

# **RESILIENT ROTTERDAM PORT**

Toward a social-ecological integrated estuary and Rotterdam port transformation

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P5 Presentation | 06-07-2021

Tutors:

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Dr.D.A. Sepulverda Carmona

#### PRESENTATION STRUCTURE

Toward a social-ecological integrated estuary and Rotterdam port transformation

#### INTRODUCTION

Delta Context of Rotterdam

The story of landscape transition

Problem field

Problem statement

### **RESEARCH FIELD**

Case study: Rotterdam port

Why choose Rotterdam port as the case

Main research question

Sub research questions

#### SYSTEM ASSESSMENT

Ecological and social-economic system

Guiding principles

Summary of principles

#### **COLLABORATIVE GOVERNANCE**

Power and interest of stakeholders

Multi-actors interaction

Desired situation

Overarching the planning framework

#### **STRATEGY**

Strategy planning tool

Plans, programes and project

Strategic plans

Strategic timeline

Project M4H

Programmes stadhaven

Adaptive planning pathways

preferred pathways

#### CONCLUSION

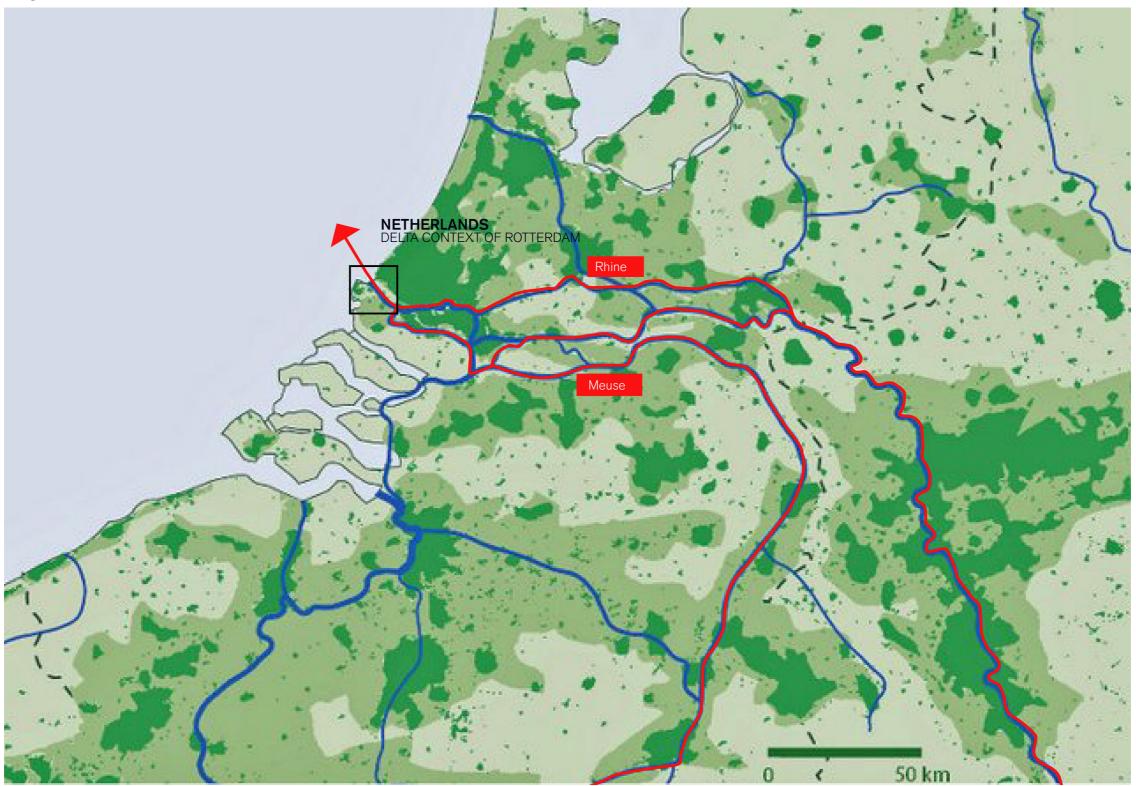
Back to research questions

Relationship to urban ecology lab



## **INTRODUCTION**

DELTA CONTEXT OF ROTTERDAM



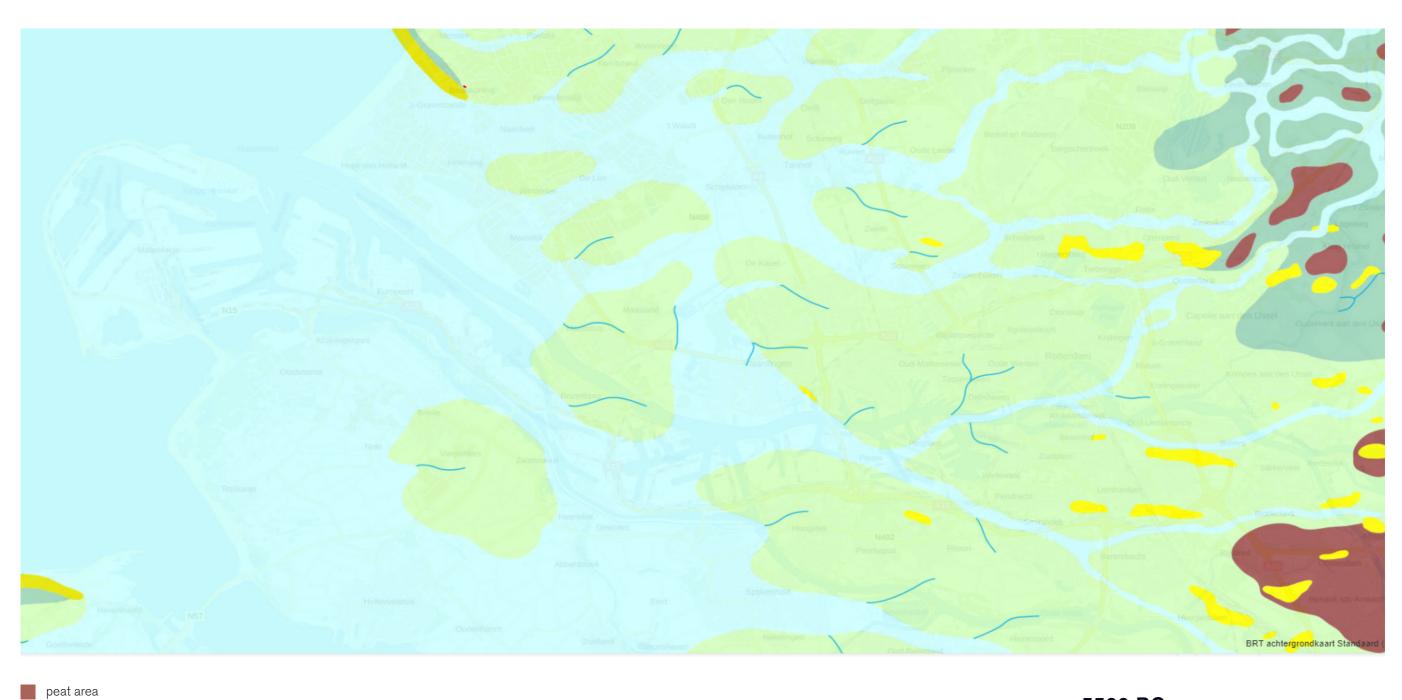
The Delta Environment of Rotterdam
Rotterdam has the only open link to North Sea;

Source:The Dutch-Belgian Rhine-Meuse-Scheldt delta (from: Deltanet, 2014). https://www.researchgate.net/publication/287968520\_Sediment\_transport\_

## **INTRODUCTION**

THE STORY OF LANDSCAPE TRANSITION

What is the transition of landscape before and after **Urbanization?** 



wadden and mud flat

open water

saltmarshes and river plains

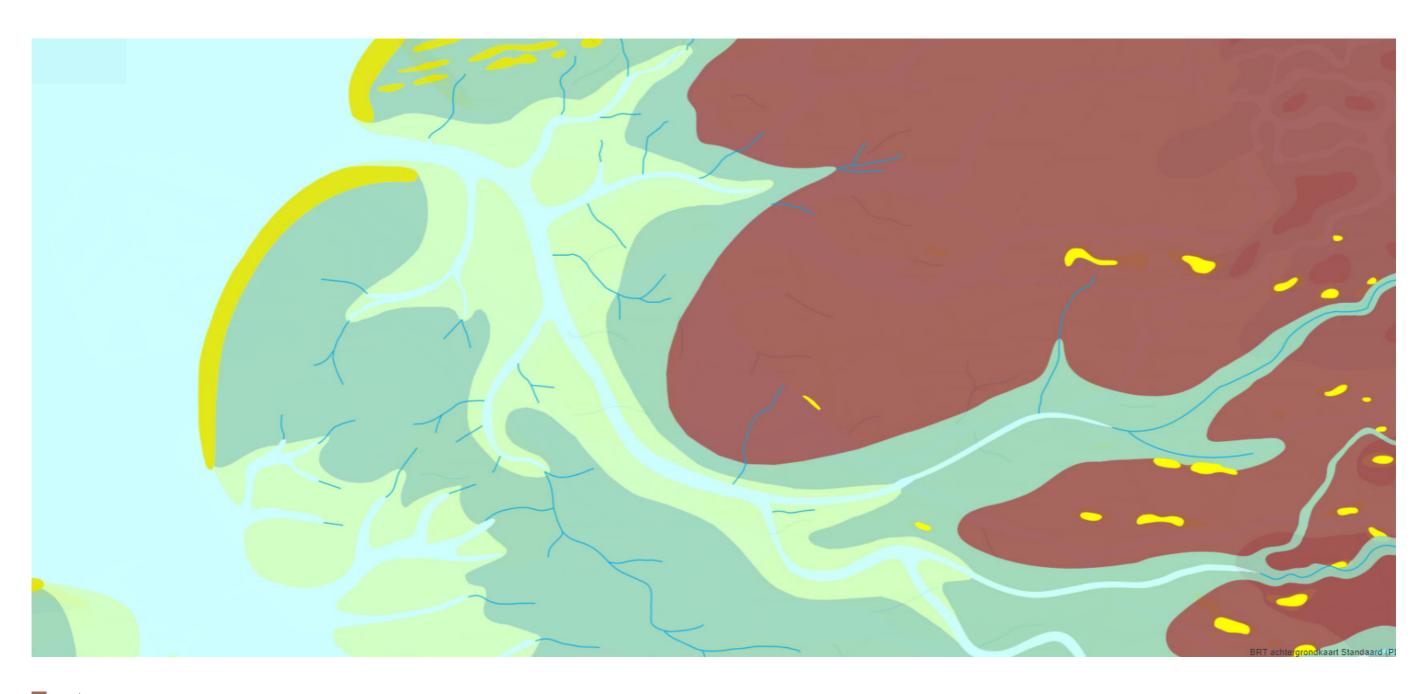
5500 BC

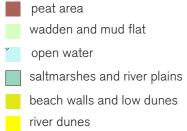
Mudflats, wadden and dunes take the dominance of the area

The transition of Rotterdam landscape(Workshop of Urban Ecology Lab)

Source: http://rce.webgispublisher.nl/Viewer.aspx?map=Paleogeografischekaarten#

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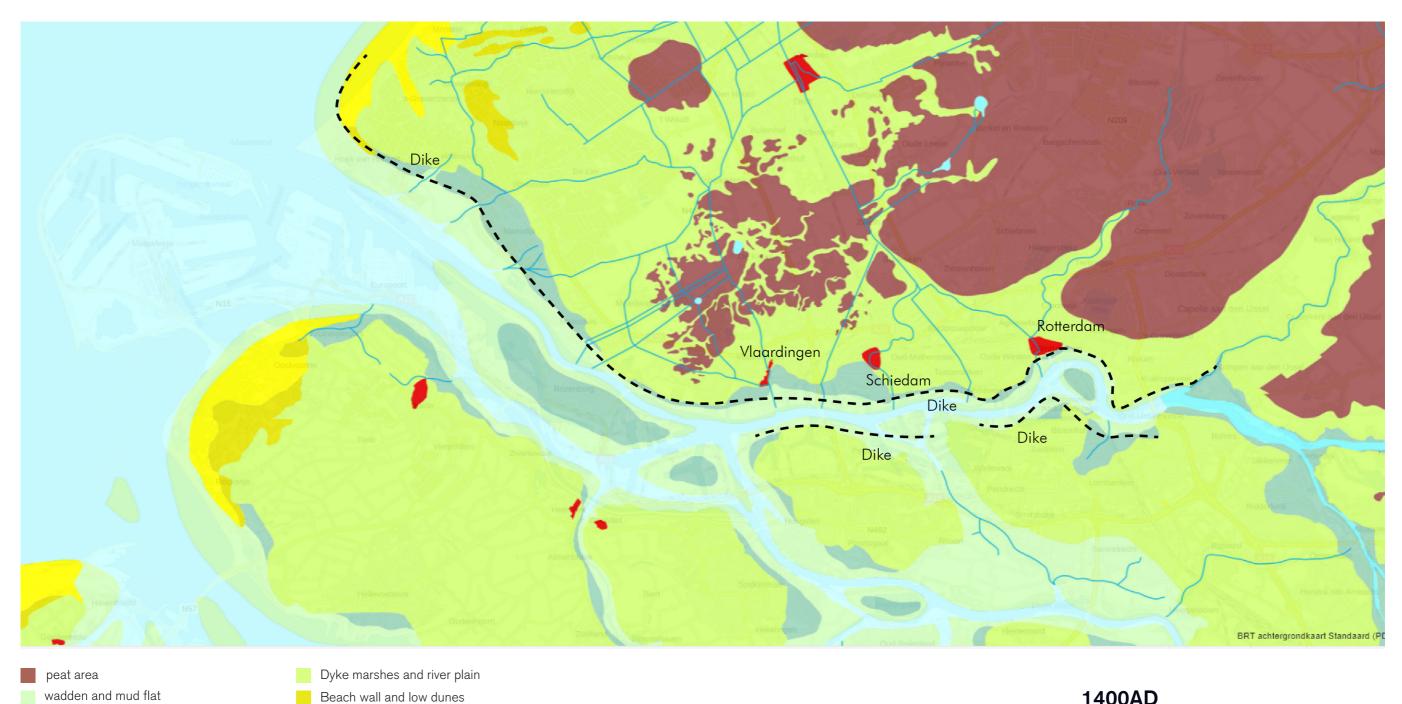


The transition of Rotterdam landscape(Workshop of Urban Ecology Lab)

Source: http://rce.webgispublisher.nl/Viewer.aspx?map=Paleogeografischekaarten#

# 2750 BC

The coastline was decreasing and closing; Water dynamic influnced the expanding peat area.



The transition of Rotterdam landscape(Workshop of Urban Ecology Lab)

open water

urban area

inland water

saltmarshes and river plains

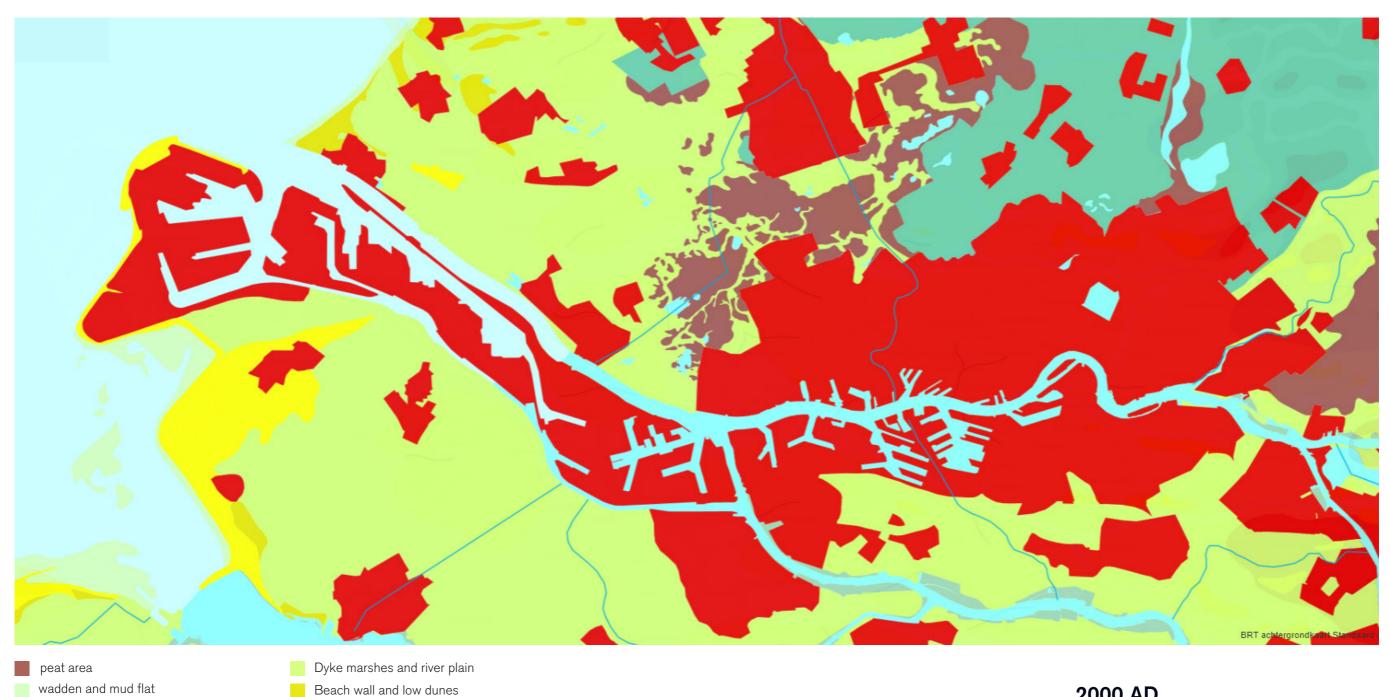
Source: http://rce.webgispublisher.nl/Viewer.aspx?map=Paleogeografischekaarten#

Beach wall and low dunes

River dunes

## 1400AD

After building up the dams in Rotterdam; the city kept to expand and grow, natural system shrinked, cultural landscape developed



The transition of Rotterdam landscape(Workshop of Urban Ecology Lab)

open water

urban area

inland water

saltmarshes and river plains

Source: http://rce.webgispublisher.nl/Viewer.aspx?map=Paleogeografischekaarten#

River dunes

Land reclamation

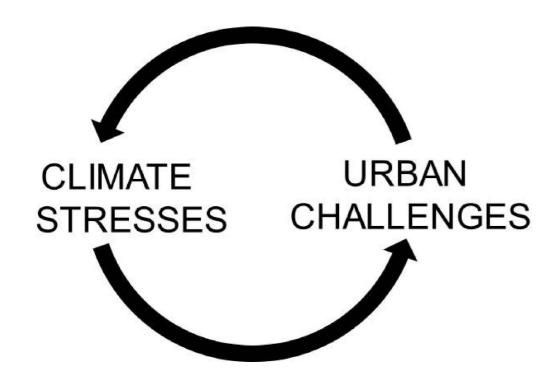
## 2000 AD

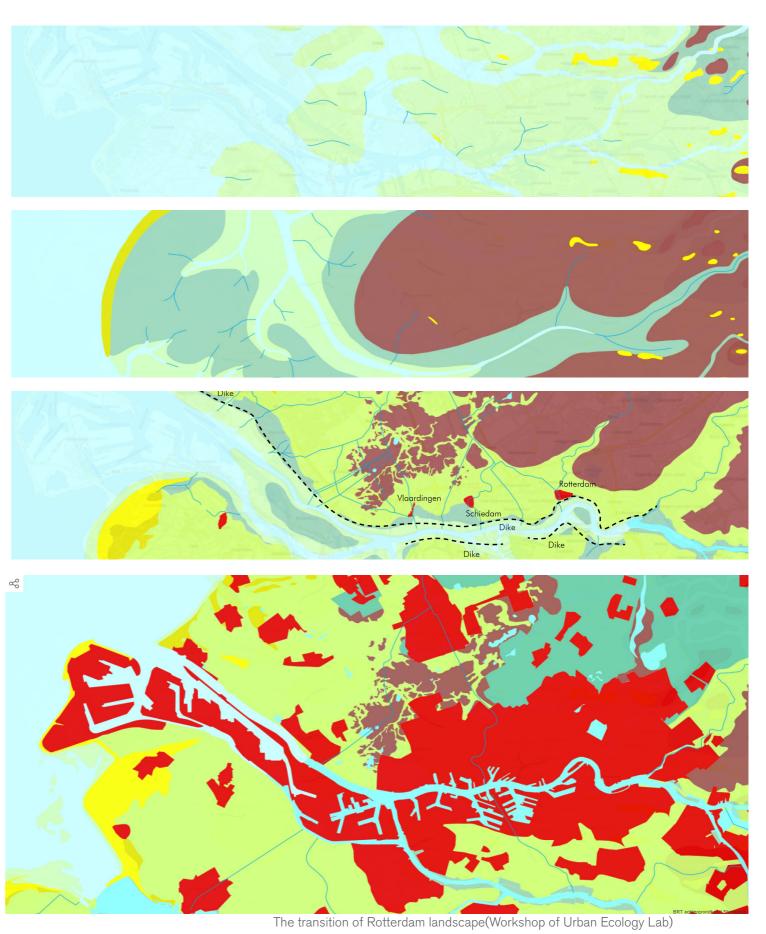
Becasue of the port and city expansion, the nature system and cultural landscape gradually declined in Rotterdam

### **INTRODUCTION**

PROBLEM FIELD

With this tranistion, Rotterdam development encounter with issues...





