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CORSO DI LAUREA

SCIENZE AMBIENTALI E PROTEZIONE CIVILE

***How Rotterdam is tackling flood risk under the uncertainty of climate change:  
exploring an example of resilient community and city planning***

Come Rotterdam sta affrontando il rischio inondazioni nell'incertezza dei cambiamenti climatici: studio di un esempio di comunità e pianificazione urbana resilienti

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## RIASSUNTO

Rotterdam è una città che da sempre ha dovuto gestire il rischio inondazione, trovandosi in corrispondenza dell'estuario del fiume Reno e del Mosa ed essendo il suo territorio per l'80% sotto il livello del mare.

La città ha evoluto un approccio resiliente nella gestione delle acque, stimolata anche dalle problematiche dovute ai cambiamenti climatici. In questa ricerca, applicando il "metodo delle 6 caratteristiche", andremo a vedere come la resilienza è diventata un punto chiave nella pianificazione urbana: dimostreremo come le caratteristiche della resilienza vengono applicate in 2 casi studio, la piazza d'acqua di Benthemplein e l'argine multifunzionale di Dakpark.

Nello studio delle 6 caratteristiche (1.Attenzione alla situazione corrente; 2.Attenzione ai trend del futuro; 3. Imparare dall'esperienza; 4.Abilità di fissare obiettivi; 5.Azioni concrete; 6.Partecipazione pubblica) vedremo come in Benthemplein possiamo ritrovarne applicate 4, mentre in Dakpark sono messe in pratica tutte, ponendo importanza soprattutto alla numero 6, ovvero la partecipazione pubblica dei cittadini nella pianificazione e realizzazione di queste opere di prevenzione strutturale.

In conclusione metteremo in evidenza i motivi per cui Rotterdam è un perfetto esempio di città resiliente:

- Il rischio inondazione è parte integrante della città;
- L'approccio tradizionale puramente ingegneristico alla gestione del rischio si è evoluto in un approccio di adattamento e convivenza con l'acqua;
- Coinvolgendo i cittadini nei processi di pianificazione e nelle fasi post-realizzazione dei progetti, viene stimolata anche la loro consapevolezza e la loro autosufficienza nei confronti dei rischi naturali con cui devono convivere.

Main reference: *Lu, P., & Stead, D. (2013). Understanding the notion of resilience in spatial planning: A case study of Rotterdam, The Netherlands. Cities, 200-212.*

## INTRODUCTION

- **Rotterdam** is located in the South of the region, at the Rhine and Meuse estuaries in the North Sea
- It is one of the most important **Delta cities** due to its port (the biggest in Europe)
- **80%** of the city is below the sea level
- It is very exposed to **flood risk** because of its geographical position
- **Climate change** is increasing flood risk (rise of the sea level, increasing river discharge)



## A RESILIENT CITY

This paper examines awareness and understanding of urban resilience in the planning policy arena in Rotterdam. The article highlights two aspects of a city's resilience performance in a flood prone area :

- Preparation before the flood occurrence (flood control systems, administration of flood risk management,...)
- Reaction to and management of the disturbances (drainage systems, rescue services,...)

Being a multisectoral issue, the authors list 6 main characteristics of resilience related to flood risk and urban planning, all of which can be found in Rotterdam:

	Charachteristic	Evidence of application
1.	Attention to current situation	Fighting flood risk since the city foundation
2.	Attention to trends of the future	Adaption strategies and policies
3.	Learn from experience	1953 flood event changed the water management
4.	Ability to set goals	Room for the River Programme, Living with Water Strategy
5.	Concrete actions	Dakpark, Water Squares
6.	Public involvement	Dakpark, Benthemplein

## RESEARCH FRAMEWORK: what we know

Rotterdam has fully applied the adaptive National Policy Program “*Living with Water*”, hence it became a landmark for urban planning. Green roofs, water squares and Dakpark are evidences of the ability to integrate urban planning with flood defences and climate proof buildings.



