INTERRELATED HUB

MIGRATION OF MOBILITY HUB AS PUBLIC SPACE

Wenshun Cui - 5049121
Complex Projects Graduation Studio
MSc Architecture, TU Delft
January 2021
Supervisors: Dr. M. Triggianese & E. Blom

KEY WORDS:

Leftover space; Infrastructure; Mobility hub; Migration of ideas; Rotterdam South

ABSTRACT

Migration of ideas means a movement of thoughts, methods, theories, or other non-physical concepts, transfer from the original environment to a new environment. Since the ideas do not originate from the traditional environments, this migration process can often bring new perspectives for solving the local problems.

Nowadays, with the rapid development of cities, more and more infrastructures such as highways, railways, are built to connect different districts. These infrastructures are usually built elevated from the ground and create a large amount of leftover space underneath. Various problems such as quality space, divisions in urban planning and safety issues will arise because of these leftover spaces. However, due to the high accessibility, these spaces could have opportunities to be freely used by citizens if proper activities could be introduced into these areas.

Migrating through time, as a part of the transportation system, stations had gradually integrated with many public functions and become mobility hubs, which can provide opportunities for all kinds of activities taking place around them. Therefore, as the "migrated idea", the mobility hub could open a new perspective to solve the leftover space problems caused by infrastructure. Focusing on ths specific leftover space and mobility hub, this thesis is trying to answer the question: "How to use a mobility hub to activate the leftover spaces caused by infrastructures in public places? "

In this study, Rotterdam South was selected as the site for the new mobility hub. As one of the main development areas of Rotterdam, it has the leftover spaces problem caused by the Noord-Zuidlijn metro line. By comparing the research and design, this thesis can provide a new perspective for rethinking the characteristics of infrastructure, leftover space, and mobility hub. It could further prevent the land-waste in current and future urban planning.

1. INTRODUCTION

How to use a mobility hub to activate the leftover spaces caused by infrastructures in public places?

1.1 Leftover space

Due to various reasons such as infrastructure, the modern movement in architectural design, the privatization of public space, the changing land use, etc, many unused and undefined spaces began to occur in the cities, especially from the 20th century. (Trancik, 1986,4-20) They usually took up a large amount of space in cities but didn't have many functions. Ela defined these spaces as "leftover space", which is not possessed by people and become unused, or underused space that has low appearances due to the lack of maintenance. (Aral, 2009, 18) Therefore, these spaces would usually lead to various problems, such as lack of spatial quality, disconnection with surroundings, create divisions in the city planning, and safety issues for local residences. (Trancik, 1986, Rovers, 2016).

However, although leftover spaces could cause various problems, these spaces have the potential to contribute to the public realm. Whyte believed that "where there is waste, there is opportunity". (Whyte, 1968, 266) In his opinion, these leftover spaces are close to the city and have high accessibility, so they have a high intensity for people to use them. (Whyte, 1968, 163) In this case, the leftover spaces could be used as the place for unanticipated actions and further contribute to the public realm when allowing numerous experiences, encounters, and communications for different users. (Aral, 2009, 73)

Fig 1: Vast empty parking lots in Vastra Frolunda, Sweden (Trancik, 1986)

Despite many articles having mentioned the potential public value of leftover spaces, the part of how to activate the leftover spaces caused by infrastructure is still lacking. Ela further referred the leftover spaces under elevated vehicular routes are usually "not accessible, neither admirable nor preferable, thus they are not already being used in positive ways in cities." (Aral, 2009, 117) However, these spaces are most likely to cause problems in low quality, a division inside the city, and safety issues. Therefore, to further explore this issue, this article will focus on the leftover spaces caused by infrastructures and further research on how to activate this specific type of leftover spaces in public spaces.

1.2 Mobility hub

To activate these leftover spaces, the major issue is introducing appropriate activities, in this way, people could be attracted to those spaces and allow various events to happen. (Aral, 2009, 85) Mobility hub could become one of the solutions to this. Both station and infrastructures are a part of transportation system. With more infrastructures are constructed, more stations are needed. Migrated through time, these stations had gradually integrated with many public functions and become mobility hubs which allow different people to meet, and various activities to happen. (Triggianese, Cavallo, Baron and Kuijper, 2018) This makes it possible for the mobility hub to activate the leftover spaces caused by the mobility itself.

1.3. Relationship with Rotterdam

In the 21st century, the design of mobility hubs became one of the main focuses of the Dutch government. They decided to improve many important stations in Randstad. Rotterdam Central Station was one of the main projects. (Triggianese, Cavallo, Baron and Kuijper, 2018, 91) Furthermore, with the rise of the 'smart' station concept', AMS Institute conducted a large amount of research on 'Smart Urban Mobiliy' with aim of further improving mobility hubs in the Netherlands. (Triggianese, Cavallo, Baron and Kuijper, 2018, 22) Therefore, mobility hubs in the Netherlands had attracted high attention and became essential public spaces in city planning. However, the problem of leftover space caused by infrastructure could also be found in Rotterdam. Although the metro lines in Rotterdam North Center are currently located underground, there are some elevated infrastructures located at the Rotterdam South. It will become a problem for future development in Rotterdam South. Therefore, in this study, Rotterdam South will be selected as the research site to test the ability to use mobility hub to activate leftover space.

1.4. Research Methodology

The research can be divided into three main sections, researching on how to activate leftover space caused by infrastructure by searching on different projects around the world, searching on how stations had gradually integrated with public functions and became mobility hubs, and case studies about how the mobility hub could be used for regenerating leftover spaces caused by infrastructure. From these researches, a more thorough understanding of these leftover spaces could be obtained, and a more appropriate design which combining the leftover space and mobility hub could be expected to have the following qualities: suitable for the characteristics of the leftover spaces under the elevated infrastructure, attractive to the users to gather and use this new type of space, and a positive impact to the city and surroundings.

Fig 2: Syracuse, New York. Leftover spaces at the edge of the freeway, 1983. (Trancik, 1986, 5)

Fig 3: Retail shops underneath the railway platform in Rotterdam Central Station ("Rotterdam Central Station / West 8 + Benthem Crouwel Architects + MVSA Architects", 2021)

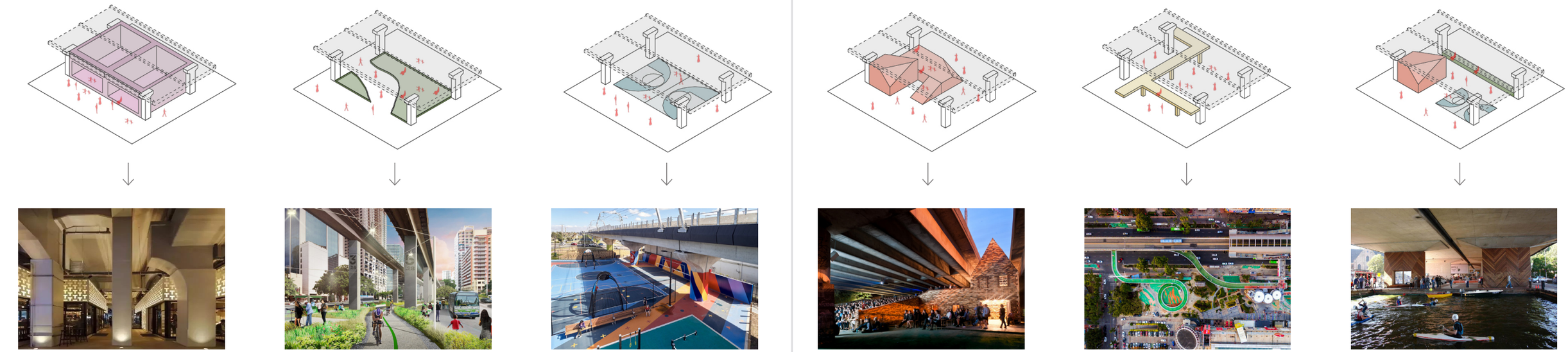


Fig 4: Typology of activiting leftover space under the infrastructure (made by author, 2020)

2. ACTIVATING LEFTOVER SPACE

To activate leftover space, the major task is to introduce different activities into them and reconnect these spaces back to the city. During this process, designers need to consider the identity of the space itself and the conditions of the surrounding environment. (Aral, 2009) It could also work for the leftover spaces caused by infrastructure. Although little literature had discussed how to activate these spaces, some designers had realized that these spaces could have high social value. In recent years, many projects around the world are aiming to activate the leftover spaces into public spaces. After researching a large number of projects, the activities that can be introduced into these leftover spaces can be divided into six categories: commercial function, greenery and landscape, playground, architecture furnishing, another infrastructure layer, and mix-use functions.

The first type is introducing commercial functions into these leftover spaces. Nakameguro koukashita in Tokyo is a good example. By introducing various commercial functions like book stores and restaurants, it created a commercial pedestrian under the infrastructure. (THE GATE. 2021) The underline park in Miami USA used greenery to activate the space. It achieved a continuous landscape park underneath the elevated infrastructure and connected different exercise areas together. (The underline. 2021) Skyrail community designed by March Studio was finished in Melbourne, Australia, in 2018. In this project, various playgrounds were designed underneath and around the elevated railway and created a lively public space for the local residents. (March. Studio, 2018) “Folly for a flyover” is an architectural furnishing in London. The pointed roof indicated there are some activities happen underneath so it could attract people to explore the space under the infrastructure. (Frearson, 2011) Xiamen Bicycle Skyway is another way to activate the leftover space. By adding a new layer of mobility, it solves the leftover space and the pragmatic transport-related problem at the same time. (Dissing + weitling, 2021) The final type is a mixed-use of the first five functions. In 2013, the A8erna project was completed in Koog aan de Zaan, Netherlands. It activated the leftover space caused by infrastructure into a mix-use public space while re-connecting the spaces divided by the highway. (Marmorstein & Nielsen, 2011)

Although the activities used in these projects are different, they share some common rules. Firstly, in these designs, they all migrate various new functions into these leftover spaces. Secondly, these activities are all selected according to the local condition and fulfill local requirements. Thirdly, these spaces all have high inclusivity and accessibility that could be accessed by people of all ages. By following these rules, they succeeded in turning these low-qualities space into a place that people could pass frequently and also give them reasons to stay.

3. MIGRATION OF MOBILITY HUB AS PUBLIC SPACE

3.1 Migration of ideas

Migration of ideas means a movement of thoughts, methods, theories, or other non-physical concepts that break a certain boundary and transfer into a new environment. As a consequence, when the movements are finished, these ideas often cause a certain impact on their surroundings and also will be influenced by the new environment at the same time. Therefore, things always change after the migration. In addition, because the ideas are not derived from traditional environments, the migration of ideas could usually lead to new perspectives for solving the local problem.

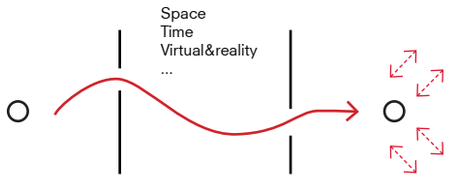


Fig 5: Illustration of migration of ideas (made by author, 2020)

