

Transformation possibilities of inner city railway yards



Transformation possibilities of inner city railway yards

Introduction / Theoretical framework / Calculation tool / Method & feasibility factors / Testing / Conclusions & recommendations

Content

1. Introduction;
2. Theoretical framework;
3. Developed calculation tool;
4. Method & feasibility factors;
5. Testing applicability calculation tool & method;
6. Conclusions and recommendations.

Transformation possibilities of inner city railway yards

Introduction / Theoretical framework / Calculation tool / Method & feasibility factors / Testing / Conclusions & recommendations

1 / Introduction



Transformation possibilities of inner city railway yards

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1 / Main problem

Inner city railway yards disrupt the urban functioning of inner city areas and these inner city railway yards do not exploit the full development potential of these inner city areas.

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1 / Research question

- Railway yards disrupt the urban functioning;
- Railway yards do not optimize the use of the potential;
- + Additional problems caused by location close to railway tracks.

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1 / Research question

- Railway yards disrupt the urban functioning;
- Railway yards do not optimize the use of the potential;
- + Additional problems caused by location close to railway tracks.

Research question

Which transformation possibilities give a feasible result for the transformation of inner city railway yards into multifunctional inner city living areas?

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1 / Research method

- Consists of 3 parts:
 - Calculation tool;
 - Method & feasibility factors;
 - Testing applicability tool & method;
- End products based on case study.

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1 / Research method

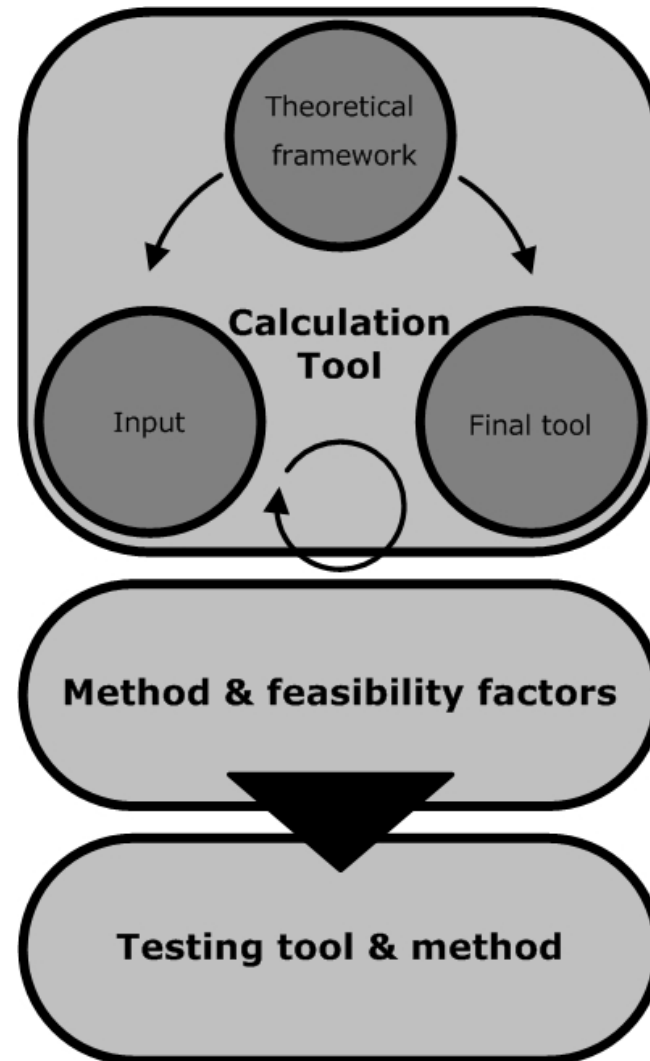
- Consists of 3 parts:
 - Calculation tool;
 - Method & feasibility factors;
 - Testing applicability tool & method;
- End products based on case study.
- Zutphen chosen as case study.

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1 / Research method

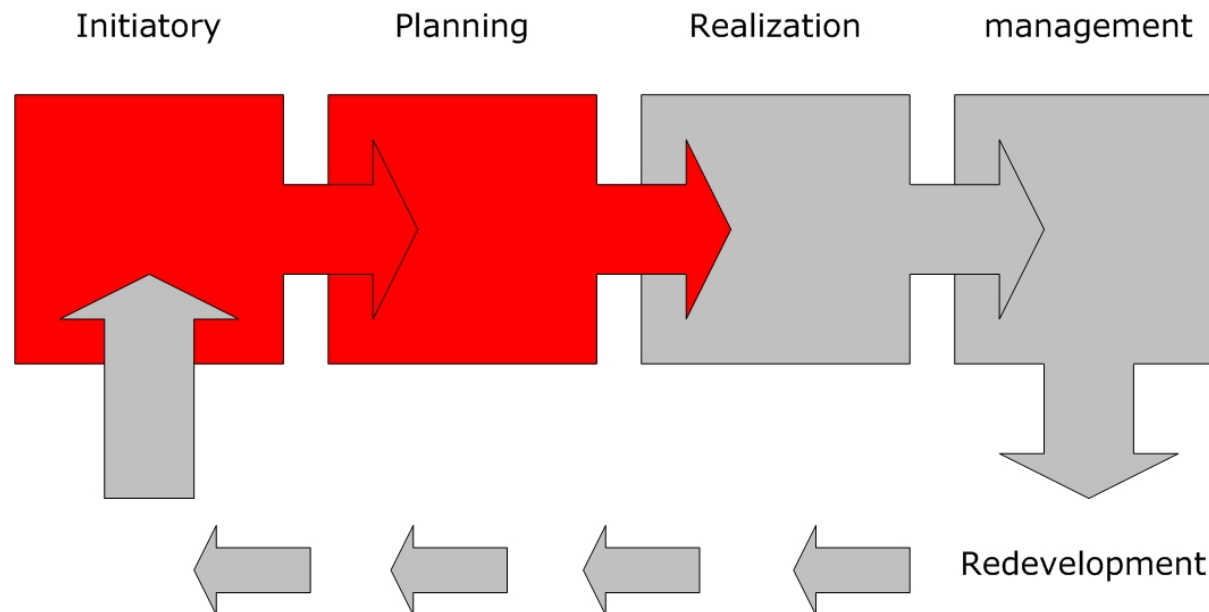
- Consists of 3 parts;
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- End products based on case study.
- Zutphen chosen as case study.



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1 / Application possibilities end products



- Private stakeholders: Financial consequences;
- Public stakeholders: Financial and qualitative consequences.

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2 / Theoretical framework



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2 / Railway yards

- Areas for storing, sorting, or loading/unloading, railroad cars and locomotives;
- Railway yard which are still in use are left out of the scope of this research;
- Railway yards moved for infrastructural reasons are included in the research.



