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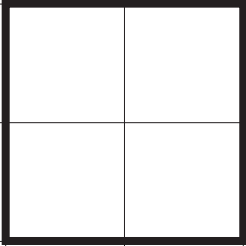
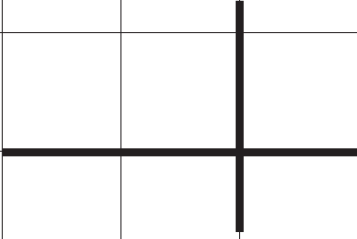
Obstruction

Sven van der Hulst

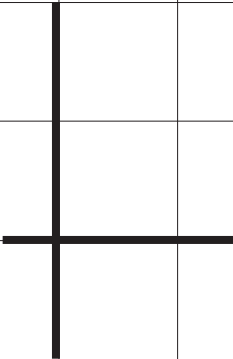
Spontaneity



**FREEDOM**



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# Freedom

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To discuss freedom, related to the city of Skopje, this chapter is divided in topics regarding; Metabolism, the group Kenzo Tange was not officially part of, but could categorize his way of practicing architecture in the late 60's and early 70's; The Skopje Transportation Center, or railway and bus station Kenzo Tange designed, focussing on how the station through the different design stages up until now has been functioning as an obstruction or border; Ethnographical

research, meaning participant observation and narrative description; Site specific analysis on pedestrian routes and the lack thereof, backed up by reference material. Finally resulting in a conclusion on next steps to be taken in order to resolve observed issues in the area.

This chapter will have freedom as the general topic. To talk about freedom however, we should first define the word itself, and words related to it.

## Freedom /'fri:.dəm/

### 1. A right to act in the way you think you should.

Freedom in architecture in this chapter is seen as the ability to create 'invisible architecture' which means, architecture that does not astonish or amaze, but architecture that serves the needs of the people interacting with it, without them noticing. Architecture should serve, should enable. Architecture should not limit, annoy or block. It is a basic right that ensures logic in movement and use. In Skopje, and more widely in North Macedonia, 'Freedom from' was gained in 1991, when independence from Yugoslavia was declared. 'Freedom to' is different. and rings closer to the definition in the dictionary. 'Freedom to' is the freedom that is discussed in the upcoming chapter: freedom to move, freedom to act or interact. Erich Fromm, who was amongst other things, a humanistic philosopher, described the difference between negative and positive freedom, of which the latter one was explained through spontaneity.

## Spontaneity /ˌspɒn.təˈneɪ.ə.ti/

1. A way of behaving in which you do what feels natural and good whenever you want to, rather than planning things first.

Here, spontaneity is seen as a result, effect or one of the ways of 'practicing freedom'. Where freedom can result in aloneness and powerlessness, rather negatively, Fromm argues Spontaneity is the only positive way freedom can be practised. In architecture spontaneity accounts for a possibility of interpretation. What feels natural and good to one, might not for others, and by interpretation of public space and putting the function of a space or object in brackets, it allows for more spontaneity in use. Where a vertical extrusion of the landscape can for some users mean a place to sit, others might use it as a playground, a business opportunity, a desk or something else. Furthermore spontaneity, it being an expression of freedom, can also be associated with free time, or leisure. Spontaneity gives people the possibility to do something in a whim, out of pure randomness.

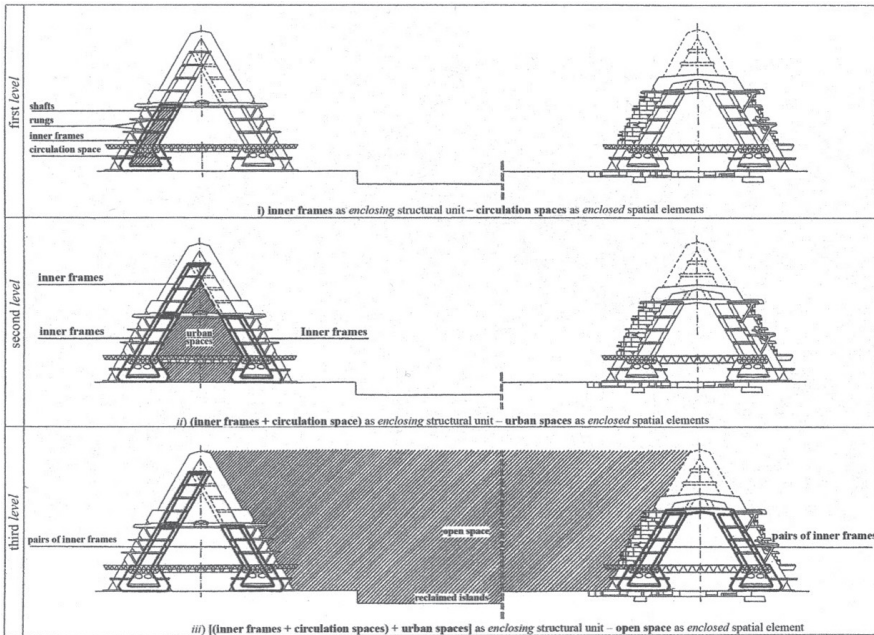
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## Obstruction /əbˈstrʌk.ʃən/

1. Something that blocks a road, passage, entrance, etc. so that nothing can go along it, or the act of blocking something in this way

One of the opposites of freedom is obstruction, also in non-architectural context. The description found in the dictionary however offers a good basis for architectural interpretation of the term. Further along this chapter, it will become clear that in this case, it is not anything that blocks a road, it is, amongst other elements, the road that blocks freedom.

