Sveriges lantbruksuniversitet
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Faculty of Landscape Architecture, Horticultureand
Crop Production Science

REVITALISING URBAN LANDSCAPE

Strategies and Visions for the Railway Loop of Riga

INTA VASKA

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Revitalising Urban Landscape
– Strategies and Visions for the Railway Loop of Riga

Inta Vaska

Supervisor: Anders Westin, SLU, Department of Landscape Architecture, Planning and Management

Examiner: Marie Larsson, SLU, Department of Landscape Architecture, Planning and Management

Co-examiner: Helena Mellqvist, SLU, Department of Landscape Architecture, Planning and Management

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SLU, Swedish University of Agricultural Sciences
Faculty of Landscape Architecture, Horticulture and Crop Production Science
Department of Landscape Architecture, Planning and Management

Abstract

Almost two centuries ago technological progress together with a growth of manufacturing rapidly changed the way how we organise our cities and infrastructure. Transport, especially railways, gained a dominant role as very efficient way to transport goods and people. Now often the infrastructure that served manufactures and ports have grown into cities' fabrics and cause many planning issues like it is in a case of Riga. This master thesis is an investigation of the revitalisation possibilities of the post-industrial landscapes along the operating railways through the case of Riga. The aim is to contribute to a framework for strategic redevelopment steps which could be used to reclaim the brownfields and wastelands in similar cases.

The study is divided in six parts. First four introduces with the existing situation, reviews the history how it has developed, addresses the main environmental issues what the existing situation cause and explores some inspirational examples of how to deal with various infrastructural issues. The fifth part is my concept and strategy for the revitalisation and includes the framework for strategic redevelopment steps. The sixth part is my visionary proposal; it introduces with site specifics, my overall vision, potential catalysts for change, some design principles and ideas for identity creating elements, gives specific examples of solutions for specific places and an overview of phasing.

The study is concluded with discussion, conclusion and some suggestions. The overall purpose of this study is not to create a design proposal but to raise awareness and discussion about the problem and to illustrate examples of potential solutions.

Content

Introduction

Latvia is a country in the Baltic region in North-East Europe (Image 1). Riga is the capital of Latvia and the largest city of the Baltic States with 696 593 inhabitants in 2015. Both historically and nowadays the city has been an important infrastructural hub between Eastern and Western Europe.

Image 1, Latvia in Europe,
(CC BY-SA)©OpenStreetMap contributors.
I have added colours and text.

Riga has an international airport, a passenger port and one of the biggest export ports in the Baltic States which serves cargo transfers. Most of the transit goes through the city centre by using the railway system with a 1520 mm railway track gauge. For the upcoming 10 years there are plans for a new high speed railway line via city centre of Riga and the airport connecting Tallinn to Warsaw (and Berlin) using the standard 1435 mm gauge. All of these connections will meet at the city centre of Riga. At the same time the city itself is not that well connected. The main problem is that the city centre (approx. 3km^2) built before the industrialization until the end of the 19th century is separated from the new city built in the 20th -21st century. This separation is caused by the railway line surrounded by wastelands and brownfields (Image 2-3).

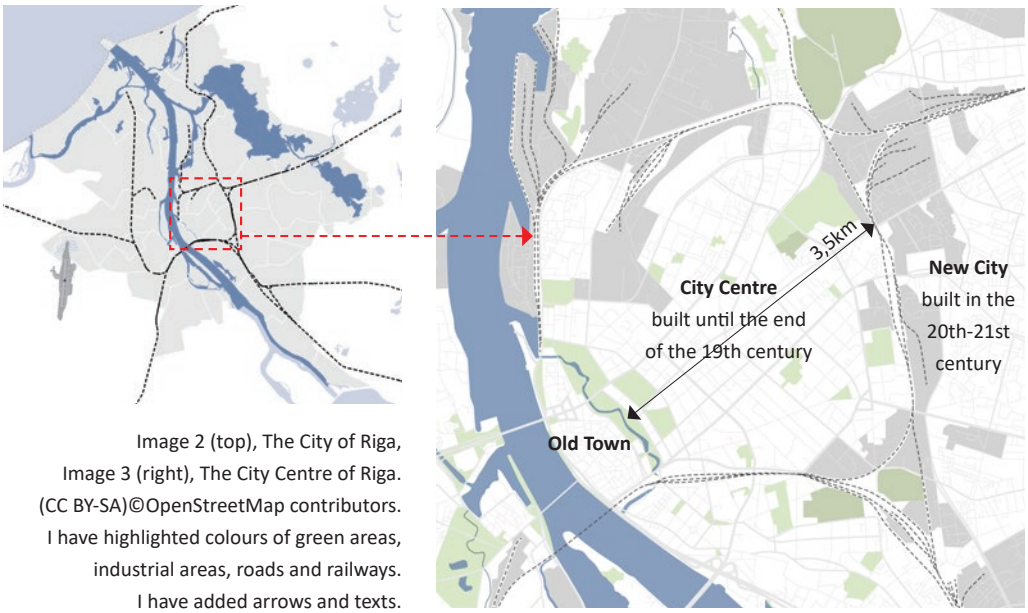

Image 2 (top), The City of Riga,
Image 3 (right), The City Centre of Riga.
(CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours of green areas,
industrial areas, roads and railways.
I have added arrows and texts.

Historically, before the industrialization Riga was in the size of the inner part of the railway loop (Image 4). The first railway in Riga was built in 1861 *(Albergs, Augustāne, Pētersone, 2009, p. 9)*. The railway loop around the city centre was finished on 1872 and factories where placed along it followed by working-class residential areas *(Albergs, Augustāne, Pētersone, 2009, p. 9)*. Nowadays most of the factories are gone from the area around the railway line. Old industrial warehouses are destroyed or unused or used as storages. Currently most of areas are lacking clear functions, moreover, they are unsafe places in dark hours and they are disturbed by noise and vibrations from the railway. All of these factors has created a belt of wastelands around the city centre and separates the centre from other parts of the Riga.

My interest in this topic is based on one question: why are these lands so undervalued? Clearly one of the reasons is that they are affected by noise and vibrations which lead to the question: how that can be changed by using vegetation, shaping the landscape and choosing the right building forms? Another issue is that the railway together with the brownfields creates segregation between the city centre and the suburbs. That brings up the next question: how revitalisation of these lands could help to provide a better connectivity between the neighbourhoods on both sides and how these brownfields and wastelands could be integrated back into the city fabric.

All of these questions lead to the essential discussion about how the post-industrial landscapes along the operating railways can be revitalised and developed into an attractive and healthy environment for city's residents and guests.

Image 4, The City Centre of Riga
Imagery ©2018 CNES / Airbus, Map data ©2018 Google.
I have turned down colours and added railways and the Central Station.

In my master thesis project in Sustainable Urban Design at Lund University I studied how to reclaim brownfields along the railway loop of Riga and how to integrate these areas back into the city and its neighbourhoods. The focus of the project is how to connect both sides of the railway around the city centre to lessen the barrier effect and possibilities for densification along the railway (Vaska I., 2016, pp. 11).

The Lund thesis project offers an extensive insight and detailed design proposal for one specific part of the railway loop. However, as one of my conclusions I pointed at the possibility to develop a green loop with mixed-use local transit hubs (Vaska I., 2016, pp. 106).

In this study I will explore the possibilities to develop the green loop as well as main environmental issues that affect the areas in close proximity to the railways and potential solutions, which I lacked in my previous work, and possibilities for landscape revitalisation without necessarily densification.

Aim

The aim of the project is to contribute knowledge and ideas about how urban infrastructure and neighbouring lands in general, and more specifically railways and areas in their proximity, can be revitalised and integrated into the existing city fabric. The aim is also to contribute to a framework for strategic redevelopment steps in projects like this and to analyse their consequences.

The thesis questions are:

1. How was the growth of Riga affected by industrialization in general and railways in particular?
2. How can one revitalise areas in proximity to the Riga railway loop and make them connected and accessible for public?
3. How can one integrate these areas back into the city and its neighbourhoods?
4. How can one reduce the environmental impact of operating railways?
5. How can one mitigate noise and vibrations from railways?
6. How can one work strategically and visionary with redevelopment of areas affected by urban infrastructure, derelict (abandoned) industries and brownfields near the city centre?

Method

According to the book "Research in Landscape Architecture: Methods and Methodology" *(Brink, A., Bruns, D., Tobi, H., Bell, S, 2016)* words 'research' and 'design' go hand-in-hand when talking about academic research in landscape architecture. They suggest that the research can be divided in three categories:

- Research *on* design meaning "studies about the products of design" *(p. 54)*,
- Research *for* design meaning "all types of research supporting design process and the coming into being of the design product" *(p. 54)*,
- Research *through* designing meaning "all research and studies that actively employ designing as research method" *(p. 54).*

As the core of this study is to find a concept and strategy for the revitalisation of the study area, I have worked mainly with the last two, especially, the research *for* design.

The research methods of this study are based on a theoretical and analytical approach, including literature study, and research conducted through testing design opportunities. The research also includes several project fieldworks with photo fixation and a lot of reference material from my personal study trips to Copenhagen and Køge in Denmark, Berlin in Germany and Amsterdam in the Netherlands.

An important part of my research *on* (in this case meaning existing situation) and *for* design is literature study. In terms of sources, the research of the literature can be divided into two parts. One is literature studies of urban planning history regarding the role of railways on shaping the cities and planning history of Riga that has affected the city's fabric. The other one is literature studies regarding soil pollution, phytoremediation, noise pollution and mitigation of noise and vibrations. I must mention that these topics of the second part overlies with the other science fields which made the research slightly challenging. From this second part, I want to highlight HOSSANA project materials that constituted a large portion of the Analysis of the Environmental Issues part of my thesis.

Additionally important sources for my research include planning documents by Riga City Council and findings from my fieldworks. Ray Lucas in his book "Architectural Research Methods" *(2016)* claims that conducting and documenting fieldwork is a "primary source of research data" although he later adds "the issue is that it is difficult to draw clear conclusions or recommendations" *(p.69)*. In total, for this study I have done five fieldworks with notes, sketching and photo fixation:

1. January 17, 2016 – Survey of the whole loop in a very cold winter day with occasional snowfall. As it was wintertime with a lot of snow I could find recent traces of people on snow. Unexpectedly, there were quite many traces followed the rails, except in the areas where the railway is placed on a berm. I also found unsanctioned railway crossings. Most of them took place next to the bridges over the railway which means that some people prefer to cross the railway at ground level not over the bridge.

2. July 27, 2017 –Survey of the East part of the railway loop in a sunny and warm summer day. This is one of the most active parts of the loop and I could see a few people walking along the rails on unsanctioned trails through grass. There was

some activity in the nearby park and at the train station Zemitani.

3. August 10, 2017 - Survey of the East and South part of the railway loop including the Central Train Station in a hot and sunny summer day. I could see a few people walking along the rails on unsanctioned trails through grass and more people on the pedestrian paths along the railway berm in the South part of the loop. This walk was very enjoyable as the weather was great and I could fully experience biodiversity along the railway with wild vegetation and sounds of insects.
4. August 29, 2017 - Survey of the North part of the loop in a cloudy summer day. I could see a couple of people walking along the rails but if compared with the East and South parts of the loop, this part was much more lifeless.
5. September 17, 2017 - Survey of the neighbourhood characters along the railway. I got confirmation for my findings from the literature study that the neighbourhoods along the railway are truly diverse.

Although the fieldworks gave me good understanding of the site and some proof for the assumptions I could make from my literature studies, I do agree with Ray Lucas that it is still problematic to interpret the findings.

Lastly, to strengthen my arguments as one of my methods I have also choose to use a lot of visual material. Ray Lucas in "Architectural Research Methods" *(2016)* points out that "Architectural research can be conducted and communicated by means other than the written text" *(p.177)* as graphic representation is native to the discipline *(p.176)*. He suggests that the use of "drawing, diagramming, notation, cartography and other graphic representations in the research process can bring the results of the research closer to the design process" *(Lucas, R., 2016, p.175)*.

Altogether, through the theoretical research, fieldworks and my own observations, I have obtained a better understanding of the topic. With all of that in mind and my own critical review on my first master thesis project, I have carried out the last two parts of the thesis: Concept and Strategy and Visionary Proposal. These two parts are based on testing the design opportunities or in other words - research through designing.

Limitations

Although the research included several site surveys, overall it is theoretical and has been based on literature research, exploration of various planning documents and maps, and my own knowledge and observations which leads to several limitations.

First of all, this study does not include any people polls and walking interviews which means that the concept, strategy and vision is built on a theory and my own observations. The lack of public opinion and the fact that I come from Riga brings to limitation of certain subjectivity. I did consider to do people polls but eventually, after discussing my thesis topic with my friends and family, I decided that it would not add much for discussion because it is very likely that most of the people haven't thought about this topic before.

Another, much more measurable topic not included in this study is a review of the property structure and distribution of the land ownership which would have a large impact on any changes, however the strategy of this study suggests to have multilateral discussion between the municipality, land owners including the state joint stock company Latvian Railways (Latvian: AS Latvijas Dzelzceļš), and the locals.

In the analysis of environmental issues I have researched the potential threats of soil pollution but as this question overlays with other sciences, it definitely needs more extensive investigation as well as the actual effect of phytoremediation. Another topic that overlays with other sciences is noise pollution and mitigation measurements, this could also be explored more and specified by location and type.

As the strategy and the vision of this study do not aim to give a clear site borders and design proposal, the study does not include any calculations of necessary investments to create the first phase zero changes as pedestrian and bike paths, plantings etc.

All of these parts left-out, especially public opinion, would probably change the vision but I believe that they would not change the concept and strategy because they are based on the city scale goals.

Terminology

Before analysing site specific issues of the areas alongside the railway loop of Riga, I want to clarify the definition of 'brownfield'.

The term **'brownfields'** is relatively new and it cannot be found in dictionaries published before 1990's. The term was introduced in 1992 in the United States and US Environmental Protection Agency (EPA), *(2017)* has defined 'brownfield site' as "a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant".

Even though the term was invented in US, the US version is not necessarily the only correct definition. Interpretations of the term 'brownfields' differs between different countries and there is no common worldwide or European definition.

The definition that is generally accepted in EU countries is defined by the European brownfield regeneration expert network CABERNET, The Concerted Action on Brownfield and Economic Regeneration Network, originally funded as a EU project from 2002-2005. According to CABERNET *(University of Nottingham 2006, p. 3)* brownfields are sites "that have been affected by the former uses of the site and surrounding land; are derelict and underused; may have real or perceived contamination problems; are mainly in developed urban areas; and require intervention to bring them back to beneficial use".

To define brownfields In Latvia, according Riga City Council, an adopted CABERNET definition is used: "A place that has been previously used or built up, but currently is derelict or abandoned - can also be contaminated" *(University of Nottingham 2006, p. 30)*.

Despite the fact that there is a clear definition of the term 'brownfields' in Latvia, there is no specific word in Latvian to describe the term and it is more common to use a term 'degraded territories' instead. According to local legislations 'degraded territories' are territories with destroyed or damaged soil surface or abandoned lands of mineral extraction, economic or military activity *(Land Management Law 2014)*; very often also understood as contaminated territories.

In this paper I will use the official definition of 'brownfields' in Latvia that was adopted from CABERNET.

Other terms used in the study:

Green belt – a zone of farmland, parks, and open country surrounding a town or city: usually officially designed as such and preserved from urban development
(Hanks, P. 1979)

Green remediation - The practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprint of clean-up activities (U.S. Environmental Protection Agency 2017)

Phytoremediation (also called: bioremediation) - the use of plants to extract heavy metals from contaminated soils and water (Makins, M. 1991)

Transit oriented development (TOD) - is a type of community development that includes a mixture of housing, office, retail and/or other amenities integrated into a walkable neighbourhood and located within a half-mile of quality public transportation (Reconnecting America 2017)

Wasteland – an empty area of land, especially in or near a city, which is not cultivated or built on, or used in any other way (Walter, E. 2005)

Image 5, Field Study, 2016-01-17

PART 1

Introduction of the Existing Situation

1.1. The City of Riga

Riga, the capital of Latvia is located on the Gulf of Riga, the Baltic Sea and it is bisected by the river Daugava . According to the state institution Office of Citizenship and Migration Affairs (OCMA), in 2017 the population of Riga was 704 476 inhabitants, which is almost 1/3 of total population of Latvia (2 129 320). Territory of Riga covers 304 km^2. 39% of the area is natural landscapes, 16% are water bodies and 23% are green areas *(Municipal portal of Riga 2016)*.

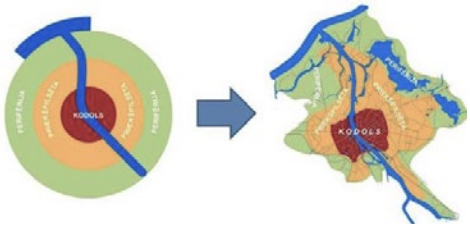

Image 6, Spatial structure of the population setting of the city (Riga 2030, 2014)

According to the city's planning documents it is considered green and aims to be compact, however, if compared to Copenhagen, Malmo or Amsterdam, Riga is less dense and less compact (Image 7), and the amount of blue-green structure seems large just because the city border includes the green periphery.

The city of Riga is the regional centre, and most of the agglomeration population is commuting to metropolis daily. The metropolitan area of Riga consists of three parts that are divided in the West and East side by the river (Image 6). These parts are:

1. the city core with the historical centre,
2. suburbs with Soviet microdistricts and mixed use neighbourhoods,
3. green periphery with low-rise buildings like private villas and cottages.

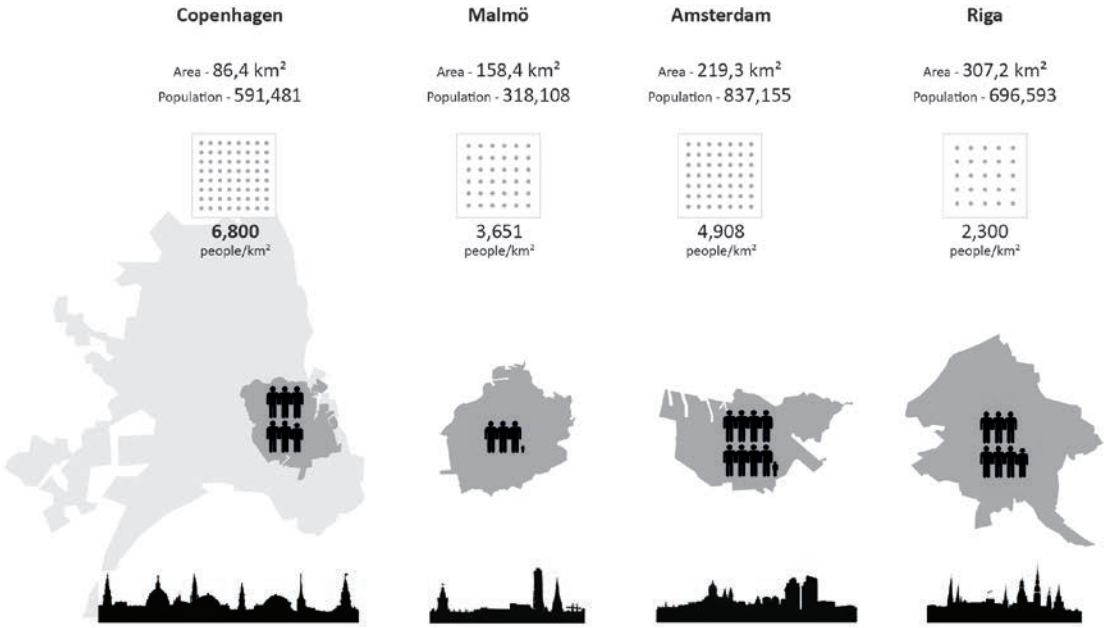

Image 7, Scale comparison of four different cities. Illustration is designed and drafted by myself. Contours of the cities are from (CC BY-SA)©OpenStreetMap contributors and given numbers are official statistics of each country.

The city is distinctly monocentric and most of the activities are placed at the city core where the oldest historical built structure is located. The city core or the so called city centre is surrounded by railway and historical industrial areas that are separating the city core from suburbs and periphery where large scale housing areas are located.

As historically Riga has developed as a transit hub and it is a capital of Latvia now, all the main roads and railways of the country are leading to Riga and meets at the centre of the city (Image group 8). Even if the city has a ring road around it, most of the traffic still ends up at the centre, because of its monocentric structure. The Slightly

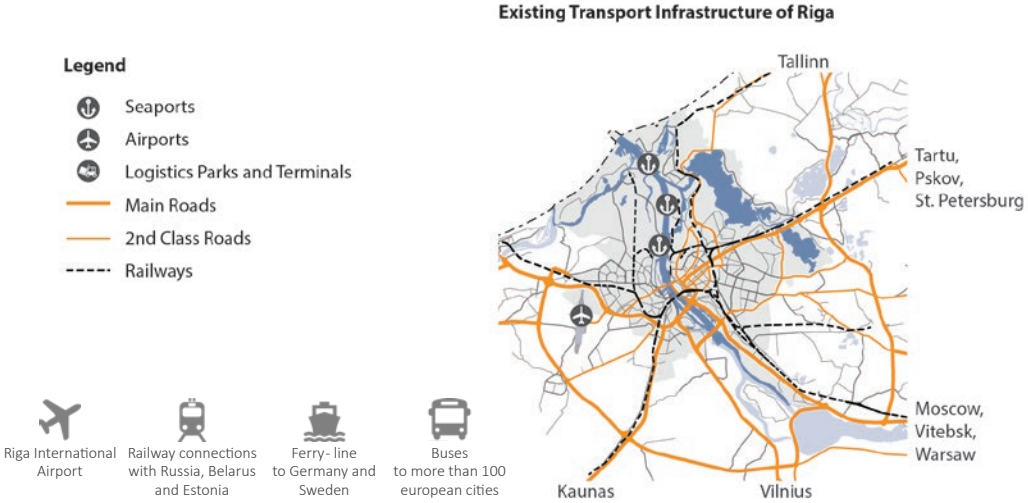

Image group 8, Transport infrastructure of Latvia and Riga. (CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours of roads and railways, added self-drafted icons and the legend.

radial street structure with all the main roads leading to the city core is creating traffic-jams in the centre as well as in suburbs and especially on bridges that crosses the railways and the river.

The railway that divides the city is still in use and it serves one of the main ports in the country and the main port of Riga (Image group 8). The railway net in the country is very similar to the main road net except, that the railway net creates unclosed loop around the city core unlike the roads. The main destination for passenger trains is central station next to the old town in the city core. However, there are several other stations on both sides of the river.

One of the most important near future projects of Latvia and Riga is Rail Baltica. As I have mentioned in the Introduction of the thesis, it will be a high-speed train line that will connect all Baltic countries with Warszawa and Berlin (Image 9)*(Rail Baltica, 2017)*. According to latest plans, part of the Rail Baltica railway will go through the city of Riga *(Rail Baltica, 2017)*. As existing railway is built according Russian standards (1520 mm track gauge), but the new system will be a part of West Europe net (1435 mm track gauge), it is planned to add an extra track next to existing one along the railway in the city *(Rail Baltica, 2017)*. It means that in some parts the railway loop that divides the city can become even wider barrier in the city, and at the same time the existing central station can become a stronger and busier transit hub.

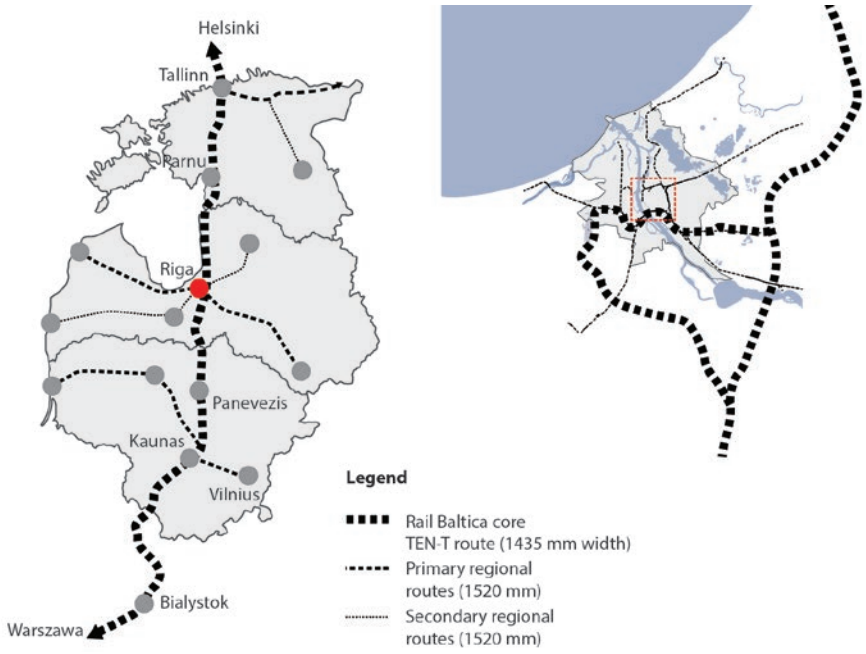

Image group 9, Rail Baltica. (CC BY-SA)©OpenStreetMap contributors.
I have highlighted railways and added dots for stations and the legend.
Data for the new planned conncetions are taken from Rail Baltica Global Project (2017)

Overall, the landscape of the city has significant differences between inner part of the railway loop and outer part. The inner part is mostly organized in a block structure with masonry and wooden architecture (Image 11), streets are organized in a grid system and the only green structure is unconnected historical parks. Whereas the outer part is much greener with un-regular street net and much more diverse architecture starting from one-two storey wooden houses (Image 12) until large scale multi-storey housing areas from Soviet times (Image 13). And these both sides of the railway are divided not only by railway tracks, but also with industrial areas, brownfields and wastelands alongside the railway (Image 10).

According to the Riga City Council planning document "Sustainable Development Strategy of Riga until 2030" *(2014)*, there are no plans to improve the spatial connectivity between both sides of the railway. Currently, most of the prioritized projects by municipality are related to transport infrastructure however the same document suggests that pedestrians and cyclists should be prioritised within the core of the city. It might be a challenge if considering that most of the population lives on the suburbs and periphery while the cycling infrastructure is very poor.

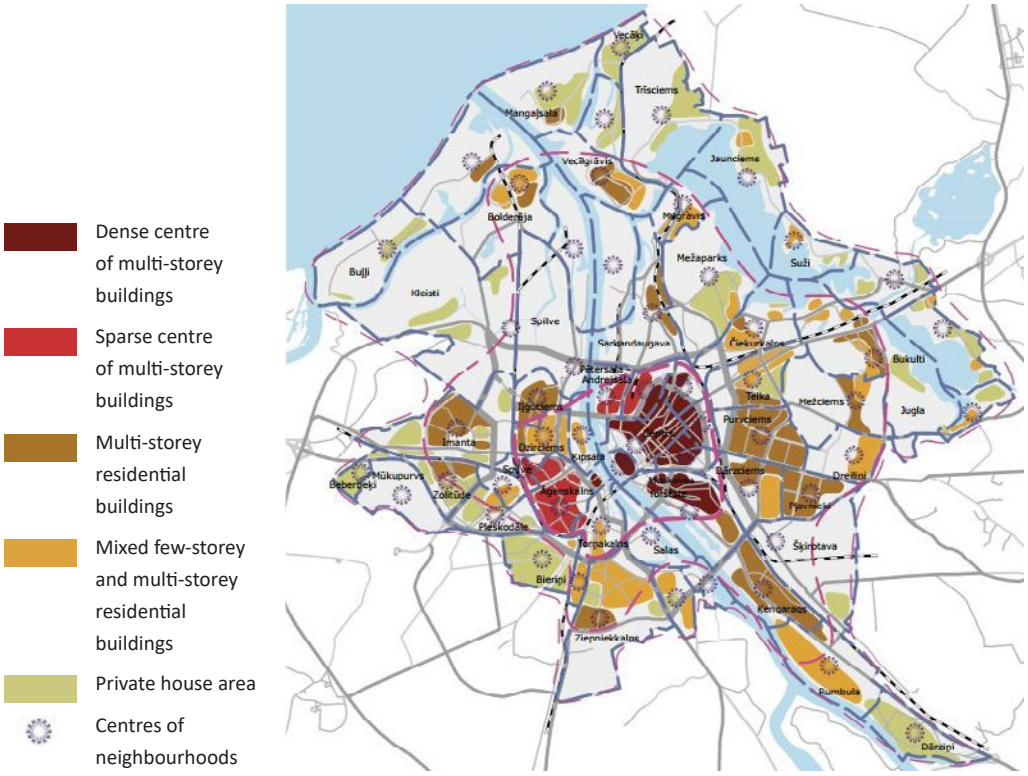

Image 10, Guidelines for the structure of population setting of the city of Riga, (Riga 2030, 2014, p. 19)

Image 11, Gertrudes Street, The city centre with multi-story masonry and wooden buildings. Personal Archive, 2017-09-09

Image 12, Maskavas Street, Latgale Suburb with many wooden buildings. Personal Archive, 2017-09-09

Image 13, Riga, Purvciems, 2009. Vidzeme Suburb with Soviet microdistricts. Photo by Laurijs Svirskis (CC BY-SA 3.0)

All maps on this page (Image 14-16) are based on
(CC BY-SA)©OpenStreetMap contributors and information from
Comprehensive Plan of Riga City 2006 – 2018 (2009)
I have highlighted colours and railways and added zoning and legends.

Image 14

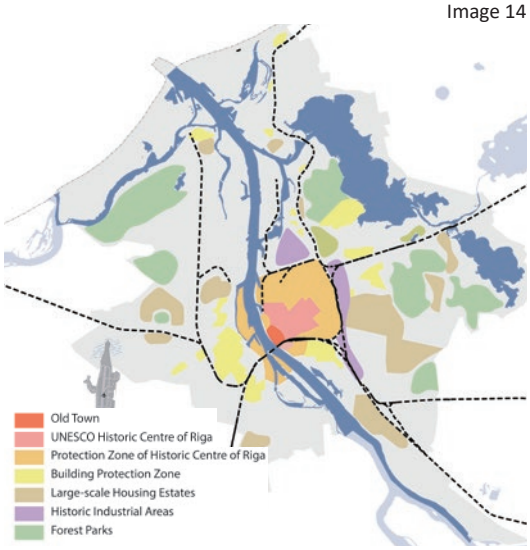

Image 15

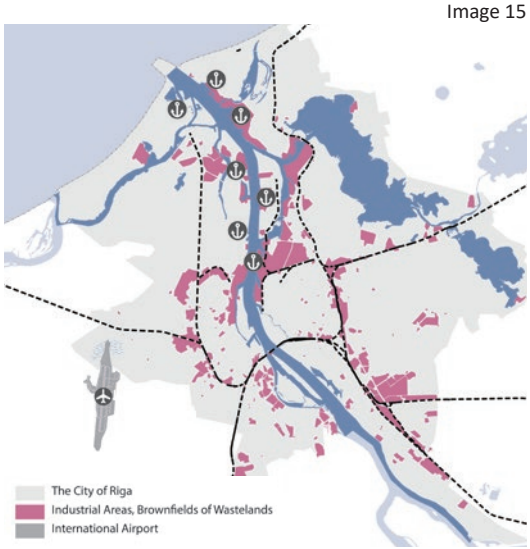

Image 16

Green - Blue City Structure

44.8% of the city consists of vast natural and green areas and waters *(Comprehensive Plan 2009, p. 20)*. There are several large forest parks in the periphery of the city but the historical centre is not as green as it could be. The centre has several historical parks, but they are not connected and most of the streets don't have any vegetation which leads to poor air quality.

The Most Important Historical and Cultural Spaces and Landscapes

The city structure is diverse and offers places for all kinds of needs, but most of the areas are mono-functional and poorly connected, except the city centre which is the main destination for citizens' daily needs. The city lacks mixed-use centres in the suburbs and in periphery and it is divided by industrial areas that take large spaces right next to the centre.

Existing Industrial Areas, Brownfields and Wastelands

Almost all the industrial areas are located next to the railway as historically it provided easy access to the port to transport goods. Currently, most of the places of the former factories are unused and considered as brownfields. The port is still an important industrial part of the city, but most of the other ex-industrial sites has now become barriers in the city.

All maps on this page (Image 17-19) are based on
(CC BY-SA)©OpenStreetMap contributors and information from
Comprehensive Plan of Riga City 2006 – 2018 (2009)
I have highlighted colours of roads and railways and added
planned transport infrastructure, distribution of population and legends.

Image 17

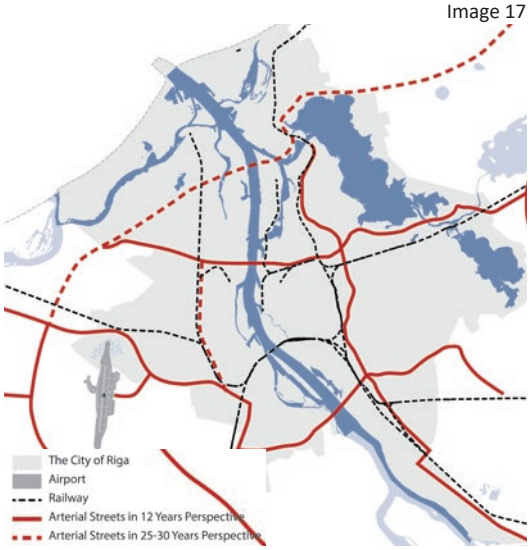

Image 18

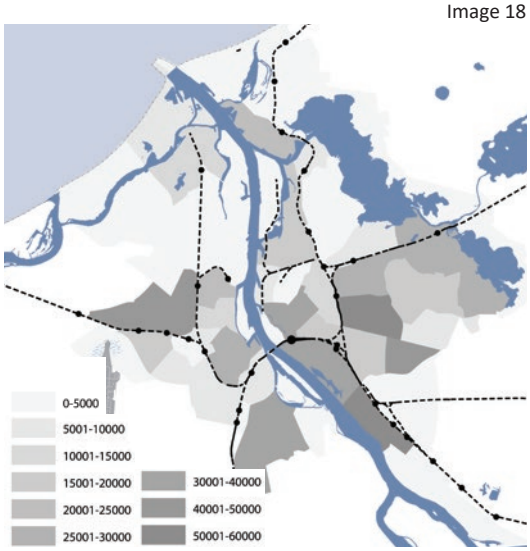

Image 19

Existing Transport Infrastructure

The city centre has a slightly radial street structure – all the main streets leads from the old town to the suburbs in different directions. In the suburbs and periphery the street structure is irregular, however the main streets continue this radial character. Most of the traffic conjunctions are related to the railway and river crossings. There are several bypasses built to avoid cargo traffic in the centre.

Planned Transport Infrastructure

For the coming future the Municipality of Riga has planned a double-loop bypass around the city centre to divert car traffic from the city centre; some parts of it are already completed. The new bypass together with the railway poses a threat to increase the barrier effect of the industrial lands along the railway (Image 15, purple colour, Image 16). This must be taken into consideration in the planning processes.

Distribution of Population

Most of the population is located in the East, North and West side of the city, because large areas in the North side of the city are occupied by the city's ports. The densest neighbourhoods are those with Soviet microdistricts. Those are poor quality multi-storey housing areas. The city centre is not very dense in terms of population as it holds the more expensive properties and buildings are often used for offices and commercial spaces.

1.2. The City Centre of Riga

Officially, ‘Centre’ is the name for one of the neighbourhoods of Riga, but often the term used to describe everything between the river Daugava and the railway loop on the right side of the river. In this paper, the term ‘City Centre’ is used to describe the inner part of the railway loop.

The centre is formed by the end of the 19th century, and the central part of the city centre is a UNESCO World Heritage Site (Image 20), noticed by its collection of Art Nouveau/Jugendstil buildings and wooden architecture.

