

Reclaiming the Isla

A phased approach to nature-based remediation methods in the reclamation of the Isla Refinery in Curacao

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2nd Second mentor: Prof.dr.ir. Arjan van Timmeren



USA

NORTH ATLANTIC OCEAN

MEXICO

CUBA

CARIBBEAN SEA

NETHERLANDS ANTILLES

PANAMA

VENEZUELA

COLOMBIA

● Location

● Problematization

● Methodology

● Analysis

● Phyto-remediation

● Design

● Conclusion



CARIBBEAN SEA

NETHERLANDS ANTILLES

ARUBA

CURAÇAO

BONAIRE

COLOMBIA

Península de Paraguaná

GRAN ROQUE

ISLA LA ORCHILA

GULF OF VENEZUELA

CORO

ISLA LA TORTUGA

LAKE MARACAIBO

VENEZUELA

● Location

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● Methodology

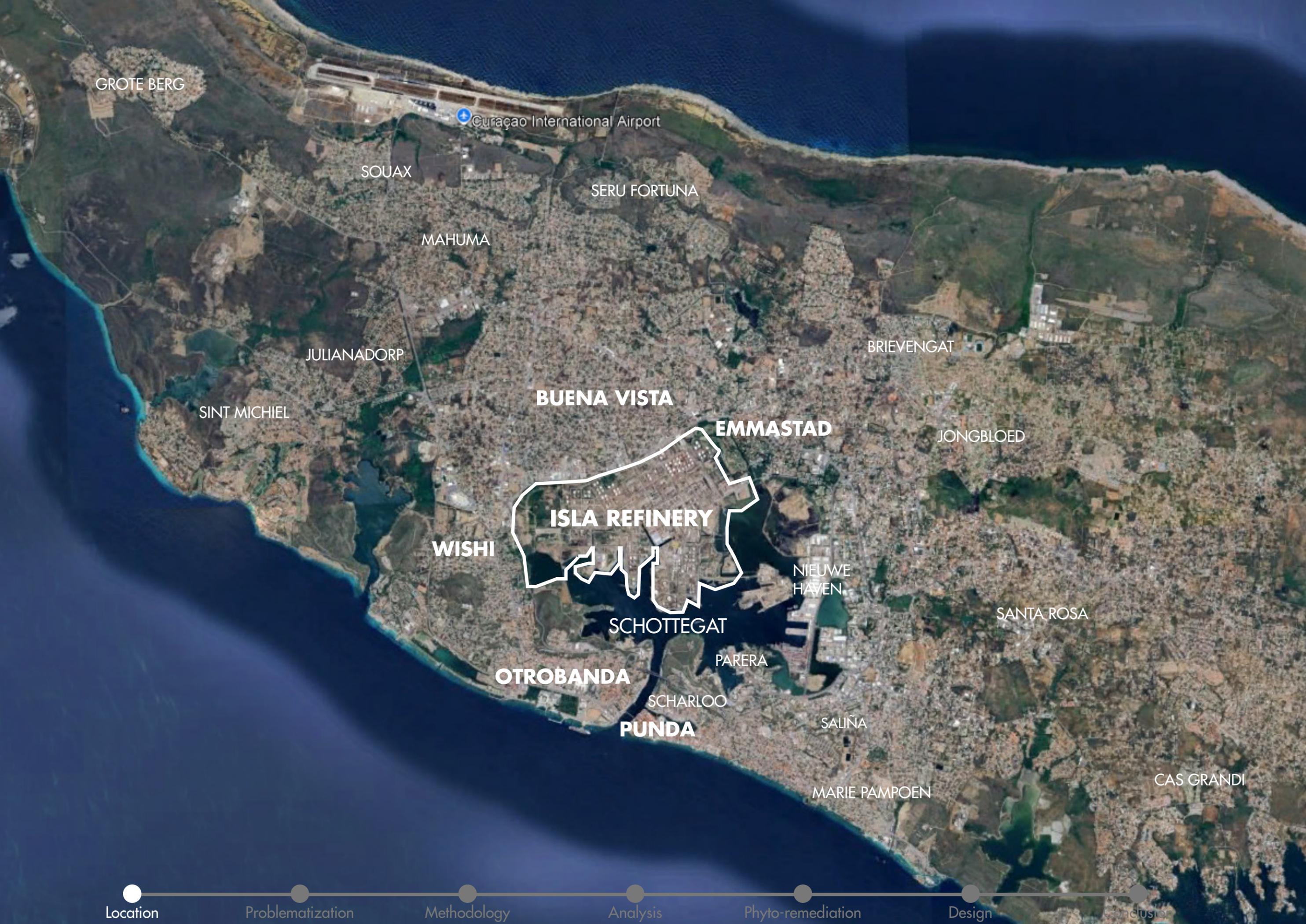
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GROTE BERG

Curaçao International Airport

SOUAX

SERU FORTUNA

MAHUMA

JULIANADORP

BRIEVENGAT

SINT MICHIEL

BUENA VISTA

EMMASTAD

JONGBLOED

ISLA REFINERY

WISHI

NIEUWE HAVEN

SANTA ROSA

SCHOTTEGAT

OTROBANDA

PARERA

SCHARLOO

PUNDA

SALIÑA

MARIE PAMPOEN

CAS GRANDI

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Sources: Bottom left: de Jong (2015); Bottom middle and right: van Soest (1976); Top: Verhoeff (1975).

Location

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PDVSA



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● Design

● Conclusion

Sources: Reuters (2018),
8

Venezuela's PDVSA Sued for Missed Payments at Curacao Refinery

The state-run oil firm is also being asked to relocate crude deposits at Bonaire's BOPEC storage facility due to the risk of accidents caused by poor maintenance.

Paul Dobson | August 31, 2020

CURACAO —

'PDVSA GEEN ALTERNATIEF'

CURACAO —

EXIT VOOR PDVSA

CURACAO —

SCHULD VAN PDVSA LOOPT VERDER OP

Teller staat al op minimaal 135 miljoen gulden

Algemeen

Ook olie zal niet meer uit Venezuela komen

14 januari 2019

Oct 7, 2024

Refineria di Kòrsou is now 2BAYS Curaçao

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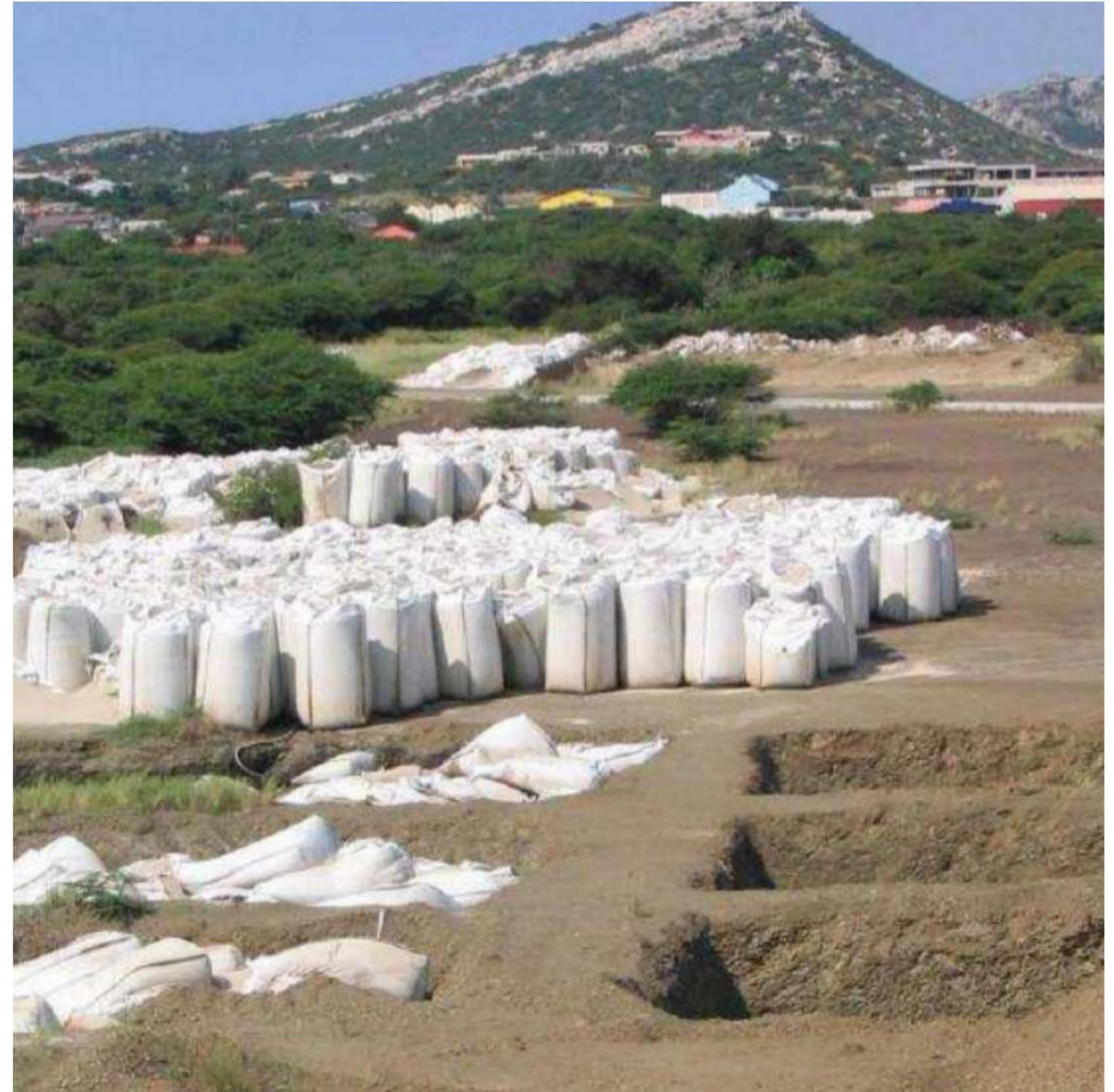