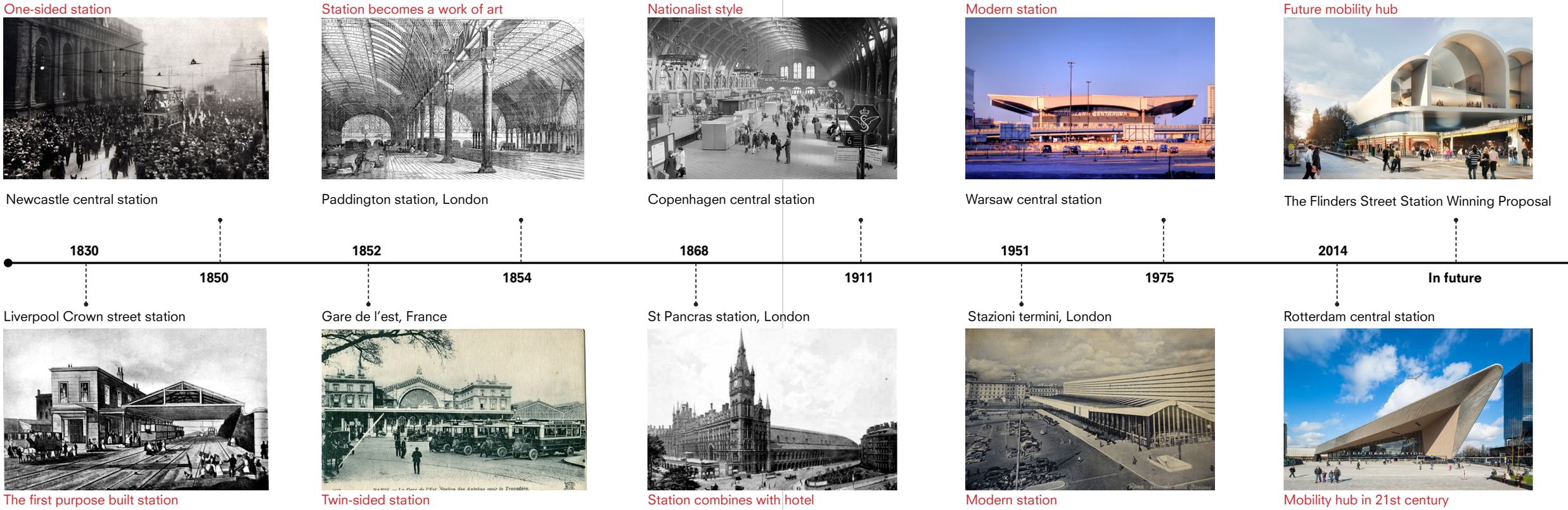


Fig 6: Migration of mobility hub as public space

3.2 Migration of mobility hub as public space

Railway station could be seen as the beginning of the mobility hub. Since it was constructed, it provided opportunities for other activities surrounding it. (Matthias, D. 2014) The trains in the 19th century and also early 20th century were mainly used steam engines, and the range of that was around 200 miles. Therefore, each station needed a service center to refuel, and provide shelters for workers. (Richards and MacKenzie 1988, 121) The first purpose-built station was Liverpool Crown Street station, which opened in 1830. The building was a two-story classical-style townhouse but it already had the basic elements of the station: the platforms for the trains, a reception and waiting area for goods and passengers, the necessary offices for the question about tickets, the dispensing of information, the accommodation of staff, and the relief of various human needs and functions. (Richards and MacKenzie 1988, 19) The earliest form of the station was the one-sided station, that both the arrival and departure of the tourists happened at the same side, one of the great examples is the Newcastle central station(1850). However, around the middle of the 19th century, the twin-sided station gradually became a common type. For instance, the Gare de l'est (1852) in France. It changed the original orientation into a head-type station that a frontage building as the main entrance connecting various platforms. From then on, the station had gradually been seen as the gate of the city. Subsequently, with the development of technology, the scale of the railway station was getting larger and larger. In the Paddington station (1854), the single span of the station had reached 238 feet. The iron roofs, the pillars as well as the detailed ornaments had made the station not only an architecture but also a work of art. (Ruskin, 2012) The station itself had become an attraction that could express the culture of the city, even the country. Therefore, many nationalist styles were springing up. The Plaza de Armas Station, Serville (1901), the Amsterdam Central Station, Netherlands (1889), and Copenhagen Central Station, Denmark all had their unique styles.

With further development of the railway station, more and more functions became to be added to or around them. The hotel was the first function that combined with the station, in St Pancras station, the frontage was provided by the Midland Grand Hotel. More budget had been given to the station and allowed it to become one of the landmarks in London. The business around the station also benefited from it. During this period, stops of 17 to 19 minutes were common, so the travelers could take a walk around the station for a cup of drink while stretching their legs. (Richards and MacKenzie 1988, 122)

Around the middle of the 20th century, both the functions and appearance of the station had started to change. Firstly, vehicles were invented and been mass-produced. It gradually became one of the most important mobility for people's daily life. The railway station began to include more types of mobilities like car, bus, tram, etc. It had become a mobility hub that needed to allow transition between different modes. Secondly, due to the architectural modernism movement, the appearance of the station had also changed. New materials like timber and concrete began to be used in the design. Modern stations like Stazioni termini in Rome (1951) and Warsaw central station (1975) replaced the nationalist style which was flourished in the early 19th century. (Richards and MacKenzie 1988)

3.3 Current mobility hub

Currently, the mobility hub had become more complex. Near the end of the 20th century, the high-speed train began to occur in Europe and largely shorten the travel time between different cities. (Kuijper, Cavallo, de Boer, van der Wal, 2019). New modes of travel, such as light rail and metro lines, made mobility hubs more complicated as transition points. With the pivotal location, the hub becomes a destination where people all gathering and passing daily, especially for the central station. (Triggianese, Cavallo, Baron and Kuijper, 2018, 17) The hub also leads to very high expectations for the development of surrounding areas. (Kheyroddin et al., 2014) Thus, more functions like restaurants, shops, and office buildings, even residential blocks had been combined with the station and allow this mobility hub to become one of the most important public space for the city. For instance, the Rotterdam Central Station has various commercial functions

under the railway platform, the Breda Central station combines residential blocks and office with mobility function and the Flinders Street Station also has the theatre and gallery function.

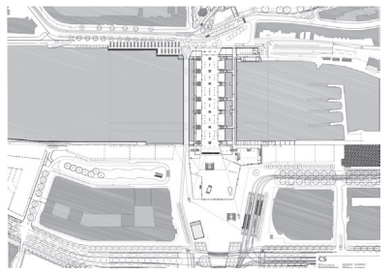
3.4 Mobility hub and leftover space

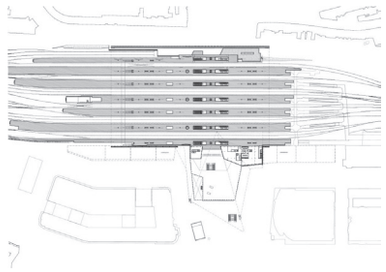
There are mainly three reasons why the mobility hub could contribute to the leftover spaces caused by infrastructure. Firstly, the mobility hub could gather a large number of people. Over time, the mobility hub has become both an attraction and a destination for residents and tourists. (Triggianese, Cavallo, Baron and Kuijper, 2018) A large number of people flow through the hub every day and that provides more opportunities for the leftover space to be reused.

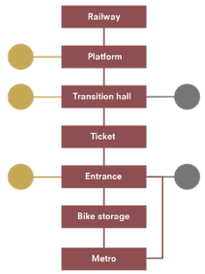
Secondly, the mobility hub usually creates a clear and strict route and has a guiding effect on the flow of people. To activate these leftover spaces, inclusivity and accessibility are quite important. However, due to the low quality and lacking of functions, people usually wouldn't access these spaces. (Aral, 2009) Mobility hub could improve this condition. According to the study of Zemp et all, the mobility hub can link catchment are and transport networks while supporting transfer between different modes of transport. (Zemp, 2011) Therefore, the route inside these hubs are usually been set clearly and couldn't be changed. By designing the internal route of the mobility hub, the designer has opportunities to guide people to the leftover spaces and allow more activities to happen there.

Thirdly, the mobility hub usually combines various functions and also could contribute to the surroundings. (Chiba and Ito, 2001) Through the migration, the mobility hub not only functions as a transition place but also allows facilities and activities which are not related to mobility, such as shops, restaurants, offices, etc to occur. (Triggianese, Cavallo, Baron and Kuijper, 2018) These functions can be introduced into the leftover space and further make it a public space with various uses.

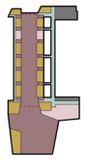
Rotterdam Central Station,
Rotterdam, Netherlands,
Crouwel Architects + MVSA Architects
Area: 46000m2

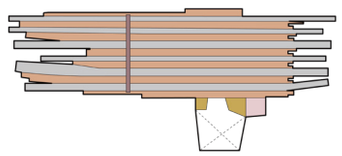


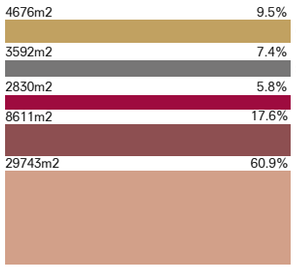




Legenda:
- Commercial
- Service/Facility
- Circulation
- Transition hall
- Platform







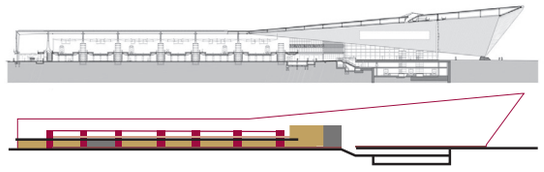
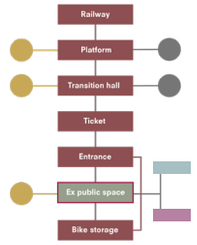
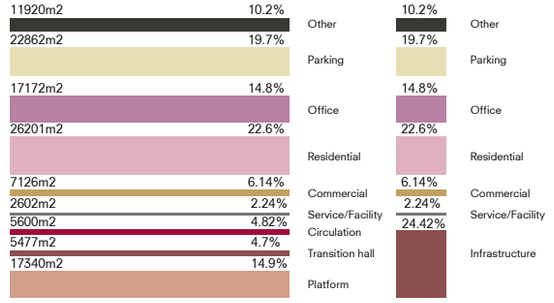
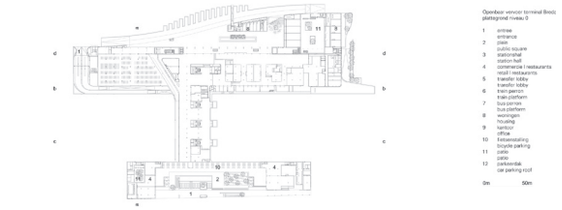


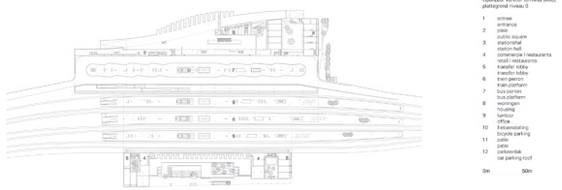
Fig 7: Analysis of Rotterdam Central Station



Legenda:
- Other
- Parking
- Office
- Residential
- Commercial
- Service/Facility
- Circulation
- Transition hall
- Platform
- Exterior public space







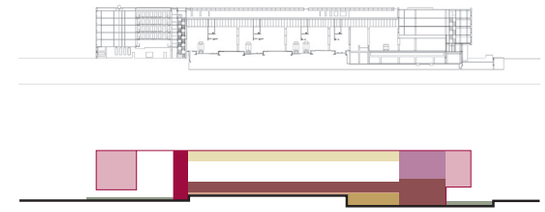
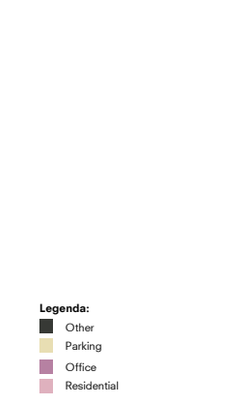


Fig 8: Analysis of Breda Central Station

The Flinders Street Station Winning Proposal,
Melbourne, Australia,
HASSELL + Herzog & de Meuron
Area: 140,000m2



Legenda:
- Other
- Parking
- Office
- Residential
- Commercial
- Service/Facility
- Circulation
- Transition hall
- Platform
- Exterior public space

Deck Level Circulation

Fig 9: Analysis of the Flinders Street Station

4. CASE STUDY
UNDER THE CHUO LINE RAILWAY TRACK
HIGASHI KOGANEI STATION, TOKYO, JAPAN

To have a better understanding of the relationship between the mobility hub and the leftover space, the "Chuo line community and mobility station" project was chosen as the case study. This research has mainly two focuses. The first one is what the functions have been introduced into these spaces. The second focus is what made this project succeed in renovating these leftover spaces.

4.1. Under the Chuo Line Railway Track

There is a distance of 13.1 km between Japan Railways Chuo Line Mitaka Station and Tachikawa Station. However, 18 crosses were located there in this short interval which led to frequent traffic jams there and also affects the integration of the entire region. (Rewrite Development, 2016) To solve this problem, the Tokyo Metropolitan Government decided to construct an elevated infrastructure here, which was completed in November 2010. However, in this way, although the problem of the traffic jams was solved, 70000m2 unused leftover spaces were created under the new railway. (JR East Lifestyle Business Development Headquarters, 2017)

To activate these spaces, two intervention were proposed around Higashi Koganei station, namely Chuo Line Community Station on the east side of the Higashi Koganei Station and the Chuo Line Mobility Station which on the west side of the station. Both of them has various functions, the mobility station includes a cafe, bicycle storage, and a bicycle renting office, and the community station was made by restaurants, retail space, and a community square. Linked by the Higashi Koganei station, they created a continuous community under the infrastructure and brought a new life for the leftover space. (Rewrite Development, 2016)

Fig 10: View to the Chuo Line Community Station

Fig 11: Inside view of the pedestrian under the Chuo Line Railway

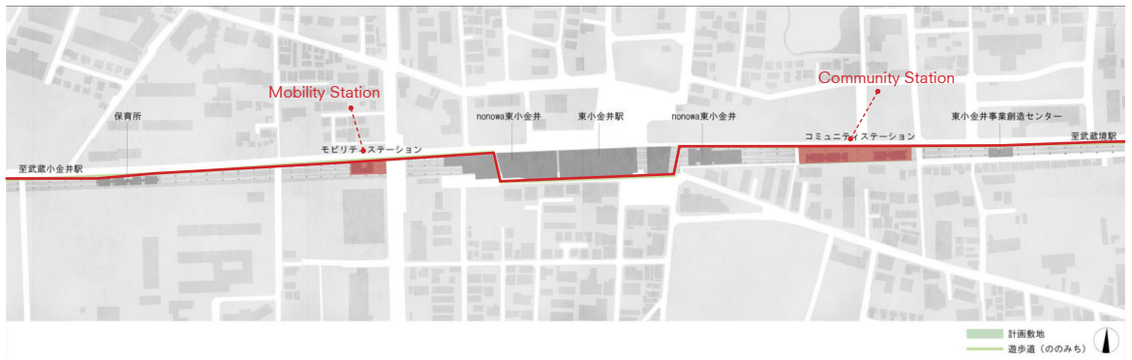


Fig 12: Contious pedestrain linking the leftover space with Higashi Kogane station

4.2 Three reasons for the successful renovation

There are three main reasons for the success of this project. Firstly, the new functions meet the requirements of the local residents. In this project, the main fundings were from the local community instead of public funds. (Rewrite Development, 2016) Therefore, the need of residents had been thoroughly considered during the design process.