Benthemplein water square

Source: raingain.eu



Dakpark multifunctional dyke

Source: pinterest.co.uk

RESEARCH FRAMEWORK: what we expect

### HYPOTHESIS

*“the city of Rotterdam is fostering urban resilience accounting for public participation in flood risk governance”*

RESEARCH FRAMEWORK: what we question

### RESEARCH QUESTIONS

- What is Rotterdam doing to increase urban resilience?
- How are citizens involved in public processes?
- Are community suggestions put into practice?

RESEARCH FRAMEWORK: how we answer

### METHODOLOGY

- “6 characteristics of resilience”
- Benthemplein
- Dakpark

### CASE STUDIES

# BENTHEMPLEIN WATER SQUARE

An evidence of the municipality's effort to make flood risk investments visible to the citizens is Benthemplein water square.

- 3 water storages situated on the surface
- The “pools” fill up when it rains
- When they are dry, they can be used as recreational spaces(playgrounds)



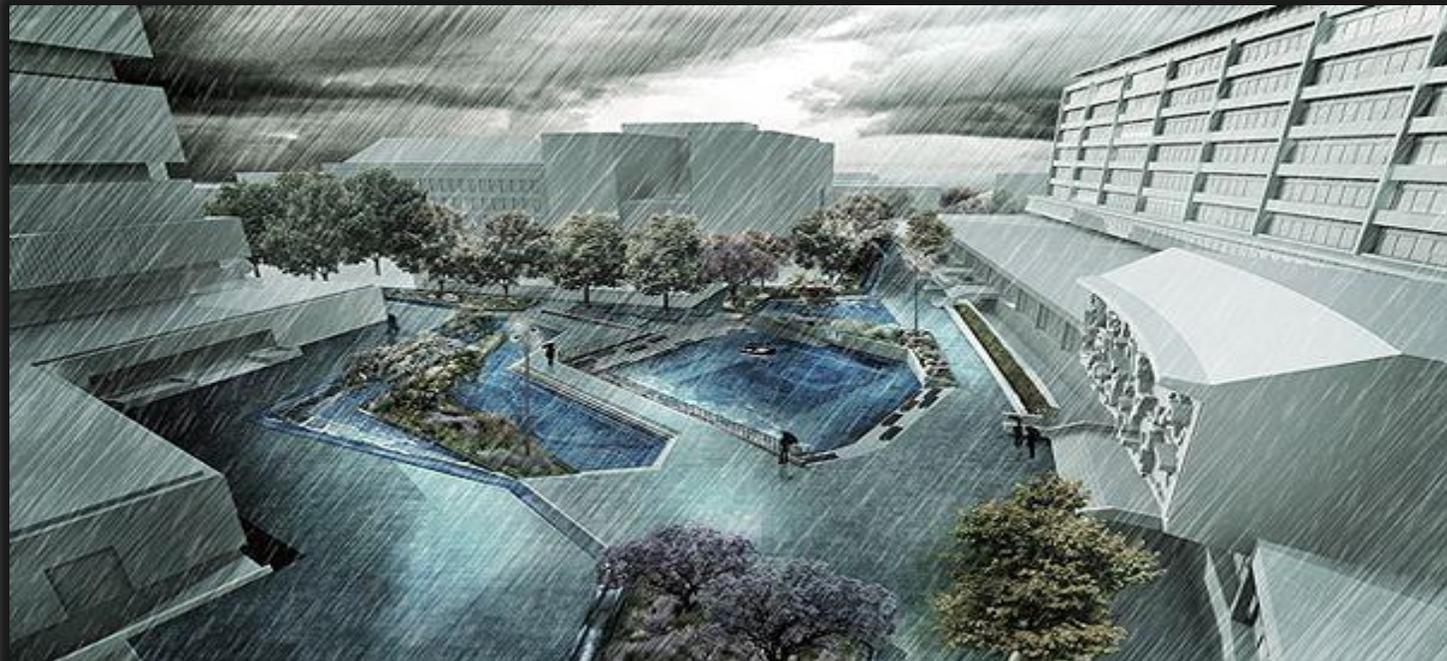
In Benthemplein case study are recognised only **4** of the 6 resilience characteristics:

**(1)** Attention to current situations → It was built because large part of the district was flooded after intense rainfall events.