# Metabolism



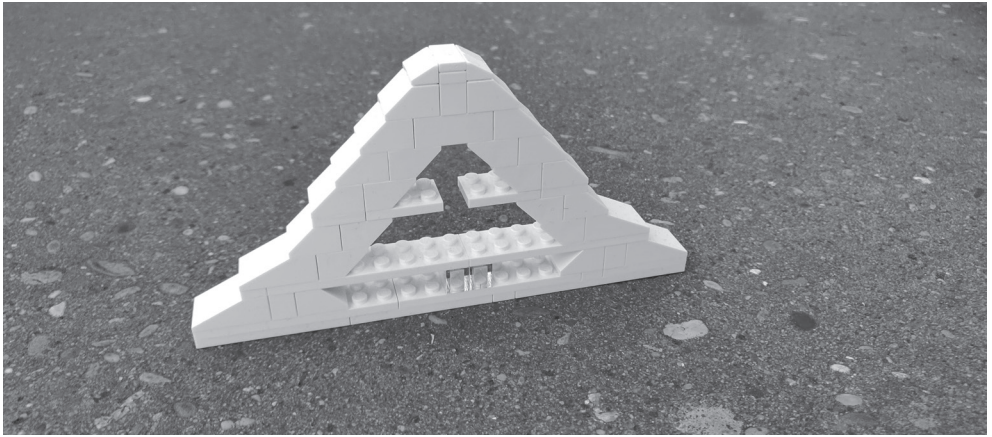
Kenzo Tange's MIT Boston design, analytical drawing

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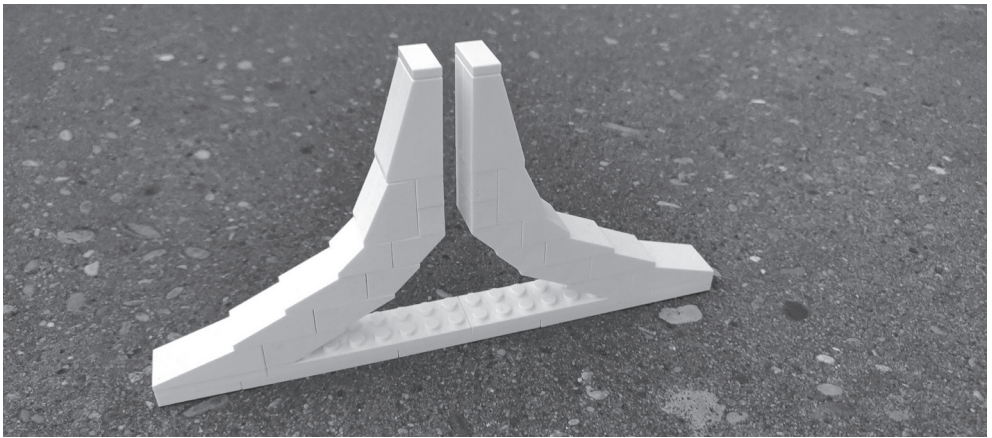
Kenzo Tange, although not officially part of the Metabolism movement, embraced the philosophy. Through his designs one common feature can be seen. The division of different scales of public space, with different atmospheres attached to it. The inside of the building at MIT would be for circulation, the A-shaped volumes would encapsule a semi-public space to be used by the inhabitants, and two A-shapes would frame a bigger public square. This principle can also be found in his design for the Tokyo Bay, as well as the original design for Skopje. Three public spaces next to each other, where the outer two would be more semi-public, intended for the inhabitants and users, while the middle one would function as a promenade directing people to the city center. What becomes

clear when looking deeper into what part circulation played in his designs, one could see that the metabolistic attitude of separating different forms of traffic was carried out, but also that Tange often hid the traffic in (MIT) or under (Tokyo and Skopje) the structures, away from the eye of the user. In the initial design of the Skopje city center, the trainstation was planned as an underground structure. Due to the financial aspect of that, in later designs the now realised platform-buildings can be seen. The train and bus station together were initially only one story high.

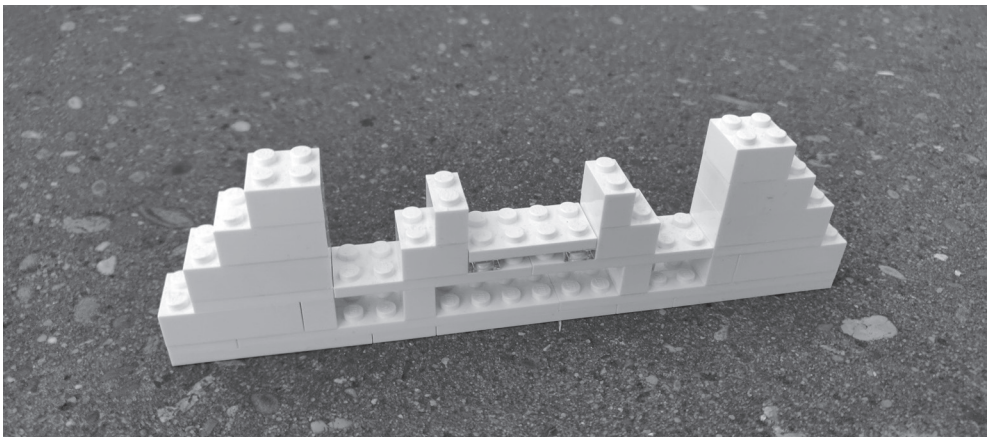
The fact that the construction of the promenade and the surrounding buildings never even started, and that promenade now is a car-dominated aorta into the city, makes it feel like an obstacle in the city.