Amersfoort



Groningen

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2 / Stakeholder analysis

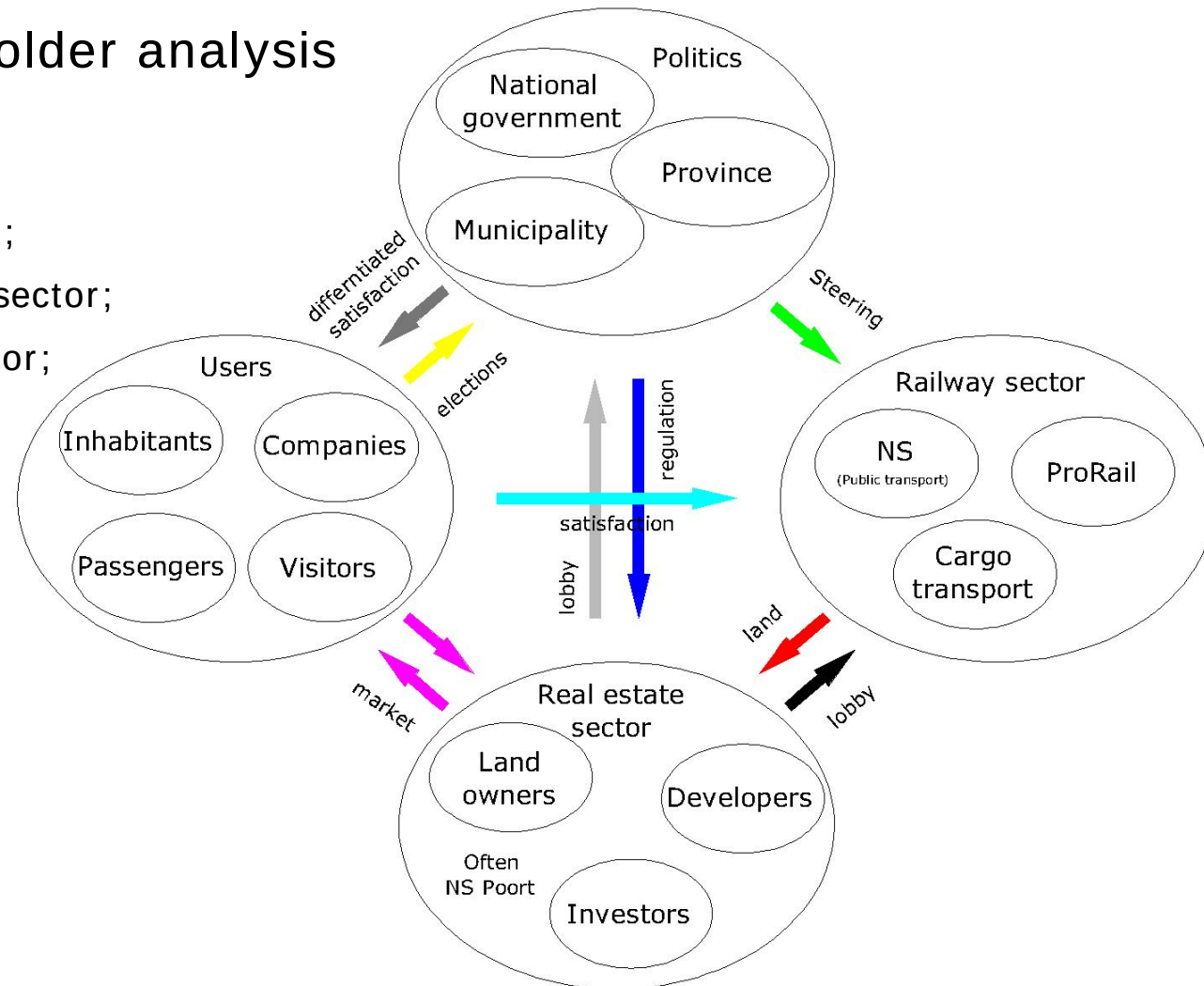
- Government;
- Real estate sector;
- Railway sector;
- Users.

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2 / Stakeholder analysis

- Government;
- Real estate sector;
- Railway sector;
- Users.



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2 / Characteristics of Railway yards

1. The costs are higher due to:
 - a. Restrictions on environmental regulations;
 - b. Solving the disrupting function of the railway yards;
2. Transforming railway yards is a very time consuming process;
3. Both financial and qualitative feasibility are important.

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2 / Environmental regulation

1. Regulations on sound;
2. Regulations on external safety;
3. Regulations on air pollution;
4. Guidelines concerning vibrations.

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2 / Environmental regulation

1. Regulations on sound;
2. Regulations on external safety.

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2 / Feasibility

- Financial feasibility.
- Qualitative feasibility.

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2 / Financial feasibility

- Land value is the base of the calculation method;
- High costs for land development;
- Residual land value compared with value based land value;
- NPV used to calculate real estate value.

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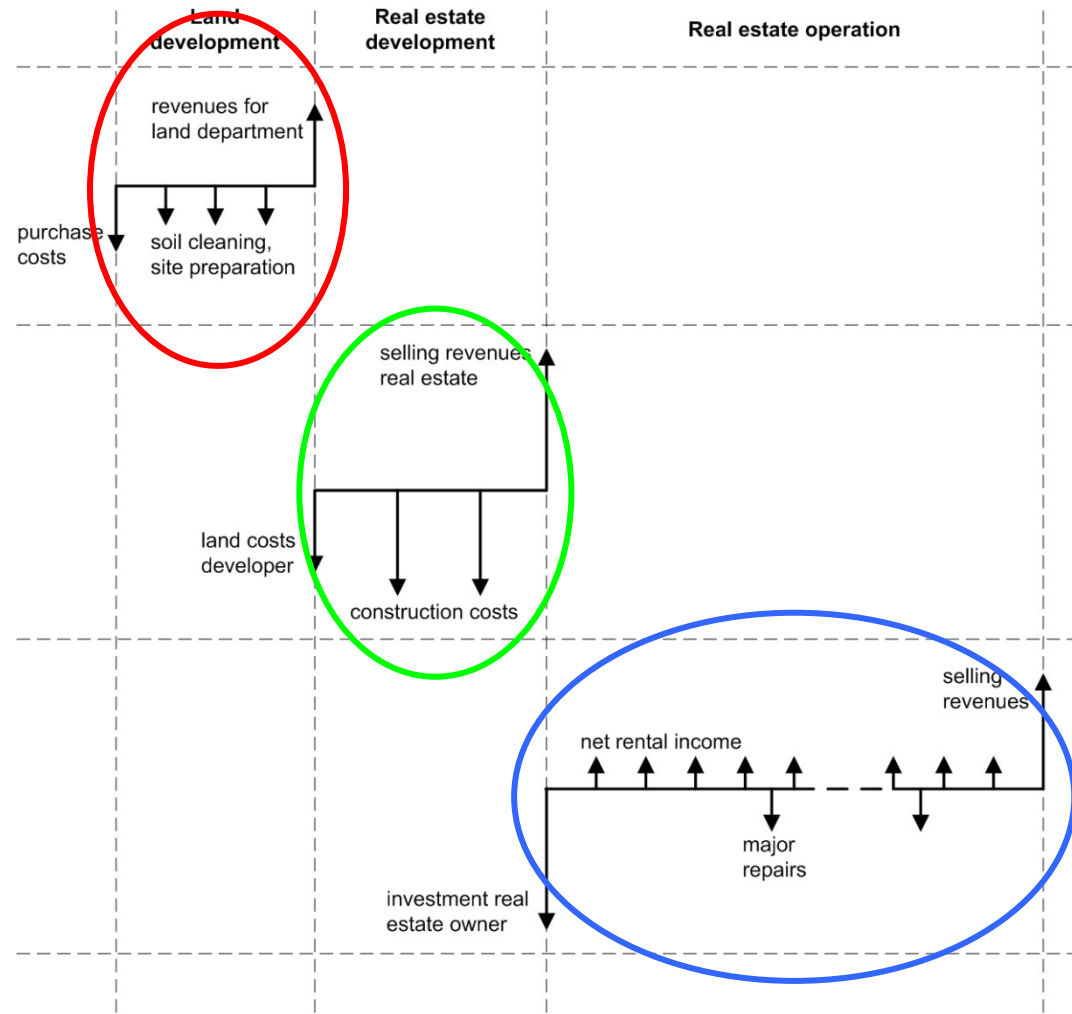
2 / Financial feasibility

Value based method

The actual costs for preparing the land.

Residual land value

The maximum price the real estate developer can pay for the land.



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2 / Qualitative feasibility / Existing plans

- Gain insights & determine standards for qualitative feasibility;
- Commonly accepted “good” redevelopments as references;
- If other qualities are preferred other references can be analyzed.