Second, the design of the project used the special site condition caused by the infrastructure. In this project, the beam and column supporting system creates an order for the spaces under the infrastructure. The designer didn't see it as a challenge, but as an opportunity, and further designed a continuous pedestrian path along with it. In this way, the columns and beams created a concrete-tree-lined path under the infrastructure.

Thirdly, the success of this project is highly related to Higashi Koganei station. First of all, Higashikoganei Station has contributed to the commercial value of the surrounding area. The station has the ability to gather a large number of people, and more people means the higher commercial value of these leftover spaces could gain. And also the station allows designers to introduce the bicycle storage and renting functions to the leftover spaces. Finally, together with the order of the pillars and beams beneath the infrastructure, it provides a link that connects the different leftover spaces and creates a continuous lane with different experiences for visitors and residents.

Except for these three reasons, the architectural languages like the fake door and the container structure of the shops also make the project more attractive. In this way, a lively public space was achieved under the Chuo line railway infrastructure.

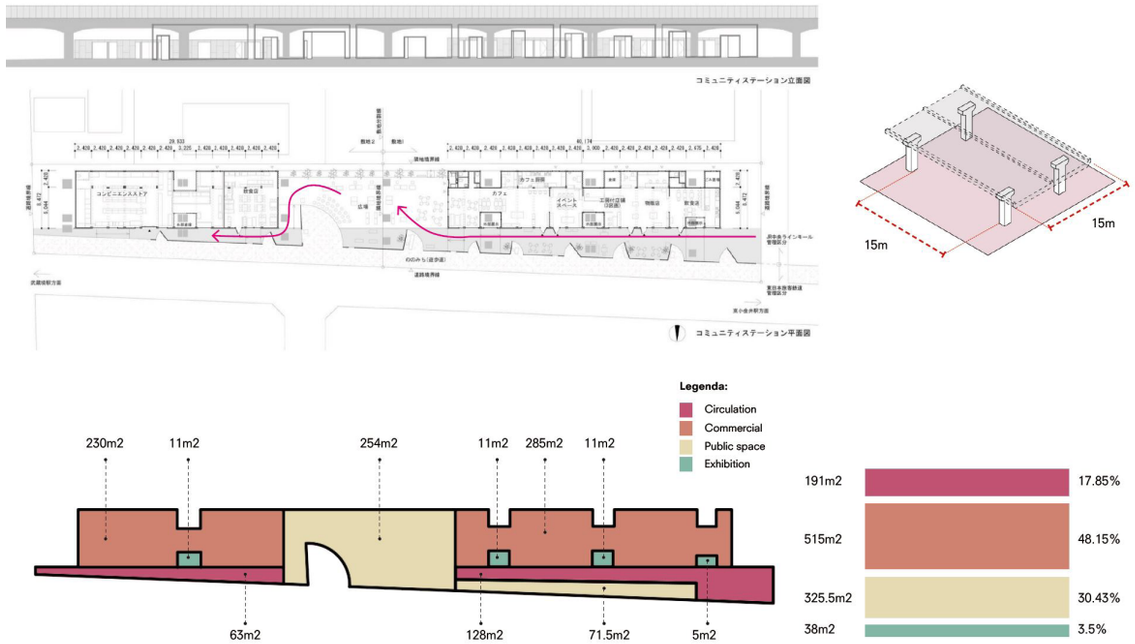


Fig 13: Analysis drawing of Chuo Line Community Station

5. RELATION WITH DESIGN BRIEF

By comparing the researches of leftover space caused by infrastructure and mobility hub, it is clear that as a public space, the mobility hub could contribute to the leftover spaces and further change it into public spaces that have a positive effect on city planning. From the researches, four rationales could be established and further influenced future design decisions.

Firstly, because the mobility hub has the ability to gathering and guiding people, the sequence of the mobility functions in the mobility hub requires careful design. It needs to guide the people into these leftover spaces to increase the accessibility of these spaces and create more opportunities for various activities to occur.

Secondly, except for the mobility functions, the mobility hub could also have other functions like shops, restaurants, galleries, offices, etc. It also has an influence on the surrounding district. Some mobility hubs could evolve even further and incorporate parks and greenery in their designs. (Chiba and Ito, 2001, 9) By comparing these functions with six different activities that could be introduced into the leftover space, there are some overlap functions. Therefore, during the design process, these overlapped functions should be carefully considered and designed into the leftover space for activation.

Thirdly, the functions introduced to both the mobility hub and leftover spaces need to be conform to city planning and local requirements. By adding inappropriate functions to the space, it may lead to a negative impact on the surrounding environment while creating more leftover spaces instead of activating the existing ones.

Finally, when designing leftover space, the space characteristics such as the column and beam structure should be fully considered and used. This rationale is derived from the case study “Chuo line community and mobility station", in this project the designer created a continuous pedestrian by using the structure beneath the infrastructure.

6. ROTTERDAM SOUTH AS SELECTED SITE

6.1 Development of Randstad

The Randstad is a densified urban place on the west coast of the Netherlands. It could be seen as a large polycentric city with four important centers: Amsterdam, Rotterdam, The Hague, and Utrecht. (Ministerie van VROM. 2008) It plays a key role for not only Netherlands but also Europe's economy, with one-third of Europe's import and export here. (Rijksoverheid, 2009) The connections between different cities are quite important for Randstad. In the 21st century, the Dutch government decided to improve the connections in Randstad by improving central stations here. Utrecht CS, Rotterdam CS, The Hague CS, Amsterdam-South CS, Breda CS, and Arnhem CS have all been improved and designed into various mobility hubs with various functions added. (Triggianese, Cavallo, Baron and Kuijper, 2018)

Fig 14: Four important cities in Randstad

6.2 Mobility hub in Rotterdam

As one of the most important cities in Randstad, Rotterdam plays a key role in mobility. The Rotterdam Central Station has been designed into a successful mobility hub with extra shops and restaurants located underneath the railway platform. ("Rotterdam Central Station / West 8 +

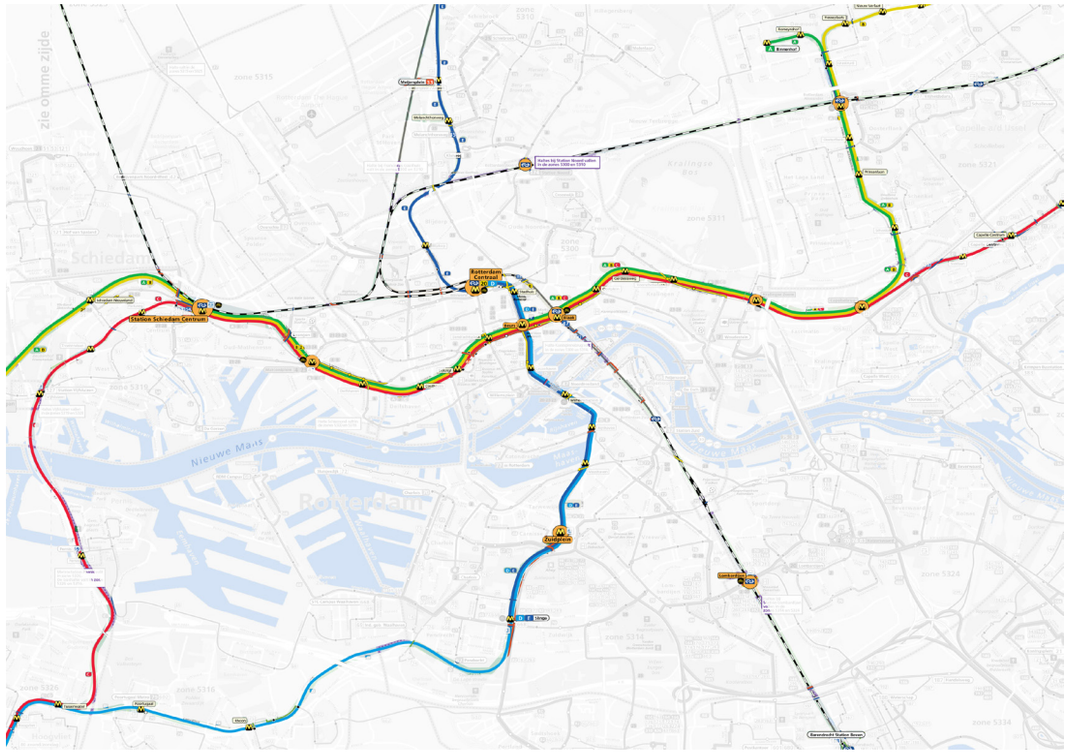


Fig 15: Metro lines and railways in Rotterdam

Benthem Crouwel Architects + MVSA Architects", 2021) In the future, the mobility hub will begin to gain more attention in Rotterdam. From the city vision, to create a clean and sustainable city, the use of cars will be reduced and more people will choose to use bicycles and public transportation to travel. (Rotterdamse Mobiliteits Aanpak, 2020) In that case, more infrastructure and more mobility hubs will be needed to achieve a coherent traffic network.

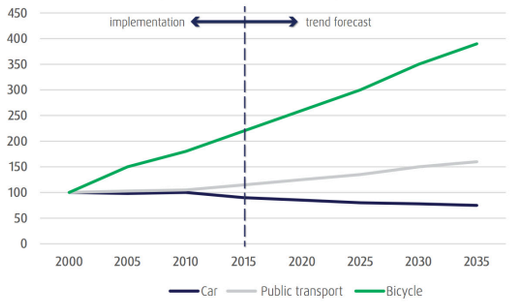


Fig 16: Mobility development in Rotterdam city center

6.3 Leftover space in Rotterdam

Many infrastructures had been built in Rotterdam and created some leftover space aroun the Rotterdam. These elevated infrastructures could be divided into three types: metro-line, railway, and highway. In these three types of infrastructure, the highways create the least problem because they are mainly located at the edge of the city and the metro-line creates the most leftover spaces.

6.4 Rotterdam south as selected site

In the current city planning, the center of Rotterdam is on the north side of the Nieuwe Maas with not many leftover spaces there. However, according to the city vision, the Rotterdam South plays an important role in future development. (Municipality of Rotterdam 2007) However, in that district, a continuous leftover space caused by the metro line cut the South into two parts. To achieve the car-free vision in Rotterdam South, some new mobility hubs will be needed there, and they could provide a solution for the leftover space problem. Therefore, the Rotterdam South will be chosen as the selected site which will be further studied.

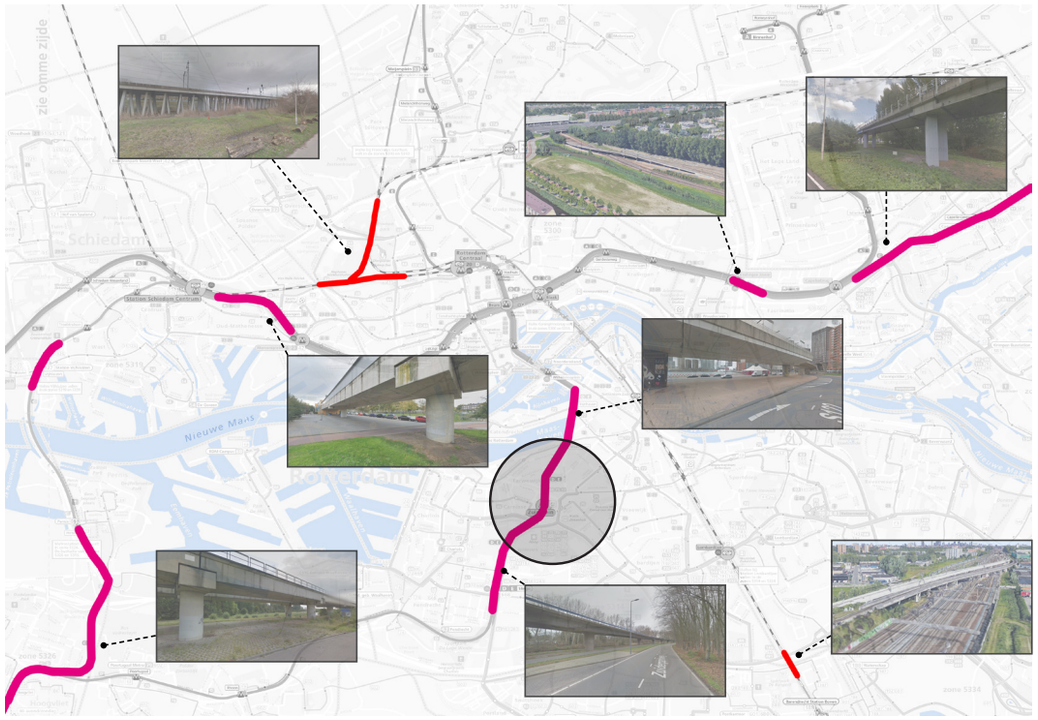


Fig 17: Leftover spaces caused by infrastructure in Rotterdam

7. CONCLUSION

With the development of cities, more and more infrastructures are needed to achieve a coherent traffic network. Some of them are raised to a certain height and create unused leftover space underneath. From the theoretical research and case study, there are three main points for activating these leftover spaces. Firstly, the leftover space can be activated by introducing various activities. Secondly, the new activities in the leftover spaces need to fulfill the local requirements. Thirdly, high inclusivity and accessibility are important for the leftover spaces to be reused by people.