Island
Needs



Oil &
Gas

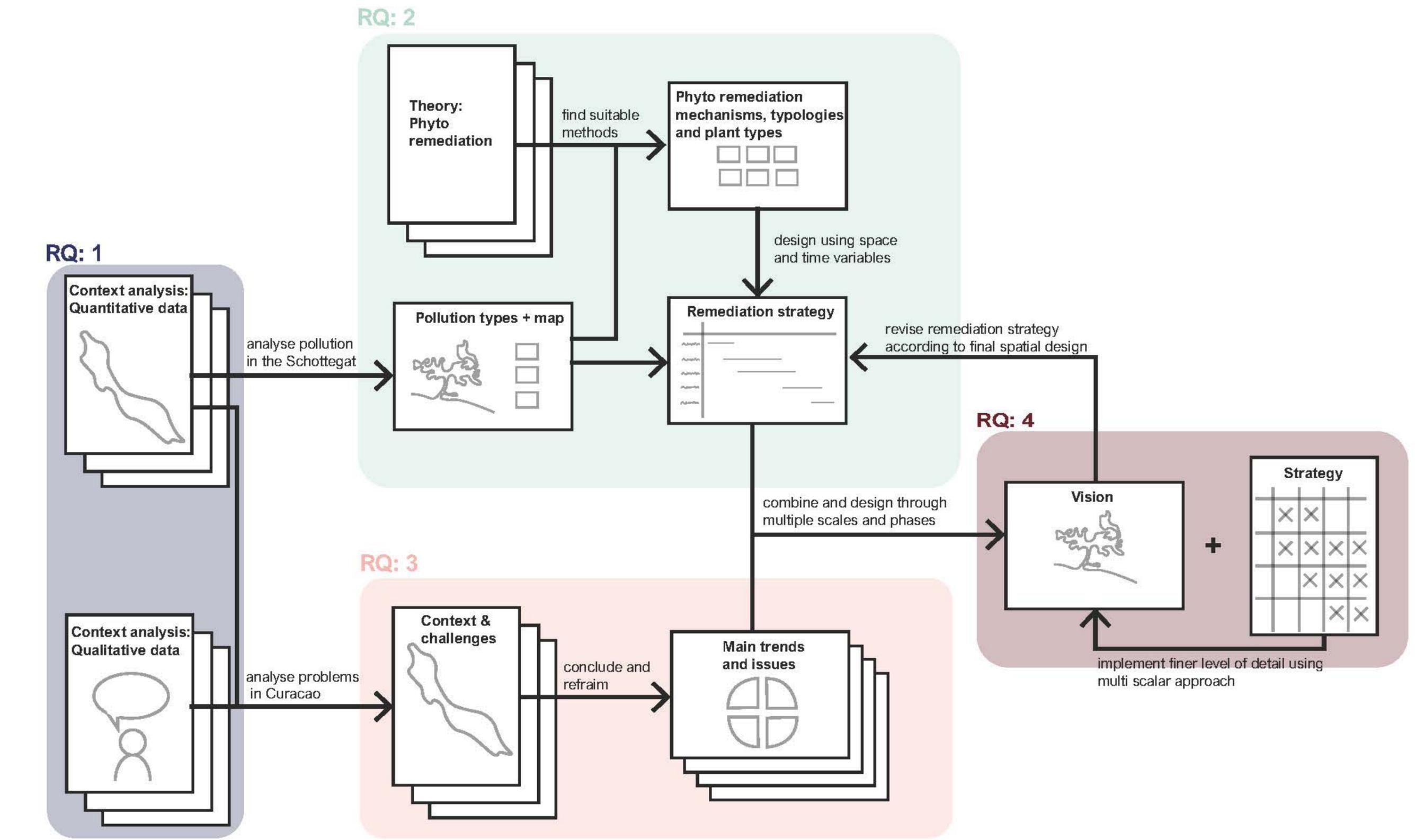
Business Opportunities →

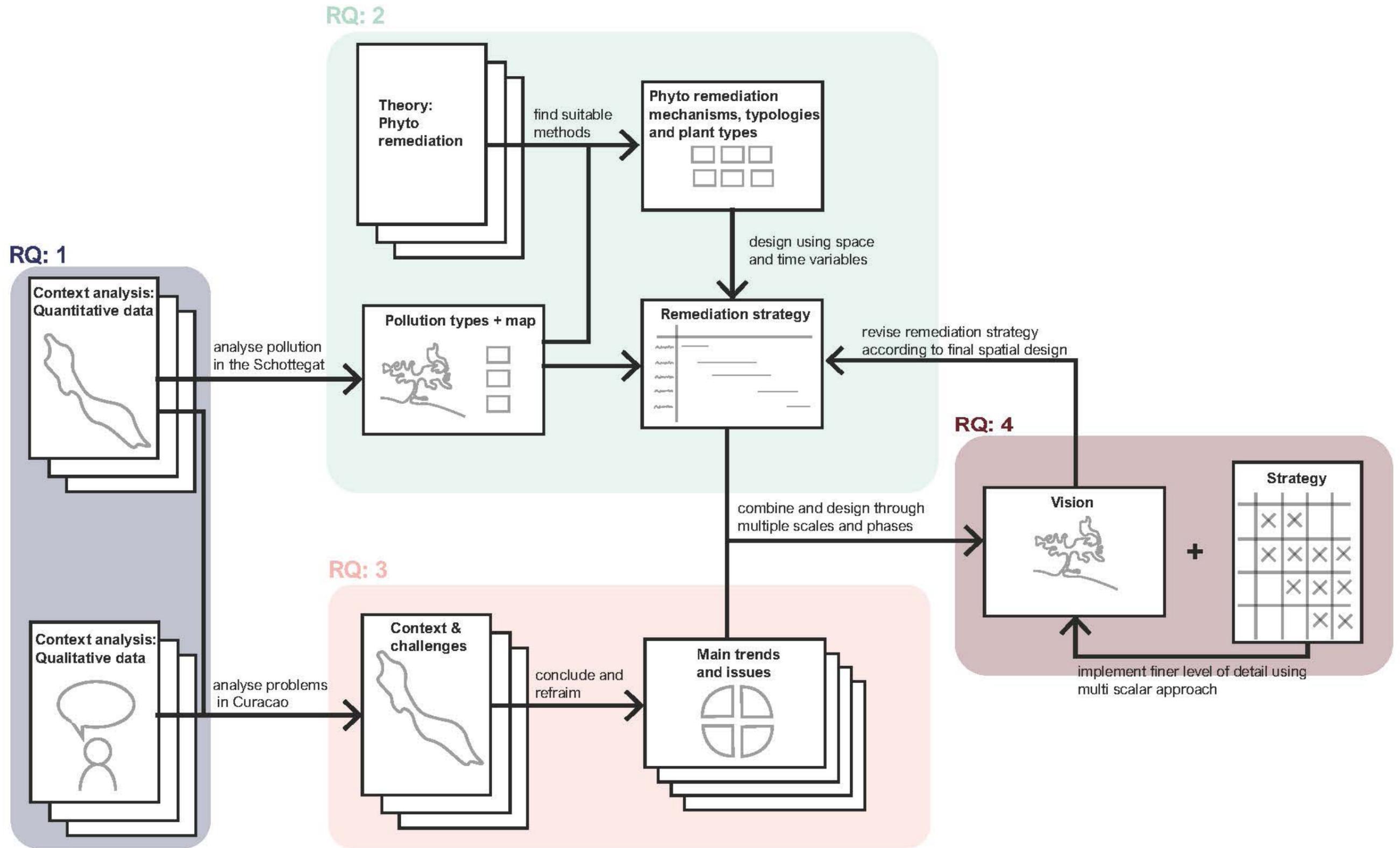


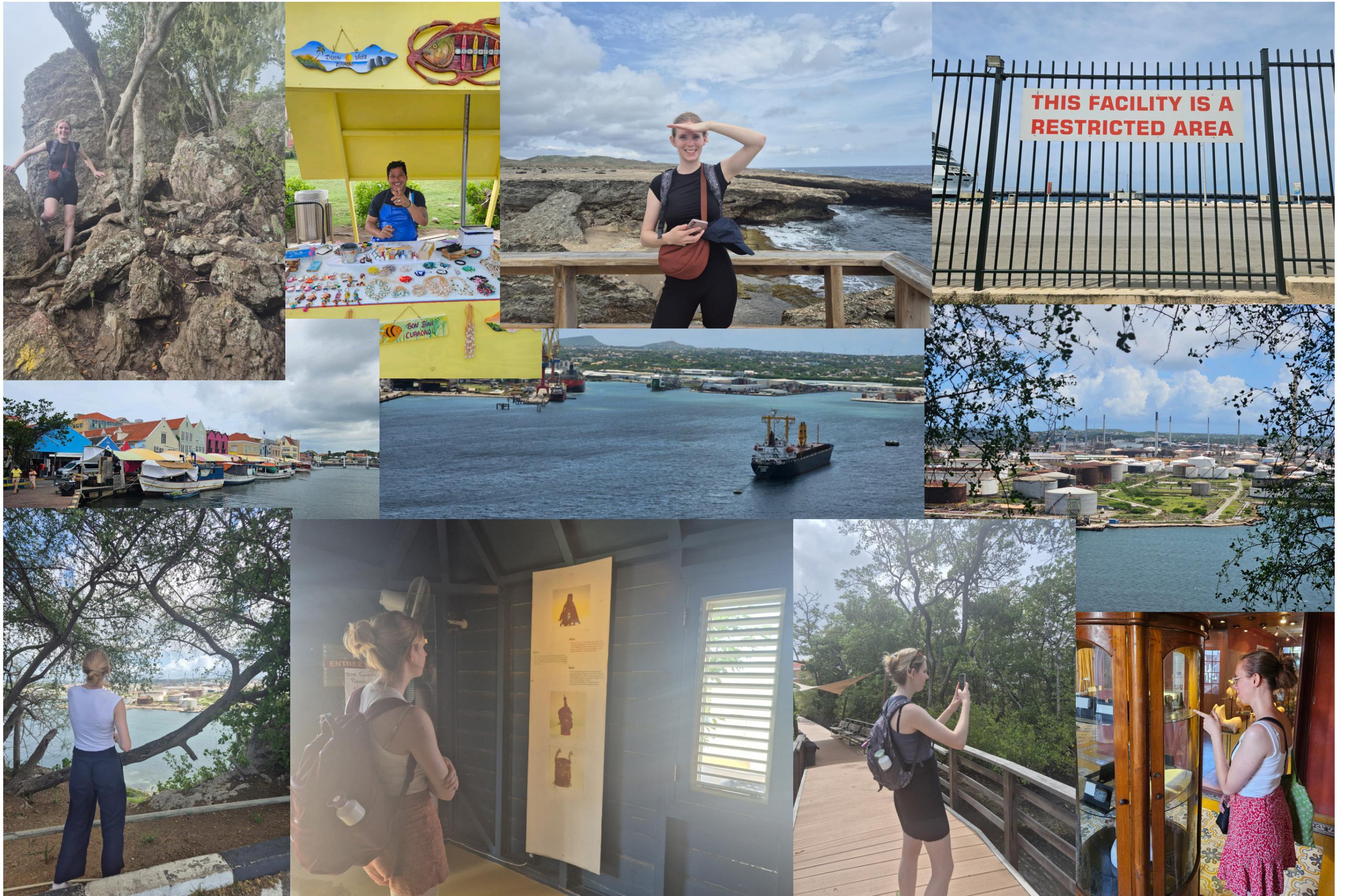


How can the former Isla Refinery site be **remediated** and **redeveloped** to benefit local **citizens, ecosystems** and **economies**?

Subject	SRQ	Method	Outcomes
Caste study contextualization	<i>What is the existing context of the case study and how will this research interact with that context?</i>	Triangulation: GIS-mapping, stakeholder analysis, reference projects and semi-structured interviews	Contextualisation
Remediation methods	<i>How can the pollution on the case study site be sustainably remediated?</i>	Literature review	Remediation strategy
Sustainable future program	<i>What are possible new sustainable activities for the case study and how are they contributing to the value of People, Planet and Prosperity?</i>	Theory and semi-structured interviews	Program recommendation and scenario's
Final outcomes case-study	<i>What will a sustainable future look like for the case study?</i>	Research and design	Future design case study through scales and time