's-Hertogenbosch



Tilburg

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2 / Qualitative feasibility / Existing plans

Conclusions

- Suburban character;
- High level of green;
- High level of parking places;
- Function mix:
 - 60 % residential;
 - 40 % non residential.

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2 / Qualitative feasibility

- Urban type;
- Green area;
- Parking places;
- Function mix.

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2 / Use of calculation tools

- + Used to gain insights in consequences on the feasibility by simulation;
- + Most useful in the initiatory and planning;
- Reliability output dependent on reliability input.

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Introduction / Theoretical framework / Calculation tool / Method & feasibility factors / Testing / Conclusions & recommendations

2 / Theoretical framework / RICARDO

- Transparent calculation tool;
- Input method in line with the phase of the development;
- Design-and-calculating-method.

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2 / Theoretical framework / Adjustments to RICARDO

1. Adjust design part to environmental regulations;
2. Introducing a new calculation part;
3. Adjust the output.

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2 / Theoretical framework / Adjustments to RICARDO

1. Adjust design part to environmental regulations;
2. Introducing a new calculation part;
 - a. NPV-method for real estate value;
 - b. Land value as the base of the calculation;
3. Adjust the output.

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2 / Theoretical framework / Adjustments to RICARDO

1. Adjust design part to environmental regulations;
2. Introducing a new calculation part;
3. Adjust the output.
 1. The Main variant has to be as **financial feasible** as possible;
 2. The Main variant has to have a **urban type** like the reference railway area;
 3. The Main variant has to be as **green** as a the reference railway areas;
 4. The Main variant has to have a **parking** ratio like the reference railway areas;
 5. The Main variant has to be a **multifunctional living area**.

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3 / Developed calculation tool



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3 / Adjusting the design part

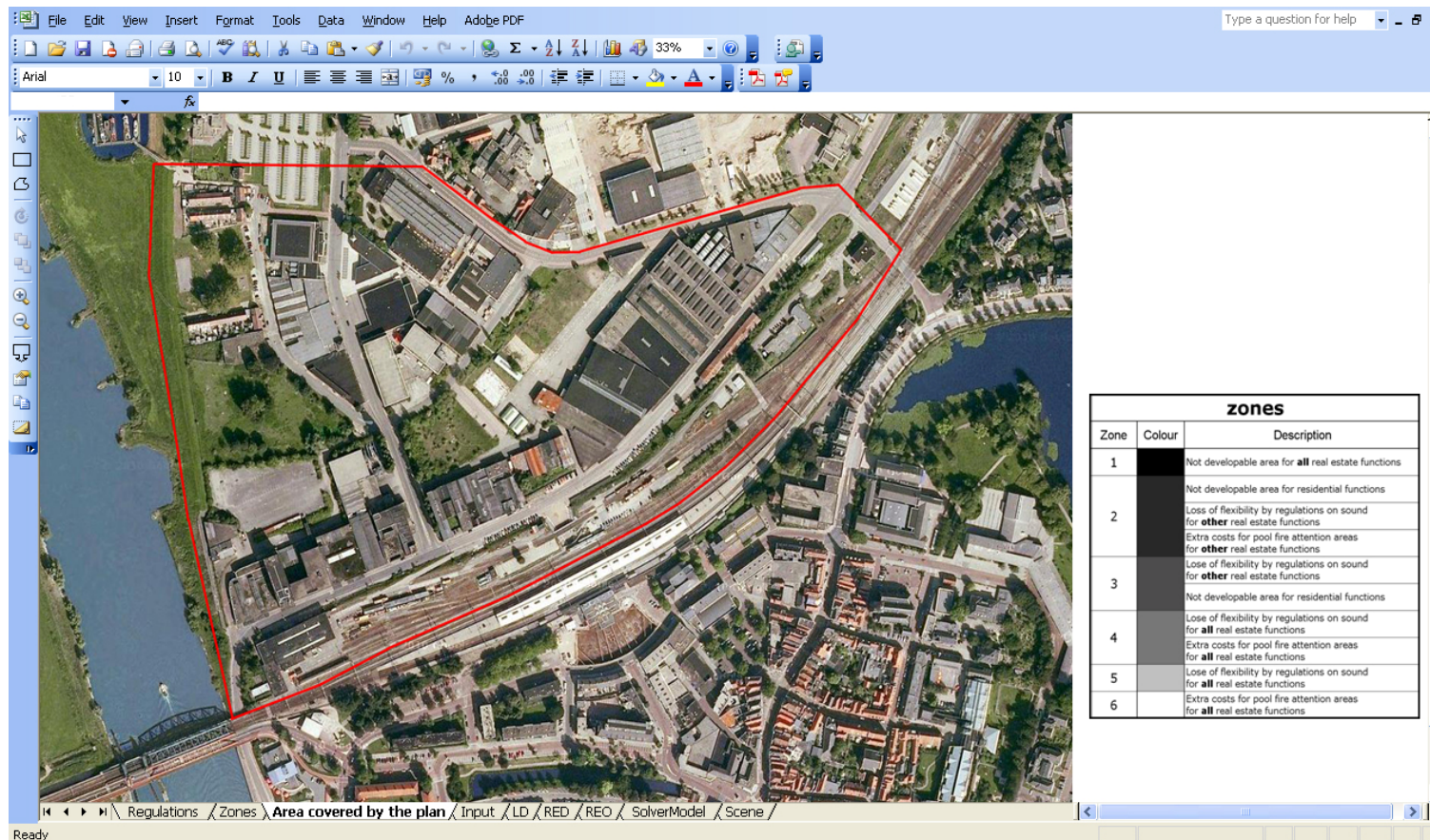
Environmental regulations need to be implemented:

1. Creation of zones linked with infrastructure;
2. Check density with maximum density linked with infrastructure.

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3 / Adjusting the design part / Zones



The screenshot displays a software application window with a menu bar (File, Edit, View, Insert, Format, Tools, Data, Window, Help, Adobe PDF) and a toolbar. The main area shows an aerial photograph of an urban area with a red boundary line. The bottom status bar indicates the current view is 'Area covered by the plan'.

