

Re(f)used Resources:

Landscape approach for
Reykjavík's future resilience

Svana Rún Hermannsdóttir
MSc. Landscape Architecture



Content:

1. Problem Statement
2. Research Objective and Questions
3. Research Approach: Theoretical Framework and Methodology
4. Analysis Overview
5. Reused Resources: Future Vision
6. Reflection

“The point is not so much to contest or contradict our tools of work but rather to understand how they have been misused, abused and manipulated in both the design and decision making processes. We know that the contemporary city is no longer the product of a single thought or plan, the vision of some prince, but rather the diffuse result of successive layers of decisions rarely having anything to do with each other.”

- (Waldheim, 2006)

1. Problem statement

Climate change, increased urbanization and overwhelmed infrastructure is causing water management problems, fragmented urban green spaces and a decline in biodiversity in Reykjavík, Iceland.

The current situation disrupts the local water cycle, causing an environmental decline and affects the overall quality of life in Reykjavík.



(McCulley, n.d.)



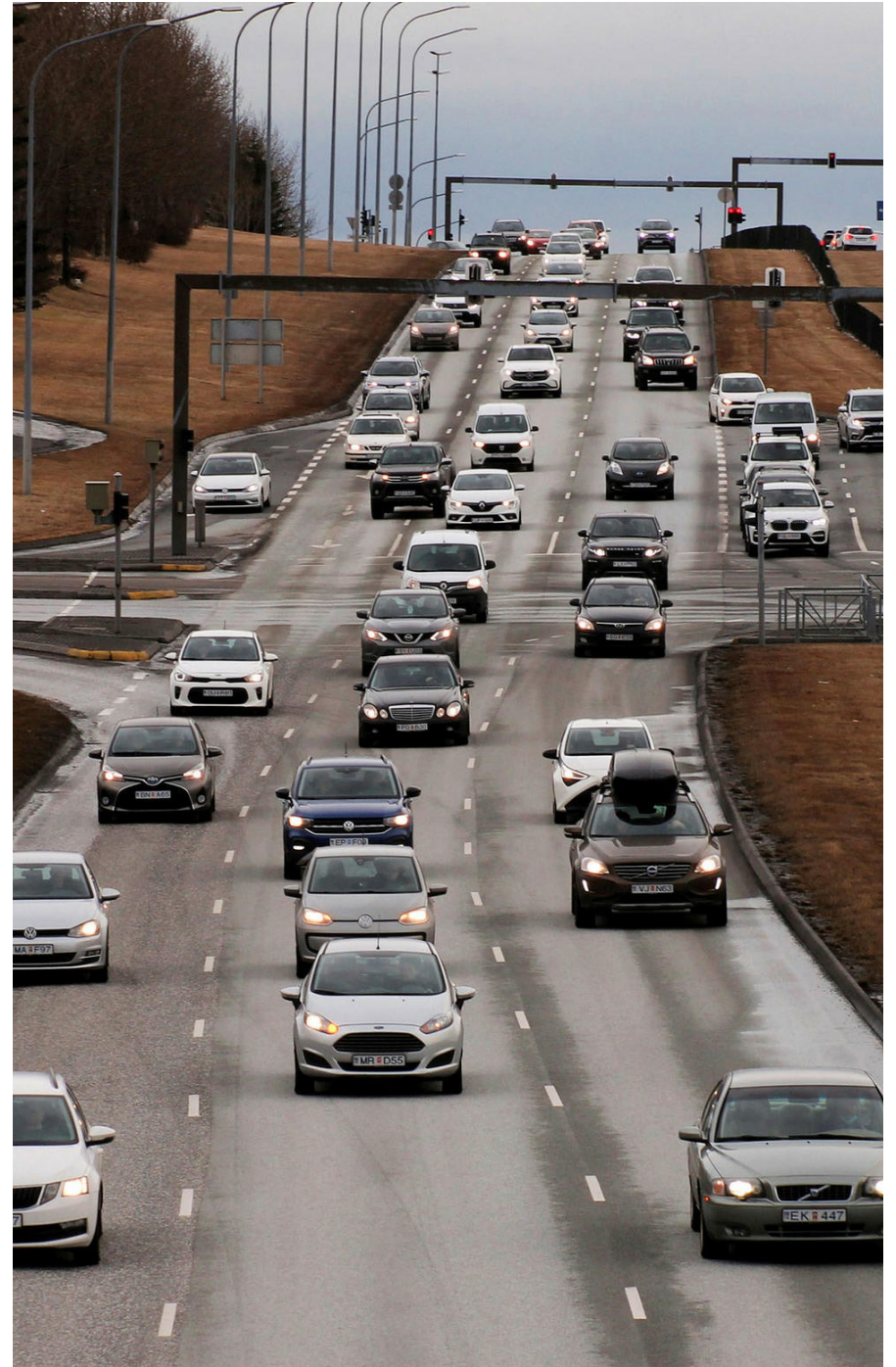
(Reykdal, 2016)



(Jónasson, 2018)



(Nachtmann, 2024)



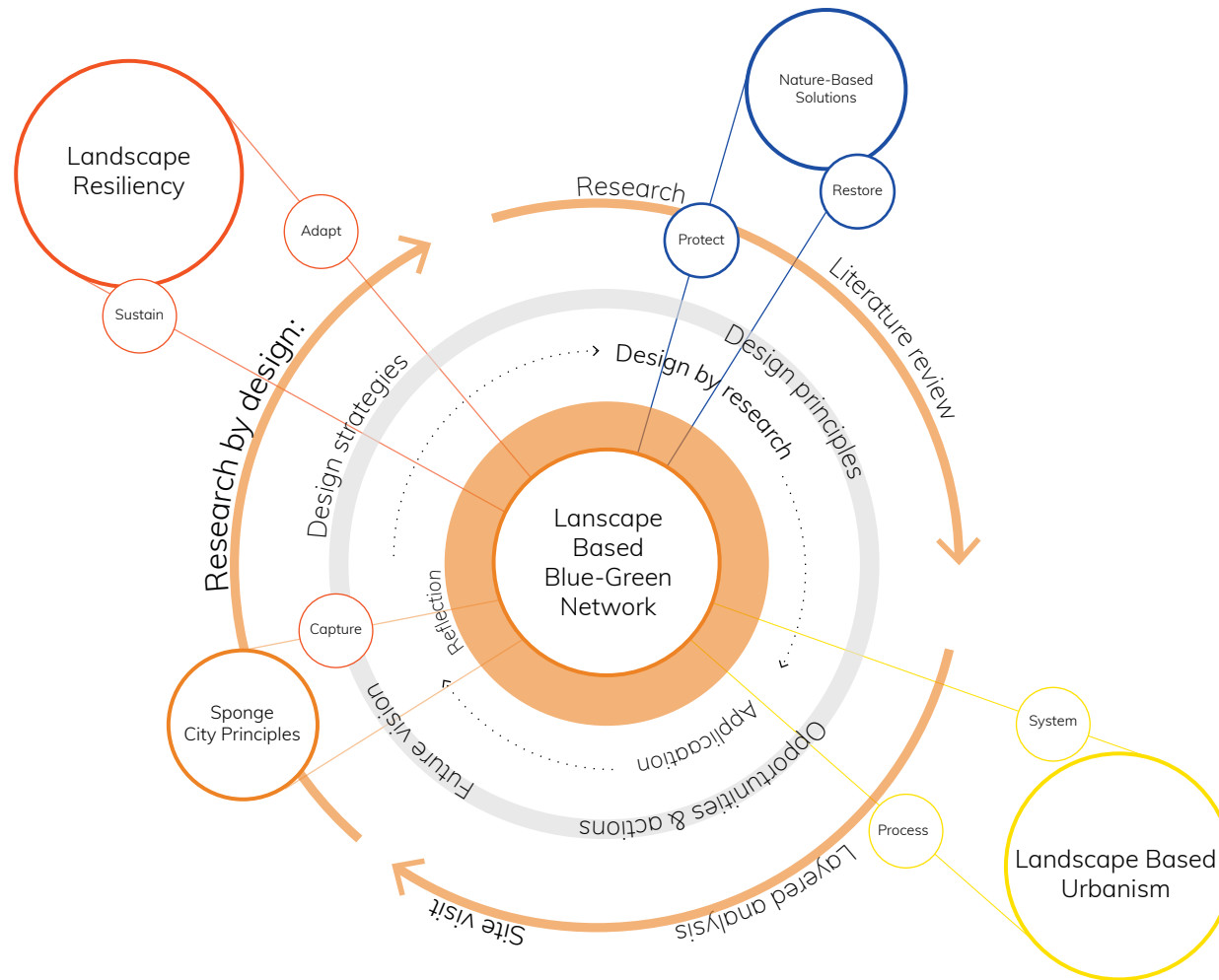
(Sævarsson, 2021)