Interpretation of MIT Boston section

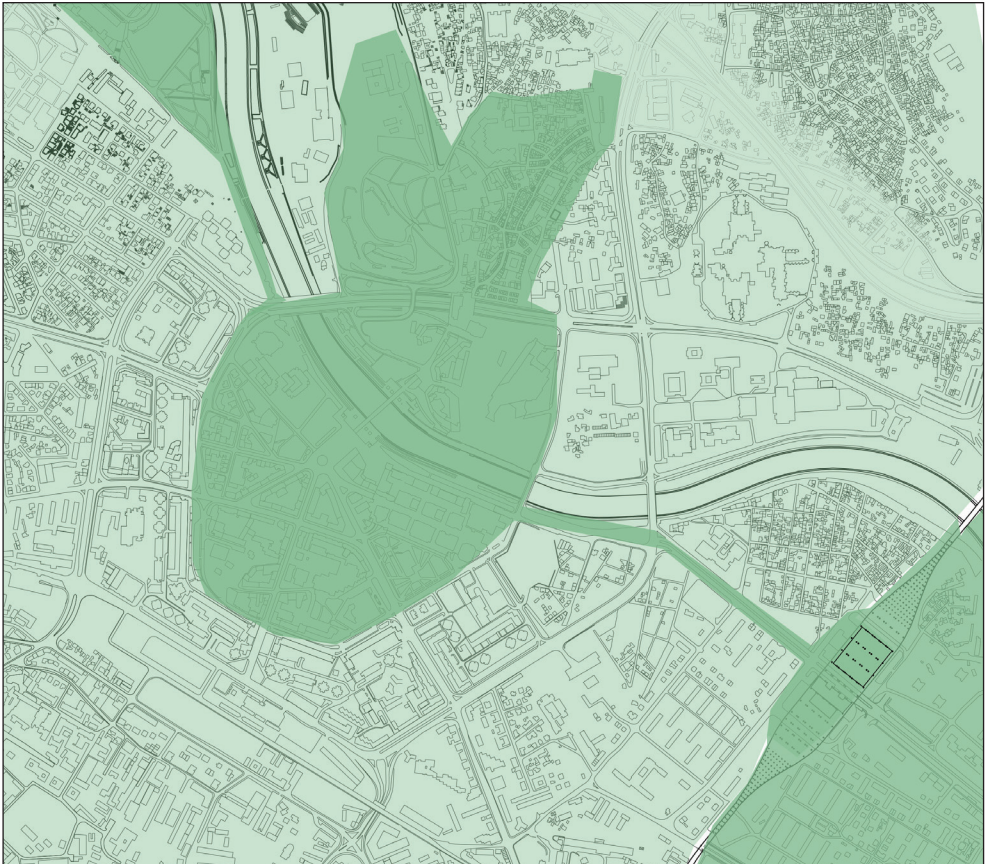


Interpretation of Tokyo Bay Project section



Interpretation of Skopje masterplan section

# Transportation Centre

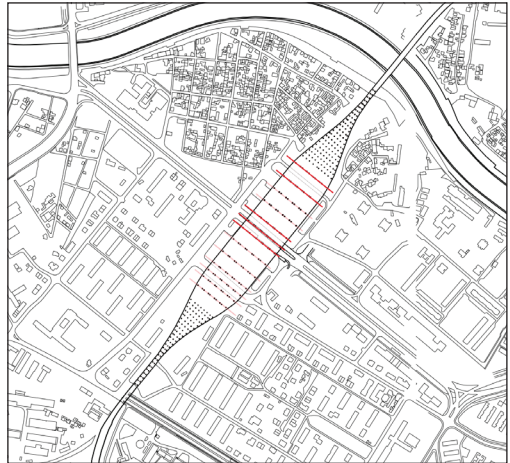


For people in aerodrome, the city only begins at the station, while for citizens of the west from the station part of the city, the city ends at

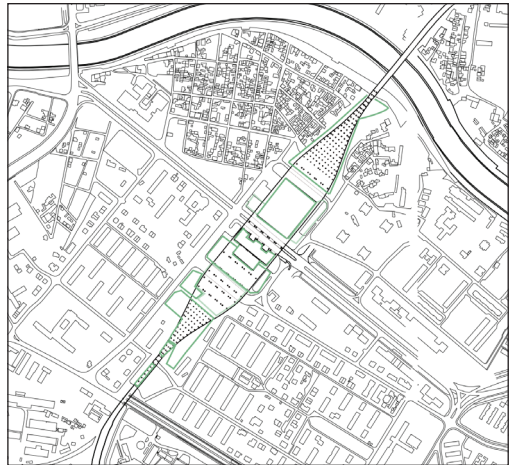
the station. This means it is a mixing or meeting point. The station is the location where the 'Aerodromer' is introduced to the city.



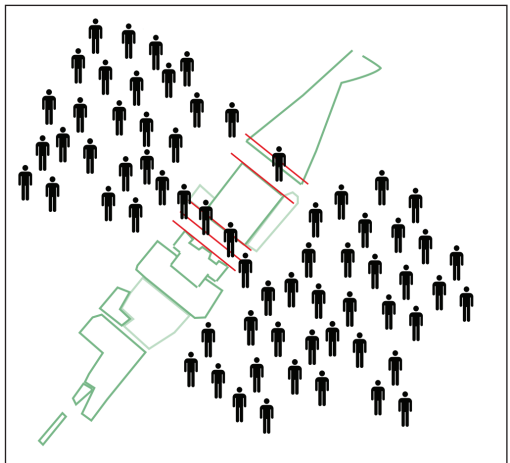
The pace in the busstation is overall quick and more chaotic. The transportation center, in which the busstation is situated truly is the center of traffic of all kinds in the city. On the deck above, about 10 to 15 trains depart each day. Under the platform is a busy international busstation, accompanied by many citybusses that have a stop here too.

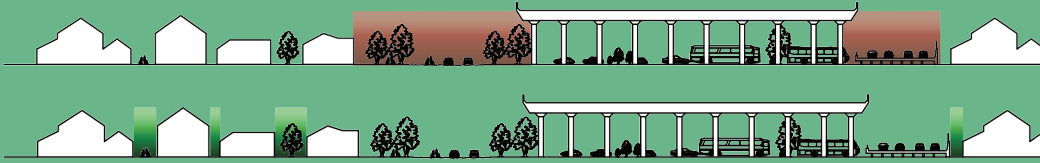


The transportation center has a great contrast in itself, where the movement towards it is fast, due to the departure times of public transport, but the pace in, around and moving away from the station are slower or even stationary; people wait for their busses, taxis wait for customers and busses wait to depart at the right exact minute. Restaurants around the station seem filled in with functions for that last group of users, while inside the station shops are more focused on the people in a hurry.

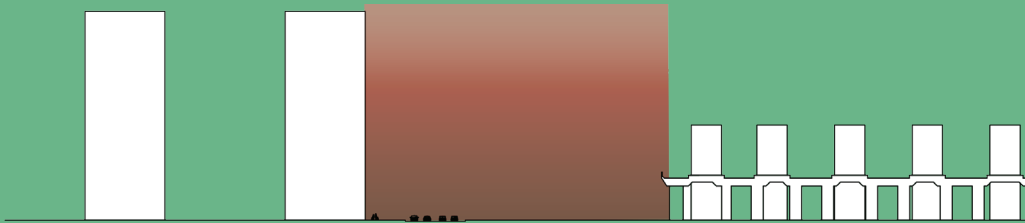


The station was designed as a city gate, and in the structure we can see this. All the lines give a strong sense of direction. But when we have a look at the obstructions one faces under the station, one can see this direction is not in the slightest recognizable in the built shapes underneath the platforms. Only the busstation gives the opportunity on the inside to walk from east to west, while the rest is oriented differently. All this congestion under the station leads to a station that is not easy to cross.