Location

Problematization

Methodology

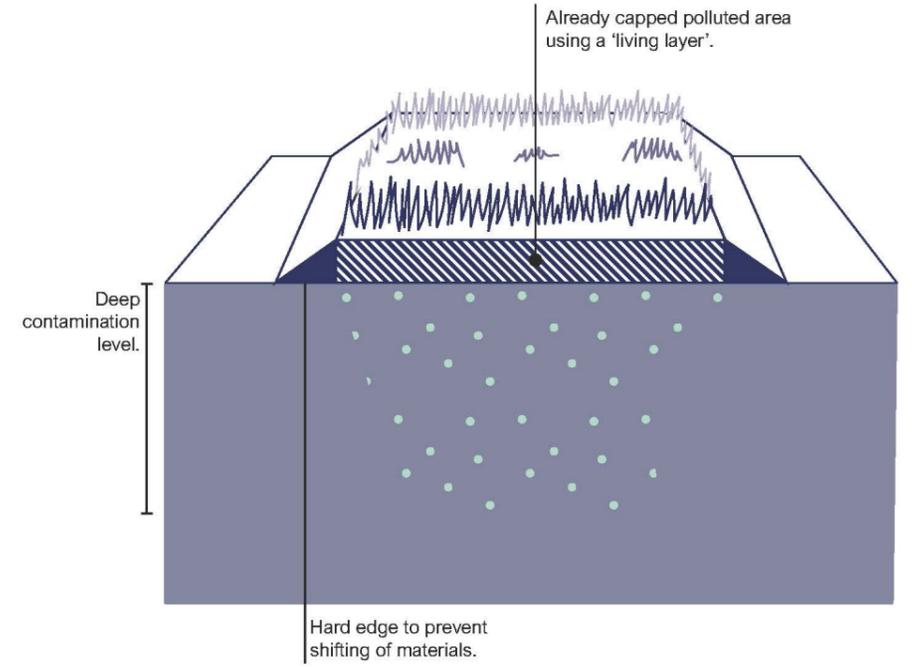
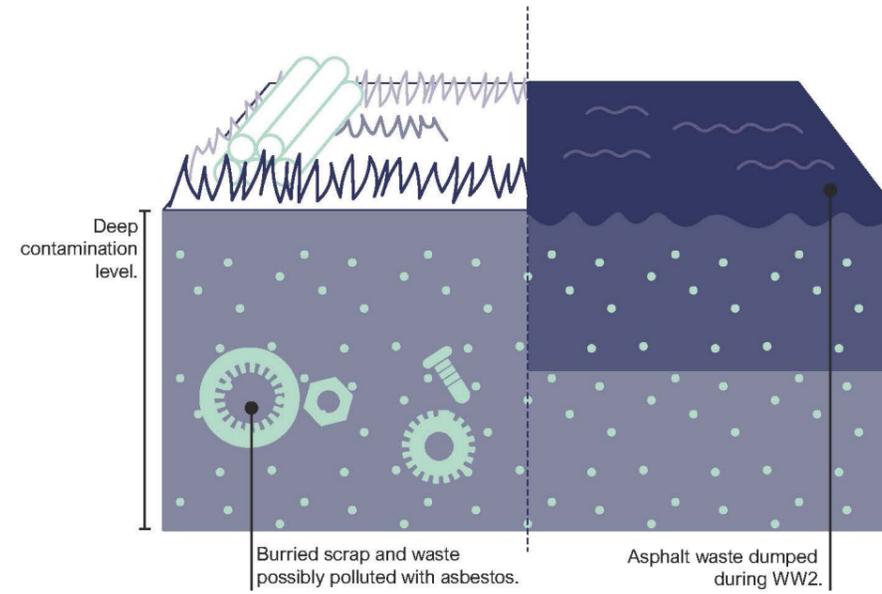
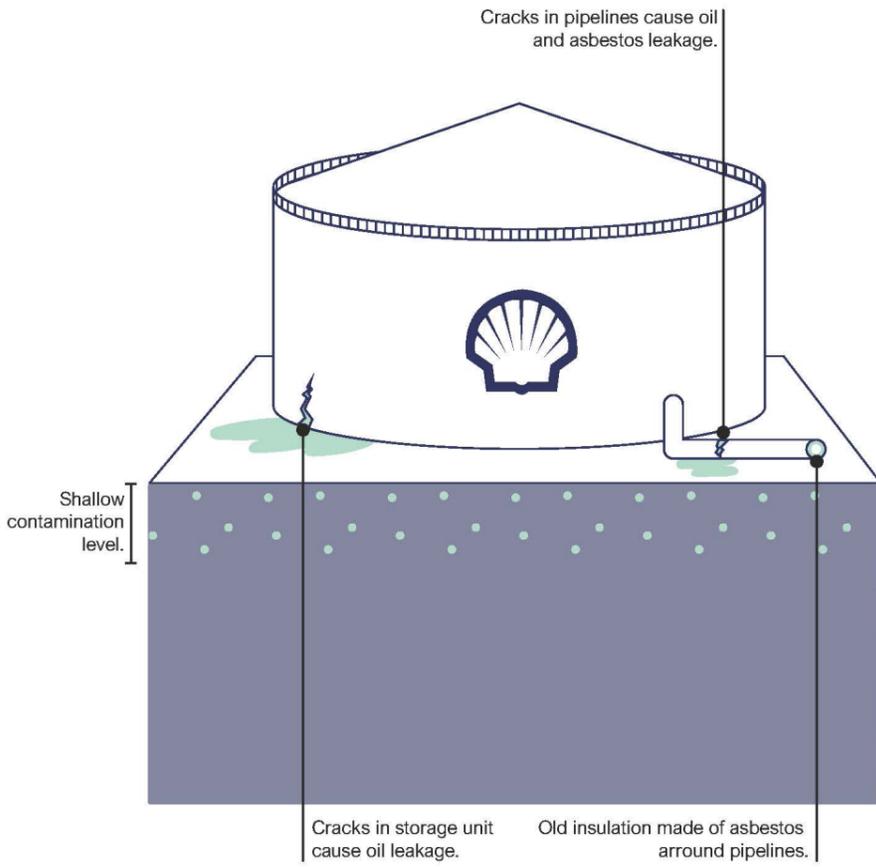
Analysis

Phyto-remediation

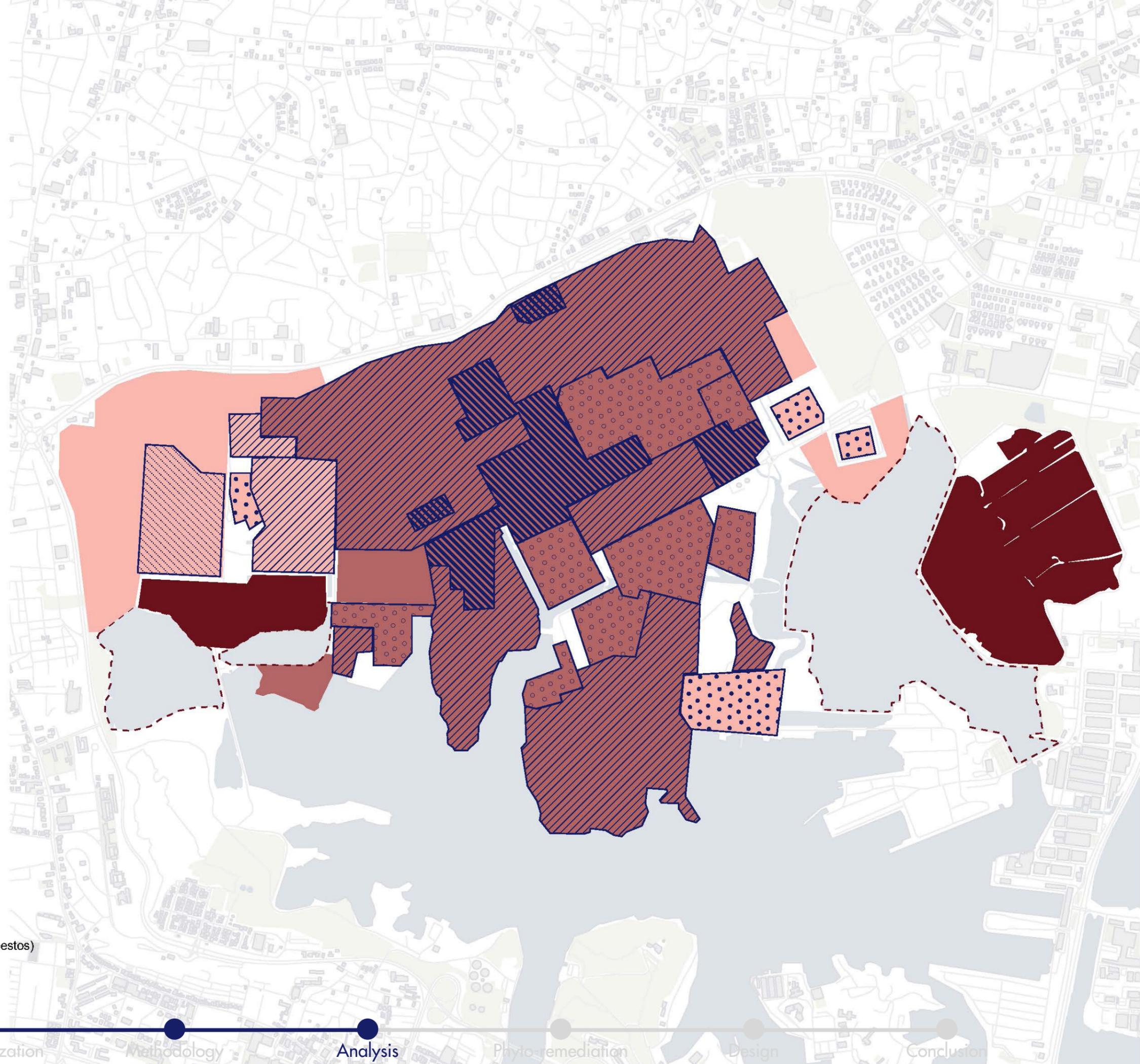
Design

Conclusion

Pollution types



Pollution map



- Remediated Area Using Capping
- Light Refinery Constructions
- Heavy Refinery Constructions
- Potentially Transformable Refinery Constructions
- Historic (Monumental) Constructions
- Heavily Polluted Area with Deep Mixed Pollution
- Potentially Polluted Surface Area with Oil (and Asbestos)
- Potentially Clean Area
- Possibly Polluted Water Bodies