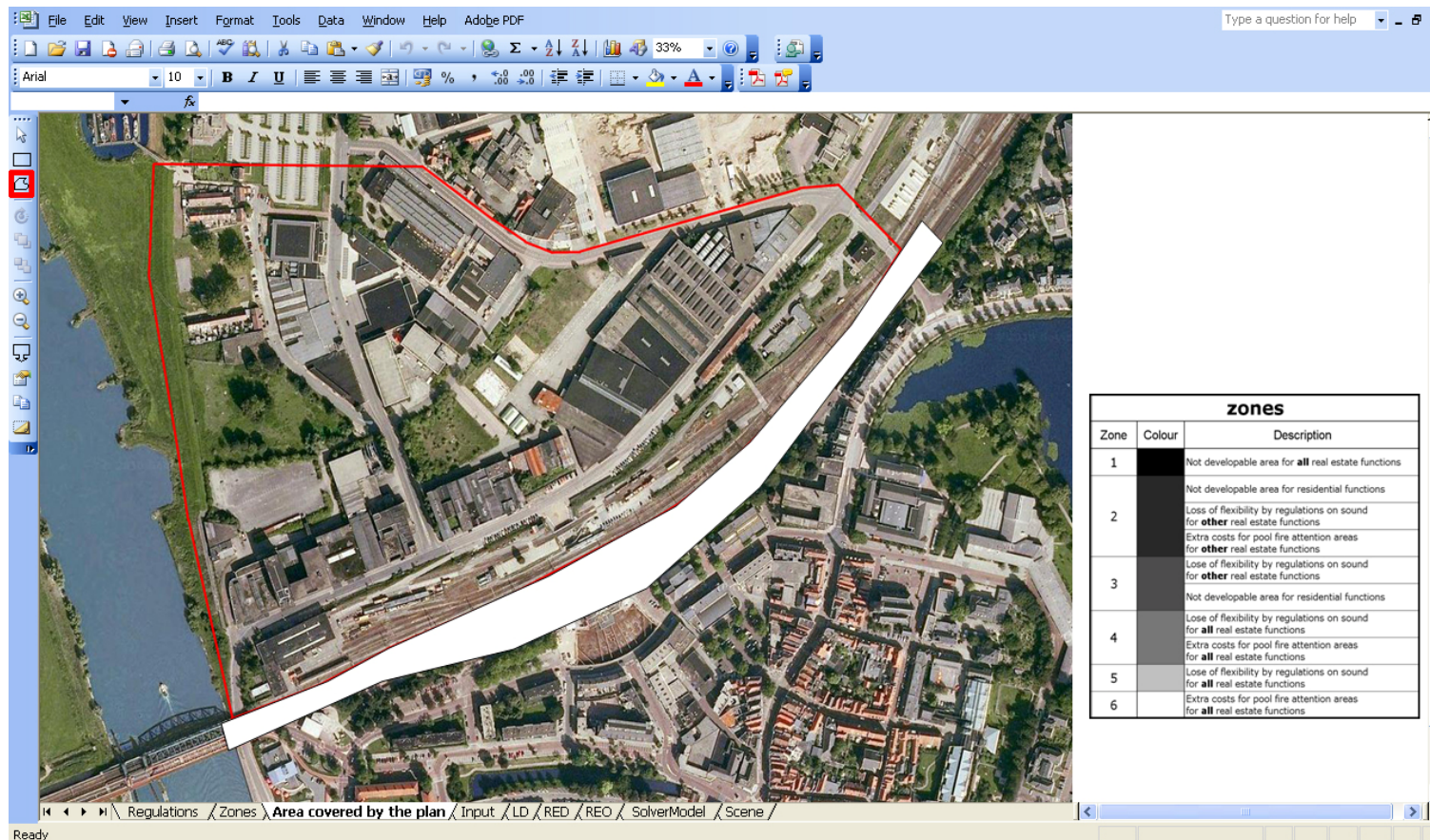
On the right side, there is a table titled 'zones' with the following data:

Zone	Colour	Description
1	Black	Not developable area for all real estate functions
2	Dark Grey	Not developable area for residential functions Loss of flexibility by regulations on sound for other real estate functions Extra costs for pool fire attention areas for other real estate functions
3	Medium Grey	Loss of flexibility by regulations on sound for other real estate functions Not developable area for residential functions
4	Light Grey	Loss of flexibility by regulations on sound for all real estate functions Extra costs for pool fire attention areas for all real estate functions
5	Very Light Grey	Loss of flexibility by regulations on sound for all real estate functions
6	White	Extra costs for pool fire attention areas for all real estate functions

Transformation possibilities of inner city railway yards

Introduction / Theoretical framework / Calculation tool / Method & feasibility factors / Testing / Conclusions & recommendations

3 / Adjusting the design part / Zones



The screenshot displays a software application window with a menu bar (File, Edit, View, Insert, Format, Tools, Data, Window, Help, Adobe PDF) and a toolbar. The main area shows an aerial photograph of an urban landscape with a red boundary and a white diagonal line. A table titled 'zones' is visible on the right side of the interface.

Zone	Colour	Description
1		Not developable area for all real estate functions
2		Not developable area for residential functions Loss of flexibility by regulations on sound for other real estate functions Extra costs for pool fire attention areas for other real estate functions
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5		Loss of flexibility by regulations on sound for all real estate functions
6		Extra costs for pool fire attention areas for all real estate functions

The bottom status bar shows the following tabs: Regulations, Zones, Area covered by the plan, Input, LD, RED, REO, SolverModel, Scene. The status is 'Ready'.

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3 / Adjusting the design part / Zones

Input screen Railway area			
Noise pollution railway		75,50	dB
Utilization space		0,00	meters
Group risk	Day	12.500,00	users/km²
	Night	7.500,00	users/km²
Pool fire attention areas		Yes	

Information Regulations			
Sound			
Preferred intensity on façade dwelling		53,00	dB
Maximum intensity on façade dwelling		68,00	dB
Hazardous substances			
Pool fire attention areas		30,00	meter

Output Railway area			
Factor		Meters	Meters
Preferred Distance dwelling		0,00	180,00
Maximum Distance dwelling/Office		0,00	5,00
Utilization space		0,00	0,00
Pool fire attention area		0,00	30,00

Zone 1. Not developable area all functions			
Other function		0,00	0,00

Zone 2. Not developable area residential functions - AAS other functions - extra costs PFAA			
Residential, hospital, education		0,00	5,00

Zone 3. Not developable area residential functions - AAS other functions			
Other function		-	-

Zone 4. AAS - extra costs PFAA all functions			
Residential, hospital, education		5,00	30,00

Zone 5. AAS			
Residential, hospital, education		30,00	180,00

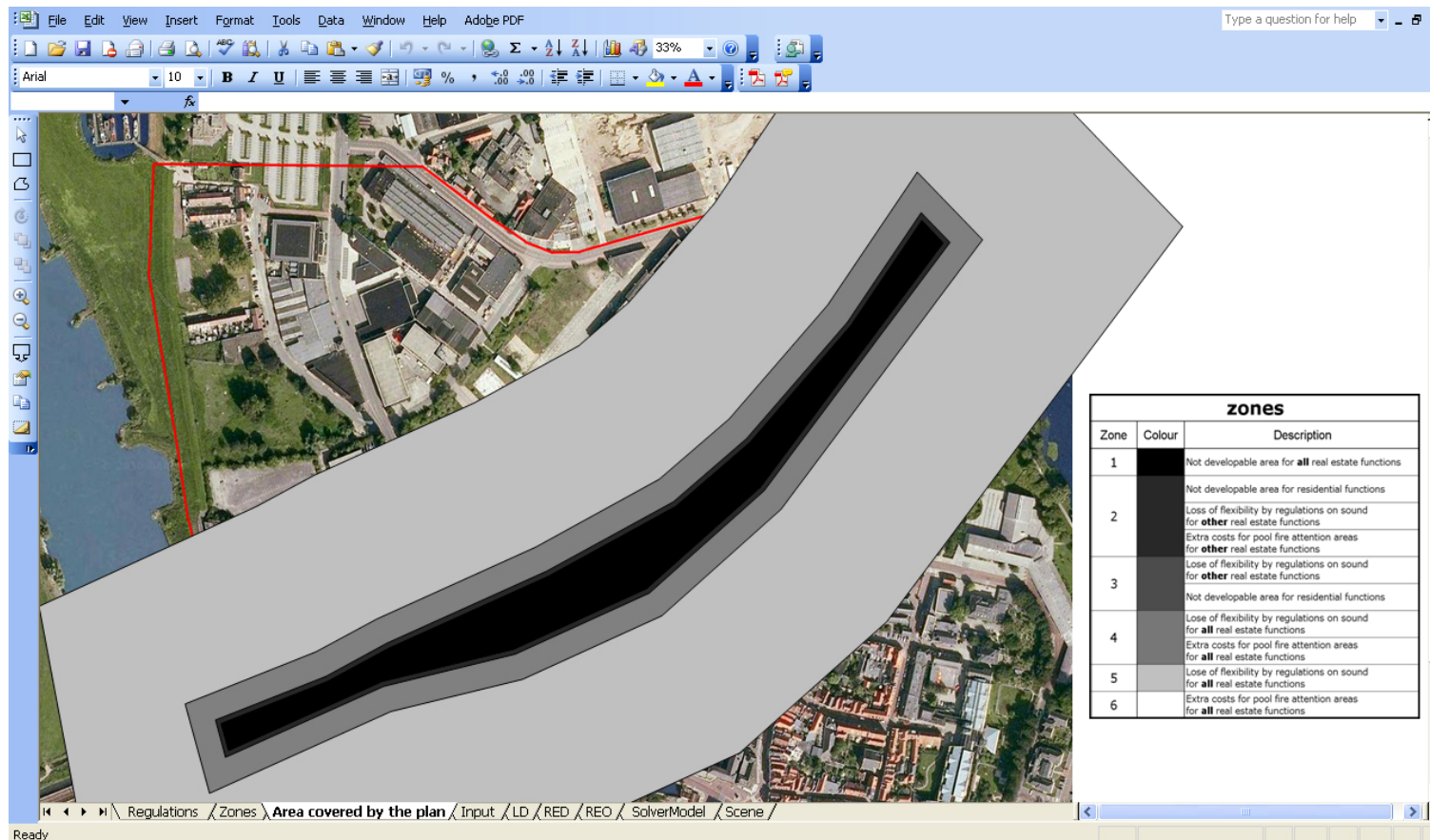
Zone 6. Extra costs PFAA			
Residential, hospital, education		-	-