Besides the neighbourhood called ‘Centre’, there are 6 more neighbourhoods in the inner part of the railway loop: Old Town, Avoti, Grīziņkalns, Brasa, Skanste and Pētersala-Andrejsala (Image 21). The neighbourhoods differ in character and their borders are strongly related to their historical development.

Very often visitors of the city do not see much more than the Old Town (Image 22) that does not represent the overall character of the city. Typically the city centre is associated with 6-7 floor masonry buildings laid out in slightly radial street grid, shaping rectangular building block structure (Image 23). However, the neighbourhoods along the railway have much more diverse characters as they have been affected by the closeness of the former industries along the railway.

Avoti, Grīziņkalns and Brasa in the East of the city’s centre are similar in their character (Image 24). They are greener and have a mix of masonry, wooden and industrial buildings. In the North-West part of the city centre there is a large undeveloped neighbourhood called Skanste. Historically, the area was urban pastures, but now it is one of the new development areas which are planned to be developed in a vibrant mixed-use district. Whereas, Pētersala-Andrejsala, the neighbourhood next to Skanste, historically has been partly occupied by the city’s port and currently has rather unclear future.

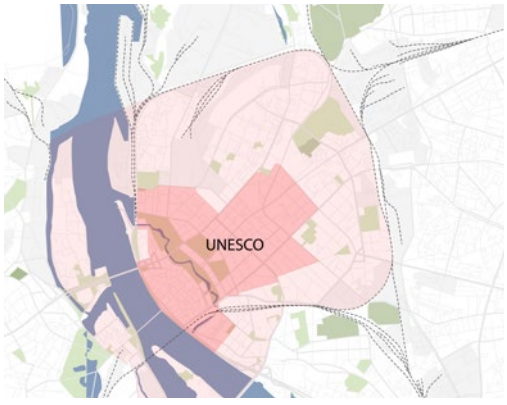

Image 20 (on left), UNESCO heritage site with its protection zone and Image 21 (on right), Neighborhoods of Riga.
Both maps: (CC BY-SA)©OpenStreetMap contributors.
I have highlighted UNESCO heritage site with its protection zone and borders of the neighborhoods.

Image 22,
Personal Archive
2011-09-24

Image 23,
Center,
A.Čaka Street.
Personal Archive,
2017-09-09

Image 24,
Avoti,
Mūrnieku Street
Personal Archive,
2017-09-09

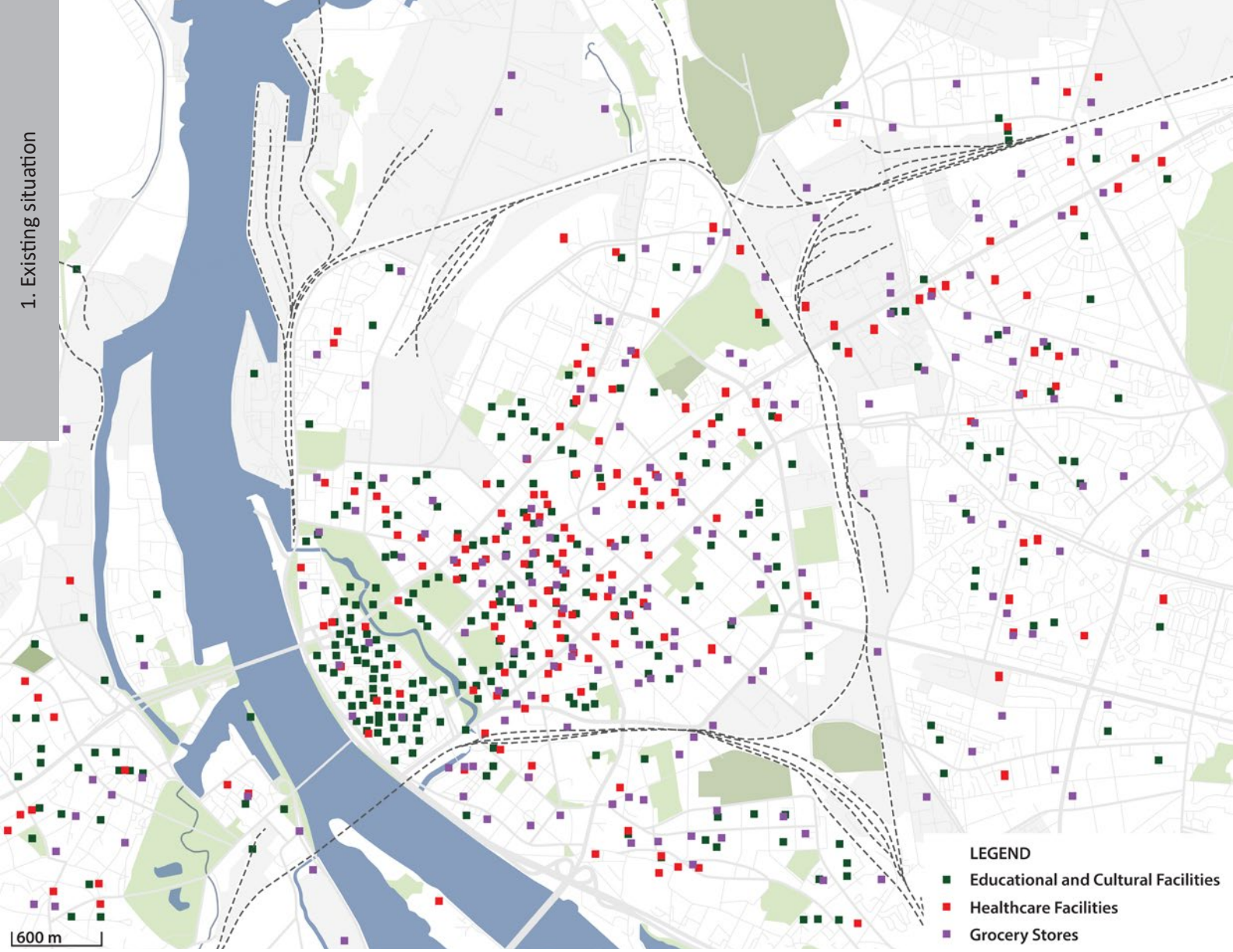

Image 25, Public facilities. (CC BY-SA)©OpenStreetMap contributors. I have highlighted colours of green areas and railways. I have added dots and legend that is dased on Data characterizing urban development of Riga in terms of quality and availability of public services (Pilsētvides attīstību, 2016).

As mentioned before, the city is completely mono-centric and most of the public facilities are concentrated at the city centre (Image 25). The Old town is the heart of the city and holds almost all tourist and night life of the city. Most of the culture events take place at the Old Town or the biggest parks, theatres or opera house at the centre. Almost all cafés and restaurants of the city are situated in the centre, most of them at the Old Town.

The Old Town is surrounded by a canal and a row of parks built at the place of former fortifications. In addition, almost all the other green areas in the centre are historical parks, created between the end of 19th century and II world war, with a rich assortment of trees. Despite this, the centre does not seem very green as there are not many plantings along the streets; it suffers from the flooding when it rains heavily and from the air pollution.

Everything in the city centre is in walkable distance, max. 3-4km from the Old town. However, the city is still very traffic oriented and walking can become unpleasant because of dust and air quality.

Image 26, Industrial zones and existing train stations. (CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours of industrial areas, green areas and railways and
I have added existing railway stations with proximate 600km and 1km zones .

The railway loop around the centre with industrial zones along it (Image 26) gives a clear picture where the border of walkable areas in the centre is and also explains the lack of public facilities along the railway.

Former factory areas along the railway create up to 1 km and even more wide non-residential zone around the city centre. The industrial zone still holds a couple of manufactures. However, it is mainly used for storages and for small businesses that require warehouse-type spaces. It is unused during nights and there is no need for public facilities except lunch places for people who work there because almost nobody lives there. The industrial zone together with the railway creates a wide barrier that is inconvenient and unpleasant to be crossed by foot or bicycle.

At the same time, right next to industrial zone, there are several still functioning train stations. This rises another important question: accessibility to the stations. The only train station that is integrated in the city and works as urban hub is the main Central Station, but the others do not serve any other public functions than being stations and does not work as urban hubs.

1.2.1. Historical Parks

As I have already stated before, the city centre of Riga is not as green as it could be and all public green spaces in the centre are historical parks. In this chapter I will very shortly explain what exactly I mean with 'historical parks' and what historical and cultural context these old parks have in many post-Soviet cities and how it affects their use nowadays.

Almost all the historical parks of the city centre are created in the period from 1880-1914 *(A.Kavere, 2003, p.6)* under the Russian Empire, except Ziedondarzs which was created in 1935 *(I.Davidsone, 1988, p.112)* after the fall of the Russian Empire, during the first independence of Latvia. Despite the fact that most of the parks were created during the time of the Russian Empire, the use of these parks or to be more precise - the lack of use, nowadays is strongly affected by the Soviet Union traditions.

One of the young Russian sociologists, Anna Zhelnina, has paid much of attention to this topic in several of her research papers. She discusses differences between the use of public space in post-soviet cities and western cities *(A. Zhelnina, 2011)*. She explains the difference as two different concepts of what urban space means. Regards the post-soviet cities she writes: "The first is the concept of open urban space as a 'postcard' that should represent not the living city and its people, but the official and 'nice' views. This one is closely related to the soviet idea of the open urban space as a stage for rallies and demonstrations organized by the Communist Party" *(p.2)* and then she continues that the western concept is: "humanist concept of 'city for the people' ". This definition of differences basically explains what historical parks are in Riga. In many of these parks in Riga it is still forbidden to walk on the grass (Image 27) and lawns stay empty even in the warmest summer days (Image 28) whereas in so many parks in western cities, for example in Copenhagen (Image 29), people are lying on the grass and walking on it whenever it is sunny and warm enough or even in a bit chilly weather. Zhelnina in her research also discuss that the situation in post-soviet cities is not only about what is forbidden or restricted but also about overall concept of appropriate behavior in public green spaces which has been taught through generations *(A. Zhelnina, 2011)*. Also from my own experience I can tell that it is a case in Riga however it is slowly changing with new generations.

The question about the use of public space in post-soviet cities, particularly Riga, will be important for the last part of my thesis, the part 6 - my Visionary proposal.

Image 27,
Bastejkalna parks.
"Uzturēties zālienā aizliegts" (in latvian)
in transl. to english
is ***"It is forbidden to stay in the lawn"***
Personal Archive
2011-09-24

Image 28,
Grīziņkalna parks.
Personal Archive
2017-07-27

Image 29,
Copenhagen, 2018.
Horticultural Gardens /
Landbohøjskolens Have.
Photo by Jorge
Franganillo, (CC BY 2.0)


Aerodrome Spilve
Riga
Commercial Port
R = 3 km
R = 2 km
R = 1 km
Arena Riga
Highschool
Supermarket
Skonto Stadium
Riga's 1st Hospital
Freeport
of Riga
University
THE CITY CENTRE
Shopping Mall
International
Exhibition Center
University
Theatre
RTU
campus
Swimming
Pool
Shopping Mall
University
Market
National
Opera and Ballet
THE OLD TOWN
University
Shopping
Mall
University
Elmentary
school
Gymnasium
Highschools
C Bus
Station
Central
Market
College
Science
Institution
Market
Educational
Institutions
Gymnasium
Central Library
600 m

Image 30, Main facilities and functions

(CC BY-SA)©OpenStreetMap contributors.

I have highlighted main facilities, industrial areas, green areas and railway lines. I have added a legend and circles that represent 1, 2 and 3km distances from the Old Town.

All maps on this page (Image 31-33) are based on (CC BY-SA)©OpenStreetMap contributors and data from Riga Planning document "Concept for Cycling Network Development of Riga 2015-2030" (Rīgas pilsētas velosatiksmes .., 2015, p.39).
I have highlighted colours of existing bicycle routes and railway lines.
I have added planning bicycle routes and marked railway crossings.

Existing bicycle routes and railway crossings (bridges and tunnels)

Currently, cycling infrastructure is one of the most discussed questions in the city planning of Riga. In recent years cycling has become more popular even though the infrastructure is very poor. There are only few streets with bicycle lanes and none of the bridges over the railway is cycle-friendly.

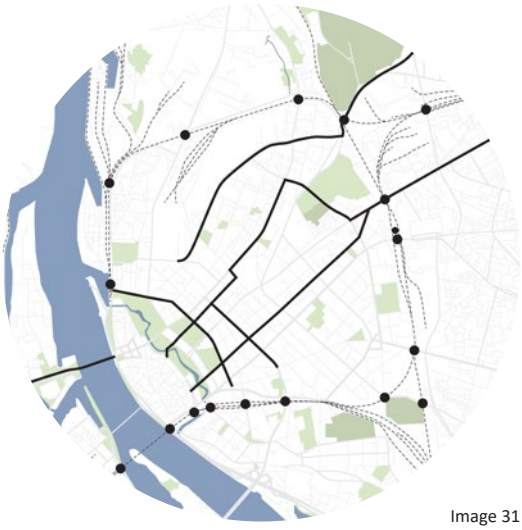

Image 31

Planned magistral bicycle routes and railway crossings

(by the municipality of Riga)

The planned magistral bicycle routes will follow the same directions as the main streets. They will be built in less busy streets, often next to the tram lines and will provide connections between the centre and neighbourhoods in suburbs and periphery. *(Rīgas pilsētas velosatiksmes .., 2015)*

Image 32

Other planned bicycle routes and railway crossings

(by the municipality of Riga)

All the secondary bicycle routes will be built on the local streets of the centre. The city doesn't have a clear plan for suburbs yet, but most of the city's residential areas are in less than 8 km distance from the old town and would be reachable without much effort. *(Rīgas pilsētas velosatiksmes .., 2015)*

Image 33

All maps on this page (Image 34-36) are based on (CC BY-SA)©OpenStreetMap contributors and data from © 2012 RīgasKarte.com (Maps of public transport, 2012).
I have highlighted existing public transport routes and railway lines.

Existing tram routes

The city has 10 tram lines, they all pass the Old Town and are the most convenient public transport in the city, although the speed of trams is very low (16 km/h) if compared with the average in EU (22,76 km/h) (Pyrgidis, 2016). The overall speed of commute can be increased by prioritising trams over cars.

Image 34

Existing trolleybus routes

Trolleybus or trolleys are is an electric bus that gets the electricity from overhead wires similar as trams.

The city of Riga has 19 trolleybus lines and similar as trams, all of them pass the Old Town from one side or the other. Trolleybuses are the slowest type of public transport in Riga (15,8 km/h). They get stuck in traffic and their wires can easily get detached from the electrical overhead wires.

Image 35

Existing bus routes

The city of Riga has 55 bus routes and their route-network cover almost the entire city. Buses are comparatively fast (20 km/h), but they are affected by traffic jams and pollut the city as they are powered by diesel fuel. In the coming decade the municipality is aiming for the electrification of buses instead.

Image 36

Image group 37, Field Study, 2016-01-17


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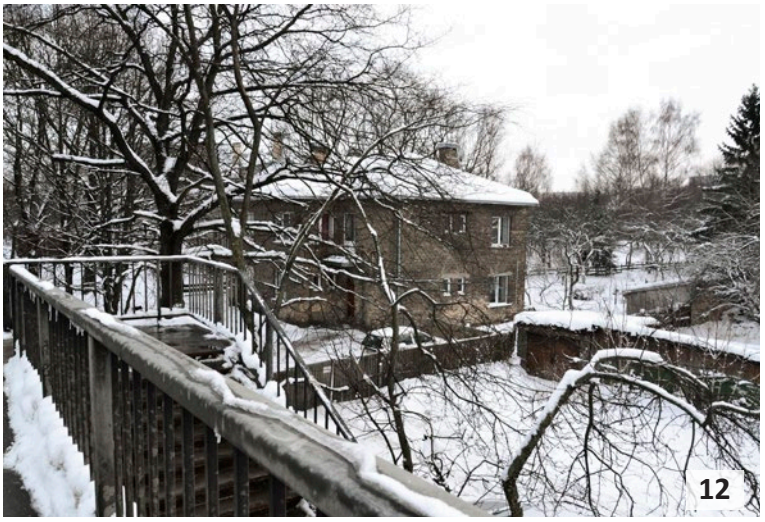

Image 38
(CC BY-SA)©OpenStreetMap contributors.
I have highlighted railway lines. I have added dots for railway stations, numbers of the views and arrows showing directions of the views.

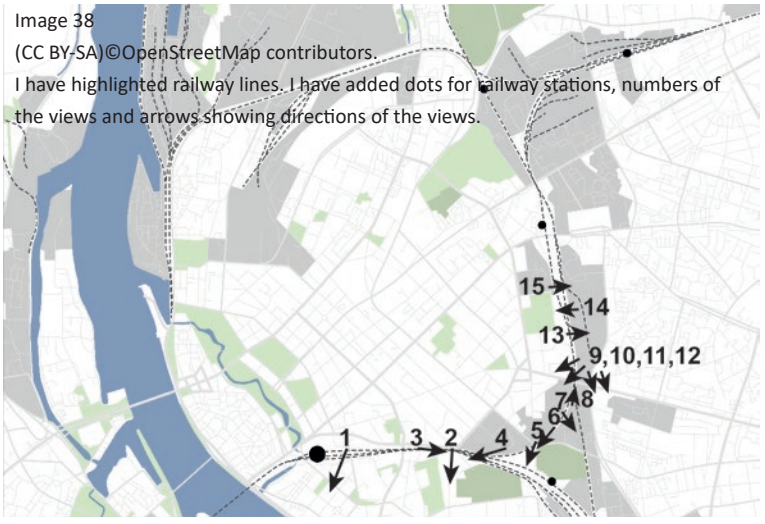

Image group 39, Field Study, 2016-01-17


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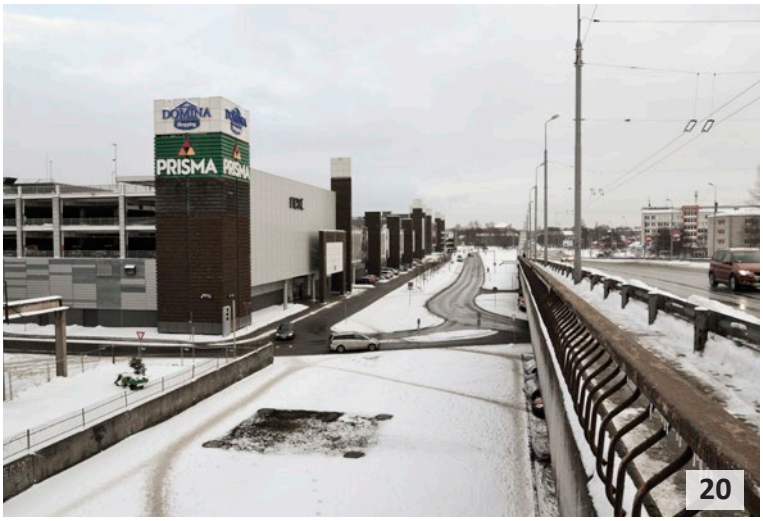

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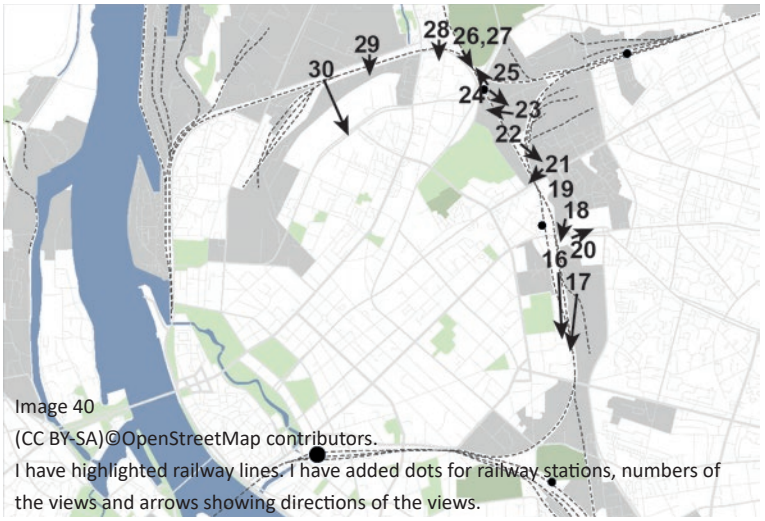


Image 40
(CC BY-SA)©OpenStreetMap contributors.
I have highlighted railway lines. I have added dots for railway stations, numbers of the views and arrows showing directions of the views.

1.3. Conclusions

In general, the city of Riga is very diverse and its multilayer character is fully revealed in its varying neighbourhoods. However, at the same time the city is very much divided into zones by the land use and building typologies which often comes together social aspects of this.

The population of the city is plus-minus stable for the last decade with a slight drop at the beginning of the decade which means that there is no need for large scale new developments now. There is need for planning that would provide better life for those who already live in the city.

One of the important aspects to increase the life quality is a healthier environment such as access to good quality green spaces, fresh air and unpolluted public and private space. Other important aspects are mobility - the to move around freely and easily *(Oxford dictionary 2017)* and accessibility to public services and facilities. Both of those can be improved in the case of Riga.

To understand what the main qualities and challenges of Riga are and how the revitalisation of the brownfields and wastelands along the railway loop could improve the environment of the city, I have summed up the main issues of the existing situation and opportunities for the future.

The main issues are:

- The city is **monocentric** which leads to increased high property prices in the centre, daily commuting and many issues with traffic as I concluded in my master thesis at Lund *(Vaska I., 2016, pp. 30)*.
- The city is **divided** by the railway, the industrial zones along it and by the river which results in disturbed accessibility and bottle-neck traffic situations on the bridges.

Image 41, Field Study, 2017-07-27

Image 42, Field Study, 2017-07-27

- The city **centre lacks vegetation** and areas for sport and other activities because the existing historical parks are more suitable for recreational needs, they are not connected and the streets are not very green which leads to poor air quality.
- The **cycling infrastructure is very poor**, unsafe and inconvenient; the city is still very car-oriented.

The opportunities:

- **Existing train stations** have the potential to grow in new urban hubs especially when Rail Baltica is built to balance
- **Development of bicycle routes** can increase mobility in the city and help to decrease the use of cars.
- The city centre has a **lot of space for densification** so the sprawl can be avoided.
- **Short distances** between different destinations in the city provides pedestrian access and can provide cycle-friendly lanes if the cycling infrastructure is improved. In the centre everything is within 3-4 km distance and many of the suburbs are in less than 8km distance. For example the centre of the suburb called Purvciems is 5.4km or within 1h 7min walk from the Old Town.
- **Diversity of functions** along the railway like educational facilities, stadium and other sport facilities, parks, shopping places etc. can help to revitalise the areas along the railway loop.
- **Brownfields along the railway** can be an opportunity to compensate the lack of vegetation in the city centre

Image 43, Field Study, 2017-07-27

Image 44, Field Study, 2017-07-27

Image 45, Rīga. Dzelzceļa tilts (1914) (transl. The Railway Bridge). Author unknown. Source: Latvian National Digital Library Zudusī Latvija. Permission for use from Ginta Zalcmane, the head of the Information services and Interlibrary Loan, Reference Centre of the National Library of Latvia. Available at: *http://www.zudusilatvija.lv/objects/object/29198/* [2017-09-12

PART 2

Historical Background

The aim of the history study is to explore the role of railways in shaping cities and how the technological progress and railway constructions changed the urban landscape and the way people use cities; in addition, how this has led to the city planning issues we face now.

Despite the fact that the industrial revolution in Europe began more than two to three hundred years ago, depending on the place, all of the European metropolis are still dealing with the infrastructural, zoning and environmental issues it created. The way we think about transport and infrastructure has changed a lot since the industrial revolution but the urban landscape with its countless historical layers has not changed as fast. To explore issues like pollution, lack of functions, spatial and social isolation, lack of integration and spatial connectivity and to find potential solutions, I find it important to understand advantages and drawbacks of the urban infrastructure progress in the history.

In the first section of this chapter, I will look at the first origins of the industrial revolution, then I will continue specifically with Eastern Europe. In the second section, I will look into the history of Latvia's capital, Riga, and its railways. I will then proceed by concluding an overall picture of how it has affected the character of Riga.

2.1. The impact of railways on shaping the cities in Europe

Developments of transport infrastructure have always gone hand in hand in with economic growth of the regions and cities while also being closely related to migration of people.

Until the mid-eighteenth century the size of the population in Europe was fairly stable with a gradual growth and rather even distribution between small and middle sized settlements and rural areas. The first wave of urbanization came with the industrial revolution when more and more people started to migrate to cities to find the best-paid employments *(Lees, A., Lees, L. H. (ed.) 1976)*.

The industrial Revolution began in the late eighteenth century in Britain with the transition from hand processed manufacturing to power-driven machines and

from rural to an urban life-style. For example, in 1750 Manchester in England was a town with less than 20,000 people (Image 46) but by 1850 its population was around 250,000 people (Image 47). In a hundred years it had grown in Britain's third largest city *(Davenport, R., Boulton, J., Black, J. 2013)*.

Mass migrations to the cities, together with the significant transformation of the transportation systems resulted in new ways of building cities. Subordinated by the idea to have labour homes close to the factories, people moved closer to their work places and new industrial centres grew into major cities with uncontrolled expansion. As cities grew, the need for efficient transport system also rose to transport not only goods, but also people. Hence railways became an important backbone of most industrial cities.

According to Lewis Mumford, an American historian and one of the most prominent social thinkers, the new industrial city was characterized by the factory, the railroad and the slum *(Mumford L. 2010)*. The factory became the core of the new urban organism, every other detail of the life subordinated to it. The factory usually claimed the best sites often near to the waterfronts because of the need for large quantities of water in production processes. New railway network was attached to factories, ports and city centres provided time and cost-efficient transportation of the goods and passengers. In most cases new railways were built through the historical parts of the cities with rail yards placed right next to the heart of the city (Image 48). All the industrial, commercial and domestic functions were integrated together. No functional zoning was used for new urban centres and lack of the planning, together with chaotic expansion turned new industrial towns in fragmented lands with factories, railways and chaotic street layouts in leftover areas in-between.

Rapid development of the industries and cities created previously unprecedented problems such as excessive environmental pollution and outbreaks of diseases because of the poor living conditions. Mumford describes environment degradation and living conditions of the industrial city: "To pay attention to such matters as dirt, noise, vibration, was accounted an effeminate delicacy" *(Lees, A., Lees, L. H. (ed.) 1976)*.

Environmental degradation was just a part of the problem; another major issue was social segregation and spatial fragmentation which came alongside it. Mumford writes that "In industrial towns that grew up on older foundations, the workers were first accommodated by turning old one-family houses into rent barracks. In these made-

Image 46, 1750. Author unknown, Public Domain.

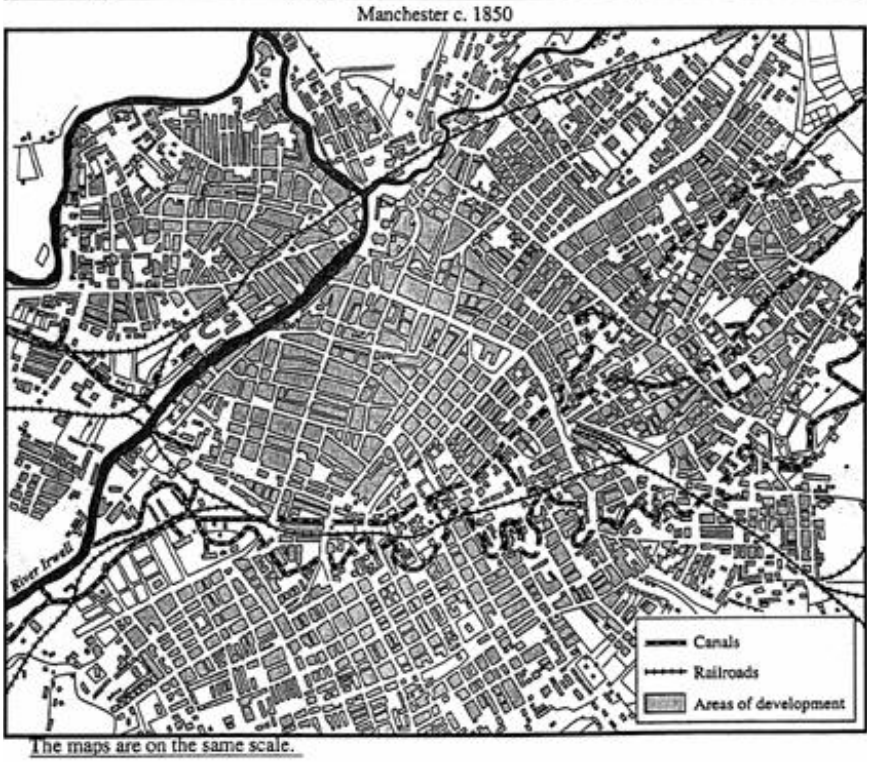


Image 47, 1850. Author unknown, Public Domain.

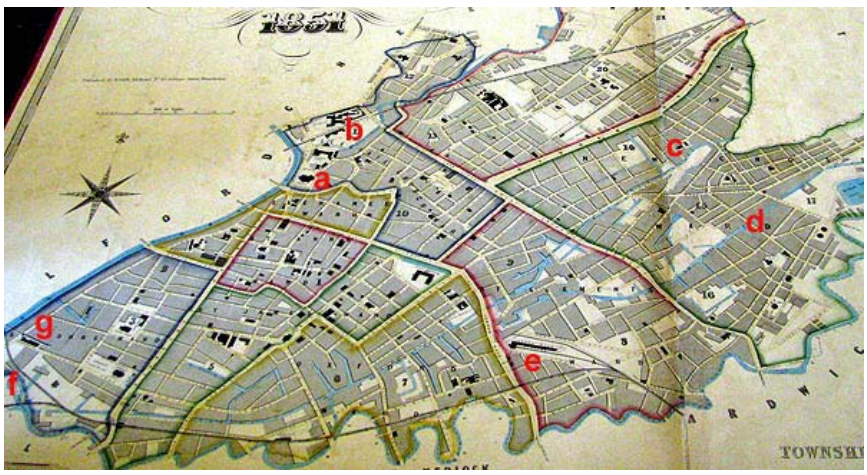


Image 48, The Adshead Map , 1851. Author unknown, Public Domain. Original map in Chetham's Library, Manchester.

over houses, each separate room would now enclose a whole family: from Dublin to Glasgow and Bombay, the standard of one room per family long held" *(Mumford L. 1961)*. However, the small living space was not the biggest concern for the workers; it was the unsanitary conditions of the homes. Many working class areas in the cities lacked toilets and large numbers of people shared a small amount of common toilets, not to mention the lack of water. According to Mumford: "The surviving housing built between 1830 and 1910 did not represent even the hygienic standard of its own day; and it was far below a standard framed in terms of present-day knowledge of sanitation, hygiene, and child care – to say nothing of domestic felicity" *(Lees, A., Lees, L. H. (ed.) 1976)*.

Contrary to poor and very poor that moved into the city slums, the middle class was wealthy enough to move away from the cities creating new socially segregated suburbs that provided higher living standards. The cities became divided into mono-functional and isolated spaces that lacked connectivity and integration.

Due to this, unbearable living and working conditions for the labourers led to the first labour unions and first social reforms which were gradually implemented during the nineteenth century in fear of social upheavals *(Bond, E., Gingerich, S., Archer-Antonsen, O., Purcell, L., Macklem, E. 2003)*. Later in the nineteenth century, the first origins of the modern urban planning started to appear. Initially, these were only concerned with sanitation and movement of goods and people. Later however, at the beginning of twentieth century, more and more theorists began to develop utopian visions how to mitigate the consequences of chaotic expansion of the industrial city.

Clearly, the predecessors of industrialization and rapid urban expansions in Europe were metropolitan cities such as London and Paris in the 17th and 18th century while large parts of the Central Europe and Eastern Europe experienced remarkable delay. Though, contrary to the Western European countries where industrialization lasted mainly until the end of the Second World War, industrialization in Eastern Europe continued through the twenty century *(Behrends, J., Kohlrausch, M. 2014)*.

From 1700-1917 Latvia was part of The Russian Empire where the urbanization process begun in late nineteenth century. The expansion of railway network raised the number of migrants and brought new challenges to the cities. However, the network itself was very limited and, unlike in Britain, the migration pattern was uneven.

Similarly with in Britain, workers experienced challenging living conditions. They were treated as urban "outsiders", forced to live in small communal apartments, dormitories and tenements with poor sanitation and often freezing conditions *(Alpha History 2015)*. However, delayed industrialisation gave opportunity to not only avoid Western mistakes but also test out some of the new Western post-industrial planning ideas. For instance, at the very begining of 20th century the landscape architect Georg F. F. Kuphaldt, director of the city gardens and parks in Riga, created a plan for one of the world's first garden cities which was a neighbourhood called Mežaparks (direct translation: "forest park") in the city. Sadly, it is another example of social and spatial segregation as the park was not built for mixed communities. However, it should be noted that at the time even neighbourhoods for workers acquired good quality outdoor green spaces as a result as, unlike Britain, they were exposed to strong planning regulations.

The urbanization processes of the Russian Empire mainly took place in European Russia and even though the construction of railways in Russian Empire did not reach the levels as it did in Britain, it had a significant effect on the development of Riga. The first railways that connected the city with the east provided expansion of the city's port and economy that led to growth of industries and urbanization. During the nineteenth century Riga become one of the most developed cities of the Empire due to the trade and industrialization that took place.

2.2. The history of Riga and city's railways

The first settlement that set up the location for the city of Riga was located on the right side of Daugava River at a natural harbour. It was settled by Livs, and during the middle ages, it developed as a centre of Viking trade.

Officially Riga was found in 1201 by German bishop Albert. It is one of the very few European cities whose extensions beyond its medieval core were built according to several successive comprehensive plans *(Bākule I., Siksna A., 2009)*. Most of them were related to military needs.

The construction work of the first fortifications started in 1207, and by 1282, Riga became a member of the former trade organisation Hanseatic League. Three centuries later, with the new military achievements, the first fortifications lost their value and new ones were built in 1554 *(Rīga, 1988)*.

