MNNP Scope and expected impact.

Category	Details
Project Name	Madrid Nuevo Norte
Location	Northern Madrid, Spain
Project Area	3.3 million square meters
Development Area	2.35 million square meters
Main Zones	Chamartín, Las Tablas, Fuencarral, Malmea-San Roque-Tres Olivos
Land Use	Mixed-use (residential, commercial, offices, green spaces)
Residential Units	10,500 units
Affordable Housing	20% of residential units (around 2100 units)
Commercial Space	1.7 million square meters
Office Space	1.2 million square meters
Public Spaces	400,000 square meters of green areas and public spaces
Green Infrastructure	Large central park, linear green belts, and urban gardens
Transport Infrastructure	Integration with Chamartín Station, new Metro lines, and bus connections
Expected Investment	€6 billion (€ 5.7 billion from private sector)
Job Creation	Estimated 250,000 jobs (direct and indirect) during construction and development
Economic Impact	Expected GDP contribution of €19 billion over the life of the project
Project Duration	Phased development over 20–25 years
Environmental Impact	Sustainable urban development with energy-efficient buildings and renewable energy usage
Key Stakeholders	Distrito Castellana Norte (DCN), City of Madrid, regional and national governments
Current Status	Initial construction phase, expected to begin in late 2024

Source: [79].

Project Setup, Approval and Execution

The setup of the project has taken more than 20 years to be completed since the original idea created in the 90's. The political and regulatory changes have been the main impacting factors of the approval delays (Figure 2).

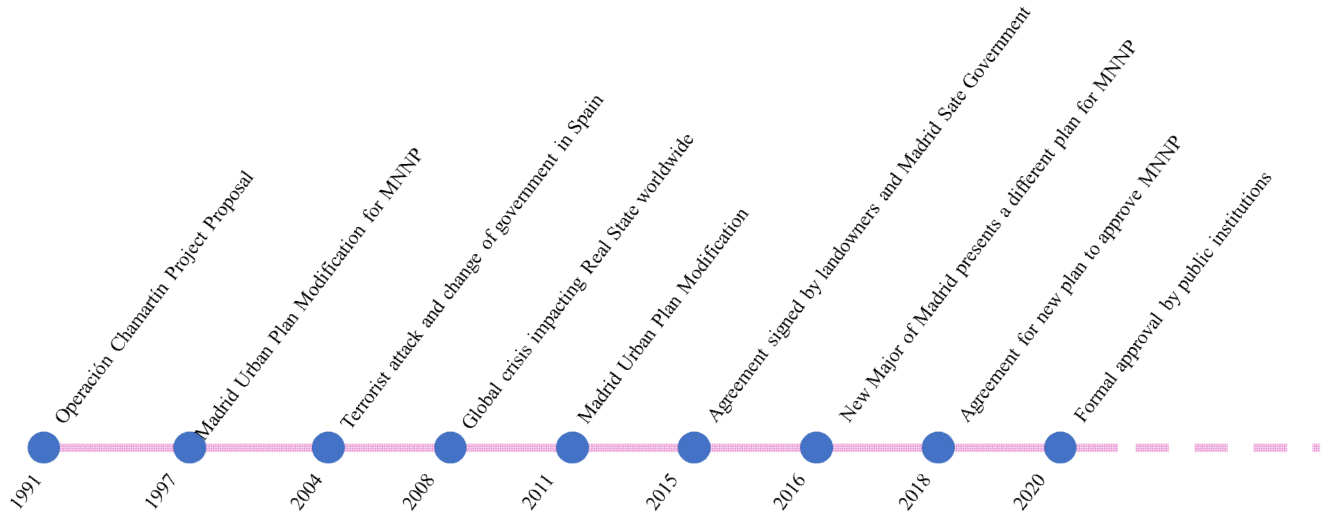

Figure 2. Planning and approval timeline of MNNP.

Initial setup

The MNNP, originally conceived as Operation Chamartín, had its inception in the 1990s [80] as a comprehensive urban redevelopment initiative cantered around the railway station of Chamartín, at the north of Madrid's downtown and its adjacent neighbourhoods in Madrid, Spain [79]. The initial 'Operation Chamartín' was conceived in 1991 by the then Prime Minister, Felipe González, accompanied by Joaquín Leguina, the President of the Community of Madrid, and Agustín Rodríguez Sahagún, the mayor of the capital. The project did not officially start until two years later when Renfe, the train operation public monopoly that operated in Spain at that time belonging to the Ministry of Development, led by Josep Borrell, awarded Argentaria (today known as BBVA Bank—Banco Bilbao Vizcaya Argentaria S.A) the urban development of Operation Chamartín. For 15 years, the former landowners, expropriated by the State for the construction of the railway, fought in court to reclaim their lands decided to change its use. However, in 2012, the Supreme Court confirmed that the reversal of the territories was not appropriate as they were not disaffected from the purpose for which they were expropriated.

Evolution

On March 11, 2004, the day that marked the most devastating terrorist attack in Spain's history, resulting in the loss of 190 lives and nearly 2000 injuries, coincided with the day the Popular Party, then in government, was expected to approve the launch of 'Operación Chamartín' [81]. With the Ministry of Development, the Community of Madrid, and the capital's City Council governed by the 'populars', there was no reason to believe that the urban project would not proceed. Except for a terrorist attack of this magnitude. Following the severe blow, an unexpected victory of the

socialist party changed the political arena, so José Luis Rodríguez Zapatero came to power, dashing hopes for progress on the project as the socialist executive began to express its disagreement with some aspects of the 'Operación Chamartín', so the political discrepancies between popular and socialists make the operation to be stopped [79].

In 2008 the global economic crisis exploded based on real state global implosion. This year, the government signs an agreement for the management of the plan with Duch (the society created by the landowners BBVA and San José). One of the elements that delayed the decision making was the urban plan modification in 2011 to limit the maximum number of floors per building up to 4, which was contradictory with the original plan [80].

In 2015 the city Town Hall, the presidency of the Community of Madrid and the landowners sign an agreement for the definitive plan under the new name of DCN. This year, a new change on the political landscape with a new mayor, Manuela Carmena, of the city stopped again the formal approval of the plan. The difference between left and right parties in different administrations lead to a blocking point where the landowners where suffering from a continuous investment and a potential employment decrease of over 150,000 according to BBVA declarations [82]. In 2016, the new mayor presented its new plan for DCN to reduce the scope of the project without impacting on employment without previous agreement with the Government of the Region or the Ministry; this plan was called "Madrid Puerta Norte" [83]. Due to the fact that this proposal was not accepted, the city Town Hall created a commission to negotiate with ADIF (Administrador de Infraestructuras Ferroviarias), DCN, the Ministry and the Region [82]. Derived from this negotiation, it was agreed to increase the commercial period of DCN two additional years and negotiate a new proposal of the plan.