Migrating through time, station has been intergrated with other functions and become mobility hub. It could be used as a gathering space for people and has a guiding effect for different users. In addition, except for the mobility functions, the mobility hub could also include other functions and cause an influence on the surrounding districts. It has cultural value, economic value, and social value that could allow various activities to happen both inside the hub or around it. Therefore, the mobility hub could be used for activating the leftover space caused by infrastructure. It could be seen in the projects Chuo line Community Station Higashikoganei, Tokyo, Japan. The Higashikoganei station has a continuous pedestrian for the visitors and leads them into the renovated leftover spaces that are used for commercial and community functions. In this way, the conclusion that the mobility hub functions as a public space could affect the leftover spaces caused by infrastructure into lively spaces used by both local people and visitors could be established.

However, some rationales are needed during the design process. To activate these leftover spaces, the mobility hub needs to create suitable functions for them and guide the people into these spaces while using the specific characteristics of these spaces. In this way, together with the leftover spaces, the mobility hub could create a lively public space and maintain a good connection with urban planning.

As a common issue for metropolises, Rotterdam also has the same problem. The leftover space caused by the Noord-Zuidlijn metro line creates a challenge for further development of Rotterdam South. According to the city vision, the use of public transportation will increase in the future and some mobility hubs will be needed to be constructed in the future. Rotterdam South, as the test-bed, could provide an opportunity to use mobility hubs to solve the leftover space problem.

By designing the mobility hub in the south of Rotterdam, the ability to use the mobility hub to activate leftover space can be further demonstrated. The results of this research and design could offer a new perspective to rethink the characteristics of infrastructure, leftover space, and mobility hub, while further preventing the land-waste in the current urban design and future urban planning.

BIBLIOGRAPHY

Aral, E. A. (2009). Redefining leftover space : value and potentiality for the city. VDM Verlag.

Chiba, Masatsugu and Ito, Kuniaki (2001), 'Railway Stations and Local Communities' in Japan Railway and Transport Review, pp. 4-17

Discover the Neighborhood | Culture Workshop Tarwewijk . Cultuurwerkplaatsarwewijk.nl. (2021). Retrieved January 7, 2021, from https://cult thin-setarwewijk.

Dissing + weitling (2021). Dissing+Weitling | Xiamen Bicycle Skyway. Dissingweitling.com. Retrieved 6 January 2021, from https://dissingweitling.com/en/project/xiamen-bicycle-skyway.

Frearson, A. (2011). Folly for a Flyover by Assemble | Dezeen. Dezeen. Retrieved 6 January 2021, from https://www.dezeen.com/2011/07/05/folly-for-a-flyover-by-assemble/#:~:text=Folly%20for%20a%20Flyover%20was,part%20of%20the%20Create%20festival.

Gemeente Rotterdam,(2019). Visie openbare ruimte 2019-2029 Rotterdam Een gezond en groen Rotterdam voor iedereen. Rotterdam: Gemeente Rotterdam.

Geschiedenis Metro Rotterdam. (2020). Retrieved 10 November 2020, from https://www.metrorotterdam.nl/geschiedenis.

JR East Lifestyle Business Development Headquarters. (2017). Making Best Use of Spaces in Railway Facilities. Deployments in JR East Under-Viaduct Spaces and Ekinaka Commercial Spaces. Retrieved from Japan Railway & Transport Review No. 69, Mar. 2017.

Kheyroddin, R., Taghvaee, A., & Forouhar, A. (2014). The Influence of Metro Station Development on Neighbourhood Quality. International Review For Spatial Planning And Sustainable Development, 2(2), 64-75. https://doi.org/10.14246/irspsd.2.2_64

Kuijper, J.A., Cavallo, R., de Boer, J.J. van der Wal, I.A. (2019). Smart Mobility & Urban Development in Haven-Stad, Amsterdam. Delft: TU Delft Open. Retrieved from http://resolver.tudelft.nl/uuid:af85c70a-0331-408e-be2b-d5edc2489c81

Neufert, E., Neufert, P., & Kister, J. (2012). Architects' data (4th ed.). Wiley-Blackwell.

March.Studio. (2018). Sky-rail community nodes, Retrieved 6 January 2021, from https://march.studio/skyrail.

Marmorstein, D., & Nielsen, T. (2011). Public space. Architectural Publisher B.

Matthias, D. (2014). A railway station as a public space: The case of Tokyo. Retrieved 12th December 2021, from https://1library.net/document/q02x5k3y-railway-station-public-space-case-tokyo.html

Ministerie van VROM. (2008). Samenvatting-structuurvisie-Randstad-2040. Den Haag, Nederland: Author.

Municipality of Rotterdam (2007, November 29). Stadsvisie Rotterdam; ruimtelijke ontwikkelingsstrategie 2030. pp. 120-121 Retrieved from: www.rotterdam.nl

Rewrite Development. (2016) Under the Chuo Line Railway Tracks, Tokyo, Japan. Retrieved from Unbanism and architecture Feb. 2016.

Richards, J., & MacKenzie, J. M. (1988). The railway station : a social history. Oxford University Press.

Rijksoverheid. (2009, November). Blik op de Randstad. Randstad Urgent. Retrieved from https://www.rijksoverheid.nl/onderwerpen/ruimtelijke-ordening-en- gebiedsontwikkeling/meerjarenprogramma-infrastructuur-ruimte-en-transport-mirt

Rotterdam Central Station / West 8 + Benthem Crouwel Architects + MVSA Architects. ArchDaily. (2021). Retrieved 6 January 2021, from https://www.archdaily.com/588218/rotterdam-central-station-benthem-crouwel-architects-mvsa-meyer-en-van-schooten-architecten-and-west-8.

Rotterdamse Mobiliteits Aanpak. (2020, February). Gemeente Rotterdam. Retrieved from https://www.rotterdam.nl/wonen-leven/mobiliteitsaanpak/Rotterdamse-Mobiliteitsaanpak1.pdf

Rovers, B. (2016). Spreiding van criminaliteit in stedelijke gebieden. In: Bureau voor Toegepast Veiligheidsonderzoek.

Ruskin, J. (2012). Seven lamps of architecture. Dover Publications. INSERT-MISSING-URL.

THE GATE. (2021). Nakameguro Koukashita What is NAKAME GALLERY STREET? Retrieved 6 January 2021, from https://thegate12.com/article/219.

The underline. (2021). Recent — The Underline. [online] Available at: <https://www.theunderline.org/news/> [Accessed 4 January 2021].

Trancik, R. (1986). Finding lost space : theories of urban design. New York: Van Nostrand Reinhold.

Triggianese, M., Cavallo, R., Baron, N. and Kuijper, J., (2018). Stations As Nodes. Delft: TU DElft Open. Retrieved from http://resolver.tudelft.nl/uuid:9aef29e0-3db5-4945-bdbd-bb48a5715156

Veld Academic, (2019) Hart van Zuid 2019: Onderzoek naar overstap beleving en fietsgebruik in Hart van Zuid, Rotterdam. Retrieved from https://www.veldacademie.nl/img/Document/8e/e3/8ee3c13b-e964-4767-8c51-c81e2e958e79/HartVanZuid_2019.pdf

Whyte, W.H. (1968). The Last Landscape. Gardencity, New York: Double Day&Company Inc.

Zemp, Stefan et all, (2011). 'Generic functions of railway stations – a conceptual basis for the development of common system understanding and assessment criteria' in Transport Policy, 18, pp. 446-455

APPENDIX: DESIGN BRIEF

1. AMBITION

1.1. Culture strip in Group vision

The new mobility hub inside the Tarwewijk will offer it a huge potential to be further developed. Combining with cultural hub it becomes a gateway for visitors to meet with local residents and experience the diverse culture inside the neighborhood. Together with Maasilo, the Rotterdam Art Ride, Hart van Zuid, and Rotterdam Ahoy, a continuing culture strip will appear inside Collage City while offering a chance for commercial flourish and economic development for the surrounding areas.

1.2. Initial project ambition:

An interrelated hub with various functions (mobility functions, commercial functions, cultural functions, post office, and other facilities such as playgrounds and sports yards), while providing opportunities for various activities to occur in the surrounding leftover spaces caused by infrastructure.

1.3. Users:

The users of this project could be mainly divided into three types: the local residents, visitors, and staff who will work in this hub.

1.4. Client:

Due to the various functions, the project will be funded by different clients. The Rotterdamse Elektrische Tram (RET) is the client for the mobility functions, Post NL is the client for the office, Kenniscentrum Cultuureducatie Rotterdam (KCR) and Stadsarchief Rotterdam are the clients for the culture hub, the Gemmeente Rotterdam is the client for the commercial functions and the office.

1.5. Urban ambitions:

1) Car free city vision.

According to the Rotterdam city vision, the use frequency of bicycle and public transportation will increase in the future, and the use of the car will decrease. (Rotterdamse Mobiliteits Aanpak, 2020) By adding a new mobility hub, it offers more chance for both residences and visitors to use public transportation and will further contribute to the car-free vision in Rotterdam Zuid.

2) Provide opportunity of the leftover space.

A new interrelated hub could provide opportunities for various activities to occur in the surrounding leftover spaces. In this way, it could reduce the problem caused by them and change these spaces into public spaces which have a positive effect on urban planning.

3) Connected culture strip.

The Tarwewijk neighborhood has abundant history therefore the cultural value in this district is high. ("Discover the Neighborhood | CultuurWerkplaats Tarwewijk", 2021) By introducing culture functions into the project, this interrelated hub will create a continuous culture strip from Rijnhaven to Rotterdam Ahoy.

4) Future development inside Tarwewijk district

By adding a new mobility hub inside Tarwewijk, the neighborhood would be activated and further developed in the future. In the 2050s, more housing and high-rise could be designed and built around the new hub. Together with Productive Waterfront and Hart van Zuid, the Rotterdam South could finally become another center in Rotterdam.

1.6. Program ambitions:

In this project, the mobility hub (metro station and bicycle storage) is the primary program that should link with all the other functions. The cultural hub is the secondary program that should function as an attraction for both visitors and residents. The other functions such as shops, cafes, restaurants, and playgrounds are the tertiary program, they should be designed for activating the leftover space. The office functions as a consulting center for future development along the culture strip in Tarwewijk. The public space in this design is also important. The public space along the metro line needs to connect the Productive Waterfront with Hart van Zuid. The public space from the two sides of the metro line needs to function as the gateway to the neighborhood.

1.7. Building (construction) ambition:

The new hub needs to be a sustainable building. The materials of the building are timber and steel, while the timber is the primary material and the steel will only be used for the connection between the adding structure and the existing structure.

