COLOGNE, GERMANY: A GREEN BELT EXTENSION AND RE-IMAGINATION MASTER PLAN

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The purpose of this project is to develop a master plan for the redevelopment of the old wholesale market area and the adjacent riverside land along Bonner Street, Cologne, Germany. The site properties will be developed into a mixed-use district and as a part of the existing green belt system.

The city of Cologne has historic roots dating back to a Roman settlement. During the growth of the city, a system of successive fortifications belts have been built and later developed into semi-circular green belt systems around the city, which greatly contribute towards the quality of the city’s environment. During the development of the city, much of the attention from the government was paid on the extension of existing green belt and achieving a further intact green belt system that embraces the inner city of Cologne. However, the project site is currently located at the southern end of the existing green belt and is disconnected from the green belt and the Rhine River, which means a necessary transformation of the project site into a part of the green belt is expected to take place. The proposed master plan of the future development of green belt system indicates that the city intends to extend the existing impeded portion of the green belt to the Rhine River and to create a better connection to the riverfront areas. A mixed-use district is also expected from the city for the redevelopment of the site.

The mission of this landscape master plan is to transform the project site into a part of the green belt system that is well-connected with the Rhine River, and to create a mixed-use district that interacts well with the green belt. The other focus of this project is to propose a sustainable community development plan to achieve low impact to the environment, and to create interconnections between the green belt and the community. European town planning and spatial configuration traditions have been studied and incorporated to help develop a new mixed-use community appropriate to the context of the adjacent properties.

The project has been accomplished in the following phases:

- Research and analysis phase: site inventory and analysis; study of city history and history of green belt development; case studies.
- Concept phase: program development; concept development; preliminary master plan.
- Design phase: finalize comprehensive master plan; site development and details.
- Final document phase: composition of final design book; prepare for final defense and public presentation.
# TABLE OF CONTENTS

## BACKGROUND INVENTORY AND ANALYSIS
1. PROJECT CONTEXT .......................................................... 2
2. HISTORY OF COLOGNE CITY DEVELOPMENT ................. 3
3. HISTORY OF GREEN BELTS IN COLOGNE ....................... 4-6
4. BRIEF CULTURAL BACKGROUND OF COLOGNE ............... 7
5. HISTORY OF WHOLESALE MARKET ................................. 8
6. VISUAL INVENTORY AND ANALYSIS ................................ 9-11
7. CLIMATE OF COLOGNE .................................................. 12
8. SOLAR DATA AND SOIL MAP ............................................ 13
9. TOPOGRAPHY .............................................................. 14
10. LAND COVER ANALYSIS ................................................. 15
11. EXITING RHINE RIVER BANK CONDITION ..................... 16
12. FLOOD PLAIN AND FLOOD MANAGEMENT ..................... 17-18
13. VEHICLE TRANSPORTATION ANALYSIS ......................... 19-20
14. BIKE AND PEDESTRIAN PATH ANALYSIS ......................... 21
15. NEIGHBORHOOD LAND USE MAP .................................. 22
16. SITE LAND USE MAP .................................................... 23
17. BACKGROUND STATISTICS OF LAND USE AND LAND VALUE 24
18. EXITING GREEN BELT FUNCTION ANALYSIS ................... 25-26
19. CITY PROPOSED GREEN BELT MASTER PLAN ................ 27-28

## LITERATURE REVIEW AND CASE STUDIES
1. LITERATURE REVIEW OF URBAN DESIGN ......................... 31
2. CASE STUDY---THE NIDDA VALLEY GREEN BELT IN FRANKFURT 32
3. CASE STUDY---ZOLLVEREIN COAL MINE INDUSTRIAL COMPLEX .33-34
4. CASE STUDY---SUSTAINABLE RESIDENTIAL DEVELOPMENT .... 35

## CONCLUSIONS
1. POTENTIAL COMMERCIAL LAND VALUE EVALUATION .......... 36
2. POTENTIAL RESIDENTIAL LAND VALUE EVALUATION .......... 37
3. SWOT ANALYSIS .......................................................... 38-39

## DESIGN PROGRAMMING
1. MISSION STATEMENT ...................................................... 41
2. PROJECT GOALS AND OBJECTIVES ................................. 42-43

## DESIGN CONCEPT
1. CONCEPT DIAGRAM ....................................................... 44
2. MASTER PLAN .............................................................. 45
3. AERIAL VIEW ............................................................... 46
4. MASTER PLAN SESSION I: WAREHOUSE PROMENADE & DENSE GROVE 47
5. MASTER PLAN SESSION II: MIXED-USE BUSINESS ZONE & TRAIN STATION PLAZA & SHOPPING COMPLEX .................. 48
6. MASTER PLAN SESSION III: MARKET HALL PLAZA & MIXED-USE ZONE & RESIDENTIAL AREA ........................................ 49
7. MASTER PLAN SESSION IV: WATERFRONT GREEN BELT AND PROMENADE ...... 50
8. BIKING AND PEDESTRIAN SYSTEM ANALYSIS .................. 51
9. VEHICLE TRANSPORTATION ANALYSIS .......................... 52
10. MIXED-USE FUNCTION ANALYSIS .................................... 53
11. GREEN BELT SYSTEM ANALYSIS ...................................... 54
12. SECTION I & II ............................................................. 55
13. MARKET HALL PLAZA PERSPECTIVE ................................ 56
14. WATERFRONT GREEN BELT PERSPECTIVE ....................... 57
15. DESIGN METRICS ........................................................ 58
16. VALUE EVALUATION ..................................................... 59

## REFERENCES

## ACKNOWLEDGEMENTS
# Table of Contents

**Background Inventory and Analysis**
1. Project Context
2. History of Cologne City Development
3. History of Green Belts in Cologne
4. Brief Cultural Background of Cologne
5. History of Wholesale Market
6. Visual Inventory and Analysis
7. Climate of Cologne
8. Solar Data and Soil Map
9. Topography
10. Land Cover Analysis
11. Existing Rhine River Bank Condition
12. Flood Plain and Flood Management
13. Vehicle Transportation Analysis
14. Bike and Pedestrian Path Analysis
15. Neighborhood Land Use Map
16. Site Land Use Map
17. Background Statistics of Land Use and Land Value
18. Existing Green Belt Function Analysis
19. City Proposed Green Belt Master Plan

**Literature Review and Case Studies**
1. Literature Review of Urban Design
2. Case Study---The Nidda Valley Green Belt in Frankfurt
3. Case Study---Zollverein Coal Mine Industrial Complex
4. Case Study---Sustainable Residential Development

**Conclusions**
1. Potential Commercial Land Value Evaluation
2. Potential Residential Land Value Evaluation
3. SWOT Analysis
Introduction

Germany is located in the heart of Europe, sharing borders with nine European countries, second only to Russia. Cologne is situated in the west of Germany, where it is close to Belgium and the Netherlands. It is the largest city both in the German Federal State of North Rhine-Westphalia and within the Rhine-Ruhr Metropolitan Area, and is one of the major European metropolitan areas with more than ten million inhabitants. Cologne is developed on the Rhine River, with major city center on the west bank. The city is famous for its Cologne Cathedral (Kölner Dom), which is the largest Gothic cathedral in Germany.

The project site is located in the south of the city adjacent to the Rhine River. It is located right outside the inner city core where the new city was developed with the historical expansion of the city. A wholesale market is occupying the west half of the site, while east half is currently a mixed-use area. A railway line runs on the northern edge of the site, interrupting the north to south connection along the railway. A part of the existing city green belt is bordering the west of the site.


**2 HISTORY OF KOLOGNE CITY DEVELOPMENT**

Cologne is one of the oldest cities in Germany. The Romans founded the Ubii village on the Rhine in 50 AD and named it "Colonia". The Roman settlers fashioned the city street system in the grid pattern with two main axes which could still be seen as two major avenues today. In the Middle Ages, Cologne's location on the Rhine River placed itself at the major intersection of trade route between east and west, and the city became one of the most important trade centres in Europe.

In 1180, a fortification wall was built around the city of Cologne, and which led Cologne to the largest German city in the Middle Ages. The semi-circular wall was reinforced with bastions in 1650. In 1815, Cologne became a fortress city in the kingdom of Prussia, and a new ring of fortresses was built.