0 0,25 0,5 0,75 1 km

Location

Problematization

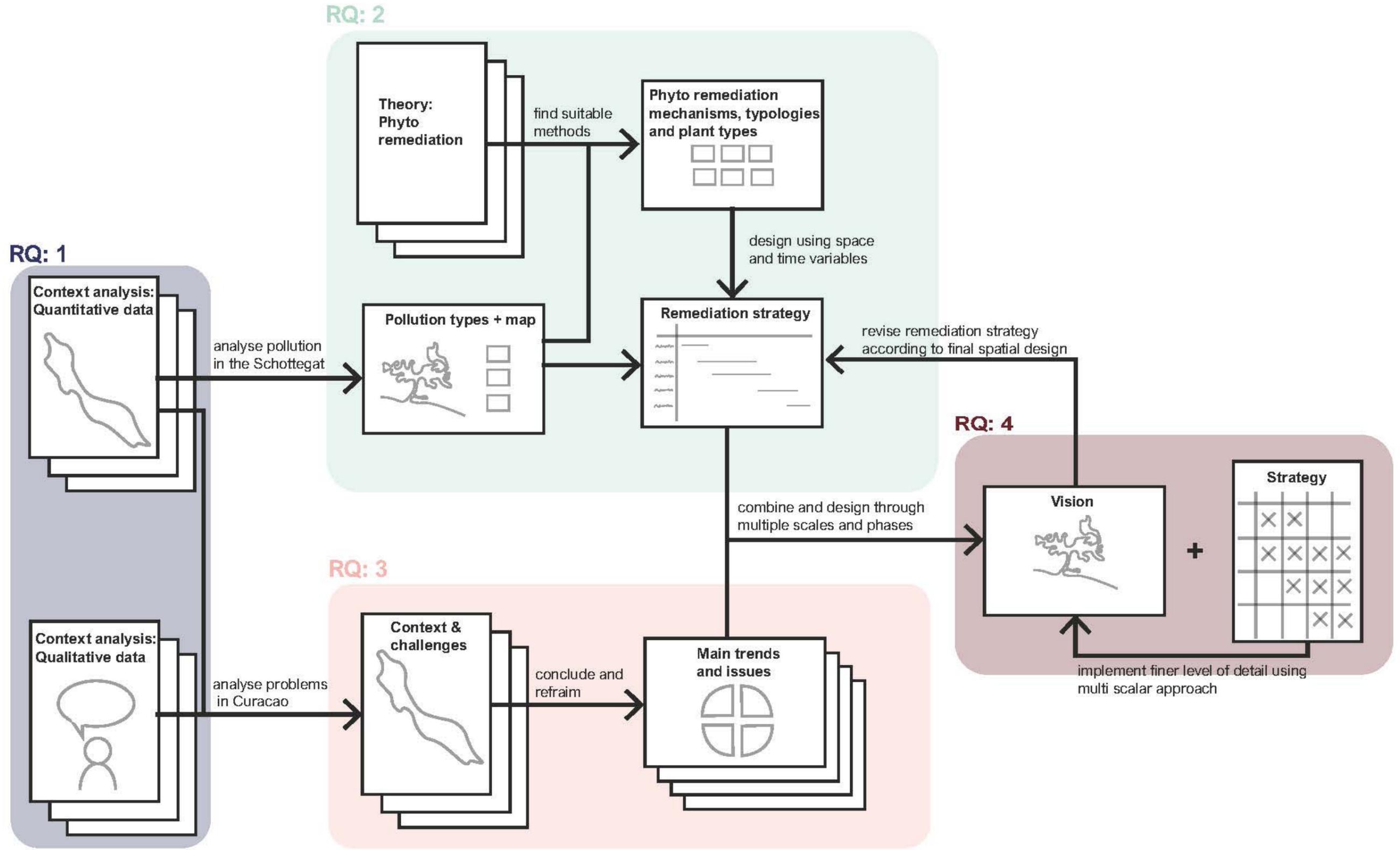
Methodology

Analysis

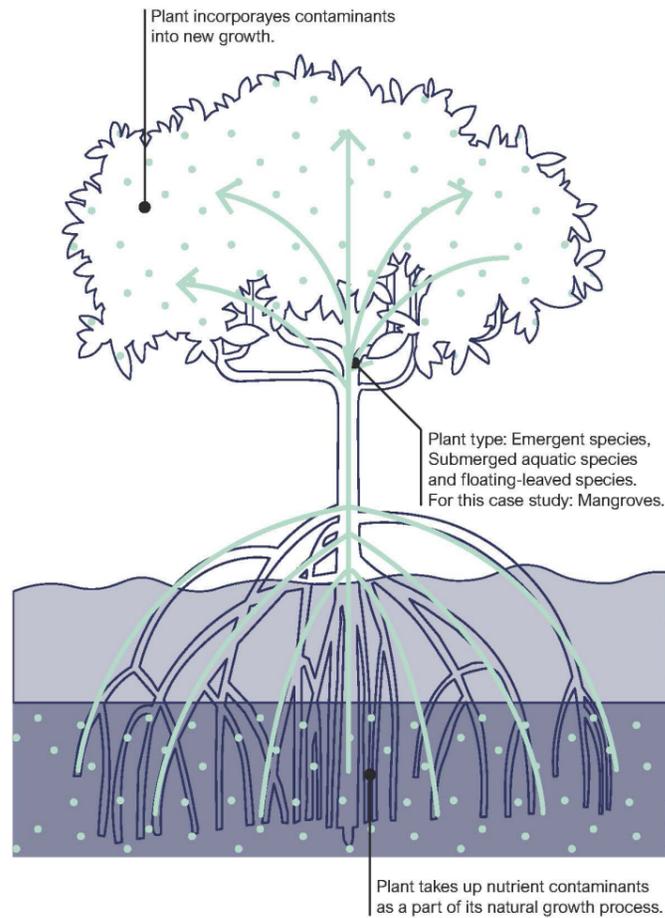
Phyto-remediation

Design

Conclusion



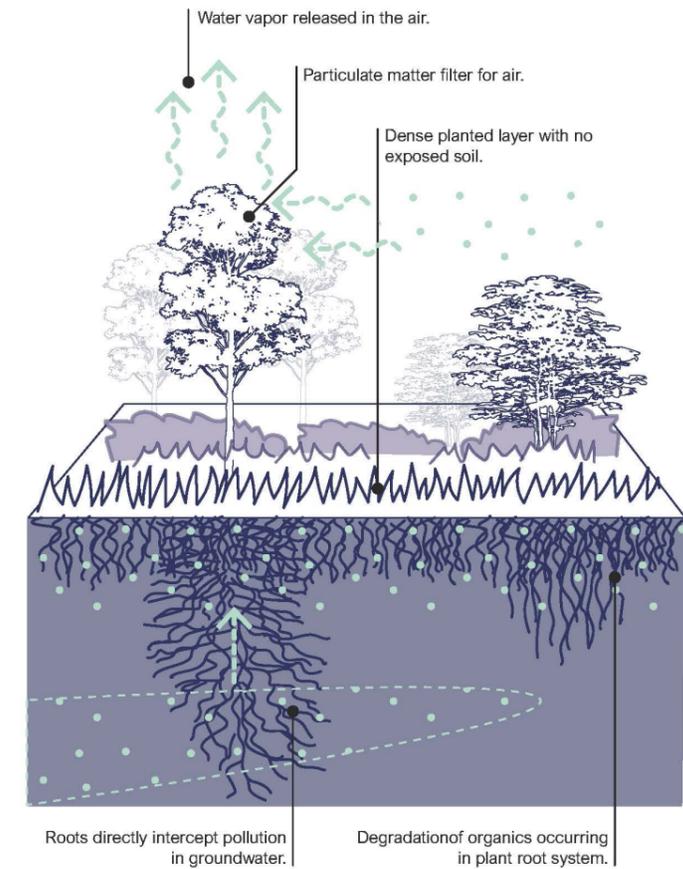
Surface flow constructed wetland



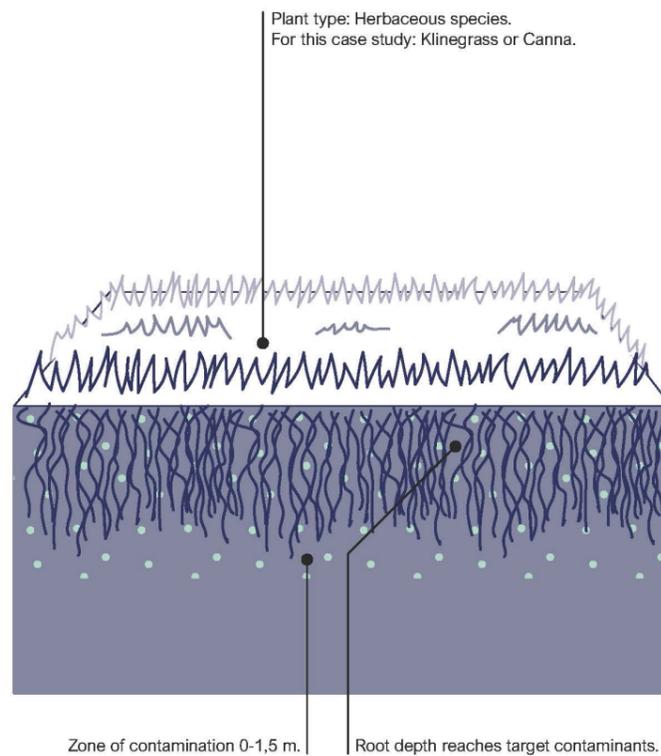
Groundwater migration tree stand



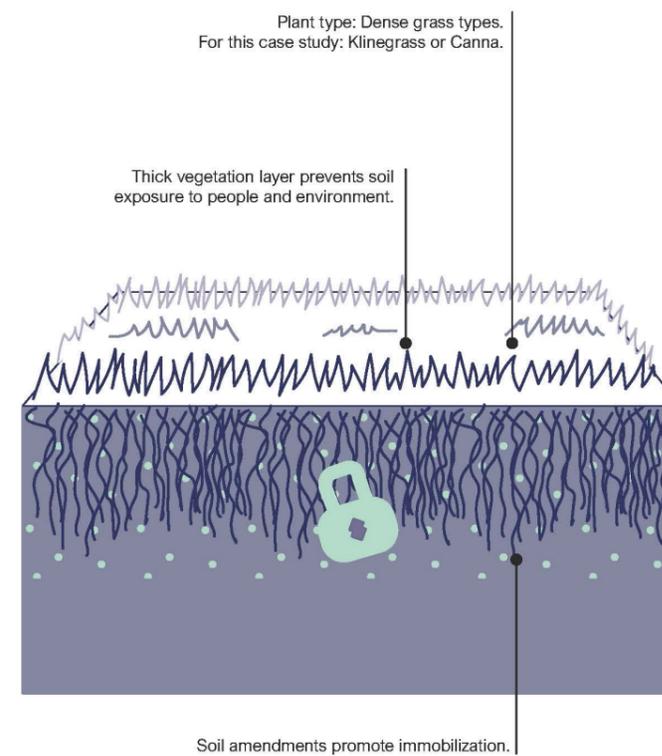
Multi mechanism buffer



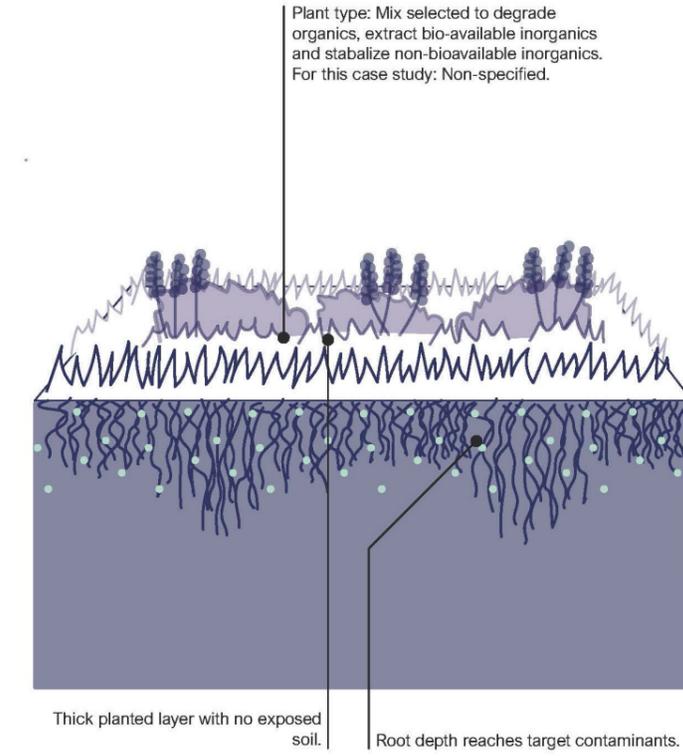
Degradation cover



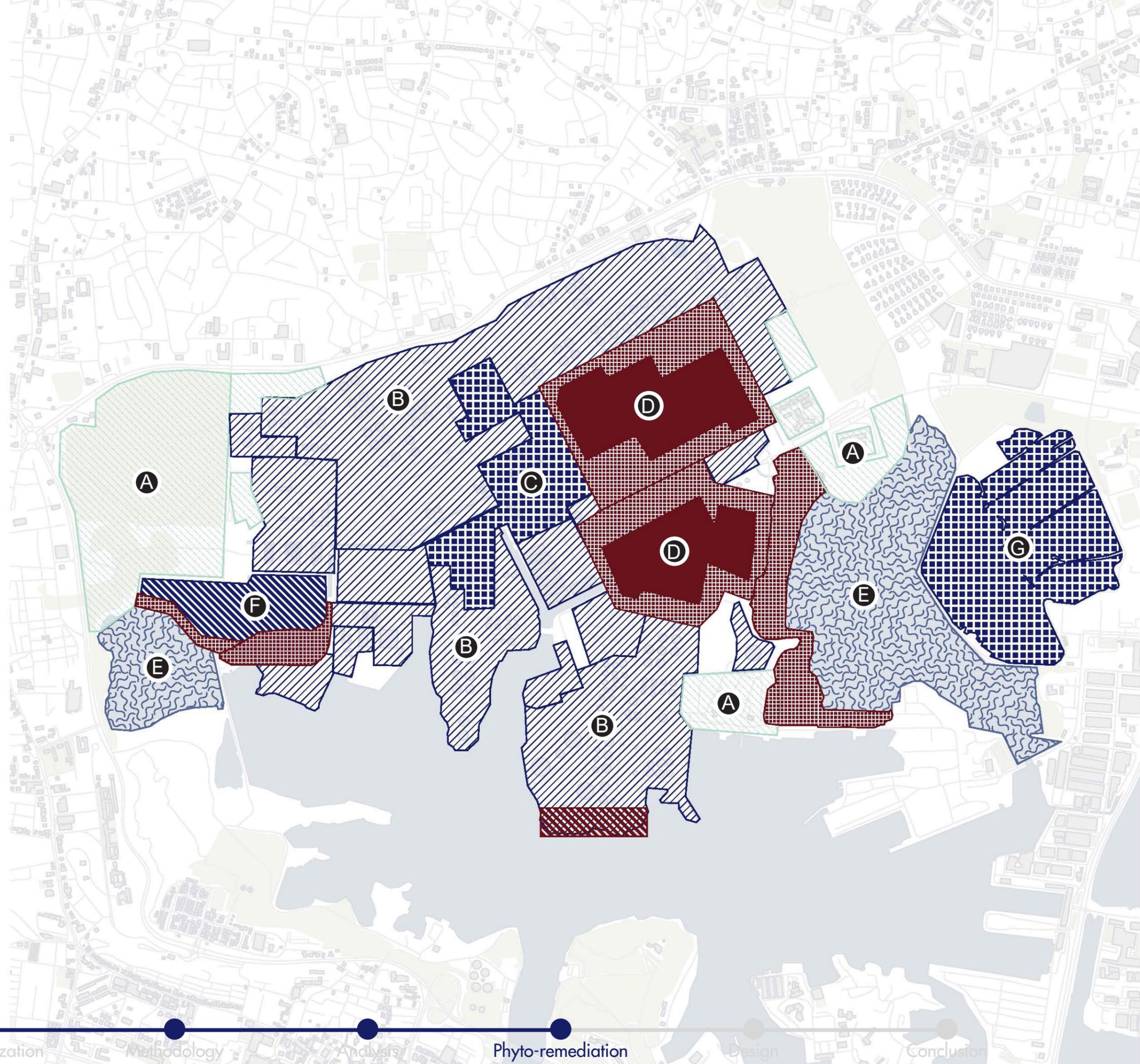