**(3)** Learn from experience → In this case citizens rejected the first project, than the administration presented another one after listening to their proposals.

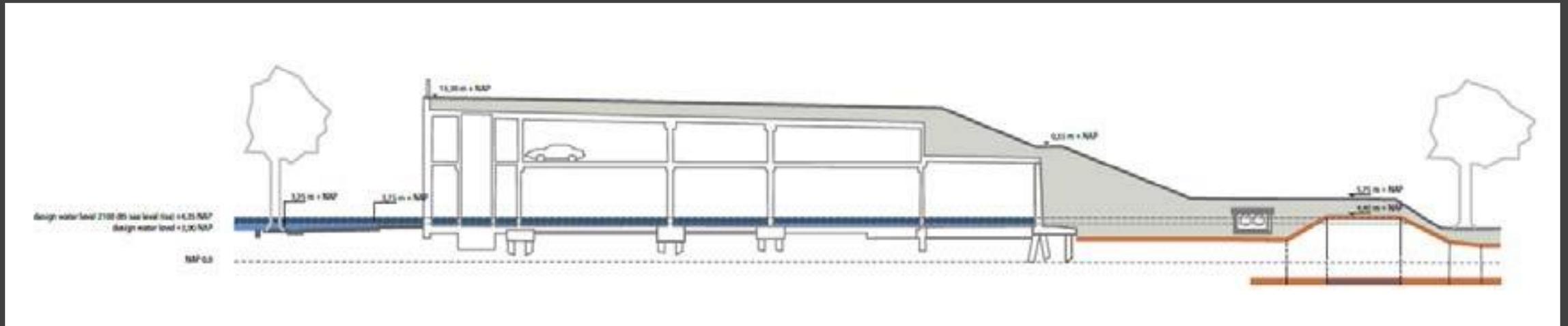
**(5)** Concrete actions → It is an effective water defence.

**(6)** Public participation → Citizens were actively involved in the planning process through workshops.



# DAKPARK MULTIFUNCTIONAL DYKE

- The primary function is **flood defence** against fluvial flooding from the Meuse river
- But it is also a recreational area because it has been integrated with a retail centre and a car parking; on top of the dyke is situated a **park**.
- It took 13 years (2000-2013) to complete the planning process and inaugurate it.



Dakpark section

Source: van Veelen, 2012

Dakpark is a representation of all of the 6 characteristics of resilience:

(1) Attention to current situation → Restyling of an existing dyke

(2) Attention to trends of the future → Height of the dyke raised to make it climate-proof

(3) Learn from experience → Evidence of the change from traditional flood risk approach

(4) Ability to set goals → Application of the “Living with Water” strategy

(5) Concrete actions → Flood defence

(6) Public participation → Citizens: *i.* participated in the planning process, through a facilitator; *ii.* suggested the idea of the park; *iii.* created the Dakpark Foundation



## CONCLUSIONS

Rotterdam represents all the aspects of a resilient city:

- **Flood risk is part of the city**: interventions have always been necessary (*1.Attention to current situation*)
- Paying attention to trends and experience, **the city has changed the approach to disaster risk** developing an adaptive urban planning → **giving space to water** instead of confining it through its **integration** with buildings and everyday life (*2.Attention to trends of the future, 3.Learn from experience, 4.Ability to set goals, 5.Concrete actions*)
- **Citizens are actively involved** in the planning process to make them **self-responsible and aware** of the risks they are exposed to (*6.Public involvement*)

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