In 1860, the need for a new defensive line became acute, both from military considerations and urban expansion need. The Neustadt was built between the old city wall and the second ring. The third defensive ring was built after 1873 with 185 independent fortifications.

Rings of fortification have been dismantled by the city with them losing the function as defensive rings, and three green belts have been built on the former defensive rings to improve urban environmental quality. After the First World War the city was abandoned, and as a result of lack of space in the city center, several suburbs of Cologne had grown rapidly into industrial districts.

The project site is located in the southern district called Bayenthal where one of the industrial districts is located.
HISTORY OF GREEN BELTS IN COLOGNE

The first ring of fortification (1650)
A city wall was built in 1180, after that Cologne became the largest German city in the Middle Ages, with flourishing arts and crafts and the most important markets. The wall was further reinforced with bastions in 1650.

The second ring of fortification (after 1815)
The second ring was built at a distance of about a kilometer outside of the old city wall. This wall was comprised of a moat and casements, which were built between 1882 and 1890, and ran from Fort I in the south to Fort XI in the north.

First Green Belt as a Ring Boulevard
Josef Stübken won the first prize for the urban development of the Neustadt which is between the first and second ring of fortification. In his design, streets were carefully laid out with rows of trees, park elements and pedestrian paths. A strong focus was on the architectural facades along the street. Public buildings with squares were designed for prominent points. The boulevard was designed with flower gardens, fountains and monument that formed a chain of festive spaces. Stübken’s plan was to give every important street a unique character with a striking focal element.

Summary
The ring boulevard pays attention to the facades of building along the streets, which helps to accentuate the streetscape. Occasional small landscapes along the street reinforce the image of the street, while providing series of focal points.

Second Green Belt --- Schumacher’s Freiflächenplan
The second green belt was built on basis of the second ring of fortification after it was demolished. The plan was comprised of segmented axial succession of architectonic green spaces. Three green radials, including Aachener Tor, the Volksgarten and Fort X, were designed with two concentric green rings. Cemeteries, allotment gardens, sports complexes, private arable fields pastures and woods complexes were included in the green system. This plan was considered the first green infrastructure plan, because its decisive step of taking green structure as an integral component of an urban development plan.
3 HISTORY OF GREEN BELTS IN COLOGNE

The Third Green Belt and the Functional zoning of the Green

Schumacher designed green radials running into the city to make the most use of the existing parks. Vorgerbirgspark is among the several radial green spaces and is right adjacent to the west of the project site, forming a connection between the project site and the third green belt.

In 1925, Encke developed a plan for the outermost green belt. The essential spirit of the plan was creating usable for all classes in society and all age groups. The activity list consisted of walking, sports, play and nature education. Theodor Nussbaum succeeded Encke in 1926. More focus was placed on physical exercise in the green, including sports fields and facilities for water sports. In Encke’s plan, considerable attention was given to the green radials. In his view, a green belt would only function well when it was connected with city center by strip parks. Blücherpark in the north, Stadtwald in the west, and Vorgerbirgspark in the south were built as parts of green radial.

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The design approach for the Cologne green belt was in a transition from a visual-spatial focus to an approach that solves design problems the late 19th century to early 20 the century. The concern about public health and physical exercise demanded more open spaces in the city, where light and air invited people in by creating a sunny and active spaces. Attention was also paid to the mass recreation for the working class. The needs of practicing sports and various age groups were taken into account in the design process.

Presentation of Nature --- Klettenbergpark

Klettenbergpark was designed before the idea of green structure for the city was taken as a fixed form. It was designed around an old gravel quarry, with an area of about 3.5 hectares. It was surrounded by residential facades, and is adjacent to an important radial avenue to the center.

The park was surrounded by densely planted trees with clearly articulated entrances and views out to its surroundings. In the center lies a lake with a meandering banks, small islands on the edge, and a mooring place for boat. A more formally designed rose garden lies in the acute angle at the head of the lake.

The park has hardly any facilities for active recreation. Rather, it is a material display of nature.
The Evolution in Design Approaches of Urban Green Spaces

Deconstruction of Pastoral Landscape--- Vorgebirgspark

Vorgebirgspark was designed as a part of the green radials to the outermost green belt. This park is comprised of a few elements: a large central meadow, a pond in one corner, a dense grove edge, a series of gardens and squares. The central meadow was enlarged from an initial concept of playing field, merging different activities in the site. The interior space was emphasized by a path along the edge of the woods. The design was not focused on the facades of the buildings along the park, but is turned inward. The paths serve as the connection with the urban fabric.

The Vorgebirgspark marked a turning point in the design of urban green spaces. The observation of nature became subordinate to functional playing space. Visitors were not led by the paths, but were able to actively use the space. The pattern of picturesque walking paths in the park was reduced to a system of functional connections.

Standarising the Programmatic Form --- Blücherpark

The Blücherpark was the first park that was design to accommodate a large amount of population’s activities. The main axis of the park ran through into the street system, supporting the direction of the green radial. The design regarded the formal geometric form as the most suitable for handling a large number of visitors and offering varied recreational opportunities. A comprehensive recreational program was fitted into the system, including canoeing, skating, a play meadow, children’s playgrounds, wading pool, tennis, ornamental gardens, and gardens for relaxation, strolling paths and shaded promenades.

Reference & Map Source:
**4 BRIEF CULTURAL BACKGROUND OF COLOGNE**

During World War II, Cologne was a Military Area Command Headquarters. Cologne endured 262 air raids which caused approximately 20,000 civilian casualties and almost completely wiped out the center of the city. The bombing destroyed 600 acres (243 ha) of built-up area, killed 486 civilians and made 59,000 people homeless. By the end of the war, the population of Cologne had been reduced by 95 percent. The entire city was rebuilt on top of the destroyed city after the war.

**Historic Architecture**

Because of the long history in Cologne, some historical buildings have been preserved until today. The city hall is famous for its loggia, the Renaissance facade built by the Kalkar master builder Wilhelm Vernukken. Romanesque churches and memorials can be found throughout the city center. Being an internationally renowned cultural metropolis, Cologne boasts 36 museums and far more than 100 art galleries. Museums have a wide variety of exhibitions, ranging from Roman, medieval via non-European to contemporary art.

Cologne Cathedral is one of the architectural masterpieces of mankind. It was declared as a World Cultural Heritage Site and presented as a perfect example of Gothic construction. Germany’s largest Cathedral is also the country’s most popular architectural monument, with about six million visitors a year. It is the symbol of the metropolis on the Rhine.

**Cologne after World War II**

Special Events

The Cologne Carnival is a carnival that takes place every year in Cologne, Germany. It has been declared as the “fifth season” of Cologne. Cologne folks would go out masqueraded, watch parades, drink beer, and enjoy Christmas market opens every year in front of the Cologne Cathedral. More than 160 stalls offer many traditional goods and handicrafted gifts. Their sparkling lights, beautiful decorations, and the peaceful atmosphere attracts millions of visitors from all over the world every year.

**Green Spaces**

The inner and outer green belt were built on the premises of former fortresses, bringing a profound influence on people’s life and the concept of urban green spaces. A series of green spaces have been developed as parks, forests, zoo, botanic gardens and lots of open spaces. Large park areas invite to practice sports at the open air, such as jogging and strolling. Biking and walking trails can be found everywhere in the green belt area.

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5 HISTORY OF WHOLESALE MARKET

Bayenthal was developed into an industrial district after the First World War. Railway lines were introduced into the market area in convenience of trading activities and transportation purpose. Most of the buildings were arranged following the railway lines and it remained until today.

Today most of the space is either used as driveways for large vehicles or warehouses. There’s merely any vegetation existing on the market, and the roads are paved with impervious concrete.

Market Hall certainly marks the industrial roots in the Bayenthal region, and should be preserved as a landmark to remind people of the history.

“Cologne Wholesale Market is one of Germany’s largest markets. The wholesale market hall is an impressive structure. It is listed for preservation as the construction method is especially interesting. Since its opening on 1st November 1940, the wholesale market has spread out over privately owned and municipal land, growing in size from 70,000 to 230,000 sqm.”

