Public (transport) infrastructure

Morphing public space and public transport

MSc AUBS | Graduation studio Architectural Design Crossovers

Research plan

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Keywords

Madrid, public transport, public space, open city, assemblage theory, ANT

Introduction

The public transportation network of Madrid is an extensive system of (inter-city)buses, metro and commuter, regional and high-speed trains. The metro system alone consists of a vast network of 294 km of tunnel and 302 stations. Through these tunnels run 13 metro lines that serve 662,3 million passengers annually (Metro de Madrid, 2023). The public transport network connects the city, region, country and Europe to Spain's capital. Many of the stations on the network link together various modes of public transportation forming hubs. Especially the intermodal hubs handle large flows of people and have a high level of centrality. These hubs are places where many people come together. Over the last years these have also become commercial spaces with more than just the to-go convenience shops. However, the transport hubs are still very transient spaces that move people in and out as efficient as possible. Moreover they lack an openness and publicness that would allow these places to be more than mere facilitating infrastructure.

Problem statement

As we move to a future of sustainable mobility, public transit will be more important in everyday life. The car loses importance and thus will more people switch to public transportation for mid- and long-distance travel. Therefore, stations will have a greater role as public place in the everyday life op citizens. Currently transit stations are designed in a way that most effectively processes flows of people. It does not function as civic space.

Moreover, the character of public transport nodes is shifting. Transport hubs are nodes in the public transport infrastructure which in turn is part of a large infrastructural assemblage (Graham, 2010). Graham (2010) describes infrastructures as dynamic processes instead of static constructs. The assemblage is constantly restructured and rebalanced, hereby also changing how transportation nodes fall into this assemblage. For example, the expansion of high-speed rail infrastructure exacerbates the centralization of a limited number of places and increases focus on transportation hubs. This can be clearly seen in the high-speed service in Spain in Figure 1. The structure of the infrastructure facilitates the urban and is most intense in the urban landscape (Graham & Marvin, 2001, p. 13). Therefore, the city gets improved connections to other cities at the cost of connectivity to smaller towns and villages. This creates a positive feedback loop for the cities that do get new connections, because they will be allowed to grow even further.

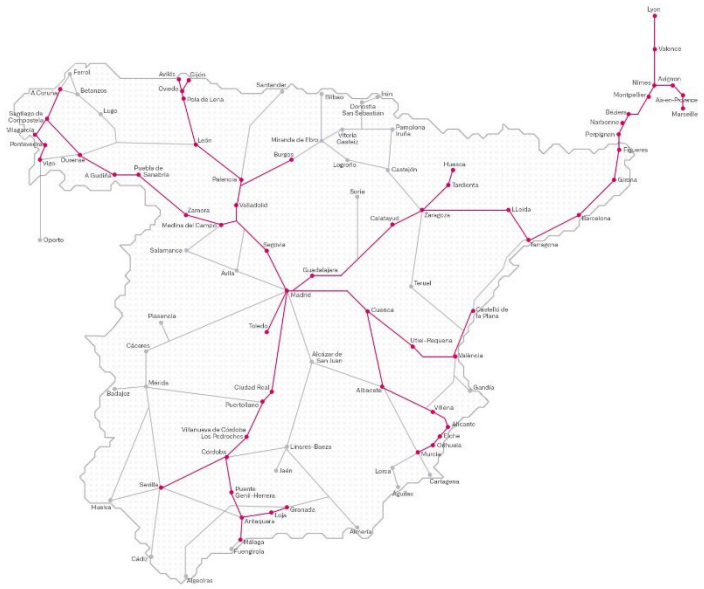

Figure 1: Long-distance train network with high-speed lines in purple (Renfe, 2024).

Lastly, public transportation is a transient process constantly reconfiguring itself. Angélil & Klingmann (1999, p. 14) describe the city as a system that is constantly in motion and is based on fluid conditions. This can be translated to the public transport of the city. Changing dynamics (e.g. demographic shifts, migration flows and new modes of transportation) shift the intensity and nature of public transport stations. Stations are in essence never finished and constantly reconfiguring themselves to new circumstances. Moreover the boundaries between architecture, landscape and infrastructure are blurring challenging the concept of architecture as a seperate entity (Angélil & Klingmann, 1999). However, this constant reconfiguration and blurred relation between architecture, infrastructure and landscape is insufficiently addressed in stations.