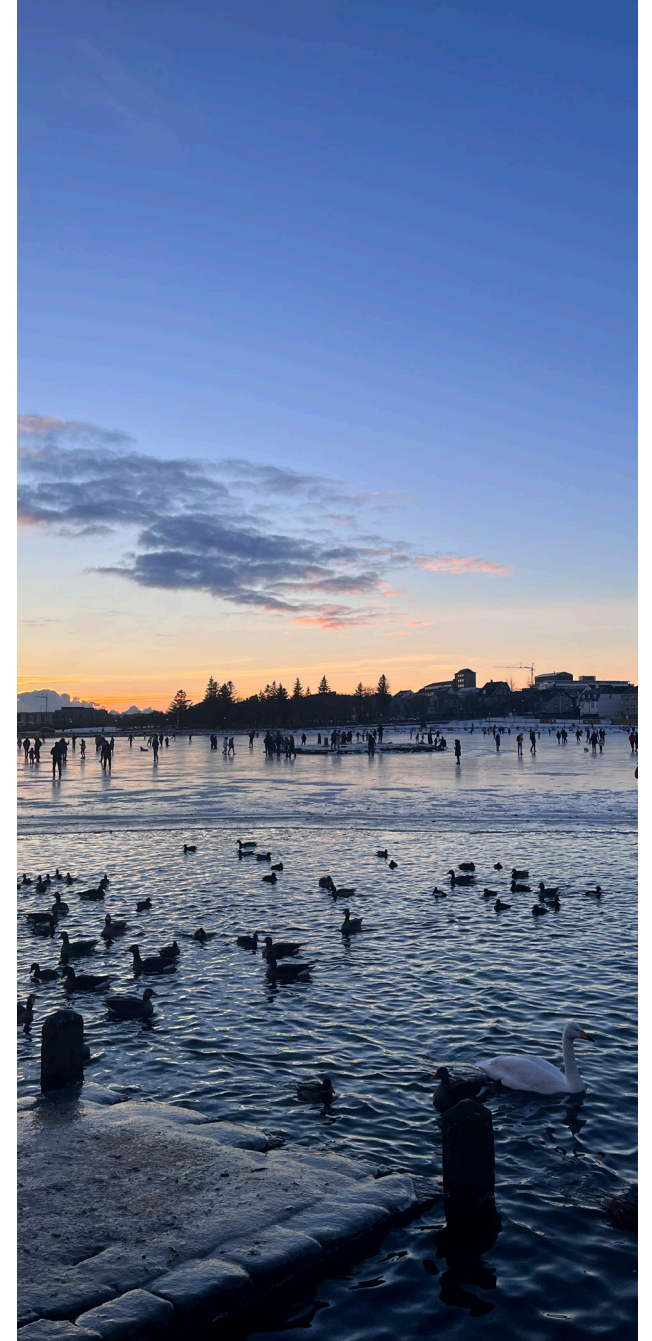
2. Research Objective and Questions

To explore the potential of a landscape based blue-green network for Reykjavík to enhance climate resiliency and provide a cornerstone for water management, urban ecology and sustainable urban development within the city.

- 1. How has the socio-ecological system in Reykjavík evolved from its historical functioning to its present state, considering the impacts of urbanization, and what are the main challenges and potentials associated with the current dynamics?
- 2. How can landscape-based approaches systematically serve as a crucial tool to address the challenges that Reykjavík is facing, leveraging their potential to contribute to urban development and exploit the city's spatial capabilities?
- 3. How can the translation and application of the principles and strategies developed be incorporated into landscape architectural design?