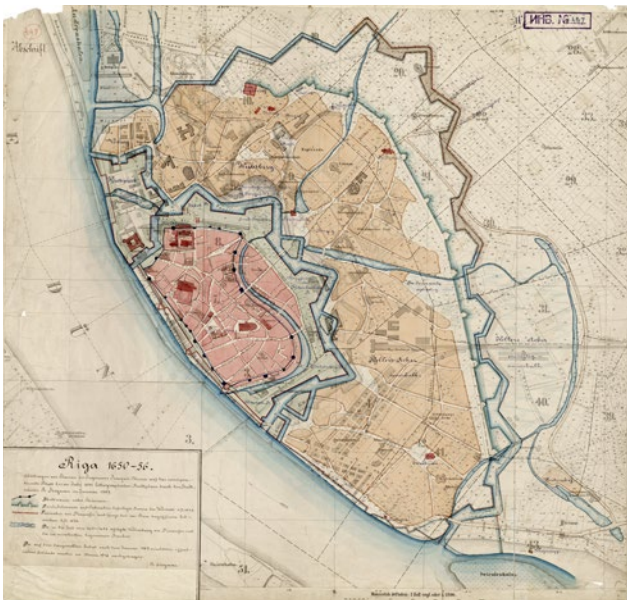


Image 49, Comperative plan of Riga: the situation in 1650-1656 overlaidon a late 19th century plan.
Late 19th century. Richard Julius Stegman. (RVKM, VRVM 161857)

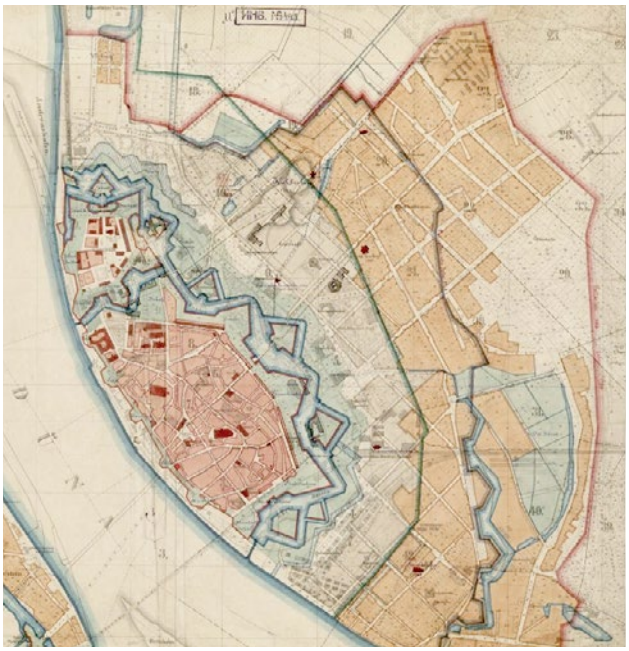


Image 50, Comperative plan of Riga: the situation in 1763-1789 overlaid on a late 19th century plan.
Late 19th century. Richard Julius Stegman. (RVKM, VRVM 159169)

In 1621 Riga came under the rule of Sweden. The first plan for Riga's suburbs was designed by Johann Rodenburg in 1652. It was similar to fortifications of Amsterdam and Gothenburg *(Bākule I., Siksna A., 2009)*. The plan proposed to replace the spontaneously formed

street layout (Image 49) with parallel quarters formed by new street grid (Image 50) *(Barzdeviča, M. 2011, p.134)*. During the 18th century the plan of suburbs was changed several times.

In 1710 Riga was occupied by the Russian Empire. The period of industrial revolution in Latvia started in 1830's. Due to the Industrial Revolution in Great Britain and Western Europe as well as the progress of military possibilities, fortifications had gradually lost their importance and they were demolished in 1856 *(Bākule I., Siksna A., 2009, p. 134)*. Unlike at the first part of 19th century when fortifications were replaced with new building blocks, in the second part of 19th century it was more common to use some of the space for parks, squares and other greenery. One of the earliest examples is Gothenburg in Sweden, similar transformations of fortifications took place Groningen in Netherlands, Cracow in Poland, Bremen in Germany and other cities in Europe *(Bākule I., Siksna A., 2009, p. 136)*.

The City Architect of Riga Johann Daniel Felsko, who had studied in architecture at the Royal Danish Academy of Fine Arts and was familiar with tendencies in Europe *(Bākule I., Siksna A., 2009, p. 137)*, prepared redevelopment proposal for the area of the fortifications. After being revised by architect Julius August von Hagen, in 1858 the project was approved. The area of fortifications was redeveloped into a park with a canal in the middle and new boulevards on both sides of the park. The park was surrounded by masonry buildings (Image 51) *(Bākule I., Siksna A., 2009, p. 150)*.

Image 51, Plan of Riga: indicating new, wide defensiveline to encompass the suburbs. 1862.
Franz Eduard Todleben (RVKM, VRVM 30527)

The first railways in Latvia were built as part of the larger arterial nets from East to West with sea ports as final destinations. The first railway in Riga was built in 1861 (Image 52, from the point C to direction A); it was Riga to Daugavpils line. Just a couple of years later, in 1872, the line was extended to the port in the city's north (Image 52, from point C to direction B), and it marked the border of the 19th century's city *(Altbergs T., Augustāne K., Pētersone I. 2009 p. 9)*.

These and other new railway lines caused economical and spatial development of the city and its ports. Many new factories were built and people flocked from the countryside to work in these areas. The factories and storage areas were placed along the railways, mainly on the outer side, as well as houses for workers *(Altbergs T., Augustāne K., Pētersone I. 2009 p. 10)*.

During the second half of the 19th century, the city continued to expand strongly regulated by several sequent comprehensive plans. The city council developed strong regulations of building typologies. The city was formed by masonry buildings in the Classical style, Art Nouveau, National Romantic and Rationalist style; many wooden buildings were replaced. The only wooden buildings of the second half of the 19th century were mostly apartment houses for factory workers *(Bākule I., Siksna A., 2009, p. 227)*.

Despite the fact that the inner side of the railway developed in a very organized way, the city's structure on outer side of the railway formed quite chaotically. It was not included in the former comprehensive plans, and its structure was developed in later years during the Soviet times.

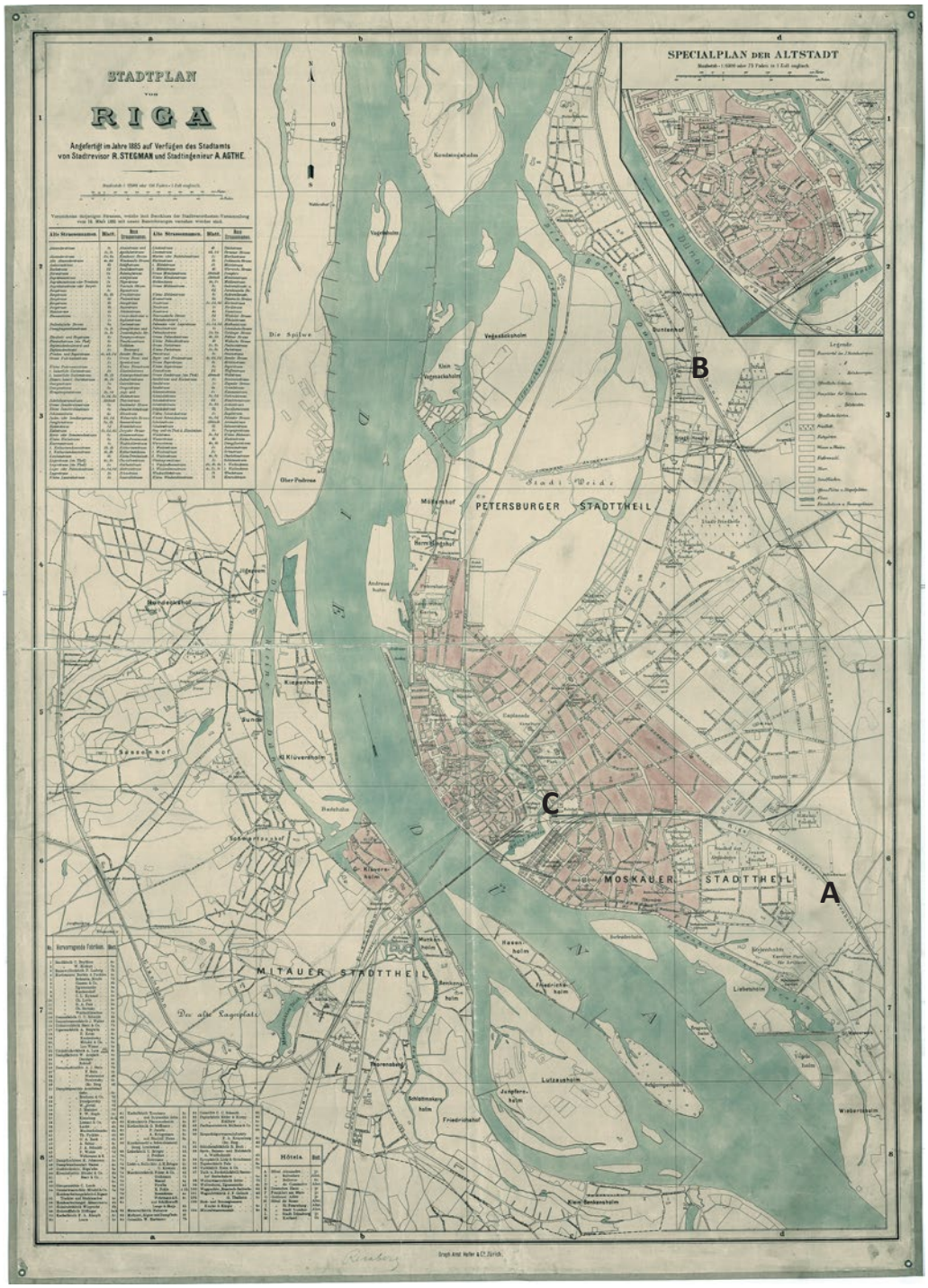


Image 52, Map of Riga. 1885.
Richard Julius Stegman, Adolf Agthe (RVKM bibl. 6587)

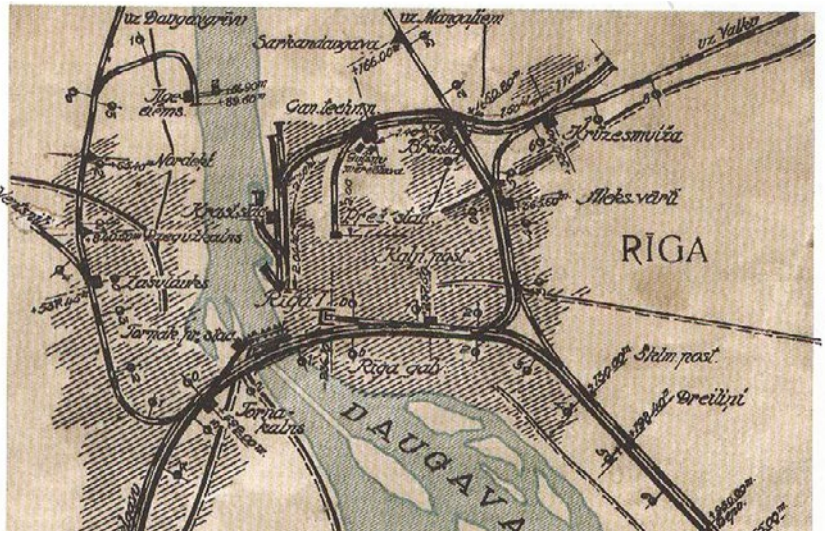


Image 53, SM Latvijas dzelzceļu karte, 1928.gads. (transl. Map of Latvia Railways, Year 1928) Author unknown. Collection of the Latvian Railway History Museum, Inventory No. LDzM L3641. Permission for use from the Latvian Railway History Museum.

The rapid growth of Riga at the second half of the 19th century was interrupted by World War I. During the war, the city's infrastructure including railways were mainly used for military needs. After the war I, Latvia gained its independence, and the city was renewed. The City Council introduced new large development plans, but they were not economically possible. After World War II, Latvia was occupied by the Soviet Union which led to new poor quality micro-district developments in the suburbs on the outside of the railway loop.

The second half of the 19th century was one of the most important periods of the city's development. Industrialization, economic growth together with geographical location of Riga led to rapid growth of the city, and highly educated architects and engineers has developed the city's centre fabric in a very organized and quite successful example of the 19th century city. Unfortunately, the same cannot be said about the 20th century developments during the Soviet times.

The railway loop around the city centre was built between 1861 and World War I. This started with Riga to Daugavpils line, east of the city and finished with the seaport of Andrejsala in the North from the Old town. It marks the border not only in terms of architectural character, but also the social distinction. During the 20th century the working class areas that were placed along the railway expanded in much larger micro-districts on the outer part of railway loop. Nowadays, these are areas with the cheapest accommodation and the most issues with regards to social questions and life quality standards.

Image 54, Rīga. Gaisa tilts, [191-]. Author unknown. Source: Latvian National Digital Library Zudusī Latvija. Permission for use from Ginta Zalcmane, the head of the Information services and Interlibrary Loan, Reference Centre of the National Library of Latvia (LNB). Available at: *http://www.zudusilatvija.lv/objects/object/22894/*

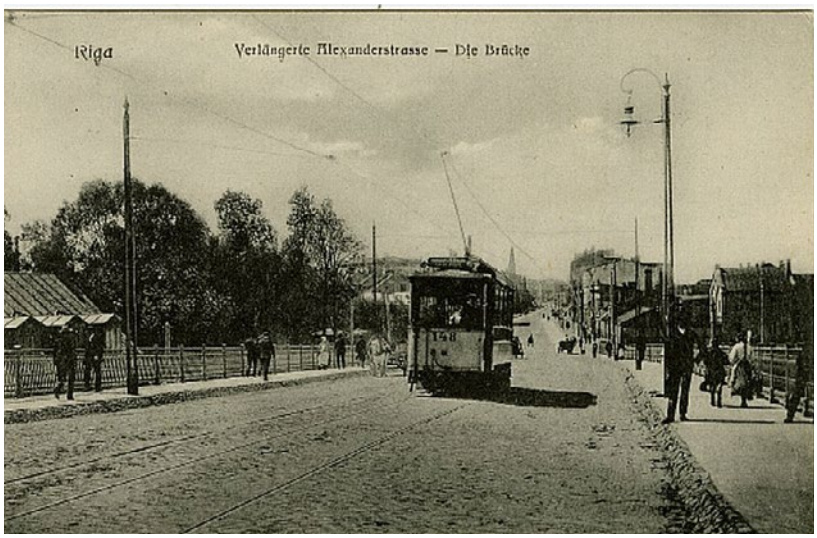


Image 55, Rīga. Gaisa tilts, [191-]. Author unknown. Source: Latvian National Digital Library Zudusī Latvija. Permission for use from Ginta Zalcmane (LNB). Available at: *http://www.zudusilatvija.lv/objects/object/22893/.*

Image 56, Zemitānu stacija, [192-]. Author unknown. Source: Latvian National Digital Library Zudusī Latvija. Permission for use from Ginta Zalcmane (LNB) Available at: *http://www.zudusilatvija.lv/objects/object/2365/.*

2.3. Conclusions

The city of Riga has a very rich and diverse history which can be seen in its architecture and city's structure. As the city has developed according to several successive comprehensive plans even during the industrialisation, the centre has a very clear structure and character of many neighbourhoods.

Image 57, which shows a map dating streets of the former suburbs of Riga, reveals the borders of the typical character of the city centre's neighbourhoods as well. Image group 58 shows examples of different characters in the city centre. Also the neighbourhoods built after the World War I on the outer side of the railway has a clear function and character even though the quality could be questionable.

What the city lacks is a clear character along the railway and in the north side where the former city pastures, the city's port and the industry was and are still placed. During the industrialisation, the areas along the railway were filled with factories that were the main work places in the city. Now they are empty but by clearing-up and forming the space, by adding functions and giving it back to the people, many environmental, spatial and social issues could be potentially solved.

Image 57, Map dating streets of the former suburbs of Riga
(CC BY-SA)©OpenStreetMap contributors. I have added a legend and lines representing dating streets based on data from "Rīga Beyond The Walls" (Bākule I., Siksna A., 2009, pp. 182-183))

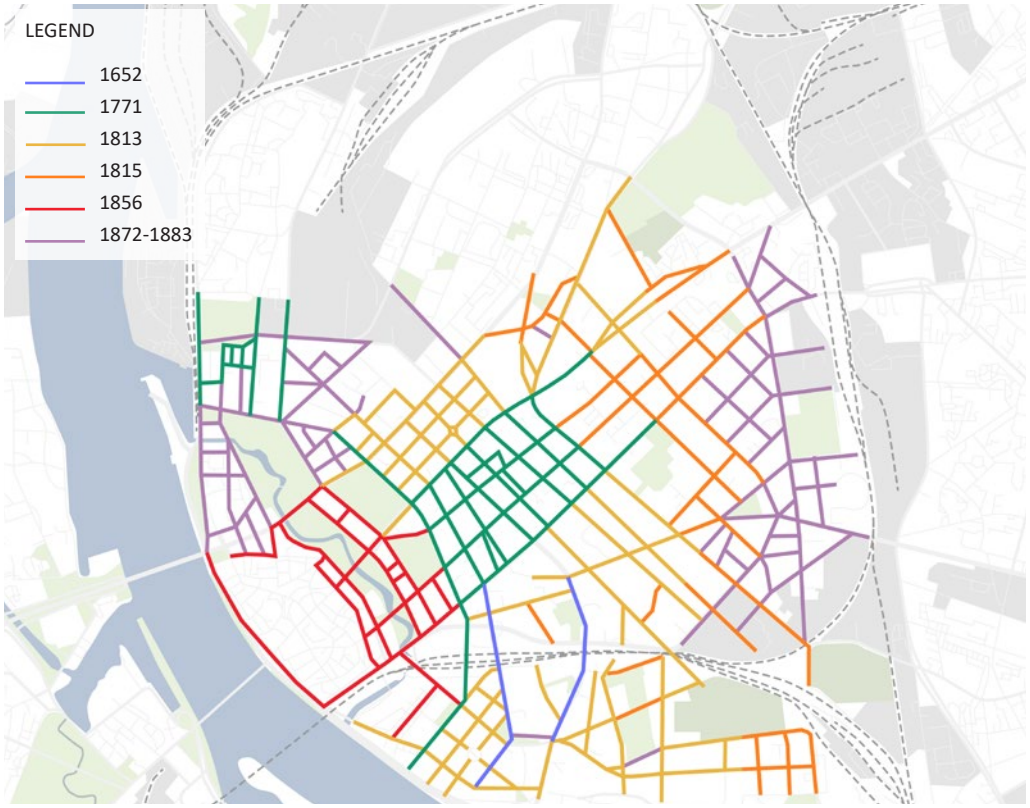


Image 58, Character of the city centre of Riga.
The bird's view form Imagery ©2018 CNES / Airbus, Map data ©2018 Google.
I have added lines, numbers and text marking matching areas.

Image 59, Field Study, 2017-07-27

PART 3

Analysis of the Environmental Issues

As all of the areas along the Riga railway loop are strongly affected by their former and present land use and closeness to the railway, the main issues with the area are related to the environment. The aim of the analysis of the existing situation is to understand potential environmental and human health threats as well as to locate the methods that can mitigate them.

The first section of this part will describe environmental degradation issues that come from the former and current land use and close proximity of the railway. I will give an insight of potential soil pollution risks and suitable soil remediation methods. The second section will deal with impact of noise pollution and vibrations from the railway, and mitigation methods that can be used for it.

3.1. Environmental degradation - brownfields and wastelands

Almost two centuries ago the industrial revolution led to rapid growth of the cities across Europe including Riga. New factories, railways and ports were the main development generators for cities. These days such post-industrial areas, very often, are unused and degraded. How many of these areas has become urban brownfields, and how many of them are contaminated and how to remediate them are the questions Europe is dealing with currently.

Most of the brownfields in Riga are result of the changes in industry, economies and politics. The most typical brownfields are former industrial areas left over from Soviet times as well as the infrastructure that served them. Similarly with many other European countries, these areas are very often located in the urban boundaries and are well connected within the city. The case of Riga railway loop with the areas alongside it is a very typical example of this.

Before analysing potential environmental risks of the areas in proximity to railways, I want to remind the definition of 'brownfield' in Latvia. As mentioned before in Terminology, there is no specific word for 'brownfield' in Latvian. Therefore instead of 'brownfield' the term 'degraded territories' is used. According to the research on degraded territories in Riga *(Degradēto teritoriju izpēte, 2004)*, instructed

by Riga City Council, there is very little research on planning of the degraded territories in Latvia. They also state that the problem of the degraded territories was identified only in the mid-nineties *(p.8)*. For this reason, when talking about brownfields, the definition by CABERNET is still used in all Riga planning documents *(Degradēto teritoriju izpēte, 2004, p.9).* The CABERNET definition of brownfield is: "A place that has been previously used or built up, but currently is derelict or abandoned - can also be contaminated" *(University of Nottingham 2006, p. 30)*.

The definition states that the areas should be currently derelict or abandoned which basically means left empty or uninhabited. From my fieldworks I found out that many buildings and territories luck usage but the other half was fenced private areas used for industrial or storage needs. I did see some other people walking along the railway. However, I believe they were there to take a shorter route, to walk a dog or other personal reasons not related to the territories along the rails. Overall, from my empirical experience and findings from the municipality documents, I would like to suggest that part of the territories along the railway is industrial and the other half is abandoned. Even more, most of the territories are fenced which makes people walk very close to the rails. Additionally, the definition also states that brownfields in Latvia are not necessarily contaminated, but must be previously used. Most of the areas alongside the railway loop of Riga have been previously used for industrial needs; consequently almost all of them can be described as either brownfields or wastelands, because of their former use or lack of the use.

Due to the industrial history and railway line still in operation, the main environmental issues with the areas alongside the railway loop around the city centre of Riga are related either to their former and current land use or potential pollution from railway.

3.1.1. Former and current land use of areas alongside the railway loop of Riga

According to Riga City Council *Survey of brownfields (2012)*, there are very few areas in the city that are officially considered as degraded despite there being a great number of buildings in the city centre that are considered degraded. It is clear that the criteria used to create a map of brownfields and degraded objects as part of *Survey of brownfields (2012)* in Riga do not include industrial areas and post-industrial areas; it is more focused on individual buildings than larger spaces.

As mentioned before, degraded areas in Latvia do not necessarily need to be polluted but is most definitely a critical aspect that indicates the level of degradation. The only public source that gives information of potentially polluted places in Riga is done by Latvian Environment, Geology and Meteorology Centre. The online source "Map of contaminated and potentially contaminated sites" by Latvian Environment, Geology and Meteorology Centre (2014) indicates only officially registered places including potential threats from former land uses. However, the map does not show the size of potentially polluted areas. Most of the threats of pollution are related to existing or former production as well as to objects of transportation and gas/petrol stations. Many of them are connected with the railway or were connected in the past.

3.1.2. Potential soil contamination from railways

Former industries are not the only potential threats to environment. There is a lot of information and discussions about impact of railway on the environment compared with cars in terms of CO2 emissions, with researches showing that railway transport itself can cause a hazard to natural environment *(Wierzbicka M., Bemowska-Kałabun O., Gworek B. 2015)*.

According to article by Polish researchers Tomasz Staszewski, Małgorzata Malawska, Barbara Studnik-Wójcikowska, Halina Galera and Bogusław Wiłkomirski *(2015)* "The contaminants may originate from the dispersion of freight goods such as coal and minerals or the presence of ballast stone thrown on to the track either by the passengers of the train or during ballast cleaning operations." As the railway loop in Riga serves not only passenger transportation but also cargo transportation, the environment along it is in similar risk as the one researched in Poland. 39% of all goods transported by freight trains in Latvia are oil and oil products, 34% is coal and 7% is mineral fertilizer (*Latvijas dzelzceļš 2016)*; and many of these are carried through the city to the Free Port of Riga.

As the most common chemicals responsible for soil pollution along transport infrastructure are polycyclic aromatic hydrocarbons (PAHs) and heavy metals *(Wiłkomirski B. et al, 2012, p. 3)*.

PAHs are chemicals released from burning coal, oil, gasoline, wood and other organic substances. They get into environment mainly from railway and train maintenance through machine grease, fuel and transformation oils, impregnation of wooden structures like railway ties and others *(Wiłkomirski B. et al, 2012, p. 3)*. PAHs get into plants mostly from atmospheric air albeit some amount can be absorbed by root system. PAHs can cause serious human health risks like cancer and others *(Bostrom, C.-E. et al, 2002)*. There is a lot of research done on remediation on soils contaminated by PAHs. The technologies include physical, chemical and biological techniques. Later in this paper, I shall discuss the most sustainable and potential solution for Riga's case..

Another main pollution threat from the operating railways are heavy metals. They come from abrasion of construction materials, fuel combustion in diesel-electric locomotives and cargo leakages. According the research paper "Soil and plants contamination with selected heavy metals in the area of a railway junction" *(Staszewski T. et al, 2015)* the highest levels of heavy metals can be found in plants and soil that

grows close to the platform areas and this pollution comes from abrasion of wheels and tracks. As heavy metals mainly come from mechanical abrasion then they are distributed by atmospheric air. Affected areas can be divided into four pollution zones depending on distance from railway: heavy pollution zone (0–10 m), medium pollution zone (10–50 m), slight pollution zone (50–100 m), and warning zone (100–500 m) *(Hao Liu, et al, 2008)*. Pollution mitigation should be adjusted in relation to the zone of pollution.

PAHs and heavy metals are just some of the main chemicals that can be found in soil next to railways that can cause hazard to human health, there are also others. As the railway loop around the city centre of Riga is an important connection to the city's port, it will continue to function in the future. It is important to make long term solutions to mitigate pollution and remediate soil.

3.1.3. Soil remediation

Reusing brownfield sites is commonly recognized as urban planning step to make cities more sustainable. However, as stated in CABERNET report *(University of Nottingham, 2006)* "Brownfields are commonly associated with issues of contamination (real or perceived) and associated risk to public health" *(p.103)*. For this reason, as mentioned in the same report "In the redevelopment of brownfields, risk assessment is a significant part of the overall decision process" *(p.64)*. This means that the threats of potential contamination should be taken in consideration before reusing the sites. If the risk assessment indicates any soil contamination, several diffrent remediation methods can be applied.

Generally, all possible soil treatment methods can be divided in two groups: ex-situ and in-situ methods. Ex-situ methods involve removing soil and waters from their original location and cleaning them on-site (excavating and cleaning at the same site) or off-site (excavating, transporting and cleaning in another site). In-situ methods seek to treat the contaminated soil and groundwater in the site where they are originally located without removing them. Both ex-situ and in-situ treatment technologies can

be divided in: physical, chemical, electrical, thermal and biological methods.

Biological methods, including phytoremediation, are considered as one of the most environmentally considerate. Phytoremediation (from Ancient Greek *phyto*, meaning "plant", and Latin *remedium*, meaning "restoring balance") describes the soil and water treatment through the use of plants.

Phytoremediation is a rather new technology but has shown good results in testing many different contaminants in many places around the world *(Wuana, R. A., Okieimen, F. E. 2011)*. Despite the fact that phytoremediation is long process, it is potentially the least harmful method to clean soil. With phytoremediation, the soil is treated at the place in the site, it is energy efficient and there is no needed to excavate the contaminant material and dispose it elsewhere. Treating soil with plants has low costs and it is easy to monitor the process.

Phytoremediation uses special plants which are able to contain, degrade, or eliminate contamination from soil and waters (Image 60)

As discussed in the previous section, the main threats in the case of Riga are polycyclic aromatic hydrocarbons (PAHs) and heavy metals.

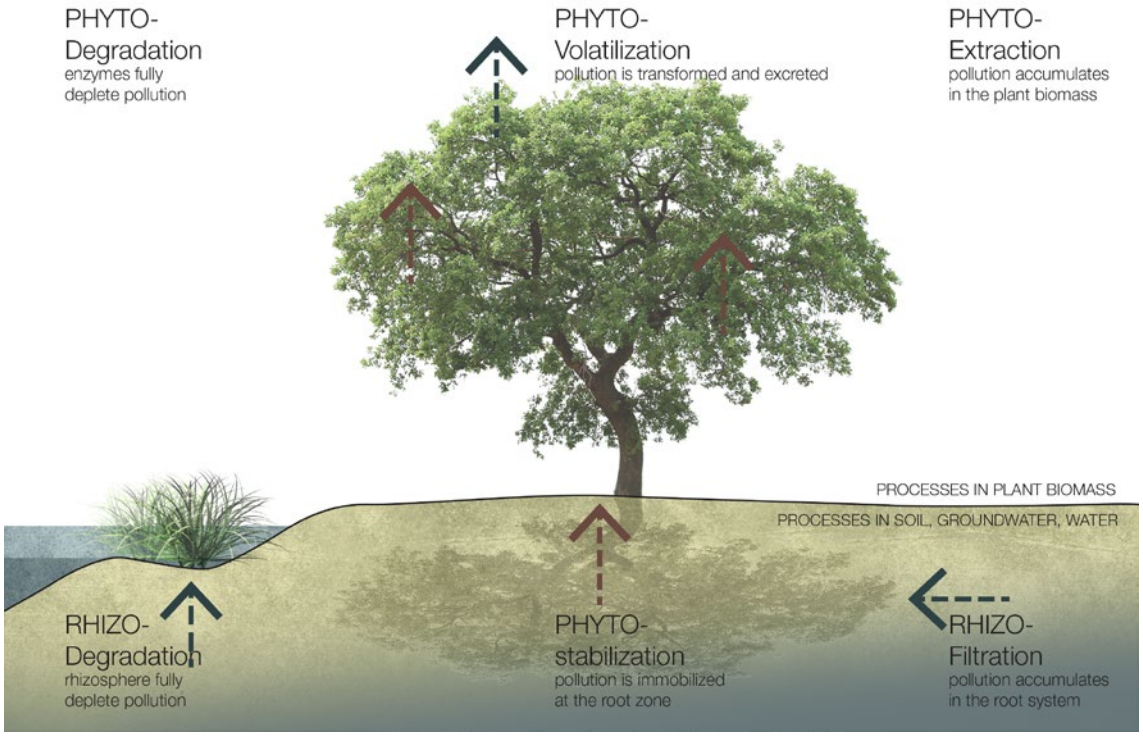


Image 60 , Diagram of Phytoremediation Processes, Illustration is designed and drafted by myself and based on information from UNEP Guide "*Phytoremediation: An Environmentally Sound Technology for Pollution Prevention, Control and Redmediation*" (United Nations Environment Programme, 2018)

PAHs are environmental pollutants generated from organic materials like coal, oil, petrol, and wood. Numerous researches show that there are several plants that are efficient for in-situ phytoremediation of PAH contaminated soils. For example:

Festuca arundinacea Schreb

(in Latvian: niedru auzene, in English: tall Fescue, in Swedish: rörsvingel) is a long-lived (8-15 years) tall (70-150cm) perennial bunchgrass. It is resistant to cold weather, suitable for wet areas and grows on roadsides, in wet meadows and on the banks of various water-bodies. *(Kļaviņš, A. 2017)*.

Image 61, Festuca arundinacea - Berlin Botanical Garden - IMG 8538 (2010). Photo by Daderot, Public Domain.

Medicago sativa Linn

(in Latvian: sējas lucerna, in English: Alfalfa, in Swedish: Blålusern) is a long-lived tall (30-90 cm) perennial flowering plant. An important common cultivated fodder plant. Solitarily specimens and groups can also grow on roadsides, waste grounds and along railways. *(Kļaviņš, A. 2017)*.

Image 62, Medicago sativa Alfals006 (2006). Photo by Victor M. Vicente Selvas, Public Domain.

Brassica napus L.

(in Latvian: rapsis, in English: Rapeseed, in Swedish: raps) is a tall (60-130 cm), bright-yellow flowering annual plant. An important common cultivated fodder specie grown also for edible vegetable oils and biodiesel. Solitarily specimens and groups can be found on roadsides, waste grounds and along railways. *(Arvanaghi, H. R., et al, 2017)(Kļaviņš, A. 2017)*

Image 63, Rapeseed field (Brassica napus) in Germany (2010). Photo by Vincent van Zeijst (CC BY 3.0)

Heavy metals are inorganic chemical elements. The most commonly found heavy metals in contaminated soils are lead (Pb), arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), zinc (Zn), mercury (Hg), and nickel (Ni) *(Burlakovs, J., 2015, p.17)*. Proved by numerous of researches, there are several plants that are well recognized for in-situ phytoremediation of heavy metal contaminated soils. For example:

Helianthus annuus L.

(in Latvian: vasaras saulgrieze/ saulespuķe, in English: the common sunflower, in Swedish: solros) is a tall (100-300 cm), yellow flowering annual plant. Extensively cultivated for food production and fodder *(Kļaviņš, A. 2017)*.

Image 64, Flower Sunflower Field Helianthus Annuus Sunflower Photo by Max Pixel, CC0 Public Domain.

Salix viminalis L.

(in Latvian: klūdziņu kārkls, in English: the basket willow or osier, in Swedish: korgvide) is a multi-stemmed mid-siez (3-6m) shrub commonly found by water-bodies and other wet places. Lately often used in energy forestry *(Kļaviņš, A. 2017)*.

Image 65, Salix viminalis 009 (2007). Photo by Willow, (CC-BY 2.5)

Populus tremula L.

(in Latvian: parastā apse, in English: Aspen, in Swedish: asp) is a tall (30-40 m) and fast-growing at the beginning deciduous tree. It has great winter hardiness. Used for pulp and paper production and production of matches. Lately often used wood for production for renewable energy. *(Kļaviņš, A. 2017)*.

Image 66, Populus tremula 001 (2007). Photo by Willow, (CC BY-SA 2.5)

3.1.4. Summary of soil remediation possibilities

Phytoremediation is a long term solution effective for medium and light pollution. Each case and polluted area should be tested and evaluated individually before applying any solution. However, for pollution zones along the railways where single-use solution would not be an option, phytoremediation can be very suitable.

The 6 plants given as examples in the previous section are not the only plants that can be used for phytoremediation; they are the most researched ones that have proven themselves to be effective and are suitable for climate of Riga. The plant selection must be improved after deeper research on soil condition along the railway.

As phytoremediation is a long process and can take years or even decades, it gives space and time for social remediation. While step by step as remediaton takes place, the time can be used to raise people's interest of environmental questions and to test various activities and physical structures. By inviting locals to participate with their opinions and activities, the reclaimed brownfields can be developed into new programs that fit to local needs. Culture as driving force and possibility for bottom-up place-making can help to bring locals together and create unique characters of the places and it does not ask for huge investments similar as phytoremediation.

Image 67, Urban farming in temporary event place in Copenhagen, Personal Archive, 2017-06-18

Image 68, Centrale-nucleaire-Saint-Laurent-des-Eaux (2007). photo by Nitot (CC BY-SA 3.0)

Image 69, Berlin-Kreuzberg Prinzessinnengärten 1 (2011). Photo by Assenmacher (CC BY-SA 3.0)

Image 70, Urban farming as part of Køge Kyst project in former industrial harbour area, Denmark Personal Archive, 2012-09-05

Image 71, De Ceuvel - a city playground with offices and shops made from old reused boats, Amsterdam, Personal Archive, 2014-10-07

Image 72, Temporary event place next to construction zone at Bernstorffsgade Copenhagen, Personal Archive, 2017-06-18

3.2. Noise pollution and vibrations

In the previous chapter of this paper I looked at the environmental degradation in terms of potential chemical soil pollution, but besides that, there are another serious threats to human health from railways. They are noise pollution and vibrations.

According to European Environment Agency (EEA), 12 million EU inhabitants are affected by railway noise with exposure of above 55 dB during the day and 9 million people are affected with noise exposure above 50 dB during the night. In reality these figures are even much higher since EEA's research included only those noise sources that are within agglomerations bigger than 250 thousand inhabitants *(European Environment Agency 2014)*.

Transport noise including railway noise depending on its level can cause serious health problems. There is substantial evidence that noise annoyance can lead to stress and disturbed sleep patterns, it can cause loss of hearing, it affects cognitive functioning especially for children and it can contribute to certain cardiovascular disorders. According to the World Health Organisation (WHO), noise is the second largest hazard to human health right after air pollution caused by environment.

In 1999 the WHO has published a document called Guidelines for Community Noise *(Berglund, B., Lindval, T., Schwela, D.H. 1999)* that unite scientific knowledge on the health impacts of environmental noise and gives recommendations for limitations in specific environments.

This guidelines presents specific noise limits for adverse health effects. LAeq represents A-weighted equivalent continuous noise level and LAmax represents A-weighted maximum noise level. The time base for LAeq is 12-16 hours for daytime and 8 hours for night-time. No time base is given for evenings; those are typically 5-10 dB lower than in the daytime. Image 73 illustrates sound levels in a simplified way to get a basic idea on how loud noise levels are. Noise levels from 0 dB up to 40 dB for most people seems to be moderate and not very disturbing (such as leaves rustling for example), levels from 40dB to 70dB seems loud, but levels above 85dB are dangerous for human health and can cause permanent health damages.