Source: Google Earth

Source: Google Earth

Source: Thomas Knöven (AIb Instructor)
6 VISUAL INVENTORY AND ANALYSIS

Current Site Aerial Photo

1. East site vacant land

A linear vacant land is located at the west end of the site, a triangular zone between the railway line and warehouses. Currently the place is over grown with weeds and is fenced off from the public, which is a waste of land.

2. Land occupied by facilities

This long linear leftover area is located behind the warehouses on the edge of the railway lines. Being used as a place to store facilities and park vehicles, it certainly is a type of spontaneous land use decision.

3. Parking lot adjacent to railway line

A parking lot is assigned to the space under the railway lines. Overgrown by dense grass and shrubs, the railway ramp is screened off from its neighborhoods. The elevation difference is about 5 meters.

4. Warehouses and parking lot

This reflects the typical condition of the site: large warehouses with wide vehicle lines in between. The warehouses are usually one storey buildings at about five meters high, with large openings toward streets. It is a place that is unwelcoming to pedestrians.

5. Large parking lot

This is a central parking lot area in the middle of the site. The area is quite opened up with an uncomfortable scale for pedestrians. It has been paved with concrete or concrete pavers all over the area, leaving hardly any vegetation on site.

6. Warehouses next to the market hall

There are several lines of one-storey warehouses aligned adjacent to the market hall. This place is covered with canopies, creating a semi-indoor space between warehouses. The spatial scale is relatively smaller than the rest of the site, providing a suitable walking street space.

7. Inside the market hall

The space inside the market hall is occupied by many small units which are rented out by traders. Most of the trading activities would happen in the middle of the night, while a quiet locked place in the daytime. It could be disturbing at night while an underused place in the daytime.

Summary

The wholesale market area is currently occupied by warehouses and parking lots, sharing less or even no care of the space along the railway lines. The spatial scale is not appropriate for pedestrians, and the concrete pavements leave no space for natural vegetation to grow.
A green open space is designed between the residential building complex. Residents were detected on site resting on the lawn or playing soccer. This community sets a good example for later residential development.

This triangular shaped pocket green space is outside the gateway of the wholesale market. The view from outside the space is very nice and peaceful. It creates a nice resting space for the neighborhoods even if it is more of a leftover space between the major streets and the wholesale market area.

A green open space is located at the southern east corner of the wholesale market, abutting a mixed-use community which is along the major street. This community is privately used yet next to the market area, which makes it questionable to be reserved in the planning phase.

Even though the wholesale market is adjacent to the existing green belt area, the market street is separating the two with densely planted vegetations alongside. The connectivity between the project site and the green belt is currently compromised by the traffic.

Nicely situated residential community is located along the major street, while a large piece of vacant land is wasted on site. Connectivity between the site and green belt should be improved.

Summary
Nice residential community is located along the major street, while a large piece of vacant land is wasted on site. Connectivity between the site and green belt should be improved.
A new S-train line is under construction on the southern side of the railway line. This tunnel provides future opportunity to connect south and north side of the railway, and a improved landscape along the railway line is in need.

An area of mixed service, office, and residential buildings is located along the major street that is on the west bank of the Rhine River. These buildings have become an obstacle of connecting future green belt to the river bank.

The residential area outside the southern edge of the project site is primarily comprised of three to four storey buildings. The streets are local and building scales are small and pedestrian friendly. New development along this street should create connection to this community.

Currently the river bank has a paved path with no other landscape improvements. Design has already taken place on the northern side of the bridge, along with the commercial development alongside the bank. Therefore, future planning should continue the early development.

The former fortress has been reserved and used as railway bridge foundation and skywalk which people could use to cross the street. This structure provides an opportunity to connect green belt with the bank on the sky level, without interrupting the traffic in between.

A regional subway line that is connecting Cologne and Bonn stands between the project site and the river bank, along with a major street aside. This traffic line is disconnecting the site and the river bank, blocking the riverfront view looking from the site.

The Oval Office building complex is nicely designed with prairie like landscapes around. These two buildings are easily visible from the subway line, which makes them a landmark adjacent to the site. Future development could extend this landmark to create an attractive riverfront skyline.

Currently the river bank has a paved path with no other landscape improvements. Design has already taken place on the northern side of the bridge, along with the commercial development alongside the bank. Therefore, future planning should continue the early development.
Cologne is one of the warmest cities in Germany. It has a temperate-oceanic climate with relatively mild winters and warm summers. It is also one of the gloomiest cities in Germany, with just 1427 hours of sun a year. Precipitation is spread evenly throughout the year. Cloud coverage is relatively high in Cologne which might hinder outdoor activities, and moderate snow in winter could reduce outdoor activities, however creating opportunities of snow related activities. Nevertheless, Cologne as a high-latitude city with such a moderate climate, is relatively an ideal location for outdoor activities and popular tourist destination in the summer and early fall.

Summary
Cologne is one of the warmest cities in Germany. It has a temperate-oceanic climate with relatively mild winters and warm summers. It is also one of the gloomiest cities in Germany, with just 1427 hours of sun a year. Precipitation is spread evenly throughout the year.

Reference: http://en.wikipedia.org/wiki/Cologne#Climate
Chart source: http://weatherspark.com/averages/28628/Cologne-Bonn-Nordrhein-Westfalen-Germany
Cologne is built on the Rhine River with majorly alluvial soil type along the bank. This type of soils are loose, unconsolidated soil or sediments.

Summer time in Cologne has the highest sun elevation which is about 63 degree above the ground, while December has the lowest of 15 degree. Low elevation of the sun will lead to much shadow area on the ground with more indoor sunlight. Meanwhile, Cologne has a daytime length from as low as 8 hours a day to 16 hours. Summer time in Cologne has about 16 hours daytime, which could provides good opportunity for outdoor activities.

Summary
Cologne has a low sun elevation and as low as 8 hours of sunlight in the winter due to its high latitude. This could shorten the length of outdoor activities. Summer time in Cologne has about 16 hours daytime, which could provides good opportunity for outdoor activities.
Regional Topography
Cologne is located at the beginning of the lower Rhine fluvial plain and is surrounded by mountains on the south and east which are marked by the yellow color.

Site Topography
The whole site is relatively flat slightly sloping toward the Rhine River. There are two relative low point on site which are shown in blue dots. The red dot shows the high point on site.
Nearly 70% of the wholesale market is covered by impermeable pavement, and the rest of the land is covered by buildings and some pocket green spaces. The east side mixed-use area is densely occupied by buildings and paved traffic ways. There are two pieces of bare land on site with hardly any vegetation, and it is currently a permeable soil ground.

Areas that are marked by dashed lines are the only biologically diverse lands left on site, and they are valuable to the site.
11 FLOOD PLAIN AND FLOOD MANAGEMENT

A 50-Year Flood Event of the Rhine at Cologne in 1995

Summary
Cologne is located at the start of the plains of North-Rhine Westphalia. It is the most flood affected city in Europe and has endured the last flood with a gauge height of 10.69 m. The flood of 1995 required extreme assignment of flood fighting forces and materials.

The Cologne drainage and flood service company is responsible for flood protection, flood management and flood prevention. Flood prevention actions have taken place in the past decades. The construction of the stationary walls with a total length of 2,878 m has been completed and steel pilings have been installed on the edge of the railway as protection.

Facts for the Cologne river gauge (KP)

- 0.80 m low water level / drought 2003
- 3.21 m average water level
- 5.75 m first overflow level
- 6.20 m flood mark I
- 8.30 m flood mark II
- 10.63 m flood in 1993
- 10.69 m flood in 1995 + 1926

Yearly 4.29 m fluctuation which is currently accommodated by the bank design.