Groups risk			
	km²	Users	Users/km²
Day	0,22	0	0
Night	0,22	0	0

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3 / Adjusting the design part / Zones



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3 / Adjusting the design part / Density

- Environmental regulations determine a maximum density;
- A check needs to be made if the actual density exceeds this maximum density;
- Implementation of building efficiency.

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3 / Design part / Calculation part

- Output design part:
 - Square meters of functions;
 - The locations which have extra costs;
- Input calculation part.

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3 / Introducing a new calculation part

- Biggest difference is implementing NPV for real estate value;
- PV-method used to calculate the costs and revenues;
- Land value basis financial feasibility:
NPV residual land value - NPV cost of the land development.

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3 / Adjusting the output of the tool

1. The Main variant has to be as **financial feasible** as possible;
2. The Main variant has to have a **urban type** like the reference railway area;
3. The Main variant has to be as **green** as a the reference railway areas;
4. The Main variant has to have a **parking** ratio like the reference railway areas;
5. The Main variant has to be a **multifunctional living area**.

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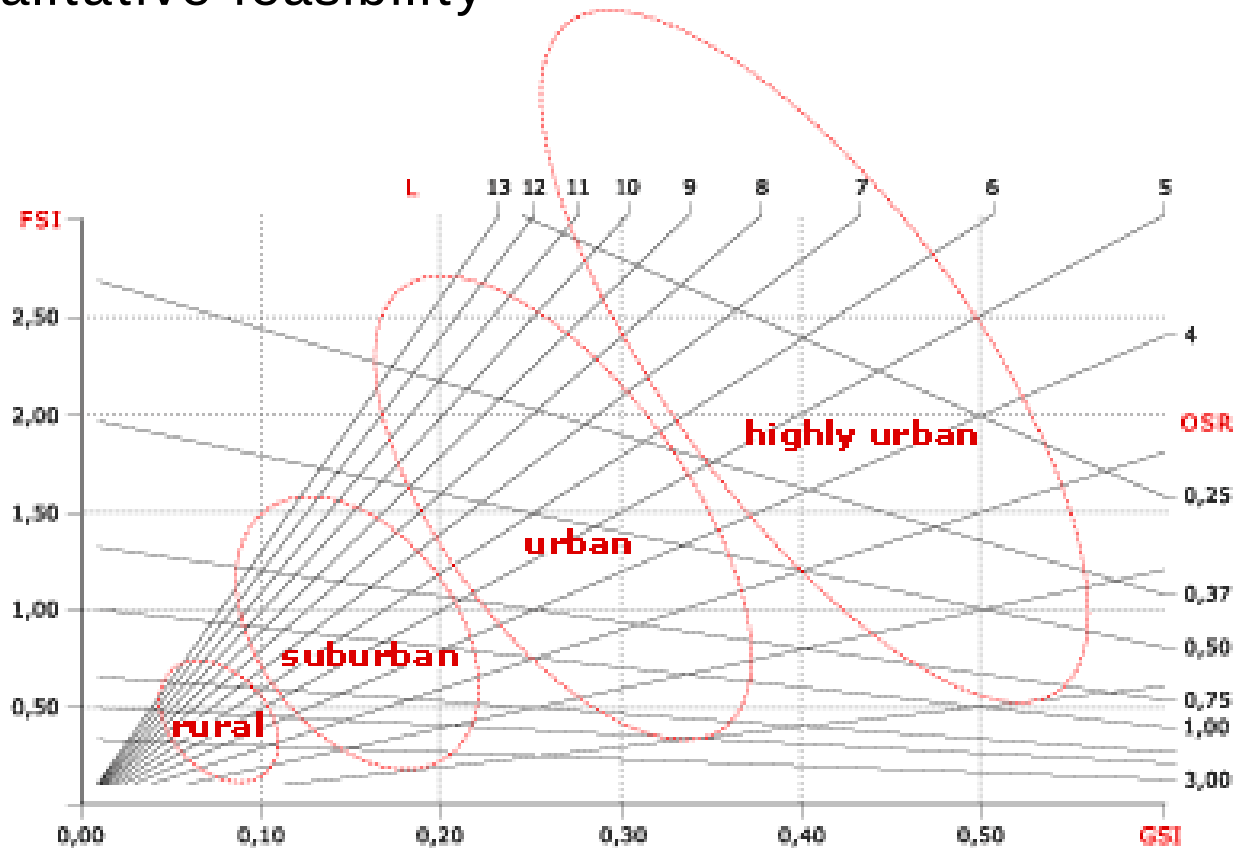
3 / Qualitative feasibility

Parameter		Description
FSI	GFA/area of the plan	Floor Space Index, a higher FSI means a higher density.
GSI	footprint/area of the plan	Ground Space Index, a GSI closer to 1 means more built-on area in the plan.
OSR	(Area of the plan-footprint)/GFA	Open Space Ratio, A lower OSR means less open space in the plan.

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3 / Qualitative feasibility



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3 / Qualitative feasibility

Parameter		Description
FSI	GFA/area of the plan	Floor Space Index, a higher FSI means a higher density.
GSI	footprint/area of the plan	Ground Space Index, a GSI closer to 1 means more built-on area in the plan.
OSR	(Area of the plan-footprint)/GFA	Open Space Ratio, A lower OSR means less open space in the plan.
GSR	Green area in the plan/GFA	Green Space Ratio, A lower GSR means less green space per square meter GFA.
SPR	GFA/amount of parking places	Space Parking ratio, a lower SPR means less parking places per square meter GFA.

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3 / Added value 3 adjustments

- More precise outcome of the financial feasibility;
- Opportunity to analyze the qualitative feasibility;
- Environmental regulations can be implemented in the variant study.