Relevance

Public transportation has an important public function. It is a mode of transportation that provides mobility to all citizens The intermodal transportation hubs of Madrid already have a high degree of publicness, since the stations are managed by the Metro company, which is owned by the region of Madrid, or the railway operator Adif, which is controlled by the Spanish national government. However, the physical spaces lack the openness that make it into an accessible and navigable space. This shortcoming prevents the public transportation infrastructure from becoming a more integrated part of the public space in the city.

Research questions

How can the assemblage of the public transport of Madrid be uncovered and inform the reconfiguration of public transport stations to achieve an open city?

Theoretical framework

The research will combine the theories of assemblage thinking, which originates from the work of Gilles Deleuze and Félix Guattari, and actor network theory (ANT), developed by Bruno Latour to analyse the public transportation infrastructure of Madrid. While the two theories have their own extensive discourse, they have great similarities. Müller & Schurr (2016) describe ANT and assemblages both as an analysis of actions that emerge from relations between initially disparate elements. While ANT is more grounded in empirical research and is thus more easily applicable it also less flexible than assemblage theory which is less tangible, however more open to unexpected changes (ibid).

Graham (2010) applies the assemblage theory on infrastructures. He argues that infrastructure networks are not stable, permanent structures, but rather part of a constant process of assembly. He shows that urban infrastructures should be considered as complex assemblages that link together human and non-human relations. Corresponding with this, Angélil & Klingmann (1999, p. 14) describe the city as a system that is constantly in motion and is based on fluid conditions. Graham & Marvin (2001, p. 13) write about the global connections and local (dis)connections. They argue that the networks of infrastructure facilitate the urban and that networked infrastructures are most intense in the urban landscape. This lays bare the complexity of the city and constant reconfiguration its assemblage of infrastructures.

The work of Richard Sennett resonates with this conception of the city. In his essay he argues for a open city as opposed to a closed city. The open system rejects equilibrium and integration and embraces complexity and an evolutionary urban development (Sennett, 2006). Later he further elaborates on this theory by providing five open forms that foster the open city (Sennett, 2018, p. 205). Among these open forms is the centre as synchronous space. With the need for synchronous space Sennett describes places where multiple activities happen simultaneously (ibid, p. 206). Sennett also argues for porosity, meaning a border that acts as a membrane. These are places where material or immaterial edges in the city becomes a place of interaction (ibid, p. 219). This can be related to Angélil & Klingmann's (1999) hybrid morphologies that is used to describe the fading boundaries of architecture, infrastructure and landscape. This blurring boundary can be a place of porosity. Furthermore Sennett (ibid, p. 227) argues for incomplete form of the city. This involves buildings and cities that allow for change and reject the notion of something that is at one point in time complete. He argues for shells and type-forms that allow different interpretations and which can be build upon over time. This again strongly resonates with Angélil & Klingmann's (1999, p. 14) idea of the city as constantly evolving and based on changing conditions.

Figure 2 illustrates the relations that will be made between the different literature. ANT and assemblage theory and related literature are used to understand the public transport infrastructures of Madrid and how the interact with the transport stations. This will inform the implementation of the concept of the open city onto public transport stations that will be supported by related literature.