Final setup

In 2017, after months of negotiations, a final agreement was signed among all parties. Then, during 2018 a new plan under the base of the agreement was created and named MNNP. In March 2020, the Government of Community of Madrid approved and was formally corroborated and approved by the city Town Hall in July of 2020 [84]. After the official and formal approval of the project by the public sector, some rejections were officially submitted to the court, but the High Court of Justice in Madrid declined the rejections and formally declared the project as compliant with the regulation [85].

Kick-off and future activities

After the approval in 2020 [80], the start of the execution phase begun with the initiation of the Charmartín station activities, and the water infrastructure project approved. It was also created the Management Commission of Chamartín Business Centre by a significant majority of

landowners in the urban area of Chamartín (with registration number APE 05.31), where the future business district of MNNP will be built. This will allow the urbanization of the area to begin as soon as possible based on the approved urban plan. This group of owners created the foundations and statutes of the future Compensation Board of the Business Center, a collaborating urban entity that will be responsible for drafting the re-parceling project and managing and financing the urbanization works.

One of the short-term objectives of the Management Commission is also to draft the urbanization project of APE 05.31 that was the modification of the original urban plan created in 1997 [80], a document that would define the execution of the works of the future financial district of Madrid and that must be subsequently approved by the City Council. Both the urbanization project and the foundations and statutes of the Compensation Board are necessary documents for the planning execution initiative of the urban area Centro de Negocios Chamartín to be presented, and thus be able to constitute the Compensation Board, as provided for in article 106 of the Land Law of the Community of Madrid. The Management Commission has been constituted grouping 85% of the property of the area and is open to new incorporations. The group has been formed by Distrito Castellana Norte (DCN); Municipal Transportaion Company (EMT); the Railway Entities (ADIF ADIF Alta Velocidad, Renfe Fabricación y Mantenimiento and Renfe Operadora); Sareb; Aliseda; Activos en Renta Mobiliarios y de Edificación, S.L.; and the Calle brothers. It has simultaneously obtained the Leaderhsip in Energy and Environmental Design (LEED) for Communities Plan and Design sustainability pre-certification at the “Gold” level, as well as the provisional Building Research Establishment Environmental Assessment Method (BREEAM) Urbanism 2020 certificate [86], the two most prestigious sustainability seals worldwide. With this recognition, MNNP becomes an international pioneer, as it is the first urban project in Europe to obtain both provisional certificates, making it an international benchmark in the field of sustainable urban development.

After Centro de Negocios Chamartín, the first of the four urban areas of MNNP to take this step, it is expected that Malmea-San Roque-Tres Olivos (APE 08.20) will be the second area to have a Management Commission [80]. So, in November 2021, the City Council of Madrid initially approved the delimitation in a single execution unit of this area, at the initiative of the majority of its owners. The Malmea-San Roque-Tres Olivos area, with over 1 million m^2, includes offices, shops, and homes. It resolves the urban edge of Fuencarral and the neighbourhoods of Begoña and Tres Olivos. The area will have a residential character, with more than 7000 homes and commerce on the ground floor. It will be traversed by the green axis of MNNP, a network of parks. The area will have two public transport nodes located to the north and south, each with a new Metro station, a Cercanías station, and several stops of the new

high-capacity priority bus system. The area will have multiple connections to the east and south. It will also see the relocation and total renovation of important conduits of the Canal de Isabel II, through which 80% of Madrid's drinking water circulates. In 2022 it was signed the agreement with Metro de Madrid to extend the subway network to Malmea-San Roque-Tres Olivos area and the execution of the first works in Chamartin station and the railway in this area was initiated with the first works.

The next actions in the plan that will take several years of execution is execute all the infrastructure civil works, start with Chamartin Business Center construction, start the civil works (once the infrastructures are ready) in Malmea-San Roque-Tres Olivos area and, finally, execute the urbanization of the pending area of Las Tablas neighbourhood [79].

FINDINGS & DISCUSSION

Theoretical Implications

MNNP contributes significantly to the theoretical understanding of PPPs in the context of megaprojects. By examining the dynamics of collaboration between public and private entities, the case study elucidates how governance structures are conceptualized and adapted over time to address challenges such as financial constraints, stakeholder opposition, and regulatory complexity. The findings highlight the importance of integrating sustainability principles into governance frameworks, advancing the theoretical discourse on how PPPs can balance economic, social, and environmental objectives in urban development [11].

This project also underscores the critical role of stakeholder engagement in shaping the trajectory of large-scale urban initiatives. Effective collaboration requires a nuanced understanding of diverse stakeholder priorities, regulatory pressures, and market dynamics. Theoretical models emerging from the MNNP emphasize flexibility and iterative planning as key characteristics of successful PPPs, expanding on frameworks proposed by Dimitriou et al. [24]. Furthermore, the study highlights the intersection of political stability and urban planning, suggesting that the success of PPPs is contingent upon consistent policy support and adaptive project management strategies to mitigate disruptions caused by political shifts.

From the theoretical implications point of view, the findings from the MNNP case study offer several contributions to the literature on public-private partnerships and megaproject management. By analysing the intricate relationship between public and private entities in such a large-scale urban development, the study enhances the theoretical understanding of how collaboration frameworks are structured, managed, and adjusted over time. These findings also expand on the role of stakeholder engagement, regulatory influence, and sustainability

considerations in shaping the outcomes of megaprojects. This case also illustrates how the PPP model can serve as a flexible yet complex governance tool in overcoming financial and organizational hurdles in urban regeneration initiatives.

Practical Implications

From a practical perspective, the MNNP offers actionable insights for policymakers, urban planners, and project managers engaged in similar megaprojects. One of the critical takeaways is the necessity of transparency in decision-making processes to foster trust among stakeholders and the public. Transparent governance mechanisms, combined with proactive stakeholder engagement, can mitigate opposition and streamline project implementation, as demonstrated in the MNNP's progression through complex regulatory and political landscapes. The project also highlights the importance of aligning private investments with public interest goals, such as affordable housing and sustainable urban infrastructure. By dedicating 20% of residential units to affordable housing, the MNNP addresses social equity concerns while leveraging private-sector resources to finance broader urban regeneration initiatives. This balance between economic growth and public welfare sets a benchmark for future PPPs. Lastly, the MNNP underscores the necessity of long-term strategic planning and adaptability. The phased approach to project execution and integration of sustainability certifications such as LEED and BREEAM provide a replicable model for managing complexity in urban megaprojects. The emphasis on renewable energy and green spaces within the project demonstrates how practical applications of sustainability can align with global urban development goals, offering lessons for megaprojects worldwide [27].