Source: http://rce.webgispublisher.nl/Viewer.aspx?map=Paleogeografischekaarten#

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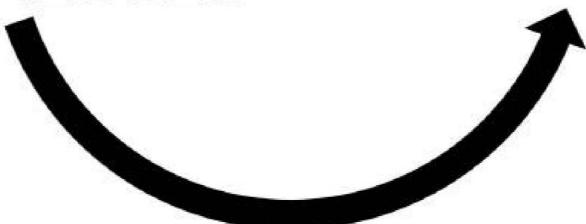




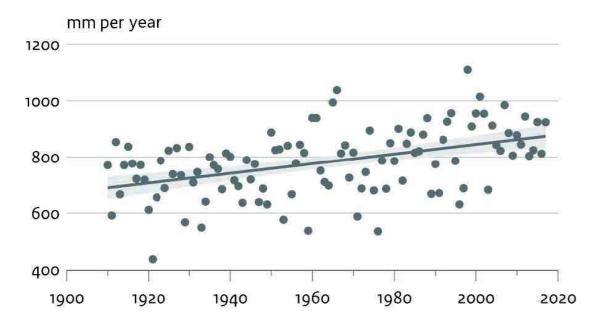




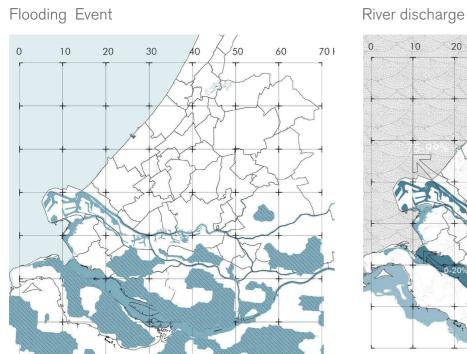


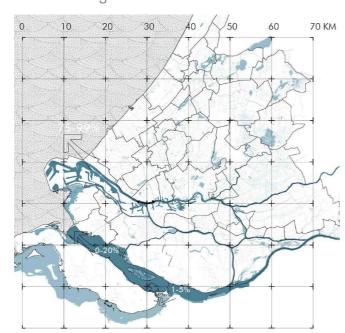


# Rain pattern change in South Holland

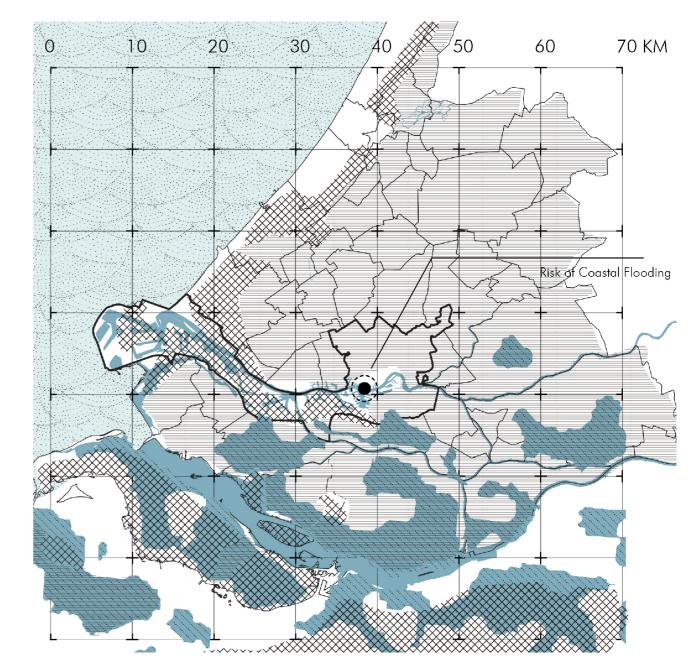


# Flooding in the region for the past and future





Data source:nationaalgeoregister.nl.



**CONCLUSION MAP OF FLOODING IN ROTTERDAM** 



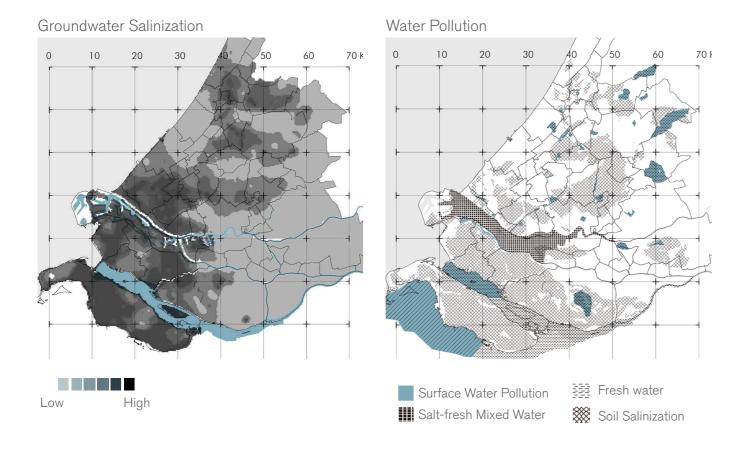




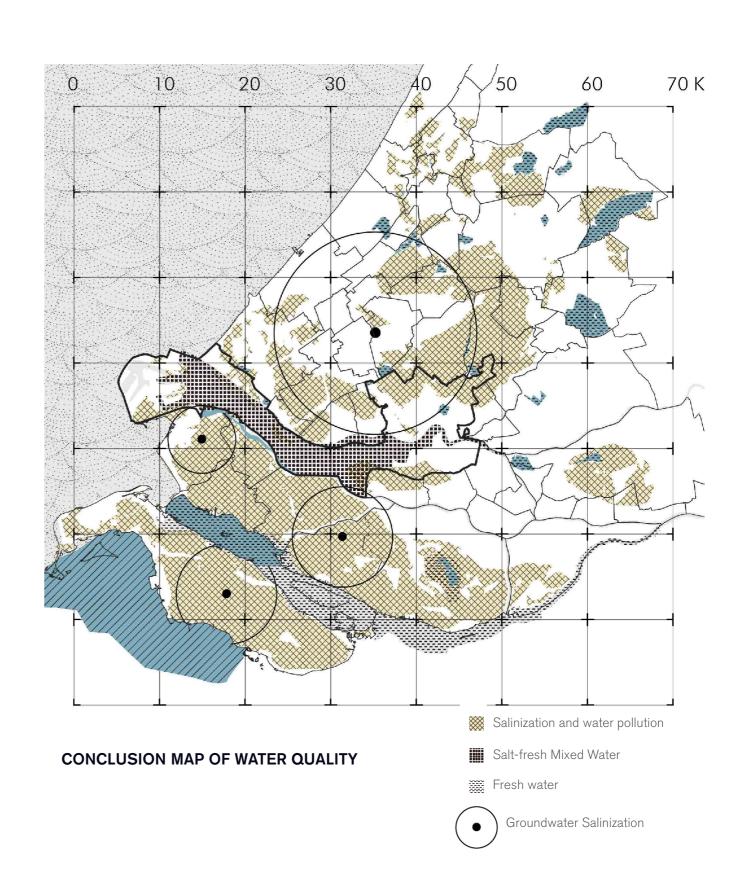


# Urban development exacerbates the climate change in water and soil

# Water Quality

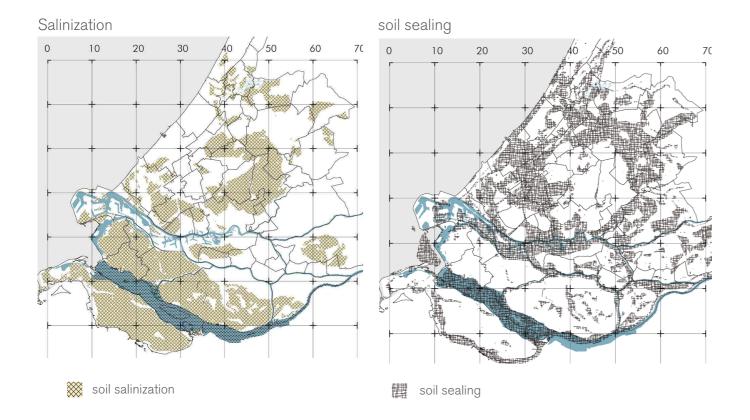


Data source:Nationaalgeoregister.nl.

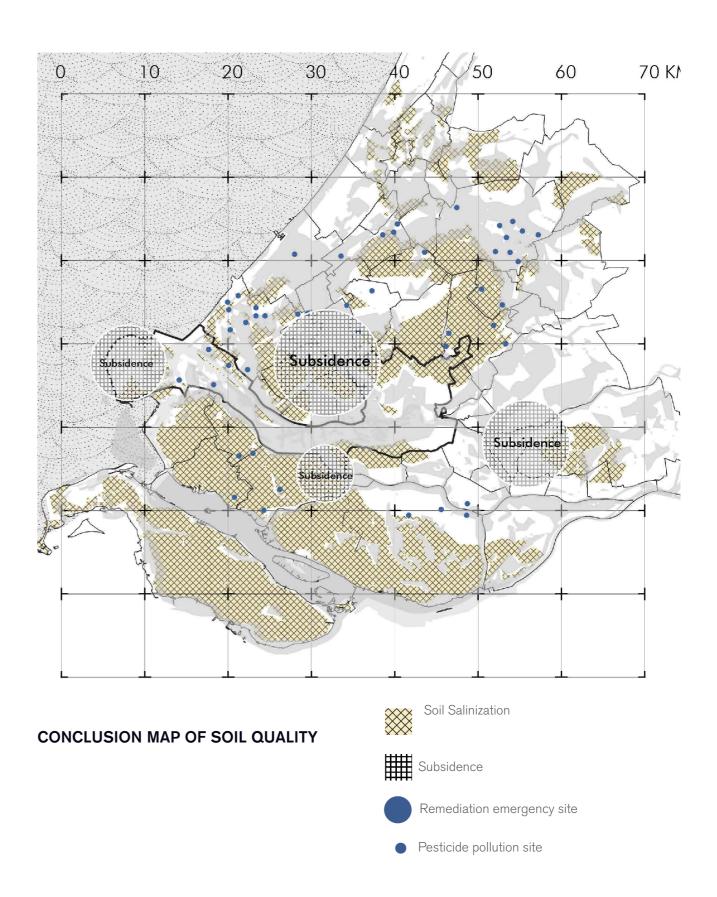


Soil and water are interelate with each other...

### Soil Condition

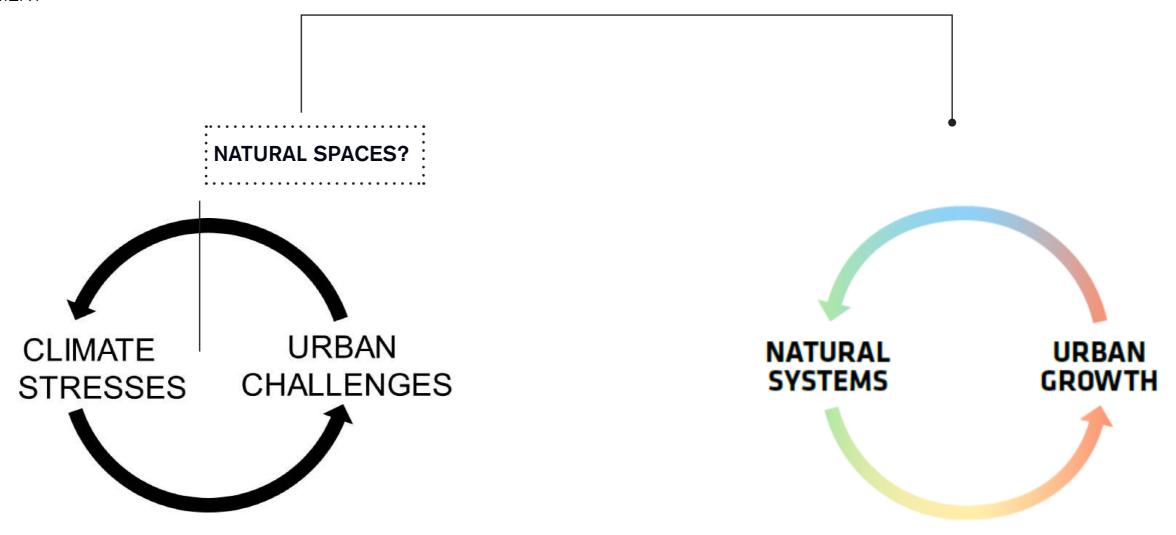


Data source:Nationaalgeoregister.nl.



#### **INTRODUCTION**

PROBLEM STATEMENT

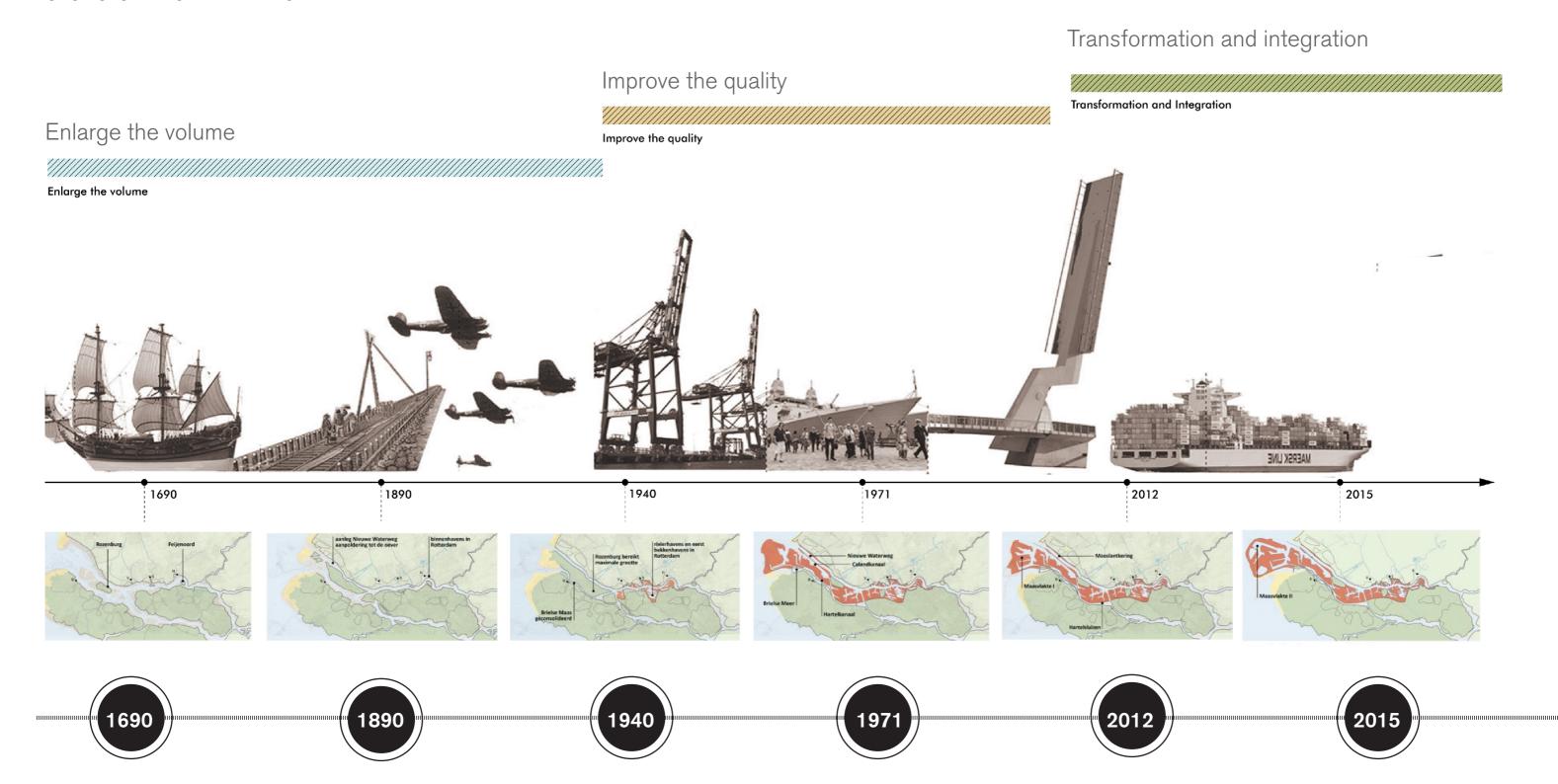


Without Natural system, Rotterdam lacks of ecosystem services, the negative cycle generates

It requires to imagine a new resilient, adaptive and sustainable urban development pattern for Rotterdam, so called "Social-ecological integration"

## **RESEARCH FIELD**

CASE STUDY: ROTTERDAM PORT



Source: De urbanisten,2014

## **RESEARCH FIELD**

WHY CHOOSE ROTTERDAM PORT AS CASE

# 1.Diversified landscape: where city, estuary and port meet

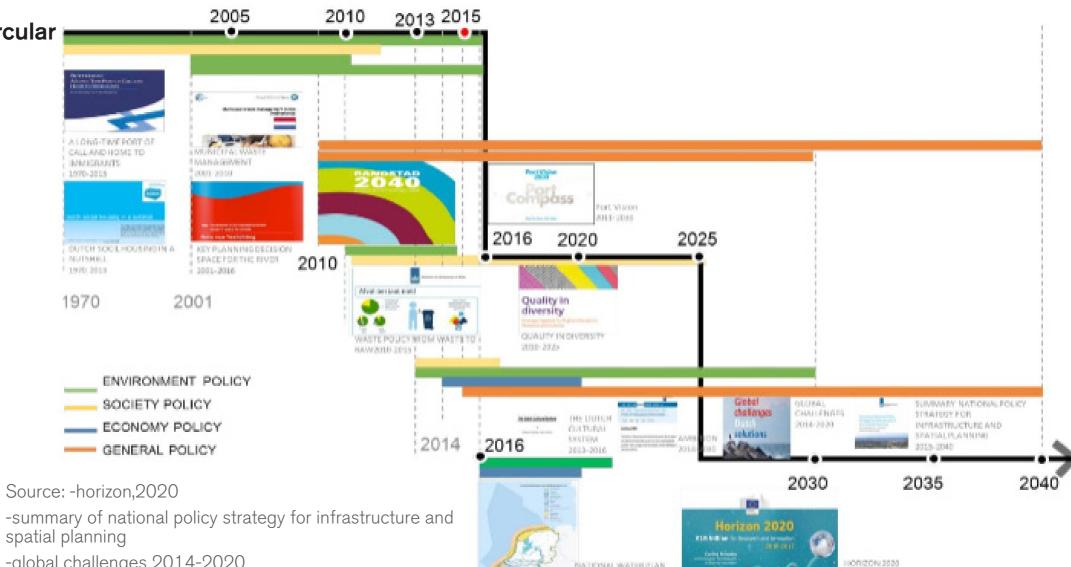








2. Energy transition and circular economy



Source: -horizon,2020

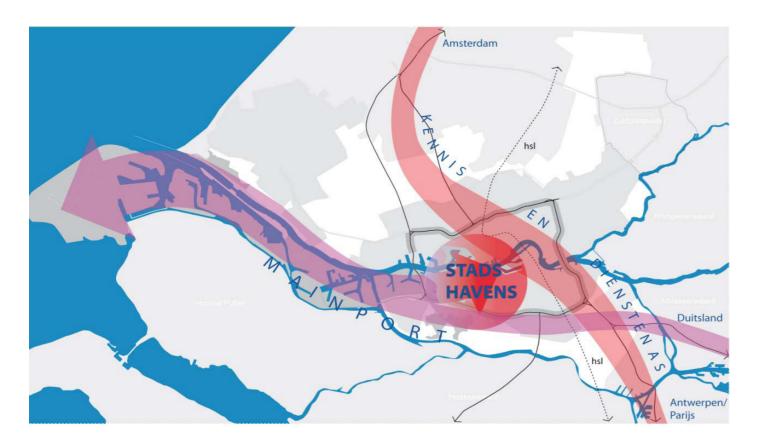
- -global challenges 2014-2020
- -a long term port of call and home to immgrants 1970-2015
- -dutch soical housing in a Nutshell 1970-2013
- -quality in diversity 2010-2025
- -the dutch cultural system 2013-2016
- -Municpal Waste Management report 2001-2010
- -key planning decesion space for the river 2001-2016
- -port vision
- -National water plan



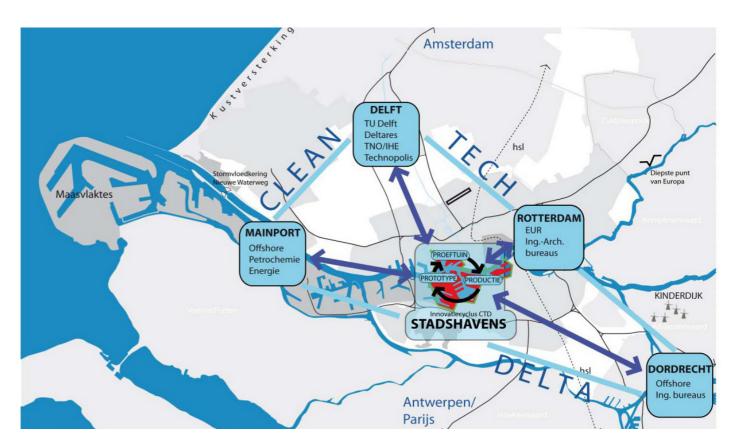


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# 3. City-port development



CityPorts Rotterdam is the place where city and port meet



Stadhaven area in Rotterdam aims to be clean tech Delta by applying knowlege and techniques in this field in terms of water, climate and energy issues

#### **RESERACH FIELD**

MAIN RESEARCH QUESTION

"In order to deal with **climate change**, is it possible to use the **river and estuary** as backbone to align with **port transfromation** and **city-port development** toward social-ecological integrations by urban planning, landscape and strategic urban design interventions?