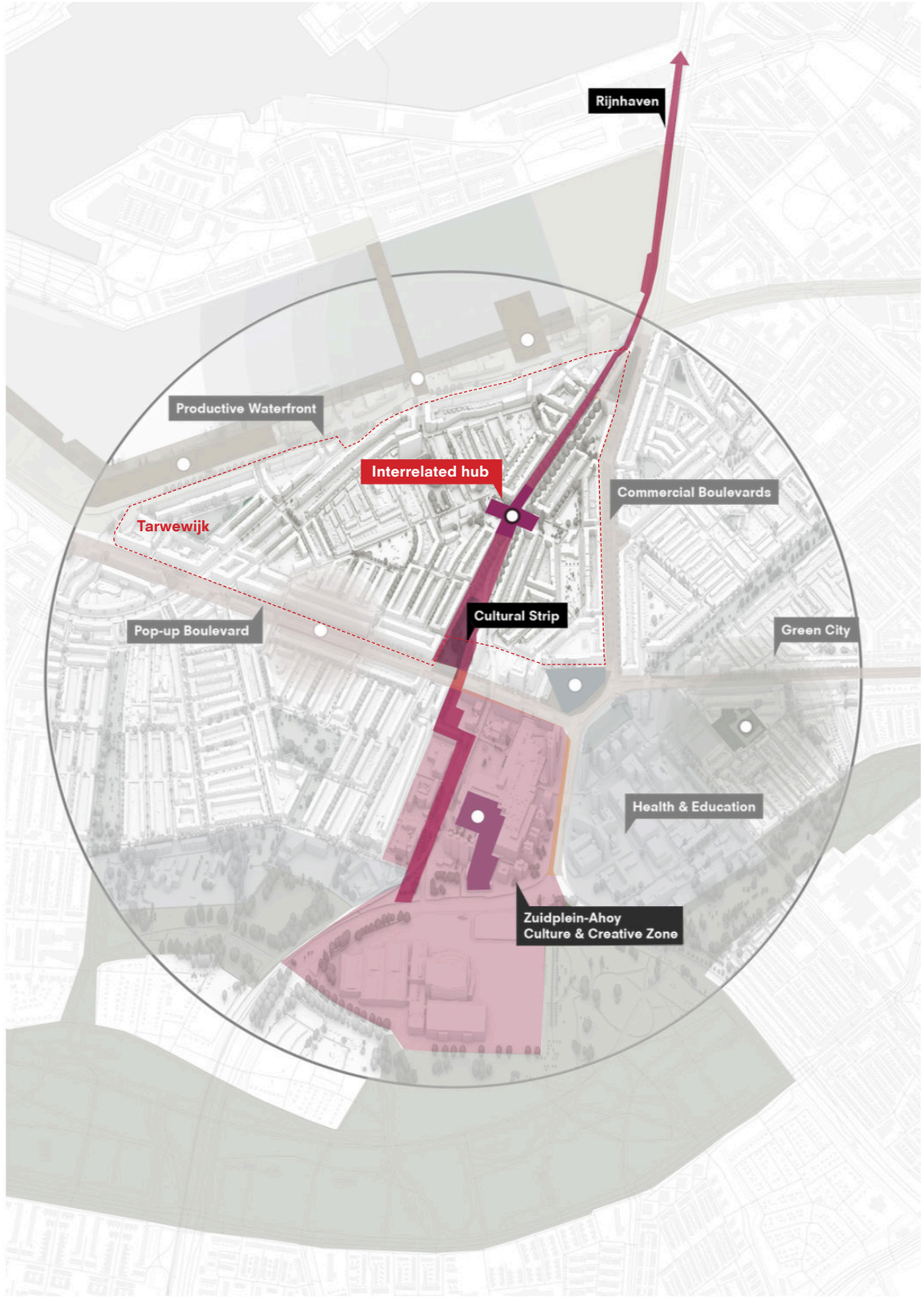


Fig 18: New Interrelated hub and Culture strip in Rotterdam South

APPENDIX: DESIGN BRIEF

2. SITE

2.1. Site location

There are some leftover spaces caused by the Noord-Zuidlijin metro line at the site and they all lead to negative impacts on the city and people who live there, especially inside the neighborhood Tarwewijk. The Noord-Zuidlijn metro line was opened in 1968. As the first metro line in the Netherlands, it connected the south Rotterdam to the north successfully. (Geschiedenis Metro Rotterdam, 2020). However, although the metro line was raised to avoid interruption with the people flows at the ground level, it still caused many undefined leftover spaces underneath. Together with the concrete infrastructure, these spaces create a sharp division inside the Tarwewijk neighborhood and cut it into two pieces. The quality of these spaces is also low, they are mainly used for car parking spaces with no activities happens and lack of management and maintenance. In addition, in order to achieve the car free vision on site, more mobility hub will be needed. Therefore, a site located between the Maashaven subway station and Zuidplein subway station was selected to design a new moblity hub.

2.2 Site mapping

1) Greenery:

There are abundant greenery at the north and the south side of the Tarwewijk district but not much

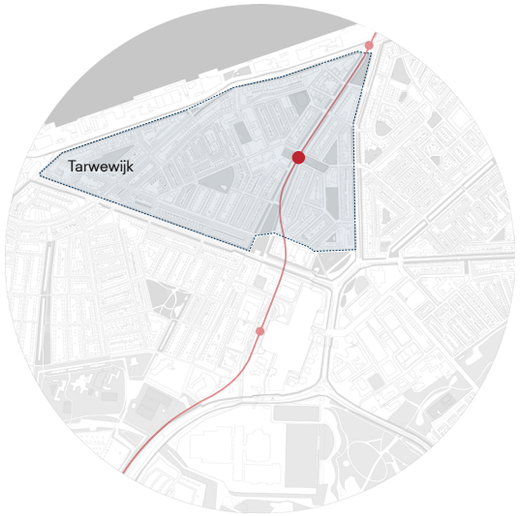


Fig 19: Site location

Greenery analysis:

Building functions analysis:

Transportation analysis:

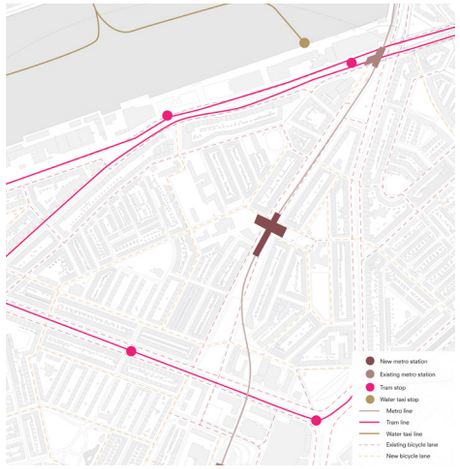


Fig 20: Site analysis-1

greenery under the infrastructure. By adding a new landscape in the leftover spaces, it could create a continous green line from the new Maashaven park to the Zuiderpark.

2) Building functions analysis

From the analysis, there are more functional buildings on the north side of the Tarwewijk neighborhood and Hart van Zuid. By adding a new mobility hub, it could activate the neighborhood and allow more activities to occur, and connect the north and south side of Tarwewijk together.

3) Transportation analysis

The public transportation at site can be divided into four types: tram, bicycle, metro, and water taxi, while the metro and bicycle lanes pass directly through the site.

2.3 Site approach

The visitors from long distances could approach the site easily by metro. The visitors who use trams and water taxis need to get off at the tram or water-taxi stop and walk for less than 500m to approach the site. The residents and the visitors who use bicycles or scooters could also easily approach the site.

2.4 Urban rules

Because the chosen site is an unbuildable space in city plan, therefore, the following rules are coming from the current rules taken from Zuidplein metro station.

1) Limitation of different functions:

Total building area <= 13300m2

Area of office <= 1000m2

Area of social functions <= 5000m2

Area of service functions <= 5000m2

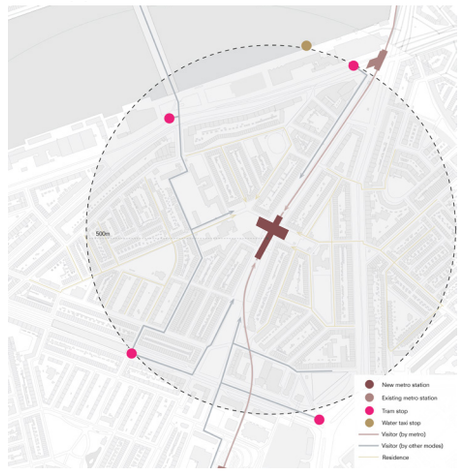
2) Set back = 15m

(The set back number is the same as the distance between two residential blocks)

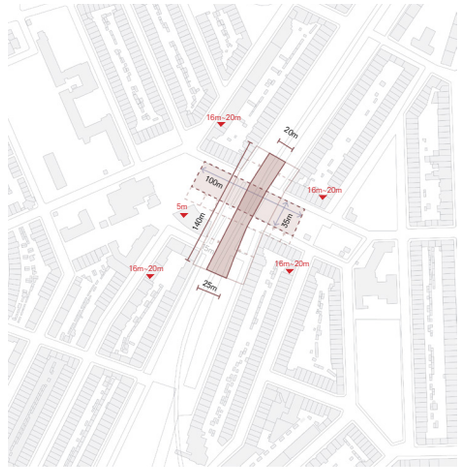
3) Height limitation = 16m

(The height limitation is equal to the lower part of the surrounding residential block while also lower than the height of Maashaven metro station)

Site approach:



Urban rules:



Connection:

Fig 21: Site analysis-2

APPENDIX: DESIGN BRIEF

3. PROGRAM

3.1. Program statement

The programming of this project is mainly depending on the local condition and future vision of the site. In 2050, the site will be developed and transfer into a polycentric area with free-car vision according to the Rotterdam vision. It will become a Collage City in Rotterdam Zuid. To help the Tarwewijk neighborhood further developed, a new interrelate hub which combines the mobility functions and cultural function will be designed, in this way, people would use public transportation more frequently. Together with Maasilo, the Rotterdam Art Ride, Hart van Zuid, and Rotterdam Ahoy, a continuing culture strip will appear inside Collage City while offering a chance for commercial flourish and economic development for Tarweweijk neighborhood.

3.1.1.Mobility hub

The mobility functions of the hub will have two main functions, a metro station, and bicycle storage, with other facilities serving them. Both of these functions will be used to achieve a car-free vision in Collage City.

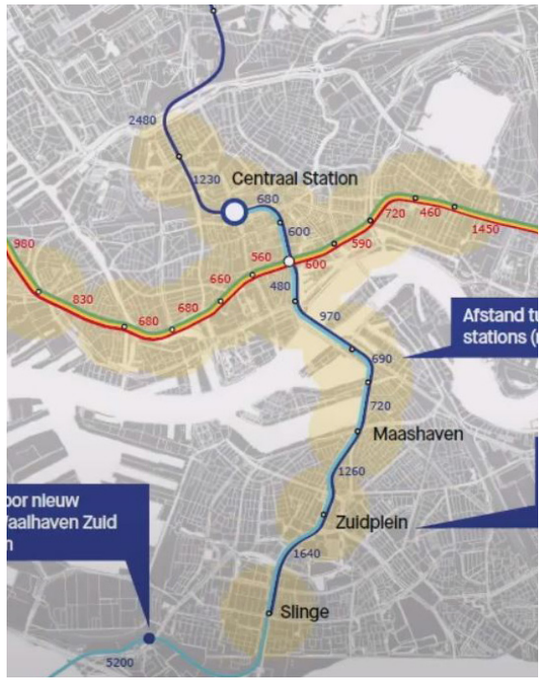


Fig 22: Distance between two Maashaven metro station and Zuidplein metro station is twice longer than distance between each two metro stations in Rotterdam North center.

1) Mobility hub --- Metro station

In around 2035, a new metro station will be built inside the Tarwewijk neighborhood. There are three reasons why a metro station is needed here. Firstly, as a large district, Tarwewijk only has public transportation stops around it, people who live inside the neighborhood usually need to walk 10~20mins to get on public transportation. Secondly, comparing with the north city center of Rotterdam, the distance between Maashaven metro station and Zuidplein metro station is twice longer than the distance between each two metro stations there. Finally, to achieve the car-free vision in Rotterdam South, public transportation will be used more frequently, so more stops with shorter distances need to be added in the city. Therefore, instead of adding new infrastructure and create more leftover spaces, a new metro station will be designed along the existing Noord-Zuidlijin metro line infrastructure.

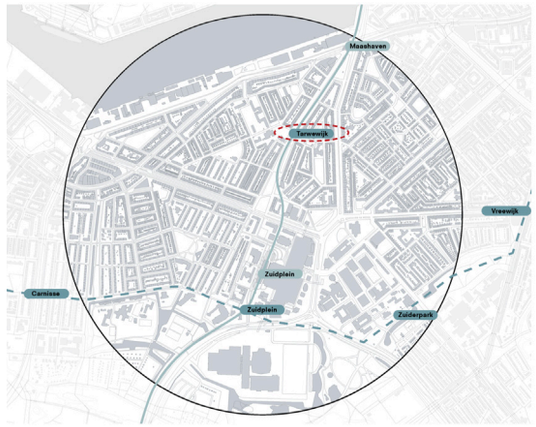


Fig 23: New Tarwewijk metro station in Rotterdam South

2) Mobility hub --- Bicycle storage

In the Netherlands, bicycle is one of the most popular transportation methods. However, in the Collage City, people donít really usually use bicycles here. The current bicycle using the situation in Hart van Zuid could indicate that situation in the overall site. In the report of Hart van Zuid, there are only 19% of people using bicycle everday, and 56% of people don't use bicycles. (Veld Academic, 2019) However, although the users are not much, the bike storage spaces are still not enough. According to the report, only 60% of total bikes could be formally parked, and others can only be parked randomly. (Veld Academic, 2019) Therefore, Zuidplein station doesn't have enough bicycle storage spaces could be concluded. If the car-free vision could be achieved in Rotterdam South, more bicycle parking spaces will be needed here. In that case, a new bicycle storage with a capacity of at least 1500 bicycle parking spaces will be needed.