From a practical perspective, the MNNP provides valuable lessons for policymakers, project managers, and stakeholders involved in similar projects. The case reveals the importance of transparency, stakeholder engagement, and political stability in ensuring the smooth progression of PPP megaprojects. The practical outcomes of this study underscore the critical need for balancing private investment with public interest, ensuring that economic development is aligned with social and environmental sustainability goals. Additionally, the project offers a blueprint for navigating regulatory challenges and adapting to political shifts, highlighting the necessity of long-term strategic planning and flexibility in execution.

Politization of Megaproject Development

As partially explained in the previous section, during the period of 1995 to 2022, MNNP encountered several specific political challenges that influenced its development and implementation that generated huge delays and extra cost to the project sponsors and landowners:

a) Approval Process Delays*:* The approval process for MNNP faced significant delays due to political disagreements and bureaucratic procedures. For example, debates over land use regulations and environmental impact assessments led to prolonged discussions in municipal councils and regional planning committees, delaying the project's advancement. A good example of this was the change of city Major in 2016, fully stopped the project and reset part of the original urban plan.
b) Political Opposition*:* Environmental organizations and community associations opposed MNNP due to concerns about its environmental impact and potential displacement of residents. For instance, protests against the project's scale and urbanization plans garnered media attention and influenced public opinion, creating political pressure on decision-makers, nevertheless those external stakeholders where not properly managed neither by the project sponsors on the private side neither on the public one (independently on the party).
c) Changing Political Leadership: Shifts in political leadership at the municipal and regional levels affected MNNP's progress. For example, changes in government administrations led to shifts in urban development priorities, with new officials revisiting project agreements and introducing modifications to align with their political agendas.
d) Funding and Budgetary Issues: Disagreements over funding sources and cost-sharing arrangements posed challenges for MNNP. Political debates over the allocation of public funds for the project, especially during economic downturns, resulted in budgetary constraints and delays in securing financial resources for critical infrastructure investments.
e) Transparency and Accountability*:* Allegations of corruption and lack of transparency in the project's administration raised governance concerns. Instances of conflicts of interest among project stakeholders, lack of public access to project information, and calls for independent oversight mechanisms underscored the importance of enhancing transparency and accountability measures in MNNP's governance structure.

Public-Private Collaboration Leverage

MNNP is a paradigm of the complexities and strategic potential of PPPs in managing large-scale urban development projects. Its success lies in the effective collaboration between public entities—including the City of Madrid, the regional government of Madrid, and the national Ministry of Transport—and private stakeholders led by DCN, a consortium that includes prominent companies such as BBVA and Grupo San José. The PPP framework underpins the entire management structure of MNNP, fostering the integration of resources, expertise, and responsibilities across both sectors to address the project's immense scale and

complexity.

Integration of PPPs in MNNP Management

The PPP framework plays a foundational role in MNNP's management, facilitating robust financial backing, efficient risk-sharing, strategic project planning, and inclusive stakeholder engagement.

a) Financing and Investment Management: The financial framework of MNNP underscores the significance of private-sector contributions, with DCN providing approximately 95% of the total €6 billion investment. This capital injection is instrumental in funding critical aspects of the project, including residential, commercial, and public space development, as well as the transformative renovation of the Chamartín transport hub. The PPP arrangement ensures the alignment of private investment with public interest, with private stakeholders financing and managing commercial assets while public entities oversee regulatory and infrastructural responsibilities (Figure 3).

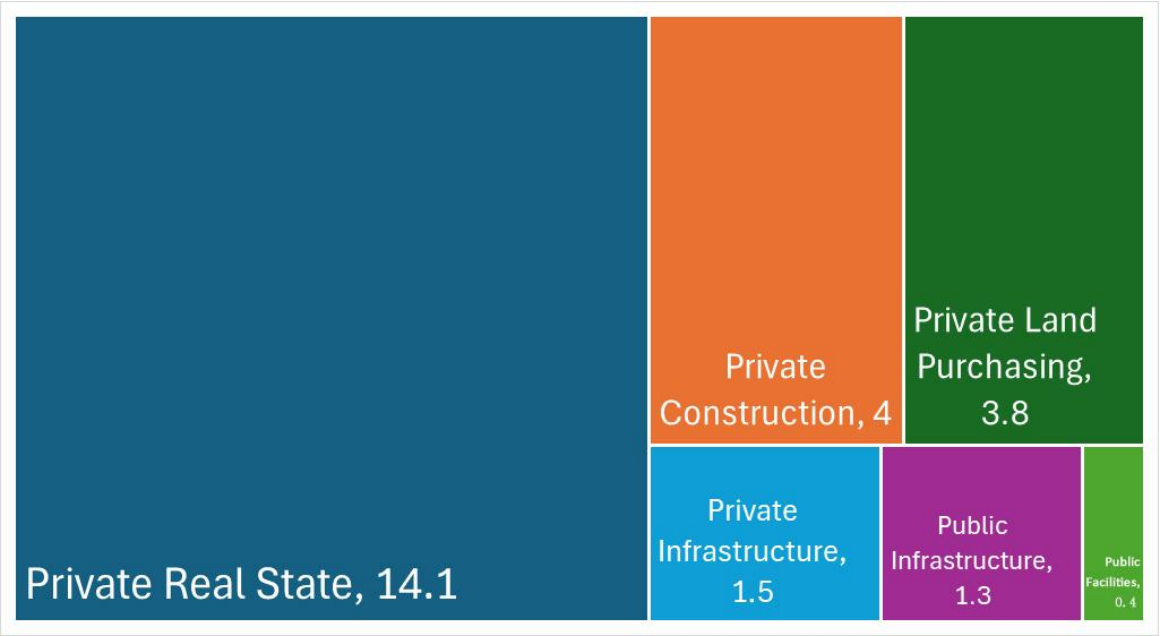

Figure 3. Investment breakdown structure [79].

b) Risk Allocation: The PPP model allows a strategic division of risks between the public and private sectors. The private sector assumes the bulk of the financial risks associated with construction and operations, while the public sector ensures regulatory compliance and urban planning alignment. This complementary arrangement enables each sector to leverage its strengths, with private entities focusing on operational efficiencies and innovation, and public institutions safeguarding the broader urban development objectives.
c) Strategic Project Planning and Execution: The MNNP benefits from a phased approach to planning and execution, enabled by the PPP

framework. Public authorities concentrate on strategic urban planning to align the project with Madrid's long-term growth objectives, while private stakeholders lead the day-to-day management of construction and operational logistics. Regular consultations and adaptable project scopes ensure that the development progresses in a timely manner despite its scale and complexity.

d) Stakeholder Engagement: Stakeholder collaboration is another cornerstone of the PPP model in MNNP. The framework accommodates diverse groups, including community organizations, environmental advocates, and political entities. This inclusive approach allows public authorities to focus on fostering relationships with local communities and ensuring that sustainability and equity goals are met. Meanwhile, private partners manage the commercial aspects of the project, balancing profitability with social responsibility. Table 2 presents the main impacts of MNNP for stakeholders' engagement.