#### **RESERACH FIELD**

SUB RESEARCH QUESTIONS

#### **SQ1** Understanding quesiton

What is the concept of socialecological integrations in spatial planning and governance?

#### SQ2 What to do question

What is the current social-ecological system of Rotterdam port, and what are the challenges and opportunities?

What are the guiding principles of social-ecological integrated port transformation in terms of ecological, social, and economic aspects?

#### **SQ3** How to do question

What are the stakeholders involved in the current and future process? and then how to facilitate strategic multi-actor collaborations?

### **SQ4** Application question

How to apply to combine the spatial planning and implementation with multi-actors in Rotterdam port through time?

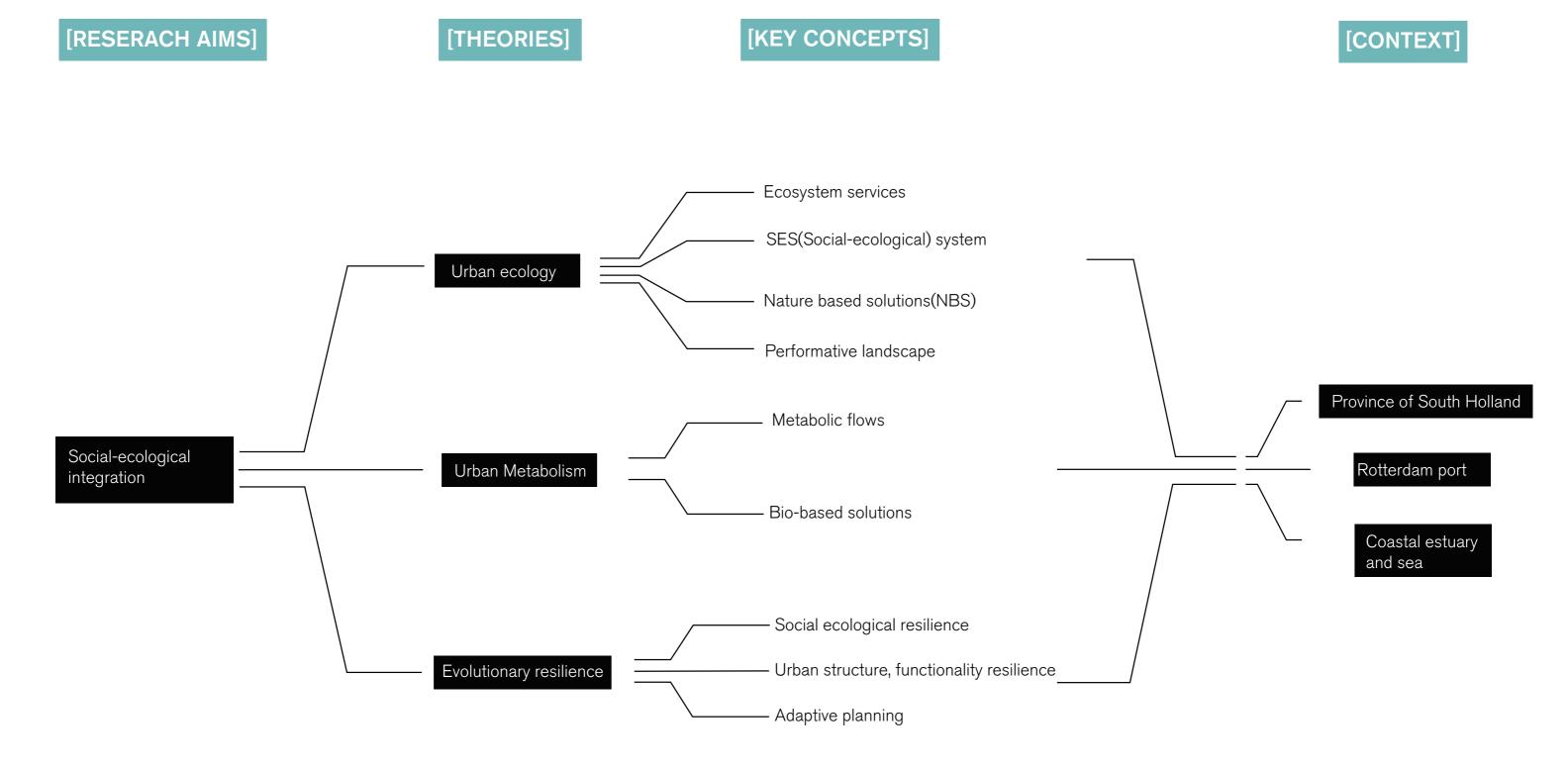
# **CONCEPT BUILDING**

SYSTEM ASSESSMENT

COLLABORATIVE GOVERNANCE STRATEGY MAKING

#### **CONCEPT BUILDING**

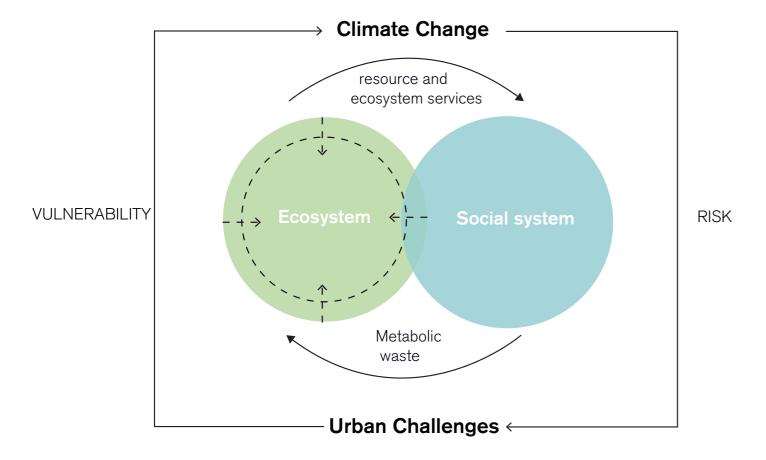
THEORETICAL FRAMEWORK



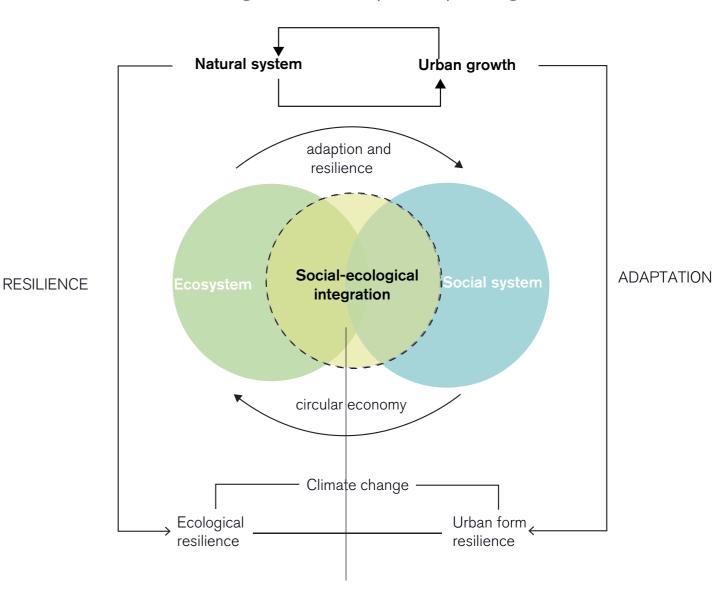
#### **COCEPTUAL FRAMEWORK**

CONCEPTUAL FRAMEWORK

## **Current Situation**



# Toward a new integrated development paradigm



Nature-based and resilient river backbone

Circular and bio-based economy

Sustainable, adaptive city and port integration

# SYSTEM ASSESSMENT

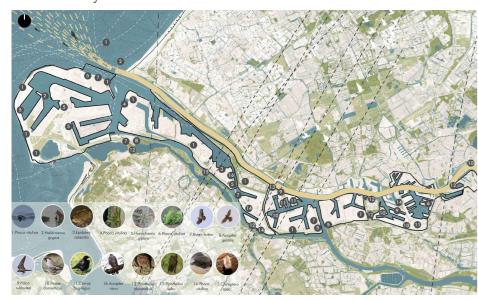


Source: I. Bobbink, Tudelft,(2015)

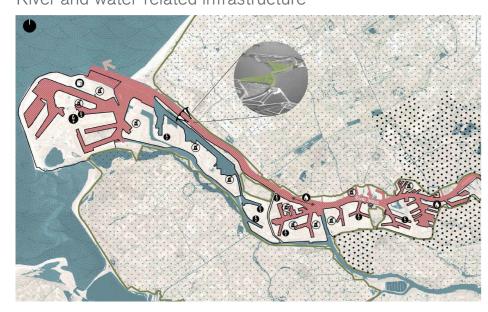
### SYSTEM ASSESSMENT

ECOLOGICAL AND SOCIAL-ECONOMIC SYSTEM

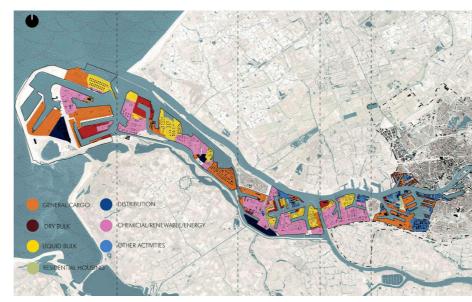
## Biodiversity



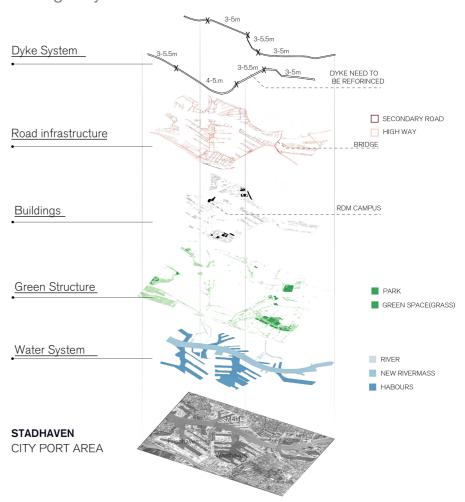
River and water-related infrastructure



Land uses and industries



Strategic layers in Stadhaven



Mobility



**BIOPHYSICAL** 

LAYERS

**RESOURCE** 

LAYERS

SOCIAL

LAYERS

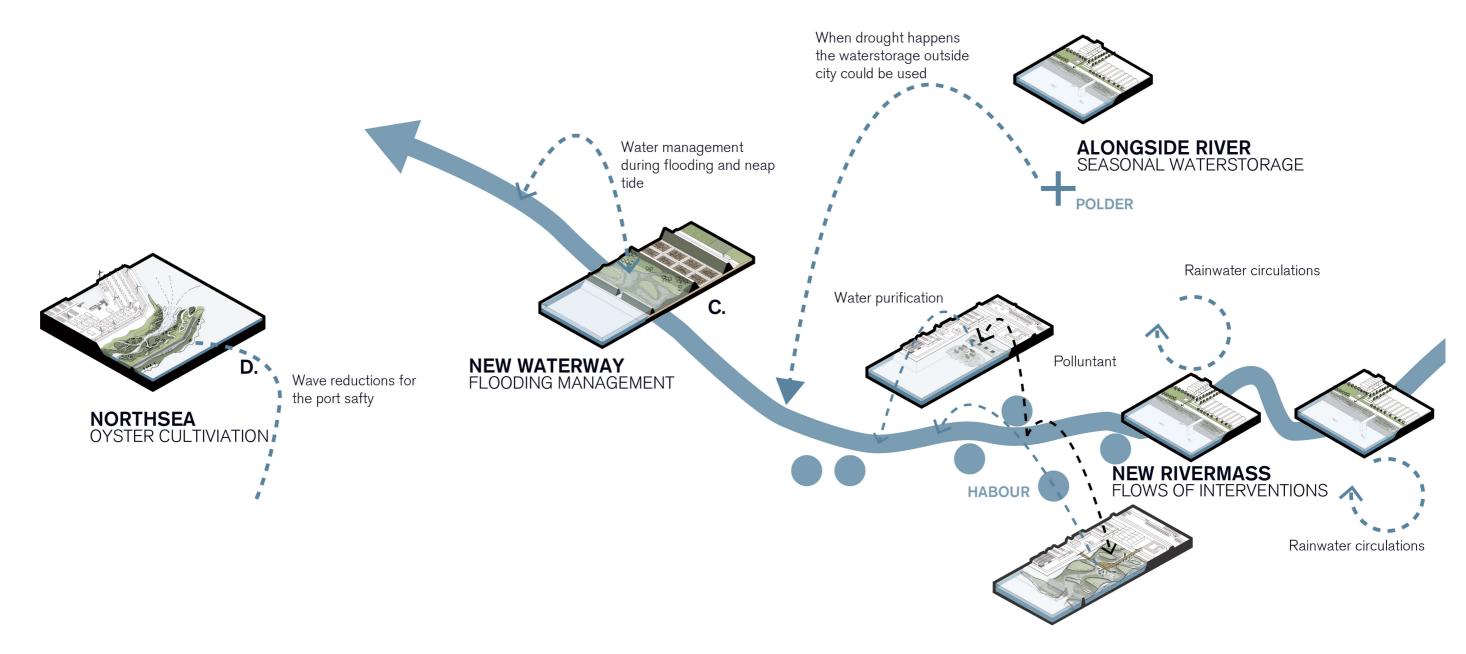
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#### SYSTEM ASSESSMENT

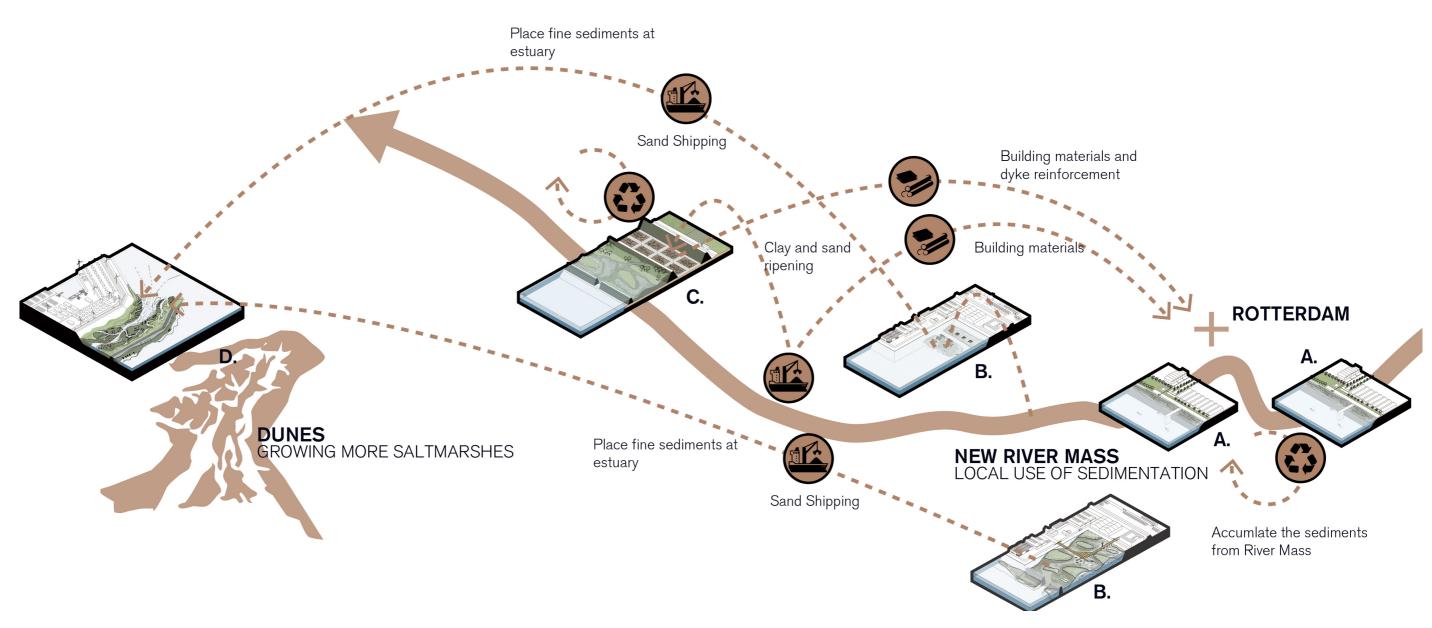
**GUIDING PRINCIPLE** 

### **Guiding Principle I**

Water managment and ecosystem restoration synergy

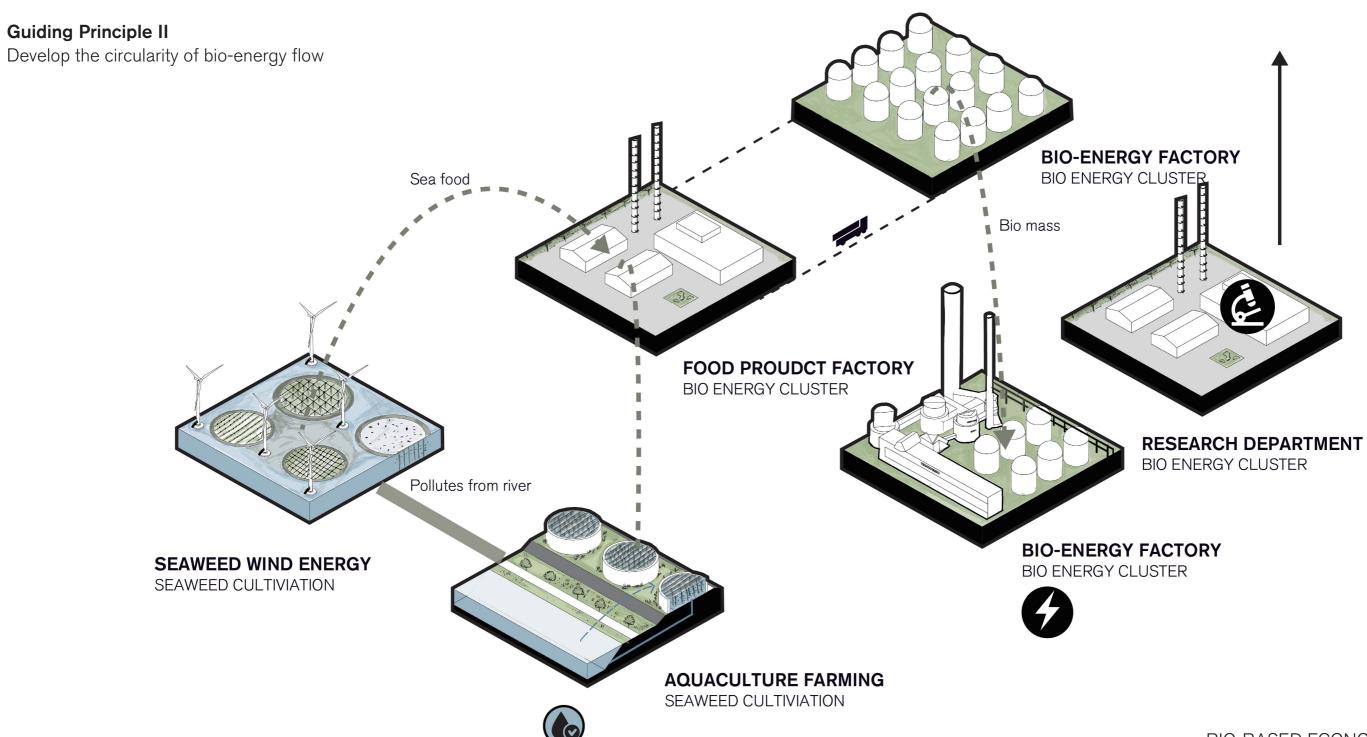


WATER MANAGEMENT



SEDIMENTATION MANAGEMENT

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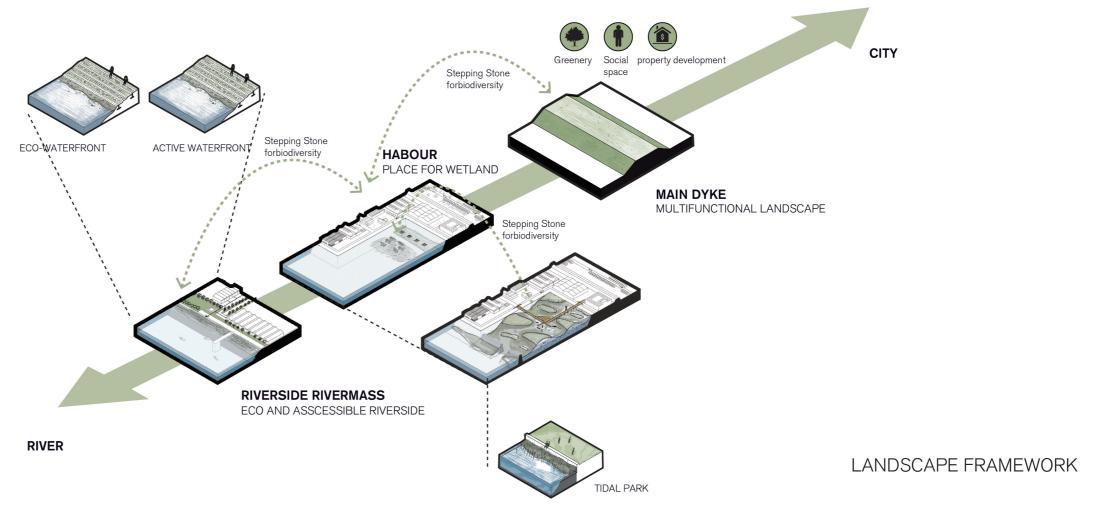