Return periods (1901-2011)

- 7.50 m KP 1 year
- 8.00 m KP 2 year
- 8.50 m KP 3 year
- 9.00 m KP 4 - 5 year
- 9.50 m KP 8 - 10 year
- 10.00 m KP 15 - 20 year
- 10.70 m KP 40 - 50 year
- 11.30 m KP 100 year
- 11.90 m KP 200 year
- 12.50 m KP 500 year

100-year Flood Plain Section

Building
Street
Subway Line
Second Level Bank
First Level Bank
Rhine River

http://www.uvo.nrw.de/uvo/uvo_main.html

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- 5.75 m first overflow level
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- 3.21 m average water level
- 5.75 m first overflow level
- 6.20 m flood mark I
- 8.30 m flood mark II
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- 10.69 m flood in 1995 + 1926

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Rhine River

http://www.uvo.nrw.de/uvo/uvo_main.html
The existing river bank near the site is comprised of two levels of flooding control plains. The first level is currently used as a wide riverside promenade, about 1.5 m higher than the water level. The river bank is grown with grasses and shrubs, and a strip of large gravel base above the water. The second level is 1.5 m lower than the subway line, with a gravel-paved path and natural vegetation along the path. The Riverfront landscape is lacking the appropriate management, leaving natural vegetation to grow naturally. A flood pumping station which has been nicely designed is located next to the subway station. There is lighting inside the building at night, making it an attraction along the river bank.
Summary

Strengths
Recent urban development has reshaped the river bank area, creating a modern riverfront mixed-use zone. The image of the river bank has been improved through the development. Crane House buildings are the new landmark of the bank. Nicely designed plaza and recreational facilities create enjoyable outdoor spaces for people to stay. The west bank is gradually becoming a modernized urban riverfront with architecture landmarks alongside.

Drawbacks
The promenade is pushed by the buildings along the bank towards the river, creating a shaded and narrow area in the afternoon, which negatively affects the quality of the space.
13 VEHICLE TRANSPORTATION ANALYSIS

Yellow lines show the major streets in the city.
U signs show the subway stations.

Legend
- Railway Line
- Major Aterial
- Subway Line
- Minor Aterial
- Plaza on Ring Boulevard
- Major Roundabout
- Minor Roundabout
- Subway stop
- Bus Stop on Site

Summary
There are two major arterial routes that pass by the site and one major street that passes through the site which connects the site with the Ring Boulevard.

The railway line is an elevated physical barrier that blocks visibility and access to the site to the north. A subway stop on the east of the site is providing convenient transportation to the site.

The wholesale market is facing a direct connection with major streets. The connection to the green belt on the west and southwest is interrupted by streets.
The wholesale market has a series of vehicle lanes which are mainly built for trading activities. Parking lots are densely concentrated around the market hall. East of the side has minor arterials passing through, while few local roads around buildings, which indicates the high density of the building complex. Major entrance and exit vehicle roads that are connecting the site with its adjacent city streets are connected to the minor arterial on the south.
The streets inside the wholesale market are mainly designated for moving vehicles and are totally non-friendly. They are in extremely large scale and paved with concrete pavements that create a harsh environment for the site. The major bike and pedestrian paths are along the arterials which are mainly in south-north direction, whereas east-west direction is lacking major bike and pedestrian paths. Connection between south and north of the railway lines need to be improved. Bike and pedestrian paths on the east of the site is as chaotic as the vehicle lanes, which may be results from the dense and less organized buildings.

Legend
- Railway Line
- Major Bike and Pedestrian Path
- Minor Bike and Pedestrian Path
- Wholesale Market Road in General (Non-pedestrian friendly)
- Community Level Path
15 NEIGHBORHOOD LAND USE MAP

Legend
- Residential building area
- Special housing area
- Mix building
- Commercial area
- Industrial area
- Special construction area
- Green area
- Waterbody
- Areas for supply and waste disposal
- Public purpose areas
- Railway system

Summary
1. Site is located close to old city core which is densely occupied by old buildings. There are mixed-use and residential buildings adjacent to the southern edge of the site.

2. There is one power plant and electric power transformation station located in the north and another on site.

3. Commercial area is located on the east of the site along the major street.

4. The major residential area is located in the south of the site outside the old city core, which indicates the later expansion of the city due to inadequate space in the city center. Kindergartens and schools are densely located around residential area near the site.
COLOGNE GERMANY
A GREEN BELT EXTENSION AND RE-IMAGINATION MASTER PLAN

16 SITE LAND USE MAP

Summary
The wholesale market has occupied most of the west side of the site. There is a small portion of residential and offices next to the market hall along the main street. Historical monuments are designated preserved architectures on site. There is one new residential area on site that should be retained. Current under-used and vacant lands are overgrown with grasses and weeds, with only one small area is currently used as urban agriculture area. These areas should be fully used later. The railway separates the site from its northern neighborhoods, and better connections are expected to be developed.

Map Source: City of Cologne
### Population Density

- **Inhabitants per square kilometer**
  - under 1000
  - 1000-1999
  - 2000-3999
  - 4000-6999
  - 7000 and more

### Single Person Households

- **Share of households (in %)**
  - under 35.0
  - 35.0-39.9
  - 40.0-44.9
  - 45.0-54.9
  - 55.0 and more

### Senior Households

- **Proportion of elderly households in all households (in %)**
  - under 20.0
  - 20.0-24.9
  - 25.0-29.9
  - 30.0 and more

### Households with Children

- **Share of households (in %)**
  - under 15.0
  - 15.0-19.9
  - 20.0-24.9
  - 25.0-29.9
  - 30.0 and more

### Use of Public Transportation

- **Proportion of respondents who regularly use public transportation (in %)**
  - under 40
  - 40-50
  - 50-60
  - 60-70
  - 70 and more

### Rent Price

- **Euro per square meter living space**
  - under 7.00
  - 7.00-8.00
  - 8.00-9.00
  - 9.00-10.00
  - 10.00 and more

### Summary

1. The population density of the project site is lower than that of the city center.
2. Household type map shows that districts outside the city center area have more families with children and senior households. Inner city area is mainly inhabited with single person households, which indicates a office, commercial, and service functioning oriented district.
3. West and east side of the project site has a slight difference on the amount of single person households.

1. Cologne has shown a trend of growth in housing market in 2008, which indicates the economic growth and the increasing in house need of families. Residential development on the project site has a great potential to attract residents in.
2. Rent price of the east side of project site is higher than the west side, which may influence the current development of residential area. Rent price along the Rhine River is higher than that of other areas.
18 EXISTING GREEN BELT FUNCTION ANALYSIS

Green Belts of Cologne

Seconde Green Belts of Cologne

First Green Belt (Ring Boulevard)
Second Green Belt
Outermost Green Belt

Project Site

Hiroshima-Nagasaki Park

Media Park

Vorgebirg Park

Volks Garten Garden

Cologne South Stadium

Frieden Park

Inner Green Belt

Dense forest/Pond/Open lawn/Cafe/Theater

University campus/Open lawn/Promenade with dense tree lines

Open grassland/Small playing gardens

Several Sports fields

Groves/Open lawn/Pergolas/Small gardens/Former fort as garden structure/Small farmlands

N.T.S.

Source: Google Earth

BACKGROUND INVENTORY AND ANALYSIS
Background Inventory and Analysis

A Green Belt Extension and Re-Imagination Master Plan

Cologne, Germany

18 Existing Green Belt Function Analysis

Summary

1. Most of the green space has been designed into open meadows with groves or densely planted forests on the periphery. People use these spaces as playgrounds, picnic areas, and sport fields.
2. Big ponds can only be found in a few places with an open plaza or open meadow, and certain small waterscapes can be found in some parks. Gardens with flowering beds can be found in the small parks. The Rhein park on the East bank has the most amount of flowering beds, which might be due to the high visiting rate of nearby commercial area and the park itself.
3. Museums, cultural institutes, commercial complexes, and a television tower are located close to the green belt. This could bring a mutual benefit by grouping these public facilities, because more people can be attracted in there for multiple purposes.
4. Most of the parks are screen by the railway line on the east side, while some are sandwiched by railway lines or highways, resulting in a loosely designed green spaces with a few connection to the neighborhood.
5. Only one group of sports fields is found on the south which could be not enough to supply the city. Playgrounds are loosely designed and spread into open spaces. There is a lack of diversity in the open space design.
6. Landmarks could be considered in the green space design. The television tower and Cologne Cathedral are the two major landmarks that can be seen in certain spots throughout green belt.
In 2009 the city of Cologne presented an inner city master plan of Cologne. This master plan took the inner city green belt into consideration and intended to further expand the existing green belt on the west side of the city towards the bank of Rhine River. Development of green belt along the east bank of the Rhine River was also under consideration, meanwhile, the inclination of creating a better connected green system between east and west banks was further reinforced in the master plan.

