

NETHERLANDS- Groningen

CLIMATE RESILIENT ANALYSIS OF THE GRONINGEN CITY

RESEARCH QUESTION

"What are the implications of including green-blue climate resilient features to the municipality of Groningen's inner-city development plan?"

SUBQUESTIONS

1. What are the possible green-blue options for a city like Groningen?
2. What benefit do these features give to an inner-city?
3. What green-blue solutions does the development plan currently include?
4. Which area is suitable for a more detailed study?
5. What are the alternatives for a climate resilient design for the specific urban space selected?
6. What are the effects of these alternatives? (we plan to use models to predict this)
7. What are the detailed costs and benefits for the alternatives?
8. What is the reaction from the various stakeholders to green-blue improvements based on the cost/benefit analysis? Is it worth it to invest in this area?
9. How much will cost to maintain the new green-blue possible options? Is it worth it to invest in these possible options?

METHODOLOGY

- Literature review
 - Spatial analysis
 - Interviews
 - Design (Revit)
 - Envi-Met
 - Costings
- Multi-Criteria Decision Analysis (MCDA)

LITERATURE REVIEW

BENEFITS TO HAVE GREEN /BLUE SOLUTIONS

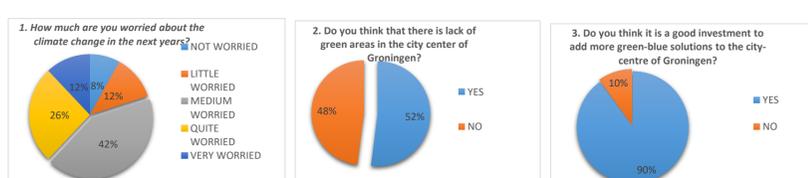
People find more attractive to live in Green districts than living in another places without green areas.



POSSIBLE SOLUTIONS



INTERVIEWS

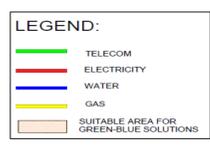


LAYER ANALYSIS

- Layer 1: Underground



Almost all the pipes and cables are on the left side, so for that reason the design for the new proposals it will take into consideration not to installed fountains and planted trees on the left side, trying to do that on the orange shaded area.



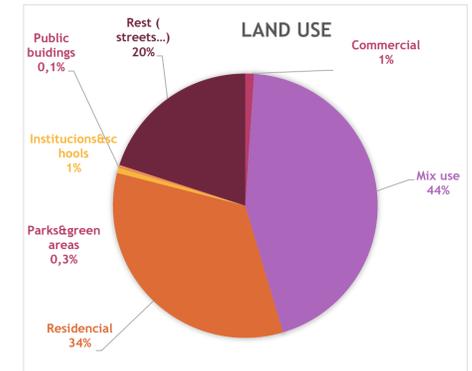
- Layer 2: Networks

Current situation vs Future situation maps. Includes a question: "Is it a environmental friendly downtown area?"

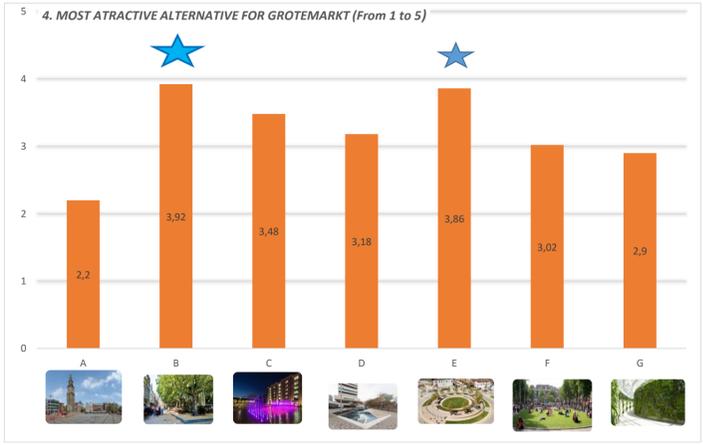
- Layer 3: Occupation



There is only a 0,3% of green areas & parks in the whole area, and if we focus on the area from Grote Markt there is not green areas.



Basically all the building functions near Grote-Markt are destiny for mix use commercial residence or offices, so it means that there is a lot of people movement during the day, with more reason it would be nice to have a place where people can rest from their shopping time or just have lunch and spend a good time.



COSTINGS

BUDGET		MAINTENANCE 1 YEAR	
PROPOSAL 1	262.465,41€	PROPOSAL 1	6.417 €
PROPOSAL 2	309.685,26€	PROPOSAL 2	9.893,3152 €
PROPOSAL 3	317.069,85€	PROPOSAL 3	8.064,92 €

- The budget will be separate in different chapters:
- Demolition
 - Earthworks
 - New pavements
 - Installations
 - Equipment
- The maintenance we will consider the next activities;
- Watering
 - Maintenance, mowing lawns and clearing.
 - Maintenance of the fountain
 - Woodland Conservation
 - Cleaning

MCDA

Criterion	Weight (%)	Priorities (%)
Criterion 1	Public Opinion	5
Criterion 2	Costs	25
Criterion 3	Maintenance	10
Criterion 4	ENVI-met effect	40
Criterion 5	Design	20
Total		100

Criterion	PROPOSAL								
	1			2			3		
	1-10	%	Result	1-10	%	Result	1-10	%	Result
1	6	(0,05)	0,3	8	(0,05)	0,4	7	(0,05)	0,35
2	7	(0,25)	1,75	6	(0,25)	1,5	6	(0,25)	1,25
3	7	(0,10)	0,7	6	(0,10)	0,65	6	(0,10)	0,6
4	5	(0,40)	2	7	(0,40)	2,8	8,5	(0,40)	3,4
5	6	(0,20)	1,2	8	(0,20)	1,6	7,5	(0,20)	1,5
TOTAL:			5,95			6,95			7,1

The third one is the best option.