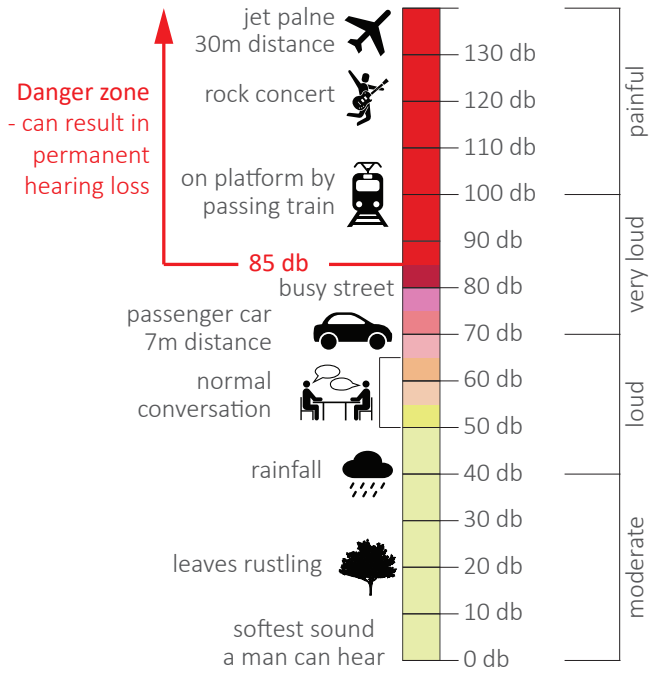


Image 73, Comparative sound levels. Illustration is designed and drafted by myself and based on information from Noise Basics (NoiseQuest, 2018) and Decibel Exposure Time Guidelines (Dangerous Decibels, University of Northern Colorado, 2018)

According to the WHO Guidelines for Community Noise *(1999)*, the best noise level for outdoor environment should be equal or lower than 55 dB and for indoor environment in dwellings 35 dB or 30 dB during night-time in bedrooms. However, ten years later the WHO in their publication Night Noise Guidelines *(2009)* has recommended that the population should not be exposed to night noise levels greater than 40 dB of Lnight, outside; and 55 dB Lnight, outside is recommended as an interim target in the situations where 40 dB is not achievable *(World Health Organization, 2009, p. 109)*.

The municipality of Riga has identified and mapped four different types of noise pollution in the city. They all are traffic related:

- Noise pollution by road traffic,
- Noise pollution by railways and tramlines,
- Noise pollution by air traffic,
- Industrial noise pollution.

Image 74 represents the average annual noise pollution from railways and tramlines and shows that overall noise higher than 50-54 dB is within less than 500m distance from the railway. Most of the loud noises are less than 100m distance from the railway and noise that is considered dangerous for human health can be found only at the railway area.

Image 75 represents the average annual overall noise pollution in the city centre of Riga mainly created by road traffic noise. Image 76 shows industrial noise pollution. As can be seen in all images from 75, most noise pollution comes from car traffic whereas noise pollution from industries and railway is generally higher than on an average street; it is still not higher than noise on the main streets.

There are not many industries left in the city centre, but all are related to the railway. Two of them next to the river are harbour areas, although in the near future they will leave the area. The third biggest area is located in the north-east part of the map. It is occupied by Rīgas Vagonbūves Rūpnīca (RVR) – privately owned manufacturer of railway locomotives and rolling stock.

Despite the fact that these maps and the research behind them warns about certain amount of noise pollution from railway in Riga, according to European Parliament's study "Reducing Railway Noise" (Clausen, U., *et al,* 2012) European Environment Information and Observation Network (EIONET) data shows that rail noise does not play a significant role in Latvia. It must be mentioned that Latvia is one of the few countries in EU that has this sort of conclusion. Furthermore, in the same paper it is stated that according the European Environment Agency (EEA) Latvia is between those eight countries in Europe that are mostly affected by railway noise according to the share of their population that is affected by railway noise with more than 55 dB(A) *(Clausen, U., et al, 2012, p.17)*.

In any case, to develop the areas in proximity to the railway in Riga, noise pollution is an important issue that must be taken in consideration.

LEGEND

>75 dB	55-59 dB
70-74 dB	50-54 dB
65-69 dB	45-49 dB
60-64 dB	40-44 dB

Image 74, Map of avarage Railway and Tram Traffic Noise
Source: Maps of noise pollution, Department of Housing and Environment, Riga City Council
Available at: *http://mvd.riga.lv/uploads/troksna_kartes/dzelzcels/*

Image 75, All sources of noise.
Overall noise pollution during day and night.
Source: Maps of noise pollution, Department of Housing and Environment, Riga City Council
Available at: *http://mvd.riga.lv/uploads/troksna_kartes/visi/*

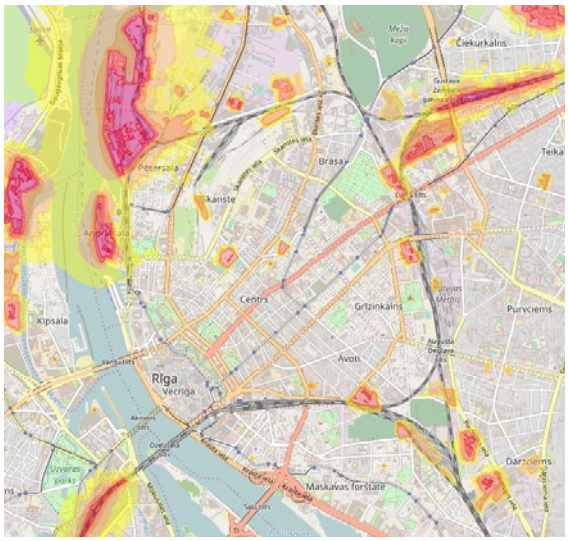


Image 76, Industrial noise pollution during day and night.
Source: Maps of noise pollution, Department of Housing and Environment, Riga City Council
Available at: *http://mvd.riga.lv/uploads/troksna_kartes/industrialie/*

3.2.1. Mitigation of noise pollution and vibrations

"The most effective noise-mitigation method is to reduce noise emissions at the source" *(Nilsson, M. E. , Bengtsson, J. , Klæboe, R. 2015, p. xiii)* however, this method is not always possible especially when dealing with pre-existing infrastructure and vehicles. Another way to minimize the impact of noise pollution is to adjust the land use of the affected areas but isn't always an option either. There are several researches and methods on how reducing noise pollution and vibrations by relatively small changes of urban design by using noise barriers, land forms, vegetation and certain surface materials.

One of the researches in noise mitigation is a project called "Holistic and Sustainable Abatement of Noise by optimized combinations of Natural and Artificial means" (HOSANNA). It was carried out by international team from 2009 -2013 and coordinated by Chalmers University of Technology, Gothenburg, Sweden. The aim of the project was to develop a toolbox for reducing road and rail traffic noise in outdoor environments by optimal use of vegetation, soil, and other natural and recycled materials, in combination with artificial elements *(Nilsson, M. E. , Bengtsson, J. , Klæboe, R. 2015, p. xiii)*.

Another interesting document is titled "Guidelines for New Development in Proximity to Railway Operations" done by The Federation of Canadian Municipalities and The Railway Association of Canada in 2013. This document introduces landscape design methods and building typologies that reduces noise pollution and vibrations and allows more flexible land uses in proximity to railway operations.

The third document is done by The Government of New South Wales or NSW Government Department of Planning, Australia. The document is called "Development near Rail Corridors and Busy Roads– Interim Guideline" and it mainly deals with building design, orientation and location.

Altogether, these three documents give an extensive toolbox for noise mitigation possibilities starting from simple solutions by using vegetation including much more expensive and laborious solutions like specific constructions and earthwork.

One of the simplest and least expensive solutions is using vegetation for noise mitigation in urban areas. Vegetation is one of the most visually appealing ways to mitigate noise, it can absorb high frequency sounds that people find most annoying and it can help to deal with refracted noise (image 77) from hard surfaces by scattering and absorbing it. Additionally, vegetation reduces air pollution, cools down urban areas, can reduce building energy use and can help reduce storm water runoff.

The image 77. Processes of noise distribution, Illustration is designed and drafted by myself and based on information from *Environmental Methods for Transport Noise Reduction (Nilsson, M. E. , Bengtsson, J. , Klæboe, R. 2015, p.79)*

At the same time using vegetation for noise mitigation can be the least effective way if it is not done correctly. Small amount of vegetation or a couple of trees won't make any significant noise mitigation. It might also be problematic to decrease noise levels by vegetation in limited spaces. To provide the optimum noise protection, the vegetation should be dense, planted as close to the noise source as possible and should create a maximum deep barrier to scatter the noise. The best species for noise mitigation are those with dense branches that extend to the ground, and thick, waxy and leafy evergreen leaves to provide year-round noise reduction. For example, broad-leaf evergreens are more effective than narrow-leaf plants and conifers. To reach maximum noise protection creating forested areas would be the best choice which is rather a rare option for cities.

Besides physical sound reduction, another important effect of the vegetation in noisy environments is perceptual or psychological effect of plants and trees. There are several researches on effects of vegetation on the perception of traffic noise. Most of them suggest that people get less annoyed from the noise that is visually screened especially with the vegetation.

For example, an article "An Assessment of Psychological Noise Reduction by Landscape Plants" done by researchers Fan Yang, Zhi Yi Bao, Zhu Jun Zhu *(2011)* introduces with a study of physiological benefits provided by vegetated environments. With doing a questionnaire – a subjective approach, the researchers found out that "90% of the subjects believed that landscape plants contribute to noise reduction and that 55% overrated the plants' actual ability to attenuate noise" *(Fan Yang, Zhi Yi Bao, Zhu Jun Zhu 2011)*. Furthermore, by doing emotional tests using an electroencephalogram (EEG) – an objective quantitative approach, the results showed that green environment has positive effect on people's mind:" The EEG data indicate that the subjects' frame of mind is significantly calmer in vegetation scenes than in traffic scenes, even when the subjects are exposed to the same traffic noise in the two scenes" *(Fan Yang, Zhi Yi Bao, Zhu Jun Zhu 2011)*.

Both physical and psychological effect of vegetation in combination with other noise mitigation ways can significantly improve the environment of the city which is important for the health, well-being and satisfaction of urban residents.

There are several ways to mitigate noise using landforms and vegetation. These include different kind of barriers, planting of trees, shrubs and bushes, different kinds of ground treatments and other vegetated surfaces such as facades and roofs.

In the following pages, I will introduce some of the most suitable physical noise mitigation ways from the 3 documents I mentioned. This toolbox could be applied to Riga's railway loop.

Noise barriers

Noise barriers are traditionally made of wood, metal, concrete, or acrylic glass; however they can also be made of recycled materials or natural materials such as stones, soil, and vegetation. According the Canadian guidelines, a noise barrier can reduce noise by 5dBA up to 15dBA *(The Federation of Canadian Municipalities .., 2013, p. 29).*

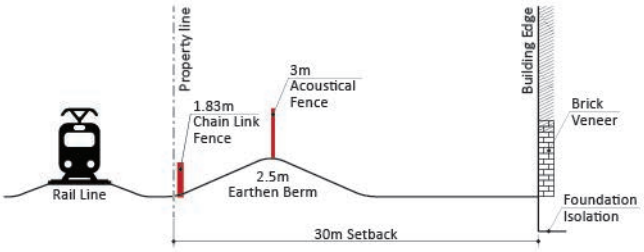


Image 78, Noise mitigation for new residential development. Sketch drafted by myself and based on information from the Canadian guidelines (The Federation of Canadian Municipalities .. , 2013, p. 19)

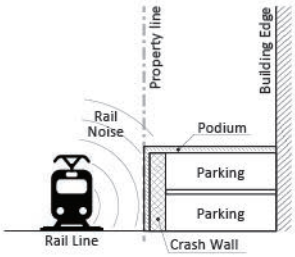


Image 79, A crash wall to reduce the recommended setbeck. Sketch drafted by myself and based on information from the Canadian guidelines (The Federation of Canadian Municipalities .. , 2013, p. 27)

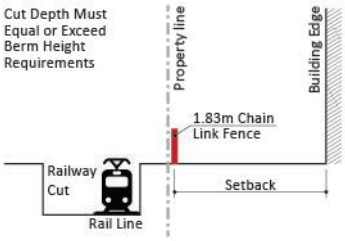


Image 80, Railway placed in an open-cut. Sketch drafted by myself and based on information from the Canadian guidelines (The Federation of Canadian Municipalities .. , 2013, p. 38)

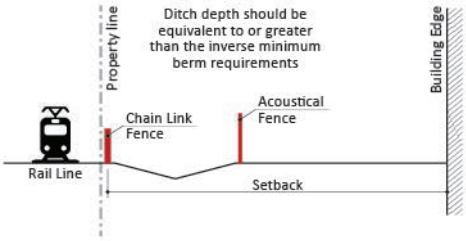


Image 81, A ditch or valley instead of a standard berm. Sketch drafted by myself and based on information from the Canadian guidelines (The Federation of Canadian Municipalities .. , 2013, p. 40)

As a standard solution for noise mitigation the Canadian guidelines suggests 30m setback from the main line with earthen berm and acoustic fence (Image 78) however implementing a crash wall (Image 79) can reduce the suggested setback. If the railway line is cut in equivalent depth, no berm is required (Image 80). Another solution could be, if the site conditions allows, a ditch or valley of equivalent depth instead of the standard solution (Image 81).

More innovative and green solution that is suggested in the Canadian guidelines is living walls as noise barriers and there are even more solutions offered in HOSANNA project materials. According to HOSANNA research *(HOSANNA Summary Brochure, 2013)*, the most suitable solution would be earth berms with non-flat surfaces and stepped profile (Image 83) where the space allows and low weight vegetated barriers at the bridges and other limited spaces (Image 84-85). The berms can be filled with recycle materials that can improve their noise absorption.

Pros and cons of earth berms:

+ Improves appearance,
+ Can be planted which increase sound absorption,
+ Very long life time,
+ Limited maintenance costs,
+ No graffiti problems,
+ Possibility to use recycled materials in construction,
+ Contributes to biodiversity,
+ Serves as safety barrier,
- Takes up more space than a barrier.

Pros and cons from *HOSANNA Summary Brochure, 2013, p.46*

Image 82, My example of a **living wall** that could mitigate noise in Kroņu Street, Riga. Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

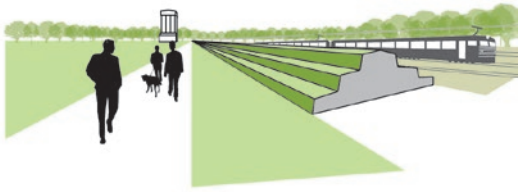


Image 83, My example of **an earth berm with stepped profile** that could mitigate noise in Kroņu Street, Riga. Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

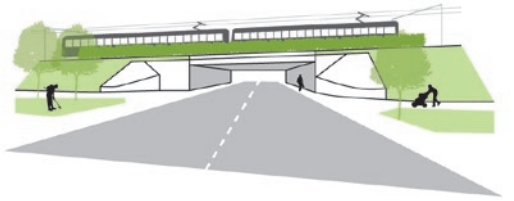


Image 84, My example of **a low weight vegetated barriers at the bridges** that could mitigate noise in Lāčplēša Street, Riga. Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

Image 85, My example of **a low weight vegetated barriers at the bridges** that could mitigate noise in Satekles Street, Riga. Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

Trees, shrubs and bushes

According to the Canadian guidelines *(2013)*, vegetation cannot "limit the intrusion of noise" (page 32) but can "create the perception of reduced noise levels" (page 32). However, HOSANNA *(2013)* project materials suggest that plant elements like stems, branches, twigs and leaves provide redirection (reflection, diffraction, scattering) and absorption of noise. Moreover, soft soil underneath vegetation such as humus layer can increase noise reduction as well as micro-climatology provided by tree canopies.

According to HOSANNA research *(2013)* approximately 15m wide tree belt with optimized vegetation is equivalent to the shielding of a 1-1,5m high traditional concrete noise wall placed directly near the road.

The HOSANNA project materials *(2013)* suggest that the most effective solution for noise mitigation from railways is tree belts and trees behind the barriers.

Pros and cons of the tree belts:

+ Fully green solution (CO2 uptake, increases biodiversity),
+ Improves appearance,
+ Reduces air pollution,
+ Tree belt can reduce wind effects on noise barriers,
- Takes many years to exert its maximum noise-reducing effect,
- Species allowing dense planting should be selected,
- Trees near berms are not advised.

Pros and cons from *HOSANNA Summary Brochure, 2013, p.46*

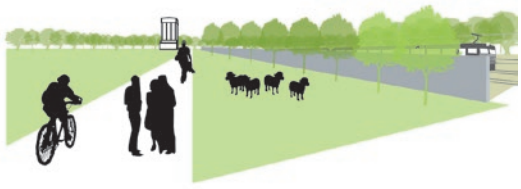


Image 86, My example of **trees behind barriers** that could mitigate noise in Kroņu Street, Riga. Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

Image 87, My example of **trees belts** that could mitigate noise in Kroņu Street, Riga. Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

Image 88, My example of **trees in street canions** that could mitigate noise in Daugavpils Street, Riga. Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

Pros and cons of trees behind the barriers:

+ Strongly reduces negative visual impact of noise walls

- Need for dense canopies to maximize effects

- Complex, distance-dependent effect

- Negative effect could appear at some distance

Pros and cons from *HOSANNA Summary Brochure, 2013, p.46*

Image 89, **Trees behind barriers. Section.** Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

Planting shrubs, bushes and hedges with high above-ground biomass densities can complement the effect of tree belts and soil effect.

Vegetated facades and roofs

According to HOSANNA *(2013)*, vegetated facades and roofs can reduce reflected noise from facades and other hard surfaces by absorbing and diffusing sound, and it can reduce sound transmission when a sound wave is passing through the vegetation.

Image 90, My example of **vegetated facades** that could mitigate noise in Turgeņeva Street, Riga. Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

Suggested solutions, pros and cons by HOSANNA *(HOSANNA Summary Brochure, 2013, p.47)*:

Vegetated facades

+ Improves appearance
+ Reduces air pollution
- Can create darker appearance
- High costs of installation and maintenance
- Short life-cycle (10 years)

Vegetated openings to courtyards

+ Improves appearance
+ Improves thermal insulation of buildings
- Can create darker appearance
- High costs of installation and maintenance
- Short life-cycle (10 years)

Vegetated roofs and vegetated roof barriers

+ Improves appearance
+ Improves thermal insulation of buildings
+ Improves storm water run-off
+ Low costs of installation and maintenance
+ Long life-cycle (50 years)

Image 91, My example of **vegetated facades, roofs and roof barriers.** Example with a view from the railway station Brasa, Riga. Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

Image 92, My example of **openings to courtyards** that could mitigate noise in Kalupes Street, Riga. Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

Ground treatments

The aim of the ground treatments is to reduce reflections from the ground. According to HOSANNA *(2013)*, the most reflective ground materials are non-porous concrete and asphalt and other acoustically hard ground materials.

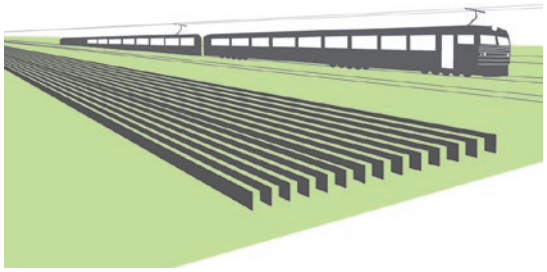


Image 93, My example of **artificial ground roughness** that could mitigate noise in Kroņu Street, Riga. Image designed and drafted by myself and based on principles from HOSANNA project (HOSANNA Summary Brochure, 2013)

Suggested solutions, pros and cons by HOSANNA *(HOSANNA Summary Brochure, 2013, p.47)*:

Creating artificial ground roughness (by using small hard blocks or by making grooves or pits)

+ Visually nonintrusive
+ Allows access
- Takes up more space than a barrier

Introducing soft strips or patches filled with gravel

+ Improves appearance

Using soft groundcover (vegetation)

+ Improves appearance
+ Increases green space

5. Building design, location, orientation and room layout

According to the Australian guidelines, “A key element of good acoustic planning and design involves increasing the separation between the road/rail noise sources and the noise sensitive area” *(The State Government of NSW .., 2008, p. 21)* which means placing rooms that are used less often like service rooms closer to the noise source and then noise sensitive rooms (Image 94-95).

Buildings can also be used as noise shields themselves or parts of the buildings like podiums and balconies, designed in sound absorption materials, can reduce noise levels that enter the building.

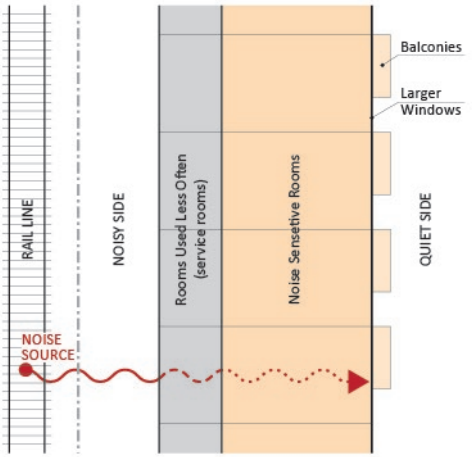


Image 94, Locating noise sensitive rooms away from rail noise in detached dwellings. Sketch drafted by myself and based on the information from Canadian guidelines (The Federation of Canadian Municipalities .. , 2013, p. 31)

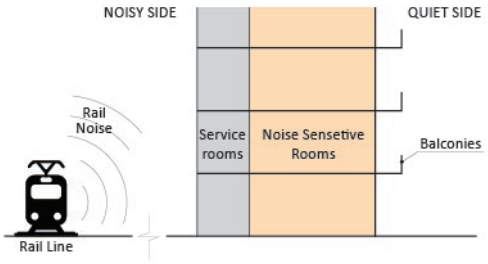


Image 95, Locating noise sensitive rooms away from rail noise in multi-unit dwellings. Sketch drafted by myself and based on the information from Canadian guidelines (The Federation of Canadian Municipalities .. , 2013, p. 31)

Vibrations

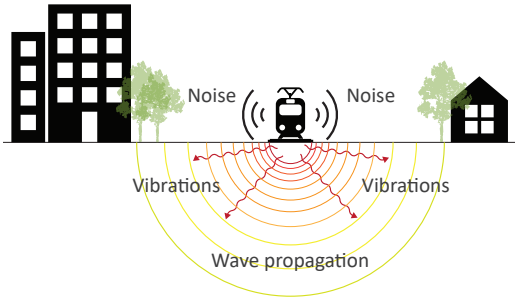


Image 96, Diagram of noise pollution and vibrations from railways, designed and drafted by myself and based on my knowledge in basic physics.

Noise pollution is just a part of the issues with the proximity of railways. Another problem is vibrations that can cause annoyance, strongly affect the life quality in the area and even cause damages to built structures. Vibrations are generated by vehicle forces passing from rolling stocks into the tracks, and then into the ground (Image 96). These vibrations are called ground-borne vibrations and they can affect the surroundings. Unlike noise pollution, vibrations are more difficult to predict and mitigate *(The Federation of Canadian Municipalities .., 2013, p. 19)*. Propagation of vibrations is site-specific and depends on the soil and subsurface conditions *(The Federation of Canadian Municipalities .., 2013, p. 33)*.

The most effective measures for mitigation of vibrations is reduction at the source, reduction of the propagation and isolation of the receiver *(Lakušić, S., Ahac, M., 2012)*. There are very few vibration mitigation methods that can be applied to the transmission path. In 2013 a joint research and development project called “Railway induced vibration abatement solutions” (RIVAS) was carried out by international team from nine European countries. The aim of the project was to create a toolbox to solve ground-borne vibration issues from railways.

According to the outcome of this project RIVAS *(Lombaert, G., et al, 2013)*, there are 4 methods that can be applied to the transmission path of the ground-borne vibrations and those are:

- Soft wave barrier at least to 32 m from the track with underground free of structures such as cables and sewers and environmentally friendly infill material.
- Jet grouting wall built in the ground alongside the track.
- Sheet pile wall built in the ground alongside the track.
- Heavy masses such as gabion walls or concrete blocks placed in a continuous row on the ground surface along the track.

All of these methods have provedn themselves in mitigation of vibrations however more extensive research of geological and geo-technical conditions is needed before applying any solution *(Lombaert, G., et al, 2013, p.6)*.

3.2.2. Summary of the noise pollution and vibrations

Noise pollution and vibrations are not easy to mitigate, however it is possible if the solutions are combined and adjusted to each site-specific situation.

To create a toolbox for mitigation of noise pollution and vibrations, I have used 4 different documents that have similar goal but different approaches:

1. Canadian "Guidelines for New Development in Proximity to Railway Operations" *(2013)* gives an overview of potential solutions for buildings and land forms such as berms.
2. "Holistic and Sustainable Abatement of Noise by optimized combinations of Natural and Artificial means" *(HOSANNA Summary Brochure 2013)* or HOSANNA project materials provides with an extensive research in use of vegetation, and also possible noise mitigation by berms and fences although it differs from the Canadian Guidelines.
3. Australian guidelines "Development near Rail Corridors and Busy Roads– Interim Guideline" *(2008)* have adopted some of the solutions offered in Canadian guidelines and, similar to Canadian ones, mainly deals with the building design.
4. "Design Guide and Technology Assessment of the Transmission Mitigation Measures Deliverable" *(Lombaert, G., et al, 2013)* was used for vibration-mitigation toolbox and it significantly differs from the previous 3 because it deals specifically with vibrations.

Overall, all the research papers on noise mitigation suggest to combine the solutions and adjust them to the site specific conditions. As noise and vibration mitigation solutions are closely related to each other, there is no contradiction between them. The toolbox given by HOSSANA *(HOSANNA Summary Brochure 2013)* project is the most relevant for landscape solutions that doesn't involve buildings, however also the other toolboxes are as important and should be especially considered if building new housing.

In the case of the railway loop of Riga, it is important to look at each section of the loop as unique case and choose the most appropriate solution or combination of solutions.

Image 97, Field Study, 2017-07-27

PART 4

Concept and Strategy for Revitalisation

The aim of this part is to give an abstract concept for the further development of the railway loop of Riga and a clear strategy how the goals stated in concept can be reached. Therefore, first I want to highlight several findings from the previous sections that I find particularly important for any further planning because they affect mobility in the city and satisfy some of the daily needs of the people.

Industrial areas, train stations and tram lines with tram stops

As stated before, the city is divided by the railway and industrial lands along it but some parts of the city are fairly well connected by rail transport such as trains and trams. The existing rail infrastructure has a great potential to become a backbone for mobility in the city. (Image 98)

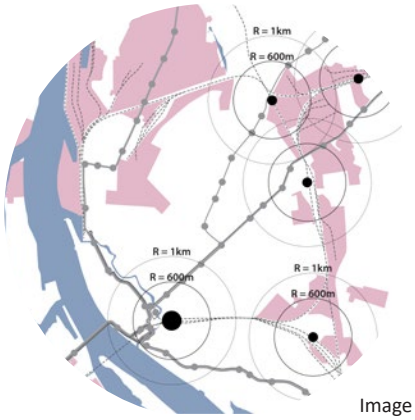


Image 98

Existing parks, cemeteries and the main public facilities along the railway

Although there are a lot of industrial lands along the railway loop, the areas are also rich with interesting functions which includes railway stations, shopping, sport facilities, existing green areas and closeness of the educational facilities. These functions have a great potential to be developed in urban life generators. (Image 99)

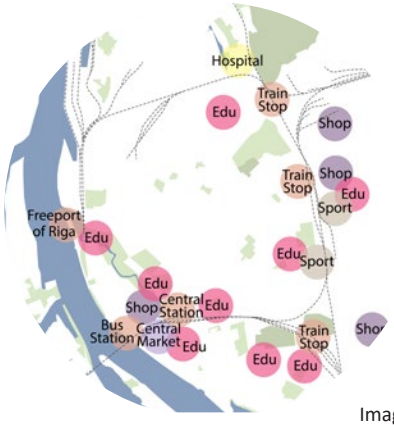


Image 99

Distribution of population and existing and planned bike path network

The distribution of the population is uneven; most of the people live in the suburbs and commute to the centre for work daily, therefore, the planned magistral bicycle routes are rather radial. By revitalising the areas along the railway, there would be a potential for faster circular cyclist flow around the city avoiding the busy street crossings at the centre. (Image 100)

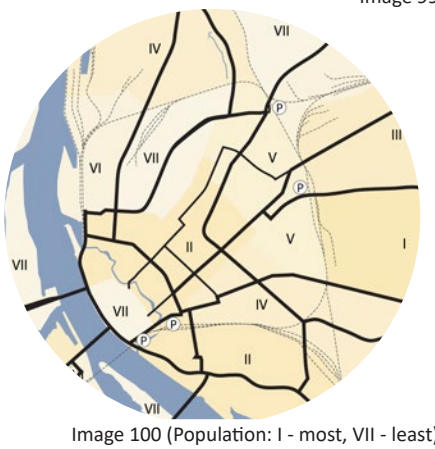


Image 100 (Population: I - most, VII - least)

Image 98-100, (CC BY-SA)©OpenStreetMap contributors. I have added rail transport routes and stops/stations, main functions, distribution of population and exsisting and planned bike path network; all is from my findings in PART 1 - Introduction of the Existing Situation

4.1. Concept

The most fundamental issues with the railway loop and areas along it are the effects of spatial barrier which comes from difficulties in crossing the railway as well as the lack of communal usage that would be of interest to the wider public.

Within the scale of the city centre, the main issues are related to lack of sustainable mobility, vegetation and public space for activities which has led to overuse of cars and poor air quality.

To give a base for solutions of these issues and to revitalise, integrate and connect the areas along the railway, my concept is to make them:

- **Connected and accessible**

  By connecting the areas along the loop step-by-step, cleaning them up and providing basic accessibility, the revitalisation process can be started with small investments. New pedestrian and cyclist friendly loop around the city centre along the railway would give an opportunity to avoid motorised traffic and waiting for traffic lights.

- **Green and active**

  By improving vegetation along the loop, the areas can be remediated from potential pollutions. While doing this, with involvement of citizens and landowners, the spaces can be activated by temporary events or even permanent improvements and developments. Also the existing programs can be used as first urban life generators and 'enter points' to the new green loop around the centre.

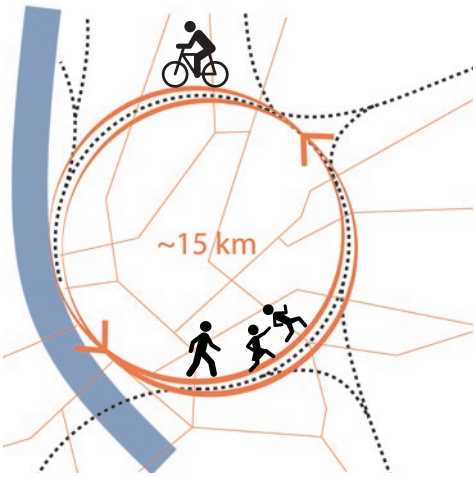
- **Polycentric and compact**

  By developing the existing train stations, some of the load could be taken away from the Central Station and surrounding neighbourhoods can become attractive places for new mixed-use developments providing compact planning model with small distances within the city. As some of the train stations are close to the tram stops, together they can improve mobility of people by railway and trams.

The overall goal of these three-part concept is to make the city more accessible and enjoyable for pedestrians and cyclists.

Connected + Accessible

Image 101,
drafted by myself and based on my findings

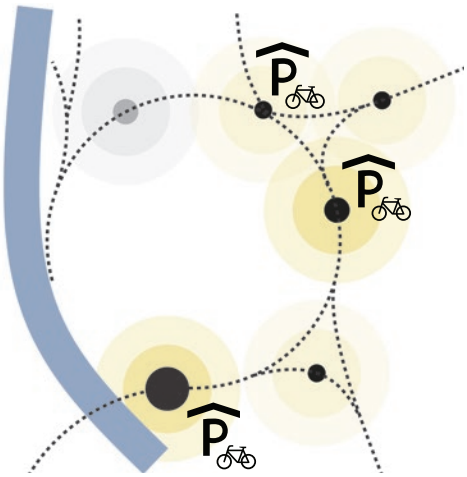


Green + Active

Image 102,
drafted by myself and based on my findings

Polycentric + Compact

Image 103,
drafted by myself and based on my findings



4.2. Strategy

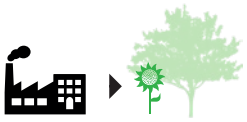
The goals introduced in the concept are successfully achievable only by slow, step by step process therefore, allowing large flexibility of events and solutions. However, a clear strategy is also needed to avoid deviation from the goals.

Table 1 represents the strategic plan of how the areas along the railway loop may be reclaimed and recovered and includes, what the main challenges are along with potentials, objectives and actions. The strategy also includes step by step process that can shift into parallel actions in some cases; **the strategic steps are:**

- **Connect the areas** means of pedestrian and cycle friendly paths, makeing them accessible from the surrounding neighbourhoods, and provide lighting.

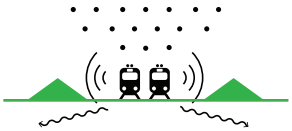
- Invite locals and landowners including Latvijas dzelzceļš (The railways of Latvia) to **create discussions, events** etc. (A process led by the municipality of Riga).

- Gradually **remove industries** and start the **soil remediation** processes where it is needed.

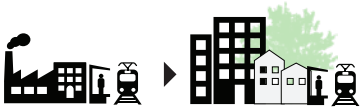


- Gradually **activate the areas** by adding small enhancements to improve quality, safety and function of the places, **develop new community spaces** with existing programs, **adding new programs** and therby **improve railway crossings**.

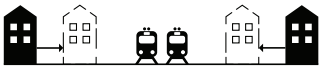
- Gradually introduce solutions for **mitigation of sound pollution and vibrations**.



- **Revitalise the existing station areas** by developing them in mixed use urban hubs.



- **Build closer to the railway**, densify the areas and reduce mental and physical distances between neighbourhoods on both sides.



- **Create a closed green loop** along the railway and fully integrate it in the existing city fabric by pedestrian and cyclist friendly infrastructure.

Proposed Strategic Plan

Table 1, designed and drafted by myself and based on my findings

Strategic Plan		
Challanges	Objectives	Actions
 **Revitalize** brownfields in proximity to the Riga railway loop	remediate soil pollution	identify polluted areas and adjust a treatment method
	connect the areas and make accessible	identify brownfield and wasteland areas, and potential connection spots between them, list small scale improvments to improve quality, safety and function of the place
	develop existing programs and add new programs	identify existing programs and potential for new ones, adjust urban design and landscaping solutions to activate them
 **Integrate** the brownfields back into the city and its neighbourhoods	integrate the areas within the city's existing street network and green structure	identify potential connection spots with existing street network and green structure, adjust urban design and landscaping solutions to make the areas along the railway linked within the city
	develop new community spaces and programs	identify existing programs and potential for new ones, adjust urban design and landscaping solutions to activate them
 **Connect** both sides of the railway to lessen the barrier effect	increase walkability	expand space for pedestrians and cyclists by reducing space for cars, evaluate potential for new bridging / tunneling / over-decking
	create a space for cycling	
	reduce mental distances	densify along the railway where the space allows and create diverse spatial character
 **Mitigate** noise and vibrations from the Riga railway loop	add new landforms and develop ground treatments	list urban design and landscaping solutions to mitigate noise and vibrations, identify where it is the most needed
	develop noise reducing constructions and noise barriers	list urban design and landscaping solutions to mitigate noise and vibrations, identify where it is the most needed
	add vegetation	list urban design and landscaping solutions to mitigate noise and vibrations, identify where it is the most needed

◀ Image group 104. All diagrams in page 86 are designed and drafted by myself

In the long run, the strategy is to create a closed green loop around the city centre along the railway that serves the needs for mobility and activities of the city's inhabitants, thus helping to enrich the city's biodiversity and reduce the barrier effect of the railway. The loop would be integrated with magistral bicycle routes and existing train stations to provide the ability to move faster in a more sustainable way.