The project site stands in the south end of the existing green belt and is disconnected from the green belt by the Rhine River, resulting in a closure of the green system and disconnection with the east bank landscape.

In the master plan, the planning team extended the green belt into the site all the way to the bank. Former wholesale market was removed from the site, retaining the market hall as a historical monument on site. A mixed-use community was developed alongside the railway and southern streets, embracing the green space in between the community.
Urban Space of Rhine River Area
The existing structural development is clearly shown on the left of the Rhine River, while the right bank skylines remain concernable out there. The need for a clear thematic focus on the design of open space throughout the Rhine River area is generally high. The current conceivable development of building height is at maximum of 60 meters. Protection measures against noise and floods in the terminal region of the Rhine should be adopted.

Inner City Green Belt
Open space corridors are the most important asset of the city next to its transport infrastructure. The design of green belt should keep the space open and public, and multi-purpose urban parks are desired. Neighborhood parks adjacent to residential areas of the New Town play an important role among the communities.

Railway and Public Transportation
Special attention should be paid to the railway ring and promotion of existing and development of additional breakpoints on railway ring in attractive addresses, promoting a barrier-free, safe and attractive ring in the city. The transportation corridor inside Kanal Street-University Street-Vorgebirgestor should be extended directly toward Market Street. The upgrading of infrastructure along railway ring can improve the quality of public transportation.

Development of the Wholesale Market Area
Wholesale market area is the last major long-term urban development of the inner city left bank area, and its development will lead the green belt on its way to the southern city shore. The proposed North-South rail station will make it possible for better connecting the public transportation system, and can bring economic benefits to the surrounding district. The development of the wholesale market area bring stimulate the revitalization of housing market in the southern city.

Historical and contemporary landmarks should be considered in the southern downtown expansion planning. Keeping the wholesale market increases the opportunities to continue the tradition of the district.

The wholesale market should be investigated for its further use and temporary use. The Ice and Swimming Stadium in the north and Museum of East Asian Art in the west are both landmarks of their own districts, and the wholesale market has the potential to be a new functional landmark for the southern city.
Key Information
A gateway of the green belt could potentially be created with the new train station planned to be built on site.
Proposed Transportation Plan
Office for urban development and statistics

Legend
- Existing major traffic route
- Planned route
- Relocation of road (partially in tunnel)
- Suggested road
- Existing main street
- Planned main street
- Living area road
- Residential street
- Shopping street
- Points of development plan routes
- Street dismantling
- Bicycle route network
- Main bike connection
- Bike route

Key Information
1. A new street which is connected to the round out is planned along the railway. (Red dashed line)
2. A new connection is created between north and south of the railway. (Green dotted line)
3. A shopping street will be developed along the major street which is in the middle of the site.
1 LITERATURE REVIEW OF URBAN DESIGN

A PATTERN LANGUAGE ---CHRISTOPHER ALEXANDER

PURPOSE OF STUDY:
Gain an understanding of good European town planning and urban design strategies. This book introduces a general pattern language that Christopher Alexander studied and discovered throughout his research on urban design in the European countries. Several chapters that are related to public space design and building configurations are chosen to be reviewed, and knowledge will be learned to contribute to creating positive, effective, and welcoming urban open spaces; in the meantime developing an active mixed-use community which enables its residents to establish a strong identity about their community.

Activity Nodes
1. Community facilities scattered individually through the city do nothing for the life of the city. Public facilities should be grouped densely in a small public squares which functions as a node. Spread the nodes about 300 meters apart and connect them with major paths.

The properties of such a node:
a. Each node should draw together the main paths in the surrounding community.
b. Keep the squares small enough to concentrate activities—45’60 feet
c. Facilities which are grouped together should function in a cooperative manner, and attract the same kinds of people, at the same times of day.

2. A mixture of household types in the neighborhood can encourage social intercourse between people from different ages, professions, family status.

Positive Outdoor Space
1. A positive outdoor space is partially enclosed and has certain degree of convexity.
2. Buildings that are isolated from each other create leftover spaces which are negative spaces.

Identifiable Neighborhood
1. Small population no more than 400 or 500 inhabitants
2. Small area—no larger than a block (100 meter)
3. Keep major roads outside the neighborhoods

House Cluster
1. Three kinds of households should be included in the community development for people with different level of privacy needs. Private homes, public homes, and in-between homes should be included.
2. People feel comfortable in a group of houses that forms a cluster, with the public land between them jointly owned by all the householders. A cluster of 8 to 12 houses around some common land and paths will increase sense of community. Arrange the cluster in a way that anyone can walk through without feeling like a trespasser.

Building Complex
1. A building cannot be a human building unless it is a complex of smaller buildings or smaller parts.
2. One large monolithic building prevents people from making human contact with other people in the building. Visitors feel it unfriendly and undifferentiated.
3. A building complex that takes the form of a collection of small buildings connected by paths, bridges, shared gardens and so on can facilitate human contact and circulation, and make the place unidentifiable.

Nodes

Positive Outdoor Space
1. A diameter of about 60 feet public square is a comfortable place to stay. It takes about 12 people to give life to such a size of the square. The place will feel deserted when it is too large with few people to give life to.
2. A person’s face is recognizable at about 70 feet, and two people can communicate fairly well within this distance.

Small Public Squares
1. A diameter of about 60 feet public square is a comfortable place to stay. It takes about 12 people to give life to such a size of the square. The place will feel deserted when it is too large with few people to give life to.
2. A person’s face is recognizable at about 70 feet, and two people can communicate fairly well within this distance.

Summary
1. Nodes could be developed as public squares with facilities of similar functions. Group facilities together to make them function in a cooperative manner.
2. Control the size of the public squares to create inviting and comfortable spaces. Create enclosure for the space.
3. Mix household types and use building complex to facilitate social interactions.
LITERATURE REVIEW AND CASE STUDIES
A GREEN BELT EXTENSION AND RE-IMAGINATION MASTER PLAN

2 CASE STUDY---THE NIDDA VALLEY GREEN BELT IN FRANKFURT

Introduction
Site Location: Frankfurt, Germany
Size: 8,000 hectares
Project Type: Green Belt Development
Key Information: Green belt occupies 52 percent of the total area of Frankfurt, and forms a 70 km circle around the city. It consists of 40 parks, 200 attractions, 350 km road network, and lots of educational programs.

PURPOSE OF STUDY:
Gain valuable experience in designing a publicly interactive urban green space from a previous green belt project.
This green belt project in Frankfurt is an award-winning project in Germany. With both developed on the big river in Germany, Frankfurt shares a similar geographic and cultural context with Cologne. Both the cities have a city-wide green belt surround the city center, and have it designated as a municipal green space for citizens to conduct various outdoor activities. Therefore, this project has been chosen as a case study to study the valuable experience in designing a good urban green belt under the urban context, in the meantime adopting creative programs and use for this project.

Green Belt History
Migge made the regional urban green space plan in 1928. The city was planned to be developed as a coherent landscape with a historic core as the center. A zone with parks, productive settlement parks were designed. Green spaces were designed as urban interior landscapes surrounded by residential belts. In 1978 the city started to develop the city green belt concept and launched a series of competitions for the idea of development in 1990. Green belt was listed as a conservation area in 1994, and a series of new development took place then.

Goal of Green Belt Development
The medium-term goals are to give the Green Belt improved access and better connections to inner-city green spaces and open areas as well as to the recreation areas in the region.

Project Highlights
1. The “Discover, explore and learn in Frankfurt’s Green Belt” program
The program brings children and young people with lots of fun exercises to allow them to take a closer look into the facts in nature. There are about 60 topics to be taught. Learning points have been set up in the difference landscapes within the Green Belt. A brochure is provided online with the list of programs throughout the year.