Stabilization mat



Multi mechanism mat



Remediation strategy

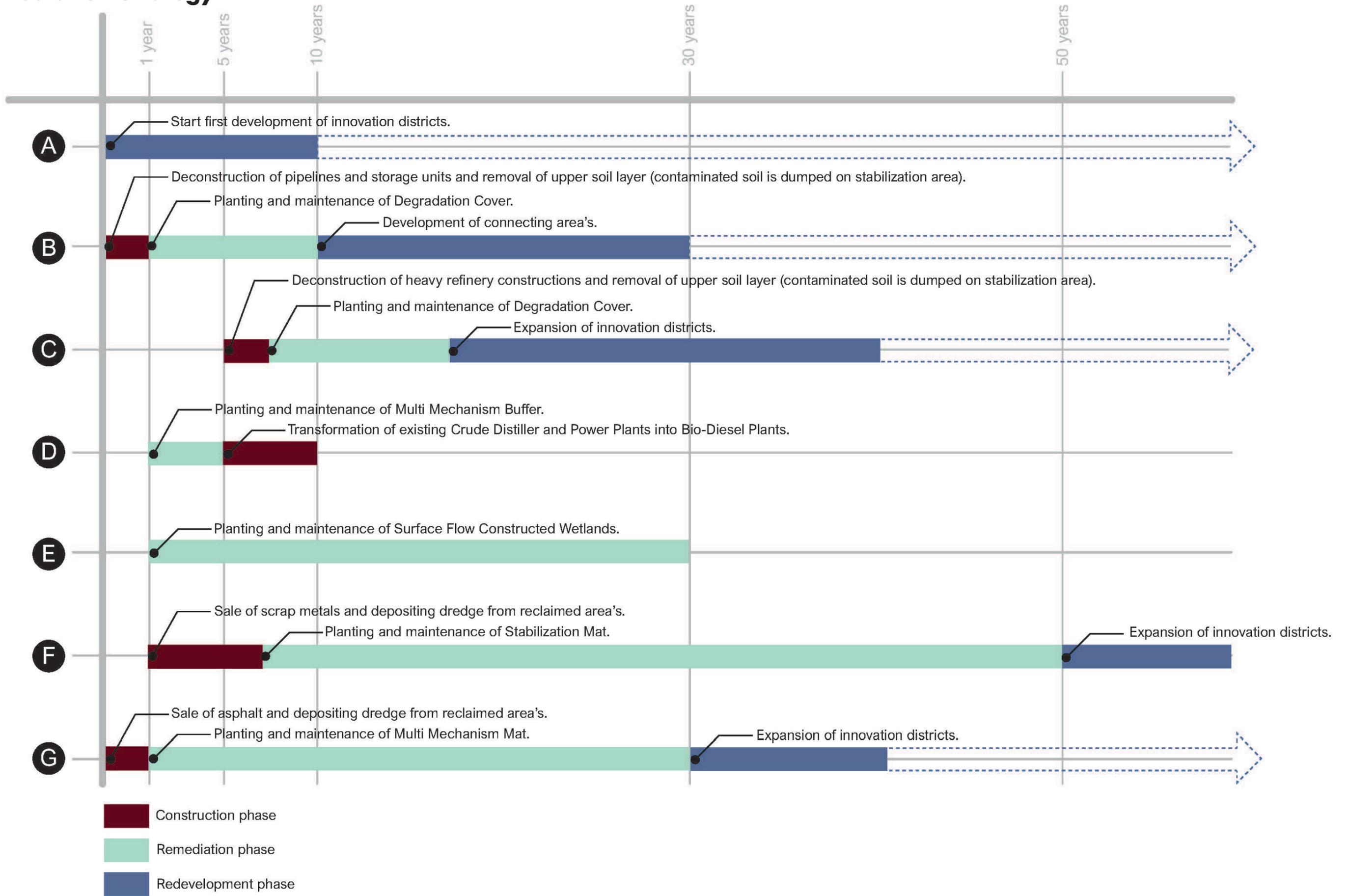


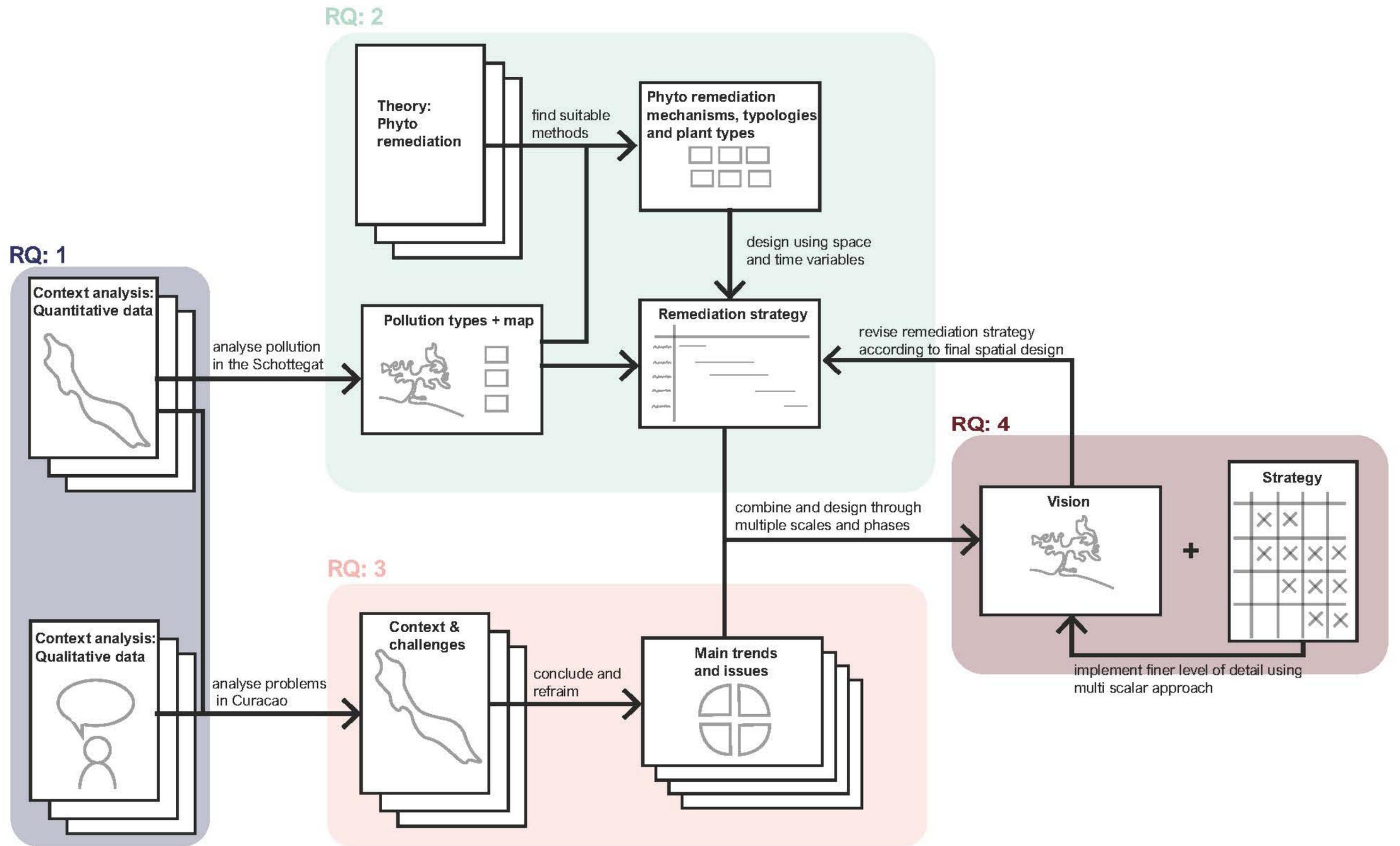
- Transformed Refinery Area
- Remediated/Clean Area
- Degradation Cover
- Stabilization Mat
- Multi Mechanism Mat
- Multi Mechanism Buffer
- Groundwater Mitigation Tree Stand
- Surface Flow Constructed Wetland

0 0,25 0,5 0,75 1 km

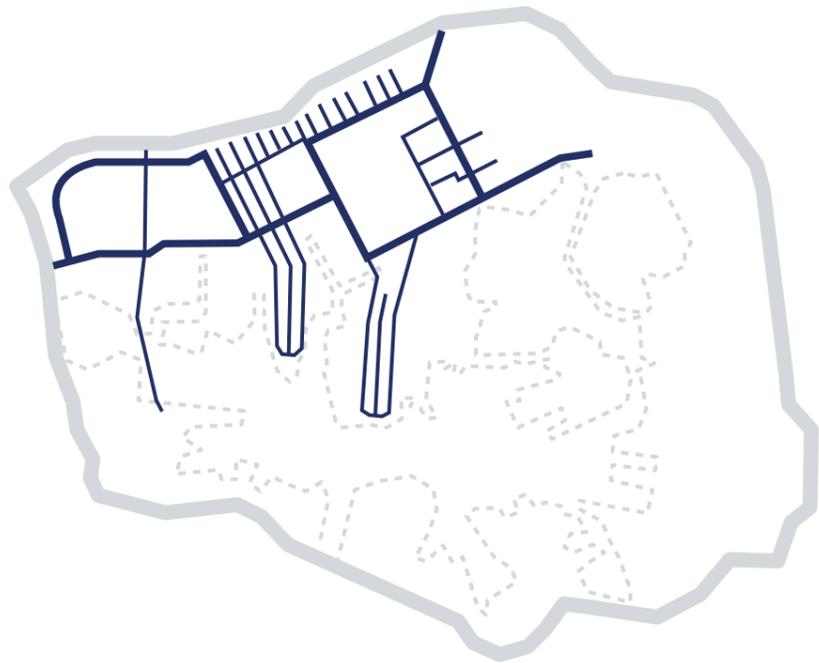
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Remediation strategy