Images 111-114 represents 4 different layers of the strategy:

1. dedevelop new pedestrian and cycling friendly path along the railway and enhance the railway crossings in existence,
2. integrate network of the new pedestrian and cycling friendly path along the railway with bicycle paths planned by municipality, again additionally improving the railway crossings,
3. integrate the new green structure along the railway with green-blue structure planned by the municipality,
4. develop the existing train stations, bus stations and stadium Daugava into attractive urban hubs.

Image 115 represents all these 4 layers of the strategy overlaid to work together in greater united system and Images 105-110 are examples of some activities that the new green loop could hold.

Image 105, Playground at former Industrial Harbour, Køge (Denmark). Personal Archive, 2012-09-05

Image 106, former waste land turned into a park at Gleisdreieck, Berlin. Personal Archive, 2015-10-30

Image 107, former waste land at Gleisdreieck, Berlin. Personal Archive, 2015-10-30

Image 108, Green Soil Remediationat former ship wharf, Amsterdam. Personal Archive, 2014-10-07

Image 109, Gardening at former ship wharf, Amsterdam, Personal Archive, 2014-10-07

Image 110, former shipbuilding shed turned into workshops, Amsterdam. Pers. Archive, 2014-10-07

Proposed Strategic Plan in Diagrams

Images 111-115. (CC BY-SA)©OpenStreetMap contributors. I have highlighted colours, roads and railway lines. I have added my proposed new connections (pink colour, Image 111), railway crossings (purple colour, Image 112), green structure (dark green and dashed green, Image 113), new urban hubs (black dots, Image 114). I have added dark green arrows and zones, dashed green zones, pink bridges and black dots for railway stations on Image 115.

Image 111,

1 - connect the areas and make them accessible

Image 112,

2 - integrate within the magistral bicycle routes and improve the railway crossings

Image 113,

3 - remediate and revitalise by integrated green-blue structure

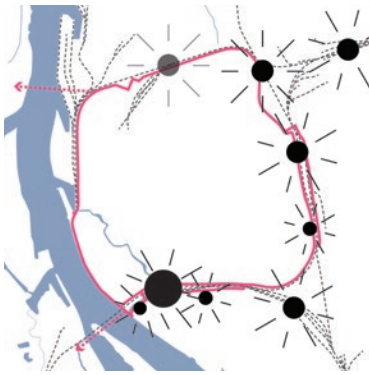


Image 114,

4 - activate by developing new urban hubs

Image 115, Proposed Overall Strategic Plan

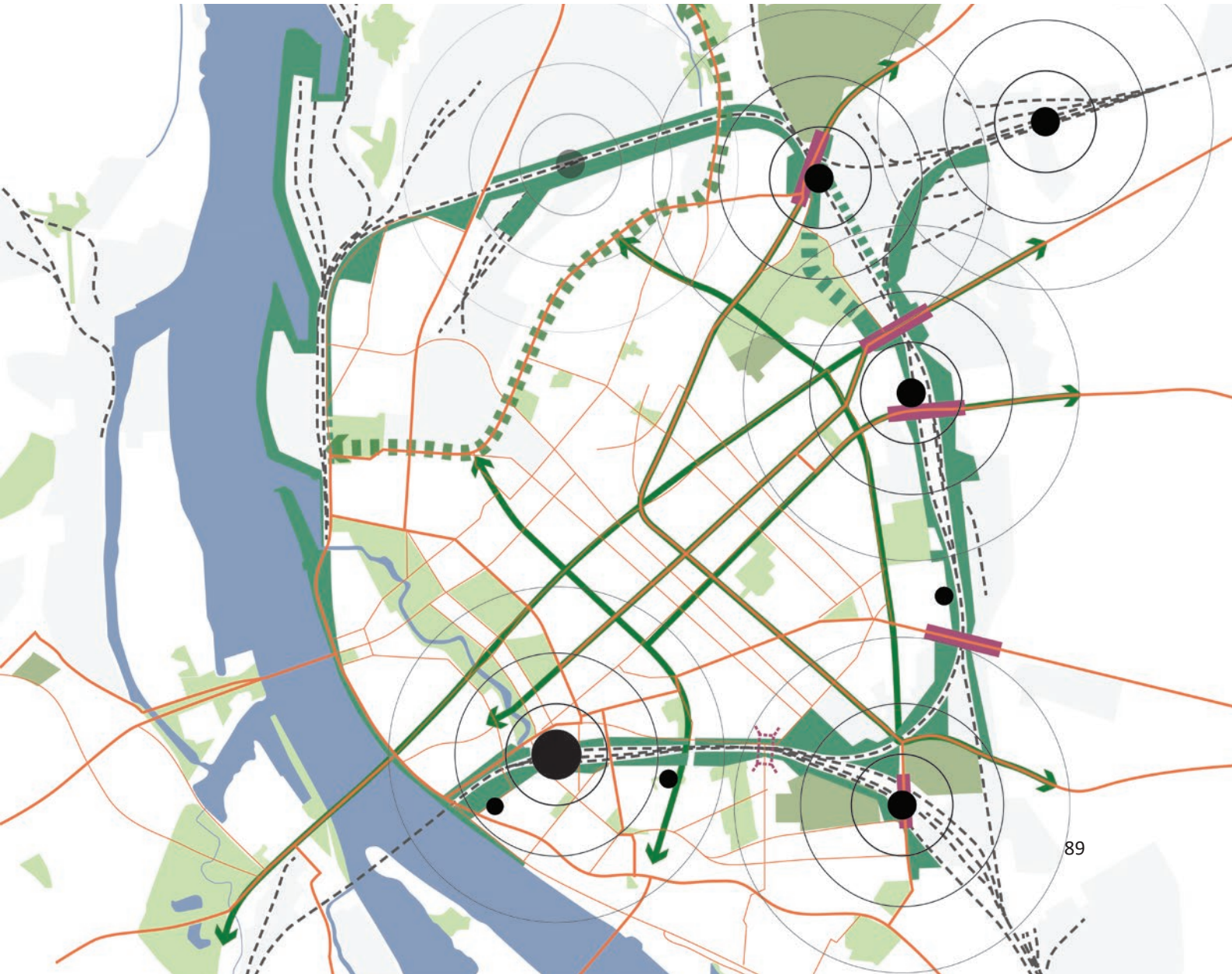


Image 116, Vision collage, designed and drafted by myself

PART 5

Visionary Proposal of Revitalisation

The aim of this part of my thesis is to explore the specifics of the sites along the railway, to identify the existing programs, future potentials, to indicate potential areas for the new green loop and to create a design vision of the revitalisation. The design vision for the entire area will be conceptual as well as the vision of the catalysts for the change and driving forces. However, at the end of this part I will present design principles for the new green loop and my own subjective vision of what some of these places could become and how they could look in terms of design.

To reach the goals stated in the concept and strategy, my visionary proposal is to create a pedestrian and cyclist friendly green public space around the city centre along the railway on both sides of the railway. The green space will take the form of an activity park with pedestrian paths, bicycle routes and running tracks around the city centre, mainly along the railway loop. Areas along the way will be divided in smaller character zones with flexible use.

By creating a new activity park along the railway, the city would acquire an area that would fit to much more extensive use than historical parks at the centre that I have shortly described in the chapter 1.2.1. It would connect the city and would be a safe place where they can move faster by bicycle without traffic lights and danger from cars. With proper protection from railway, it would be a safe place with clean air where daily sports can take place, walk with children or enjoy time with friends. As there are many educational facilities along the railway loop, the park can become a space where children and students can cycle to schools and spend their time after the school, for instance, in outdoor gyms, sport fields, playgrounds, picnic places and other. The space would also serve elderly people's needs with recreational places, free outdoor gyms or urban gardens, for instance, or be a place where arts and culture on weekend with families and friends could be enjoyed.

Overall, the city centre would become a more attractive place for living for all age groups as green high quality healthy public environment would be accessible in less than 2 km from any place at the centre, in less than 3 km from the centres of suburbs and in less than 12 km from the most distant places in the periphery.

To understand and select the potential areas for the new activity park, taking into account the advantages and disadvantages of such areas, I will start with deeper insight into various parts of the railway loop.

5.1. Character Of The Sites and Site Specific Potentials

Despite the fact that all the areas along the railway loop around the city centre have developed around the same time together with the construction of the railway, they still have different characters. The railway loop around the centre is approximately 15km long and varies in its width and height. To make it easier to describe the areas along the railway, I have divided it in 8 different sections which differs in size, character, main issues and challenges(Image 117).

- **The 1st part** can be characterised as **main transport hub in Riga**. It is located next to the Old Town where the Central Train Station, International Bus Station and central market are located. All the public transport routes of Riga lead to this hub which makes it very commercial and active. The railway is elevated on an earthen berm.
- **The 2nd part** is much less used by pedestrians, it is busy by **all kinds of motorised transit traffic** and it holds an important public transport stop - the **bus terminal Abrenes Street**. The railway is elevated on an earthen berm at the west side and goes down to street level on east side of the site.
- **The 3rd part** can be characterised as rather industrial with the **railway station Vagonu Parks**, cemeteries and prison. The railway is located at the street level.
- **The 4th part**, similarly as the 3rd, can also be characterised as rather industrial. However, the **railway station Zemitani** is more accessible and there are more residents in this area. The railway is located at the street level and crossed by 3 very busy car-oriented bridges.
- **The 5th part i**s very industrial with a lot of abandoned buildings. It holds the **train station Brasa, an existing machine-building plant and tram depot.** The railway is located on the street level and crossed by two car-oriented bridges.
- **The 6th part** can be characterised as **industrial** on the north side and **wastelands** on the south side of the site. The railway is crossed by two lowered streets.
- **The 7th part** is called Andrejsala - Petersala and it holds a place for a **former harbour area** which currently lacks a clear function, a **working harbour area** with busy cargo train traffic and rather large **residential area**. The railway is located at the street level.
- **The 8th part** holds **Riga Passenger Port** and **waterfront along the Old Town**. The site **does not include the railway** but it sort of closes the railway loop with a busy magistral road along the waterfront which creates similar effect to the railway; it creates a barrier between the Old Town and the river.

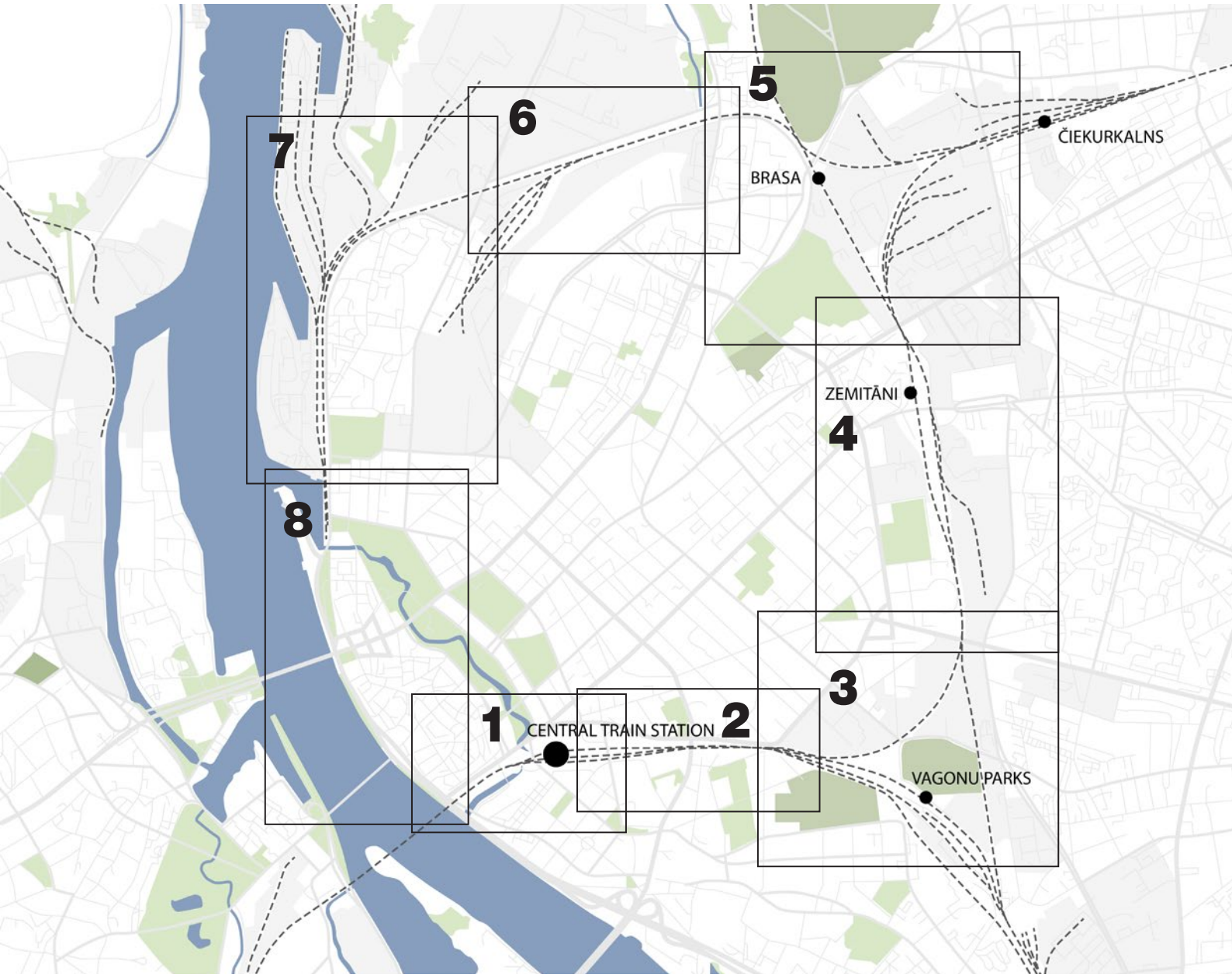


Image 117, 8 sites. (CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours and railway lines. I have added the black squares, numbers and texts.

To resume the characteristics:

- All sites but no.8 are divided by the railway.
- Sites no. 8 & 1 are strongly affected by the closeness of the Old Town.
- Sites no. 3 & 5 are the most industrial but no.6 potentially has as less users compared to 3 & 5 because of the lack of residential areas.
- Sites no. 4 & 7 are the most mixed and strongly affected by their industrial history but at the same time they have more potential users because of the residential parts.
- Site no.2 is more or less residential on both sides but is strongly affected by motorised transit traffic.

1 Central Train Station, International Bus Station and Centralmarket

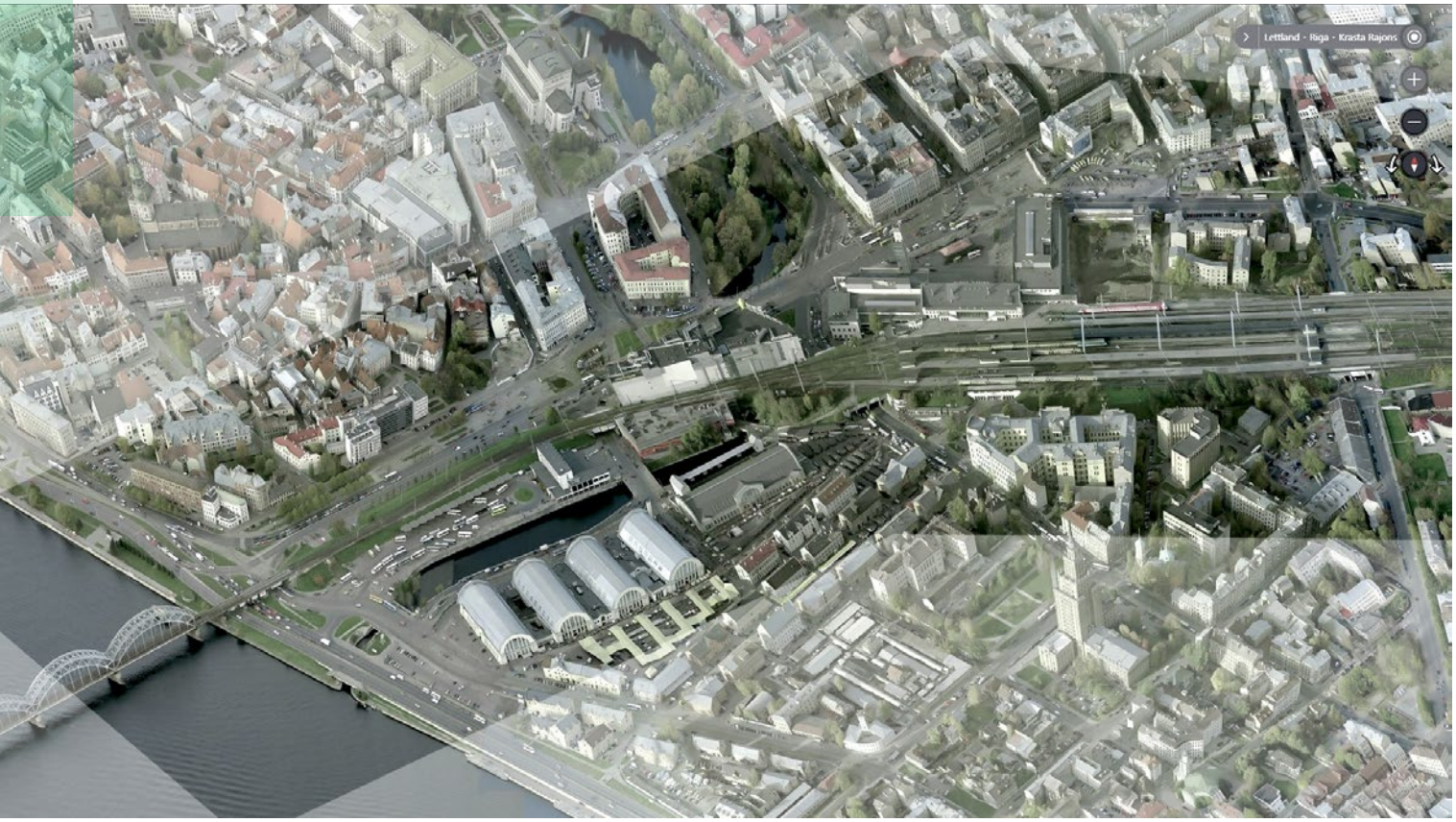


Image 118, Birdview of the site no.1. Imagery ©2018 CNES / Airbus, Map data ©2018 Google.
I have adjusted colours and highlighted focus area.

This site is the main transport hub in the city and it expected to become even busier in the future as it will be passed by Rail Baltica. The site is located right next to the Old Town and can be easily reached by all types of public transport as they all cross this place. Currently, the site is divided by an earthen berm with elevated railway on top of it but in the future, according to the winning proposal of the Rail Baltica Riga competition, the berm will be removed and there will be an open space underneath the elevated railway (Image 119 and 120). According to the Rail Baltica schedule, the area should be finished in 2022.

Image 119 (on left), PLH_Baltic_Rail_Cityview and Image 120 (on right, PLH_Baltic_Rail_Station_Overview (Santos S., 2016) by PLH Arkitekter. PLH Arkitekter Wins Rail Baltica Competition. [online]. Archdaily. Permission for use from Pernille Franch Pedersen, PLH Arkitekter A/S. Available at: *http://www.archdaily.com/800894/plh-arkitekter-wins-rail-baltica-competition-with-arch-inspired-infrastructural-system* [2019-01-19]

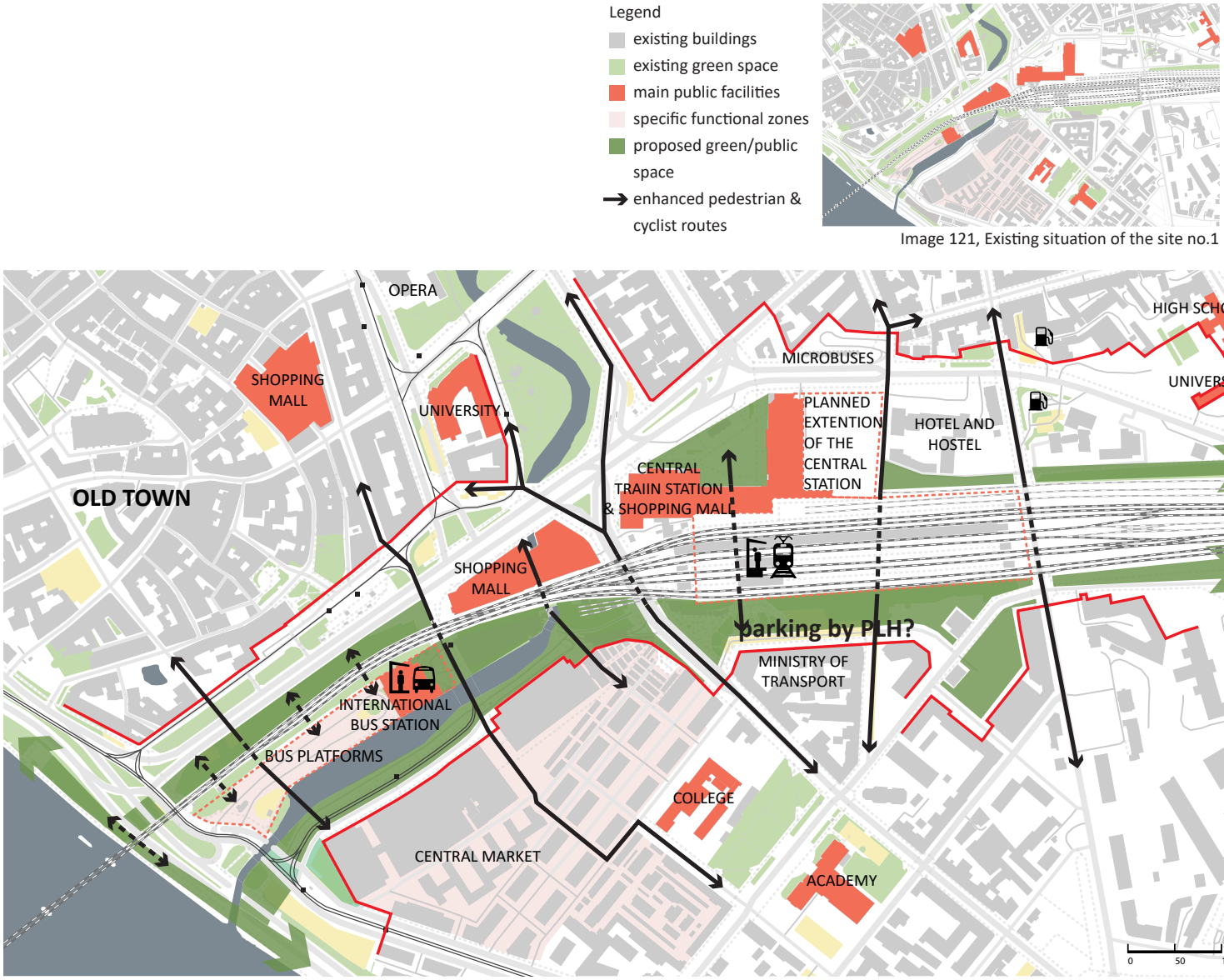


Image 121, Existing situation of the site no.1

Image 122, Potentials of the site no.1. The maps 121-122 are based on (CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours of existing buildings, green areas, roads, railways and specific functional zones.
I have added a red line marking border of the proposal area, arrows, dark green areas , texts and the legend.

My strategy complements the winning proposal by PLH Arkitekter as it deals with the same issues and also offers more green and accessible public outdoor space. The only mismatch is the part between the Ministry of Transport and the Train Station, where PLH Arkitekter have proposed parking places. Overall, the proposal by PLH Arkitekter has great qualities and with some extensions further out in the east direction it would help to connect the city and the functions located at the site and along the railway.

Image 123, Centralmarket halls and city's canal. Personal Archive 2017-09-10

Image 124, View from existing train station. Personal Archive 2017-09-10

2 Bus terminal Abrenes Street, Park Miera Darzs and concert venue "Sapnu fabrika"

Image 125, Birdview of the site no.2. Imagery ©2018 CNES / Airbus, Map data ©2018 Google.
I have adjusted colours and highlighted focus area.

This site is mainly residential and the built structure comes very close to the railway. There is the city's bus terminal Abrenes Street (Image 127) and concert venue "Sapņu fabrika". Shown here are several schools, a park with a church and a nice playground for children (Image 131). The railway is elevated on a berm which makes the site visually and spatially divided (Image 128). The railway can be crossed via 2 car-oriented tunnels and 1 pedestrian tunnel at the place where the railway comes down to the street level (Image 130). Despite the fact that the site is located very central, it is degraded both environmentally and socially with unsafe spots.

Image 126, Existing path along the railway. Field Study, 2017-08-10

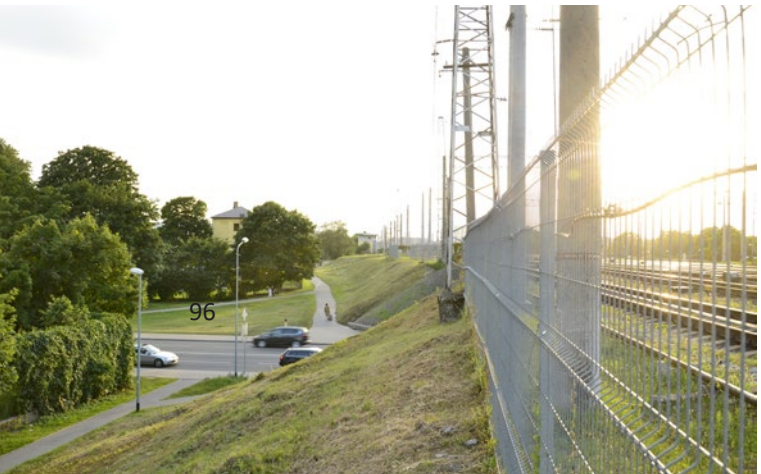


Image 127, Bus terminal with the bus stops. Field Study, 2017-08-10

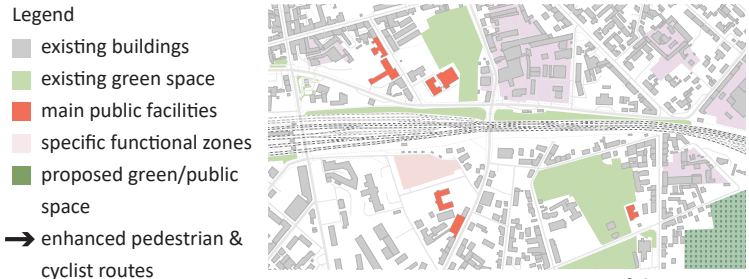


Image 128, Existing situation of the site no.2

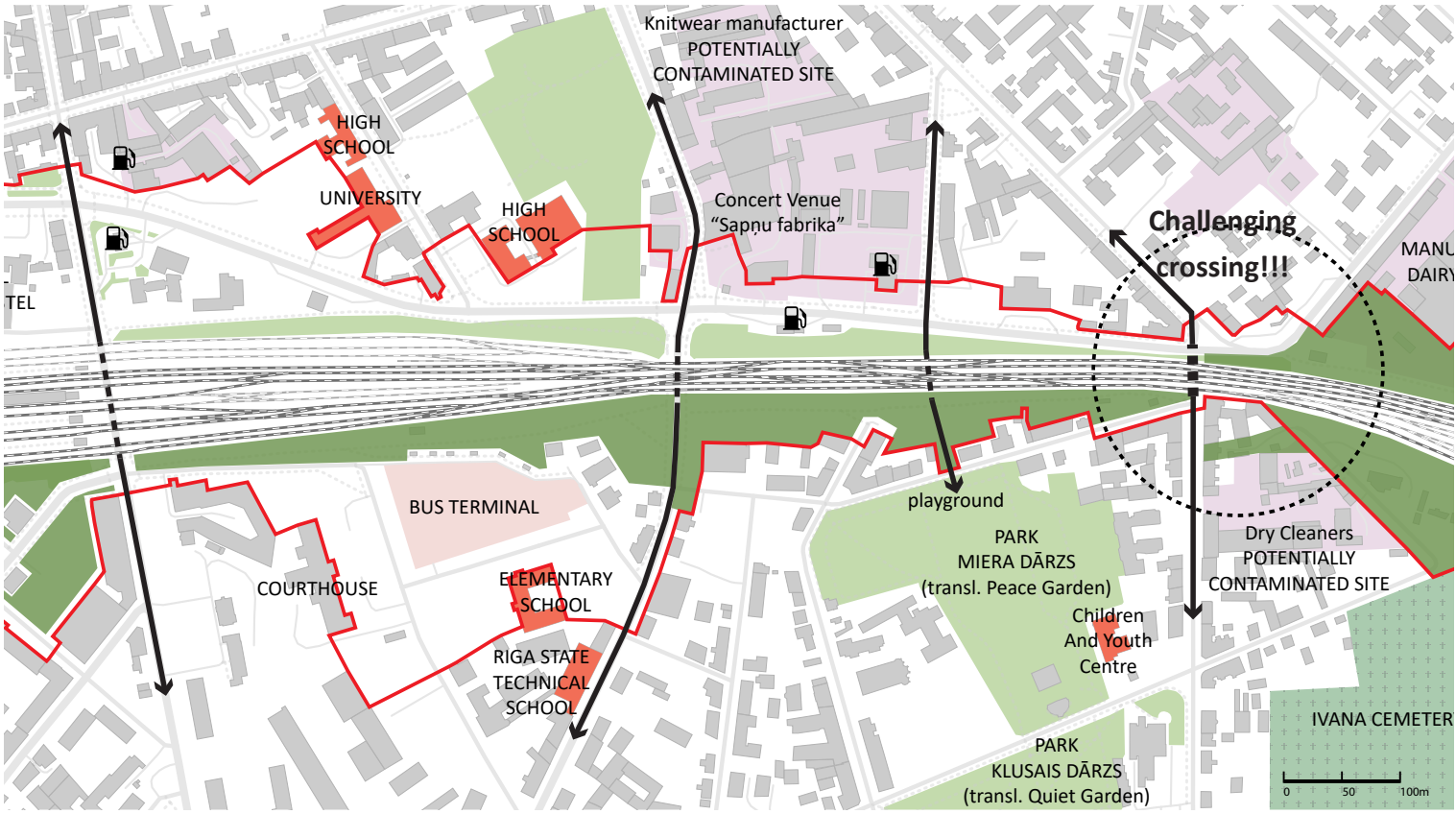


Image 129, Potentials of the site no.2. The maps 128-129 are based on (CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours of existing buildings, green areas, roads, railways and specific functional zones.
I have added a red line marking border of the proposal area, arrows, dark green areas , texts and the legend.

There are already pedestrian paths in existence along the railway (Image 128). However, the street crossings are unsafe. My proposal is to extend these paths, improve their qualities, enhance pedestrian and cyclist friendly railway crossings and make them more integrated with the local schools. The pedestrian tunnel at the east of the site is of very poor quality and inconvenience for cyclists. By redesigning this tunnel together with the spaces on both sides of the railway, the challenging crossing (Image 129) can become a small urban square that provides connection between the centre and developing neighbourhood named Maskavas Forstate.

Image 130, Pedestrian tunnel, Field Study, 2017-08-10

Image 131, Playground at Miera Darzs. Field Study, 2017-08-10

3 Railway station Vagonu Parks, Matisa cemetery and Ivana cemetery

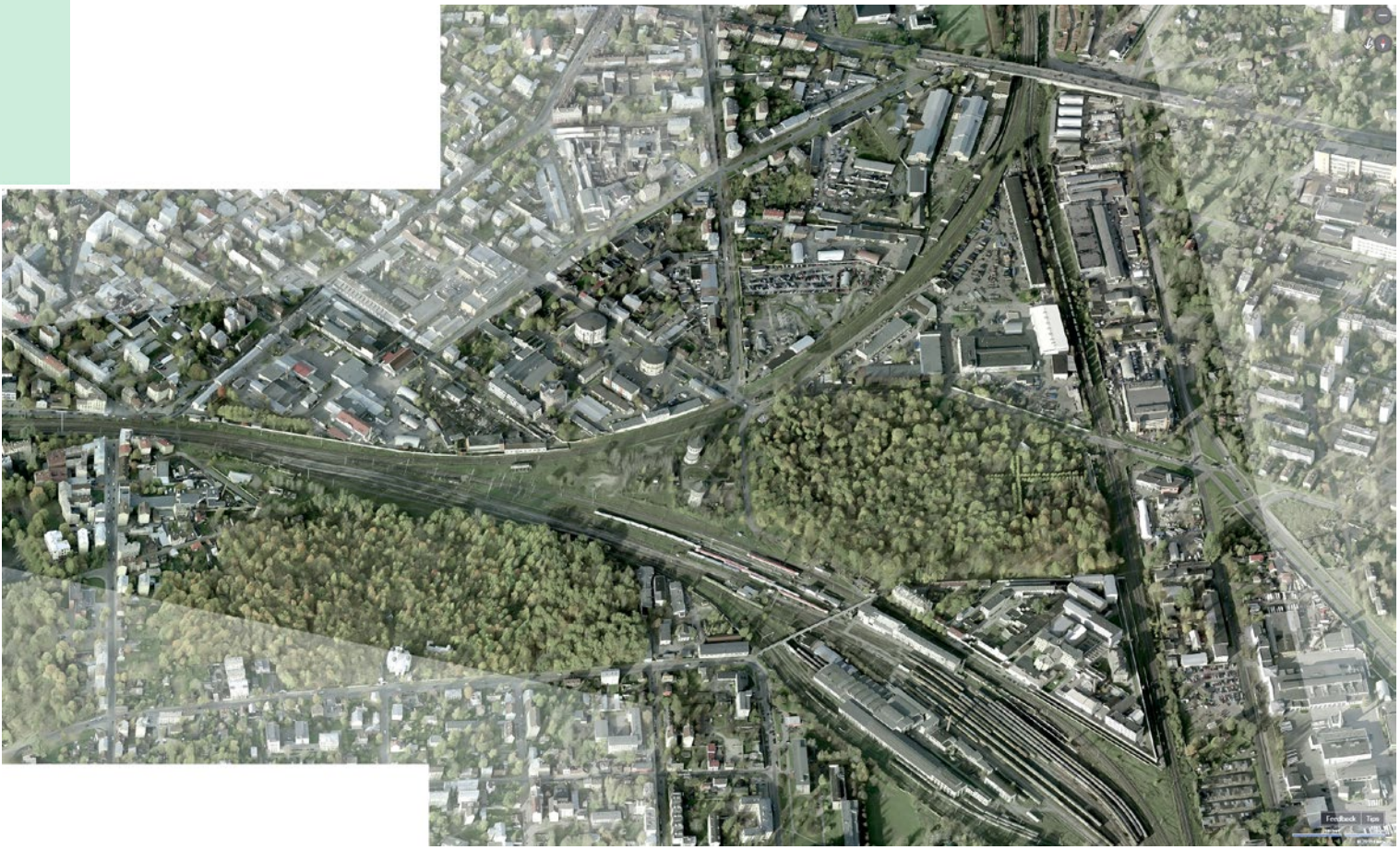


Image 132, Birdview of the site no.3. Imagery ©2018 CNES / Airbus, Map data ©2018 Google. I have adjusted colours and highlighted focus area.