Design Elements
Flower festival
Summer workshop
Green Belt animal collective passport
Forest game system
Learning center at the old airfield
Forest school

Three children in the forest a work of art built of stones.
http://www.frankfurt.de/sixcms/detail.php?id=41308&_frmpar_id_el-tem=2805
http://www.frankfurt.de/sixcms/detail.php?id=41294&_frmpar_id_in- half=319904&_frmpar_id_el-tem=2805

Map of Green Belt in Frankfurt

The Frankfurt Green Belt Monster statue in Frankfurt, Germany
http://www.worthpoint.com/blog-entry/its-not-easy-green-steiffs-emerald-creations

Adventure Playground Riederwald --- Forest Game
Children are allowed to do sawing and hammering, create open fires, dig in the dirt and many active play and experiments.

Reference:

2 CASE STUDY---THE NIDDA VALLEY GREEN BELT IN FRANKFURT

Project Highlights

2. Old Airfield Transformation
The previous military site was transformed into a park that accommodates recreational activities such as skateboarding, kites or picnics. A learning center is built for children to learn about nature. The Tower Cafe is a green classroom where children can do outdoor observation and experiments. The western part of the old airfield is reserved for nature. It has been developed into a wild place from a nearly nothing natural site. There are wet and dry habitats on site, with 125 plant species found in 2004.

Design Elements
Nature reservation
Learning center
Playground
Day care center
Leisure park
Tower cafe

Concrete landing strip is smashed and underlying soil is revealed to support the growth of vegetation.

Tower Cafe
It is also used as a "green classroom".

Playground
It is transformed from previous landing

http://imodernist.blogspot.de/2012/09/re-use-on-big-scale-germany.html

3. Comic Art and Monuments
A series of comic art sculptures are spread throughout the green belt, which add more interest to the green space. There is a museum of comic art which is set up to document and exhibit art works. The I Monument provides people an opportunity to post their own and brings laugh from the public.

4. Barbecue Area & Trails & Natural Reserves
There are designated locations for barbecue. Most of the places are in the city parks, and people have to bring their own equipment. The green belt biking trail leads to 63 kilometers around the Frankfurt, and a well-marked 65 kilometers loop trail is provided for hiking. There are a variety of natural spaces throughout the green belt, providing different feelings for visitors, but all in a natural look.

Tower Cafe
It is also used as a "green classroom".

Biking Trail

Natural Forest


http://frankfurt.de/sixcms/detail.php?id=4129&_ffmpar[_id_inhalt]=122048&_ffmpar[_id_eltern]=2805

Reference:

Summary
1. The “Discover, explore and learn in Frankfurt’s Green Belt” program provides a variety of activities for children to learn from the nature and have fun at the same time.
2. Different types of landscape have been well preserved throughout the green belt, which maintains the diversity of the landscapes.
3. Old airfield is nicely designed for public activities, and wildlife habitat has been reclaimed on site.
4. Attractive design elements are integrated into the green belt.
5. Biking and walking trails have been developed to encourage natural exploration.

Orchard

Savanna

Art Work in landscape

I Monument


**3 CASE STUDY---ZOLLVEREIN COAL MINE INDUSTRIAL COMPLEX**

**Introduction**
- **Site Location:** Essen, Germany
- **Size:** comprises 100 hectares
- **Designer:** PlanerGruppe GMBH Oberhasen
- **Budget:** 156,742,512 Euro
- **Completion Date:** 2001/ongoing
- **Land Use:** /g37/g85/g82/g90/g81/g192/g72/g79/g71/g3
- **Project Type:** Industrial Park, UNESCO World Heritage Site

**Project Highlights**
- **Landscape Design**
  1. A 3.5 km long pedestrian promenade circles the whole park area and invites visitors in to stroll and linger.
  2. Planting design takes reference from the existing industrial nature and its succession, and most of the existing vegetation around the abandoned land is preserved, meanwhile introducing more plants along the railway lines.
  3. Succession garden that consists of industrial forest, meadows at the coking plant, and lawns around the facilities illustrates the natural development on site.
  4. Materials from the site are recycled and re-used for new purposes. For example, rail lines are preserved and filled with pavers to create footpaths and bicycle paths

**Design Architecture into Recreational Facilities**
- Adaptive reuse of architecture as museum
- Design architecture into recreational facilities

**Transformation of Architecture**
1. Architecture design reserved the beauty of Bauhaus architecture and successfully transformed them into art museums, restaurants, casino, performance place, and conference hall. It is currently being developed as an incubator site for design and art.
2. A Red Dot Design Museum is transformed from a formerly old boiler, housing a collection of contemporary design and art. Shaft XII is reserved as an iconic element and landmark of the park.
3. A Ruhr museum is transformed from a coal washing plant and is connected with the ground level by a boldly designed escalator.
4. A solar powered Ferris wheel carries visitors through the coking plant to the top to catch the view. A swimming pool and restaurant were brought into the coking plant complex, and a linear canal was designed as reflective pool as well as ice skating place in the winter.

**Design Elements**
- Red Dot Design Museum
- Ruhr Museum
- Shaft XII Landmark
- Reflective Canal & Ice Skating Board
- Ring Promenade
- Sculpture Forest

**Reuse of train tracks**
- Promenade circulates the site

**Landuse Plan**
- Gewerbepark North-west
- Gewerbepark South-west
- Ring Promenade
- Sculpture Forest

**Summary**
1. Previous industrial complexes are well preserved and adaptively reused in the plan. New functions assigned to old facilities have brought them alive, and landscape design is coordinating with architectures to create beautiful decoration that enriches the architecture.
2. Commercial activities are attracted to the site and creating profits for the neighborhoods.
3. Buildings that are designed to integrate interesting activities are more attractive to visitors.
4. Paving railway lines into walking trails creates interesting visual effect and recycles materials on site which is very sustainable.

**Reference:**
- [http://www.mai-nrw.de/Zollverein-World-Heritage.41.0.html?&L=1](http://www.mai-nrw.de/Zollverein-World-Heritage.41.0.html?&L=1)
- World Heritage Zollverein, published by Entwicklungsgesellschaft Zollverein mbH
4 CASE STUDY---SUSTAINABLE RESIDENTIAL DEVELOPMENT

Geos Net Zero Energy Neighborhood

Introduction
Site Location: Arvada, Colorado, USA
Size: 25.3 acres
Designer: David Kahn Studio & Michael Tavel Architects
Completion Date: expected 2014
Land Use: Industrial
Project Type: Residential/Mixed-use

Project Highlights
1. Building arrangement provides energy savings by maximizing passive solar heat and natural day lighting, which lowers energy consumption by one-third.

2. 8.5 acres of parks and open space, including fruit tree co-ops, community gardens, play areas, percolation parks, town squares, event spaces, and mixed-use meadows.

Site Plan

4. Percolation parks located throughout the site function as both neighborhood green spaces and storm water management systems, and collect and filter runoff from streets, sidewalks, and plazas.

5. Social programming integrates nature and agriculture into the fabric of everyday life, letting residents to take active roles in managing their resources and environment.

6. Diverse housing type including single family homes, combined live/work units, connected town homes, and senior co-housing that will attract a resident population with a range of incomes, cultures, and ages.

Sustainable Features
Percolation park
Rain garden
Community supported farm
High performance passive solar buildings
Photovoltaics on every rooftop
Solar Thermal supplements Geothermal

Introduction
Site Location: Waltham, Massachusetts, USA
Size: 12 acres
Designer: Richard Burck Associates
Budget: $3,080,640 (Phases 1 & 2, site work included)
Completion Date: 2012
Land Use: Brownfield/Mixed-use
Project Type: Courtyard/Plaza
Multi-family residence/Office

Pedestrian Courtyard

http://www.dkahn.com/geos.html

Sustainable Features
Water infiltration and underground retention
Rain gardens
Contaminated soil treatment
Mixed-use development
Historical building adaptive reuse

Watch Factory, Phase 1 and 2

PURPOSE OF STUDY:
Gain knowledge in designing sustainable communities to benefit the later mixed-use development in a sustainable manner. Two sustainable residential development projects are studies to gain knowledge about integrating creative green infrastructures into residential community development. In the meantime, the project in Colorado is studied as a showcase of designing socially active and responsible mixed-use community.