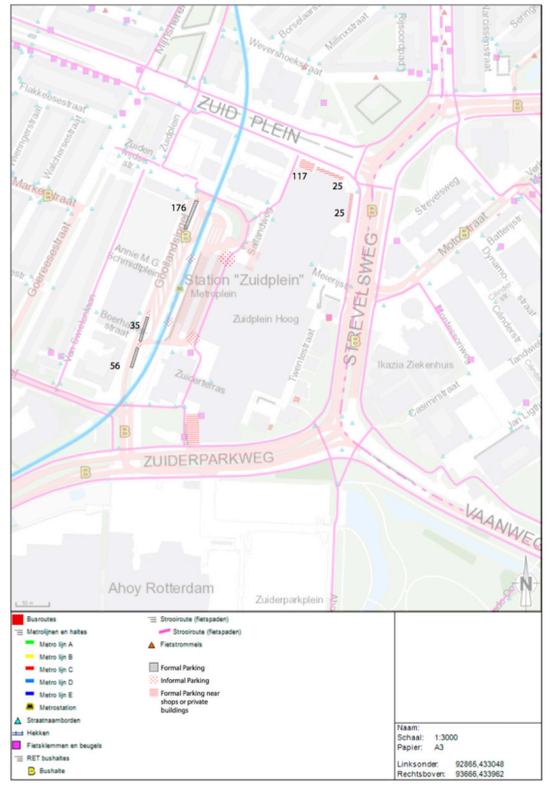


Fig 24: Bicycle parking spaces in Hart van Zuid

Datum	Dag	Tijdslot	Totaal aantal fietsen	Goed geparkeerd	%	Fout geparkeerd	%
22-nov	Donderdag	14:00-15:00	586	339	57,8	247	42,2
22-nov	Donderdag	16:00-17:00	570	375	65,8	195	34,2
22-nov	Donderdag	17:00-18:00	509	311	61,1	198	38,9
23-nov	Vrijdag	09:00-10:00	517	332	64,2	185	35,8
24-nov	Zaterdag	11:00-12:00	462	287	62,1	175	37,9
26-nov	Maandag	08:00-09:00	378	241	63,8	137	36,2
27-nov	Dinsdag	13:00-14:00	407	203	49,9	204	50,1
28-nov	Woensdag	10:00-11:00	477	292	61,2	185	38,8
28-nov	Woensdag	12:00-13:00	465	296	63,7	169	36,3
02-dec	Zondag	15:00-16:00	580	360	62,1	220	37,9
Gemiddeld			495	304	61,2%	191	38,8%

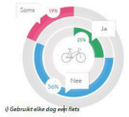
Fig 25: Current bicycle use situation in Hart van Zuid

Use bike everyday: 19%

Use bike sometime: 25%

Never use bike: 56%

Current bicycle parking (Zuidplein station): 267



Average total number of bike= 546 bikes

N_bike (if all people cycle everday) = Ave_bike/ (19%+25%/2) = 1733bikes

C_New_bike = N_bike - C_Old_bike = **1466 bikes**

Fig 26: Capacity for new bicycle storage in new mobility hub

APPENDIX: DESIGN BRIEF

Fig 27: Culture zone at site

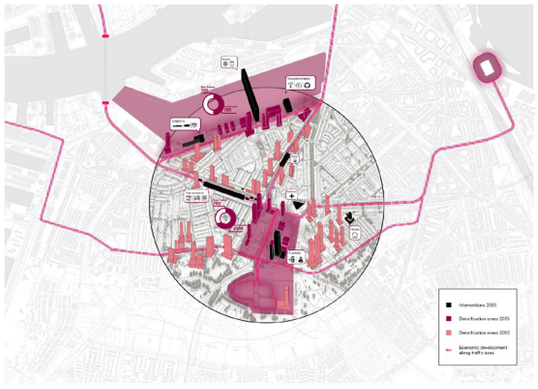


Fig 28. Future development in Tarwewijk neighborhood in 2050.

3.1.2. Culture hub

Migrated through time, the mobility hub has become a public space that carries various values. Around the mobility hub, the business value, economic value, cultural value could all increase. Therefore, by adding a new mobility hub inside Tarwewijk, the neighborhood would be activated as well. In the 2050s, more housing and high-rise will be built around the new mobility hub, therefore this district needs to have a clear character in the future.

Currently, there are some culture zones on the site already. On the north of the site, building Maasilo, the "Rotterdam Art Ride" which is located under the infrastructure and the future Maashaven park forms a culture zone. On the south side of Tarwewijk, with the new functional buildings like Zuidplein theater and swimming center, Hart van Zuid and the Rotterdam Ahoy have become another important culture zone. However, in current condition, these two zones are separated byTarwewijk without any connections.

However, it is possible to connect the Maashaven culture zone with Hart van Zuid and Rotterdam Ahoy. The neighborhood Tarwewijk is a place full of history. the local community has current forms four cultural tours inside the neighborhood such as "historical events" tour, "status and port" tour, "famous people" tour and also status introducing tour along the Pleinweg. ("Discover the Neighborhood | CultuurWerkplaats Tarwewijk", 2021) In addition, the Noord-Zuidlijn metro line also has historical value. Opened in 1968, it was the first metro line in the Netherlands and connected the south Rotterdam to the north successfully. Therefore the Tarwewijk could have the potential to become a cultural neighborhood in the future and create a continuous culture strip with Maasilo, the Rotterdam Art Ride, Hart van Zuid, and Rotterdam Ahoy.

3.1.3. Conclusion --- Interrelated hub

By combing the mobility hub and culture hub together, an interrelated hub that could both use for the local residents and visitors will connect the Maashaven culture zone and Hart van Zuid together and form a continuous culture strip from Rijnhaven to Rotterdam Ahoy. It also functions as the connection of Productive Waterfront and Hart van Zuid.

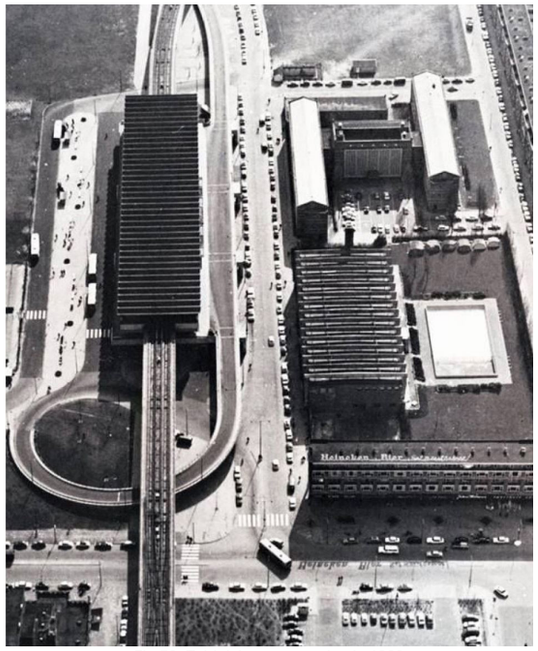


Fig 30. Zuidplein metro station in 1968

3.2. Typology research

To have a thorough understanding of how the other functions could be combined with mobility hub, three types of buildings are chosen to be researched and analyzed, each of them was chosen for different purposes and have different outcomes.

3.2.1 Metro station

The first type of building is metro station with no more than two railways. Three metro stations are chosen due to various sizes, Maashaven metro station, which has a clear orientation, Zuidplein metro station, which has a large scale and larger capacity, and Reservoir metro station which activated the leftover space underneath. The analysis of these projects are mainly focusing on three aspects: 1) Understanding the basic elements of metro station and how the circulation works. 2) Understanding how the metro station could be linked with other functions like commercial and cultural functions. 3) Understanding the average size of each different element. By analyzing these projects, the orientation of the new metro station and space requirements for the metro station would be clear.

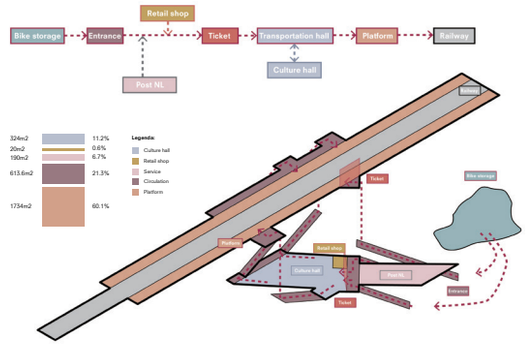


Fig 31. Analysis drawings of Maashaven metro station

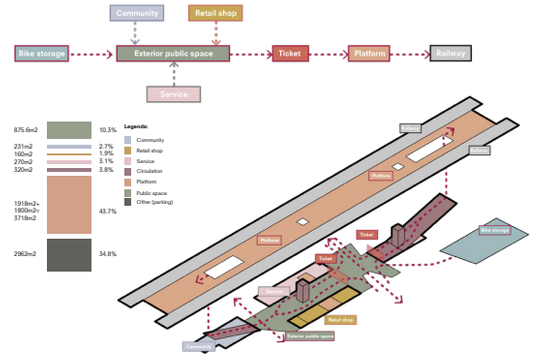


Fig 32. Analysis drawings of Reservoir metro station

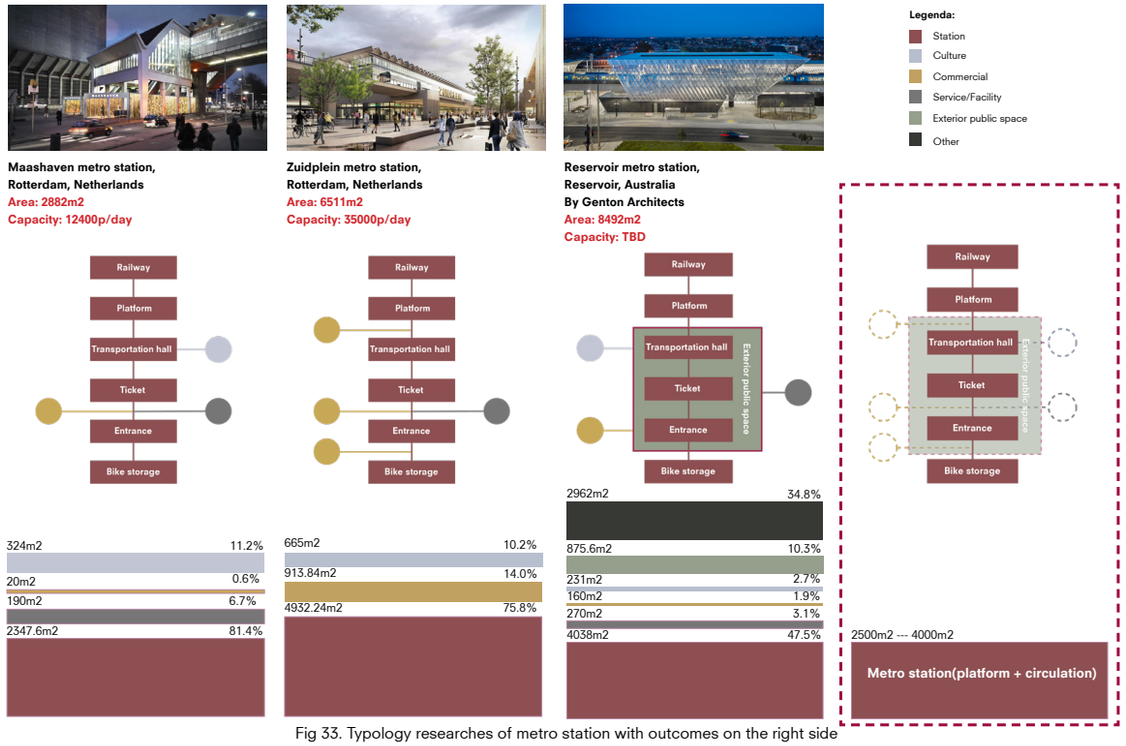


Fig 33. Typology researches of metro station with outcomes on the right side

APPENDIX: DESIGN BRIEF

3.2.2 Bicycle storage:

The second type of building is bicycle storage. In this session, two bike storage buildings were chosen to analyze, the coffee and bikes in Delft, Netherlands, and Curtin bike hub in Perth, Australia. All of them have a unique connection with public space. The analysis of these projects are mainly focusing on two aspects: 1) Researching the relationship between storage capacity and space requirement. 2) Understanding how bicycle storage could be linked with other functions like commercial and public space. By analyzing these projects the space requirements for new bicycle storage for the new metro station and the connection between the metro station and bicycle storage would be clear.