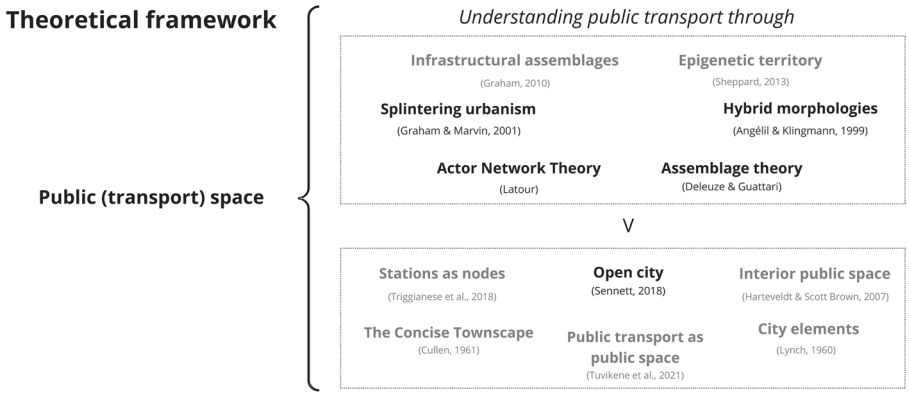

Figure 2: Theoretical framework

Methodological framework

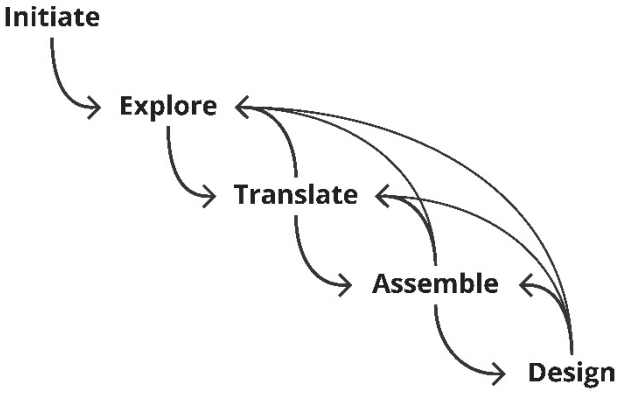

Figure 3: Research and design strategy

The methodology will involve a back and forth between different methods and steps in the research and design process. Figure 3 illustrates the constant feedback process between different phases of the research and design process. The project is *initiated* with a fascination. This leads to an *exploration* phase of literature review and the formation of a research question. After this follows a *translation* of the research question into operational questions, which forms the input for the methodological framework. The methodological framework outlines the methods that will be used to collect information. This can be seen in Figure 4. Consequently this information is *assembled* to cross-relate and interpret the data. Finally this information will be the basis for the *design* proposal.

As mentioned the process will not be linear, but cyclical. The different phases of the project can be followed multiple times. For example, findings from the research conducted can expand the theoretical framework and lead to an adapted methodology. Moreover, issues that arise in the design phase can lead to new research angles.

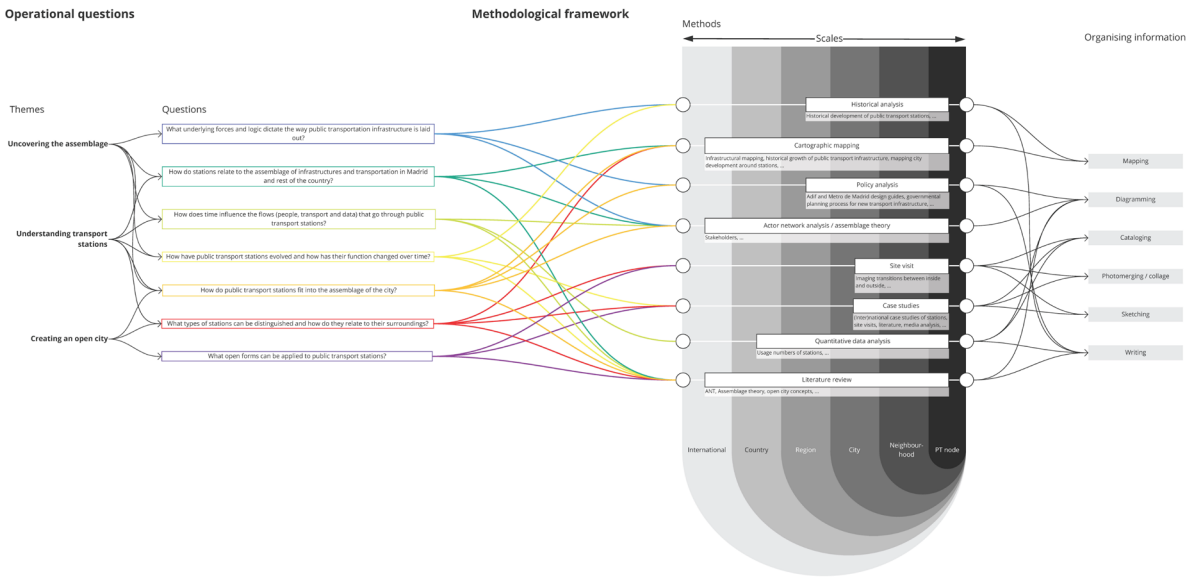

Figure 4: Methodological framework

Figure 4 outlines the methodological framework. From the main research question arise three themes: uncovering the assemblage, understanding transport stations, and creating an open city. These themes direct several operational questions that will be answered using a range of methods.