Project Highlights
1. A former manufacturing hub on the Charles River, the Watch Factory has been transformed into a mixed-use area from a complex of historic industrial buildings. The site contained hazardous materials from more than a century of manufacturing, electroplating, and polishing timepieces. Contaminated soils were identified and either capped or removed before redevelopment.

2. Stormwater is managed by directing sheet flow into gravel infiltration trenches, which hold the water in underground retention structures and allow it to infiltrate.

3. Cobblestone runnels elegantly direct and runoff from roof gutters into rain gardens, offering a visual display of the stormwater management process.

4. The rain gardens were planted with Pennsylvania Sedge; they include a rubber liner and pipe that discharges the cooled and filtered runoff into the Charles River.
CONCLUSIONS
A GREEN BELT EXTENSION AND RE-IMAGINATION MASTER PLAN

1 POTENTIAL COMMERCIAL LAND VALUE EVALUATION

Legend
- Major Arterial
- Minor Arterial
- Tram Line
- Railway Line
- Highest Value: adjacent to major arterials, and east side has nice view to Rhine River
- Potentially Highest Value: adjacent to railway lines with potential connection to neighborhood traffic
- Second High Value: adjacent to minor arterials which provide good transportation/close to residential area with customers
- Third High Value: adjacent to densely planted green belt which means less connection to surrounding resident/adjacent to minor arterial
- Lowest Value: Land is isolated from major traffic, and east part is an existing residential area.
2 POTENTIAL RESIDENTIAL LAND VALUE EVALUATION

Legend
- Major Arterial
- Minor Arterial
- Tram Line
- Railway Line
- Highest Value: west park is adjacent to green space with minor traffic disturbance, and east has river view.
- Potentially Highest Value: adjacent to market hall area where could potentially transformed into a public recreation facility.
- Second High Value: Adjacent to existing residential area which provides good community environment/west part has minor traffic disturbance.
- Third High Value: Adjacent to major arterial with convenient transportation but has noise problem.
- Lowest Value: Adjacent to railway lines with noise disturbance/partially blocked contact with adjacent neighborhoods.
1. Deep historical roots of the wholesale market set up a rich cultural background for the site and bridge emotional connection with local residents.
2. A new residential community which has a nice community environment is existing on the site.
3. There are bus stops, subway and train stations on site which create convenient transportation to the site.
4. Major arterials run through the site and connect the site directly to the city center and city of Bonn in the south.
5. The site is adjacent to the green belt and sport stadiums which provide ample recreational opportunities for residents.
6. The Rhine River next to the site provides a nice view and connection with riverfront landscape, and river side’s current rent price stays at the highest level along with the city center.
7. Market Hall is preserved as historical building with a profound historical meaning in it.
8. A new tunnel is developed under the train line bridge next to the Arterial along the river bank, which promotes connection between the site and its northern park.
9. Cologne has a temperate climate as a city of high latitude, and there is not much extreme hot or cold weather.
3 SWOT ANALYSIS

OPPORTUNITIES
1. Market Hall could potentially be transformed into a landmark for the site.
2. Existing warehouses on the wholesale market could potentially be reused on site to reduce deconstruction cost and maintain historical identity that improves its cultural value.
3. Future construction of the train station and tram lines on the site enhance connectivity between the site and city center, provide opportunity to establish a gateway for the site, and bring economic benefits to the district.
4. The project site is located close to the Rhine River, which could potentially increases land value through further developments.
5. Northern riverfront mixed-use and commercial developments are setting a great example for the riverfront development of the project site, and establishing connection with the north will create a more attractive and cohesive riverfront image for the city.
6. Adjacent to both northern densely populated city center and southern residential houses, and it provides the site reliable customer sources for future mixed-use development.
7. The city is seeking visual and connection improvement along railway lines, and a barrier-free, safe and attractive railway line is expected.
8. Existing green belt is lacking the function diversity for recreation purposes, and future development of the project site will fill in the blank.
9. Connecting to existing green belt adjacent to the site will create a naturalized landscape chain that increases the land value of the site.
10. As an international cultural metropolitan, Cologne offers much for the site to inherit and which could provides the site opportunities to host cultural events as one of the major gathering spaces.
11. Site-wide promenade proposed by the city shows a great attention on pedestrian connection throughout the green belt.
12. Southern district is lacking a landmark to enhance its identity; while east, west and northern districts all have their landmarks.
13. The site has been included as a critical part of the master plan in attempt to achieve an enclosed city-wide green belt, and the city is paying much attention on this project.

THREATS
1. Flooding potential of Rhine River challenges riverfront design.
2. Railway lines could continuously disconnecting the site with its northern district.
3. Arterials and collectors are physical barriers for green belt connection and will cause street crossing issue.
4. New tram line will cause traffic jam and interrupt pedestrian crossing.
5. City proposed new roads through the green belt could cause disconnection between existing and new green belts.
# TABLE OF CONTENTS

## DESIGN PROGRAMMING
1. MISSION STATEMENT
2. PROJECT GOALS AND OBJECTIVES

## DESIGN CONCEPT
1. CONCEPT DIAGRAM
2. MASTER PLAN
3. AERIAL VIEW
4. MASTER PLAN SESSION I: WAREHOUSE PROMENADE & DENSE GROVE
5. MASTER PLAN SESSION II: MIXED-USE BUSINESS ZONE & TRAIN STATION PLAZA & SHOPPING COMPLEX
6. MASTER PLAN SESSION III: MARKET HALL PLAZA & MIXED-USE ZONE & RESIDENTIAL AREA
7. MASTER PLAN SESSION IV: WATERFRONT GREEN BELT AND PROMENADE
8. BIKING AND PEDESTRIAN SYSTEM ANALYSIS
9. VEHICLE TRANSPORTATION ANALYSIS
10. MIXED-USE FUNCTION ANALYSIS
11. GREEN BELT SYSTEM ANALYSIS
12. SECTION I & II
13. MARKET HALL PLAZA PERSPECTIVE
14. WATERFRONT GREEN BELT PERSPECTIVE
15. DESIGN METRICS
16. VALUE EVALUATION

## REFERENCES

## ACKNOWLEDGEMENTS

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**DESIGN CHAPTER**
MISSION STATEMENT

Transform the project site into a part of the green belt system that completes the green belt connection to the riverfront of the Rhine River and a mixed-use district that connects well with the green belt, and in doing so creates a new social hub with increased cultural and economic value in the southern part of city of Cologne.
1. Develop a green belt that is **easily accessible and well connected** with existing green belt, the riverfront and the surrounding neighborhoods, and has attractive landscape with **optimized recreational function for the public**.

**Accessible and well connected with riverfront and surrounding neighborhoods**
- Develop a site-wide pedestrian and biking system well connected to the green belt as a whole and with its neighborhoods.
- Change on-site street system to better connect the site with neighboring streets.
- Develop breakpoints on the railway line to connect south and north of it.
- Break the obstruction of traffic lines between the site and riverfront by developing facilities to build easily accessible riverfront landscape.
- Establish better connections with the existing green belt.
- Combine full time and part-time vehicle paths and traffic control road system to facilitate walkability on site.
- Promote street parking and underground parking.
- Develop open and noticeable accesses to the community and green belt with recognizable signs, landscapes, architecture or structures.

**Attractive landscape with optimized recreational function for the public**
- Create visually attractive focal point and plazas as gathering spaces or special events.
- Provide active and passive spaces to meet the various needs of users, and various infrastructures and landscapes for different users.
- Provide a series of diverse landscapes, such as gardens, groves, open meadows and fountains which invite people to interact with, and in doing so build an interesting and dynamic green space.
- Build green belt promenades with attractive landscape alongside.
- Invite inspirational art works into the site to promote intimate interaction between people and arts.
- Introduce sport fields in the green belt.
- Build interesting playgrounds for children and introduce educational facilities to teach children the knowledge of green belt and nature.
- Design a riverfront promenade and open plaza with recreation facilities, meanwhile meeting the standards to prevent flood events.
- Introduce small commercial businesses, such as cafes, restaurants and bike rental, into green belt and integrate them with open gathering spaces.
- Introduce cultural institutes such as museums and galleries along the green belt to provide more recreation options for visitors.
2. Develop a mixed-use district as a **socially active community** that is well connected with the green belt.