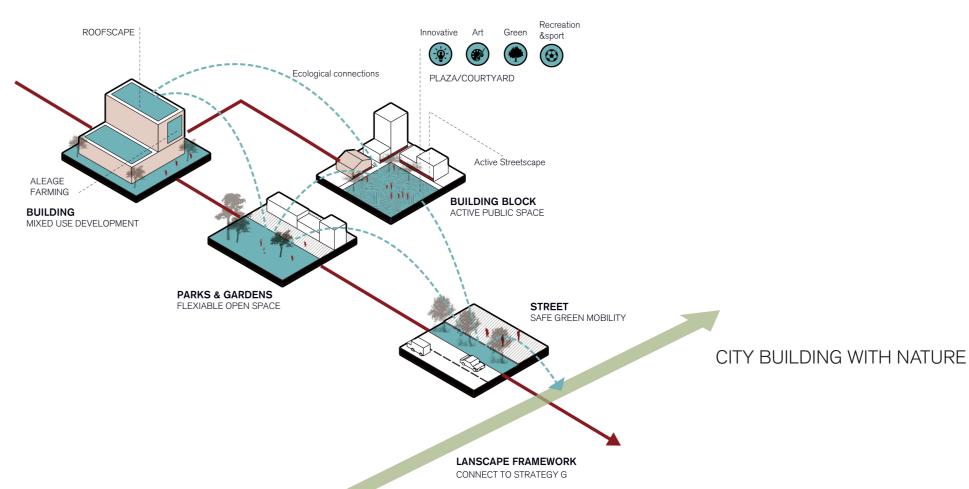
Water purfication

BIO-BASED ECONOMY CLUSTER

## **Guiding Principle III**

Multifunctionality and increase responsive nature in their systematic capacity and transformation

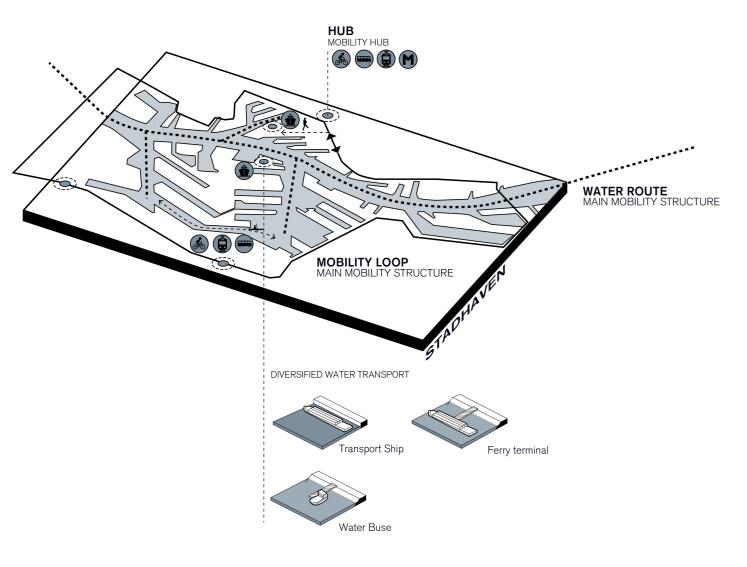


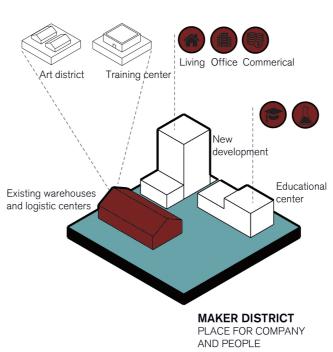


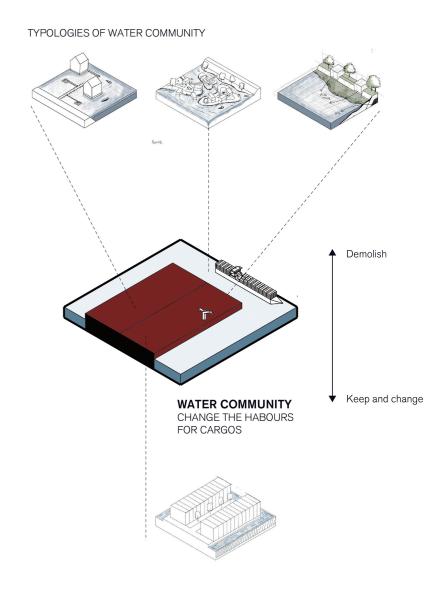
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## **Guiding Principle IV**

Land use diversification





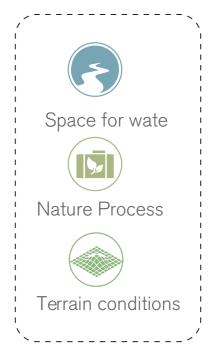


SLOW MOBILITY(STADHAVEN)

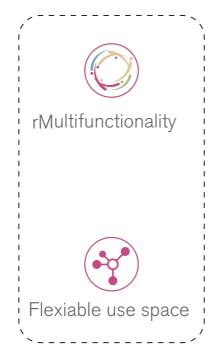
DENSIFICATIONS AND REDEVELOPMENT

#### SYSTEM ASSESSMENT

SUMMARY OF PRINCIPLES



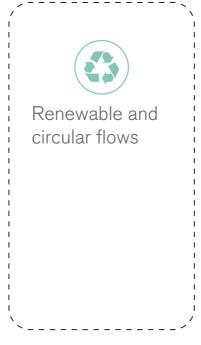
Water managment and ecosystem restoration synergy



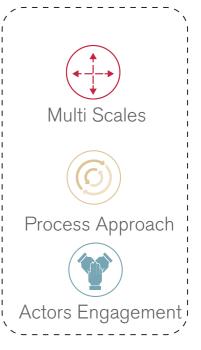
Multifunctionality and increase responsive nature in their systematic capacity and transformation



Land use diversification



Develop the circularity of bio-energy flow



Process and Multi-scales synergy for implementation

### SYSTEM ASSESSMENT

### SUMMARY OF PRINCIPLES



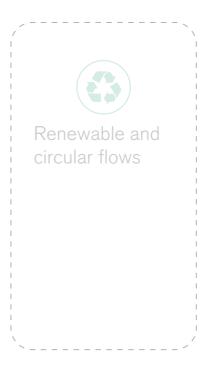
Water Mangement and Ecosystem restoratioon Synergy



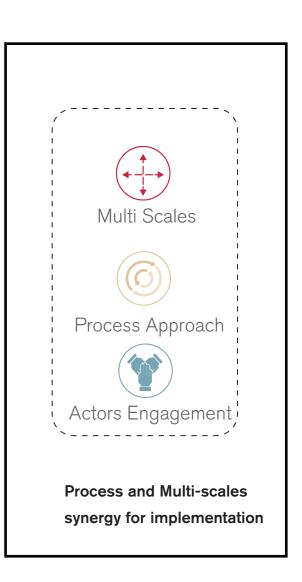
Multifunctionality and responsive nature improvment



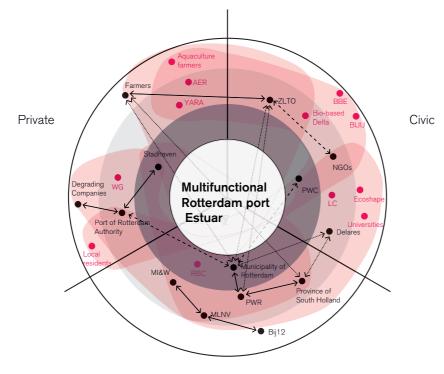
Land use diversification



Circluarity development



# **COLLABORATIVE GOVERNANCE**

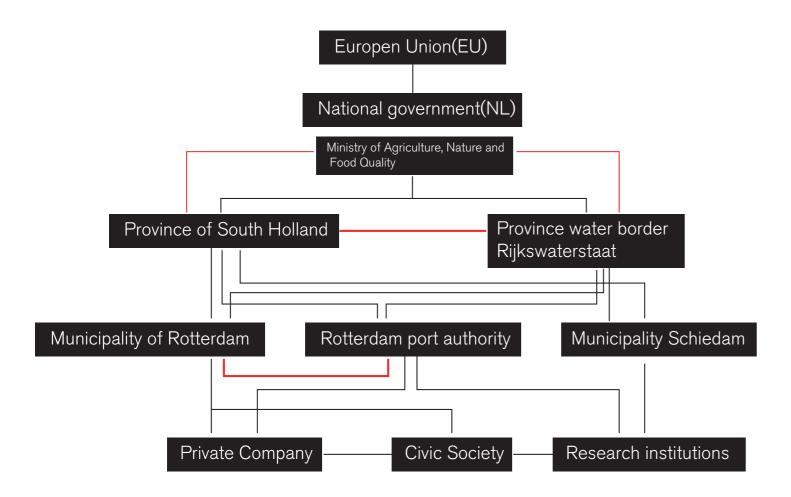


Public

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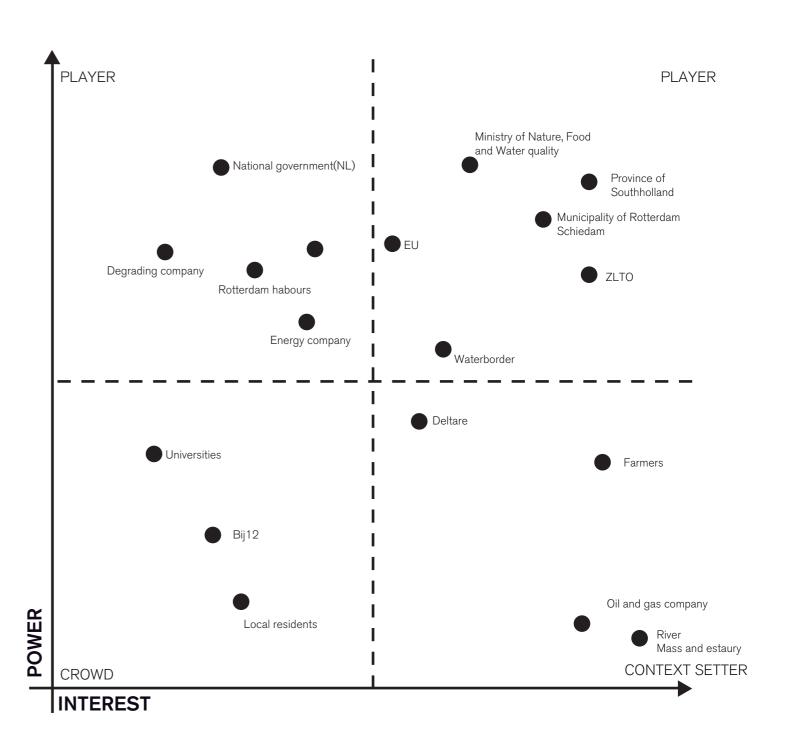
#### **GOVERNANCE**

#### POWER AND INTEREST OF STAKEHOLDERS



The hierarchy of governance structure

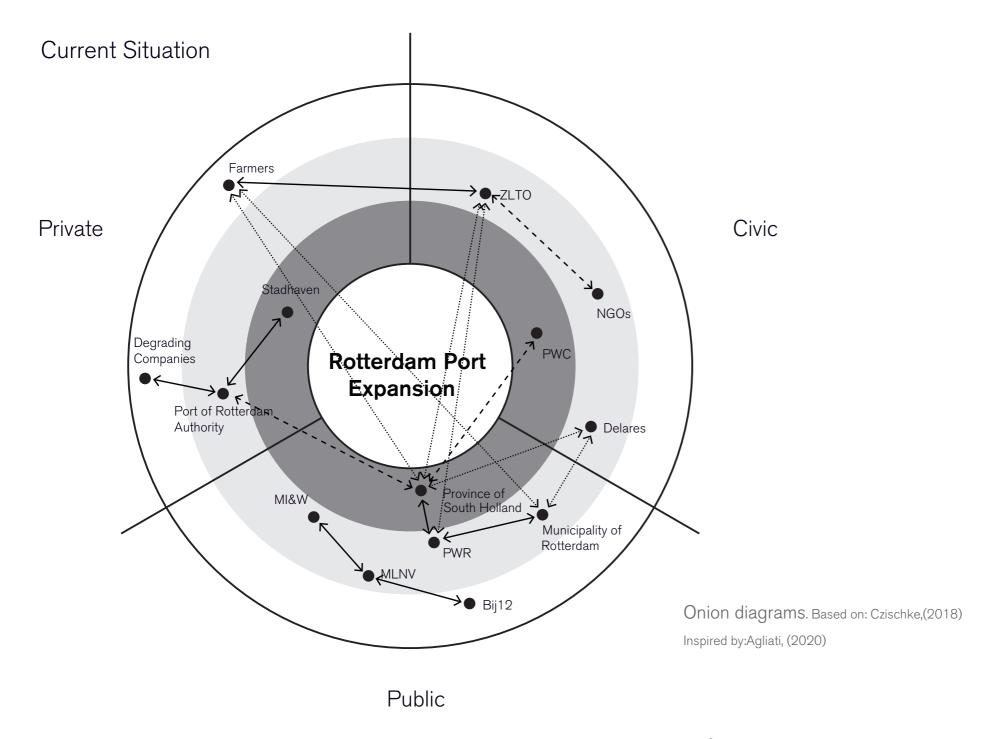
current connectionsproposed and empowered connections