Operational questions

What underlying forces and logic dictate the way public transportation infrastructure is laid out?

How do stations relate to the assemblage of infrastructures and transportation in Madrid and rest of the country?

How does time influence the flows (people, transport and data) that go through public transport stations?

How have public transport stations evolved and how has their function changed over time?

How do public transport stations fit into the assemblage of the city?

What types of stations can be distinguished and how do they relate to their surroundings?

What open forms can be applied to public transport stations?

Methods

The basis of the methods is a literature review. This informs the points of investigation for the other methods. Literature that elaborates on the concepts on infrastructure, assemblages and ANT will be consulted to get a better theoretical understanding of how stations fit into the assemblage of the city. Furthermore, the concept of the open city and related design principles will be investigated. Finally, new literature that arises during the process of research and design will be taken into consideration.

The actor network analysis will be used to get a better understanding of the (im)material relations of public transport stations throughout different contextual scales. Moreover ANT will give insight into the future development of public transport stations.

The research into various case studies is aimed at acquiring interesting examples of public transport stations that align with the principles of the open city. Case studies will be investigated through digital research methods such as Google Streetview, QGIS mapping, but also site visits to stations in the Netherlands and in Spain.

Policy analysis will be used to get an understanding of the forces that dictate the way public transport infrastructure is laid out. This will include policy's of the infrastructure management companies, Adif and Metro de Madrid, as well as government documents that outline the vision of public transportation on the scale of the city, region and country.

A historical analysis of public transportation is employed to understand the development of the transportation system throughout time. This will give insight into how and why transportation infrastructure is laid out as it is today.

The information acquired through the different methods will be organised in different ways to help interpret the data and use the outcome in the design project. This will be done through mapping, cataloguing, writing, sketching, diagramming and photo merging/collages.

Preliminary conclusions

The research progress and projection can be seen in the research diagram in Figure 5. The initial investigation of the public transportation has directed the research into larger multimodal transport stations. These stations have a high degree of connectivity and are part of a large assemblage. At the same time these are often very large structures that have grown a lot over time. These large structures are an interesting site of investigation, because they have the potential to perform very well as an open system. However, their growth over time, physical size in the urban context and narrow focus on mere transit of people makes these structures perform poorly.

Alternatively, smaller public transit stations have their own challenges that could be interesting to investigate. These can be stations that have a main purpose or are designed to handle specific traffic. This can be seen at stations such as Santiago Bernabéu that have to handle large crowds at specific times of the

day. Commuter stations in residential neighbourhoods also have their own logic and dynamic which determines the flows of the stations and how it functions in its context.

Sites of inquiry

- Sol is a large interchange station where many people stay underground without ever seeing the city aboveground. Even though it is in the heart of the city centre with lots of activity aboveground.
- Single line neighbourhood stations are places where people come together that live or work in the area.
- Lago is a leisure station mainly bringing people to the Casa de Campo park and public pools.
- The South bus station is a place where international travellers arrive in the city and connect to the city's transportation network through cercanías and metro.
- Santiago Bernabéu station is designed to handle large flows of people in a short period of times before and after events in the football stadium.
- Moncloa is a large completely underground station with two metro lines and a large bus station.
- Atocha stations is a very large station that serves as a large hub for cercanias and high speed trains with a connection to the metro system.