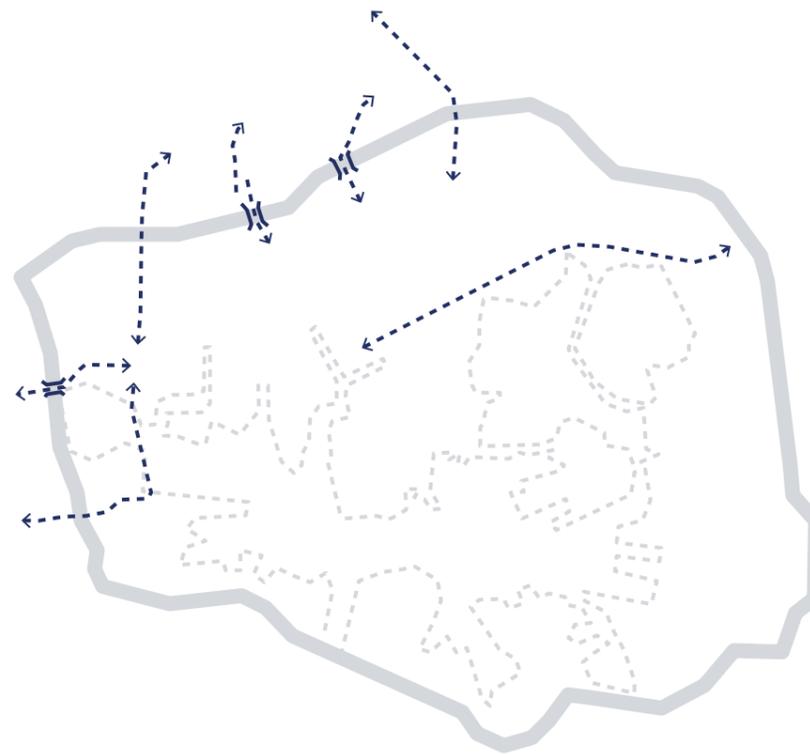




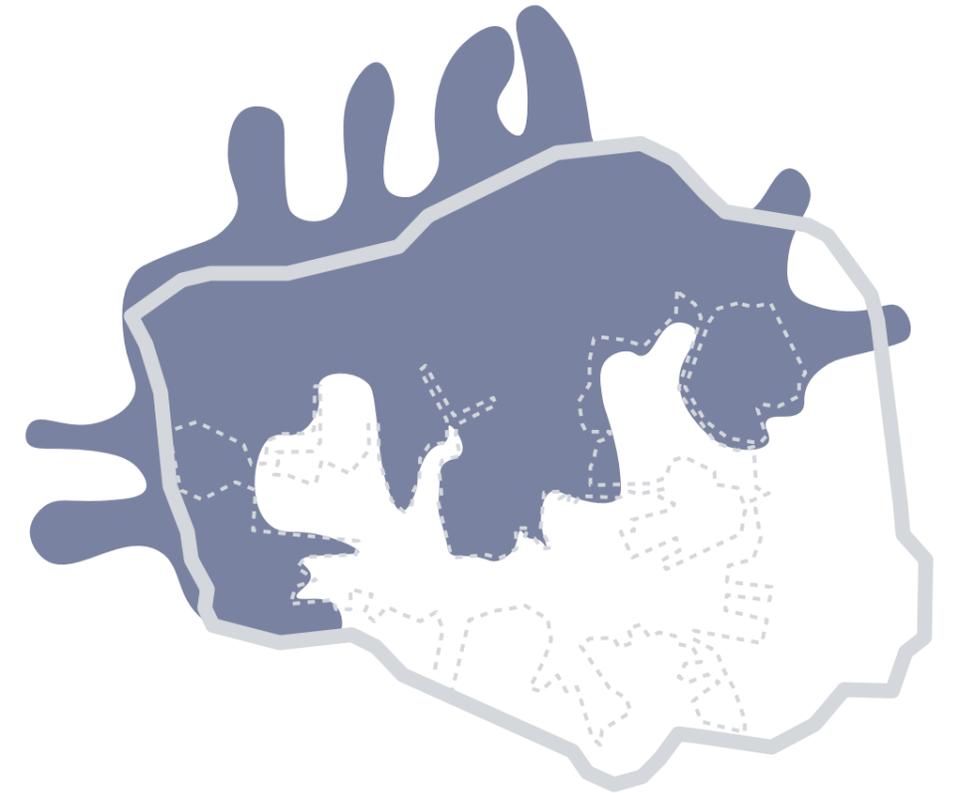
Maximize re-use of existing structures



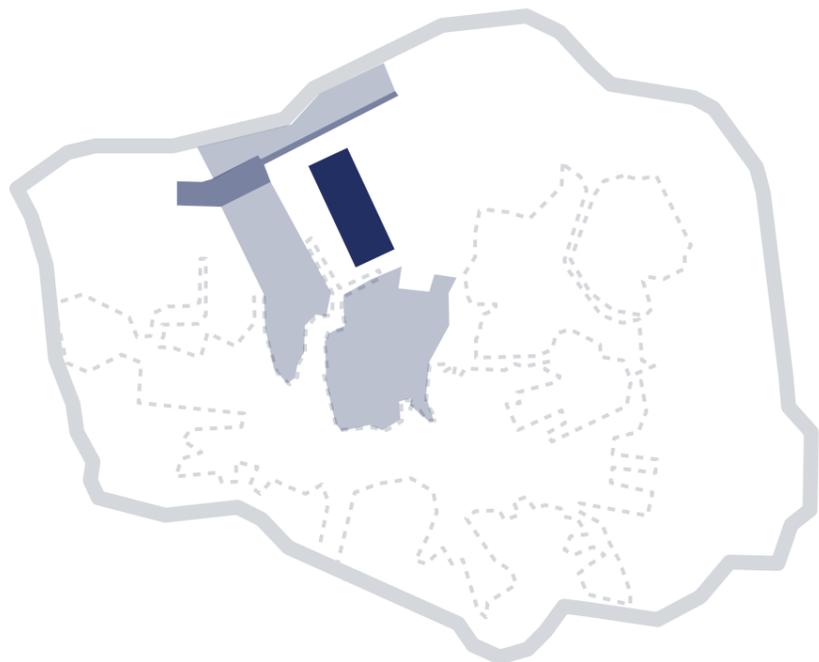
Maximize the connections with the surrounding neighbourhoods