Section of intermediate spaces comparing the station and further neighborhood



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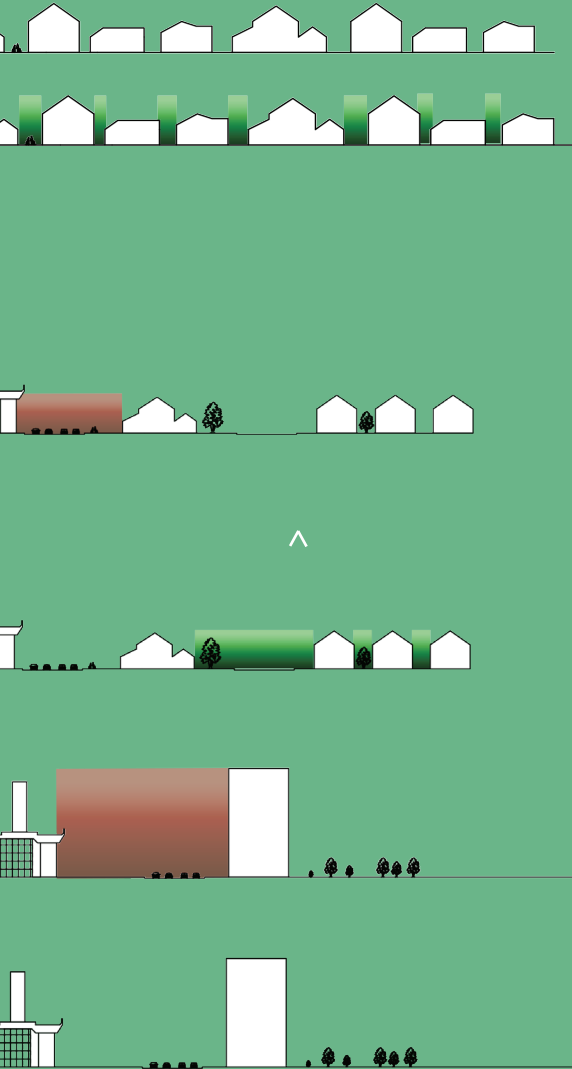


Section of intermediate spaces comparing the station and further neighborhood



Section of intermediate spaces comparing the station and further neighborhood

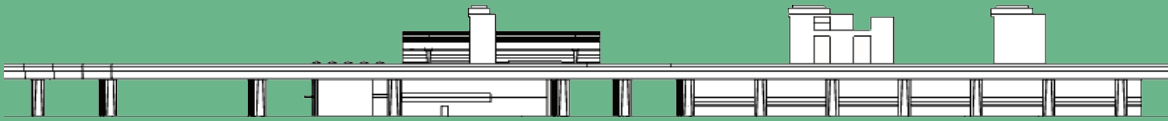
## Grain size public space



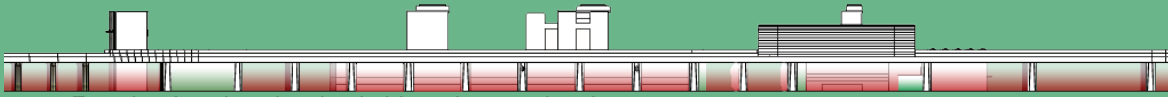
To prove that the station acts like a border, and obstruction for free movement, we first take a look around the station.

It becomes obvious that not only the scale of the station is different from the surrounding buildings, also the public space around the station is in a total different proportion than those spaces in the adjoining neighborhoods. The road connection from the highway in the north, enters the city alongside the station. This road is a four lane road, opposed to the small streets in the neighborhood, sometimes not even allowing cars to pass each other. This does not only happen on that side of the station, also on the other side the road is very wide in comparison to adjacent roads, and the space surrounding the station is occupied by cars and busses, mainly parked at the east side of the station. Even there, where the grain of buildings slightly increases from family housing to apartment buildings, the in between space is not in line with the space between the station and the first of those apartment blocks.

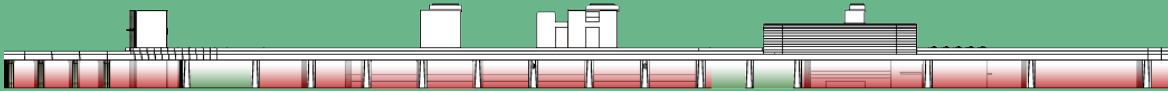
# Accessibility



Facade of station



Facade of station showing in blue where pedestrians can cross

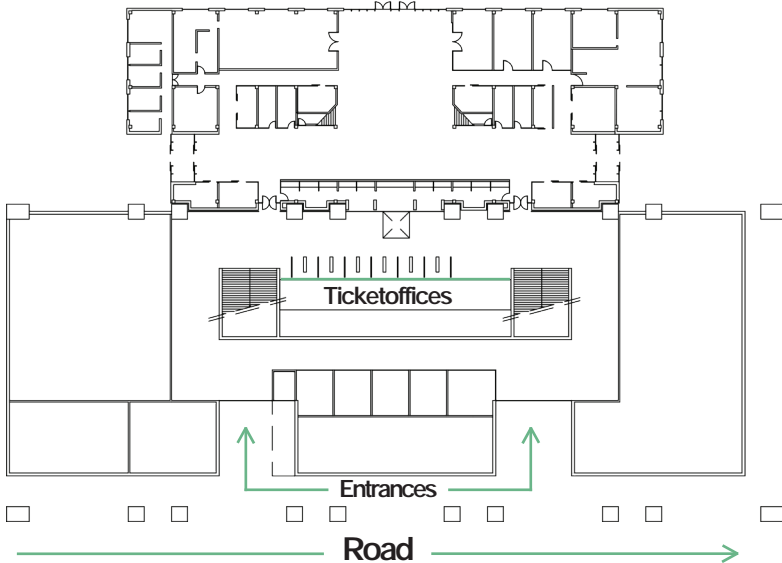


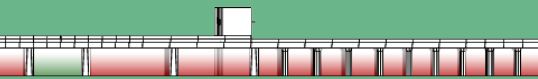
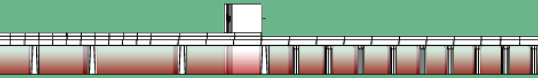
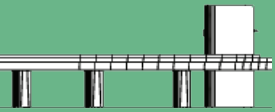
Facade of station showing in blue where cars can cross

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Furthermore, the direction of flows and the entrances are not working together very well. In the newly built busstation, adjacent to the main station hall, the direction through which people enter the building is natural.