Table 2. Main impacts of MNNP for stakeholder engagement.

Metric	Details
Total Project Area	3.3 million square meters
Affordable Housing Units	2100 (20% of 10,500 total residential units)
Green Spaces	400,000 square meters (including parks, urban gardens, and green belts)
Economic Impact	Estimated €19 billion GDP contribution over the project's life span
Job Creation	Approximately 250,000 jobs (direct and indirect) during construction and development
Transport Hub Renovation	Chamartín Station as a pivotal high-speed rail network hub
Sustainability Certifications	LEED Gold for Communities and BREEAM ES Urbanism 2020 certifications

Challenges of the PPP Model in MNNP

Despite its many advantages, the PPP framework in MNNP has encountered notable challenges that highlight the intricacies of managing such a large-scale urban regeneration initiative.

a) Political and Regulatory Delays: Political instability and shifts in leadership have caused delays in project approvals and implementation. Conflicting urban development priorities, regulatory debates, and land use disputes have slowed the project's progress. These challenges underscore the need for sustained political alignment and clear governance to ensure continuity in megaproject execution.

b) Social Equity and Gentrification Concerns: While the PPP framework has enabled significant financial investment, concerns about gentrification and housing affordability persist. MNNP's allocation of 20% of residential units as affordable housing reflects a deliberate effort to mitigate social inequities. However, the pressure remains on

public and private stakeholders to address these issues comprehensively and prevent further disparities in Madrid's housing market.

c) The Role of PPPs in Comprehensive Project Management: The integration of PPPs in the MNNP has not only facilitated its financial viability but also structured its overall management. By balancing public oversight with private-sector efficiency, the PPP model has allowed the project to address multifaceted challenges while maintaining its commitment to sustainable urban development. These insights into MNNP highlight the potential of PPPs to manage the complexities of megaprojects and deliver outcomes that align with broader social and economic objectives.

Table 3 presents the qualitative assessment of threats for MNNP.

Table 3. Qualitative assessment of threats for MNNP.

Aspect	Public Sector Contribution	Private Sector Contribution	Description
Total Investment (€ billion)	0.3	5.7	Total estimated cost of €6 billion, with private stakeholders contributing 95%.
Financial Risk	Low	High	Private sector assumes risks related to construction and operations.
Regulatory Oversight	High	Low	Public sector ensures compliance with urban planning and regulations.
Operational Efficiency	Medium	High	Private sector manages construction, innovation, and efficiency in execution.

Practical Implications: Replicable Strategies and Benchmarking

To strengthen the practical contribution of this case study, we propose the following replicable strategies derived from the Madrid Nuevo Norte Project, benchmarked against London's Canary Wharf urban regeneration initiative to underscore transferable lessons for urban megaproject management:

a) Structured Governance and Clear Institutional Roles: MNNP illustrates the importance of clearly defined roles within the PPP framework. Explicitly delineating responsibilities between public oversight and private sector execution ensures efficient resource allocation, minimizes conflicts, and enables strategic project agility. Similarly, Canary Wharf's redevelopment was successful due to clear governance and responsibilities delineated early, reducing uncertainty, and streamlining decision-making processes [55].

b) Phased Project Execution: Dividing mega-projects into clearly defined stages or phases provides flexibility in adapting to unforeseen political, economic, or regulatory challenges. MNNP adopted phased implementation, allowing stakeholders to adapt to changing

circumstances, manage risks more effectively, and respond to evolving urban priorities over time. Canary Wharf adopted an analogous phased approach, initially focusing on core infrastructures such as transport connectivity before proceeding to commercial and residential components, thus maintaining adaptability and resilience throughout project implementation (Table 4).

c) Stakeholder Participation and Transparency: Active stakeholder engagement, transparency, and community involvement are key strategies highlighted by the MNNP. Regular dialogues and open consultations with diverse stakeholders help in anticipating conflicts, building public trust, and enhancing acceptance of the project. Canary Wharf also emphasized community and stakeholder participation through structured communication and public consultations, mitigating resistance, facilitating consensus, and ensuring alignment of the project with local social expectations [24,55].

d) Integrated Sustainability Certification: Adopting international sustainability standards, such as LEED or BREEAM certifications, is an effective method to institutionalize environmental and social sustainability. MNNP's achievement of both LEED and BREEAM certifications highlights its commitment and serves as a replicable strategy for ensuring that sustainability remains embedded in the planning, design, and execution of large-scale urban regeneration. This replicable model was also employed at Canary Wharf, reinforcing the importance of standardized sustainability practices to attract international recognition and investor confidence [55].

Table 4. Madrid Nuevo Norte vs. Canary Wharf (London).

Comparative Metrics	Madrid Nuevo Norte	Canary Wharf, London
Total Area	3.3 million m^2	Approximate 400,000 m^2
Duration	Over 20 years (planning)	Approximate 15–20 years
PPP Model	Public oversight & Private execution (95% private funding)	PPP-based development (private-led with public oversight)
Governance Framework	Multi-level, political complexity	Clear delineation of roles early on
Key Challenges	Political shifts, delays, community concerns	Initial investor skepticism, regulation
Stakeholder Strategy	Transparent dialogue, community engagement	Clear, transparent public-private roles

Both projects illustrate the necessity of clear governance, strong stakeholder involvement, and structured phasing to handle complexity and ensure successful sustainable urban regeneration. While contexts differ, common success factors—such as transparency, strategic phasing, sustainability certifications, and robust governance—emerge as universally relevant strategies.

DISCUSSION AND ANSWERS TO RESEARCH QUESTIONS

Analyzing MNNP through the theoretical frameworks of Institutional Logic, the Iron Triangle, and Stakeholder Theory provides deeper insights into the project's complex governance dynamics. The application of North's institutional change theory elucidates how institutional inertia resulting from political instability and entrenched interests significantly delayed the project's progress. Concurrently, the Iron Triangle framework highlights the persistent management challenges related to balancing budget, timing, and quality objectives, especially under shifting political conditions. Stakeholder theory further illustrates the critical role of stakeholder engagement and interest alignment in mitigating these institutional complexities, ultimately facilitating the PPP model's success in reconciling competing objectives.

Looking at the three research questions, we can summarize the relevance of this case study with the following discussions:

How Has the Public-Private Partnership Model Shaped the Planning and Execution of the Madrid Nuevo Norte Project?

The PPP model has been pivotal in structuring and driving the MNNP, shaping its planning and execution at every stage. By leveraging private sector investment and expertise, the PPP framework has unlocked €5.7 billion, approximately 95% of the project's total cost, which would have been unattainable solely through public funding. This financial injection has enabled large-scale urban regeneration, addressing long-standing infrastructural and housing deficiencies in Madrid's northern area.