3. Theoretical Framework and Methodology

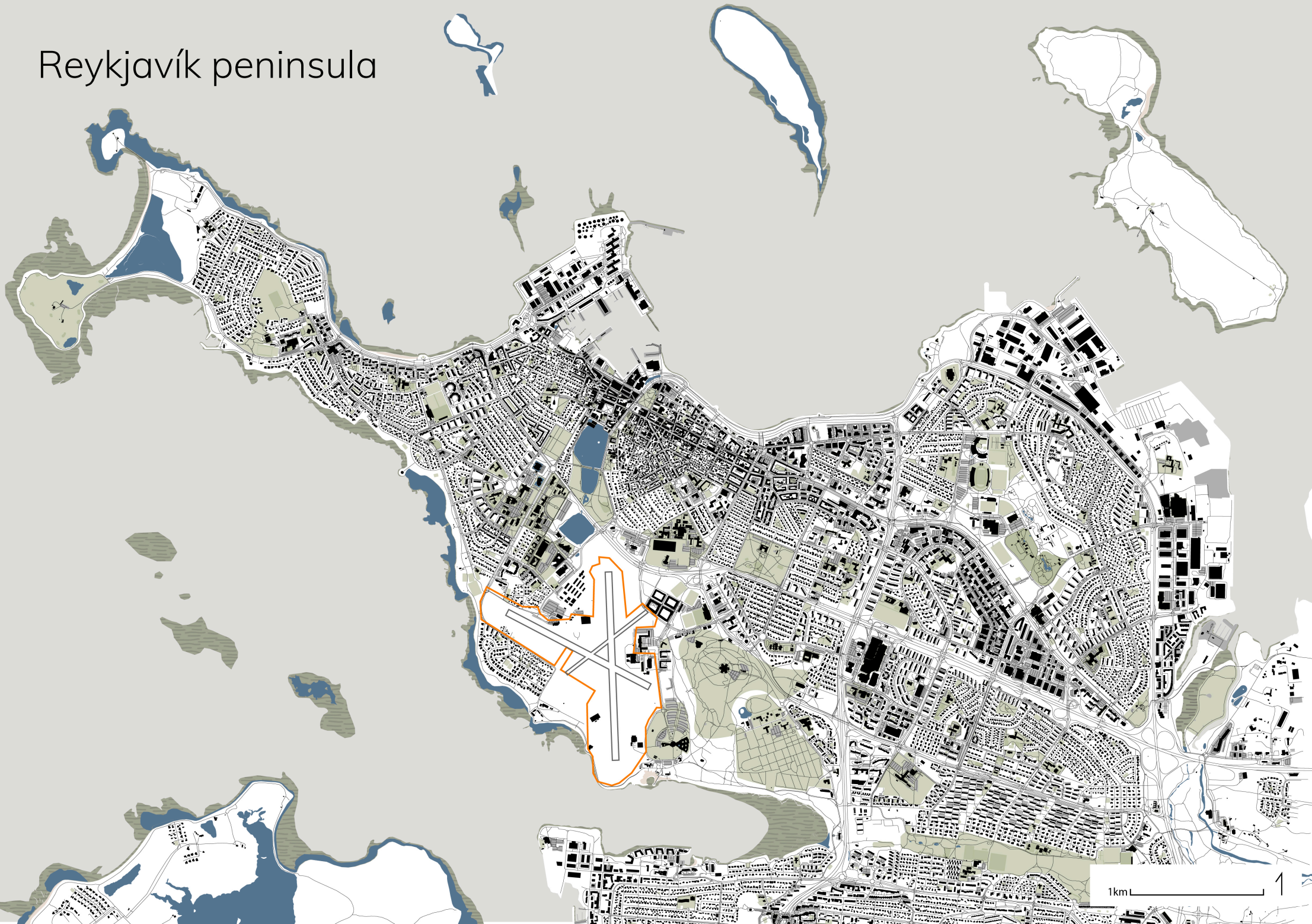


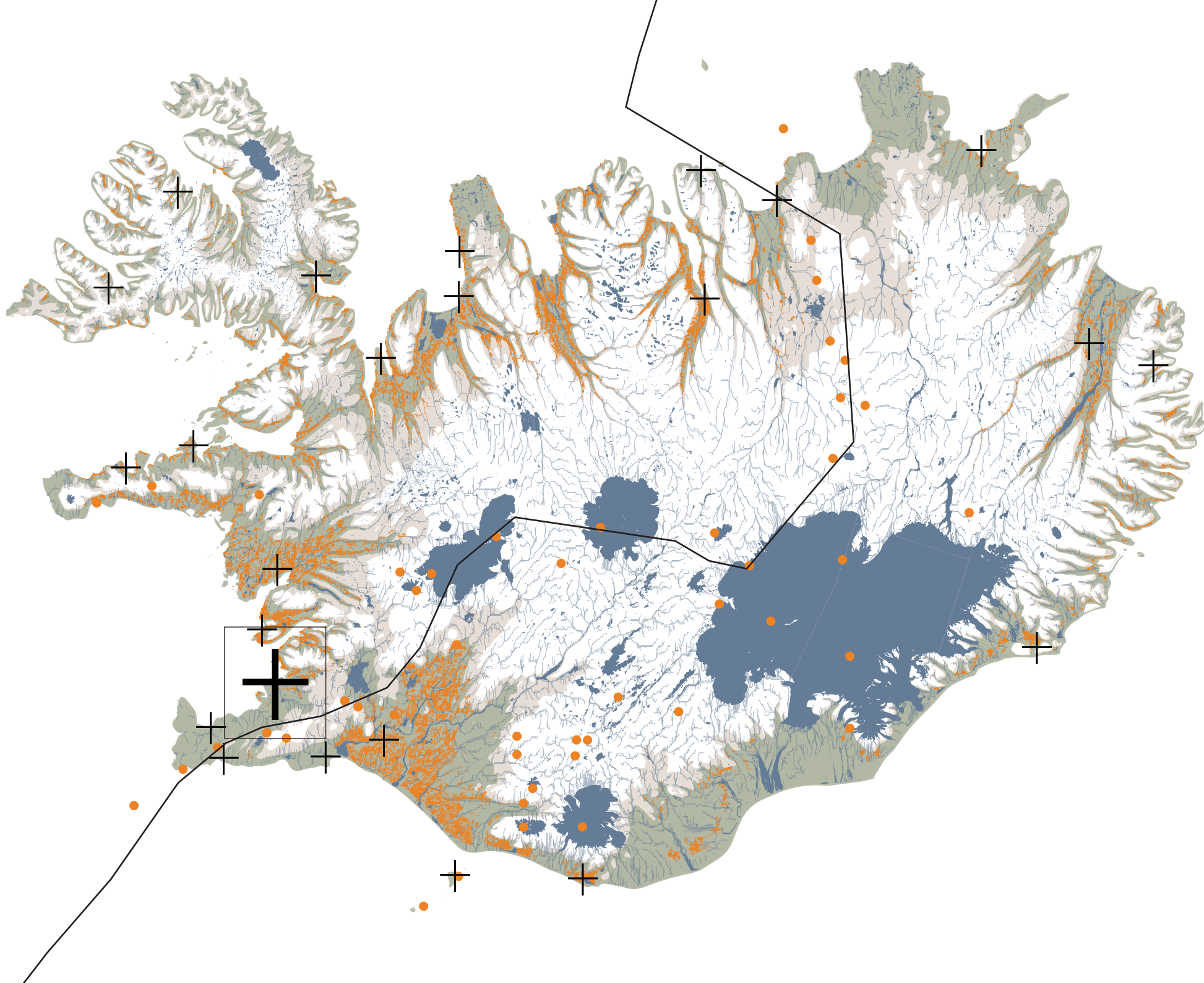


4. Analysis Overview



Reykjavík peninsula





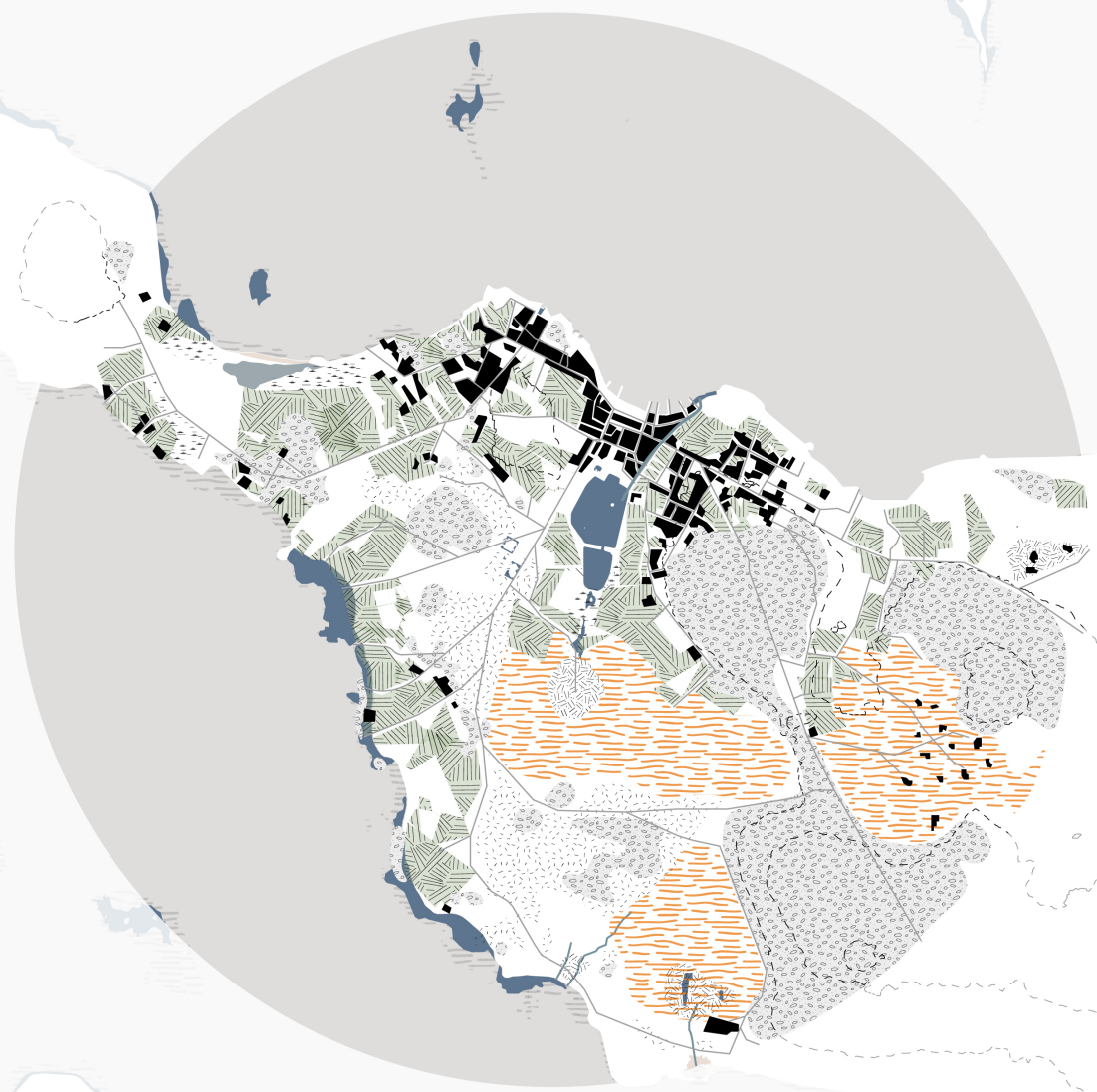
Historical landscape & urban development