The entrances of the trainstation however sit perpendicular to the road, perpendicular to the sidewalk. hidden in a setback of the facade. Approaching the building, from either side, does not give a clear idea of

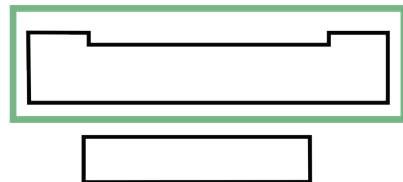
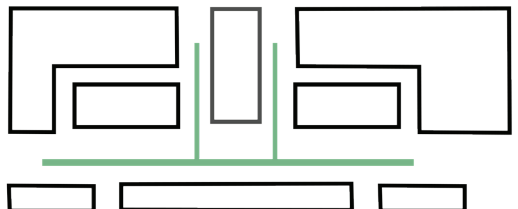
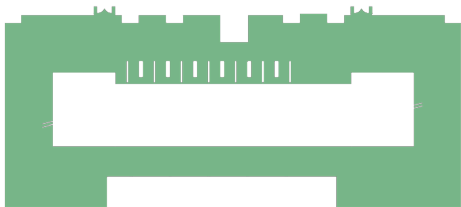




Accessibility is a great issue all together, best shown by the porosity of the groundfloor. One can see that for pedestrians, as well as vehicular traffic, not including busses that enter the station, passing through is only possible at a limited number of the many portals the station creates.

where the entrance might be. But even after finding the entrances, this building does not seem to be made for easy access. The stairs to the waiting rooms and platforms, as well as the ticket offices are located out of sight

from point of entry, and stairs protrude out, making the office even more hidden. In the design for the busstation they seem to be learning from earlier mistakes, when orientation is turned inside out.



## Obstructions

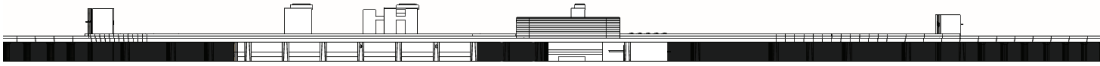
Not only the configuration of the station has an impact. Also the image from the outside plays a role. The station houses private or guarded car-parks, and a big metal fence needs to protect people from fare dodging. This really means that pedestrians only have 3 points of legal and safe passage under the station deck. The first one is the main tunnel, the second one is through the busstation, and the third a secondary road away from the city center. This means the already imposing, anonymously facaded

building gets an even more barriered image. Obviously, these fences are there for a reason. In the north, just couple of hundred meters towards the river, a gypsy commune settled. By protecting their property by a fence, even when this is not 100% effective, it keeps the gypsies from breaking the rules, and if not consequences can be enforced. The effect the fence has on the image of the station however, is one of a fortress, trying to keep the enemy out.

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Physical limitations under the station



shadows cast under the station



Shadows cast under the station

And lastly, and arguably the most metaphysical, is the fact that the platform above both stations (bus and train), casts a permanent shadow on the underlying spaces. The tunnel through the station is permanently dark. From a distance, the difference in illumination is so big you can't see what happens underneath, nor can you see anything happening on the other side. Another downside of this enormous

shadow, is that this space will never be a space where people want to spend their time. That, and the exhaust fumes by the way. But, it means, when nobody is spending time here, there will only be movement. People won't let their decision to cross the tunnel, depend on the shadows. But in my opinion, it plays a role on how the station is approached.

## Social observations



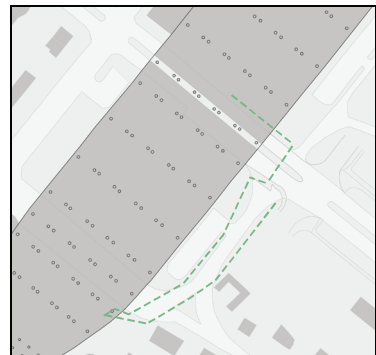
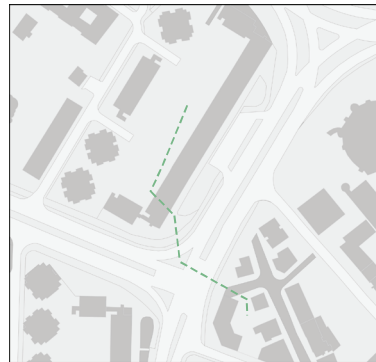
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Through following people around, one can find patterns that can tell you something. A young woman (top) is not able to walk on the sidewalk because cars have claimed the space for parking. Walking through the courtyard (middle), a lady needs to cross

the streets, to later disappear in the next courtyard. While traffic is very present near the station (bottom), the pace of humans also differs greatly from people walking towards the station (fast) and people that leave the station (slow).





Later we can see that because the sidewalk is almost always occupied, pedestrians do not recognize the sidewalk as the only place for walking. The courtyards are, at least partially protected from sound and smell of vehicular traffic, the buildings

surrounding these courtyards make that happen. Some people prefer to take an off-route in exchange for peace and quietness. Others, in case of the station, need to have fast and linear access to the services and the centre, so time is of the essence.

## Narrative Descriptions

"I feel a slight breeze running through the street. Plaster walls feel **rough**, with a lot of dents from bad maintenance. Corroded mesh metal is used for closing windows from the street. Unfinished, unplastered bricks are stacked with way too thick mortar, **the asphalt on the ground** crumbles and the pebbles used in this mix make walking uncomfortable. Barbed wire is wrapped around a metal object that shoots out of the ground. Because of the corrosion it's hard to distinct them from each other. I turn around the corner, and a **fresh breeze** is welcoming me. I sit down on a risen concrete block. It's nice and not warm, partly because of the shadow provided. Edges of the road are unfinished. Either filled with broken-off pieces from the road, or taken by an occasional grass patch combined with weeds. Not a lot of people to get in touch with. People only greet the ones they know and they avoid eye contact with others. The cars driving through the narrow street **don't allow for casual conversation**. A dog laying down in the sun is the only soft "material" in the street besides the small grass patches."