Image 133, former factory and the Bridge of A.Deglava St. Field Study, 2017-08-10

Image 134, a view from the the water towers. Field Study, 2017-08-10

Image 135, pedestrian bridge next to the train station. Field Study, 2017-08-10

Image 136, train station Vagonu Parks. Field Study, 2017-08-10

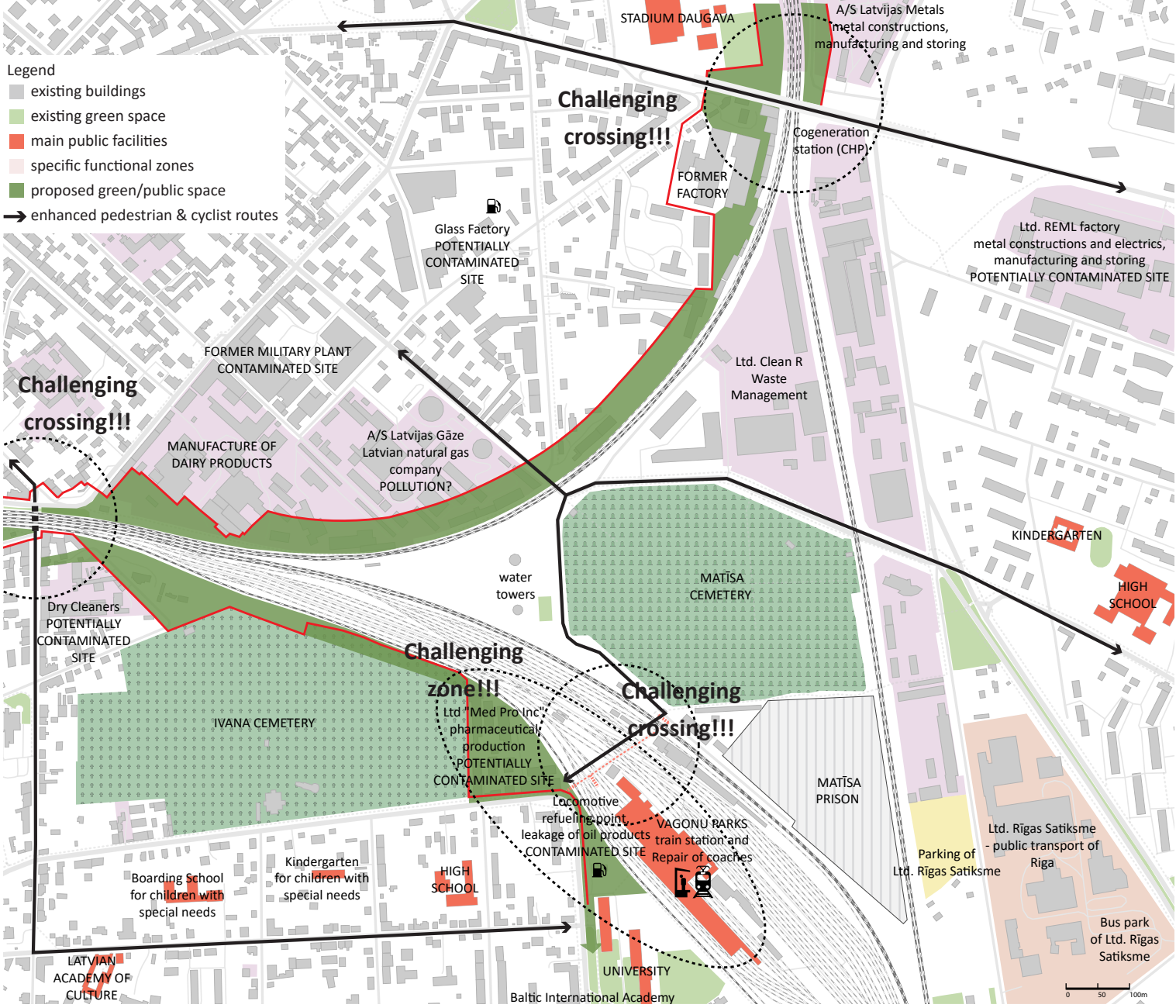


Image 137, Potentials of the site no.3

Site no. 3 is very mixed with different functions such as industrial areas, residential areas, two cemeteries, a train station, prison, and several educational facilities among others. It used to be quite an unsafe part of the city and still has some social issues. Regardless however, the station is currently commonly used by locals.

The site itself is very challenging but the first things that would help to make it safer and accessible would be to decrease the size of industrial areas and improve the railway crossings together with connections to educational facilities (Image 137). The zone next to the train station is polluted and could be remediated by use of plants that would give also some liveliness to the site. The former factory next to the stadium and the bridge in the north of the site has an interesting architecture and have the potential to be developed into something new that would help to generate the local life or maybe even become a well known spot in the city.

Image 138, Existing situation of the site no.3.
The maps 137-138 are based on
(CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours of existing buildings, green areas, roads, railways and specific functional zones.
I have added a red line marking border of the proposal area, arrows, dark green areas , texts and the legend.

4 Railway station Zemitani, Stadium Daugava and Grizinkalns Park

Image 139, Birdview of the site no.4. Imagery ©2018 CNES / Airbus, Map data ©2018 Google. I have adjusted colours and highlighted focus area.

At the Site no.4 two of the most densely populated neighbourhoods meet the city centre. The railway is located on a street level and crossed by 3 car-oriented bridges as well as 1 pedestrian bridge between the shopping mall on right side (Image 140) and the train station called Zemitāni on left (Image 141).

The site is rich with different functions (Image 148), besides the shopping mall and the train station; it has a popular historical park (Image 142), stadium Daugava, indoor skate hall, a library, museum and several schools and colleges. The site has large industrial areas especially on the suburb side and residential areas on the both sides. The main issues with the site are related to the railway crossings which are inconvenient for cyclists and pedestrians. In addition, due to the large industrial areas along the railway, the distances seems large.

The train station is commonly used by locals to go to the nearby towns as well as to the beaches. The station is close to the tram stop (Image 143) and other public transport connections. However, the station itself is hidden between the bridge and a poorly designed business district.

If we considered the distribution of the population, the existing functions of this site and amount of people that daily cross the railway through this site by public transport, bicycles, cars or even by foot on a daily basis, it is worth considering more radical solutions in the long run. By removing or decreasing the industrial areas, the reclaimed space could be used for new programs and densification to bring the both sides of the railway together. This is a suitable place to test the methods for mitigation of sounds and vibrations and remediation of soil by use of plants.

Image 140, shopping centre. Personal Archive, 2017-09-09


Image 141, existing train station Zemitani. Field Study, 2017-08-10

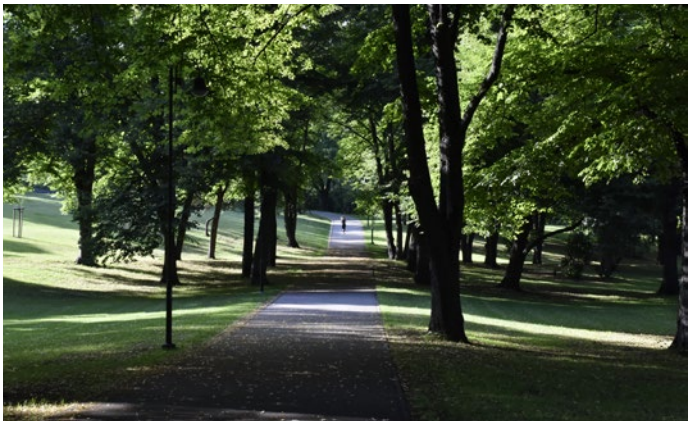


Image 142, historical park Grizinkalns, Field Study, 2017-07-27

Image 143, tram stop at Barona Street. Field Study, 2017-07-27

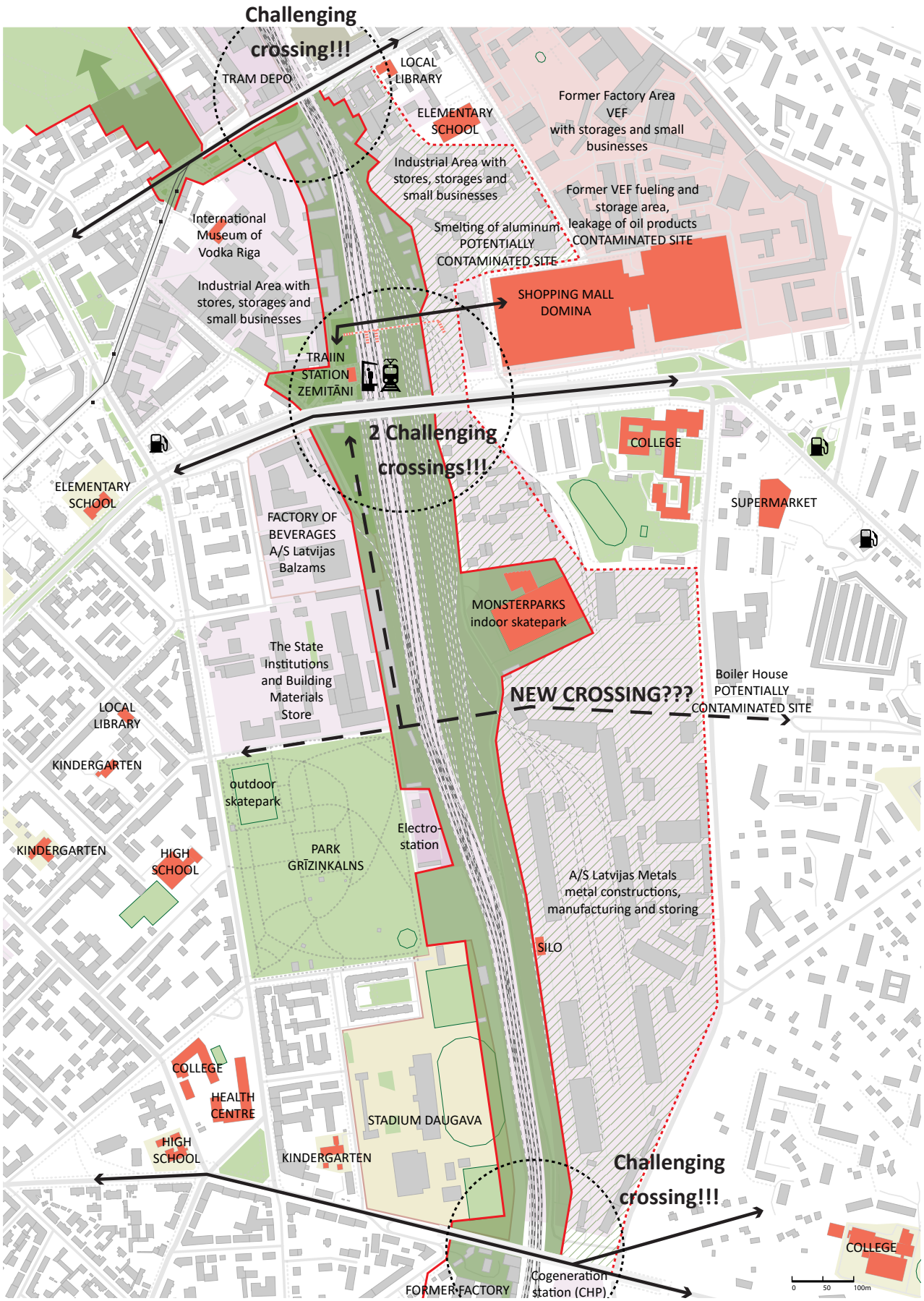


Image 144, Potentials of the site no.3. The maps 144 and 148 are based on (CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours of existing buildings, green areas, roads, railways and specific functional zones.
I have added a red line marking border of the proposal area, arrows, dark green areas , texts and the legend.

There are several options on how the railway placement can be solved in this case. One of them is to keep it on the street level as it is now (Image 145) but then there is need for significant improvements of the bridge designs to make them accessible and enjoyable for pedestrians and cyclists. With new programs, there might be a need for a new pedestrian and cyclist bridge from the historical park to the neighbourhood on the right side. Another option is to sink the railway and over-deck it (Image 146) which would help to deal with the noise pollution, allow closer

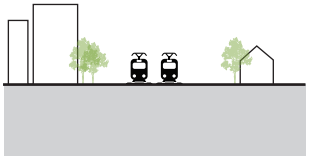


Image 145,
drafted by myself

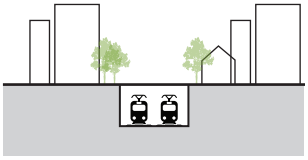


Image 146,
drafted by myself

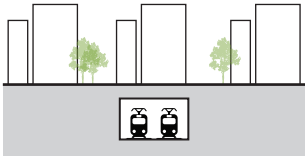


Image 147,
drafted by myself

builds to the railway which would solve the problem of connecting both sides. The solution is costly but the expenses can be covered by the development of the newly gained land. The third solution is to put the railway completely underground (Image 147) which is the most expensive solution. It does however, give even more free land for new possible developments.

If the population of the city starts to significantly increase, the last two options are worth considering as it would give an opportunity to develop large new mixed use area right next to the centre as well as good public transport connections and the train station.

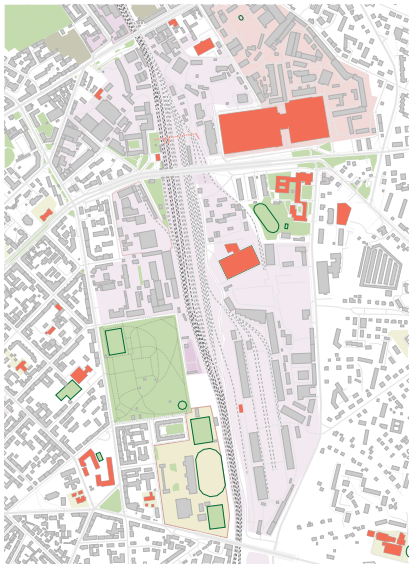


Image 148, Existing situation of the site no.3

Legend
- existing buildings
- existing green space
- main public facilities
- specific functional zones
- proposed green/public space
- → enhanced pedestrian & cyclist routes

Image 149, Existing train station. Field Study, 2017-08-10

Image 150, Silo Field Study, 2017-08-10

Image 151, Exit to the bridge next to the existing train station. Field Study, 2017-08-10

Image 152, Unused rails along the stadium. Field Study, 2017-07-27

5 Rigas Vagonbues Rupnica (RVR) - machine-building plant and tram depo

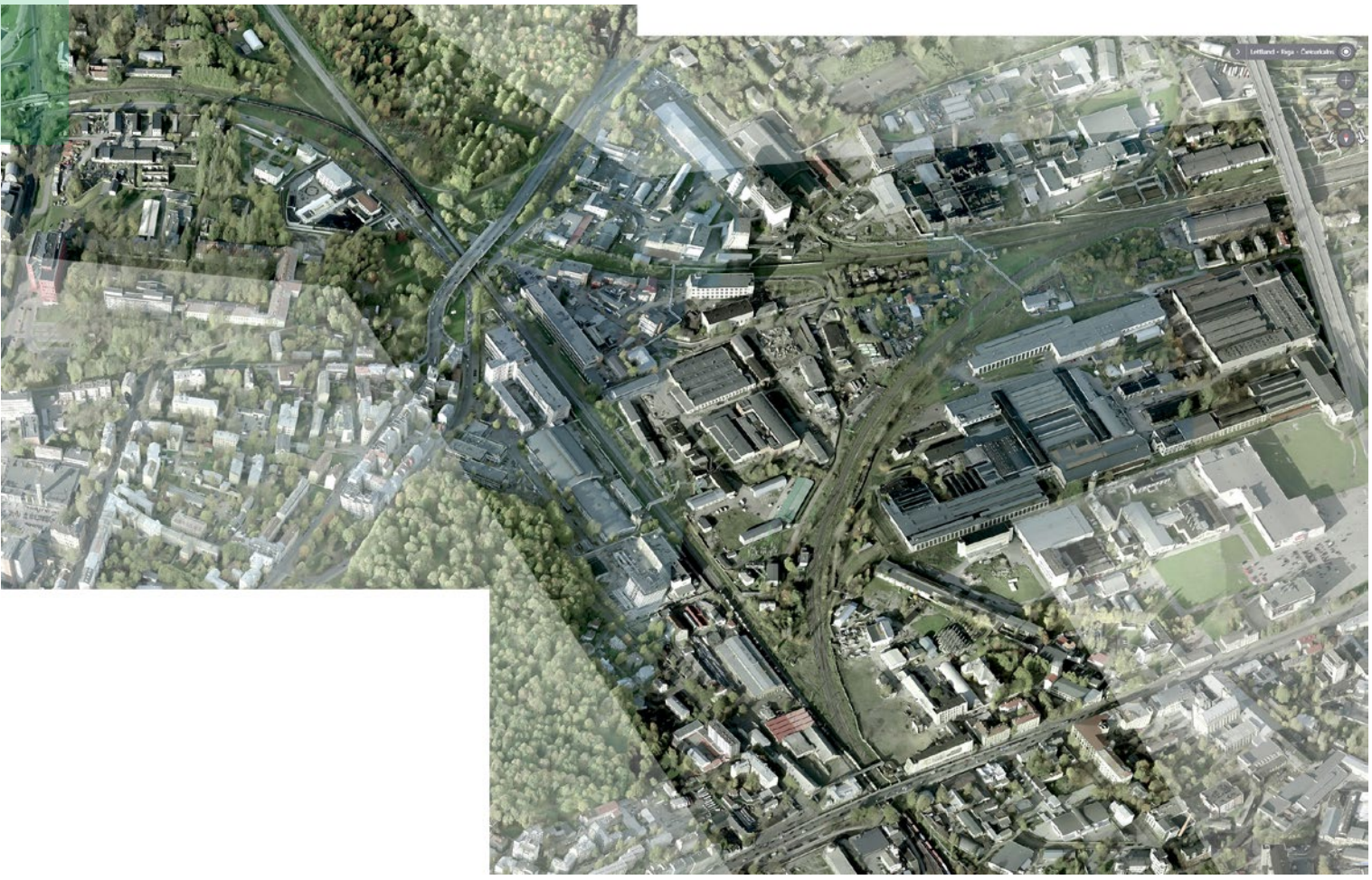


Image 153, Birdview of the site no.5. Imagery ©2018 CNES / Airbus, Map data ©2018 Google.
I have adjusted colours and highlighted focus area.

Image 154, tram depot. Field Study, 2017-07-27

Image 155. Field Study, 2017-07-27

Image 156, abandoned building. Personal Archive, 2014

Image 157. Field Study, 2017-08-29

Image 158. Field Study, 2017-08-29

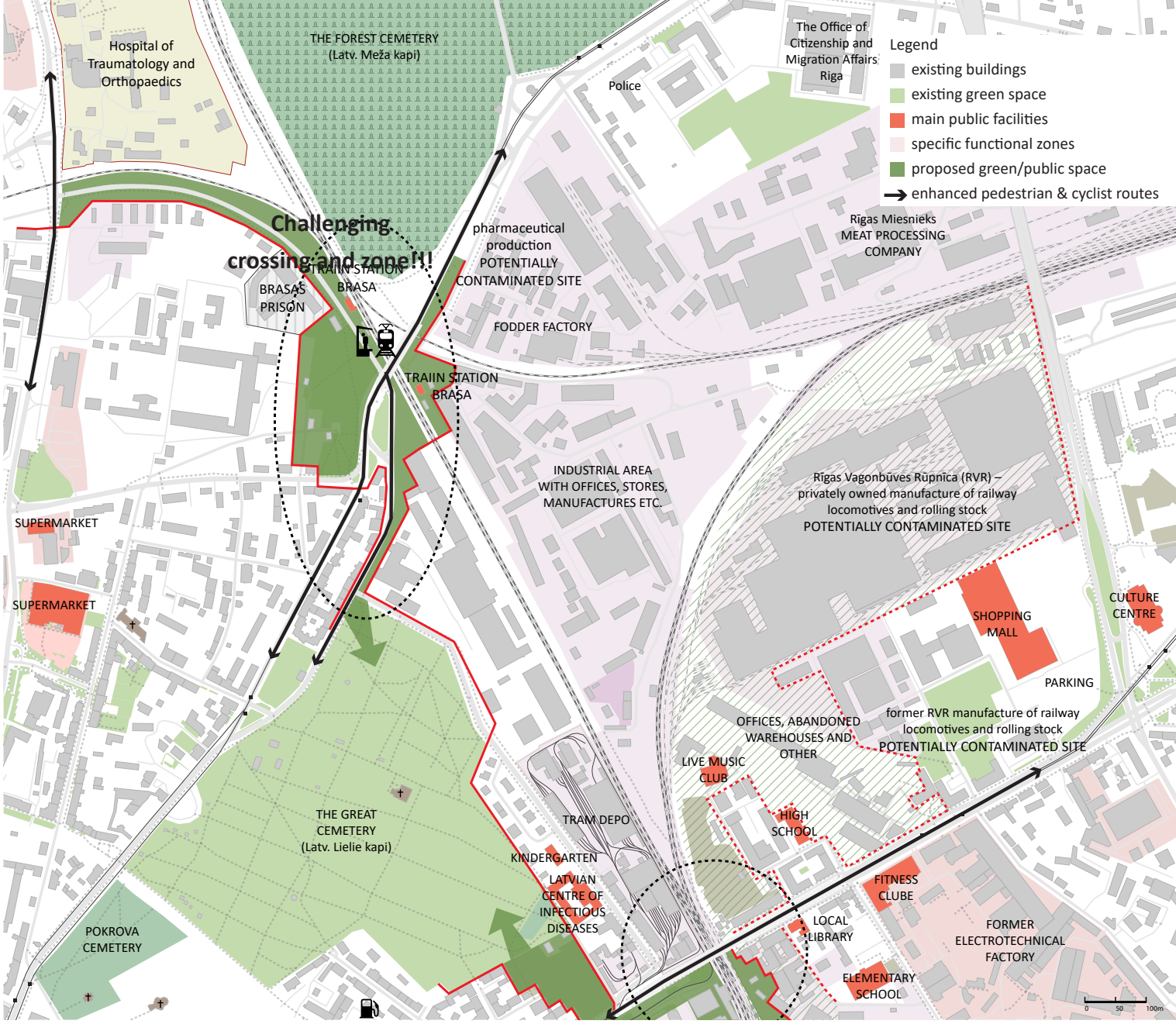


Image 159, Potentials of the site no.5

Site no. 5, similar to site no.3 is an intersection point of several railways, surrounded by cemeteries from which one has been turned into a park. Most of the land is still industrial and there are many abandoned former factory buildings. According to the municipality's research document about the city's brownfields *(Degradēto teritoriju.., 2004, p.48)*, the site officially has 41ha of brownfields at the place of the former machine-building plant.

The revitalisation of this site could be even more challenging that of site no.3 because of the fragmented property ownership. However, similar as with previous cases, improvements of the bridges, decrease of the size of industrial areas and soil remediation would help to make the areas more accessible for pedestrians and cyclists. Many of the former factory buildings have an interesting architecture. The industrial character of the site could be an appealing quality to attract creative industries which could help open-up the site for public and add more vibrant life to the area.

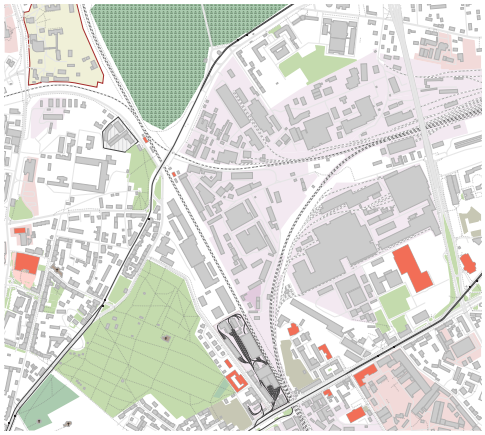


Image 160, Existing situation of the site no.5.
The maps 159-160 are based on (CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours of existing buildings, green areas, roads, railways and specific functional zones.
I have added a red line marking border of the proposal area, arrows, dark green areas, texts and the legend.

6 Skanste and Rigas preču stacija

Image 161, Birdview of the site no.6.
Imagery ©2018 CNES / Airbus,
Map data ©2018 Google.
I have adjusted colours and highlighted focus area.

This site is partly industrial and partly covered with the city's wastelands or so called meadows. Currently, there are very few residential buildings but according to the municipality's plans, in future this place will become a part of a large scale new mixed-use district (Image 166) with a new tram line, train station and a Contemporary Art Museum further down to the south, closer to Old Town. According to the plans, the site will be developed by 2030.

The municipality's plans match with my strategy with only slight differences. The main difference is that as municipality's plans do not include the whole railway loop, their plans do not include green public space along the railway with noise mitigation solutions despite the fact that there has been noise pollution predicted in the area.

Image 162, existing high-rises. Field Study, 2017-08-29

Image 163, existing office building. Field Study, 2017-08-29

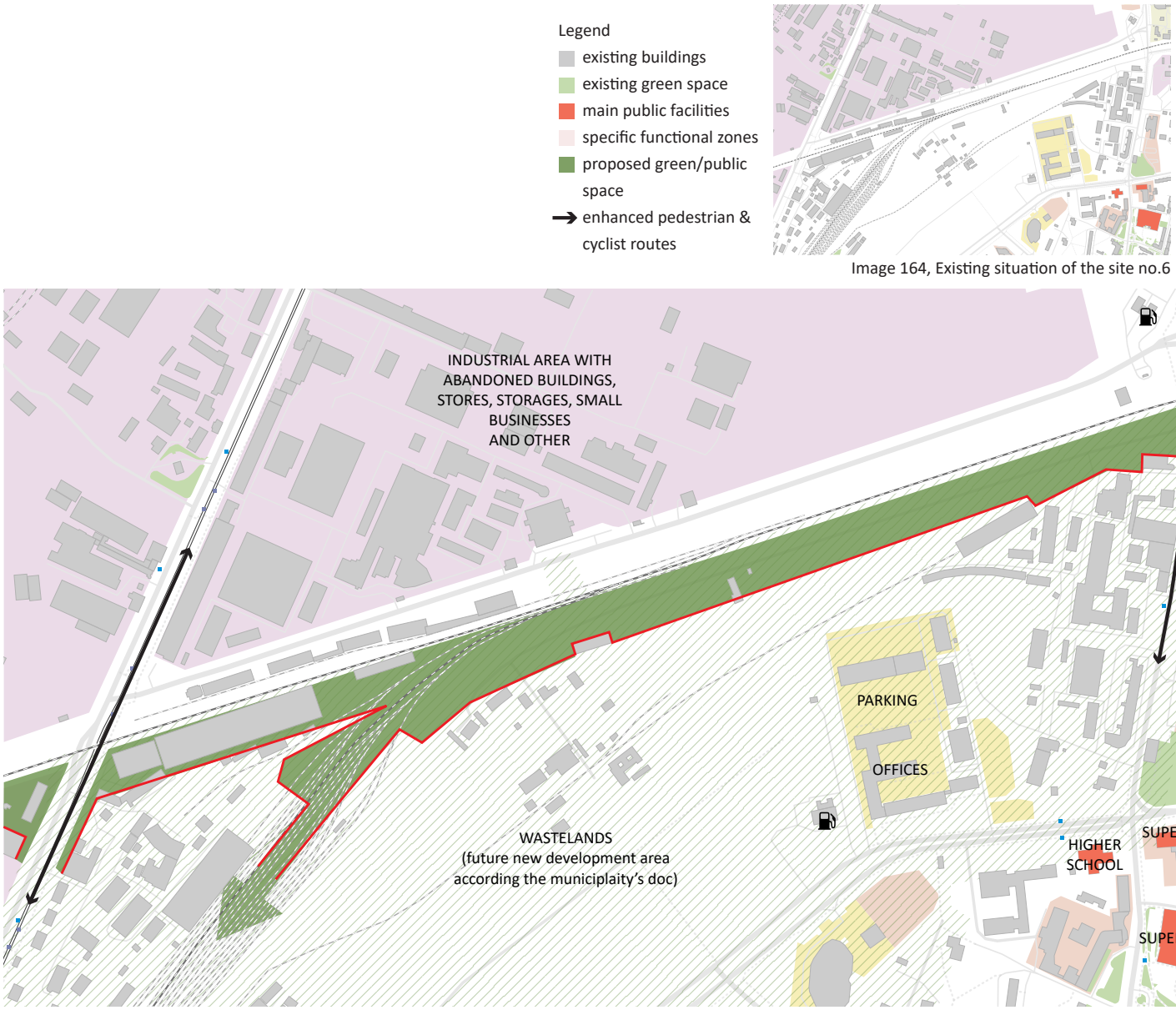


Image 164, Existing situation of the site no.6

Image 165, Potentials of the site no.6. The maps 164 and 165 are based on (CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours of existing buildings, green areas, roads, railways and specific functional zones.
I have added a red line marking border of the proposal area, arrows, dark green areas , texts and the legend.

My vision is to create at least 50m wide activity park South from the railway and connect it with the green areas that the municipality of Riga has planned in the new mixed-use development plan (Image 166). The activity park would provide a minimum safety zone from the railway, would protect from noise pollution and provide a space for a pedestrian and bicycle path. It would connect the new developed district with the other parts of the city and would be a safe place where people can move faster by bicycles.

Image 166, SKANSTE_aeroskats_2karta, Riga City Council, The City Development Dep. (2014)

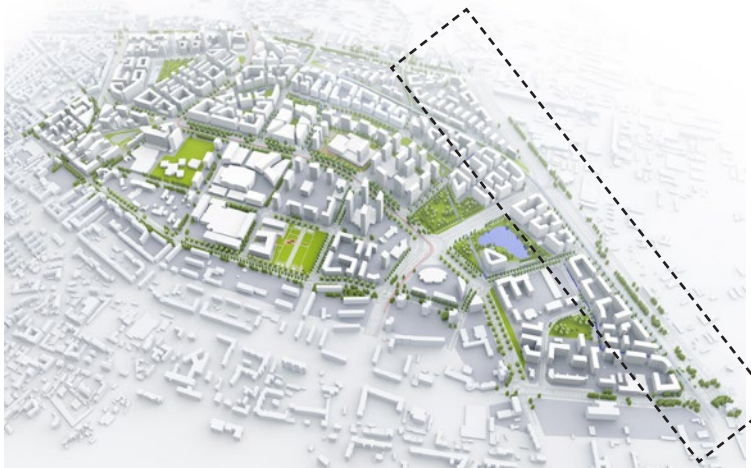


Image 167. Field Study, 2017-08-29

7 Andrejsala – former harbour area and Petersala

Image 168, Birdview of the site no.7. Imagery ©2018 CNES / Airbus, Map data ©2018 Google.
I have adjusted colours and highlighted focus area.

Image 169, Existing situation of the site no.7
The maps 169 and 170 are based on
(CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours of existing buildings,
green areas, roads, railways
and specific functional zones.
I have added a red line marking border of the
proposal area, arrows, dark green areas , texts
and the legend.

A large part of site no.7 has historically been a harbour, the northern part of it is still used for harbour needs but according to the municipality's documents, all the industry will be removed by 2030. Until then, while the railway is still in use, my strategy offers to develop the green public space along the railway on the east side which later would complement the new local plan and help to establish connections between both of the sides.

Image 170, Potentials of the site no.6.

8 Riga Passenger Port and waterfront along the Old Town

Image 171, Existing situation of the site no.8

Legend
- existing buildings
- existing green space
- main public facilities
- specific functional zones
- proposed green/public space
- enhanced pedestrian & cyclist routes

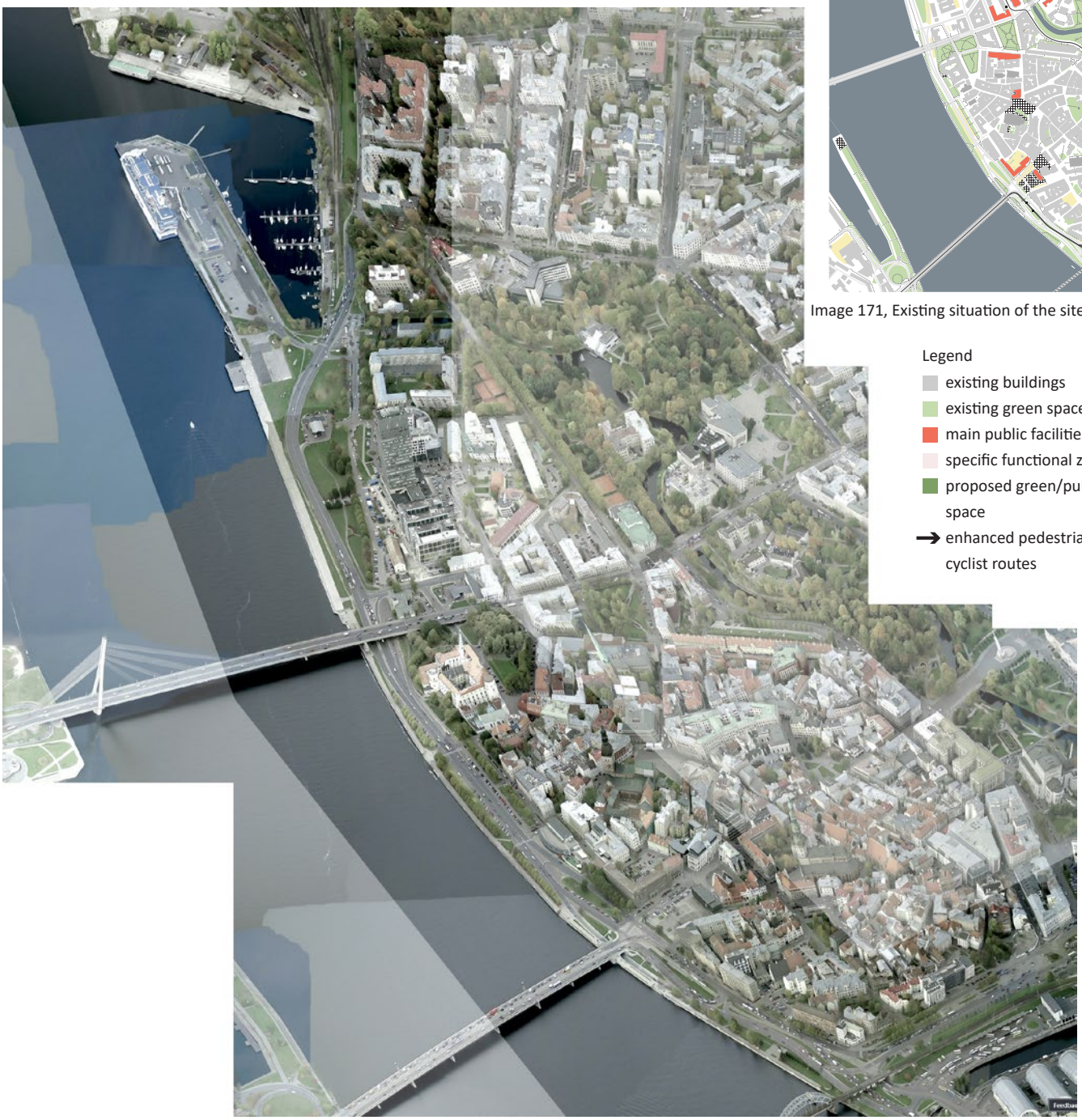


Image 172, Birdview of the site no.8. Imagery ©2018 CNES / Airbus, Map data ©2018 Google.
I have adjusted colours and highlighted focus area.

Site no.8 works in close relation with the Old Town and Riga Passenger Port. The passenger port is used by several ferry lines and brings tourists to the city on daily basis. The port is located very close to the Old Town, which very often is the main destination for the visitors of the city yet the route towards the old town is not very convenient at the moment. Another problem is that the Old Town is separated from the waterfront by a magistral street. My strategy is to connect the spaces with increased public green space and decrease the size of magistral roads with the intention to decrease the amount of actual road usage.