Power and interest analysis of main stakeholders in region

### **GOVERNANCE**

MULTI-ACTOR INTERACTION



Actors

Relationship

Existing Stakeholders

Secondary Stakeholders

Primary Stakeholders

Relationship

Frimary Stakeholders

Primary Stakeholders

Relationship

Frimary Stakeholders

Primary Stakeholders

Relationship

Frimary Stakeholders

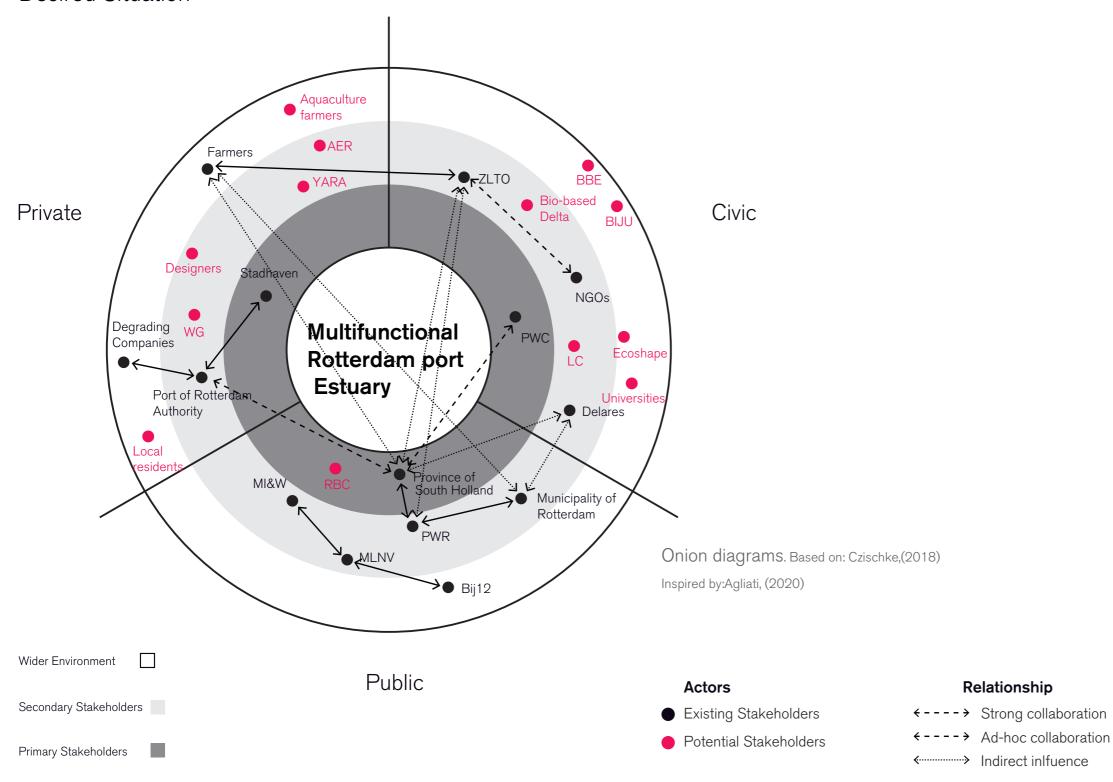
Frimary Stakeholders

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### **GOVERNANCE**

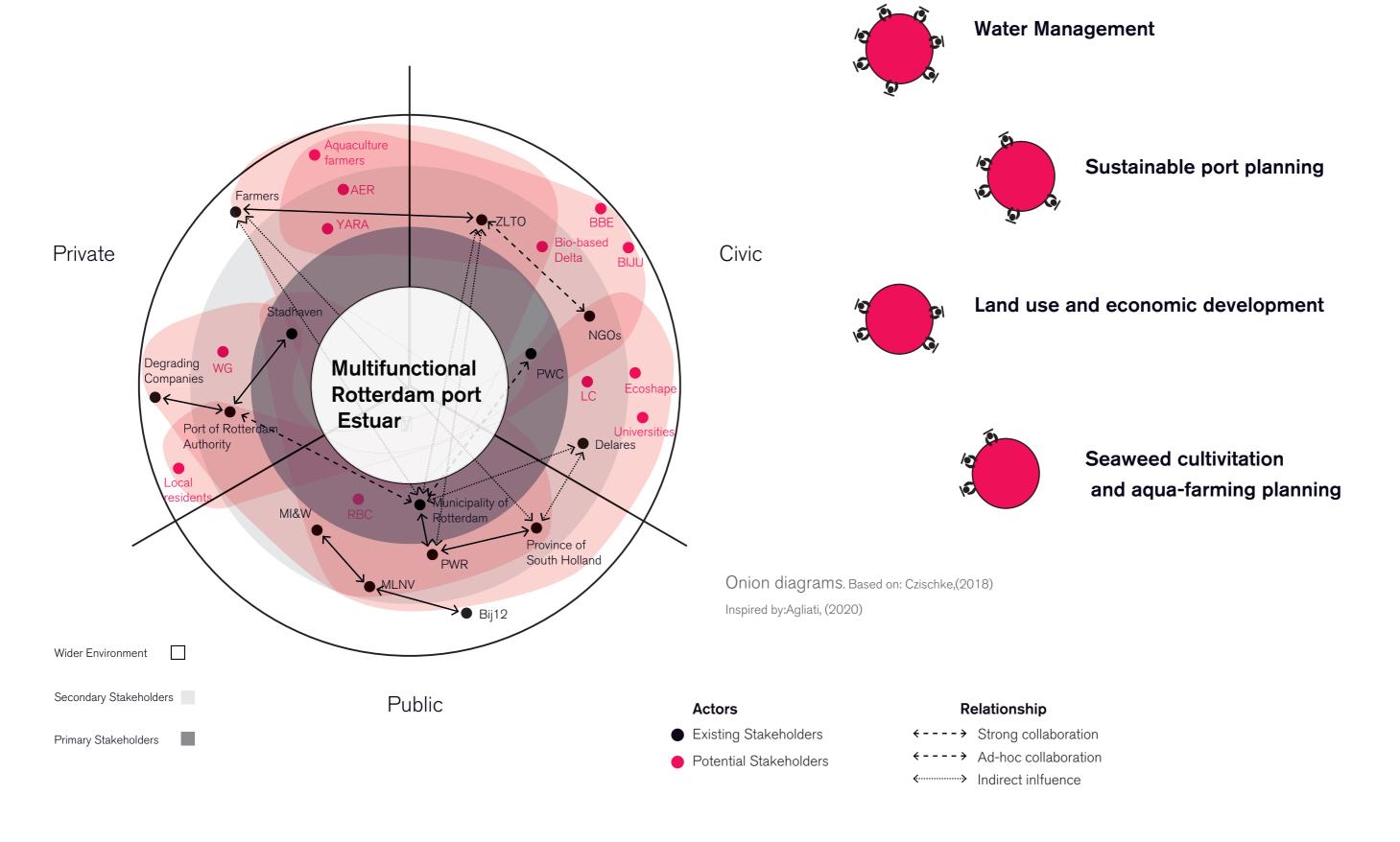
DESIRED SITUATIONS

# **Desired Situation**



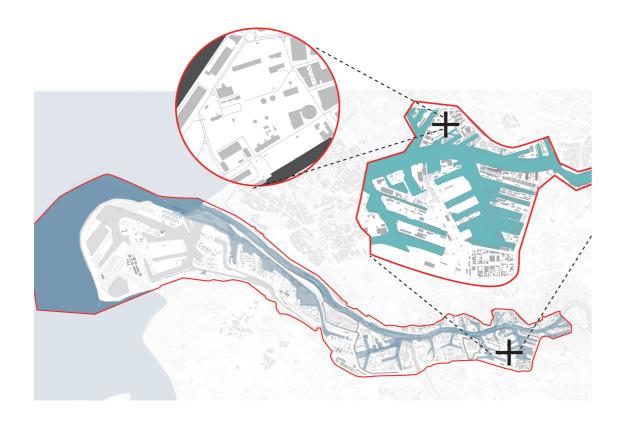
#### **GOVERNANCE**

#### OVERACHING THE PLANNING FRAMEWORK

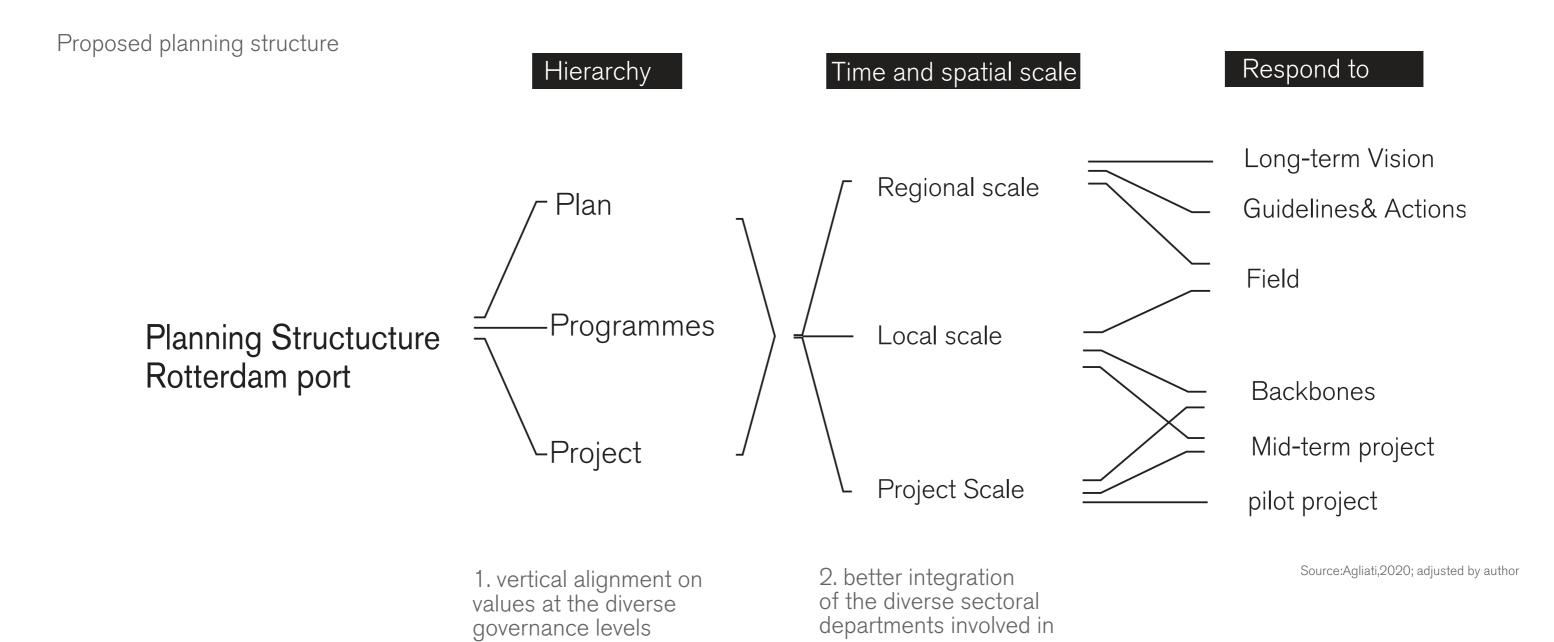


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# **STRATEGY**



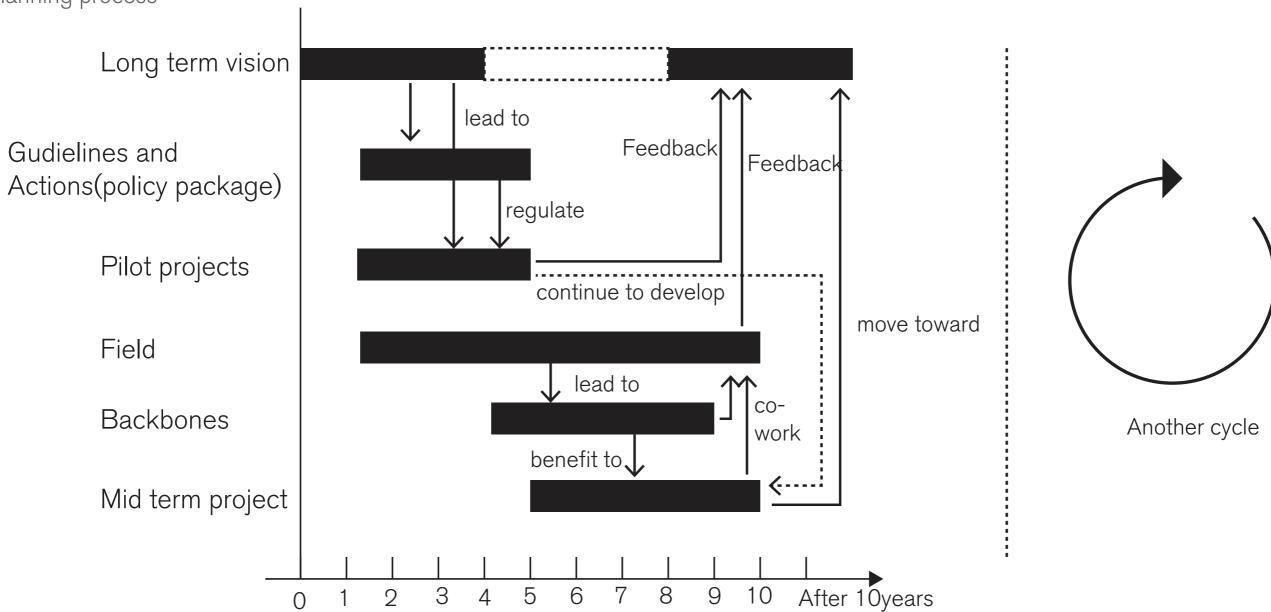
STATEGIC PLANNING TOOL

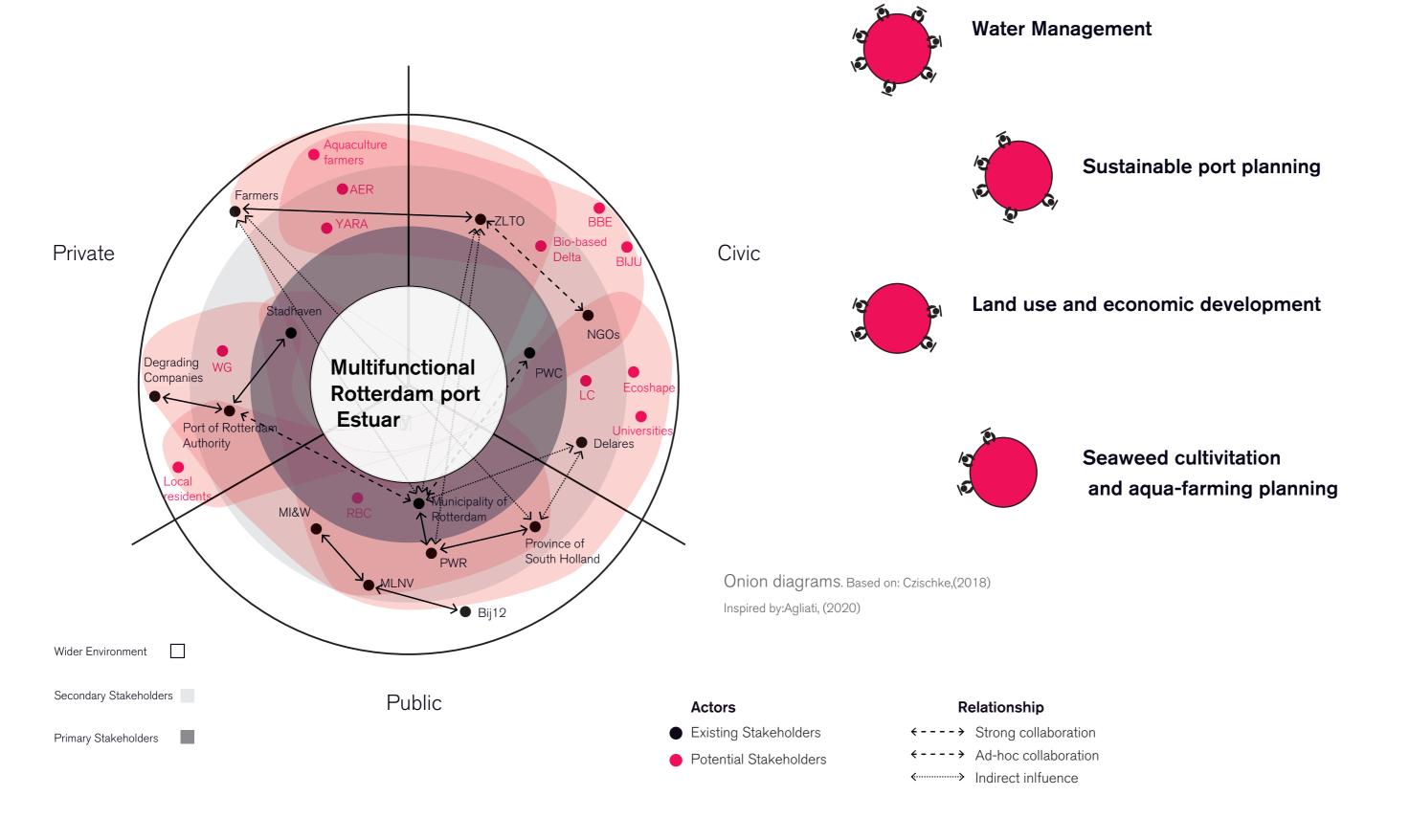


the strategic planning

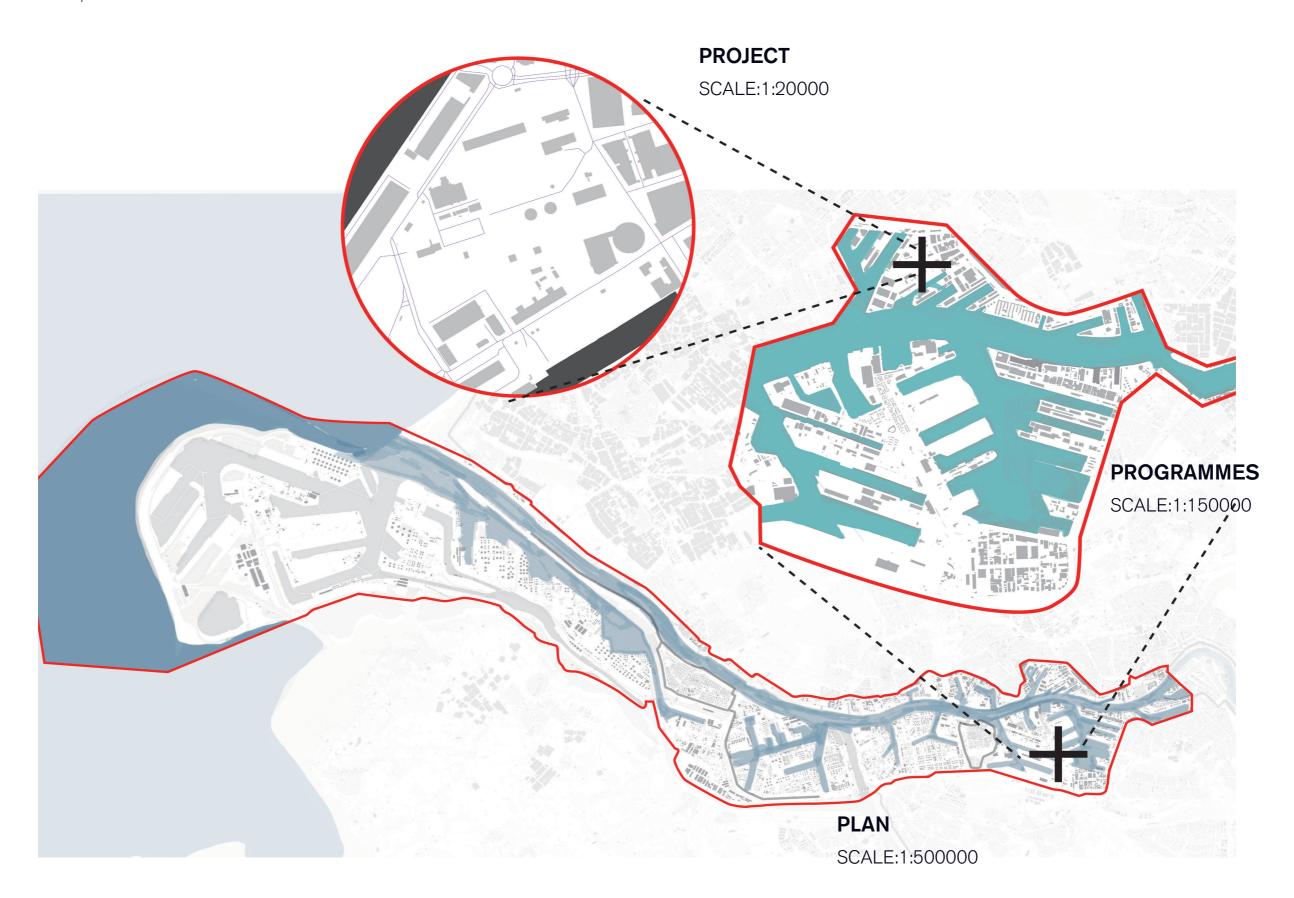
STATEGIC PLANNING TOOL

# Proposed planning process

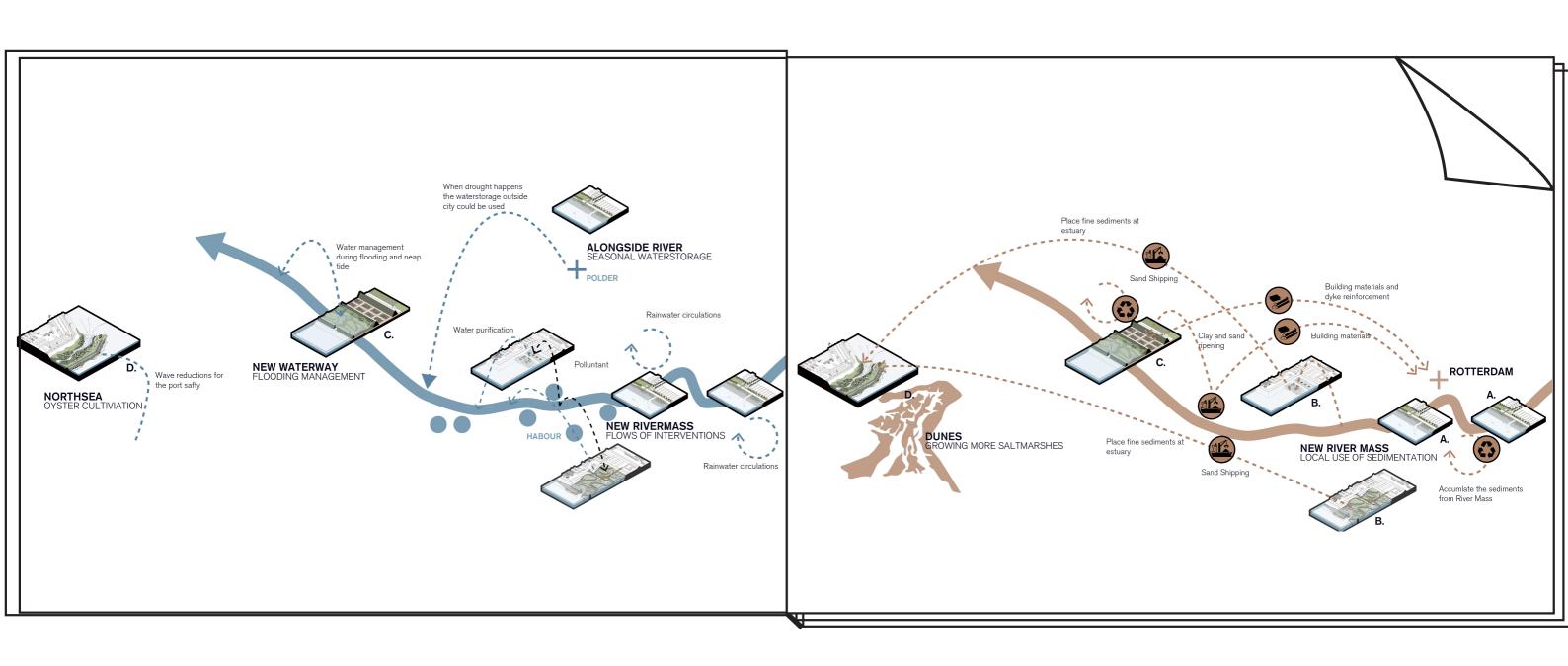




PLAN, PROGRAMME, AND PROJECT

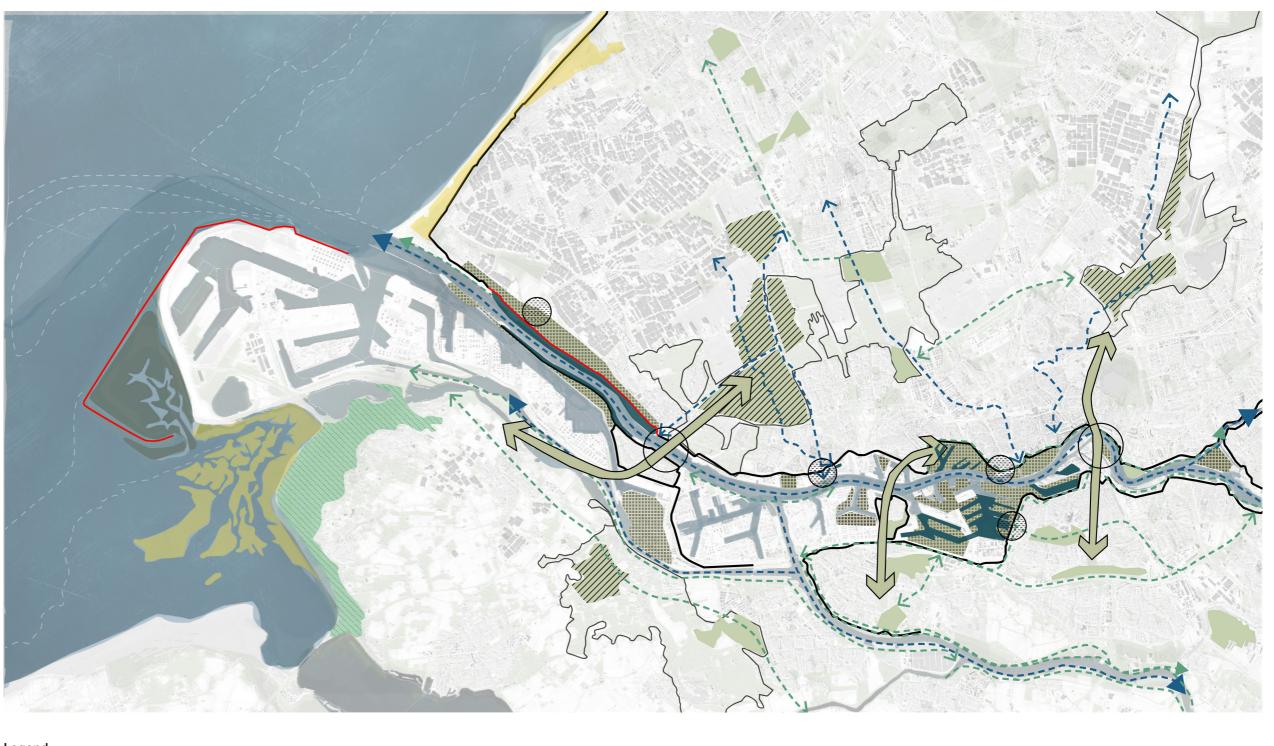


STRATEGIC PLANS



#### **Environment Actions**

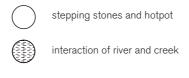
- 1.Restore the water gradients at the strategic points
- 2. Strengthen and establish ecological connections
- 3.Develop the retention area as waterscape