Plastered walls together with **a lot of shop windows**, mostly with wooden frames make for a diversity of hot and cold. Every now and then the slightest breeze replaces the **thick warm air**. Although the street is uneven, the big stones in the pavement **invite** to walk barefoot. A shop stalls **rugs, scarves and coats** outside. It is the only soft touch in a hard street. But then a patch of grass and



some flowers. I can fit exactly two feet on top. As I move further, a garden, with a terrace. Groups come together here, elderly people pass the time. Different groups however, don't mix. Handshaking, hugging, people interact with each other and the space. Touch the souvenirs, pass each other in **narrow alleys**, bound to get in contact. Workers get out of their **shops** to talk to friends or acquaintances.

Marble, stone tiles, concrete facades. Aluminium window frames, aluminium railings. A cold breeze. Cold glass. A hot statue, made of brass or copper on a marble pedestal. Cold. **Cars Cars Cars Cars Cars**. Cold. People in high-visibility vests. Cold. Pigeons, lots of pigeons. Softer. Lots of garbage. Better to avoid. Cannot take my shoes off here. My **shoes stick to the floor**. More birds. A beam of sunlight taken advantage of by a guy in the high-vis. People in suits leaving the office. **Distant**. A coffee mug on an air vent. Probably from yesterday. An empty cardboard box. Wires hanging out of the ceiling. Barely high enough to ignore. Aluminium spotlights shooting out of the pavement like mushrooms. Dirty. Trying to light up an **empty façade**. A car leaving. No one here touches anything. Only the high-vis guy is feeding a dozen pigeons. A lady walks by. Trees on the square. **A little girl in a tutu**. A woman with a grocery bag, with leek peeking out. A woman wearing a flowy dress. A metal box surrounding the next metal box. A man with an empty toner in a cardboard box. Distant.





Squares, streets (grey) and parks (green) solely designed for pedestrians



Squares, fields, courtyards or parking lots that could become designed for pedestrians

## Pedestrian priority

From the narrative descriptions and social analysis, it becomes clear that the streets are dominated by cars and the streetscape is fairly cold and hard. Despite the fact that the city center of Skopje houses a network of spaces that are designed solely for the pedestrian. Outside the city center, the car dominates not only the street, but the sidewalk and the courtyard. But there are opportunities, opportunities to close some of these spaces from car-traffic, and redevelop them to be pedestrian focused. The spaces chosen are already actively and predominantly used by pedestrians, only the space doesn't indicate this. What can be seen is most of the spaces

indicated are the courtyards inside the wall. Some of these courtyards are already car-free, aside from underground car-park entrances, some are free of cars during the day and get filled to the brim with cars once everyone returns from work. The other green spaces indicated are either grass fields of which the access is not accommodated for, or where a fence is protecting private property. These spaces could open up to give some green space back to the population of Skopje. Together, these two would then create a bigger network spreading out pedestrian possibilities, and giving people an option to escape from car traffic.



Both existing and potential pedestrian spaces together could make for a pedestrian network in and around the city centre.

“Positive freedom consists in the spontaneous activity of the total, integrated personality”

“Spontaneous activity is the one way in which man can overcome the terror of aloneness without sacrificing the integrity of his self.”

Erich Fromm

-  
Fear of Freedom



-Two people sit down on a piece of cardboard they found closeby. They use the stairs as their seat. This is the perfect place to sit. when you don't have a chair. -

“Spontaneous activity is not compulsive activity (...) it is not the activity of the automaton, which is the uncritical adoption of patterns suggested from the outside.

Spontaneous activity is free activity of the self and implies (...) literally: of one’s free will”

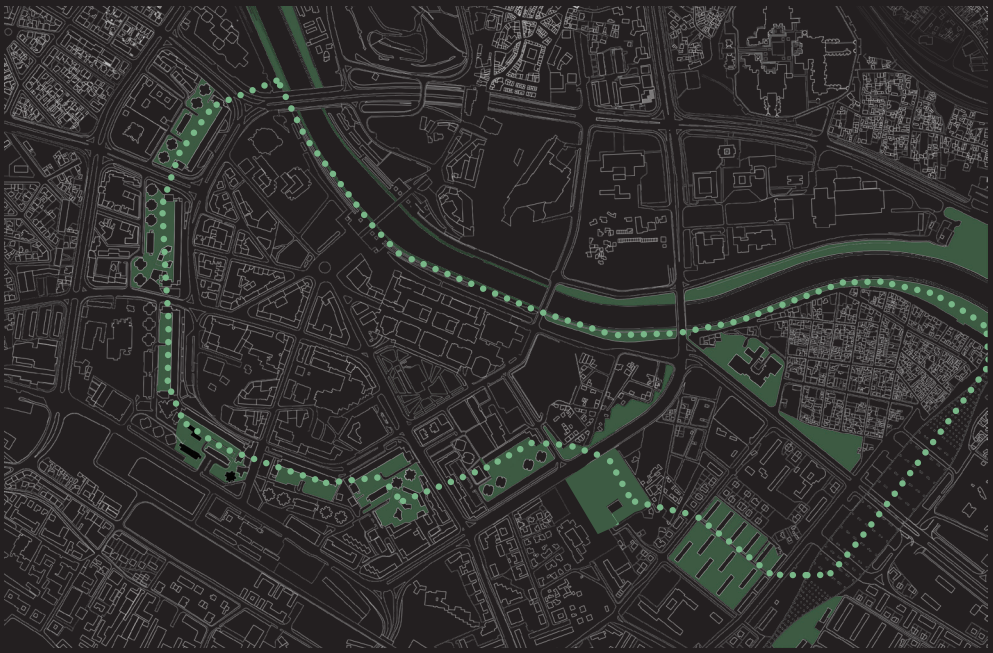
Erich Fromm

-  
Fear of Freedom





- A father walks down to the river, to catch his son, who is running down the riverbank.  
A simple height-difference appears to be enough to spark a spontaneous activity. -



Connecting all the pedestrian areas together, creates a pedestrian network around the center.