The collaboration framework has established a clear division of responsibilities. Public authorities, including the City of Madrid and the Ministry of Transport, focus on regulatory compliance, urban planning, and ensuring alignment with Madrid's long-term development strategies. On the other hand, private stakeholders, led by DCN, manage construction, day-to-day operations, and the technical complexities of execution. This balance allows the public sector to uphold broader societal goals such as sustainability and equity, while the private sector brings innovation and efficiency to the project's management. Moreover, the PPP model's integration into the project's governance has facilitated a phased and adaptive approach to development.

Public entities have ensured that planning aligns with evolving urban needs and global best practices, including green infrastructure and energy-efficient designs. Regular consultations between stakeholders have allowed for real-time adjustments, mitigating risks and ensuring timely progress. By pooling diverse resources and expertise, the PPP model has transformed the MNNP into a benchmark for collaborative urban megaprojects.

What Are the Main Challenges Faced by the MNN Project, and How Have Political and Regulatory Factors Influenced Its Progress?

The MNNP has encountered numerous challenges, primarily

stemming from political and regulatory complexities. One of the most significant obstacles has been the impact of political shifts at the municipal, regional, and national levels. Changes in leadership have often resulted in conflicting urban priorities, slowing down project approvals and leading to prolonged delays. For instance, transitions between left- and right-leaning governments have led to debates over land use, project scope, and housing policies, causing frequent revisions to plans and renegotiations of agreements.

Regulatory hurdles have further complicated the project's timeline. Navigating Madrid's stringent urban planning and environmental laws has required meticulous coordination among stakeholders. Legal disputes, particularly regarding land ownership and expropriation issues, have delayed key phases of the project. The lengthy approval processes for rezoning and the integration of sustainable design criteria have also added layers of complexity. These challenges underscore the necessity of political stability and regulatory clarity in managing megaprojects.

The MNNP has demonstrated that effective governance mechanisms, including transparent decision-making and conflict resolution frameworks, are essential to overcoming such hurdles. Establishing long-term bipartisan agreements on urban development priorities and streamlining regulatory procedures could help ensure smoother progress in future public-private ventures.

How Does the MNN Project Integrate Sustainability Principles, and What Impact Is Expected on the City's Economic and Social Landscape?

Sustainability is a cornerstone of the Madrid Nuevo Norte Project, with its design and execution deeply rooted in principles that prioritize environmental, economic, and social well-being. The project dedicates approximately 400,000 square meters to green spaces, including parks, linear gardens, and urban ecosystems, which aim to enhance biodiversity and improve air quality. Building designs incorporate energy-efficient technologies, renewable energy sources, and eco-friendly materials, aligning with global certifications such as LEED Gold and BREEAM ES.

Transportation infrastructure plays a key role in the project's sustainability goals. The renovation of Chamartín Station as a high-speed rail hub, the integration of new metro lines, and the expansion of pedestrian and cycling pathways are expected to significantly reduce carbon emissions by promoting public and active transport over private vehicle use. These measures address both immediate and long-term environmental challenges, setting a new standard for urban sustainability in megaprojects. Economically, the MNNP is projected to contribute €19 billion to Madrid's GDP over its lifecycle. It is also expected to generate approximately 250,000 jobs during construction and operational phases, providing a critical boost to the local economy.

Socially, the project addresses pressing housing needs by creating 10,500 residential units, of which 20% are designated as affordable

housing. This allocation is designed to mitigate gentrification risks and ensure inclusive growth, making the benefits of urban regeneration accessible to a broader demographic. The MNNP's integration of sustainability principles not only enhances Madrid's urban fabric but also positions the city as a global leader in resilient and inclusive urban planning. By addressing economic disparities, promoting environmental stewardship, and fostering social equity, the project serves as a model for the transformative potential of sustainable megaprojects.

CONCLUSIONS

Navigating these specific political challenges required strategic leadership, stakeholder engagement, and effective communication to address conflicting interests, build consensus, and ensure the successful implementation of the Madrid Nuevo Norte Project a complex political landscape from 1995 to 2022, the MNNP serves as a compelling case study in public-private collaboration, illustrating the critical role that the private sector plays in the successful execution of urban megaprojects.

Despite facing significant delays and bureaucratic challenges posed by public institutions and political battles, the involvement of the private sector has proven indispensable in navigating these complexities and driving the project forward. While public entities often grapple with lengthy approval processes, regulatory hurdles, and political considerations, the agility and resourcefulness of the private sector have enabled the project to maintain momentum. For instance, DCN utilized its management expertise to streamline decision-making processes and engage in proactive dialogue with public officials to leverage regulation requirements fulfilment and political roadblocks with project approvals. This approach not only facilitated timely approvals but also fostered a collaborative atmosphere that encouraged constructive feedback and adaptation. The ability of the private sector to navigate bureaucratic challenges underscores its vital role in ensuring that urban megaprojects remain on track, even in the face of institutional inertia.

The lessons learned from MNNP offer valuable insights for the planning and execution of future urban megaprojects across Europe. One of the main takeaways is the relevance of early and continuous engagement with local communities and stakeholders. MNNP's success in incorporating public feedback into the project design exemplifies how participatory processes can enhance project acceptance and mitigate opposition. Indeed, the ability to adapt to changing circumstances and stakeholder concerns is crucial to maintain the project on track despite of the delays created by political decisions. The private sector's responsiveness to community input and its willingness to modify project plans based on feedback have proven essential in maintaining public support and ensuring project relevance. In this sense, the holistic approach that considers social, economic, and environmental dimensions is being demonstrated to be key for the success of urban megaprojects.

MNNP's emphasis on sustainability, not just in fulfilling the SDGs but focusing on the creation of a sustainable project in terms of definition: something that can be maintained during the time. In this sense, the creation of public spaces highlights the need for integrated urban planning that aligns with broader urban development goals. Furthermore, exploring innovative financing mechanisms that leverage private investment while minimizing public financial burdens can create a more sustainable funding framework for future projects and the integration of sustainable practices and green infrastructure within MNNP has addressed environmental concerns associated with urban development. The project's focus on creating public parks and green spaces demonstrates the importance of environmental stewardship in urban planning, a consideration that should be prioritized in future megaprojects.

The MNNP's development team solved several critical issues through effective public-private collaboration. Initial politicization of the project posed significant challenges; however, the private sector's commitment to transparency and community involvement helped to alleviate concerns and foster trust among stakeholders. This resolution of political tensions is a crucial lesson for future projects, emphasizing the need for open communication and stakeholder engagement. The project also faced scrutiny regarding its potential to exacerbate social inequalities. By actively involving local communities in the planning process and prioritizing the creation of affordable housing and public amenities, MNNP has sought to address these concerns. This proactive approach serves as a model for future urban developments aiming to promote social equity.