1903: 6.000 inhabitants

The birch forest is already gone

Urban development at harbour

South of the pond: wetlands



Settlement

Water & water habitats

Wetland /Moorland

Cultiv. land

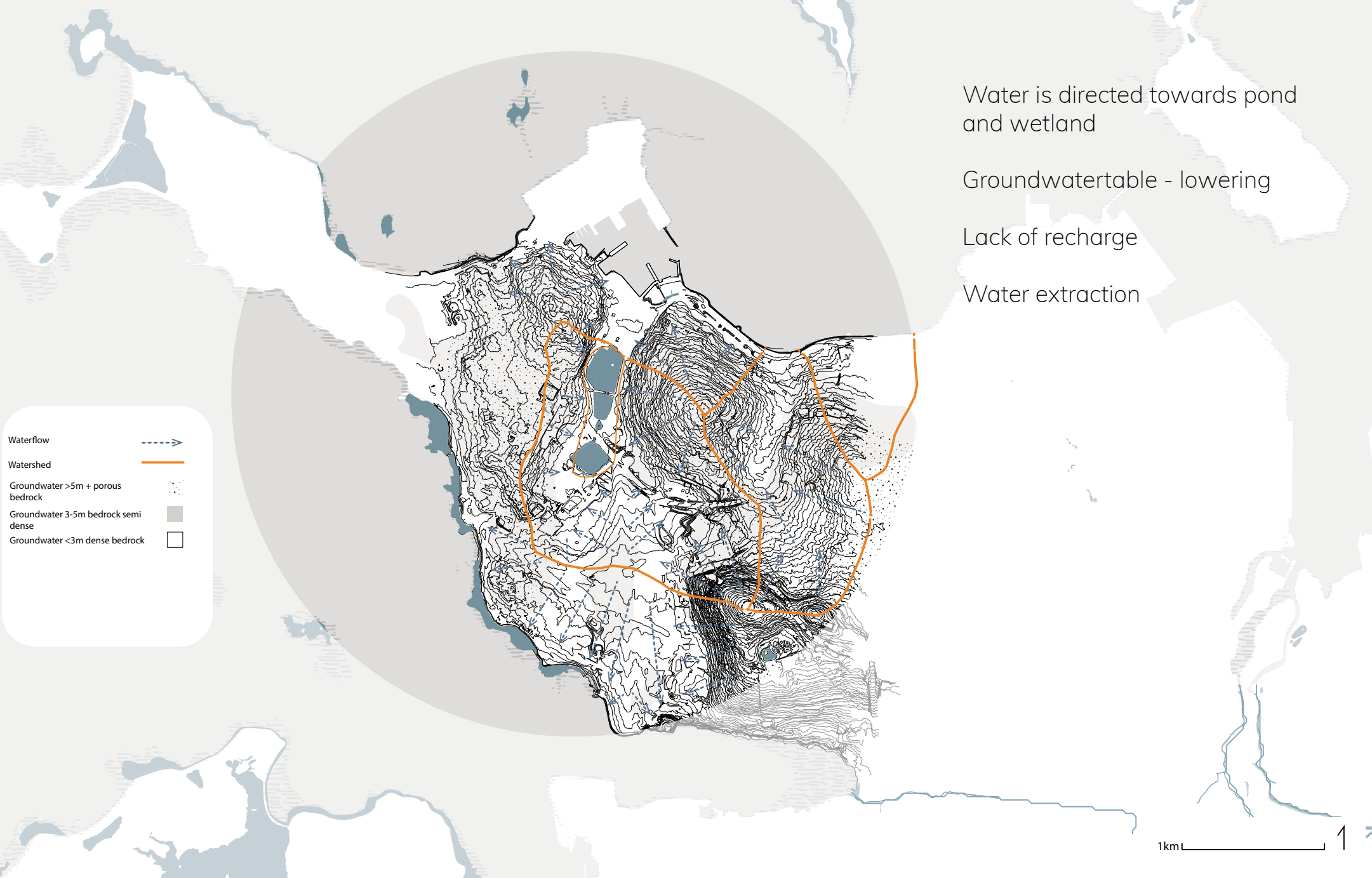
Glacial Moraine

Heathland

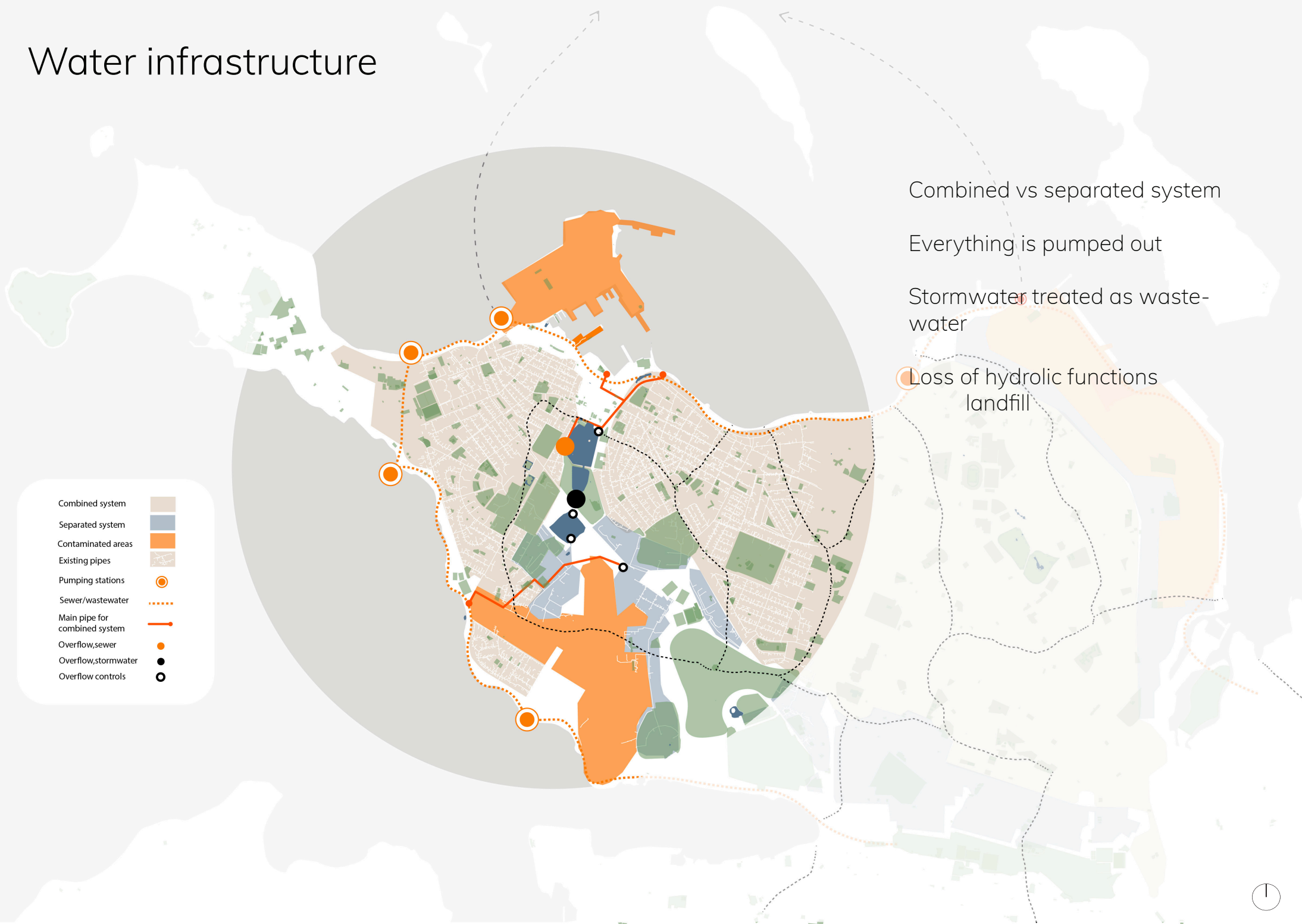
Peat bog

Meadow

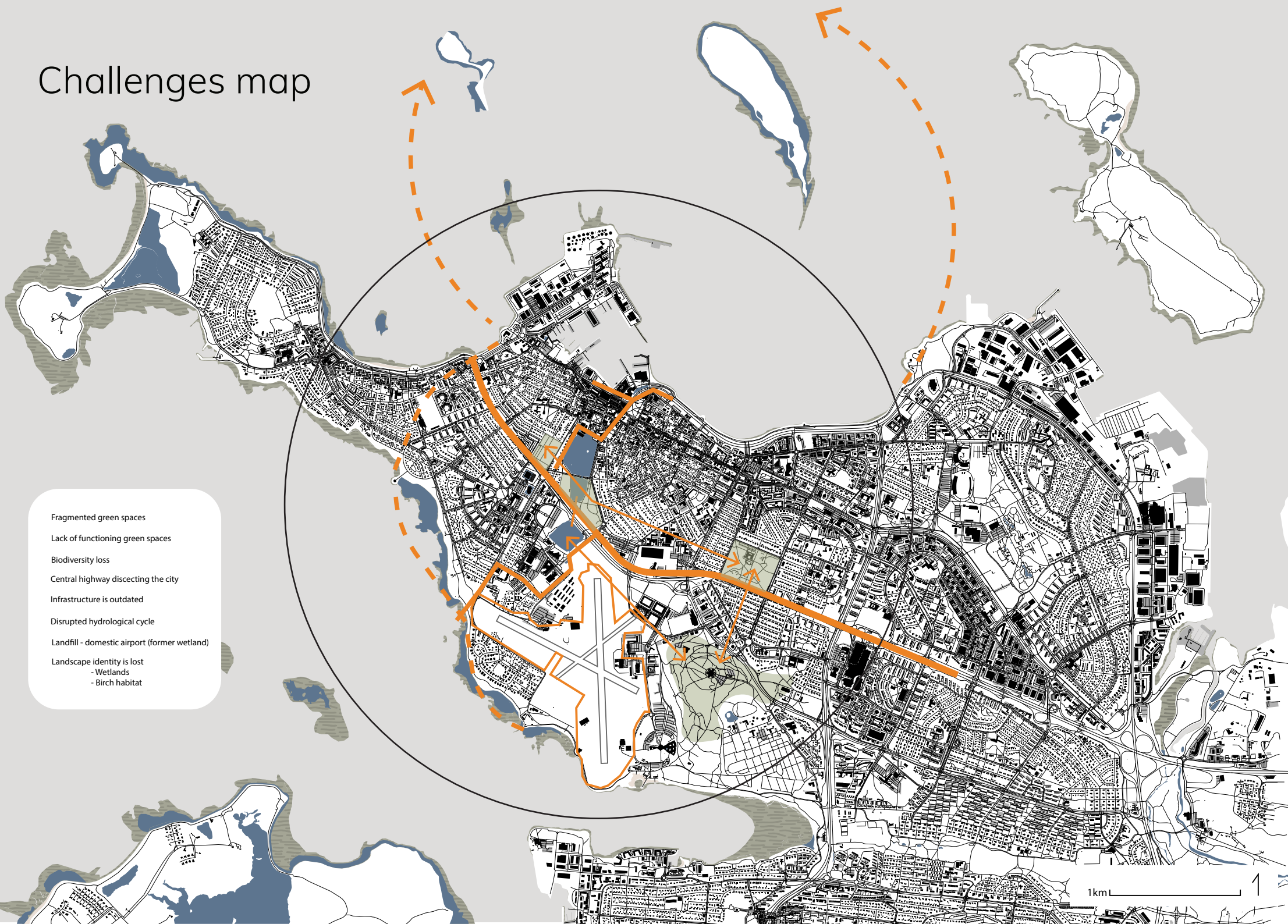
Topography, water and relief - present day