Image 173, Potentials of the site no.8.

The maps 171 and 173 are based on (CC BY-SA)©OpenStreetMap contributors. I have highlighted colours of existing buildings, green areas, roads, railways and specific functional zones. I have added a red line marking border of the proposal area, arrows, dark green areas , texts and the legend.

5.1.1. Future development possibilities

The 8 different sites are united by the railway except site no.8 but they differ in their character. Future development of these sites are very related to their current characters and programs such as, firstly, the train stations that can open possibilities for transit-oriented developments, then landscape specifics as is the case of site no.7 and 8 where the waterfront will have a huge impact on their future developments, also big shopping malls, stadiums or other public facilities which affect the potentials of the sites.

Image 174 represents a map with key possibilities for each site; they can be used as driving forces to activate the sites. For example, site no.1 is clearly the main transit hub of the city while site no.4 is rich with many different functions which can be extended even more. In addition, the site has the potential to become a hub of physical activities and alternative transit to mention a few.

With enhancing the existing programs and adding new, each of the sites can become an active and integrated part of the city. To illustarate some of the possible activities and their potential in their diversity I have chosen 13 different examples (Images 175-195) however those are just a few, the opportunities can be much greater.

Image 174, Key possibilities. (CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours and railways. I have added the black squares, numbers and text.

Image 175, Skateboard (..), CC

Image 178, Ice Skates (2011), CC

Image 176, calle-festivales (..) (2016), CC

Image 177, 3-4-Prinzessinnengart-Claudia(..)(2013), CC

Image 179, Berlin Prinzessinnengarten (2014), CC

Image 180, Climber, CC

Image 181, Play table tennis in the park (2013), CC

Image 182, Ice Skating Rink (..) (2016), CC

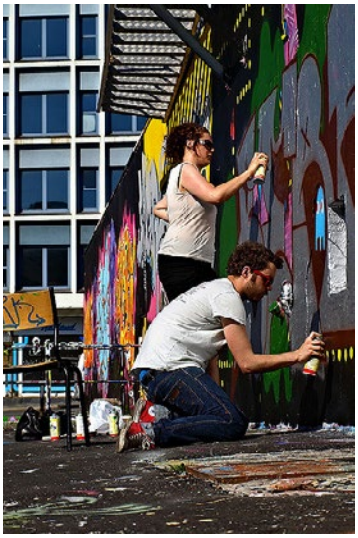
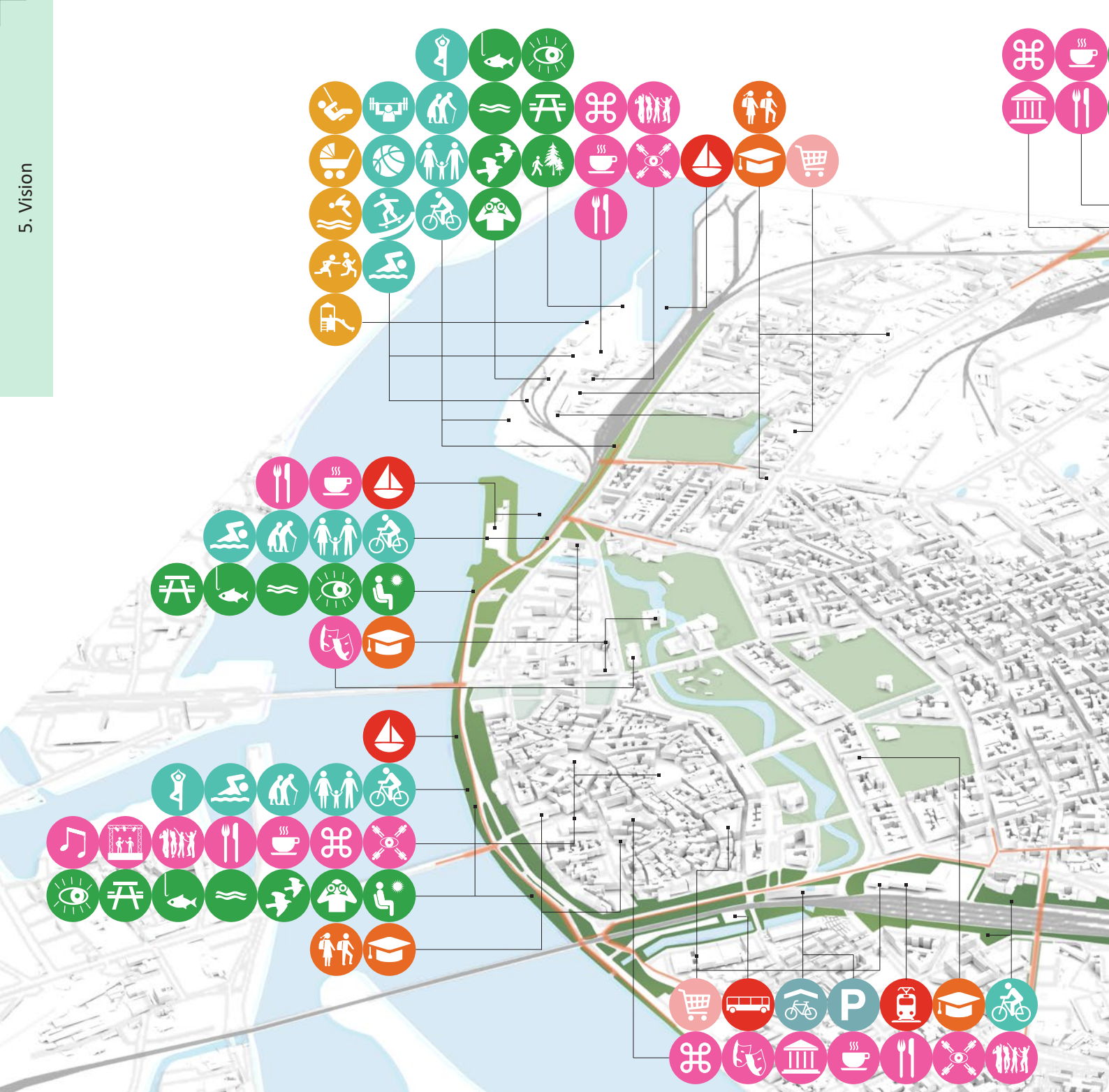


Image 185, Graffiti Artists (2009), CC

Image 183, Westpark (München) (..) (2011), CC

Image 184, Islandsbrygge waterfront (2008), CC

Image 175 - Skateboard-Bowl-Skatepark-Handplant-Layback-Pool-1674624
Author unknown, Public Domain Max Pixel, Creative commons licence: (CC0 1.0)
Image 176 - calle-festivales/grupo-el-tiempo-libre-la-gente-la-recreacion-mujer-concierto-festival-diversion (2016). Author unknown, Public Domain Pixnio.
Image 177 - 3-4-Prinzessinnengart-Claudia Tribin (2013). Photo by Claudia Tribin. Creative commons licence: (CC BY-SA 3.0)
Image 178 - Ice Skates (6625045137) (2011). Photo by Benson Kua. Public Domain Flicker. Creative commons licence: (CC BY-SA 2.0)
Image 179 - Berlin Prinzessinnengarten, 14304565042_1ed72195de_z.jpg (2014). Photo by Erik Borälv. Public Domain Flicker. Creative commons licence: (CC BY 2.0)
Image 180 - climber_climbing_wall_arm_strength_arm_stroke_climb_climbing_rope_climbing_shoes_rope-928462.jpg Author unknown, Public Domain Pixnio. Public Domain Pxhere. Creative commons licence: CC0
Image 181 - Play table tennis in the park (2013). Photo by llee_wu. Public Domain Flicker. Creative commons licence: (CC BY-ND 2.0)
Image 182 - Ice Skating Rink at Winter Wonderland, Hyde Park, London. 5229895_7c5f18ae.jpg (2016).
Photo by Christine Matthews. Public Domain. Creative commons licence: (CC BY-SA 2.0)
Image 183 - Westpark (München) - Yoga-Übungen 3 cropped (2011). Photo by Maximilian Dörrbecker (Chumwa). Creative commons licence: (CC BY-SA 2.5)
Image 184 - Islandsbrygge waterfront (2008). Photo by Jacob Friis Saxberg. Public Domain. Creative commons licence: (CC BY 2.0)
Image 185 - Graffiti Artists (2009). Photo by Anne Worner. Public Domain Flicker. Creative commons licence: (CC BY-SA 2.0)



6.2. Vision - New Activity Park

My proposal is to revitalise the areas along the railway by creating new activity park with pedestrian paths, bicycle routes, running tracks, playgrounds, sport fields, public art, temporary and permanent galleries, food places, picnic and local event places, urban gardens, open spaces and small urban forest areas, drop-off places, bicycle parking and many other places with varying functions and activities that is needed for citizens of Riga to achieve better living standards. The park shall be integrated within the city's existing green structure as well as the current and future planned bicycle routes. It would give an opportunity for mitigation of pollution, improved connections between the both sides and densification along the railway loop.

Image 186, Vision, designed and drafted by myself and based on my findings

5.3. Catalysts for Change

The New Activity Park is the end product of the strategy for revitalisation that can be reached in years or even decades but to begin, there is a need for some driving forces. What would be the reason to start using these areas? Who is the target audience? How can we get people to use the areas along the railway?

As stated in the concept, one of the first steps is to connect the places and make them accessible but even with that, it is important to get attention from the society. Considering all the research presented before, I am offering 3 driving forces to get the first users of the areas:

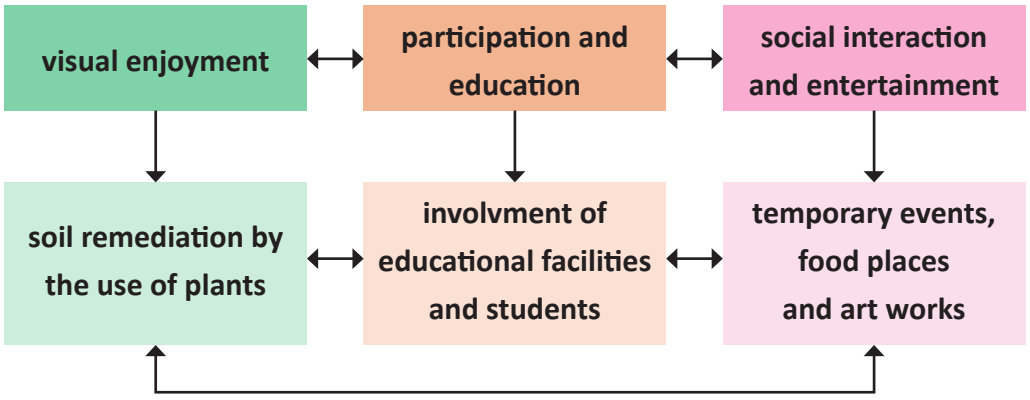


Image 187, Driving forces.
Diagram drafted by myself and based on my findings.

Firstly, as soil remediation is a very long process, it must be started at early stages. Additionally, it adds visual value of the space.

Secondly, as there are quite many educational facilities along the railway loop, children and students can be the first target audience. By involving schools and universities, young people can get educated about soil remediation processes and environmental questions in general; they can test their questions and ideas. Youngsters are also more interested in urban sports and cycling that can help to activate these areas.

Thirdly, type of gentrification could be encouraged to bring about diversity and creative, communal use of these areas. Temporary events may show up outdoors as well as indoors in form of concerts, exhibitions, festivals, markets, installations, bicycle repair places, food tracks etc.

These urban life generators are not attached to specific places whereas some of the existing programs are attached to specific places and have a great potential to become the key areas for the development.

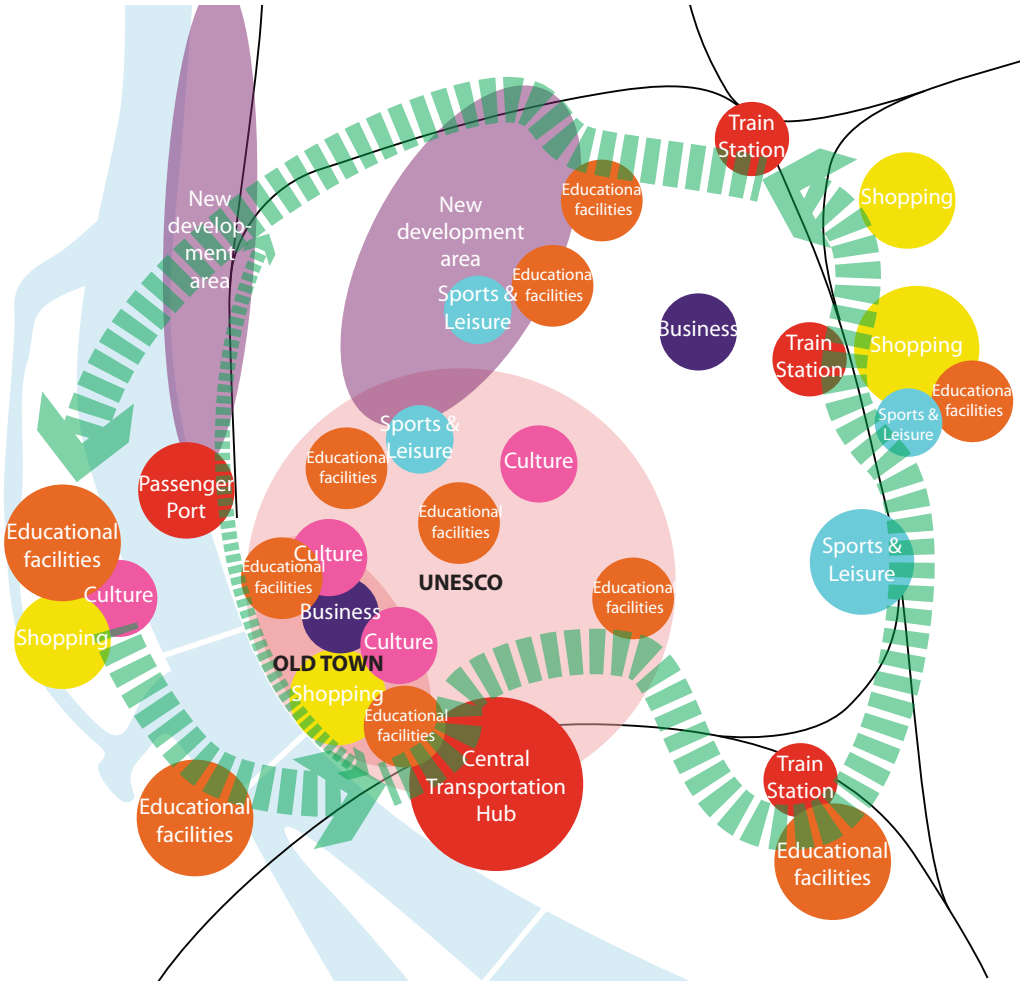


Image 188, Existing functions connected by the New Activity Park.
Illustration designed and drafted by myself and based on my findings.

There are several strong nodes (Image 188) along the railway loop that can be and used as urban life generators (Image 189). Undoubtedly the strongest hub is the Central Train Station with the Bus Station but there are several other spots with a great potential to be the key areas for the development, for example:

- Train station Vagonu parks - the place is already rather active, it is next to public transport stops and close to several educational facilities in the area;
- Stadium Daugava - currently a very introvert area, fenced and inaccessible, used only during the events in the stadium but could become much more open and active;
- Train station Zemitāni with the shopping mall and indoor skate park - rather active area with a great potential to become an important new hub in the city however, it is currently very traffic oriented with poor infrastructure for pedestrians and cyclists;
- Train station Brasa - not as active as the other two train stations but with improved accessibility and environmental quality, certainly has some potentials;
- Former harbour area Andrejsala;
- Passenger Port and many others.

urban life generators

Image 189, Urban life generators
Imagery ©2018 CNES / Airbus, Map data ©2018 Google
I have turned down colours and added yellow highlights marking the proposed route and urban life generators, I have also added text boxes and texts.


TRAIN STATION BRASA
SHOPPING MALL DOMINA
TRAIN STATION ZEMITANI
EDUCATIONAL FACILITIES
INDOOR SKATEPARK
STADIUM
OF NATIONAL IMPORTANCE
DAUGAVA
TRAIN STATION DEPO
AND EDUCATIONAL FACILITIES
EDUCATIONAL FACILITIES

5.4. Design Principles

The key areas or urban life generators have some privileges to get people to go there however, it does not exclude a need for certain qualities to make the places enjoyable.

The railway loop is approximately 15 km long and there is no need for united character along these 15 km; on the contrary, I believe quite the opposite. The way along the railway should be characterised by its diversity. However there are several principles that should be followed through the whole area and also the city to create good environment for people who add value, not only to the environment, but also to businesses, offices, schools and other areas. According to Jan Gehl publications, these are the key words for a good environment for people (Image 190):

Image 190, Key words for public spaces, pedestrian environment. Diagram drafted by myself and based on the Jan Gehl recommendations (GEHL-Architects, 2014, p. 27)

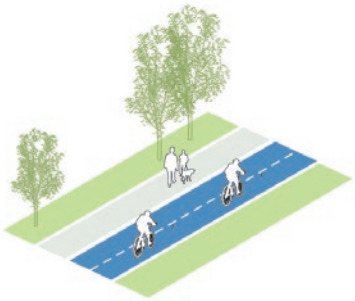
These key words give an abstract idea on how cities should be planned but unfortunately, does not give specific solutions on how to reach it. The aim of design principles, that I have based on Jan Gehl guidelines *(Gehl J., 2014, p. 27)*, is to give more specific set of tools that are adjusted to the specifics of the city, its climate and culture.

The design principles come hand in hand with a search for identity that is specific to the city and culture. Identity-creating elements can take a form of site furniture, lighting, way-finding signs and other. They are repetitive and follow throughout the entire park to create united pattern of details that help to hold together the diversity of the new programs and spaces.

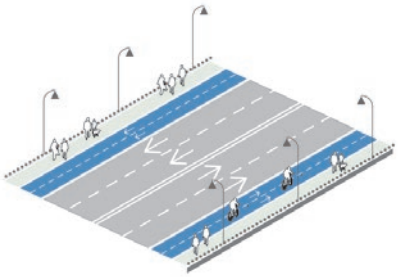
In the following pages I will give a toolbox of design principles (Image group 191) that could be used to design my new proposed activity park. I will test some of them together with noise mitigation tools in four diffrent areas in a form of principal diagrams (Images 202, 205, 208, 211).

Image group 191, Design principles. Designed and drafted by myself,
based on my findings and Jan Gehl recommendations ((GEHL-Architects, 2014, p. 27)

separated bicycle and pedestrian paths enhanced by material, colour and withzone of greenery in-between



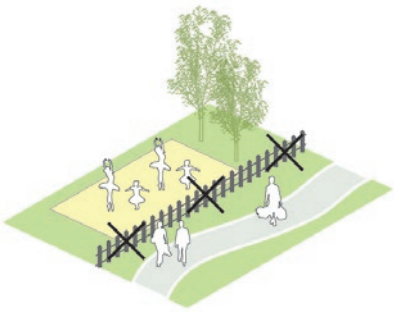
separated bicycle and pedestrian paths in limited spaces enhanced by material, colour and level difference



safe bicycle and pedestrian paths on the bridges separated from motorised traffic by material, colour and level difference

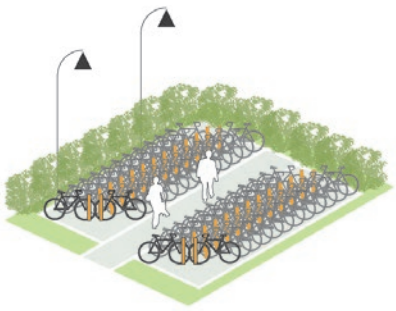
safe bicycle and pedestrian street crossings enhanced by colour and street lights

environment accessibility; smart design of level diffrences



avoid fencing as much as possible, increased transparency

benches in the sun and in shadow facing enjoyable views facing mainly South and West, also East; good lighting in the dark hours



compact bicycle parking; large parking places next to activity hubs and small parking spots placed next to benches

playgrounds, sport fields and other amenities connected to bicycle and pedestrian paths; open enough to get a breeze of wind; trees for shadow

Principal diagram with design example No.1

Abandoned former factory complex; could be cleaned-up and turned into culture centre with a flexible outdoor space. The small buildings are suitable for artist and other workshops, small stores etc. As the space is quite limited the noise mitigation can be done with dense vegetation and a noise wall.

Image 192, Location.
(CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours and railways and
I have added the black and red dots
for stations and text.

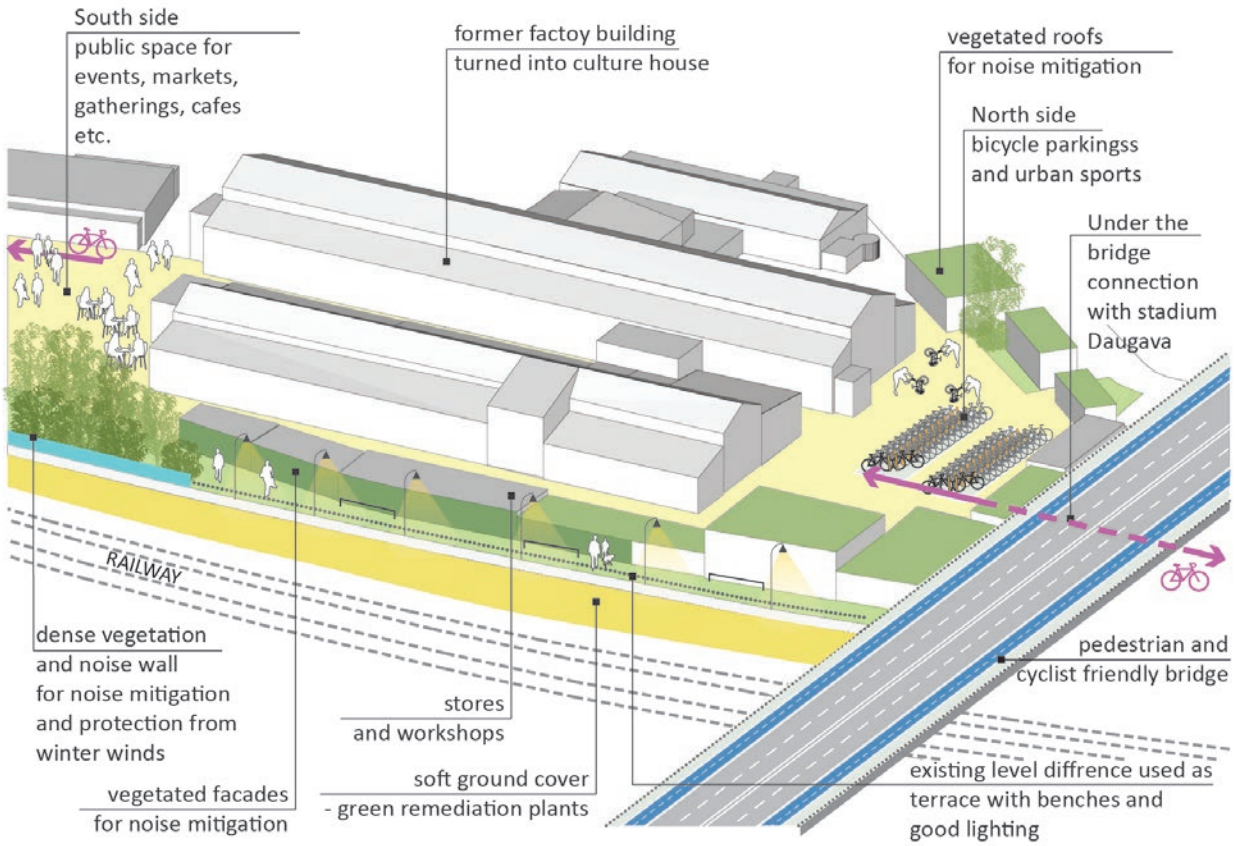


Image 193. Illustration designed and drafted by myself.

Principal diagram with design example No.2

Mixed use area with stores and small businesses; could be cleaned-up and turned into courtyard-type public space. As the space is quite limited the noise mitigation can be done with dense vegetation and a noise wall. The bridge is too narrow for trams, cars, bicycle and pedestrian paths. Therefore it could be made wider by additional constructions on the sides.

Image 194, Location.
(CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours and railways and
I have added the black and red dots
for stations and text.

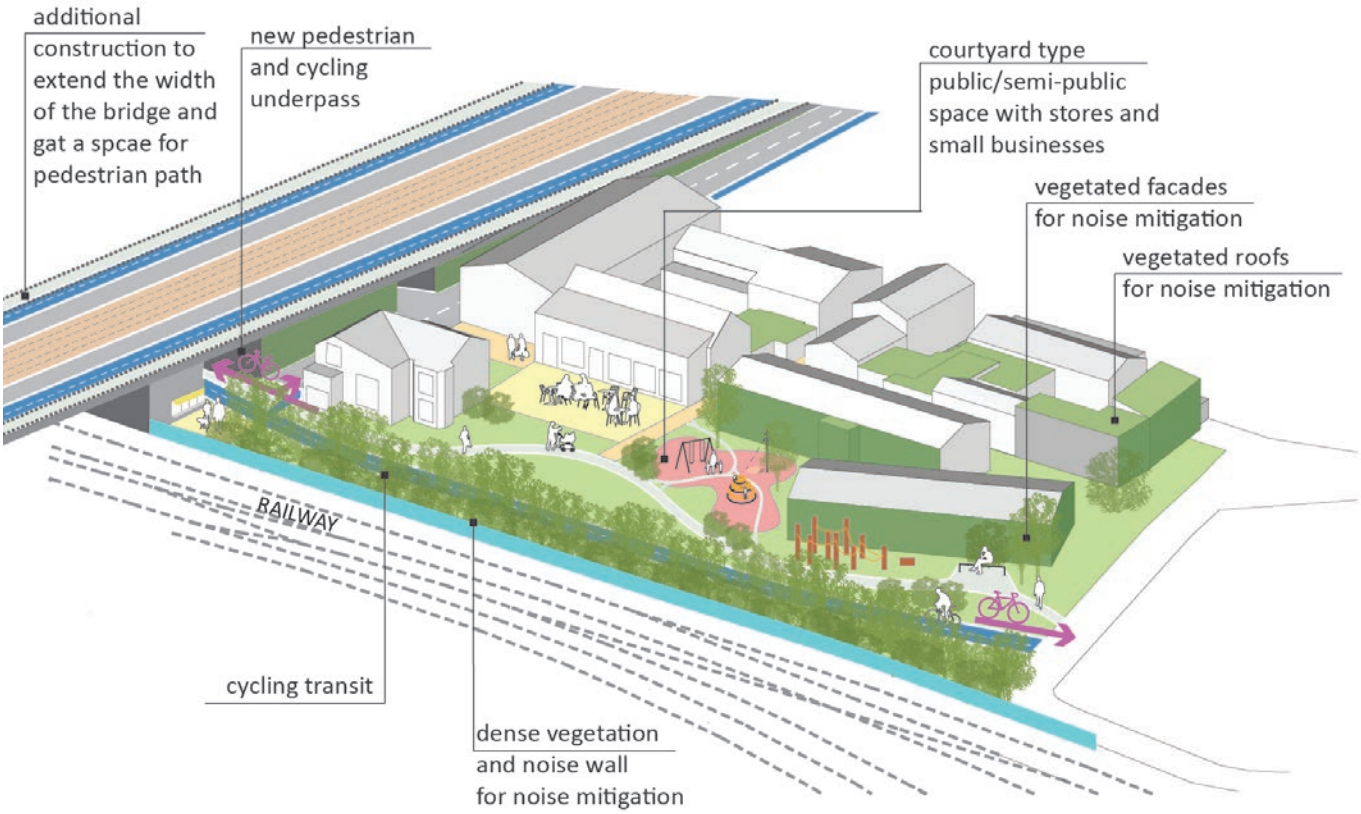


Image 195. Illustration designed and drafted by myself.

Principal diagram with design example No.3

Existing pedestrian underpass surrounded by buildings built in the beginning of the 19th century. The underpass can be improved and made accessible for bicyclists, wheelchairs and prams, and by making it more opened; the lighting and safety can be improved. Noise mitigation by noise wall as the space is very limited. New urban square to activate the spot.

Image 196, Location.
(CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours and railways and
I have added the black and red dots
for stations and text.

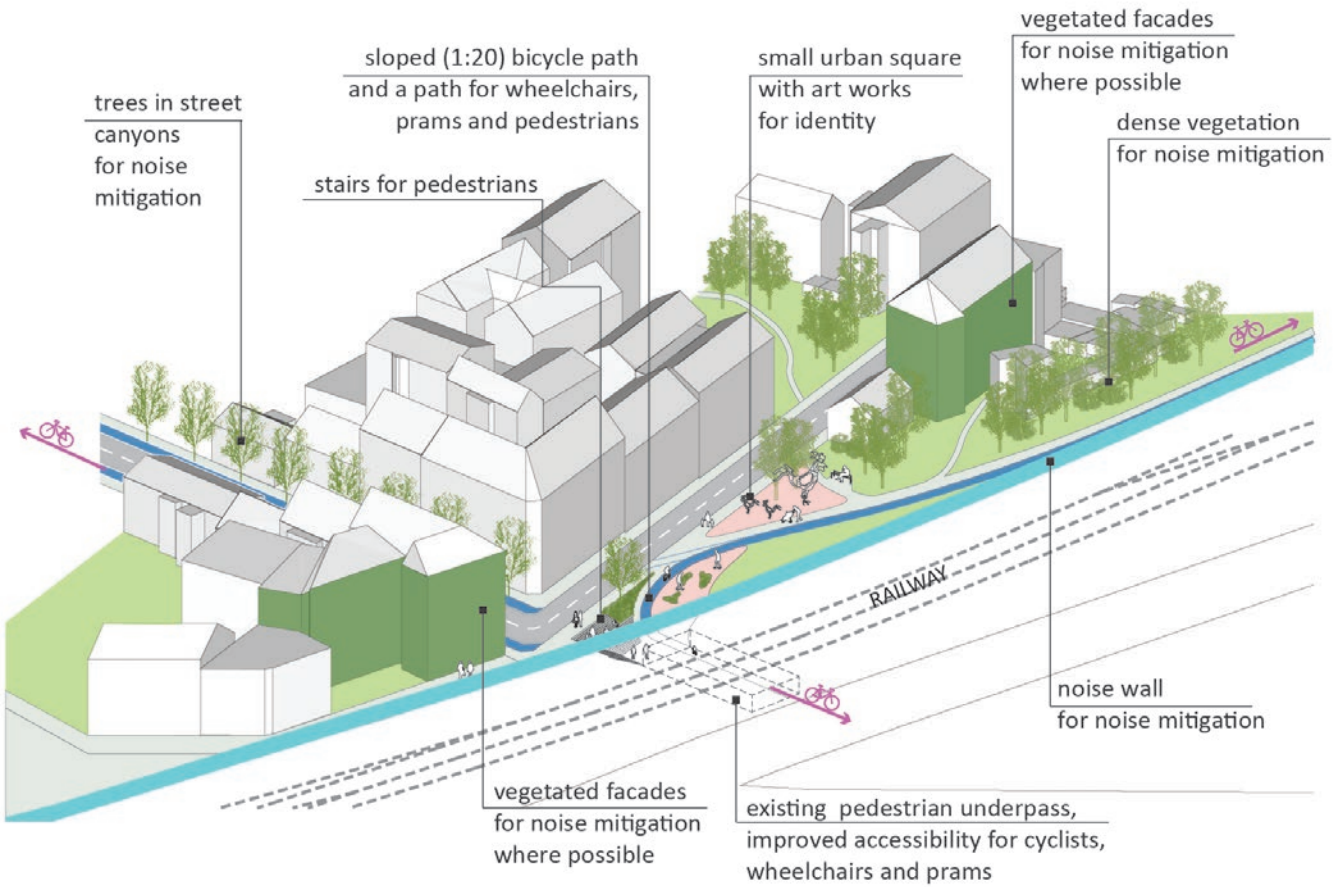


Image 197. Illustration designed and drafted by myself.

Principal diagram with design example No.4

Future developments of large open spaces. For example, at the place of “Latvia’s Metals” storages. The place along the railway could be developed into a multifunctional activity park with a fast bicycle route, sport fields, picnic and bbq places and others. As the space is relatively wide, the noise mitigation can be done with vegetated earthen berm.

Image 198, Location.
(CC BY-SA)©OpenStreetMap contributors.
I have highlighted colours and railways and
I have added the black and red dots
for stations and text.

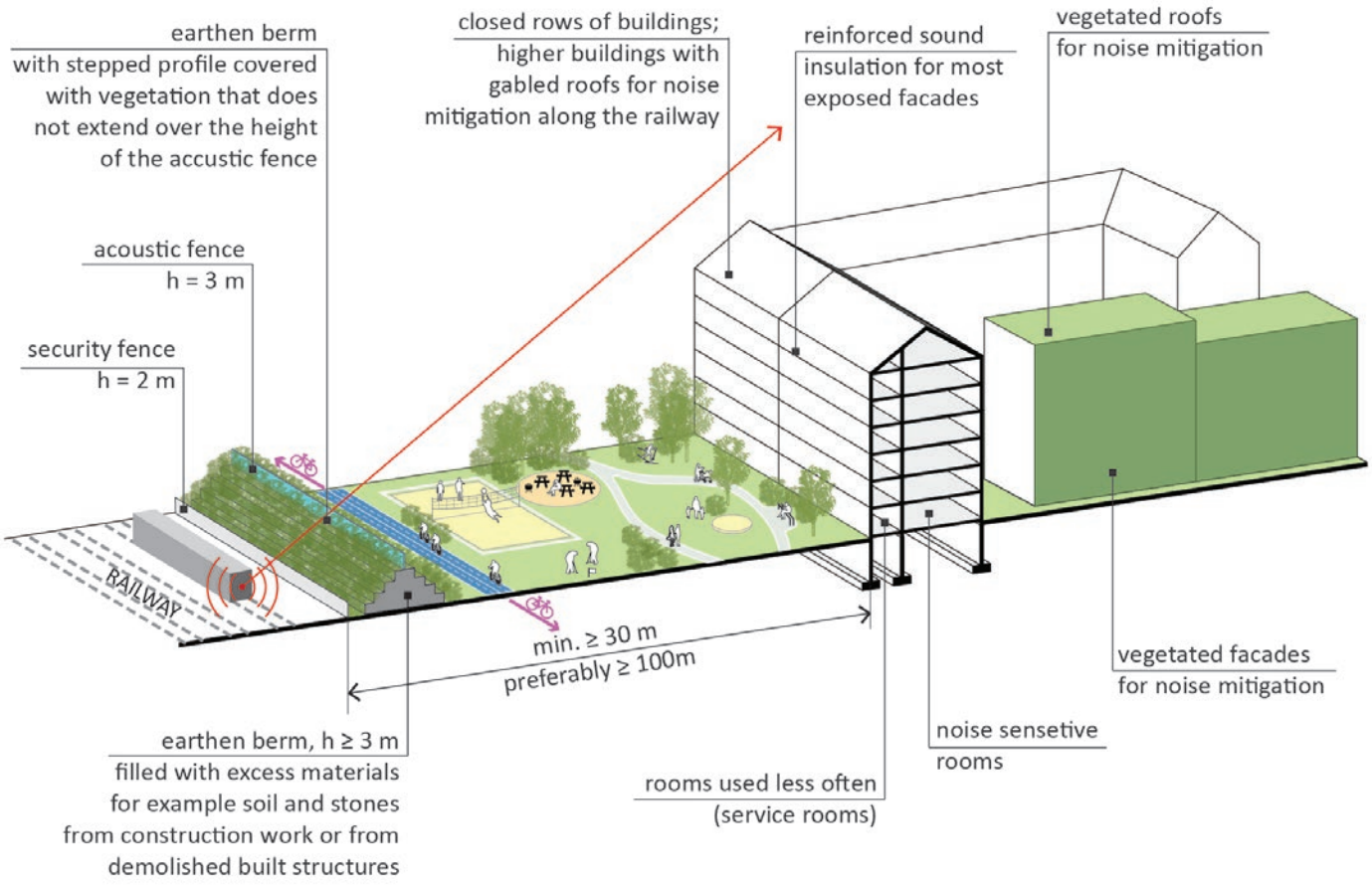


Image 199. Illustration designed and drafted by myself.