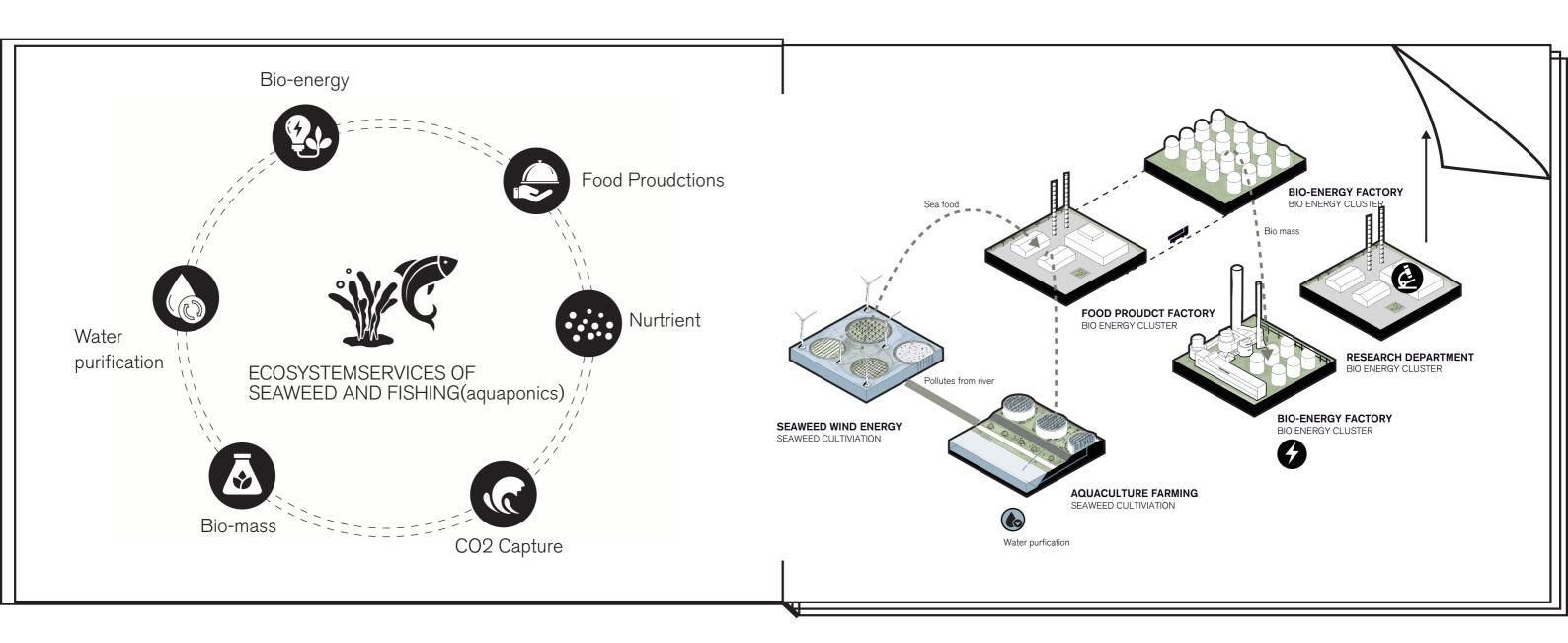


new constructed dyke



peat meadow landscape

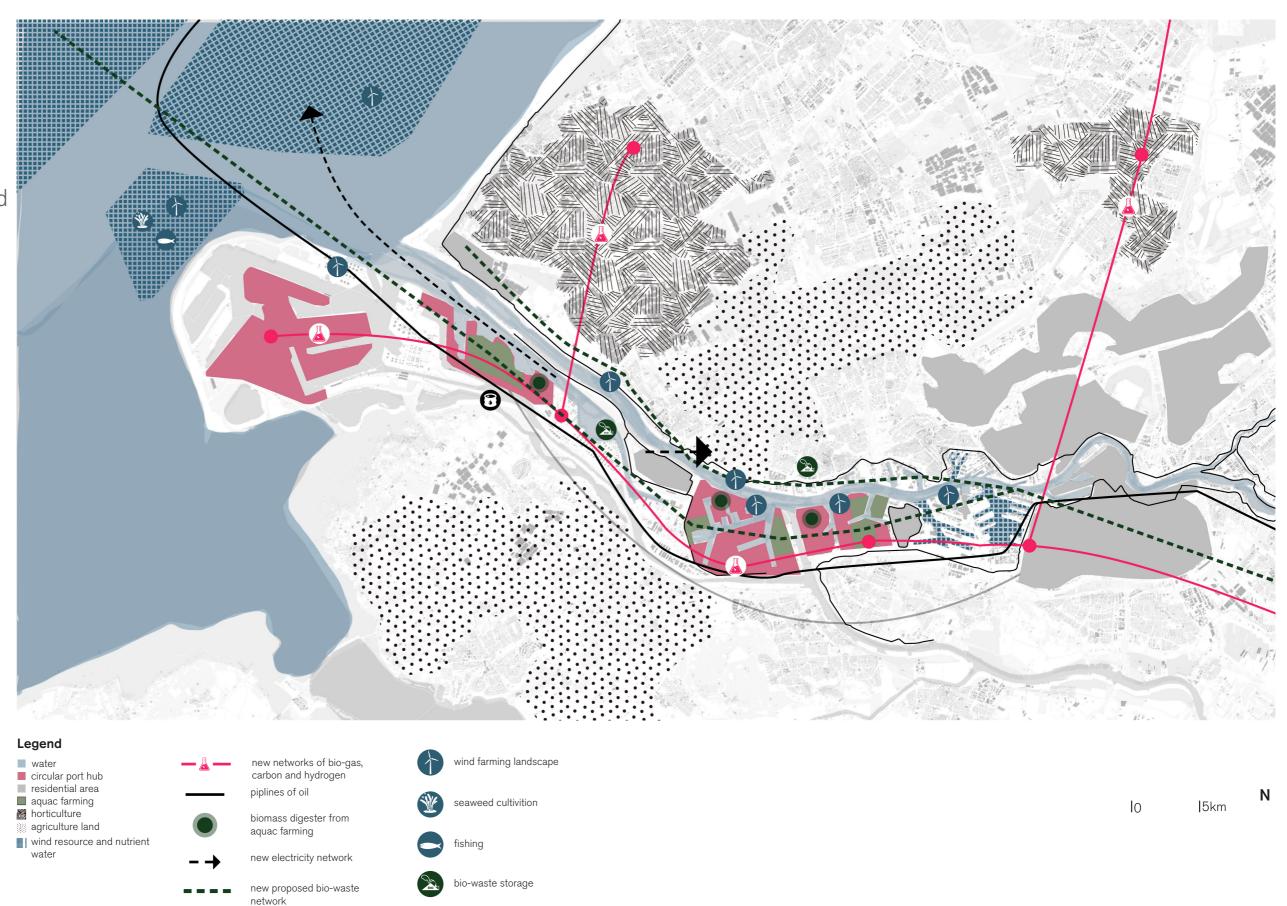




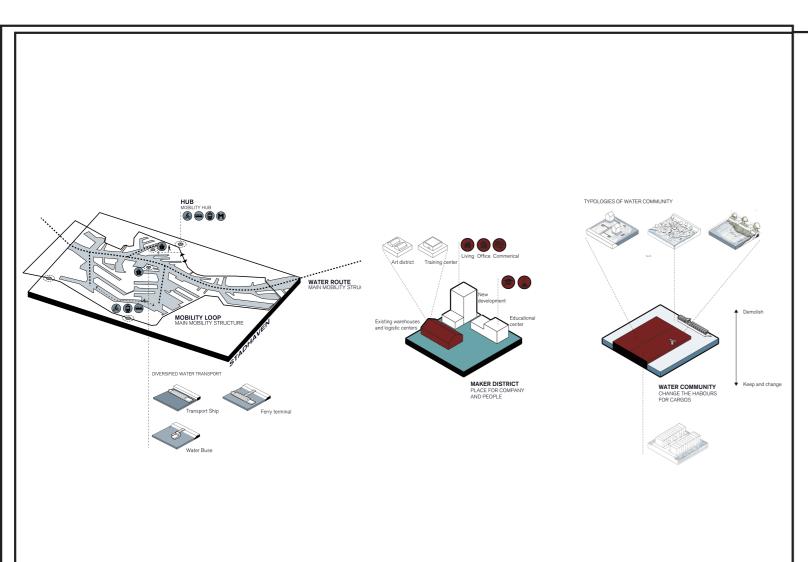
# **Economic Actions**

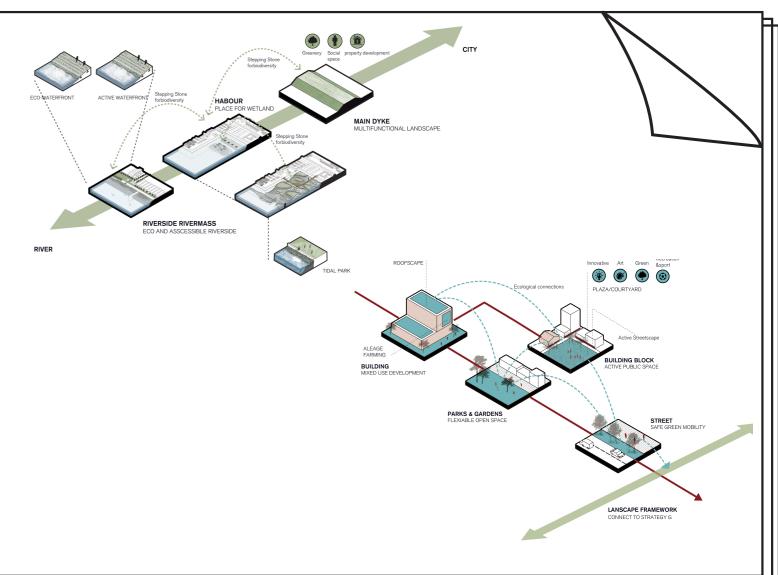
- 1. Develop energy landscape such as wind farming
- 2. Seaweed cultivation at North sea; Apply acaponic farming in Rotterdam port
- 3.Networks of bio-gas and carbon pipelines

4.network of bio-waste transport and storage space



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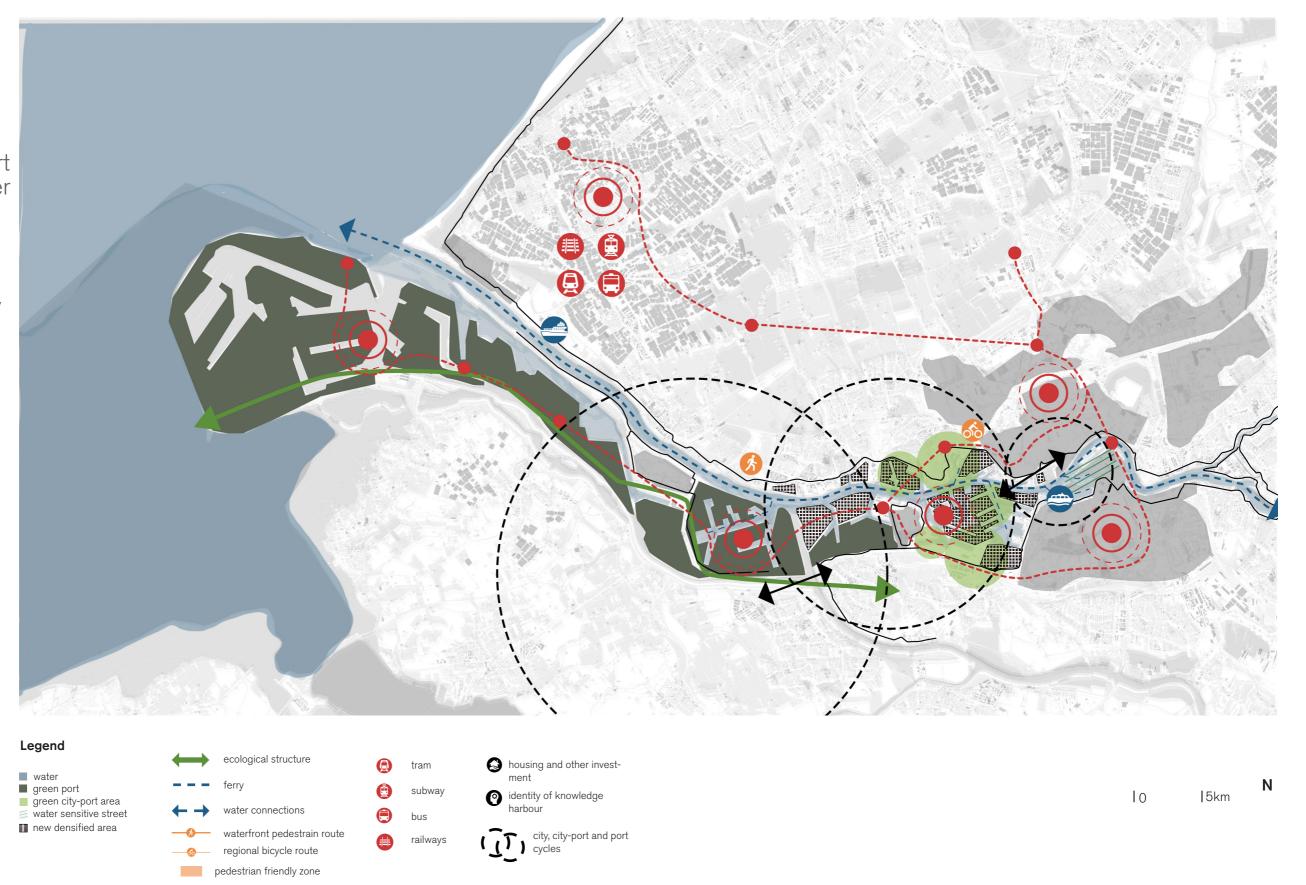
# **Social Actions**

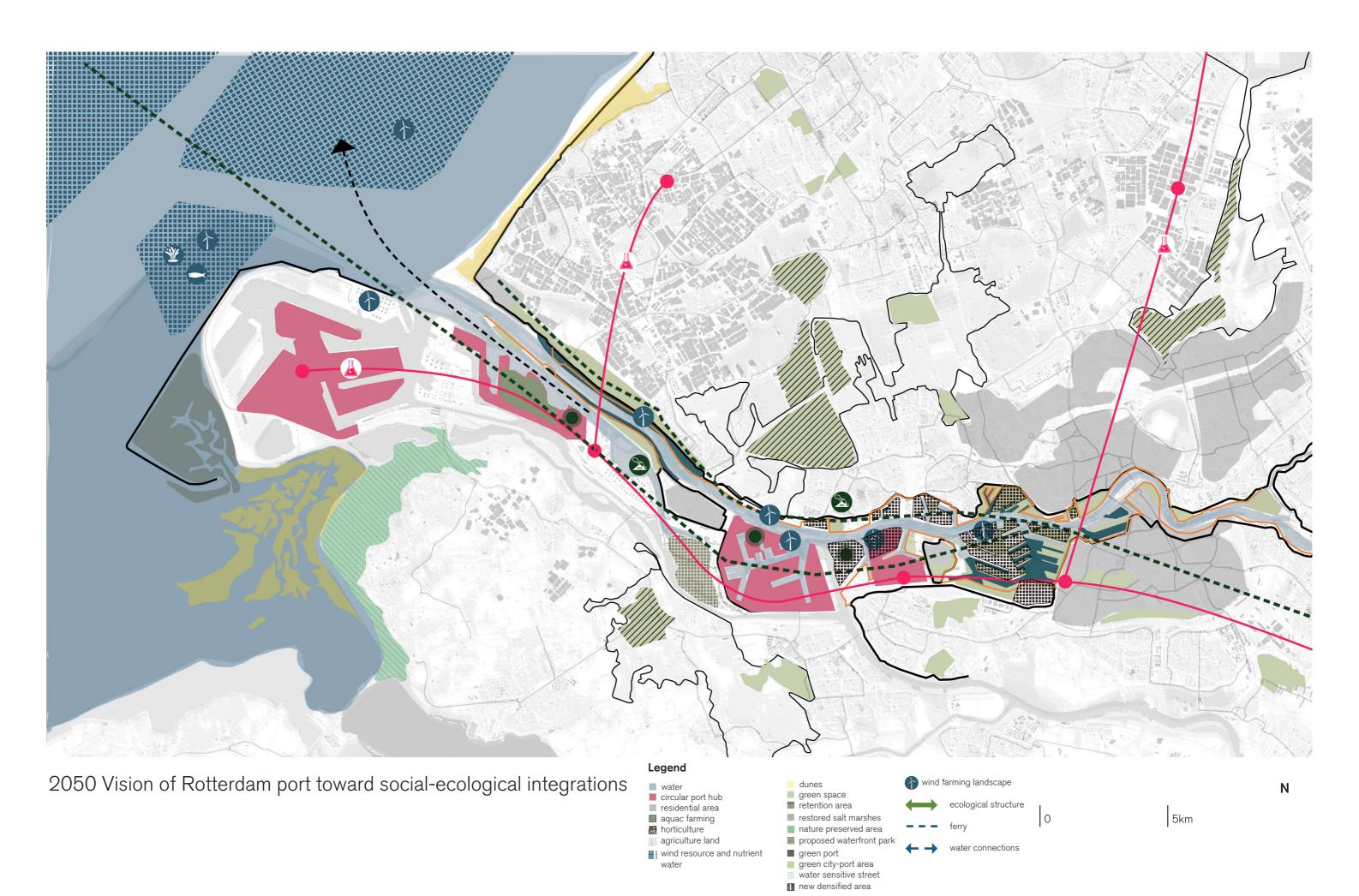
1. Integrate the tranport hubs; develop the water transportation

2. Increase the waterfront accessibility by slow mobility

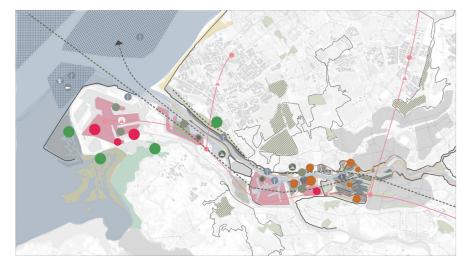
3.Identify the green port and place for the densifications for city activities

Multi-model hub

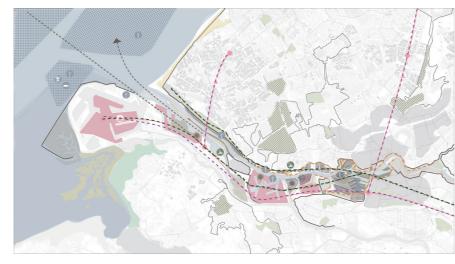




# STRATEGIC TIMELINES



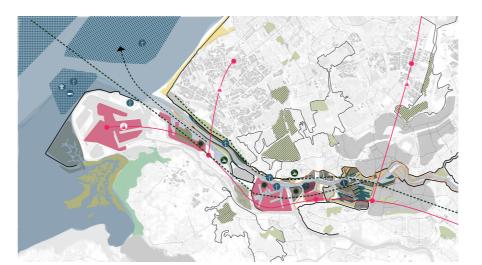
In **2025**, the pilot projects will be tested and evaluated firsl-ty.



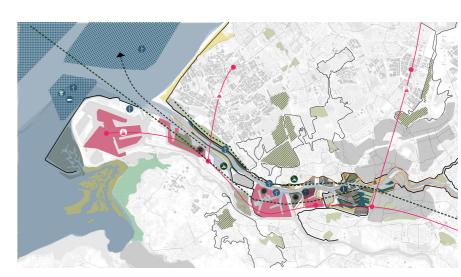
In **2030**, regional infrastructure(Backbones) will be developed.

# **Future**

#### Current



In **2040**,and the more project continues to appear and expanded.