Continuation of ecological corridors



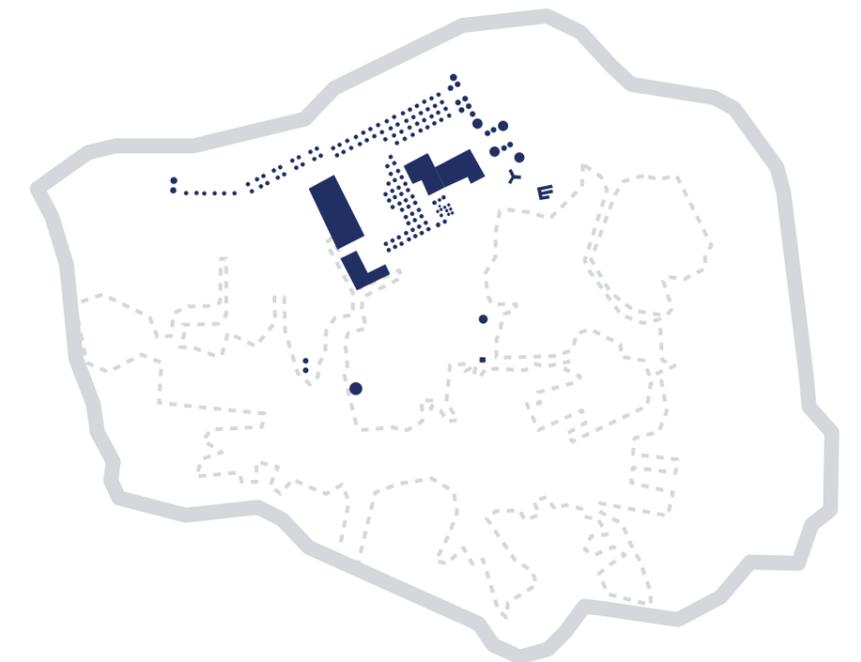
Continuation of the urban fabric



Diversify the program and economic activities



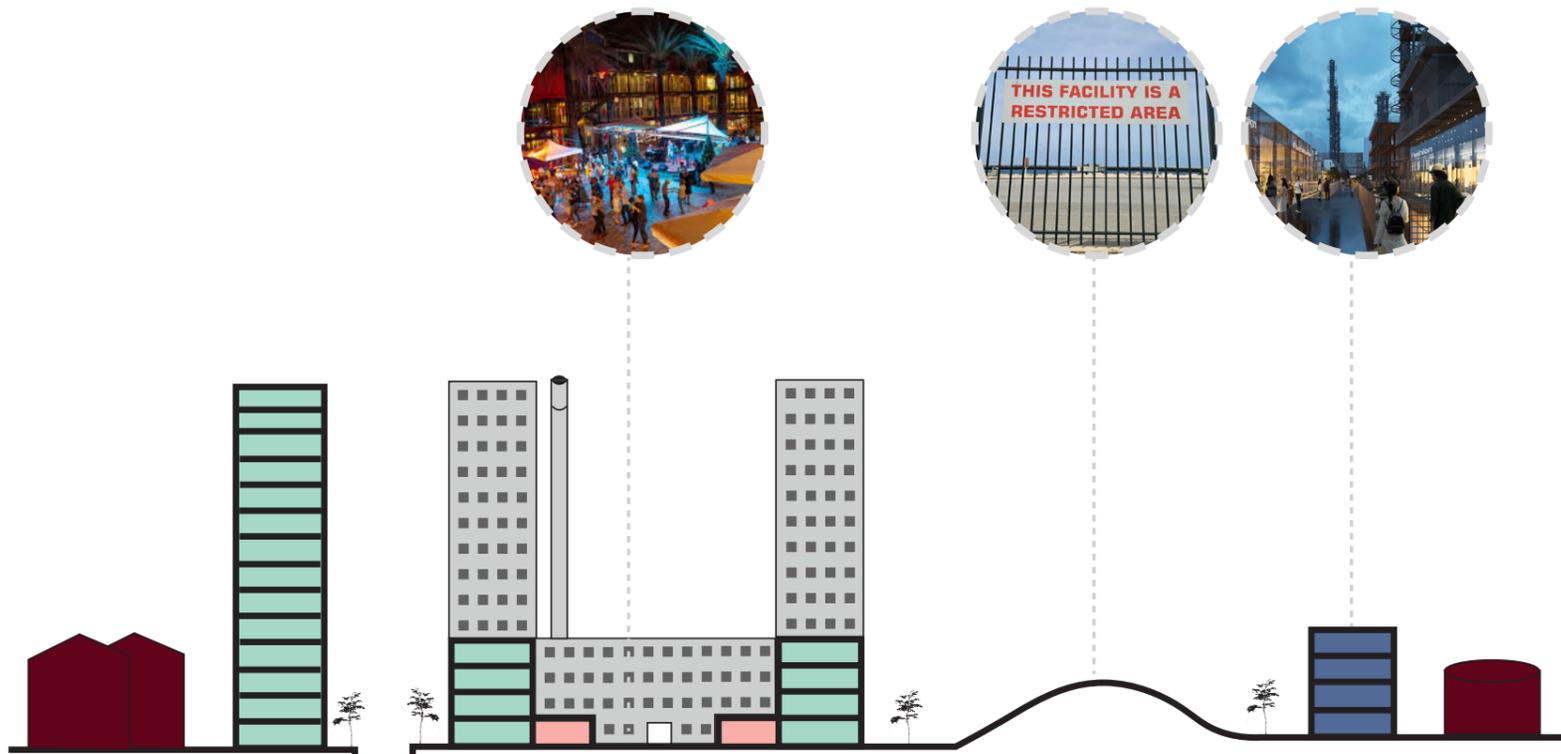
Contribute to heritage



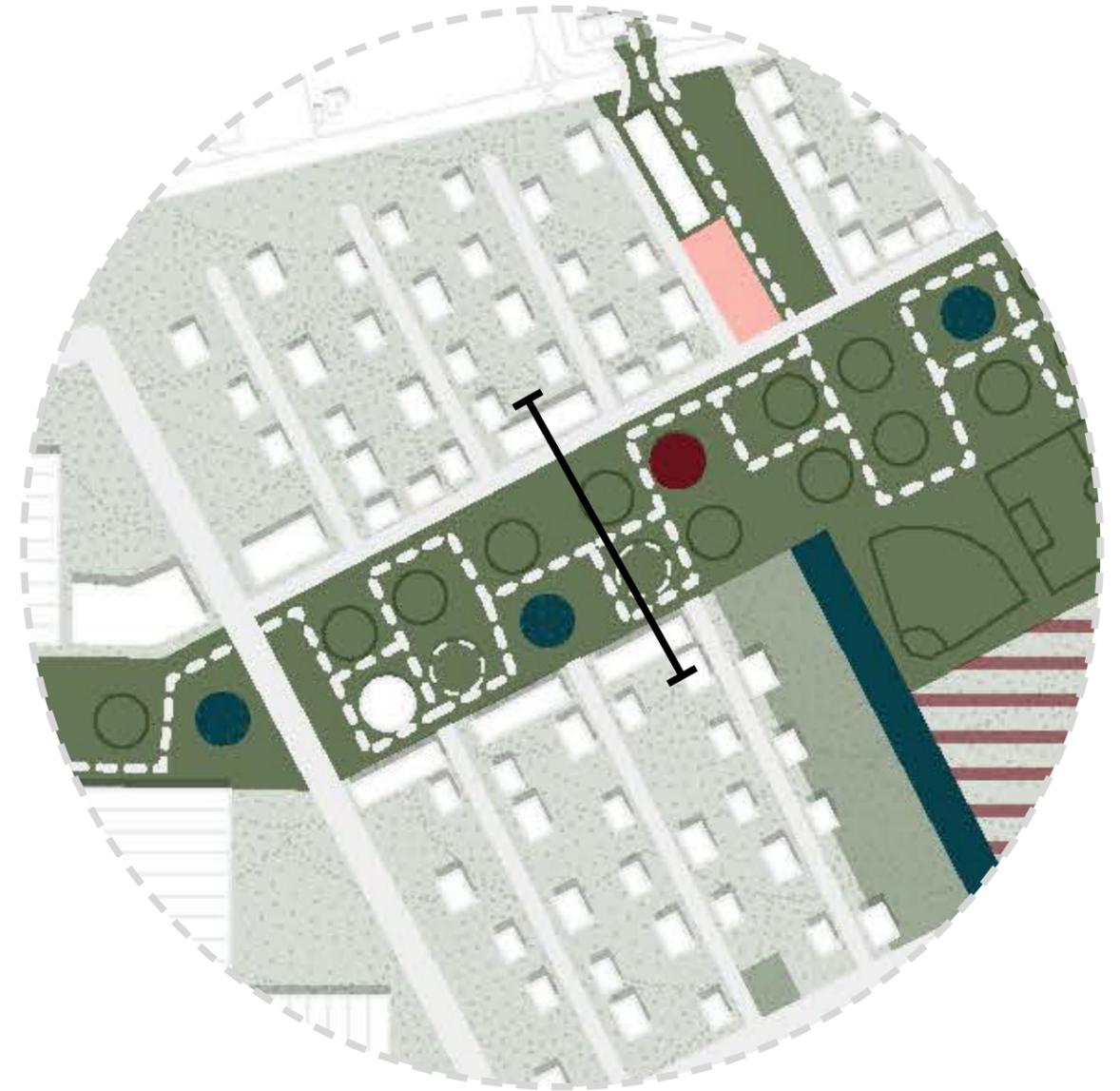
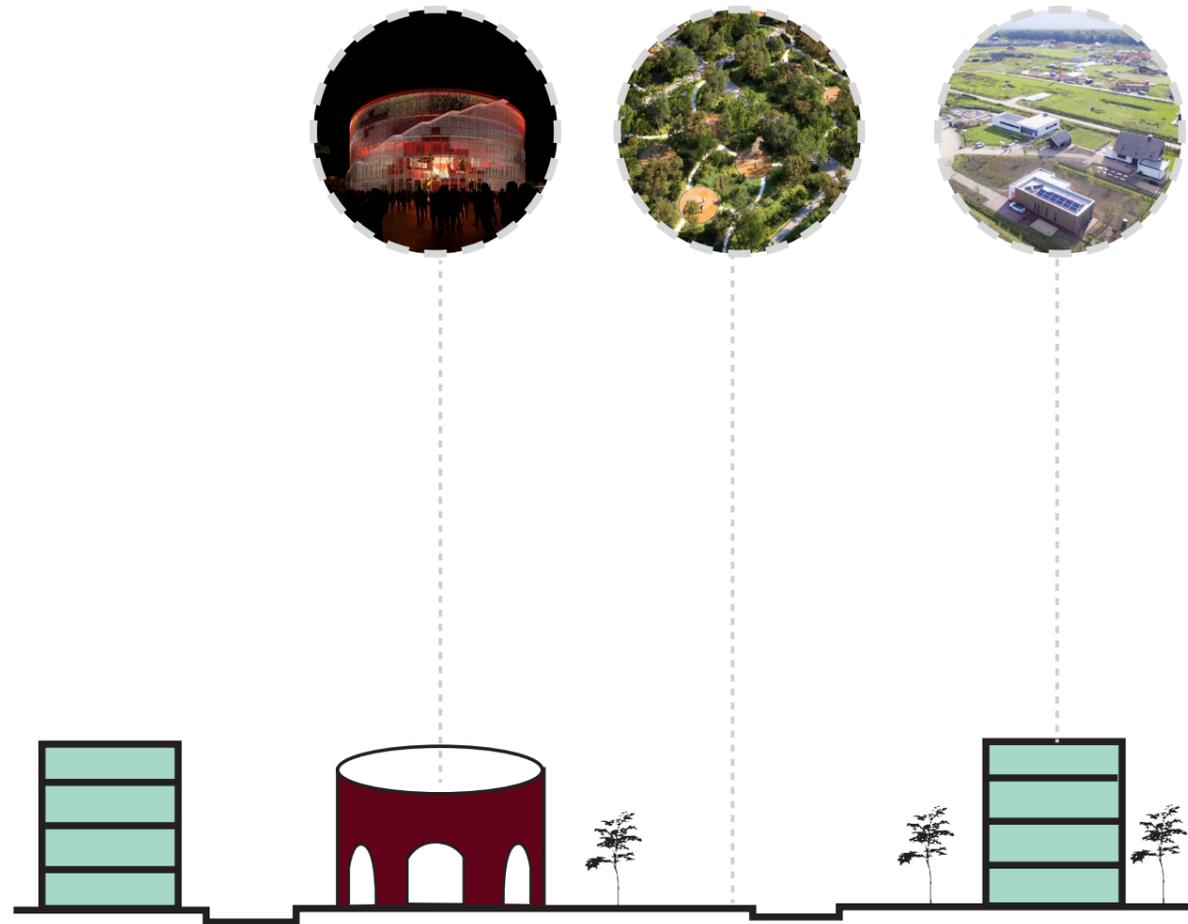
Masterplan 2075