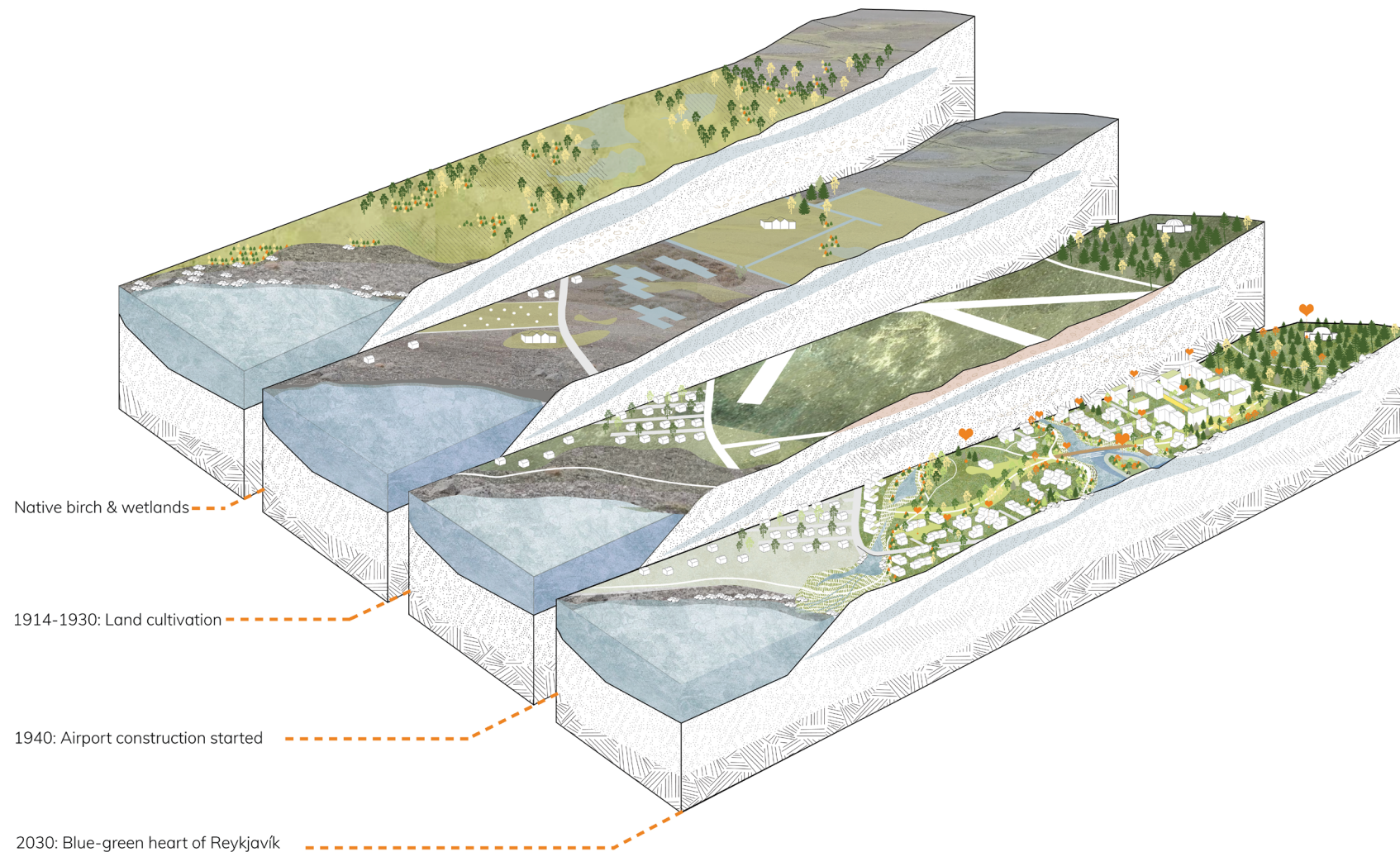
Water infrastructure



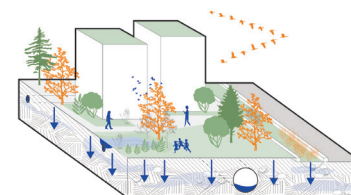
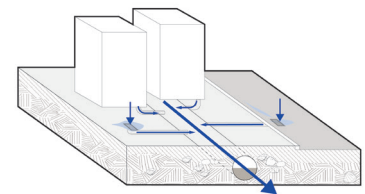
Challenges map



Analysis - results



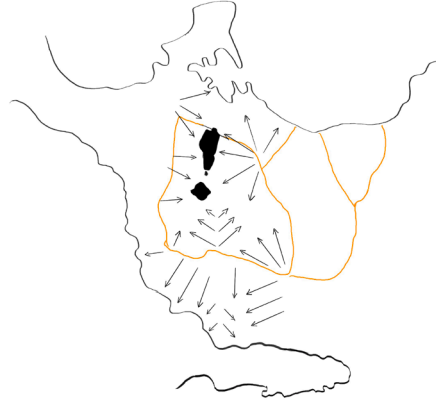
- Blue-green heart of Reykjavik
- Primary green connections
- Secondary green connections
- Ecological gradients
- Existing green areas
- New Urban typologies



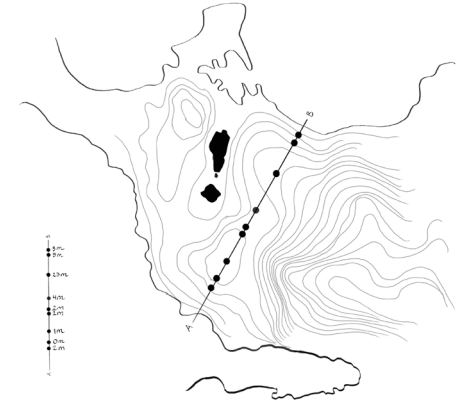
Design clues : Layer by layer to summarize



Spatial structure:
Urban edges
Airport, forest, wetlands



Watershed & waterflow



Groundwater elevation



Soil, bedrock and permeability

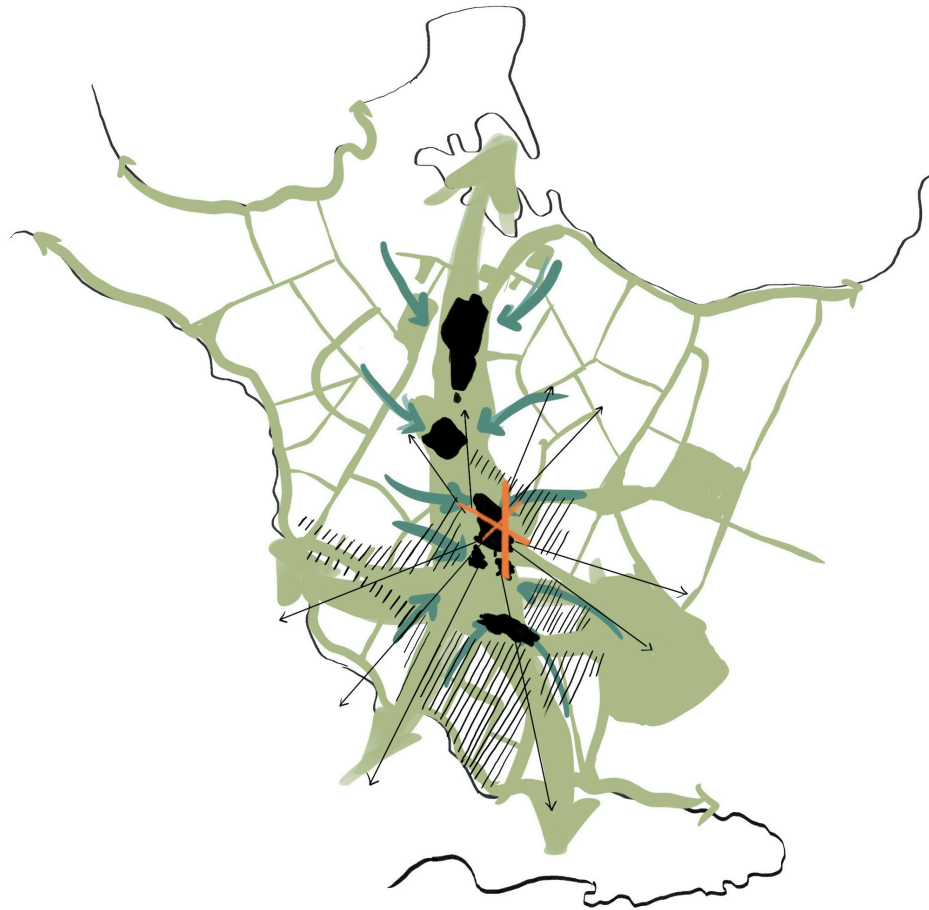


Historic wetland patches



Sun and wind

Concept:



Design elements:



Green-blue Network



New urban edges & typologies



Blue-green heart

5. Reused resources : future vision

Water management

Ecological gradients

Urban landscape typologies



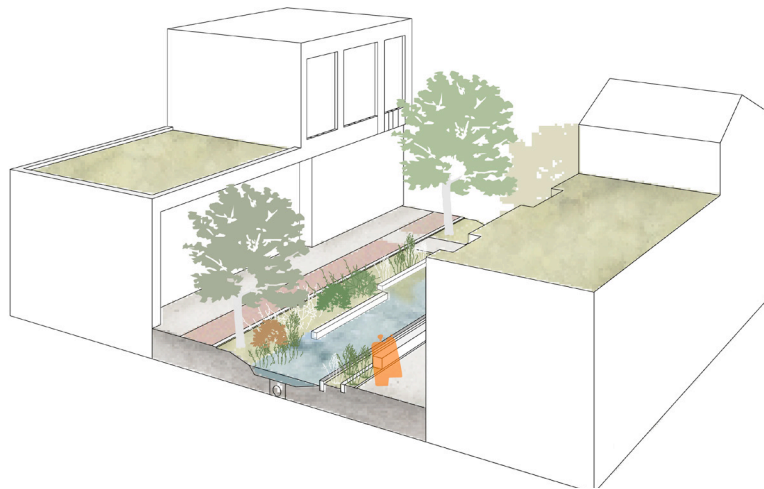
Hydrology - new water system

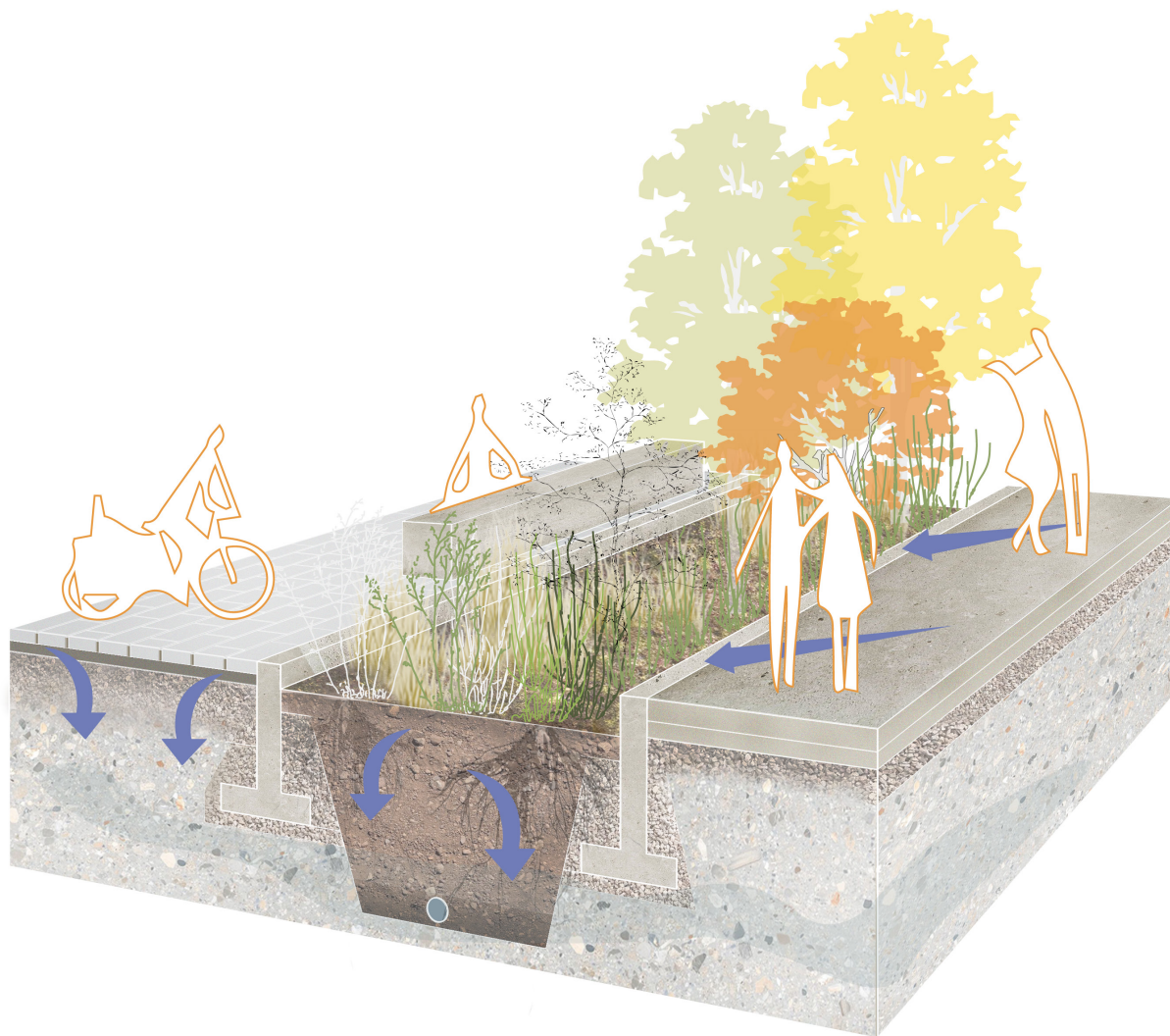
Watershed expansion

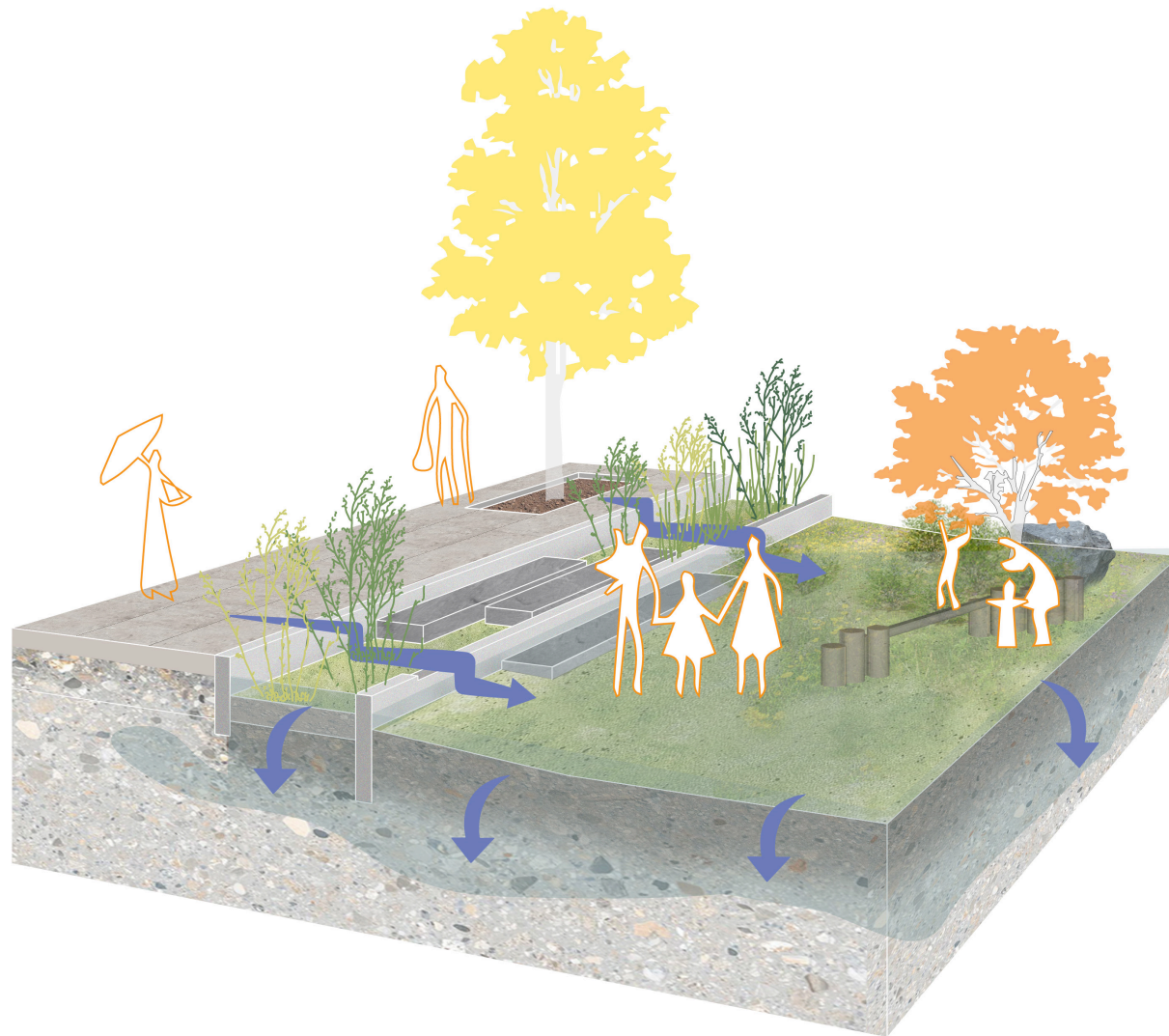
Groundwater recharge

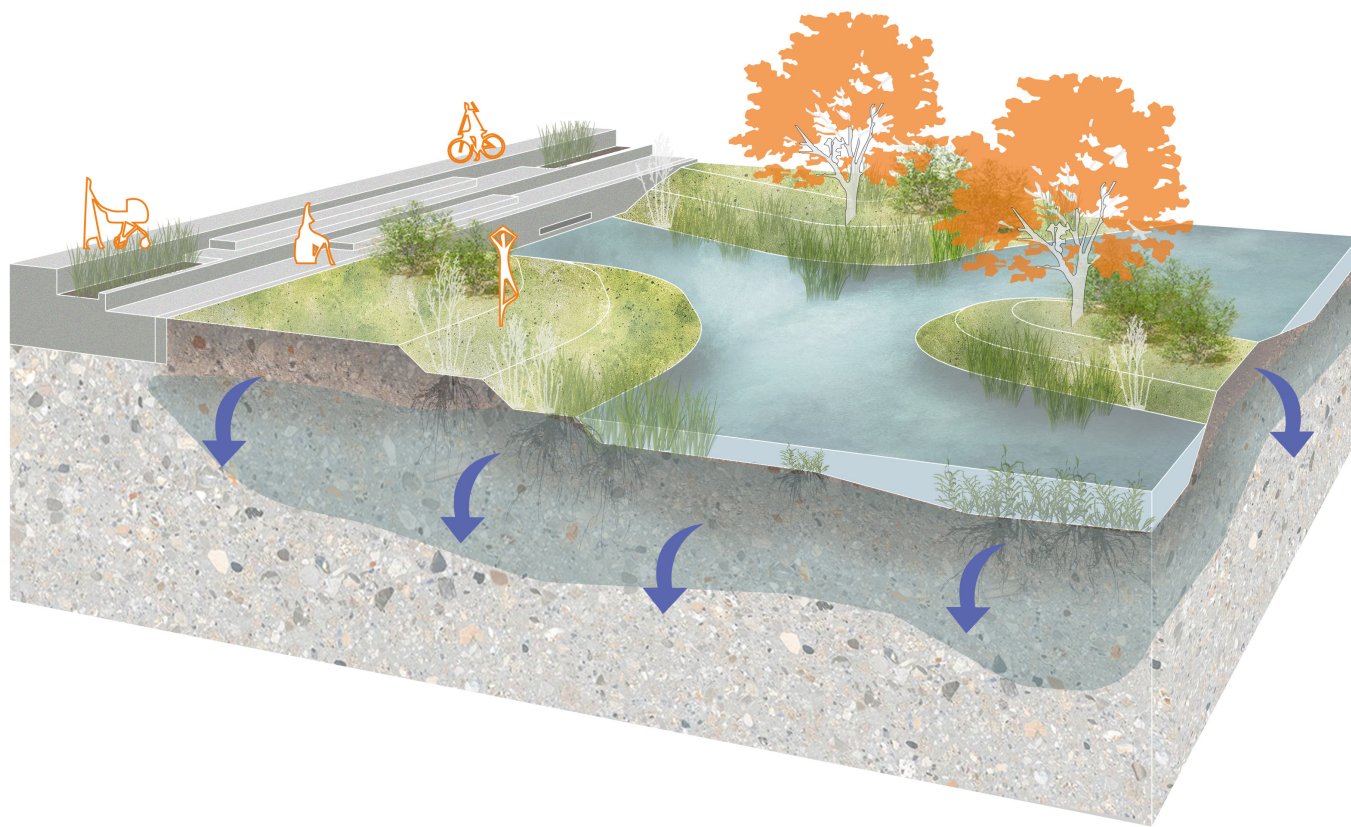
Water filtration, quality and safety

Wetland patches

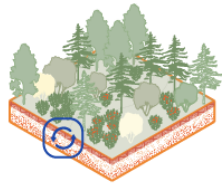




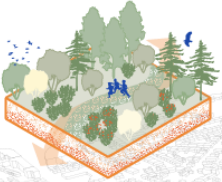




Urban forest

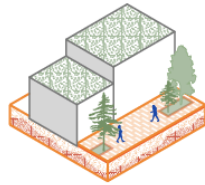


Phytoremediation forest

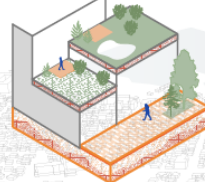


Ecological forest corridors

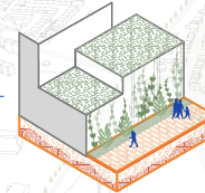
Building solutions



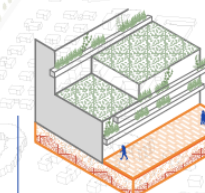