Regarding the freedom of people, and the ability to feel you can go somewhere without being interrupted or being obstructed, giving pedestrians the possibility to move freely from one side of the city center to the other seems valuable. To do this through the spaces that seemed to be suitable solely for pedestrians has another effect, being the possibility to escape from cars and the noise, smells and visual they produce. It allows people not only to calm down in the busy environment, but also a safe place for children to play, elderly to go for a walk, businessmen to take a breath, youngsters to meet etcetera. Ultimately it should also allow a more fluent, smoother vehicular traffic flow, with less pedestrians to cross. One of the challenges however, and quite a crucial one, is finding out how the transitions from pocket to pocket will take place, as the urban fabric of Skopje

restricts this movement at the moment. These transitions can be categorized in scale and nature of obstruction, from small to big, and from vertical to horizontal, and what function the obstruction fulfills. Some transitions are obstructed roads, ranging from one-way to six-lane in size. Other obstructions are height difference, ranging from 20cm between sidewalk and road, +/- 3 meters between street level and the riverside, to 10+ meters between the street level and the station platform. By looking at case studies these different scales can be understood and design approaches could be distilled from it. In this book we will discuss two examples. One, Lijnbaan in Rotterdam deals with smaller obstructions, while the station area involving the Kruisstraattunnel in Eindhoven is dealing with a multitude of traffic streams on a bigger scale.

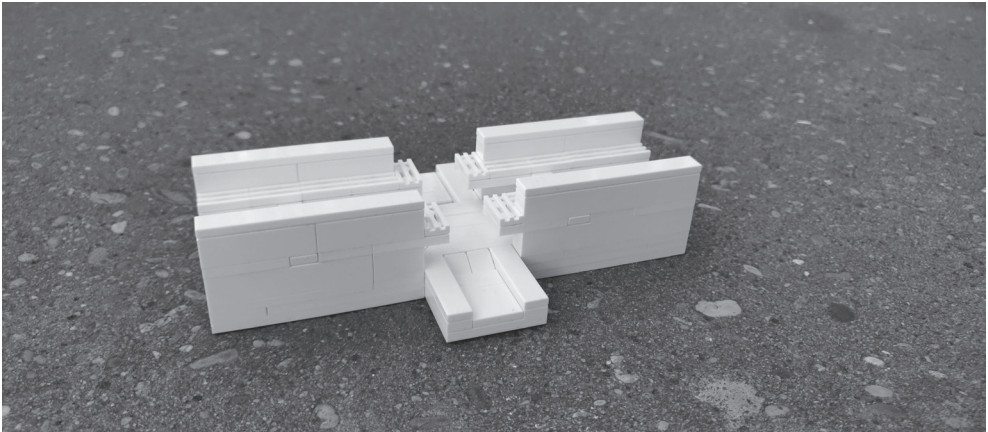




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## Small scale obstructions - Lijnbaan Rotterdam



Interpretation of the Lijnbaan project. Showing the different elements of the design.

The Lijnbaan project in Rotterdam, designed by the firm of Van den Broek en Bakema, was finished in the early fifties. The shopping area was built in a, by World War II bombings destroyed, area. The Lijnbaan stretches over almost 600 meters, and consists of shops and stockrooms.

The reason this project was picked as an example of small scale obstruction, and how to deal with, is the fact that the design has a number of features, creating a seamless transition from one side of the obstruction to the other. Two two-lane roads, plus a set of tramtracks are crossing through the project, but the pedestrian does not suffer. Looking at these crossings, one can see that the level of the crossing and the pedestrian route are leveled to the exact same dimensions. The cars crossing lijnbaan not only have to give priority to pedestrians, they are the one that are faced with an obstruction too, in the shape of a speedbump. The trams that pass through Lijnbaan, do as well do so in a non-obstructive way. Pavement continues

and rails are lowered to make for a smooth transition. Furthermore, the width of the road is modest, compared to the shopping street, being three times as small. Bicycle lanes on either side make cars cannot pass each other in both directions at all times, and need to lower their speed, regardless of the time of day. On top of this, the sidewalks parallel to the road are of comparable width as the road itself, and regarding the size of the car, versus the size of a pedestrian, the pedestrian again comes out on top. Another element that eases the transition is the canopy. On the corner of street, the canopy curves along the facade, extending towards the road, from both sides. That, together with the human scale that creates by dividing the building's height in two, strenghtens the perception that the pedestrian is 'in charge'. Lastly, although not as architectural as previous points made, the design allows trucks to restock behind the building. Access from both ways of the strip is possible, which makes crossing of heavy vehicles way less frequent.



In Eindhoven, a large junction with buslanes, very busy car traffic, both a trainstation and the busstation and tunnels for pedestrians and cyclists make for quite some obstructions all together. The interesting thing though is that pedestrians and cyclists don't have to cross one single street to pass this junction. The passageway seen in the lower middle section of the image leads to the city centre in the south (top of the image in this case), while the other end connects to a shopping street and neighborhood market square in the biggest city district of Eindhoven, Woensel. Traffic here is literally stacked on top of each other. Pedestrians and cyclists are the bottom layer, then busses and cars, and finally the railroad on top. This layering makes sure that neither of these flows have to interact with other flows than themselves, making it safe, and faster. This layering however, also results in numbers

of tunnels. Eindhoven acknowledged these tunnels were not in great condition, and the overall character of them was grim and dark. After a couple of these tunnels were restored and updated with cultural initiatives, Eindhoven decided to write a strategy, to apply to all the tunnels in the city, called *'Tunnelvisie'* or *'Tunnel vision'*. And, the improvements made, resulted in collaborations of communities of different age groups, media-events and a platform for creativity. Altogether it improved the experience and feeling of security users of the tunnels experienced. The fact that a strategy like this was needed however, shows that darkness and remoteness can really impact a tunnel, and its surroundings. Although the network, and the woven fabric of roads and walkways works, the social atmosphere in the spaces it creates are undesirable and *'Unheimlich'* (Un-homey) to use the words of the report.