5.5. Identity-Creating Elements

Architectural and site design elements that create an identity of the place can be found in large scale designs such as buildings and street typologies, creating a character of neighbourhoods. They can also appear through small design details such as lighting design, pavement design (Image 200-202), urban furniture and others. Thus creating more detailed experience of the place which becomes important with a slow recreational movement of pedestrians and cyclists. Identity-creating elements often represent local history, culture and hand craft skills.

Identity-creating elements can take various forms, scales and can become a kind of branding element of cities. One very well-known example of this is the Berlin Wall (Image 203) which was not built for this purpose yet it has become a part of identity of the city. Remains of this dolorous object have become a place for arts and memorials. Another, completely different example is the Superkilen Park in Copenhagen, Denmark (Image 204). The park from the very beginning was planned to be recognised. And there are many more very contrasting examples which in a various forms and scales represent the idea about the place's identity, local character and recognisability.

The Activity Park along the railway loop can be an identity-creating element of the city itself. However, it can also include specific places and details that would increase its value.

Image 200, Street lighting , Kuldiga, Latvia
Personal Archive, 2017-08-28

Image 201, Pavement details , Kuldiga, Latvia
Personal Archive, 2017-08-28

Image 202, Street lighting , Gothenburg, Sweden
Personal Archive, 2016-09-22

https://www.theguardian.com/artanddesign/gallery/2014/apr/03/thierry-noir-graffiti-berlin-wall

Image 203, the Berlin Wall, Germany.
Personal Archive, 2012-12-02

Image 204, Superkilen Park, Copenhagen, Denmark
by Forgemind ArchiMedia, Flickr (CC BY 2.0)

Image 205, Central Park, New York, US.
Personal Archive, 2017-05-15

5.5.1. Identity of Riga and Design Potentials

When googling “Riga” the first photos that come-up are the Old Town and its architecture, the panorama of the city and the largest bridges. Those elements are, of course a part of the city’s identity, however to some extent impersonal.

Officially, the city’s identity can be characterised by its flags and city arms. The city’s colours come from the flags, they are white and blue, and are often used in city’s graphical identity. These colours and symbols could be also interpreted in urban design to enhance the identity.

Image 206, Flag of Riga, (Annex 4. Riga City Council, July 3, 2012, Binding regulations No. 181) Par Rīgas pilsētas simboliku (2012), OP no. 2012/115.7 [online]. Official legislation website of the Republic of Latvia. Available at: *https://likumi.lv/doc.php?id=250403 [2017-09-11]*

Image 207, Coat of Arms, Riga (Annex 2. Riga City Council, July 3, 2012, Binding regulations No. 181)

Image 208, Small Coat of Arms, Riga (Annex 3. Riga City Council, July 3, 2012, Binding regulations No. 181)

1. Colour Scheme

The basic colour scheme of the new Activity Park details should include the colours of Riga supplemented by black, white and ochre or sand colour and enhanced by red.

2. Materials

Image group 209, personal archive

The selection of materials should include natural materials such as stones, wood, mulch and sand. The design can be enhanced by different tones of stones and blue colouring for example for bicycle paths to increase safety and visibility.

3. Identity By Urban Furniture

- Design Proposal for variations of Solar Charging Stations with Integrated Sitting Places and Bcycle Parkings

At the beginning of the chapter 5.4, I stated my belief that there is no need for united character along the whole loop; that the new park should be characterised by its diversity. Besides that, I also discussed the need for identity-creating elements that would fallow throughout the entire park to create united pattern of details.

In a search for an identity-creating element, I started with examination of my own daily needs, what would be the thing that would make me stay in a place even when I haven't planned it or what facilities many parks are often lacking. One of the first ideas what I got was public toilets and convenience stores like 7eleven or Narvesen but they didn't inspire me. I got inspiration from my grandmother who is in her 80s and loves to go for walks. The only requirement she has is being able to sit down and rest once in a while. I took this requirement and merged it with the typical needs my generation – increasing use of technologies and need for energy, for instance, being able to charge a phone or computer.

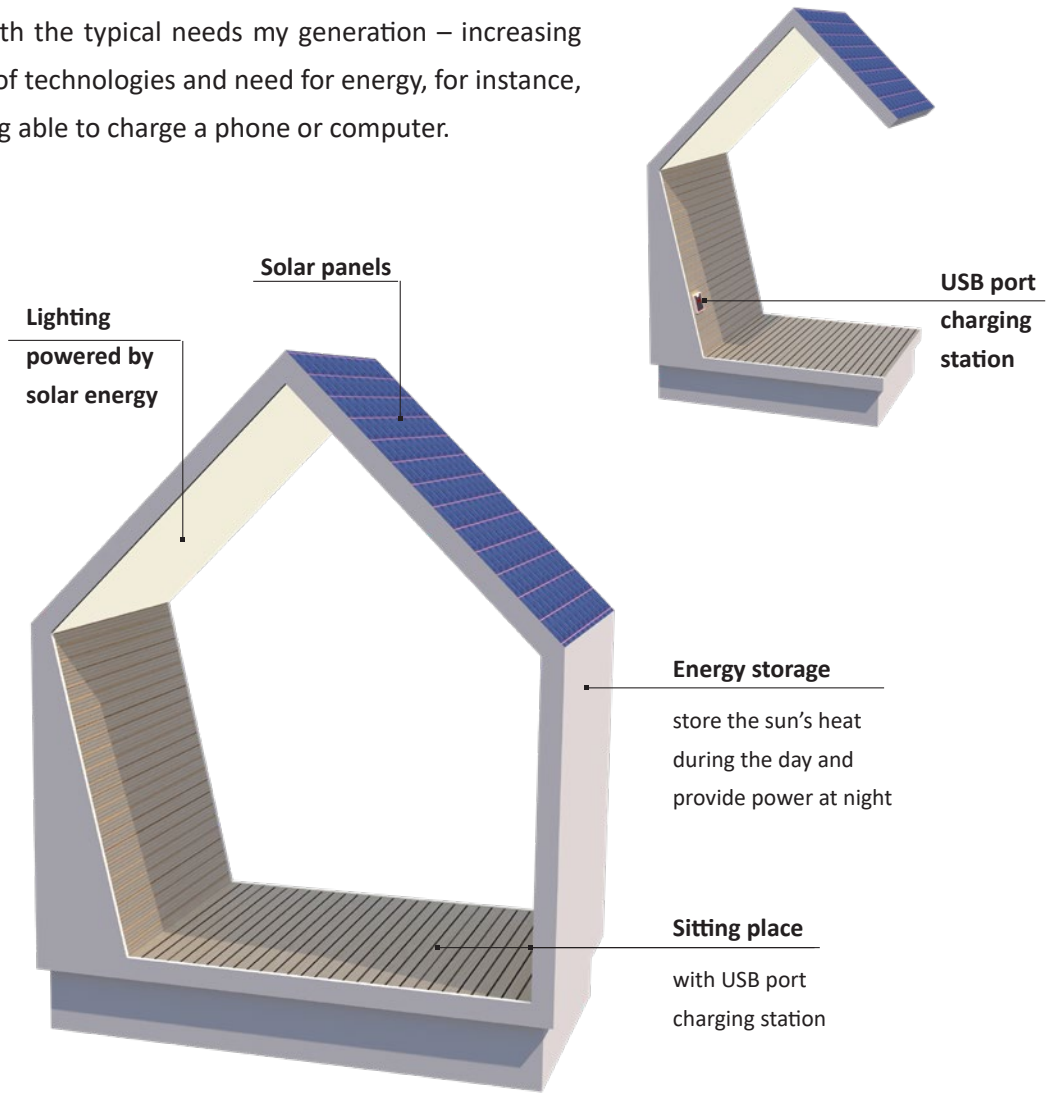


Image group 210, designed and drafted by myself

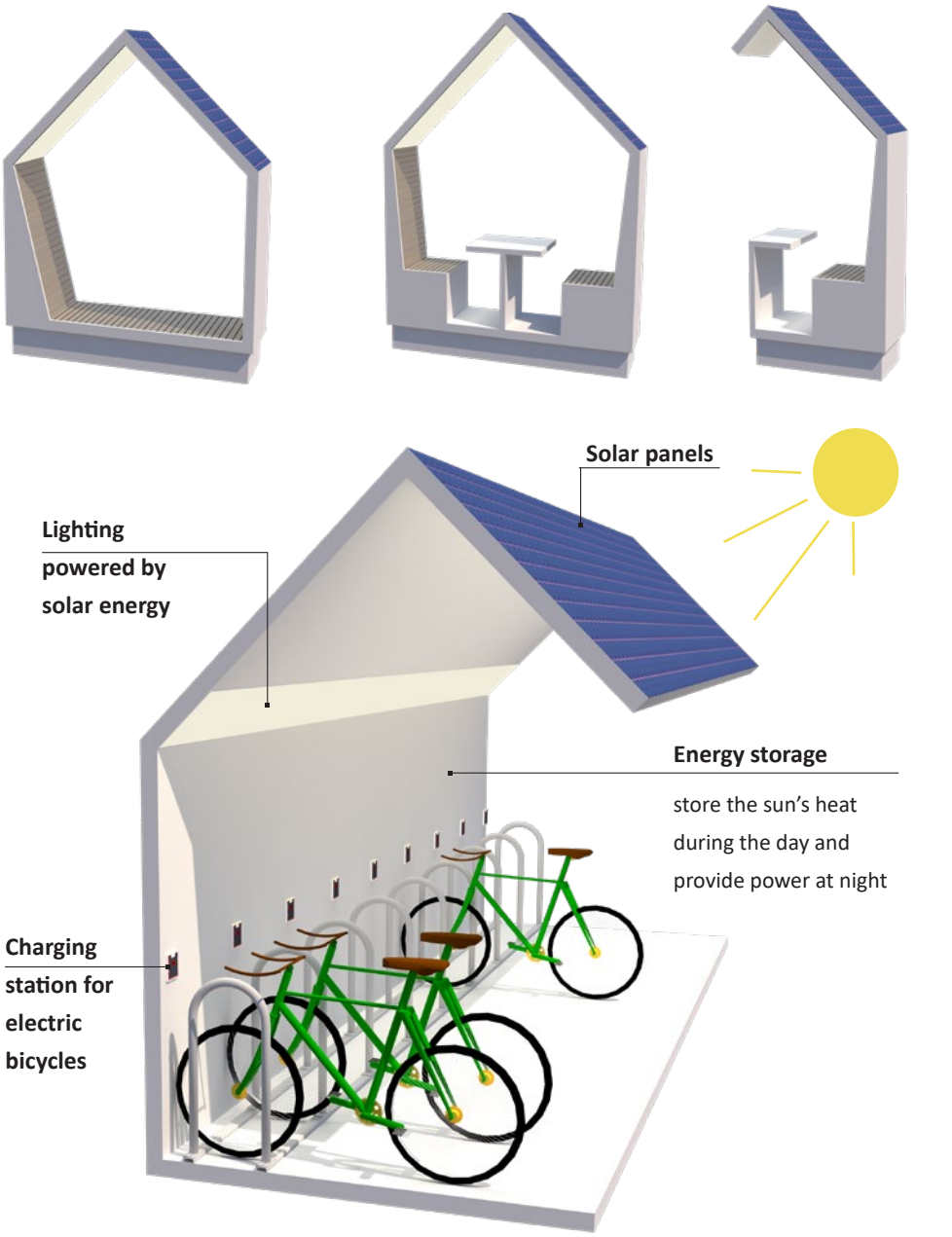


Image group 211,
designed and drafted by myself

I did some research to ascertain that technically the idea is possible but I haven't done any calculations nor tested this in real life. With the understanding I got, I have developed six design variations of solar powered stations with sitting places (Image group 210-211). The new 'benches' would provide social meeting points for all age groups. Depending on one's needs, at the new stations people could charge their phones and other electric devices or just simply sit down and enjoy the new park. Additionally, some of the stations would offer to park electrical bicycles and to charge them using renewable energy from the sun. I chose to do the stations in white and solar panels in their most common colour – blue. These two colours represent the flag of Riga colours. To make the stations more cosy, I have chosen to cover sitting parts with light colour wood deck.

These power stations could fallow throughout the entire park.

5.6. Character Areas

The aim of this section is to test out how rater small investments can change the space. I have selected three areas, which already are public but not used as much as they could be. One of the areas is a very basic pedestrian path along the railway berm in the south, the second one is a space under the bridge next to the train station Zemitani and the trird one is right next to the second one. All three can be characterised by their simplicity and at the same time relatively good accessibility.

1. Narrow linear park along the railway

The pedestrian path along the railway berm connects the areas to the Central train station. I is in rather good condition although, it is meant to be used only by pedestrians, not cyclists. The space is wide enough to be developed with bicycle path, which would provide a safe route for cyclists with no danger from cars and almost no traffic lights.

Image 212, Location.
Maps 212, 214, 216 are based on (CC BY-SA)©OpenStreetMap contributors. I have highlighted colours and railways and I have added the black and red dots for stations and text.

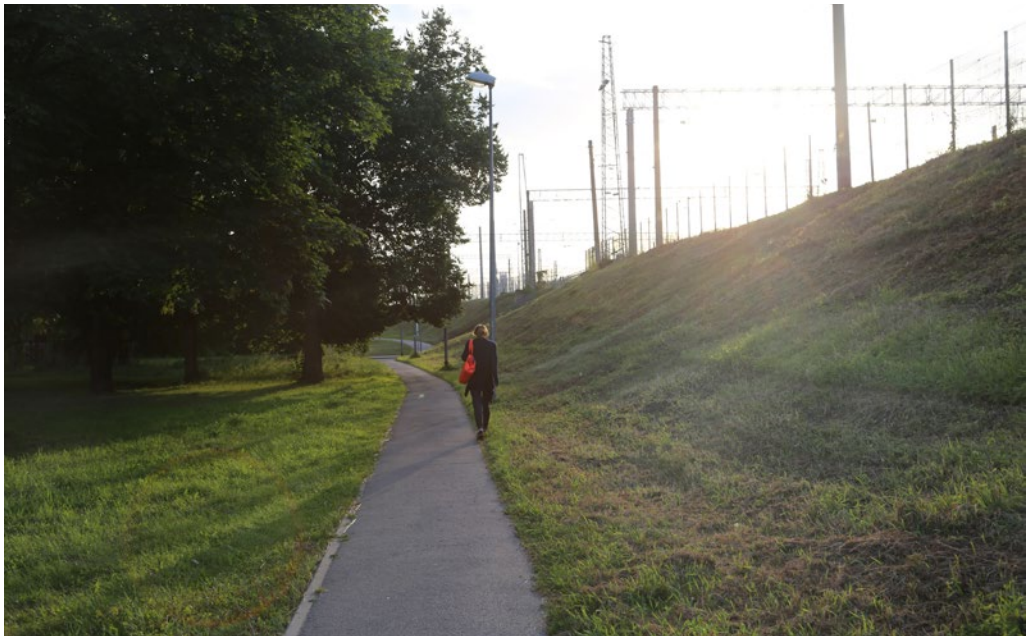


Image 213, Narrow linear park along the railway. Existing situation. Field Study, 2017-07-27.

2. Wasted space under the bridge next to the train station Zemitani

Currently, the space is unused and in a poor condition. However, people who get in and out of the trains in the train station Zemitani often pass it. This space has a great potential to become place for urban sports for instance skateboarding. By adding lights, the safety in dark hours can be improved and, besides that, also the constructions of the bridge can be highlighted.

Image 214, Location.
(same as Image 212)

Image 215, Wasted space under the bridge next to the train station Zemitani. Existing situation.
The collage is drafted by myself and based on photos from my field study, 2017-07-27.

3. Wasted space next to the train station Zemitani

Currently, the space has unclear function and it is often used for parking. As the place is located almost next to the train station Zemitani and can be seen from the bridge next to the station, it can work as transition zone between the urban station area and the new park along the railway. By using plantings, it can be made into more intimate zone than the station area and still benefit from being close to the station.

Image 216, Location.
(same as Image 212)

Image 217, Wasted space next to the train station Zemitani. Existing situation.
The collage is drafted by myself and based on modified ©2019 Google Street View images, captured Jul 2014

Image 218, Visualisation of a narrow linear park along the railway. Designed and drafted by myself.

Image 219, Visualisation of a wasted space under the bridge next to the train station Zemitani. Designed and drafted by myself.

Image 220, Visualisation of a wasted space next to the train station Zemitani. Designed and drafted by myself.

5.7. Phasing

As the entire railway loop together with the waterfront next to the Old Town is approximately 15 km long, it can not be developed in one go. The distribution of population in the city is uneven and there are more residents and activity in the South and East parts from the railway loop around the centre. The North part is partly occupied by the Commercial Port.

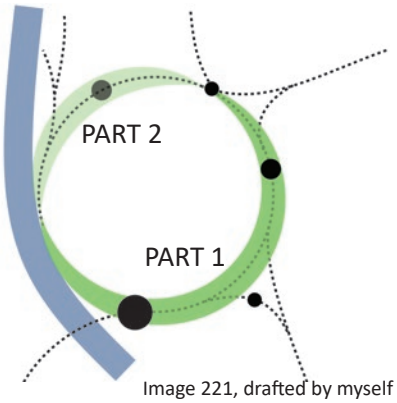


Image 221, drafted by myself

Considering the distribution of the city's residents, firstly the new pedestrian and cycling routes should be established in South and West parts of the centre (Image 221). According to planning documents of the city, the Central train station area should be finished in 2022 as well as stadium Daugava. It is quite unclear with the other large development areas in the city (Image 222) because according to Sustainable Development Strategy of Riga until 2030, most of the Priority development territories shall be developed by 2020 which seems impossible as it is in next 3 years. It is slightly more likely that, for example, Skanste might be developed by 2030 as it is stated in the Explanatory Memorandum of Skanste detail plan (Detailplan...). With taking that into account, the image group 223 gives an overview of potential phasing of the New Activity Park.

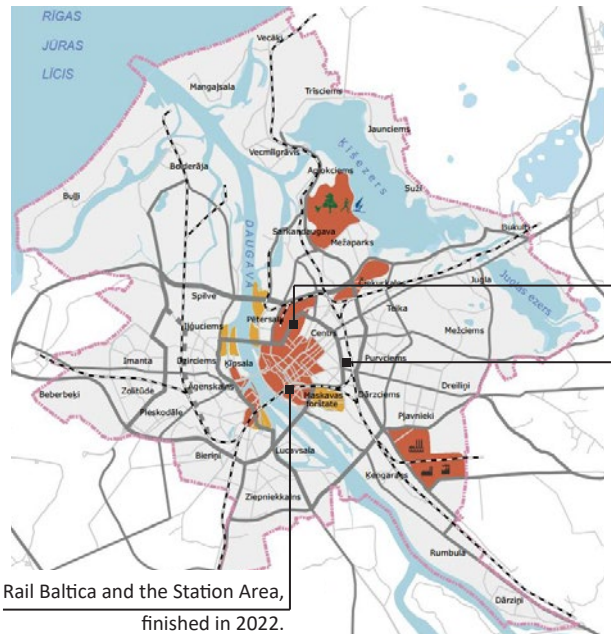


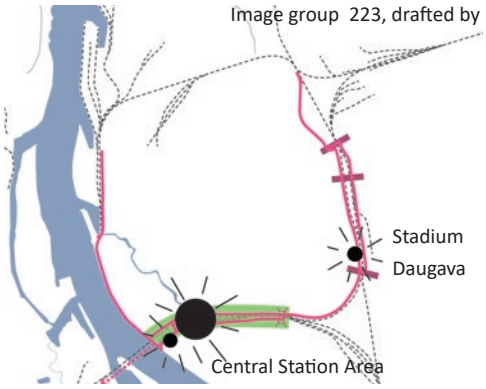
Image 222, Priority development territories in the city of Riga according Riga 2030, Sustainable Development Strategy of Riga until 2030 and Development Programme of Riga for 2014-2020 Summary (2014), Riga City Council, City Development Department.

Rail Baltica and the Station Area, finished in 2022.

Phase 0

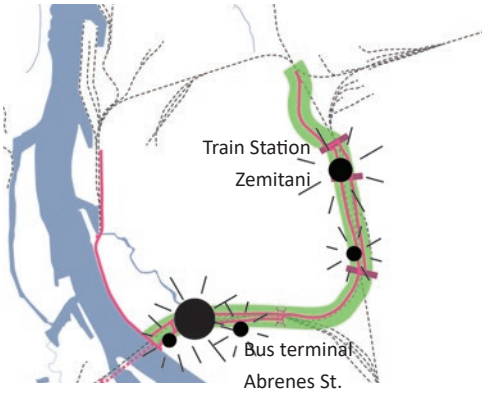
- connect the areas by new pedestrian and cycling routes, improve safety and accessability of the bridges, begin events and soil remediation if needed

Image group 223, drafted by myself



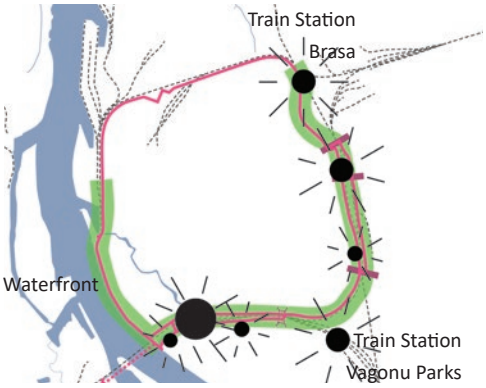
Phase 1 (in 5 years)

- in 2022 the central station area and the stadium Daugava shall be finished, the new routes can be extended and the first green public space established



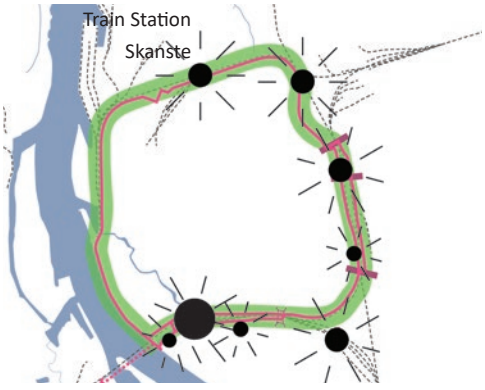
Phase 2 (in approx. 8 years)

- 2 new urban hubs - the train station Zemitani and the bus terminal Abrenes St. are developed and the green public space along the railway is extended



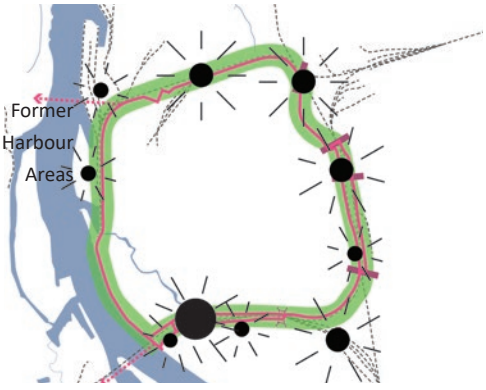
Phase 3 (in approx. 10 years)

- 2 new urban hubs - the train stations Zemitani and Vagonu Parks St. are developed, green waterfront and the pedestrian and cycling routes extended



Phase 4 (in approx. 15 years)

- in 2030 neighbourhood Skanste is developed and a new station established, the new activity park creates a closed and finished loop



Phase 5 (in 20 years or more)

- 2 new urban hubs - the former harbour areas are developed and new connection over the river Daugava is in process

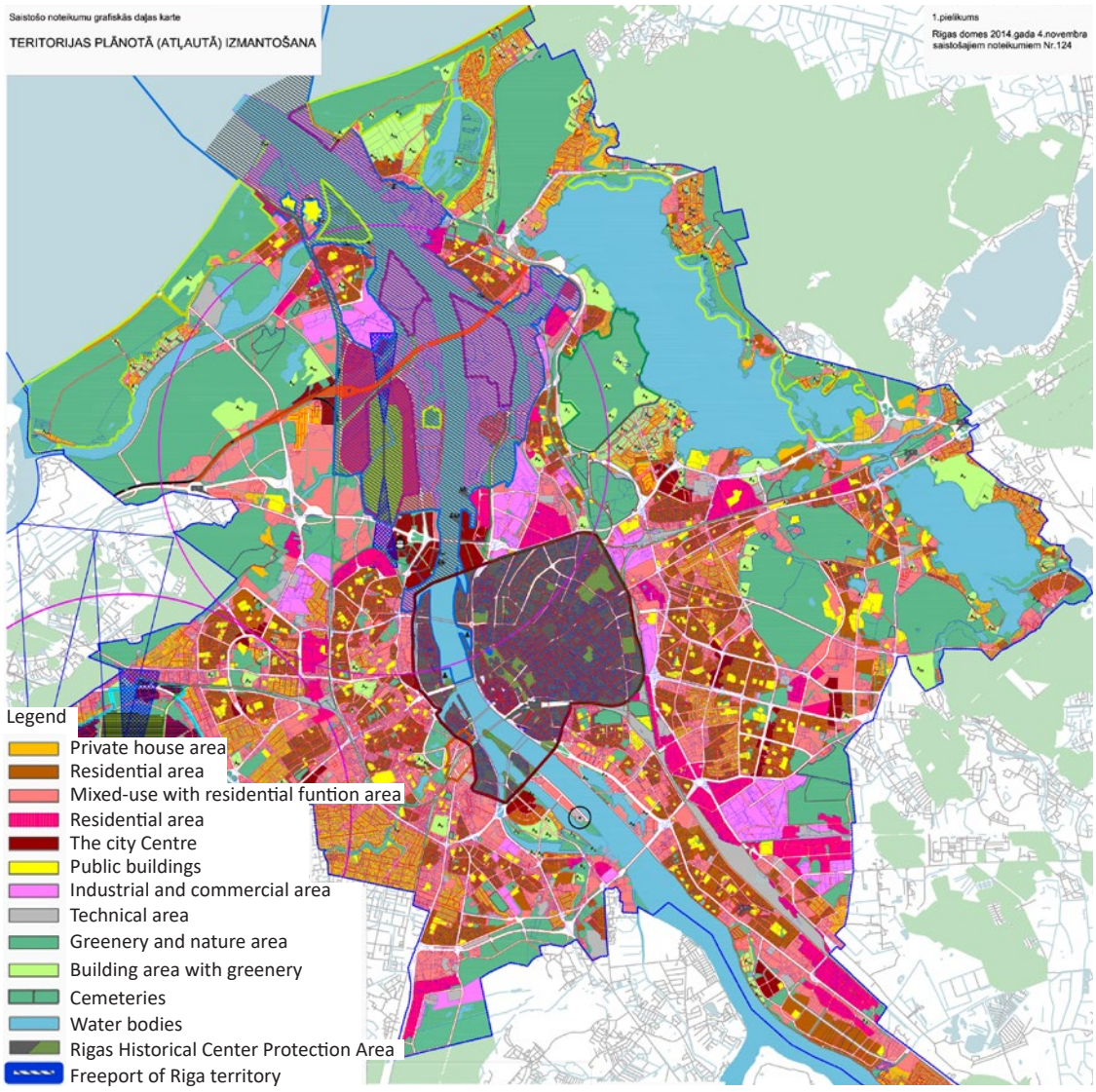
Discussion and Conclusions

This study aimed to contribute knowledge and ideas about how urban infrastructure and neighbouring lands in general, and more specifically railways and areas in their proximity, can be revitalised, connected and integrated into the existing city fabric and made accessible for public. The main findings suggest that many of the current urban landscape issues are related to the land use and lack of connections between the both sides. This can be solved by changing the current use of land to make the areas lively and attractive and by improving the connections thus making them accessible.

At the introduction of this study, I have stated that the city centre is separated from the suburbs by the railway and a belt of brownfields and wastelands along it, that these areas lack a clear function and are unsafe and disturbed by noise and vibrations. The study of history and existing situation supports this statement, however there are some places that are still used for production of goods. In this sense, my statement have been wrong and some of the areas have a clear function. Although, it can be debatable if these areas are the right places for industrial production.

The current Comprehensive plan with the current land use (Image 224) and the "Sustainable Development Strategy of Riga until 2030" do not discuss the change of the land-use along the railway loop which I believe to be significant in order to achieve the future goals of the city which include: compact, pedestrian, cyclist and public transport friendly, accessible, provided with an excellent cultural environment, diverse and high-quality natural territories, green corridors, and accessible waterfronts (Riga 2030, 2014). To reach these goals, the study shows that it is necessary to re-evaluate outdated values such as car oriented streets and mono-functional industrial and commercial areas in close proximity to the city centre (Image 225).

The exploration of existing situation gave me a good understanding what the main issues are with the brownfields and wastelands along the railway loop while the review of the history gave me a clear picture how the city was created, how the different characteristic zones have formed and why the railway loop surrounds the city centre. The review of the history took me to the conclusion that the former land use of the areas along the railway is outdated not only because the scale of industrial production has changed, but also the size of the city and sequently accessibility to infrastructure that is suitable for cargo traffic. Because of this and of the change of industrial production in general, most of the industry has since left the city creating



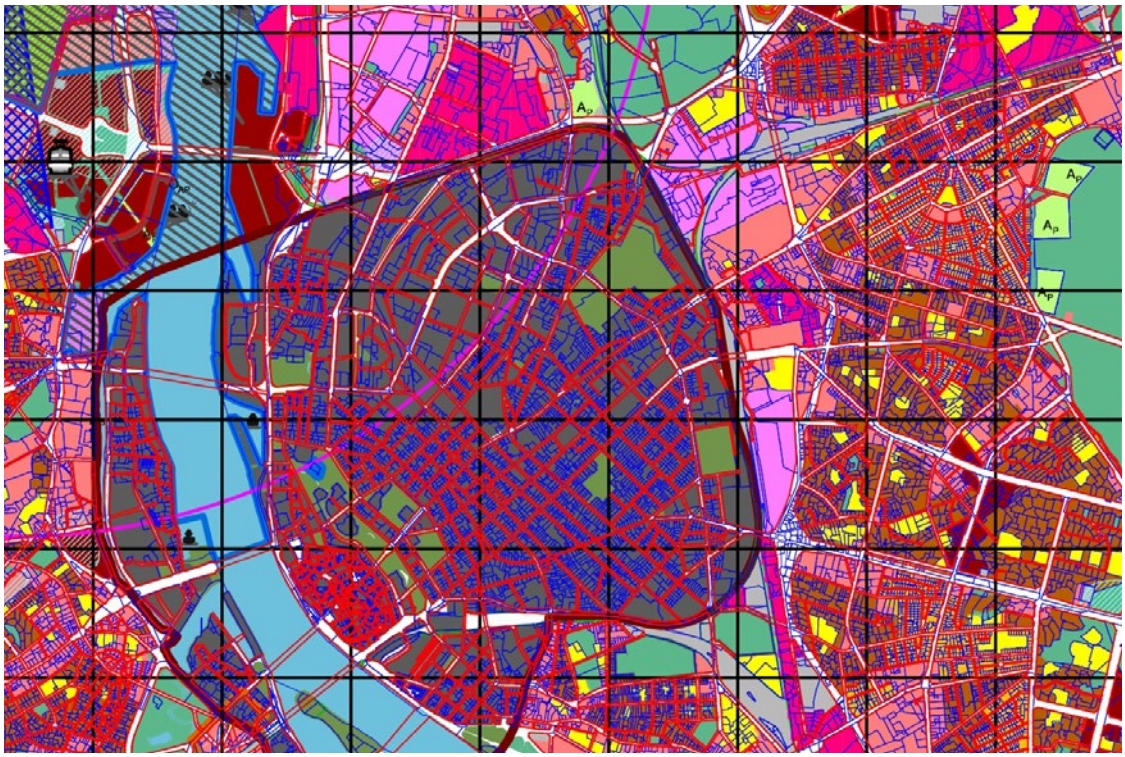


Image 224 (top) and 225 (bottom), both adjusted Comprehensive Plan of Riga City 2006-2018 (graphical part), Teritorijas plānotā (atļautā) izmantošana (transl. Planned (authorized) use of the Territory), Riga City Council
Available at: *http://www.rdpad.lv/rtp/speka-esosais/*

spaces of brownfields as they did.

The revitalisation of brownfields is not something that can be achieved quickly and it is not possible without public interest. One of the easiest ways to do this is by mixed-use of new developments, thereby regaining investments and activating the areas by its new residents. In the case of Riga, this is not a solution as the population of Riga has not changed much in the last decade and there is no expectancy for rapid growth. There is therefore no need to plan for densification. Instead, the planning should be targeted at the existing population and their well-being which also means health.

This leads to the most challenging part. Is there actually a need to plan for any changes if the city does not experience an economical growth. The small businesses and a couple of factories along the railway that brings certain investments in the city's economic, might be more attractive for the city's budget than moving them away and investing in public space.

Riga is rather small city even though it is the capital. It is easy and convenient to live in the green periphery or even in some of the villages outside the city where the air is better and the green outdoor space is more available. For this reason, it is even more important to plan for more green and healthy city with the available free activity places within the city to attract people to live closer to the centre, use less motorised transports, use more bicycles or walk. As a result, the city would become more compact and less polluted with more healthy people.

In answering my research questions I have created an abstract concept on what qualities the railway loop and the city should have as well as the strategic redevelopment steps to achieve this which resulted in my visionary proposal to create an activity park along the railway loop. It would help to deal with environmental pollution such as soil pollution, noise and vibrations. Additionally, it would work as a mixed public space with increased amount of greenery where, unlike the historical parks, people would have the opportunity to engage with sports, arts and other activities. The park can help to decrease the physical and the mental distance between the both sides of the railway, provide improved pedestrian and bicycle friendly routes and help to integrate the former industrial areas with the surrounding neighbourhoods. The city would gain better air quality and new green public space.

The overall purpose of this thesis is to raise discussion about the railway loop around the city centre as barrier in the city and to give a conceptual framework for revitalisation, not specific solutions. My attempts to draw a visionary proposal aimed to give examples of possible solutions and to test them in terms of design but they do not aim to be a final design decision.

Through the research of the transport infrastructures role in the cities, especially railways, and search for strategies of the landscape revitalisation in close proximity, I have struggled to find relation to the landscape architecture field in general as often it overlays with planning of transportation, environmental sciences, physics and even chemistry and medicine because many of the problems which firstly come from pollution, limitations for safety and effects on human health.

This study has given me a greater understanding of how important it is to respect and take into consideration problems from various fields and then think about revitalisation of landscape because without solving these and extensive issues related to the other fields, it is not possible to create healthy and enjoyable landscape.

As mentioned in the Limitations, there are several important parts that are left out in this study and would be important for any further research. These include review of the property structure and distribution of the land ownership, calculations of necessary investments, deeper research of potential soil pollution, the actual effect of green soil remediation and research of the noise mitigation measurements adjusted to specific places. However, the most important part for further research is people polls and walking interviews as the overall purpose of this thesis is to raise discussion.

This study can be used to start the discussion in order to challenge opinions and ideas.

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Online Maps

- All the maps are based on modified of Open Street Maps
  Available at: http://www.openstreetmap.org
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  Available at: http://mvd.riga.lv/uploads/troksna_kartes/dzelzcels/
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