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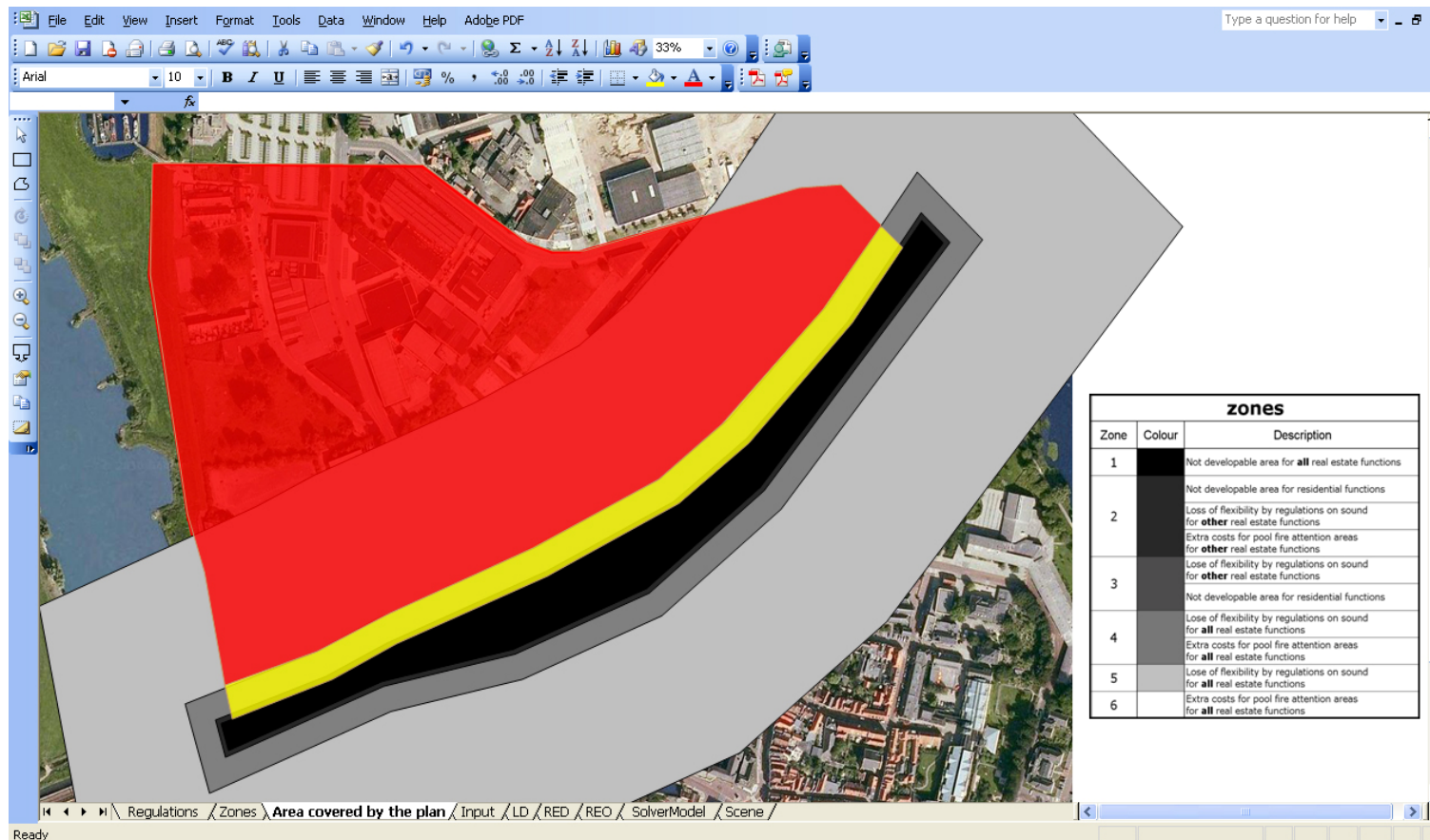
3 / Added value environmental regulations

To check the influence of an overlap with a zone, two extreme variants are created and entered in the developed calculation tool.

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3 / Added value environmental regulations



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3 / Added value environmental regulations

To check the influence of an overlap with a zone, two extreme variants are created and entered in the developed calculation tool.

Conclusion

1. Extra cost zones influence the residual land value: This has impact on the design;
2. Zones indicating a loss in design flexibility have impact on the design.

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3 / Input tool

- The reliability of the input in the tool determines the reliability of the output of the tool;
- Expert team is included to increase reliability of the input.

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3 / Input tool

- The reliability of the input in the tool determines the reliability of the output of the tool;
- Expert team is included to increase reliability of the input.
- Environmental data:
 - Sound data & external safety data;
- Real estate variables:
 - LFA, Floors, function mix & type of real estate;
- Operational data:
 - General, land development, real estate development & real estate operation.

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4 / Method & feasibility factors



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4 / Variant study Zutphen

Variant study on Zutphen is executed to create end product 2 and 3:

2. Method follows the steps of the described variant study;
3. Variant study leads to feasibility factors.

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Introduction / Theoretical framework / Calculation tool / Method & feasibility factors / Testing / Conclusions & recommendations

4 / Analysis Zutphen



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4 / Sub variants Zutphen

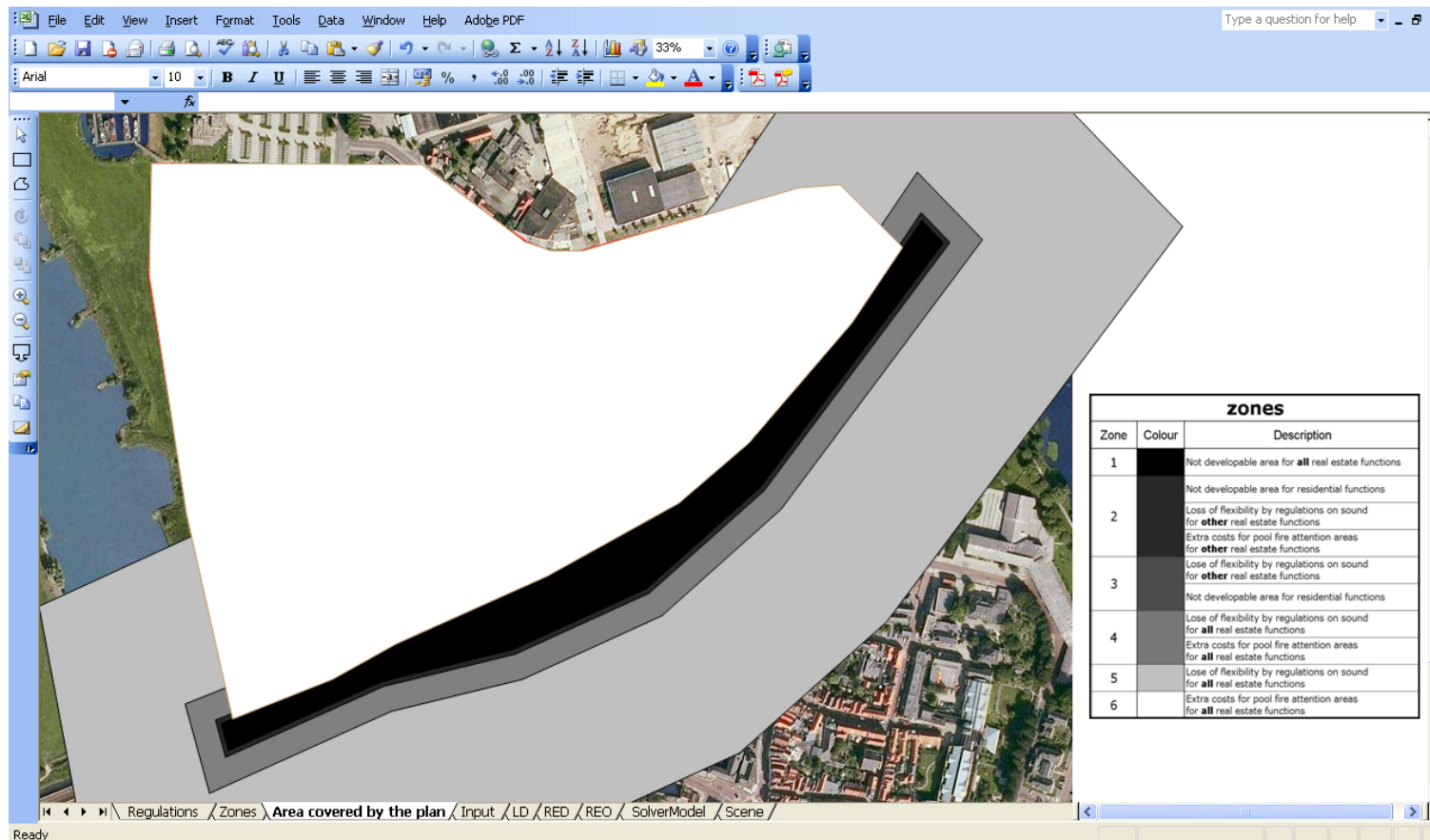
Three sub variants were developed to determine characteristics for Main variant:

- Market variant: Market research;
- Social variant: 40 % of social housing + 30 % non residential;
- Policy variant: Current real estate configuration corrected municipal vision.