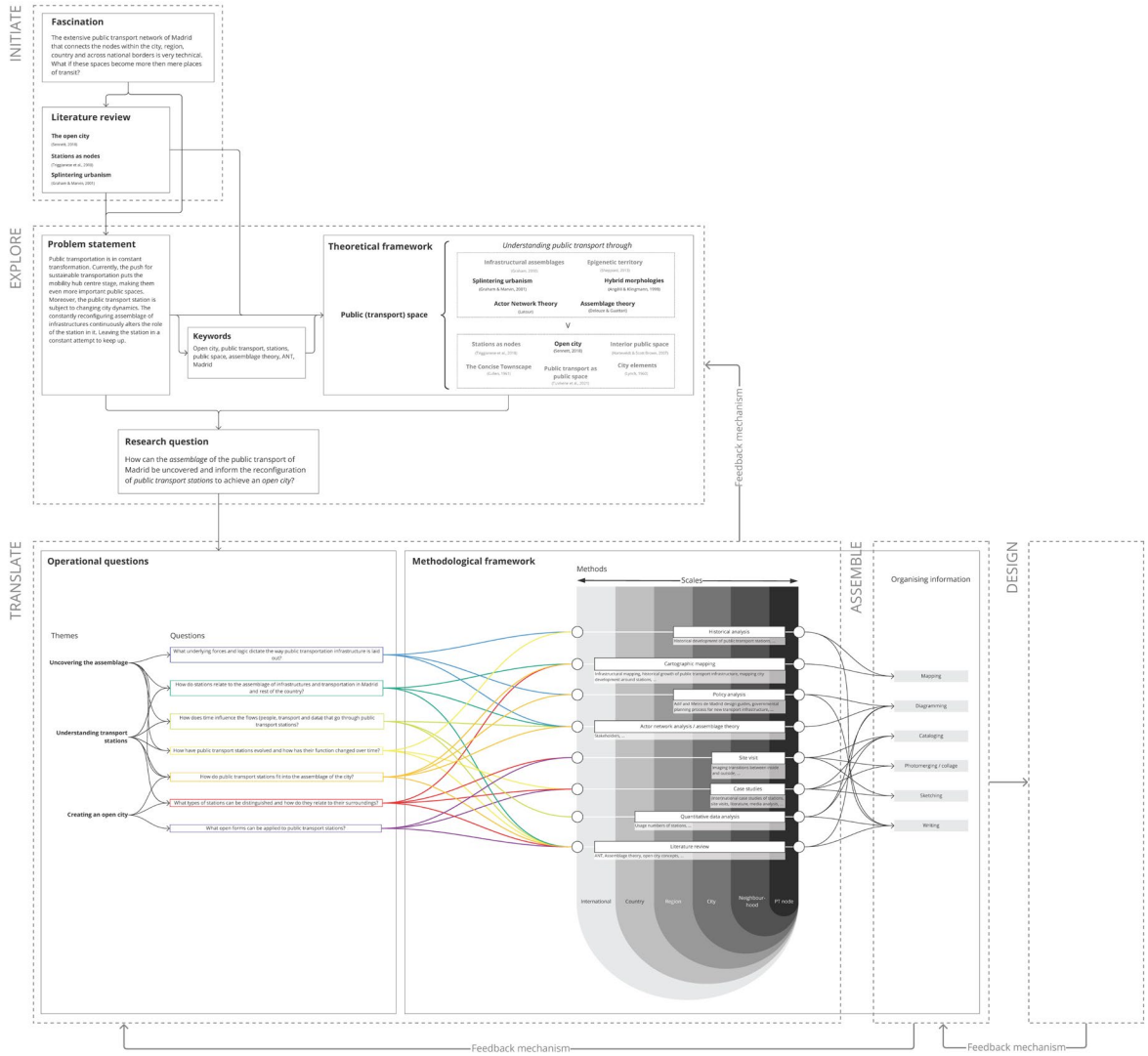

Figure 5: Research diagram

Reflection

The first part of the graduation has been tentative. Being 'thrown in at the deep end' of the metropole of Madrid to find a graduation topic is exciting but challenging. The wide range of possible leads in this large city for a research and design project make it difficult to work towards a concrete proposal. I have noticed that it was at times difficult for me to deal with the uncertainties of the formation of a topic. Sometimes causing me to wait for more information or feeling the need to first find out more about something else before starting to read literature for example. Looking back, I have noticed that it is most important to just start and keep exposing yourself to new insights in order to progress, even if this is sometimes hard.