From a megaproject management perspective, MNNP has yielded several significant outcomes. The collaboration between public and private sectors has enhanced the overall viability of the project. By leveraging private sector expertise and resources, MNNP has been able to navigate challenges and maintain progress, ultimately leading to a more robust and sustainable urban development. The project's emphasis on creating public spaces, improving transportation infrastructure, and enhancing community amenities has the potential to significantly improve the quality of life for residents in the affected areas. This outcome aligns with the broader goals of urban regeneration and sustainable development. Moreover, MNNP is poised to enhance Madrid's competitiveness as a European capital by attracting foreign investment, fostering economic development, and positioning the city as a leader in sustainable urban planning. The project's success in this regard underscores the importance of strategic urban development in enhancing a city's global standing. The experiences and lessons learned from MNNP provide a valuable framework for future urban megaprojects in Europe. By emphasizing collaboration, stakeholder engagement, and sustainability, future projects can build on the

successes of MNNP to achieve similar outcomes.

Megaprojects are powerful instruments for driving sustainable urban development, addressing critical economic, environmental, and social challenges. By integrating advanced technologies, public-private partnerships, and comprehensive planning, these initiatives can transform urban landscapes and set benchmarks for future developments. However, realizing the full potential of megaprojects requires careful navigation of challenges such as governance issues, cost management, and social equity concerns. Policymakers, urban planners, and private stakeholders must prioritize sustainability and inclusivity in every phase of development to ensure that megaprojects contribute positively to urban futures. By learning from successful examples such as MNNP, Barcelona's L9 Metro Line, and the A-7 Highway, cities worldwide can harness the transformative potential of megaprojects to create resilient, inclusive, and sustainable urban environments. These projects not only address immediate infrastructural needs but also pave the way for a more sustainable and equitable future.

This research provides important insights into the Madrid Nuevo Norte Project and highlights best practices and challenges encountered in public-private partnerships within large-scale urban regeneration initiatives. However, several limitations should be acknowledged. The case study is contextually anchored in the institutional, political, and regulatory environment of Madrid, Spain, limiting its generalizability to other geopolitical and socio-economic contexts, especially those significantly differing from European norms. PPP models and sustainability practices that proved successful in Madrid may not directly apply to urban contexts with different political, regulatory, or socio-economic dynamics, such as cities in Asia, Africa, or the Americas. Moreover, the timeframe analyzed (over 20 years of project development) reflects specific historical contingencies and local governance shifts that may not be replicated elsewhere. Therefore, future studies should complement this work by examining similar megaprojects across diverse geopolitical and institutional contexts to validate and refine the applicability of the findings presented here.

In conclusion, the PPP collaboration within the MNNP exemplifies how effective partnership dynamics can leverage the strengths of both sectors to achieve common goals. The private sector's management capabilities and commitment to collaboration not only facilitated the resolution of political challenges but also contributed to the project's alignment with broader urban development objectives. The successful integration of community input, innovative design solutions, and sustainable practices underscores the importance of fostering cooperative relationships between public and private entities in the successful delivery of large-scale infrastructure projects. As MNNP continues to evolve, it serves as a model for future mega-projects, demonstrating the critical role of integrated planning and stakeholder

engagement in achieving sustainable urban development outcomes.

DATA AVAILABILITY

All data generated from the study are available in the manuscript.

AUTHOR CONTRIBUTIONS

Conceptualization, JG and TM; Methodology, JG; Validation, JG and TM; Investigation, JG; Resources, JG; Writing—Original Draft Preparation, JG; Writing—Review & Editing, TM; Supervision, TM.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

1. Metaxas T, Juarez L, Gavriilidis G. Planning and marketing the city for sustainability: The Madrid Nuevo Norte project. Sustainability. 2021;13(4):2094.
2. Metaxas T, Gallego JS, Juarez L. Sustainable urban development and the role of mega-projects: Experts' view about Madrid Nuevo Norte Project. J Infrastruct Policy Dev. 2023;7(2):2161.
3. Baron N, Fernandez AG. Grand project and urban governmentality in Madrid: Functions, fictions, frictions. Ann Geogr. 2019;3(727):94-115.
4. Perez SI, Perez SM, Navalpotro JA. Madrid, Nuevo Norte, a project against Covid-19: Tourism as an opportunity. Cuad Tur. 2021;47:595-8.
5. Zhou Y, Cheung C, Hsu S. A dimensional model for describing and differentiating project teams. Int J Proj Manag. 2017;35(6):1052-65.
6. Rappold E. Madrid green-lights Nuevo Norte urban mega-project. Hamburg (Germany): DPA Deutsche Presse-Agentur GmbH; 2019.
7. Irimia-Diéguez AI, González-Villegas JB, Oliver-Alfonso MD. The financial performance of an innovative megaproject. Procedia Soc Behav Sci. 2014;119:417-26.
8. Li Y, Tang Q, Shen Q, Cheng EWL. A review of studies on Public–Private Partnership projects in the construction industry. Int J Proj Manag. 2010;28(7):683-94.
9. Osei-Kyei R, Chan APC. Review of studies on the critical success factors for Public–Private Partnership (PPP) projects from 1990 to 2013. Int J Proj Manag. 2015;33(6):1335-46.
10. Li H, Zhang X, Ng ST, Skitmore M, Dong YH. Social sustainability indicators of public construction megaprojects in China. J Urban Plann Dev. 2018;44(4):04018034.
11. Flyvbjerg B. What you should know about megaprojects and why: An overview. Proj Manag J. 2014;45(2):6-19.
12. Koppenjan JFM, Enserink B. Public–Private Partnerships in urban infrastructures: Reconciling private sector participation and sustainability. Public Admin Rev. 2009;69:284-96.