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4 / Sub variants Zutphen



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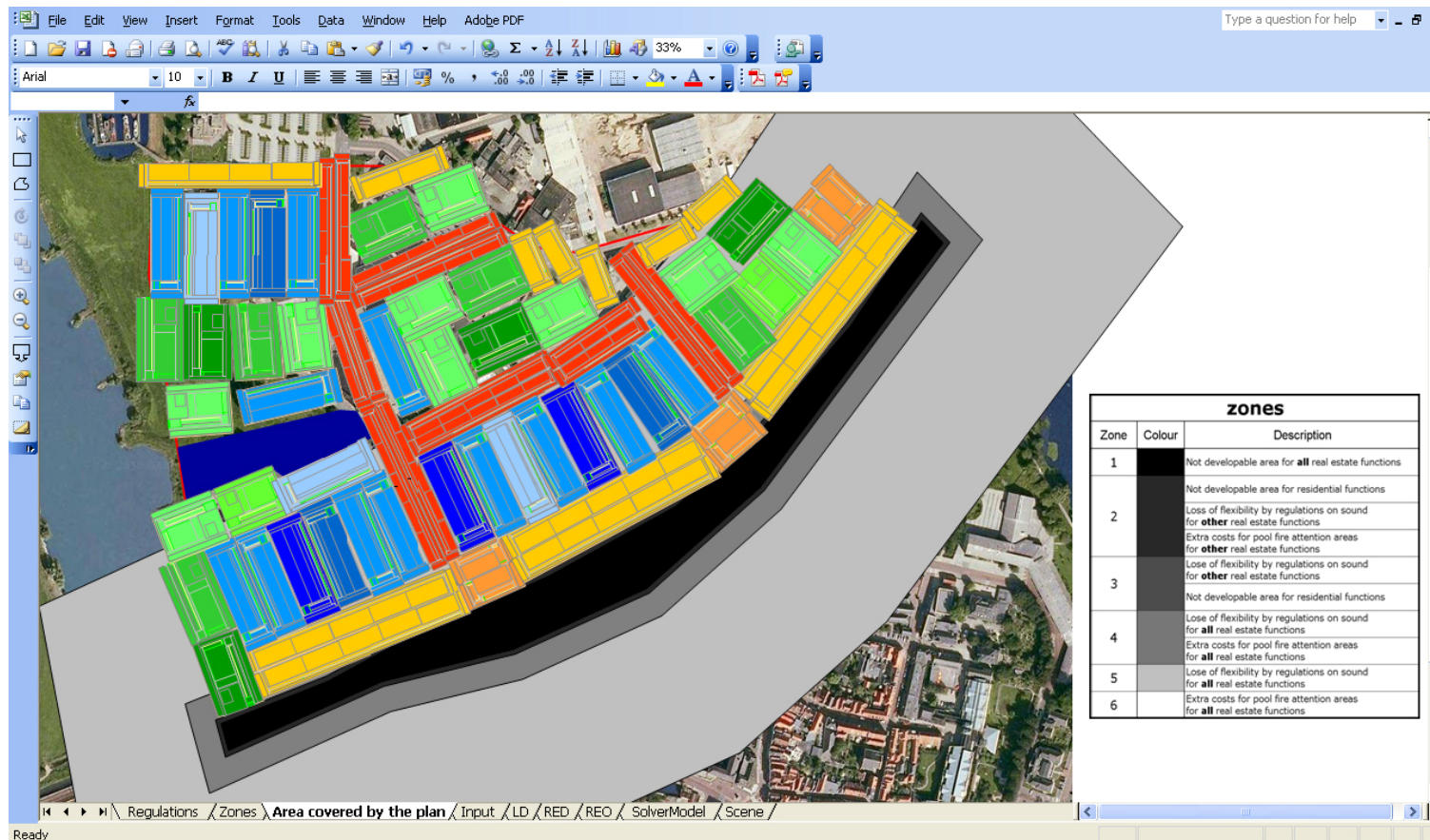
4 / Main variant / Strengths sub variants

	Strengths	Weaknesses
Market variant	+ High balance on the land development + High percentage of green	- Function mix - Low amount of parking places - High risk profile
Social variant	+ Function mix + Low risk profile + High amount parking places	- Negative balance on the land development - Low percentage of green - Density too high
Policy variant	+ Slightly positive balance on the land development + Low risk profile + Division residential real estate	- Low percentage of green - Low amount of parking places

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4 / Main variant



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4 / Main variant

Residual land value				
Real estate	Amount		m ² GFA	Land value (€)
	%	Units		
Total real estate	100.00	855	141,189	73,777,781
Parking				
Total parking	100.000	1,503		5,700,619
NPV residual land value				79,872,098
Costs land development				
				Costs (€)
NPV costs land development				65,400,772
Balance land development				14,471,326

Area of the plan	224,366	m ²	FSI	0.64
Operating area	220,953	m ²	GSI	0.31
Parking places	1,503	Units	OSR	1.08
GFA	141,189	m ²	GSR	0.17
Footprint	67,862	m ²	SPR	94
Green area	24,536	m ²	Users	Day 2,112
Building height	1-6	Floors		Night 1,642

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4 / Main variant



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4 / Feasibility factors

Variant study leads to the influencing effect of the real estate variables.

1. Financial feasibility;
2. Urban type;
3. Green area;
4. Parking places;
5. Function mix.

Transformation possibilities of inner city railway yards

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4 / Feasibility factors

Variant study leads to the influencing effect of the real estate variables.

1. Financial feasibility: Type of real estate;
2. Urban type: Building height and real estate type;
3. Green area: Type of real estate;
4. Parking places: Type of real estate;
- 5. Function mix: Balances the feasibility.**

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5 / Testing applicability tool & method



Transformation possibilities of inner city railway yards

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5 / Testing applicability tool & method

- Testing applicability on two other locations:
 - Amersfoort;
 - Nijmegen.

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5 / Testing applicability tool & method