My fascination with the public transportation in the city, especially the metro, has guided my initial research and formation of a topic. This has helped me to lay out a direction for the research, but may have also caused a bit of tunnel vision. Moreover, because I have lived in Madrid for 5 months I do no longer have an outsiders view on the public transport system and therefore may not notice the exceptions or peculiarities as easily anymore. The place where I lived and the university I studied at have largely determined my own view of the public transport system, however this is just a small part of the whole network.

The rest of my graduation I want to try to leverage what I already know about the city, but be really aware of what presumptions this may entail. This way I will attempt to not miss crucial details of the design process. Moreover I will aim to prevent myself from getting into an impasse of inaction by always exploring different options and looking at the project from different angles.

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INITIATE

Fascination

The extensive public transport network of Madrid that connects the nodes within the city, region, country and across national borders is very technical. What if these spaces become more then mere places of transit?

Literature review

The open city
(Sennett, 2018)

Stations as nodes
(Trigglanese et al., 2018)

Splintering urbanism
(Graham & Marvin, 2001)

EXPLORE

Problem statement

Public transportation is in constant transformation. Currently, the push for sustainable transportation puts the mobility hub centre stage, making them even more important public spaces. Moreover, the public transport station is subject to changing city dynamics. The constantly reconfiguring assemblage of infrastructures continuously alters the role of the station in it. Leaving the station in a constant attempt to keep up.

Keywords

Open city, public transport, stations, public space, assemblage theory, ANT, Madrid

Theoretical framework

Public (transport) space

Understanding public transport through

- Infrastructural assemblages (Graham, 2010)
- Epigenetic territory (Sheppard, 2013)
- **Splintering urbanism** (Graham & Marvin, 2001)
- **Hybrid morphologies** (Angélil & Klingmann, 1999)
- **Actor Network Theory** (Latour)
- **Assemblage theory** (Deleuze & Guattari)

V

- Stations as nodes (Trigglanese et al., 2018)
- **Open city** (Sennett, 2018)
- Interior public space (Harteveldt & Scott Brown, 2007)
- The Concise Townscape (Cullen, 1961)
- **Public transport as public space** (Tuvikene et al., 2021)
- City elements (Lynch, 1960)

Research question

How can the *assemblage* of the public transport of Madrid be uncovered and inform the reconfiguration of *public transport stations* to achieve an *open city*?

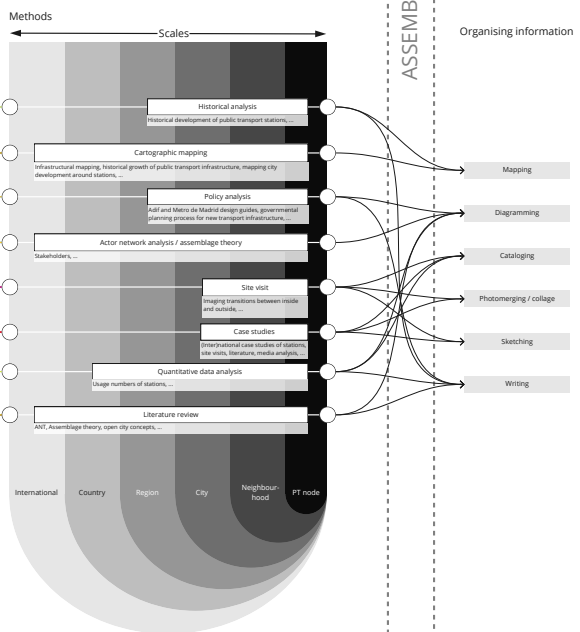
Feedback mechanism

TRANSLATE

Operational questions

Themes	Questions
Uncovering the assemblage	What underlying forces and logic dictate the way public transportation infrastructure is laid out?
	How do stations relate to the assemblage of infrastructures and transportation in Madrid and rest of the country?
Understanding transport stations	How does time influence the flows (people, transport and data) that go through public transport stations?
	How have public transport stations evolved and how has their function changed over time?
	How do public transport stations fit into the assemblage of the city?
Creating an open city	What types of stations can be distinguished and how do they relate to their surroundings?
	What open forms can be applied to public transport stations?

Methodological framework



ASSEMBLE

Organising information

- Mapping
- Diagramming
- Cataloging
- Photomerging / collage
- Sketching
- Writing

DESIGN

Feedback mechanism

Feedback mechanism