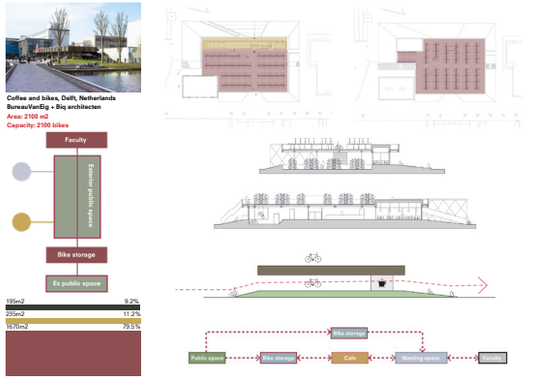


Fig 34. Analysis drawings of coffee and bike, Delft, Netherlands

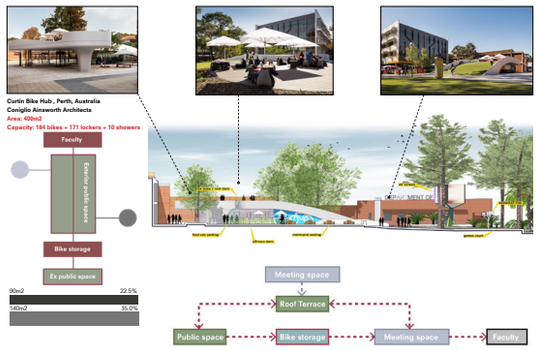


Fig 35. Analysis drawings of Curtin bike hub, Perth, Australia

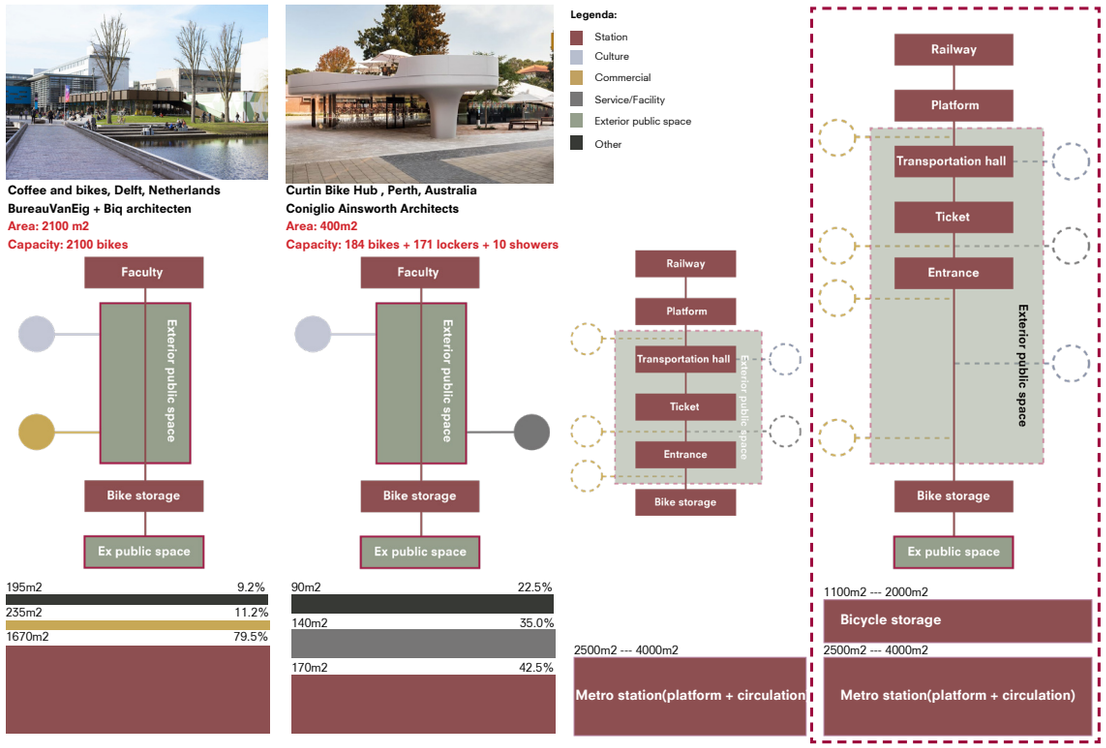


Fig 36. Typology researches of bike storage with outcomes on the right side

3.2.3 Mix-use mobility hub

The third type of typology research function is mix-use mobility hubs. Three mix-use mobility hub were chosen to analyze, Rotterdam Central Station, which is a station combining with commercial functions, Breda Centraal Station, a mobility hub combine with commercial functions, office, residential housing and parking space, and the Flinder Street Station, which is a mix-use hub with culture functions and commercial functions. The analysis of these projects are mainly focusing on two aspects: 1) Understanding how the station could be linked with other functions such as commercial functions and cultural functions. 2) Researching the percentages of different functions in a multi-function mobility hub. By analyzing these projects, how many percentages that different functions need in the new mobility hub will be clear.

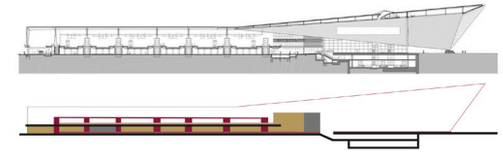


Fig 37. Section analysis drawings of Rotterdam central station

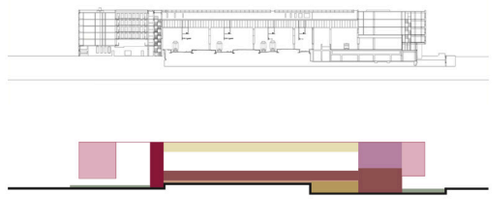


Fig 38. Section analysis drawings of Breda centraal station

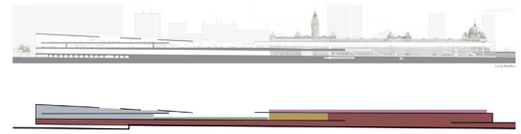


Fig 39. Section analysis drawings of the flider street station

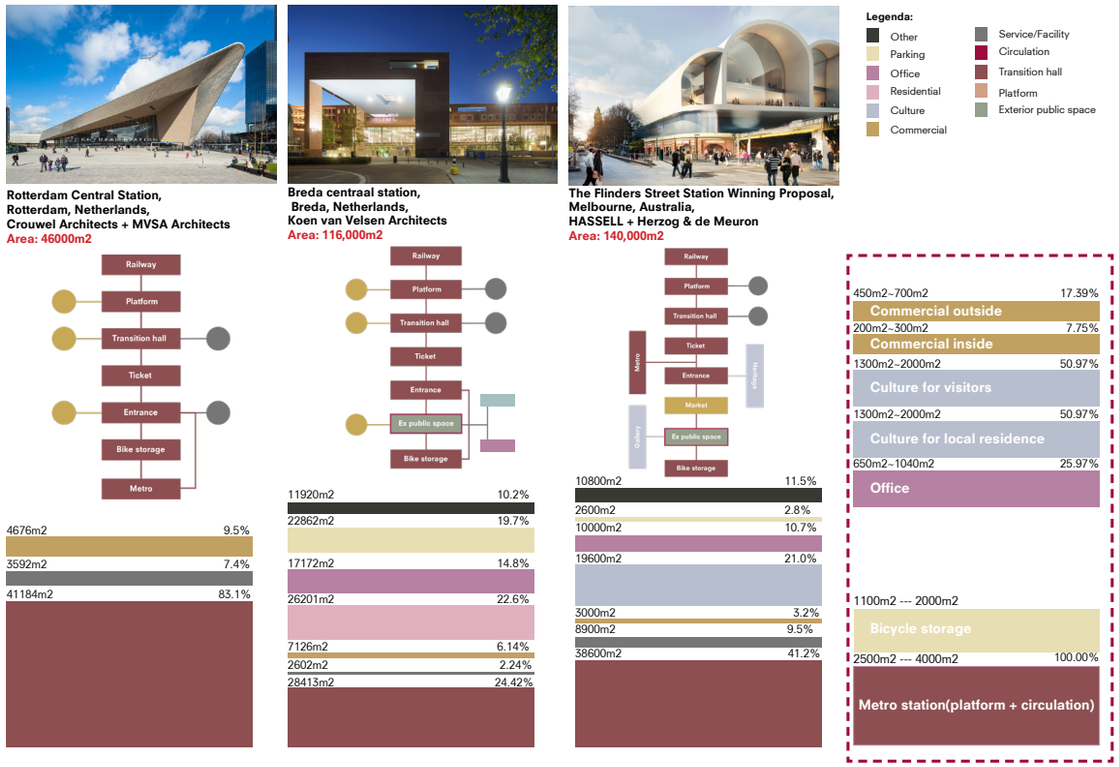


Fig 40. Typology researches of mobility hub with outcomes on the right side

3.2.4. Outcomes

Outcomes from metro station:
1) The basic orientation of metro station should be: bicycle storage, entrance, ticket area, transportation hall, platform, and metro railway.
2) The circulation of metro station could contribute to other functions such as commercial functions, cultural functions and office.
3) The size of the platform for two railways metro station should be around 2500m2 to 4000m2

Outcomes from bicycle storage:
1) The public space between bicycle storage and metro station has a high value to connect with various functions.
2) The space requirement for bicycle parking should be 0.8m2 for each bike.

Outcomes from mix-use mobility hub:
1) The space occupied by commercial functions could be around 25% of the metro station.
2) The space occupied by culture functions could be around 50% of the metro station.
3) The space occupied by the office could be around 26% of the metro station.

3.3. Program benchmarking

The programming of the interrelated hub could be divided into three categories: mobility functions, culture hub and other functions that are introduced because of the mobility hub. The mobility hub will contain metro station and bicycle storage with supporting facilities like E-bike charges. As the primary function, the mobility hub will take nearly half of the space of the new design. The culture hub has two target groups, the visitors and local residences. As the second important function in the project, it will take 35% of building space. Other functions will be commercial functions, such as restaurant, bicycle store, cafe, souvenir shop, etc. Some office areas will also be needed for the furture development in the Tarwewijk district.

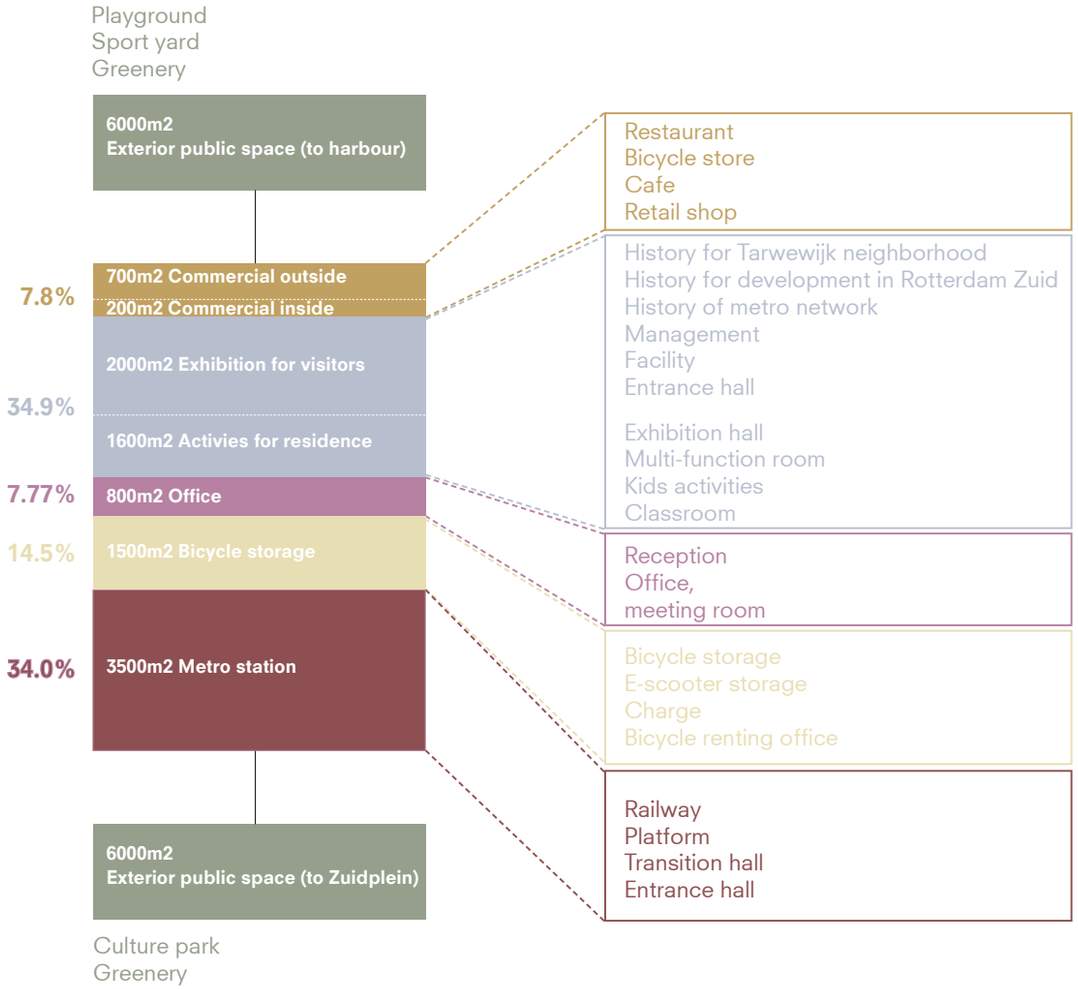


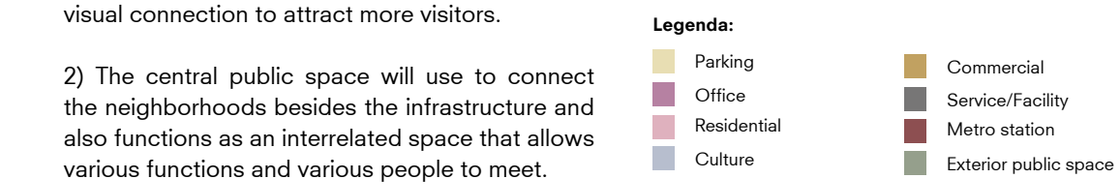
Fig 41. Program benchmarking

3.4. Program relations:

1) The culture hub and mobility hub should have visual connection to attract more visitors.