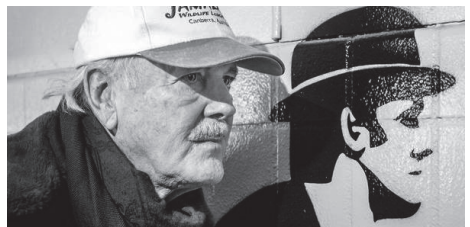
## Large scale obstructions - Station area Eindhoven



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Tunnel gets turned into prehistoric cave by local residents



John Cleese opens Tunnel of Silly Walks







The previous pages showed there is enough opportunity to bridge and overcome obstructions on a logistical level. These tunnels and bridges however were mostly to provide routes for slow speed pedestrian traffic.

However, the social analysis showed that the pace of pedestrians can differ greatly. This was most apparent around the station. A great number of people are walking towards the station, hurrying to catch a bus or train. From the station to the city centre the pace differs throughout the day. This connection, between the station and the city center, is at the moment awkwardly disrupted by a carpark and around 65 low rise buildings with dwellings and small scale businesses.

Once pedestrians cross the street, the city

centre can be seen in the distance, but the route towards it remains unclear until the street on the west side of this car park is crossed and the GTC introduces itself.

This obstruction, together with the challenge to link the pedestrian route through the green pockets, to the route of high pedestrian intensity definitely poses questions. Especially when freedom has to be taken into account.

Freedom of movement should still be guaranteed for both these streams, but transition between these two routes should be considered as part of this freedom.

Although fast pedestrian movement only gets physically, horizontally obstructed by the road passing at the east side of this plot; visually the route between the station and the city centre is almost non-existent.

## Conclusion

In Skopje the pedestrian has been unwillingly victimized by the seemingly unavoidable invasion of the vehicular traffic, fed by first of all, the rapid expansion of the city over the last decades, that has led to more private cars. This has resulted in losing valuable public greenery in the shape of tree-lines alongside the roads being removed for road expansion, and the encroaching of public space by unused, parked cars. These stationary cars filled up sidewalks and courtyards almost permanently that led to adaptation of the pedestrian.

This clearly came to light through shadowing citizens and observing their behavior. When these vehicles enter traffic, pedestrians seem to prefer avoiding confrontation with them, and instead move in between courtyards to minimize interaction. However, by trying to avoid them confrontation is inevitable as transitioning from one pedestrian zone to the other often requires crossing a six-lane road guarded by traffic lights. Freedom of movement for pedestrians is therefore limited to the main square in the city centre and a few adjacent roads, and the Bazaar on the other side of the river.

Before freedom can be regained in the city, obstructions of this freedom should be identified. With these obstructions in place, freedom of movement will always be compromised. Each obstruction has a different effect on the interactor, and for each obstruction should become clear if

it serves a function as obstruction, or if by breaking it other issues occur.

These obstructions can take shape physically, visually and by deducting a certain 'hardness' and anonymity found through narrative description. Bridging the obstacles however is possible and pedestrians found places in the city where they purposely go to feel free. However, according to Fromm, and the Cambridge dictionary, spontaneity is the only positive way to freedom, and spontaneity is described as 'A way of behaving in which you do what feels natural and good whenever you want to, rather than planning things first.'

The idea of a pedestrian route through the city, would solve a few of the above mentioned issues, but freedom of movement should also guarantee a possibility of direct movement and ability to change direction at any moment. The challenging aspect of that is trying to find a balance between people that enjoy their freedom, and people that are tied to certain obligations and need to be enabled to follow their tight schedule. A place where this all comes together is the parking-lot just outside the city centre, and more in-depth analysis should be done on this location, as the straight forward solutions discussed in this chapter do not acknowledge different types of pedestrians, but merely talk about sidewalks.

Baeten, J. P. (n.d.). Een Telefooncel op de Lijnbaan (1st ed.). NAI Publishers.

Freedom. (n.d.). In Cambridge Dictionary. Retrieved from <https://dictionary.cambridge.org/dictionary/english/freedom>

Fromm, E. (2001). *Fear of Freedom* (2nd ed., Vol. 31). Abingdon: Routledge.

Havik, K., & De Wit, S. (2017). *Narrating Places beyond the Subjective* - Delft University of Technology Graduation Projects (R. De Brouwer, Trans.). *Oase*, (98), 92–97.

Hymes, D. (1996). Educational Ethnology. In *Ethnography, Linguistics, Narrative, Inequality* (pp. 17–21). London: Taylor and Francis Ltd.

John Cleese opent Silly Walks-tunnel in Eindhoven. (2016, April 25).

Nyilas, A. (2018). *Beyond Utopia: Japanese Metabolism Architecture and the Birth of Mythopia*. Taylor and Francis Ltd.

Obstruction. (n.d.). In Cambridge Dictionary. Retrieved from <https://dictionary.cambridge.org/dictionary/english/obstruction>

Rahamimoff, A., Halevy, A., Guggenheim, D., Abrahimi, A., Bloch, A., Kleper, I., ... Rahamimoff, S. (1977). *Integrated Urban Quarter*. Israel.

Shills, E. (1982). On Being Sane In Insane Places. In *SOCIAL RESEARCH ETHICS* (1st ed., pp. 125–141). London and Basingstoke Companies and representatives all around the

world: The Macmillan Press LTD.

Spontaneity. (n.d.). In Cambridge Dictionary. Retrieved from <https://dictionary.cambridge.org/dictionary/english/spontaneity>

Tunnelvisie geeft Eindhoven meer kleur. (2017, November 6). Retrieved from <https://www.eindhoven.nl/nieuwsarchief/tunnelvisie-geeft-eindhoven-meer-kleur>

Urhahn, G., & Ernsten, C. (2010). *Spontaneous City*. BIS.

Images:

Metabolism

Scan from: Nyilas, A. (2018). *Beyond Utopia: Japanese Metabolism Architecture and the Birth of Mythopia*. Taylor and Francis Ltd.

Large scale obstructions - Station area Eindhoven:

John Cleese opent Silly Walks-tunnel in Eindhoven. (2016, April 25).

Google Earth screenshot, accessed on June 11, 2019

Facebook group 'Looptunnel Limburglaan' accessed on June 11, 2019

Station to Centre

Google Earth screenshot, accessed on June 12, 2019