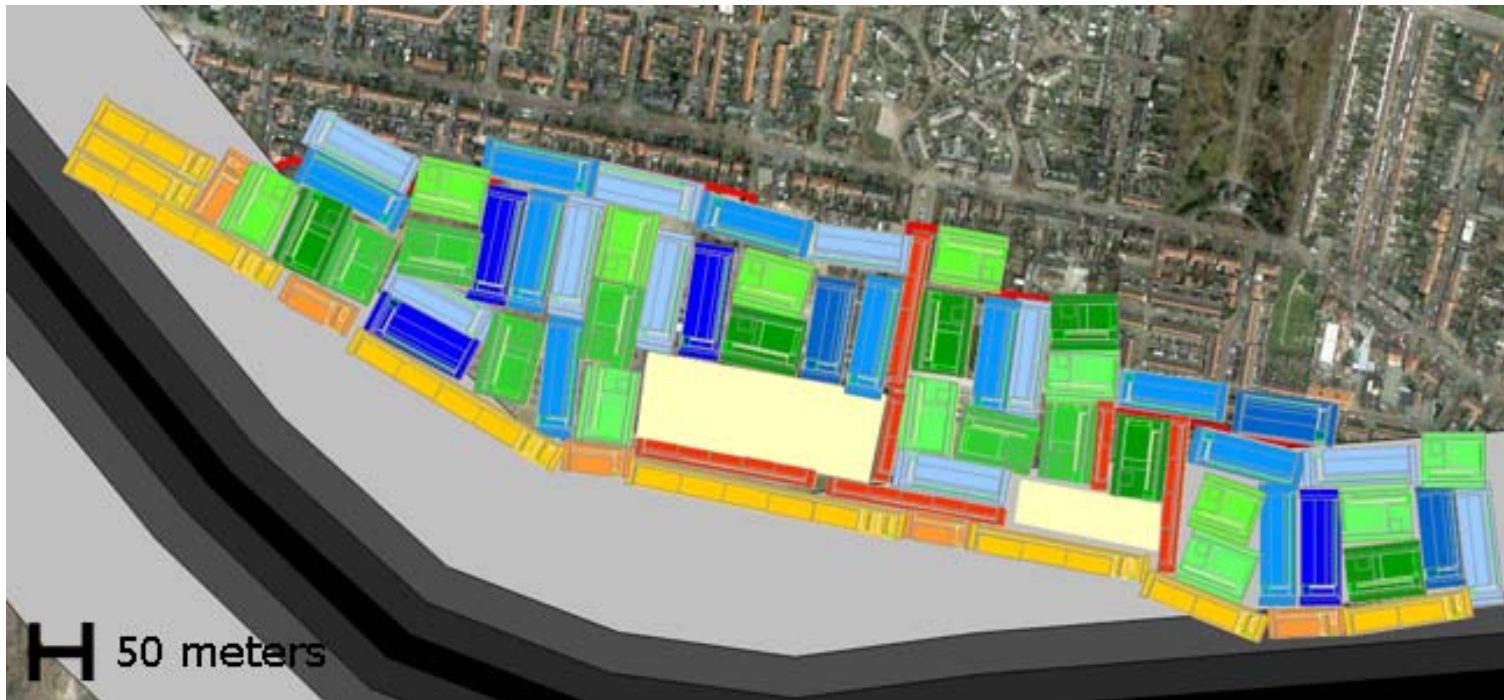
Operational data land development		
IRR land development		%
Acquisition costs		€/m ² land
Operational real estate development		
IRR real estate development		%
Operational real estate operation		
IRR real estate operation		%
GIY		%
Vacancy rate	Friction	% rent
	Start	
Rent		€/m ² LFA/Y
Selling prices		€/unit or €/m ² LFA

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5 / Case study Amersfoort

- + Feasible Main variant for Amersfoort;
- Overlap with Zone 2 & 3, only non residential, is implemented;
- Connecting railway track is entered.

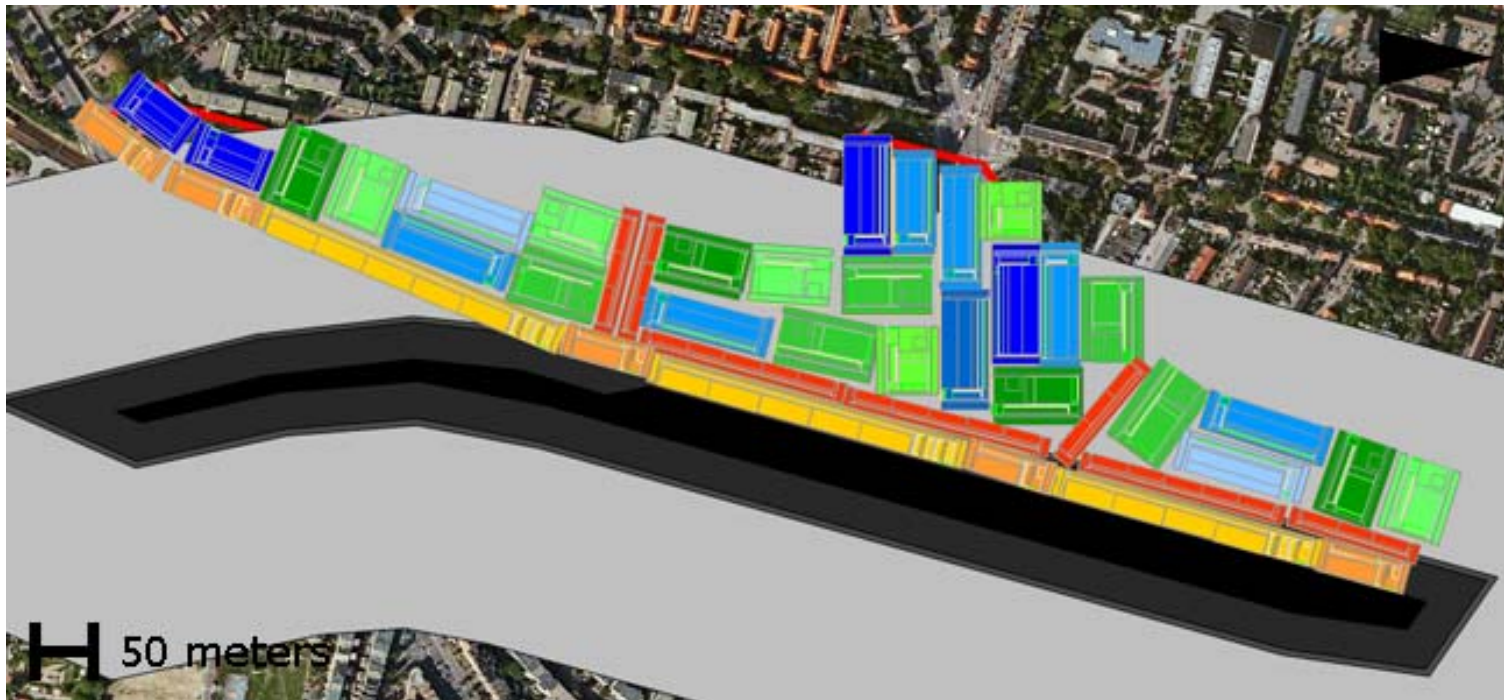


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5 / Case study Nijmegen

- + Feasible Main variant for Nijmegen;
- Check with the market research is implemented
- + New feasibility factor: ratio railway yard development area.



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5 / Testing calculation tool & manual

- After minor changes tool & method general applicable;
- New feasibility factor: Increasing ratio between railway yard and development area increases feasibility.

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6 / Conclusions & recommendations



Transformation possibilities of inner city railway yards

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6 / Conclusions

1. The developed calculation tool, the method and the feasibility factors can be used to create a feasible variant;
2. The calculation tool and the method can be seen a general applicable;
3. The two adjustments of the tool for the specific characteristics have a significant added value:
 - a. The implementation of environmental regulations in the design part has a significant effect on the design;
 - b. The implementation of a NPV-method to calculate the real estate value in the calculation part offers the best opportunity to implement time in the real estate value.

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6 / Conclusions

4. The adjustment of the output of the tool creates the ability to judge the feasibility, which in this research is indicated as a balance between financial and qualitative feasibility:
 - a. Financial feasibility is defined as the balance between the residual land value and a value based land value;
 - b. Qualitative feasibility is defined using demand on the urban type, green, parking and function mix and is judged using indexes and ratios;
5. There are two important factors influencing the feasibility:
 - a. The function mix is the most important real estate variable influencing the feasibility;
 - b. Decreasing the ratio between the railway yard and the development area increases the feasibility.

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6 / Recommendations

1. The ratio between the railway yard and development area needs further research;
2. The link between the presence of a living area close to the railway station and the amount of railway passenger on this railway areas needs further research;
3. The interface of the tool needs professionalization if the tool will be used in a professional context;
4. The insights on qualitative feasibility can be optimized by increasing the amount of reference projects for the qualitative feasibility;
5. Increase the reference database in Spacemate to make more specific references on the urban type.

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