13. Vale de Paula P, Marques RC, Gonçalves JM. Public–Private Partnerships in urban regeneration projects: A review. J Urban Plann Dev. 2022;149(1):04022056.
14. Almarri K, Boussabaine H. Critical success factors for public–private partnerships in smart city infrastructure projects. Constr Innov. 2025;25(2):224-47.
15. Simon D, Arfvidsson H, Anand G, Bazaz A, Fenna G, Foster K, et al. Developing and testing the Urban Sustainable Development Goal's targets and indicators—a five-city study. Environ Urban. 2016;28(1):49-63.
16. Krueger R, Buckingham S. Towards a 'consensual' urban politics? Creative planning, urban sustainability and regional development. Int J Urban Reg Res. 2012;36(3):486-503.
17. Kardes I, Ozturk A, Cavusgil ST, Cavusgil E. Managing global megaprojects: Complexity and risk management. Int Bus Rev. 2013;22(6):905-17.
18. Floricel S, Miller R. Strategizing for anticipated risks and turbulence in large-scale engineering projects. Int J Proj Manag. 2001;19:445-55.
19. Kavaratzis M, Ashworth G. Place marketing: How did we get here and where are we going? J Place Manag Dev. 2008;1:150-65.
20. Santamaria GDC. Megaprojects, development and competitiveness: Building the infrastructure for globalization and neoliberalism. Athens J Soc Sci. 2019;6:263-90.
21. Song Y, Hou D, Zhang J, O'Connor D, Li G, Gu Q, et al. Environmental and socio-economic sustainability appraisal of contaminated land remediation strategies: A case study at a mega-site in China. Sci Total Environ. 2018;610:391-401.
22. Xing Y, Horner RMW, El-Haram MA, Bebbington J. A framework model for assessing sustainability impacts of urban development. Account Forum. 2009;33:209-24.
23. Karji A, Namian M, Tafazzoli M. Identifying the key barriers to promote sustainable construction in the United States: A principal component analysis. Sustainability. 2020;12(12):5088.
24. Dimitriou HT, Ward EJ, Wright PG. Mega transport projects—Beyond the 'iron triangle': Findings from the OMEGA research programme. Prog Plann. 2013;86:1-43.
25. Banihashemi S, Hosseini MR, Golizadeh H, Sankaran S. Critical success factors (CSFs) for integration of sustainability into construction project management practices in developing countries. Int J Proj Manag. 2017;35(6):1103-19.
26. Ugwu OO, Haupt TC. Key performance indicators and assessment methods for infrastructure sustainability—a South African construction industry perspective. Build Environ. 2007;42(2):665-80.
27. Cervero R, Murakami J. Rail and property development in Hong Kong: Experiences and extensions. Urban Stud. 2009;46(10):2019-43.
28. Swilling M, Nygaard I, Kruger W, Wlokas H, Jhetam T, Davies M, et al. Linking the energy transition and economic development: A framework for

analysis of energy transitions in the global South. Energy Res Soc Sci. 2022;90:102567.
29. Söderlund J, Sankaran S, Biesenthal C. The past and present of megaprojects. Proj Manag J. 2017;48(6):5-16.
30. Randeree K, Ahmed N. The social imperative in sustainable urban development: The case of Masdar City in the United Arab Emirates. Smart Sustain Built Environ. 2019;8(2):138-49.
31. Ordoñez J. The Ciudad de la Justicia: An ambitious judicial infrastructure project in Madrid. Public Admin Rev. 2018;78(3):285-95.
32. Chava J, Newman P. Stakeholder deliberation on developing affordable housing strategies: Towards inclusive and sustainable transit-oriented developments. Sustainability. 2018;8(10):1024.
33. Leccis F. Regeneration programmes: Enforcing the right to housing or fostering gentrification? The example of Bankside in London. Land Use Policy. 2019;89:104217.
34. Klingmann A. Rescripting Riyadh: How the capital of Saudi Arabia employs urban megaprojects as catalysts to enhance the quality of life within the city's neighborhoods. J Place Manag Dev. 2023;16(1):45-72.
35. Iwasaki Y. Leisure and quality of life in an international and multicultural context: What are major pathways linking leisure to quality of life? Soc Indic Res. 2007;2(2):233-64.
36. Busco C, Walters J, Provoste E. Stakeholder management within PPP-arranged civil engineering megaprojects: A systematic literature review of challenges, critical success factors and stakeholder roles. Int J Public Sect Manag. 2024;37(5):649-71.
37. Di Maddaloni F, Davis K. The influence of local community stakeholders in megaprojects: Rethinking their inclusiveness to improve project performance. Int J Proj Manag. 2017;35(8):1537-56.
38. Hodge G, Greve C. Introduction: Public-private partnership in turbulent times. In: Greve C, Hodge G, editors. Rethinking Public-Private Partnerships: Strategies for Turbulent Times. London (UK): Routledge; 2013. p. 1-32.
39. Patanakul P. Managing large-scale IS/IT projects in the public sector: Problems and causes leading to poor performance. J High Technol Manag Res. 2014;25(1):21-35.
40. Patanakul P, Kwak YH, Zwikael O, Liu M. What impacts the performance of large-scale government projects? Int J Proj Manag. 2016;34(3):452-66.
41. Caldas C, Gupta A. Critical factors impacting the performance of mega-projects. Eng Constr Archit Manag. 2017;24(6):920-34.
42. Ashkanani S, Franzoi R. Gaps in megaproject management system literature: a systematic overview. Eng Constr Archit Manag. 2023;30(3):1300-18.
43. Levy DK, Comey J, Padilla S. In the face of gentrification: case studies of local efforts to mitigate displacement. J Affordable Housing Community Dev Law. 2007;16(3):238-315.
44. Shaw KS, Hagemans IW. Gentrification without displacement and the consequent loss of place: the effects of class transition on low-income

residents of secure housing in gentrifying areas. Int J Urban Reg Res. 2015;39(2):323-41.
45. Krings A, Schusler TM. Equity in sustainable development: community responses to environmental gentrification. Int J Soc Welfare. 2020;29(4):321-34.
46. Sturup S, Low N. Sustainable development and mega infrastructure: an overview of the issues. J Mega Infrastruct Sustain Dev. 2019;1(1):8-26.
47. Metaxas T. Mega projects and sustainable city image: evidence from Nuevo Norte Project of Madrid. Int J Urban Sustain Dev. 2024;16(1):108-28.
48. Valero L. The A-7 Highway: A study of Spain's Mediterranean Corridor. J Transp Econ Policy. 2017;51(2):175-93.
49. Tarazona Vento A. Mega-project meltdown: post-politics, neoliberal urban regeneration and Valencia's fiscal crisis. Urban Stud. 2017;54(1):68-84.
50. Yap EXY. The transnational assembling of Marina Bay, Singapore. Singap J Trop Geogr. 2013;34(3):390-406.
51. Akbari Ahmadabadi A, Heravi G. Risk assessment framework of PPP-megaprojects focusing on risk interaction and project success. Transp Res Part A Policy Pract. 2019;124:169-88.
52. Cui C, Liu Y, Hope A, Wang J. Review of studies on public-private partnerships (PPP) for infrastructure projects. Int J Proj Manag. 2018;36(5):773-94.
53. Little RG. The emerging role of public private partnerships in mega-project delivery. Public Works Manag Policy. 2011;16(3):240-9.
54. Leung BYP, Hui ECM. Evaluation approach on public-private partnership (PPP) urban redevelopments. Int J Strateg Prop Manag. 2005;9(1):1-16.
55. Fainstein SS. The city builders: property development in New York and London, 1980-2000. Lawrence (US): University Press of Kansas; 2001.
56. Grimsey D, Lewis M. Public private partnerships: the worldwide revolution in infrastructure provision and project finance. Cheltenham (UK): Edward Elgar; 2004.
57. Casady CB, Cepparulo A, Giuriato L. Public-private partnerships for low-carbon, climate-resilient infrastructure: insights from the literature. J Clean Prod. 2024;470:143338.
58. Anago JC. Public-Private Partnerships Infrastructure Financing Model: How theoretical perspectives help explain cost-overrun in some select projects. Afr J Bus Econ Dev. 2023;3(6):40-61.
59. Cabrera M, Suárez-Alemán A, Trujillo L. Public-private partnerships in Spanish Ports: Current status and future prospects. Util Policy. 2015;32:1-11.
60. Carpintero S, Helby Petersen O. Public-private partnerships (PPPs) in local services: risk-sharing and private delivery of water services in Spain. Local Gov Stud. 2016;42(6):958-79.
61. Di Mariano A, Franza A, Limatola V, Gens A, Bilotta E. Building response to Line 9 EPB tunnelling in Barcelona: A case study. In: Barla M, Di Donna A, Sterpi D, editors. Challenges and Innovations in Geomechanics. Cham (Switzerland): Springer; 2021. p. 126.