2) The central public space will use to connect the neighborhoods besides the infrastructure and also functions as an interrelated space that allows various functions and various people to meet.

3) The leftover space on the north of the interrelated hub will be designed into a lively public space that connects with Productive Waterfront and the leftover space on the south of the interrelated hub will be activated into a culture park that connects with Hart van Zuid



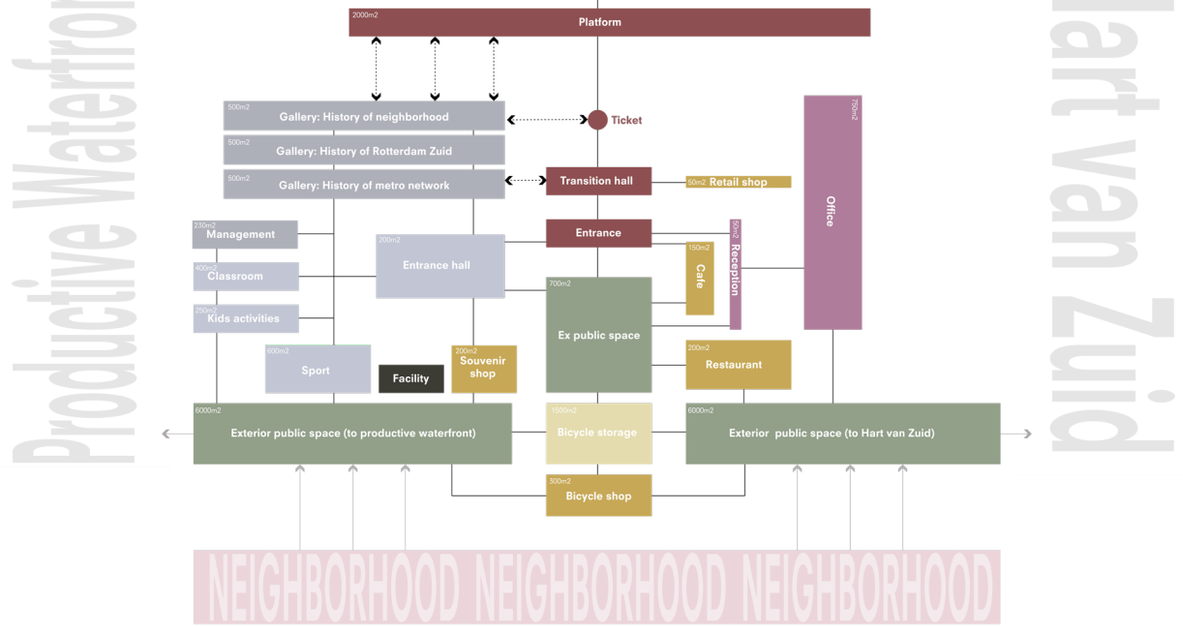
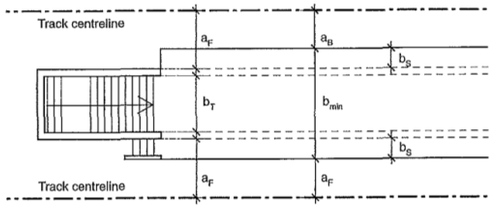


Fig 42. Program arrangement

APPENDIX: DESIGN BRIEF

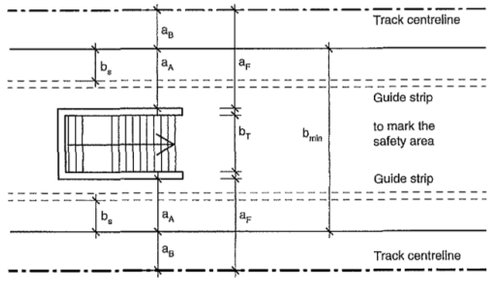
4. SPECIFIC SPATIAL REQUIREMENTS

4.1. Height, length and width of platform (Neufert, Neufert, Kister, 2012, 416)



Platform width $b_{min} = b_T + 2_w + 2(a_F - a_F)$

a_F Minimum distance of fixed objects (e.g. columns) from the track centreline
on the platform = 3.00 m
at the end of the platform = 2.50 m
a_A Distance between platform structures and platform edge taking into consideration barrier-free access width and the danger area b_S
next to short structures (e.g. columns) min. $a_A = b_S + 0.90$ m
next to longer structures with min. 1 entrance min. $a_A = b_S + 1.20$ m
a_B Distance of the platform edge from the track edge
b_{min} Minimum width of the platform
b_S Width of the danger area
V ≦ 160 km/h $b_S = 2.50$ m – 1.65 m (for straight tracks)
160 > V ≦ 200 kmh $b_S = 3.00$ m – 1.65 m (for straight tracks)
b_T Clear width of stairs or ramps between the strings
w Width of the stair string (including cladding)



❶ Platform widths and danger zones

Platform classification	A	A1	A2	A3	B	B1	B2	C	D
Platform standard length	405 m	370 m	320 m	280 m	210 m	170 m	140 m	120 m	60 m

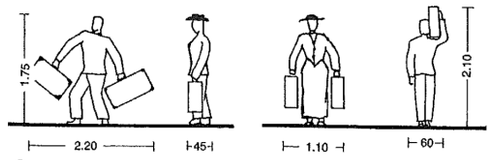
❷ Platform lengths (A express, B local, C and D less significant halts). A full Inter-City Express (ICE) high-speed train needs 405 m and a half ICE train 210 m

4.2. Dimension of lifts (Neufert, Neufert, Kister, 2012, 404)

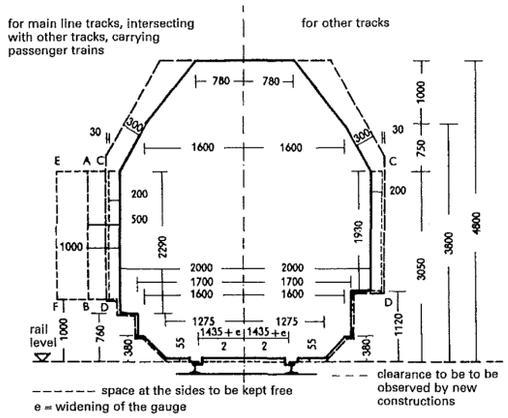
No. people/potential hindrance	Width × Depth (m)	Capacity (kg)
8/suitable for disabled	1.10 × 1.40	630
13/suitable for carrying loads	1.10 × 2.10	1000
19/suitable for cycles	1.40 × 2.10	1450

❷ Minimum size of lifts (Fiedler → refs)

4.3. Space requirements of passengers (Neufert, Neufert, Kister, 2012, 417)

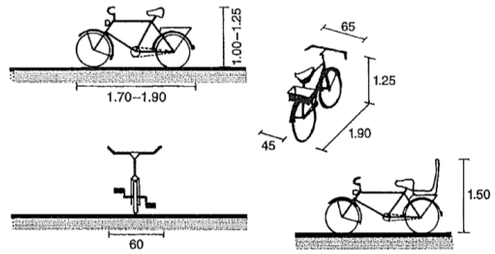


4.4. Dimension of standard railway (Neufert, Neufert, Kister, 2012, 410)

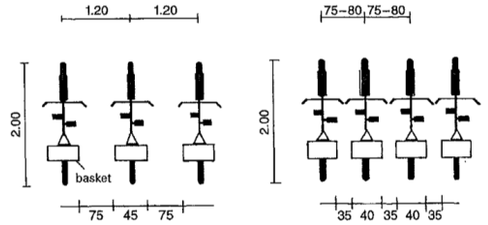


A–B for main lines on open stretches for all objects with the exception of fabricated structures
C–D for station sidings and for open stretches of main lines with special structures and signals between the tracks
E–F for fixed objects on passenger platforms

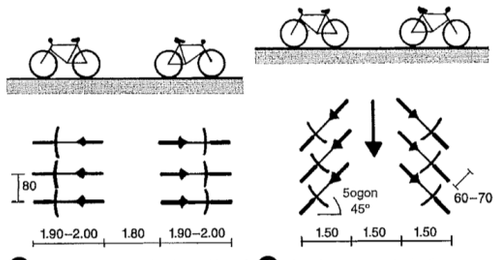
4.5. Space requirements of bicycle storage (Neufert, Neufert, Kister, 2012, 383)



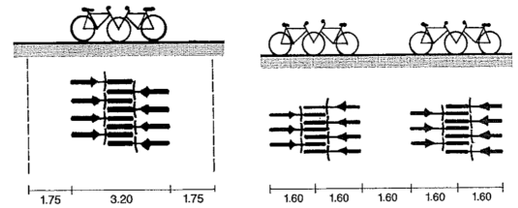
❶ Basic dimensions of bicycles ❷ Bicycle with basket/child seat



❸ Comfortable bicycle parking ❹ Cramped bicycle parking

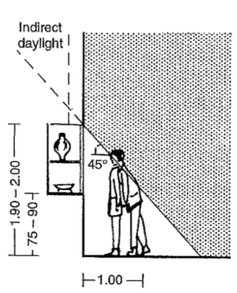


❺ Basic dimensions for the parking of bicycles, straight ❻ Level arrangement, slanting

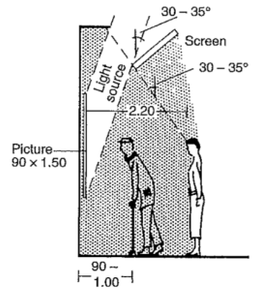


❿ Overlapping bicycles ⓬ Overlapping front wheels with central passage

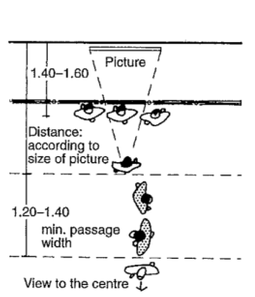
4.6. Visual analysis in gallery (Neufert, Neufert, Kister, 2012, 207)



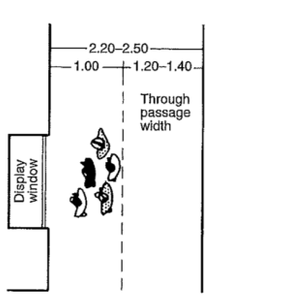
❼ Light and shadow in display cabinets



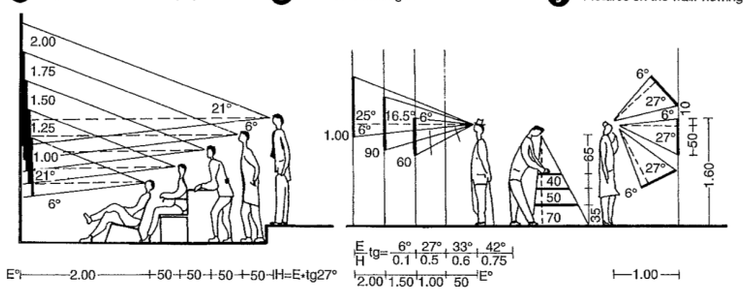
❽ Distance and light



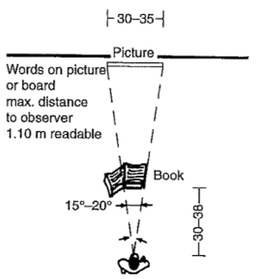
❾ Pictures on the wall: viewing and traffic



❿ Space in front of display cabinet



⓫ Field of view: height, size and distance



⓬ Ensure labels/commentaries readable

APPENDIX: DESIGN BRIEF

5. PLAN OF APPROACH

	Research	Design	Outcome
Week 3.1	Site analysis	Concept development	Concept drawing
Week 3.2	Program analysis	Concept development	Program connections
Week 3.3	Reference research	Poject vision	Ambition drawings
Week 3.4	Mass analysis	Plan and section orientation	1:500 plan drawing
Week 3.5	**P 2.5**		
Week 3.6	Function research	Plan development	1:500 plan drawing
Week 3.7	Reference research	Section development	1:500 section drawing
Week 3.8	Structure research	Plan development	1:200 section drawing
Week 3.9	Reference research	Section development	1:200 section drawing
Week 3.10	**P 3.0**		

	Research	Design	Outcome
Week 4.1	Material research	Material consideration	Perspective drawing
Week 4.2	Structure research	Structure design	3D drawing with joints
Week 4.3	Facade research	Facade design	3D model with facades
Week 4.4	Detail research	Detail design	1:5 detail drawing
Week 4.5	**P 4.0**		
Week 4.6	Finalizing research	Finalizing design	Finalizing technical drawing
Week 4.7	Finalizing research	Finalizing design	Finalizing technical drawing
Week 4.8	Finalizing research	Finalizing design	Rendering
Week 4.9	Finalizing research	Finalizing design	Rendering
Week 4.10	**P 5.0**		