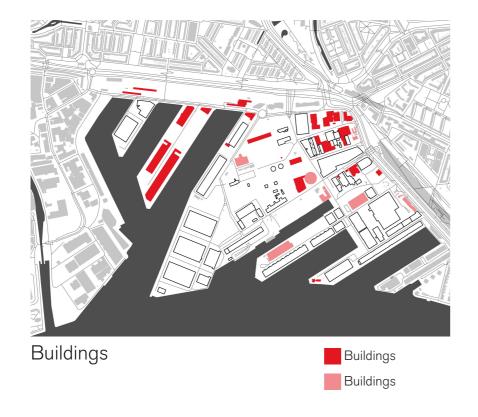


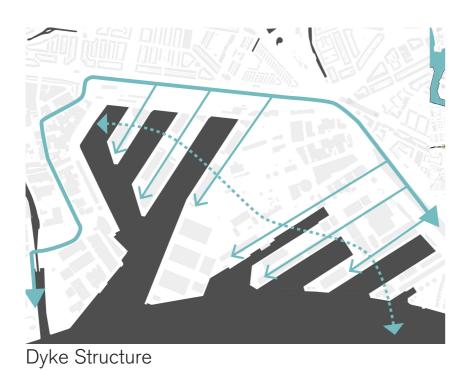
In **2050**, the targeting goals will be achieved and further develop a social-ecological integrated Rotterdam port.