62. Salas JM. El porqué de la L9 de Metro de Barcelona [The reason for the Barcelona Metro's L9 line]. Vía Libre. 2019;3606:74-9. Spanish.
63. Comunidad de Madrid. La Comunidad de Madrid invertirá 653 millones en la construcción de la Ciudad de la Justicia [The Community of Madrid will invest 653 million in the construction of the City of Justice]. Madrid (Spain): Comunidad de Madrid; 2024. Spanish.
64. Boira JV, Berzi M, Vickerman R. Synergies between the Mediterranean Corridor and the Trans-Maghreb Multimodal Corridor. Available from: https://www.cetmo.org/wp-content/uploads/2021/05/20210208_RPCSRail_CMEDES_JVBoira_MBerzi_RV.pdf. Accessed on 7 Apr 2025.
65. García A, Gutiérrez JL, Vassallo JM. Towards low-carbon interurban road strategies: identifying hot spots of greenhouse gas emissions in the Spanish road network. Sustainability. 2018;10(11):3963.
66. Agu CR, Erameh NI. Nigeria's Republic at Sixty: Dreams, Travails, and Hopes. Washington (US): Academica Press; 2024.
67. Freeman RE. Strategic Management. Cambridge (UK): Cambridge University Press; 2010.
68. North DC. Institutional Change: A Framework Analysis. Available from: https://ideas.repec.org/p/wpa/wuwpeh/9412001.html. Accessed on 7 Apr 2025.
69. Osei-Kyei R, Chan APC, Ameyaw EE. A fuzzy synthetic evaluation analysis of operational management critical success factors for public-private partnership infrastructure projects. Benchmarking Int J. 2017;24(7):2092-112.
70. Hollweck T. Case study research design and methods. Can J Progr Eval. 2015;30(1):108-10.
71. Liyanage C, Villalba-Romero F. Measuring success of PPP transport projects: A cross-case analysis of toll roads. Transp Rev. 2015;35(2):140-61.
72. Eisenhardt KM. Building theories from case study research. Acad Manag Rev. 1989;14(4):532-50.
73. Flyvbjerg B. Five misunderstandings about case-study research. Qual Inq. 2006;12(2):219-45.
74. Stake RE. The art of case study research. Thousand Oaks (US): Sage Publications; 2008.
75. Abril C. The Madrid Nuevo Norte Project: A case study of urban regeneration in Spain. J Urban Regen Renew. 2020;13(2):1-16.
76. Distrito Castellana Norte. Madrid Nuevo Norte: A Transformative Project fo Madrid. Available from: https://www.comunidad.madrid/sites/default/files/doc/presidencia/dossier_general_de_proyecto.pdf. Accessed on 16 Apr 2025.
77. Spanish Ministry of Transport, Mobility and Urban Agenda. Transport and Mobility Improvements in Madrid Nuevo Norte. Available from: https://www.transportes.gob.es/el-ministerio/sala-de-prensa/noticias/vie-04042025-1239. Accessed on 7 Apr 2025.
78. Brandis García D, Newman P, Sipe N. Urban policies and large projects in central city areas: the example of Madrid. Urban Sci. 2021;5(2):42.

79. Madrid Nuevo Norte. Available from: https://creamadridnuevonorte.com/en/. Accessed on 7 Apr 2025.
80. Ayuntamiento de Madrid. General Urban Plan 1997 Modification for MNN development—Full documentation. Madrid (Spain): Ayuntamiento de Madrid; 2020.
81. Marraco M, Gómez V. Luz verde a Madrid Nuevo Norte: Rechazados los nueve recursos contra Madrid Nuevo Norte [Green light for Madrid Nuevo Norte: All nine appeals against Madrid Nuevo Norte rejected]. Madrid (Spain): Unidad Editorial Información General, S.L.U; 2023. Spanish.
82. Ortin A. Distrito Castellana Norte creará 121.000 empleos y saldrá a Bolsa [Castellana Norte District will create 121,000 jobs and go public]. Available from: https://cincodias.elpais.com/cincodias/2015/01/30/empresas/1422623004_417102.html. Accessed on 7 Apr 2025. Spanish.
83. Comunidad de Madrid. Prolongación del Paseo de la Castellana. Plan Parcial de Reforma Interior del APR 08.03 [Extension of Paseo de la Castellana. Partial Interior Renovation Plan for the 08/03 APR]. Available from: https://www.madrid.es/UnidadesDescentralizadas/UrbanismoyVivienda/Urbanismo/MemoGest2009/6OtrasActuaciones/ficheros/2prolongaciondelpaseo.pdf. Accessed on 7 Apr 2025. Spanish.
84. Rodríguez-Avial Llardent L, Irastorza Ruigómez L, Escauriaza Lázaro JL. En defensa de la prolongación de la Castellana: El proyecto que pudo cambiar el Norte de Madrid [In defense of the extension of Castellana: The project that could have changed the north of Madrid]. Investig Geogr Boletín Inst Geogr. 2024;114:455. Spanish.
85. Proquest news. Justice endorses Madrid Nuevo Norte project. Miami (US): ContentEngine LLC; 2023.
86. BREEAM. MNN BREEM urban preliminary certificate. Available from: https://breeam.es/madrid-nuevo-norte-pre-certificado-breeam-urbanismo/. Accessed on 16 Apr 2025.

How to cite this article:
Gallego JS, Metaxas T. Madrid Nuevo Norte Project: A Case Study about Mega-Project Public-Private Partnerships. J Sustain Res. 2025;7(2):e250031. https://doi.org/10.20900/jsr20250031