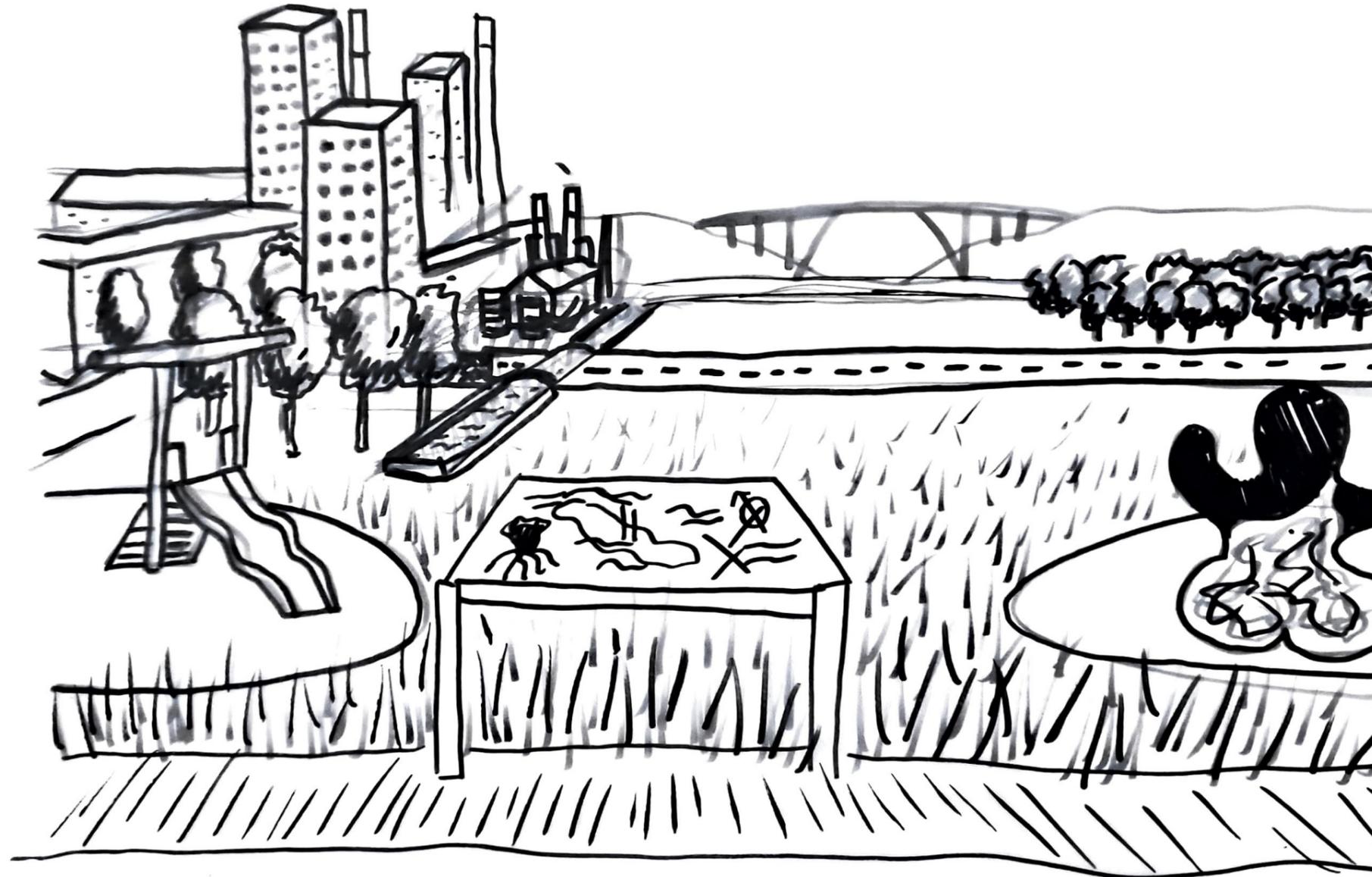




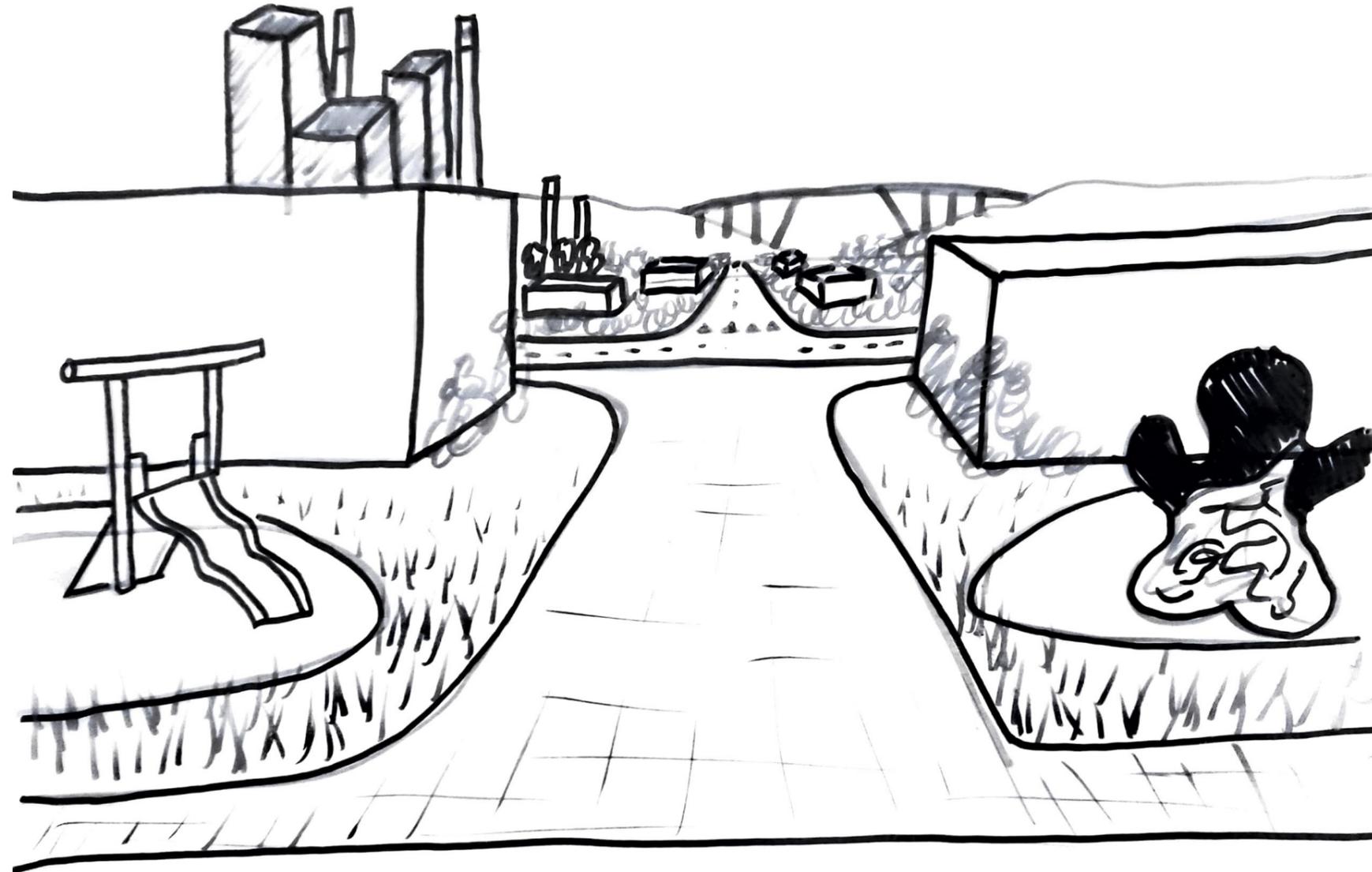
Phase 1: <10 years



Phase 2: 10-30 years



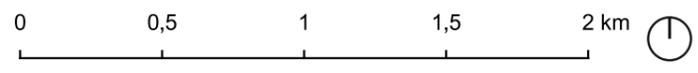
Phase 3: 30-50 years



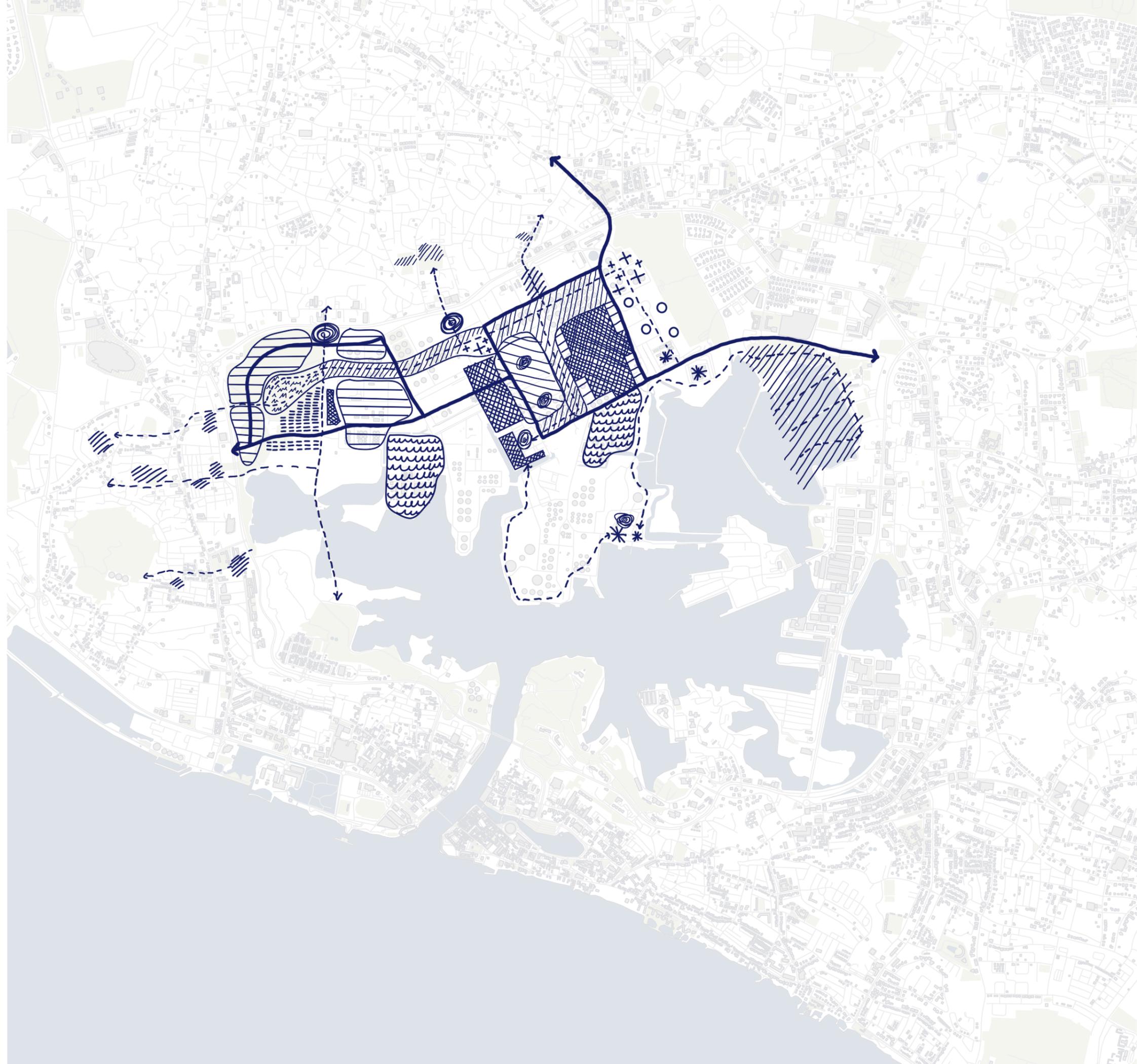
Phase 1: <10 years



-  New neighbourhoods
-  Ferry stops
-  Sub-roads
-  Heavy industry
-  Nature park
-  Mangrove forest park
-  Public centres
-  Landmarks
-  Campus buildings
-  Sport centres
-  Industrial heritage
-  Solar field
-  Innovation park
-  Pedestrian roads
-  Main roads



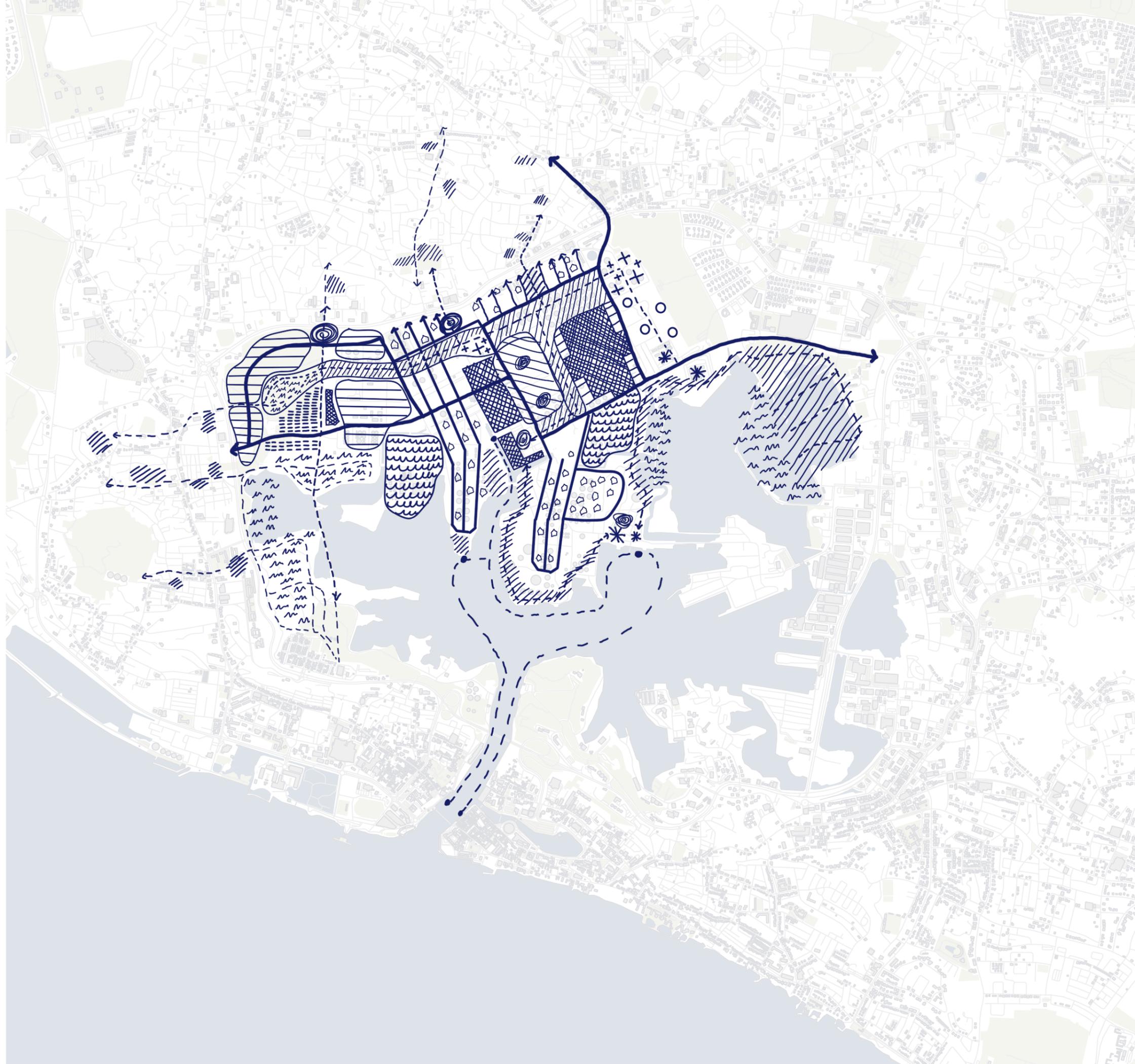
Phase 2: 10-30 years

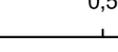


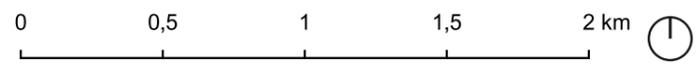
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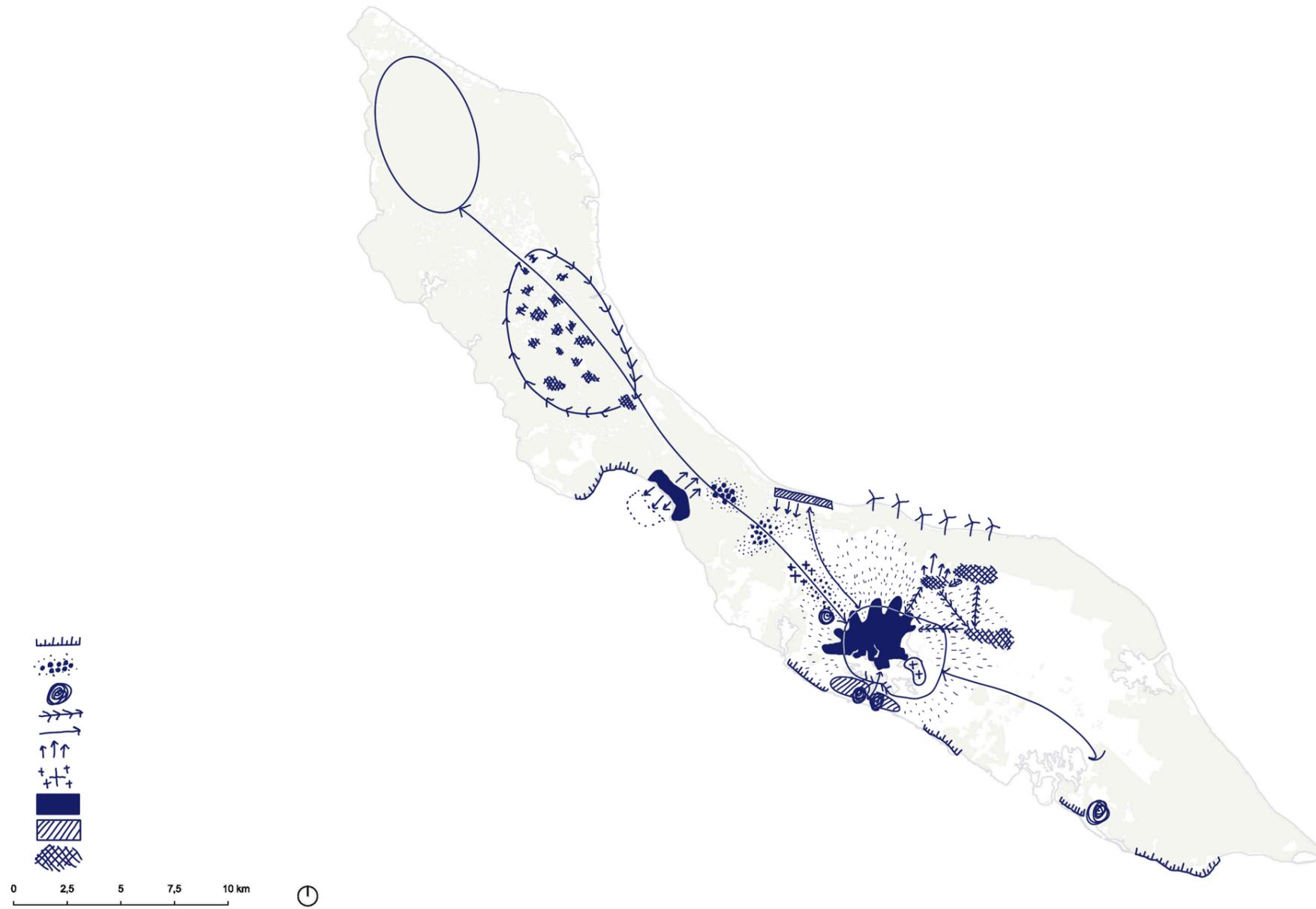
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-  Main roads



Effects on Curaçao



Transferability

What?	Why/How?	Where?
Phyto-remediation typologies	Phyto-remediation is site specific, but the proposed typologies could work in other projects, The report mentions necessary analysis to determine if/which phyto-technology is effective for other sites	Other former oil refinery sites (Aruba Oil Refinery) Other polluted brownfield sites
Valuing industrial heritage	Valuing former industrial site as an integral part of society and cultural heritage and designing with it instead of removing everything	Other industrial heritage sites Matosinhos (Refinery of Porto) TATA Steel factory (IJmuiden)
Proposed program	Proposed program is site specific (improving Curaçao), but inspiration can be drawn from the different recommended activities and their spatial structure/overlap	Other development projects (approximately 680 hectares)
Theory about sustainable development	People, Planet and Prosperity theory in report gives indications on how to use sustainability in projects	Designers and decision makers aiming for sustainability within their projects

Te awero!