**STRATEGY** PROJECT M4H 10 1.5km

TESTING: M4H

# PROJECT M4H





Green Space

Buildings
Buildings
Buildings
Buildings

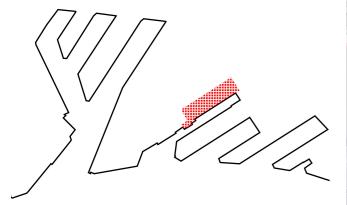


Road System

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# **STRATEGY**

TIDAL PARK



# STAKEHOLDER ENGAGEMENT



Rotterdam port authority



Municipality of Rotterdam



Deitares



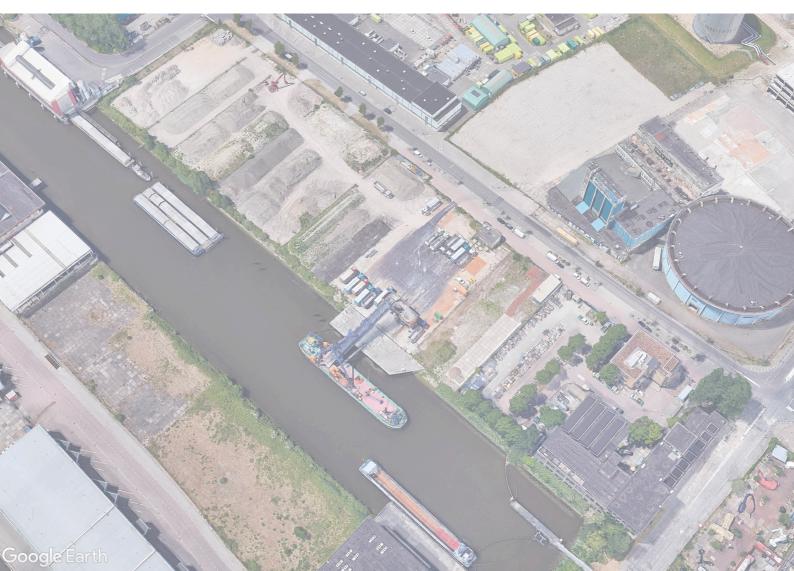
Witteveen+Bos



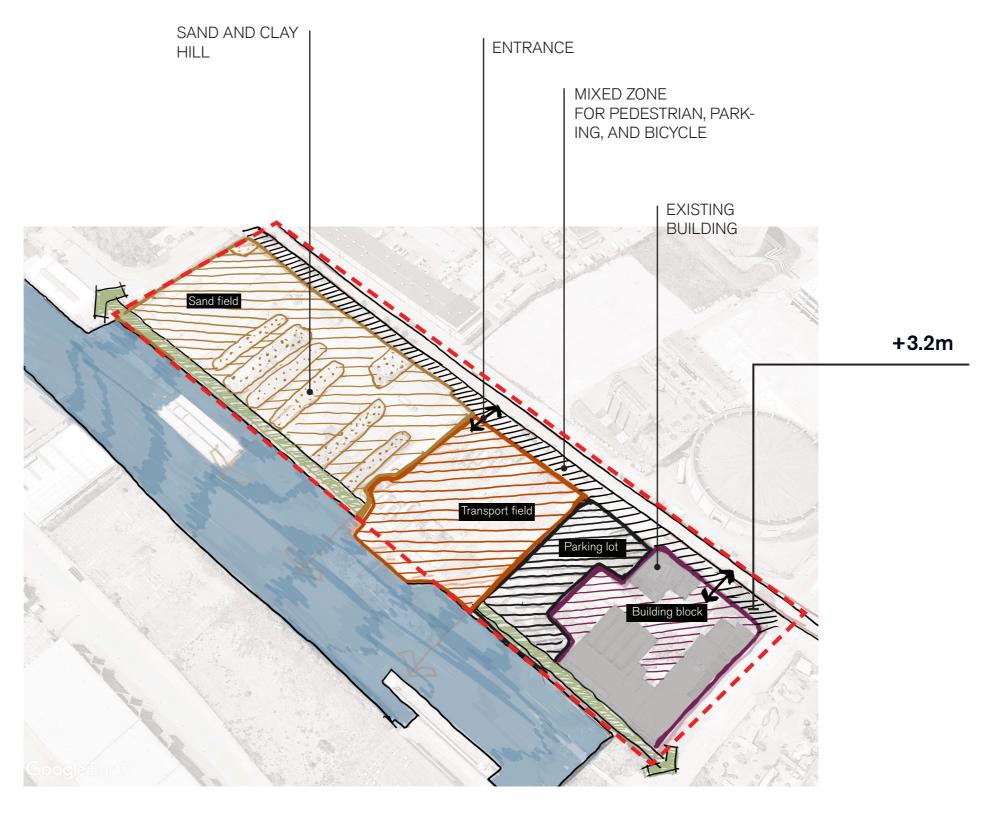
Property development



Local residents

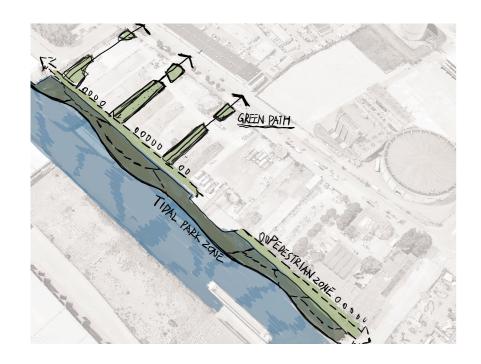


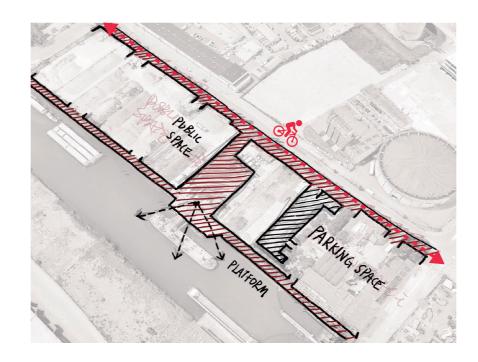
**EXISTING CONDITIONS** 

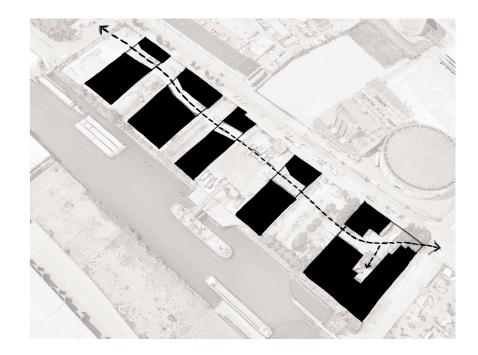


SITE ANALYSIS

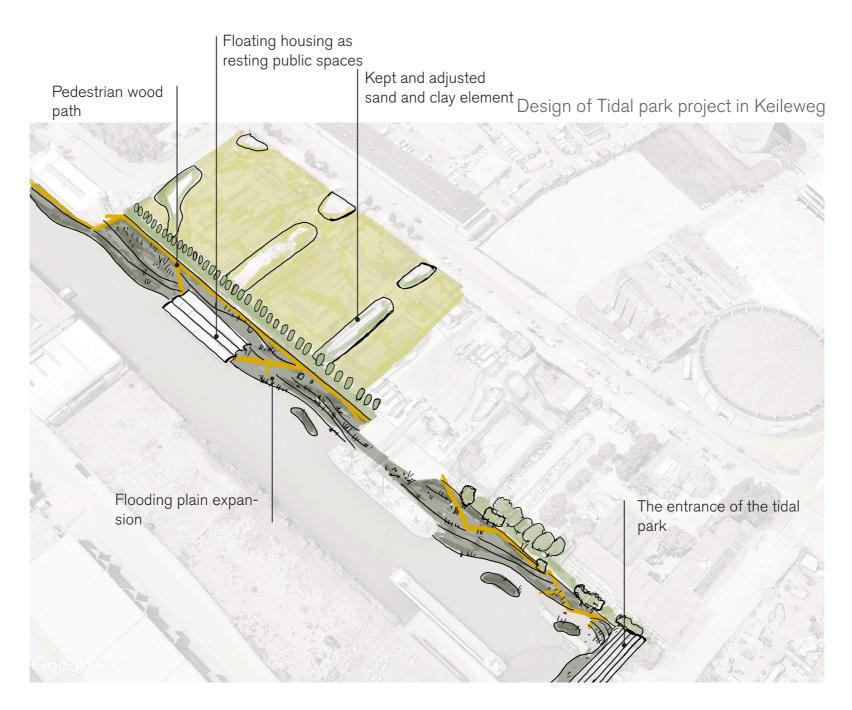
# DESIGN CONCEPT





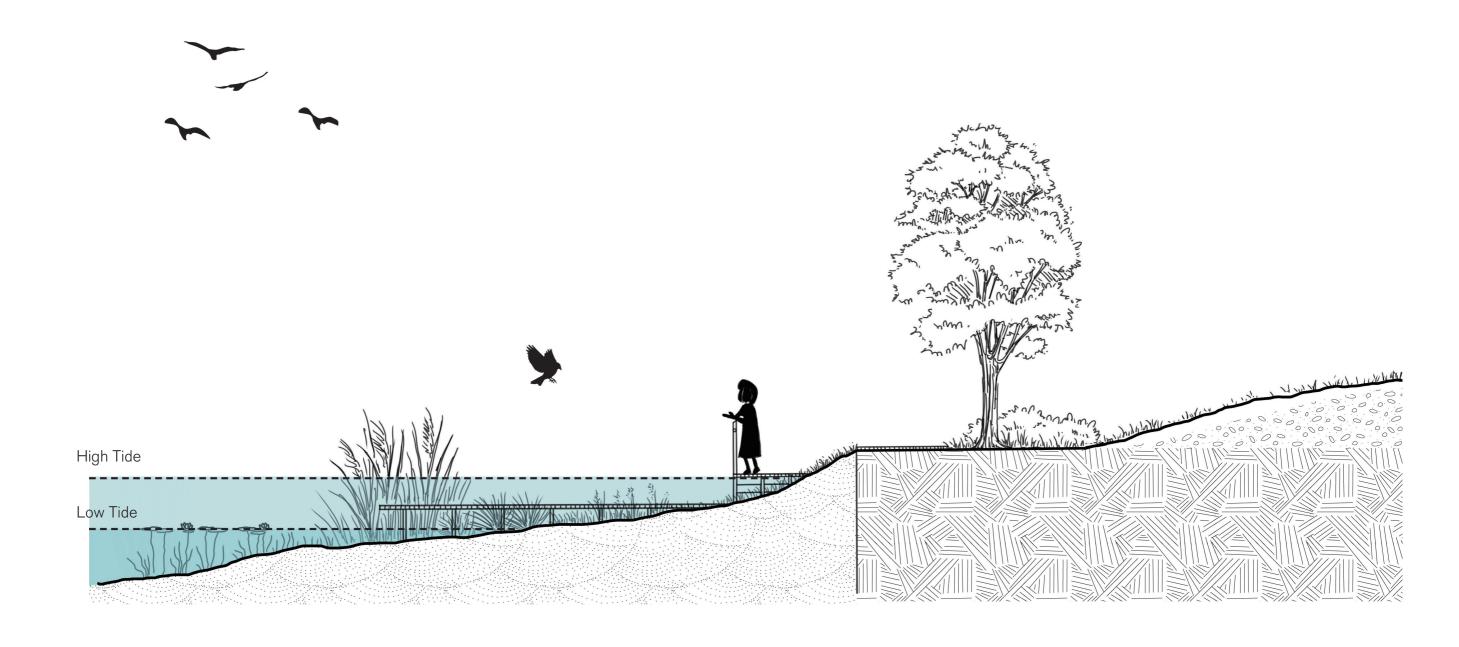


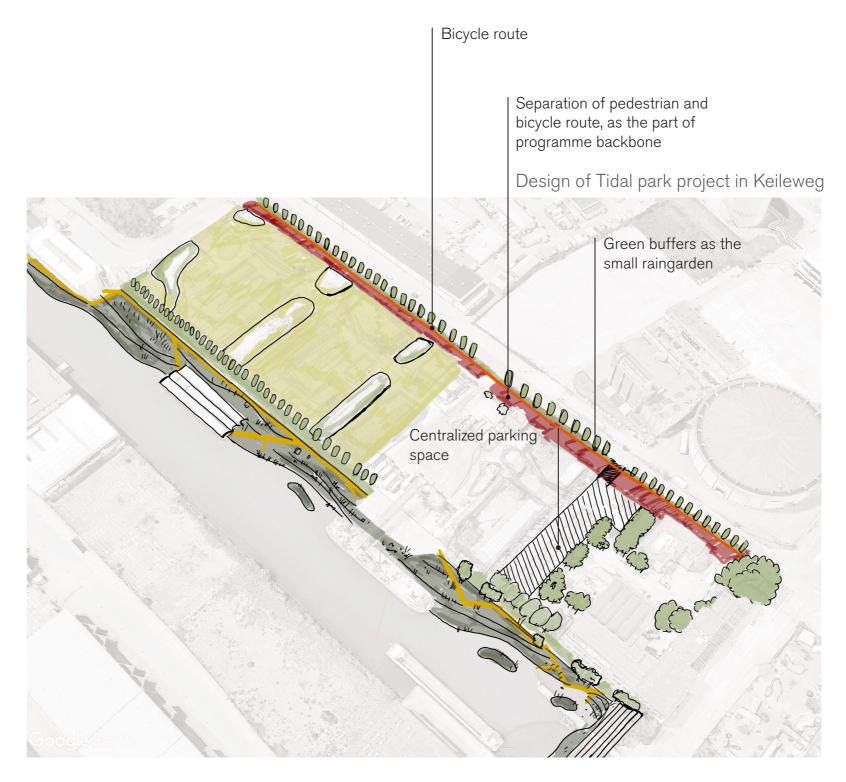
Green Space Open Space Building block



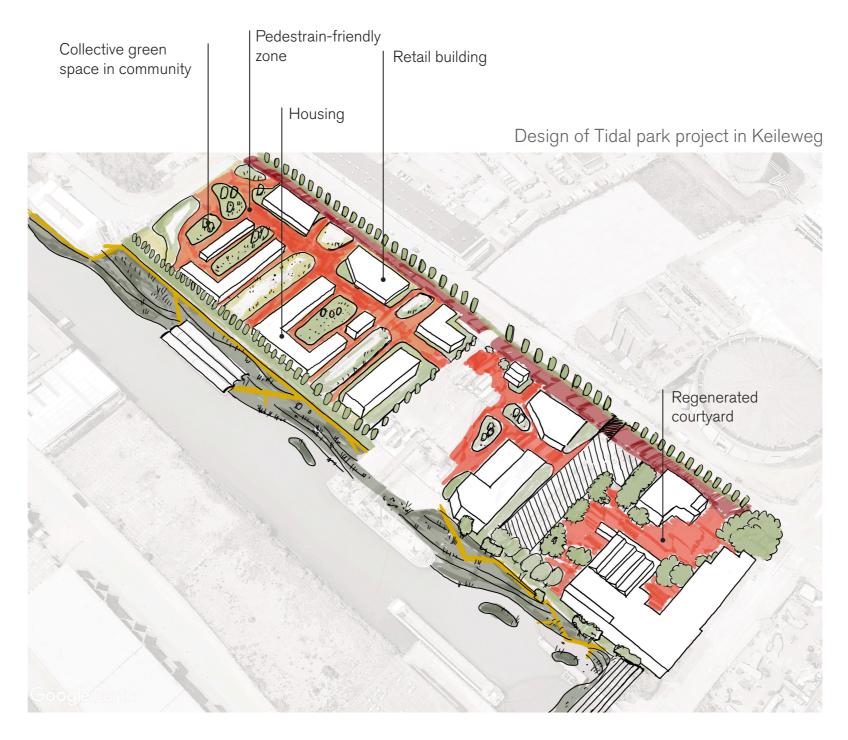
SHORT TERM

# PLACE FOR ECOLOGY IN PORT



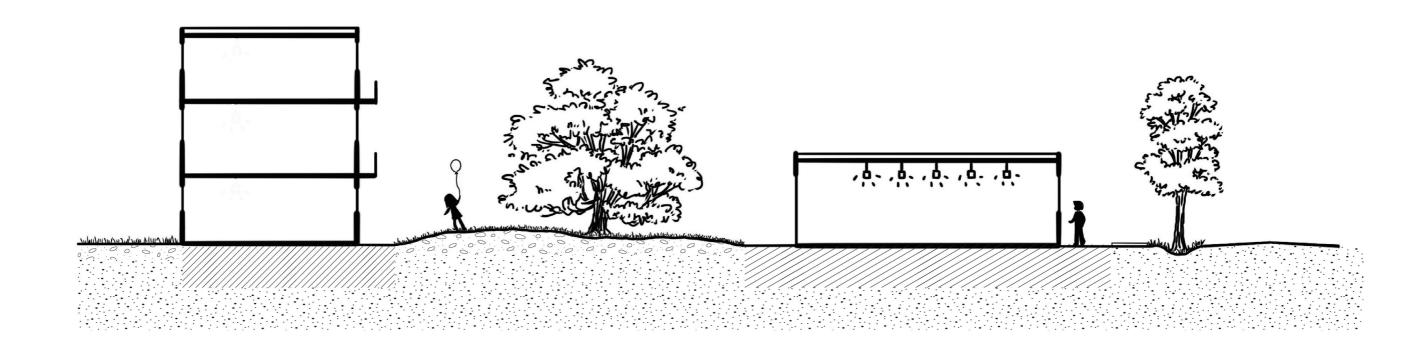


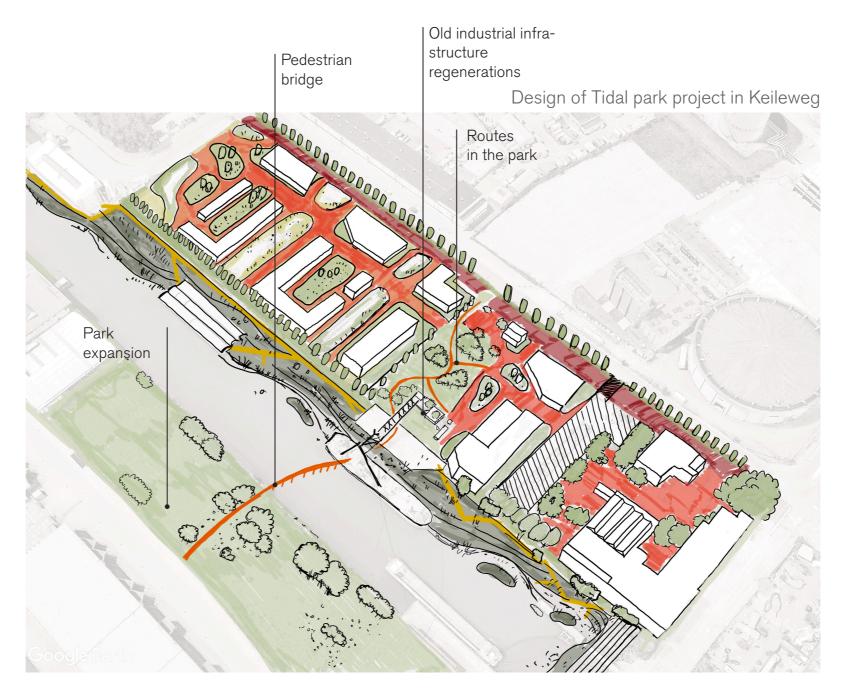
MID-TERM



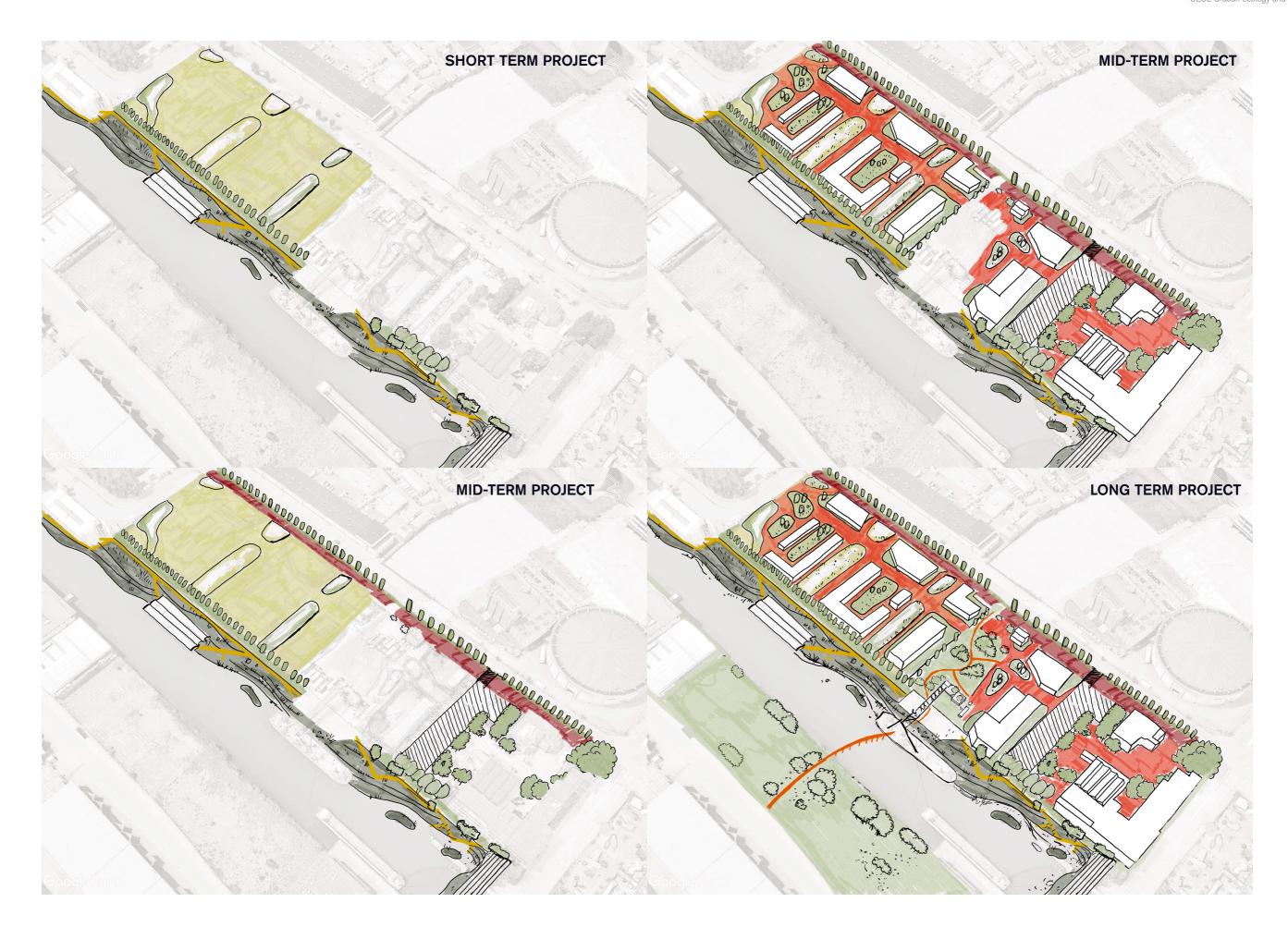
MID-TERM

# PLACE FOR SOCIAL DEVELOPMENT

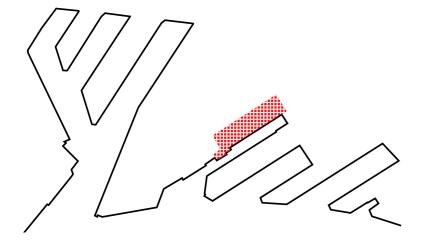




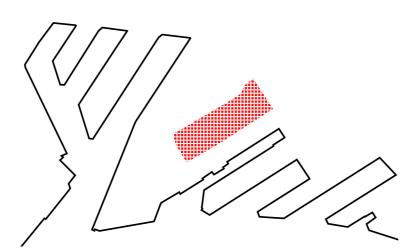
LONG TERM



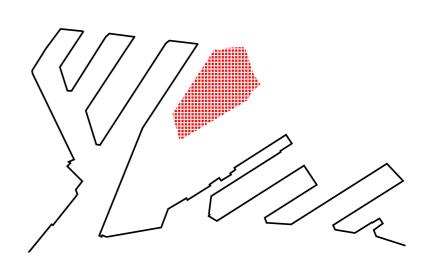
TIDAL PARK



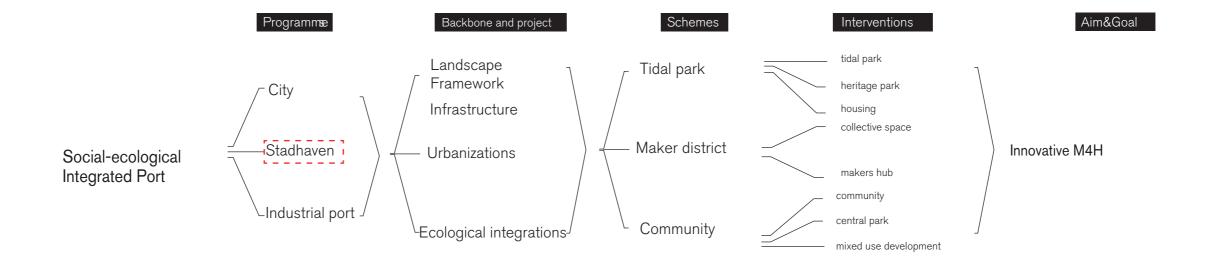




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# **STRATEGY**

# PROGRAMMES STADHAVEN



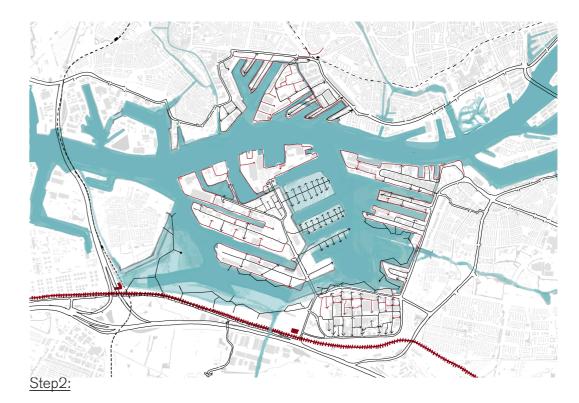
Step1:

LANDSCAPE FRAMEWORK

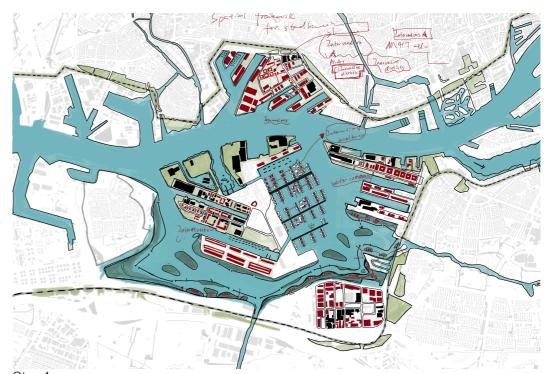


Step 3:

URBANIZATION

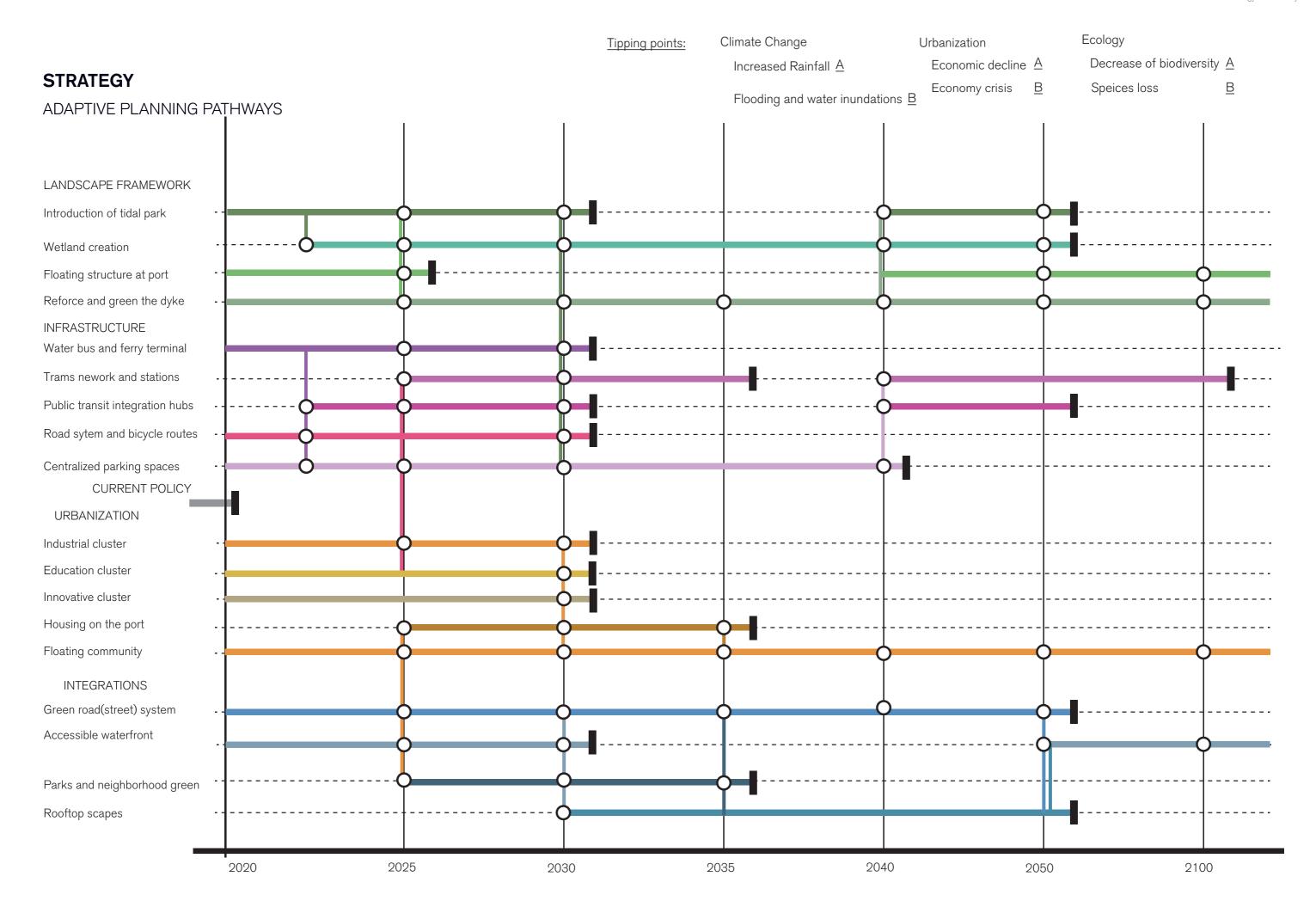


INFRASTRUCTURE

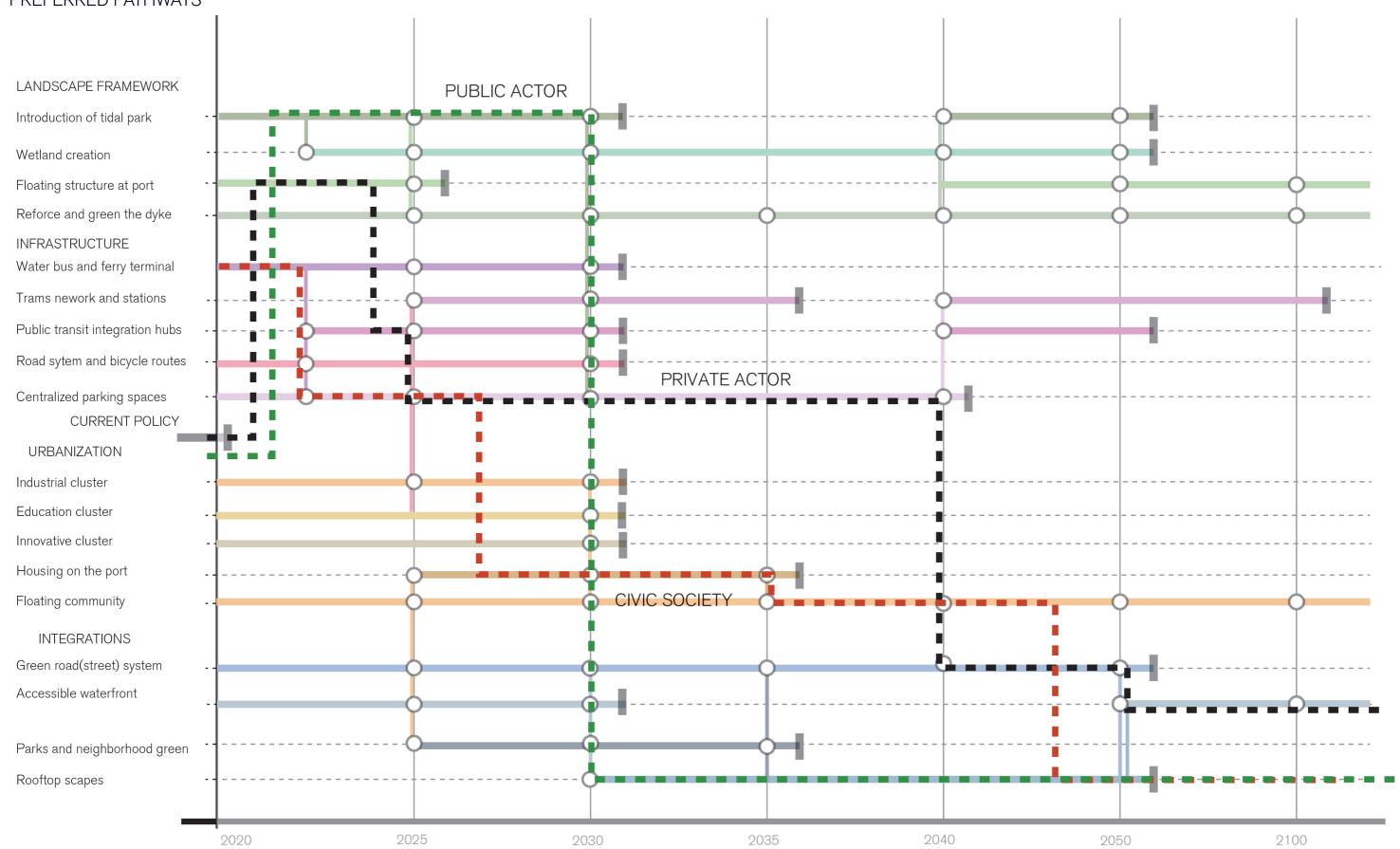


Step4:

INTEGRATIONS



# PREFERRED PATHWAYS



#### **CONCLUSION**

#### **BACK TO RESEARCH QUESTION**

# **SQ1** Understanding quesiton

What is the concept of socialecological integrations in spatial planning and governance?

#### SQ2 What to do question

What are the current social-ecological system of Rotterdam port and what are the challenges and opptunities?

What are the design principles of social-ecological integrated port transformation in terms of ecological, soical and econonic aspects?

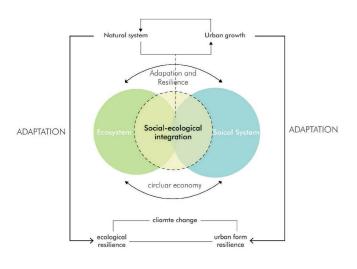
#### SQ3 How to do question

What are the stakeholders involved in the current and future process? and then how to facilitate strategic multi-actor collaborations?

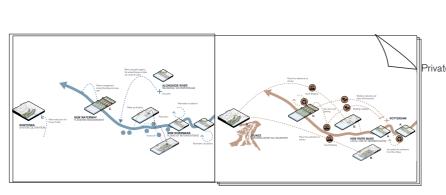
#### **SQ4** Application question

How to apply combine the spatial planning and implementation with mulit-actors in Rotterdam port through time?

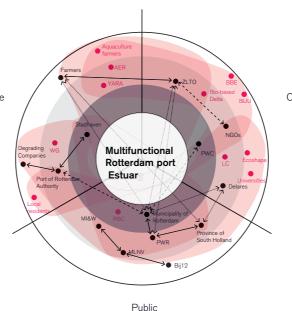
# **CONCEPT BUILDING**



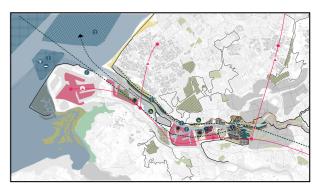
# SYSTEM ASSESSMENT



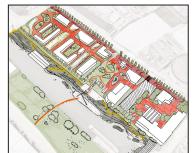
# **GOVERNANCE**



# STRATEGY MAKING



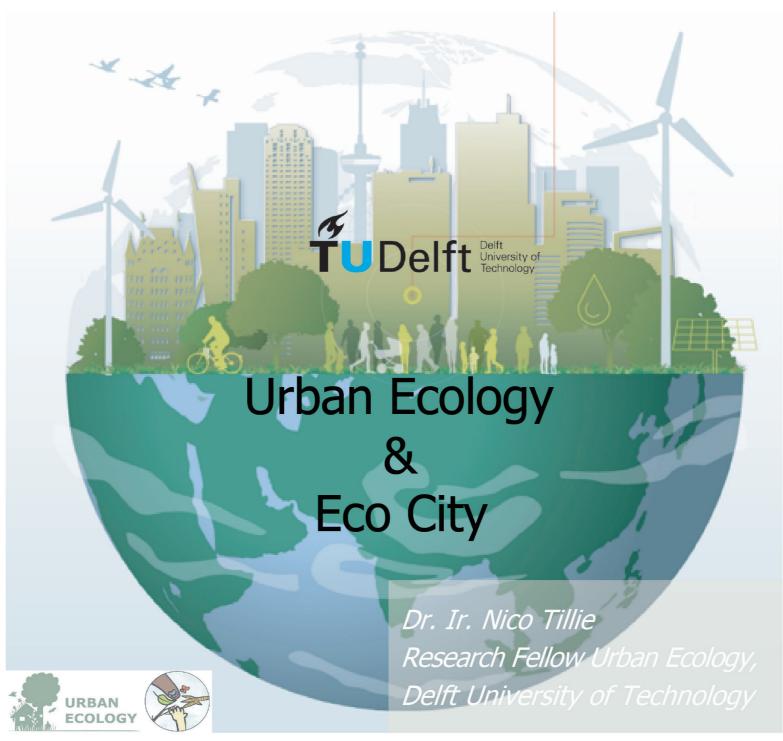




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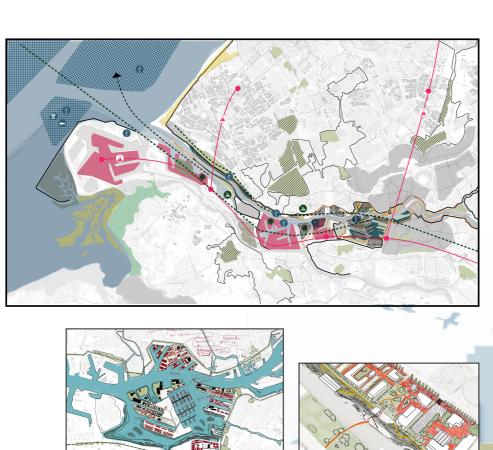
# **CONCLUSION**

RELATIONSHIP TO URBAN ECOLOGY LAB





Source: Tilie, (2019)

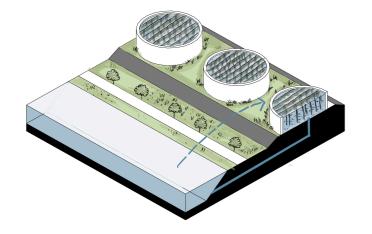








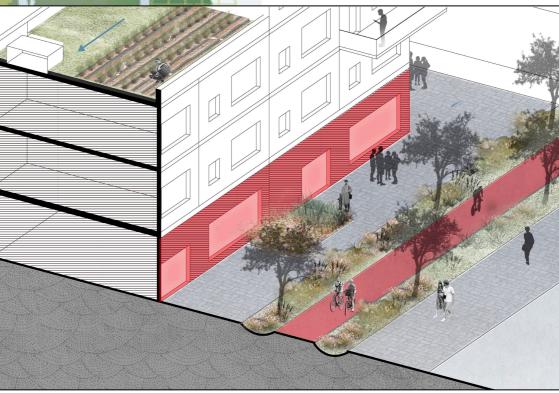








Dr. Ir. Ni Research Delft Univ







Source: Tilie, (2019)

# Thank You

Baokun Wei

TU Delft 06 July 2021