**Socially active community**
- Provide various sizes of open space as social interaction nodes for residents to meet each other and as places for public events.
- Mix household types that attract a resident population with a range of incomes and ages; and build small to medium size building complexes and clusters to facilitate community interaction.
- Group offices, residential units, and commercials together in a cooperative manner to achieve functional connection within the community.
- Create spaces that are partially enclosed by architecture to promote positive outdoor spaces.
- Integrate community agriculture into community, letting residents to take active roles in managing their resources.
- Provide safe private spaces for office workers, single residents or people seek quietness.

**Well connection with the green belt**
- Use green spaces to build spatial connection between the green belt and the community, and plan buildings with openings toward the green belt to allow direct connection between residents and green belt.
- Plan open spaces between community and the green belt as transitions and gathering spaces, and attractive focal points that draw people in.
- Develop walking and biking trails that directly connect the community to the green belt.
- Plan commercials and offices along the green belt and open plazas.

3. Preserve and integrate **historical elements** into the plan, and develop a **strong identity** for the site as a way to create an attractive and memorable city **sightseeing destination** and to **increase land value**.

- Preserve valuable site features, building styles, and structures from the wholesale market area.
- Endow the market hall with new functions and develop it into a landmark of the site.
- Develop a gateway for the green belt in combination with the future train station, and provide open plaza and distinctive streetscape along the gateway.
- Provide places for traditional cultural events to take place, such as carnival and Christmas market.
- Develop an attractive riverfront landscape to improve the riverfront image for the city.

4. Pursue **environmental sustainability** in the development.

- Integrate green infrastructures in the landscape to achieve sustainable stormwater management.
- Preserve and reuse recyclable materials on site.
CONNECT GREEN BELT TO THE RHINE RIVER
IMPROVE RECREATIONAL FUNCTION OF GREEN BELT
ESTABLISH SOCIALLY ACTIVE DISTRICT
CONNECT MIXED-USE DISTRICT TO THE GREEN BELT
CREATE A LANDMARK FOR THE DISTRICT
ACHIEVE SUSTAINABILITY
3 AERIAL VIEW

COLOGNE, GERMANY

A GREEN BELT EXTENSION AND RE-IMAGINATION MASTER PLAN

DESIGN CONCEPT
• Dense grove area as part of the existing green belt, is preserved in the development.
• The existing warehouses represent the historical pattern and memory of this site. By retaining and reconditioning part of the warehouses for adaptive reuse, parts of the pattern and history are brought to modern life with new meanings.

• Warehouse promenade as a part of the green belt promenade, is designed for pedestrian use. There are cultural and commercial facilities alongside to attract people in.
• Indoor and outdoor sports fields are integrated into the green belt for public use, which improves the recreational value of the green belt.
• The future construction of train station will attract a considerable amount of people into the site, which brings a great opportunity for the development of mixed-use zone.
• New businesses are proposed around the train station. They are mainly shopping complexes with offices and apartments on top which provide customers directly for local businesses.

All the traffic which used to go across the train bridge on the ground are proposed to go underground, and in that way creates a traffic free plaza right outside the train station. It gives freedom for people to travel through the green belt and enjoy the shopping experience, and also provides an attractive landscape and a social gathering highlight for train station.
• Market Hall is preserved and repurposed into a cultural center which could host cultural events for the community. It creates a southern city landmark and attracts visitors to the green belt.

• Market Hall Plaza provides big open space for social gathering, outdoor performance and sightseeing spot. It is the place where people can gather together for Christmas market or Carnival festivals. People can interact with each other in here, and which makes this place a social hub of the site.

• Apartments and offices are located on top of retail space, and the architecture is designed to bring small yards into the center of the complex, which creates more private space for tenants to spend some leisure time in and enhance the sense of community.

• Mixed-use communities are closely connected to the green belt through passageways, green transitional spaces. By creating outdoor lounge space on top of retail spaces for tenants, people can better enjoy the view from indoors.
• Waterfront green belt building function is more business oriented, with a new hotel as landmark on the riverbank and high-end offices. A good Rhine River view will attract many business into the site.

• Riverbank landscape is mainly designed into an open promenade with terrace seating which allows people to lounge on it and enjoy the view of river. Small cafe business adds fun to the view for visitors.

• A big zigzag ramp is designed to allow every person to go across the river to the other side of the riverbank. With more parks built on that side in future, it creates a better connection between green belts. The ramp is also designed into a landscape which not only provides connection, but also creates a park highlight. The elevated platform also provides terrace seating for people to watch soccer games.
Mixed-use development and convenient multi-transporation facilitate access to the district and support day-to-night weekday-to-weekend activities.

Enclosure brings community-like private space for residents.

Enclosure brings semi-private relaxing space for office workers.

Zigzag space chain seduces visitors to explore and creates small gathering places.
Open green space serves as the elemental feature of green belt. By adding different recreational facilities and landscapes, it makes green belt a more multifunctional and attractive place. Mixed-use district is well connected with green belt, and can provide continuous visitor resource for green belt.
1 Multi-Transportation Section
- Traffic going underground creates a traffic free plaza right outside the train station, which brings good connection between green belt and the neighborhoods. It gives freedom for people to travel through the green belt and enjoy the shopping experience, and also provides an attractive landscape and a social gathering highlight for train station.
- Multi-transportation facilitates convenient access to the district, and creates a new southern city gateway.

2 Mixed-use to Green Belt Section
- The layout of mixed-use district is based upon providing good connection with the green belt. All the mixed-use area will have direct openings or promenade for access to the green belt space. Recreation facilities are designed around mixed-use zone to provide convenient service for tenants.
- Mixed-use district is designed into community-like spaces with series of small spaces throughout the district, while large open spaces in the green belt are more public and exposed. The combination of various type of spaces with multiple levels of openness, well supports a wide needs of people and creates interesting space flow throughout the site.
• The market hall is preserved as historical building and as the landmark of the green belt. By re-purposing it into a cultural center, this building will come to live in between all the cultural events, such as carnival festival, cultural festival exhibitions, art performances.
• The market hall plaza can accommodate large social events, and it is the major social gathering space. On the daytime, people can hang out enjoying the view; at night, people can have fun from shows. This place would be an socially active highlight of the district.
- Waterfront green belt is designed to be a fun place for everyone. Hotel customers can enjoy the view and have fun in the sports, and local visitors can try the rail bike and watch and play soccer games.
- A convenient connection up to the bridge and across the river to the other side of the city directly connect people and the green belt from both sides of the river.
### 15 DESIGN METRICS

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<tr>
<th>WELL-CONNECTED GREEN BELT</th>
<th>IMPROVED RECREATIONAL FUNCTION</th>
<th>SOCIALLY ACTIVE DISTRICT</th>
<th>DISTRICT CONNECTION WITH GREEN BELT</th>
<th>DISTRICT LANDMARK</th>
<th>SUSTAINABLE BENEFITS</th>
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<tbody>
<tr>
<td>Pedestrian Path</td>
<td>Sports Fields</td>
<td>Mixed-Use District</td>
<td>Pedestrian Path</td>
<td>Market Hall Cultural Center</td>
<td>Green Roofs</td>
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<td>Bike Lane</td>
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Proposed Development seeks to create a socially attractive and significant district. It attracts people in, which serves as the energy source for all the activities on site. Green space as the signature feature, which becomes a unique culture of the district and the city. Cultural facilities add cultural value to green belt. Businesses support each other in the mixed-use development, and new businesses generate revenue and provide jobs for the district. Recycling and adaptive reuse of materials existed on site reduces waste disposal and alleviates environmental stress.
Book References
4. World Heritage Zollverein, Published by Entwicklungsgesellschaft Zollverein mbH (Provided by AiB in Germany)

Web Resources
11. http://www.mai-nrw.de/Zollverein-World-Heritage.41.0.html?&L=1
mengarten_gardens/
Thank You

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Ao Shi