Extensive green roofs



Intensive green roofs

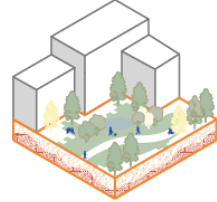


Ground based green facades

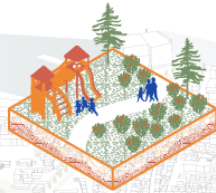


Facade bounded greening

Open green space



Pocket parks

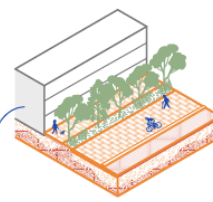


Natural playgrounds

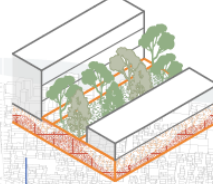


Climate-proof residential gardens/
Native residential gardens

Green Corridors



Street trees

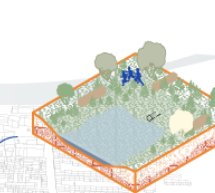


Green avenues

Bioretention



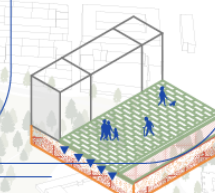
Bioswales and rain gardens



Detention pond

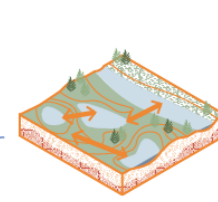


Retention pond

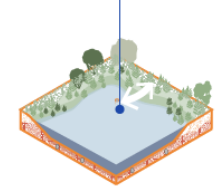


Permeable pavement

Inland Wetlands



Improving lateral connectivity



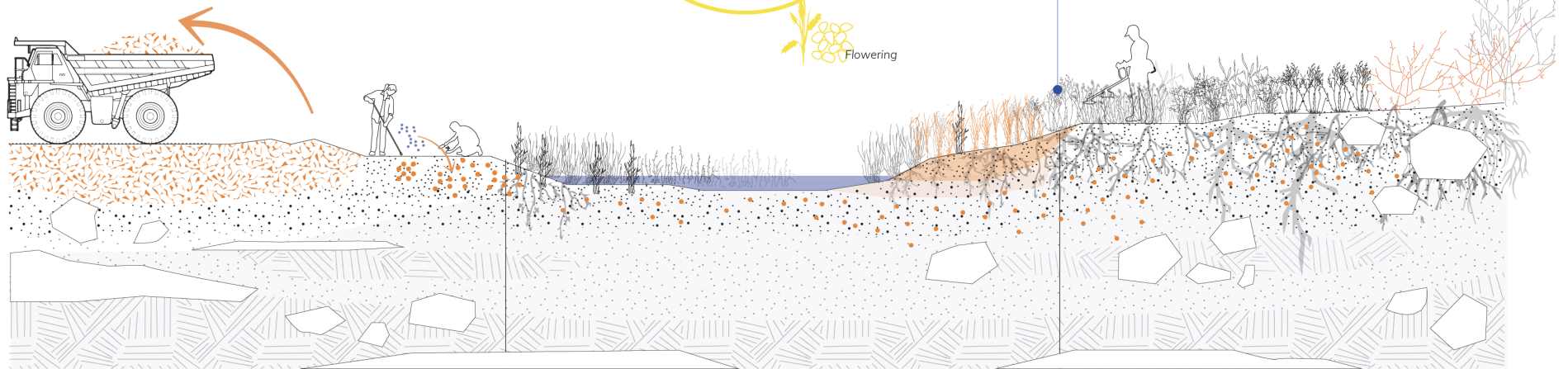
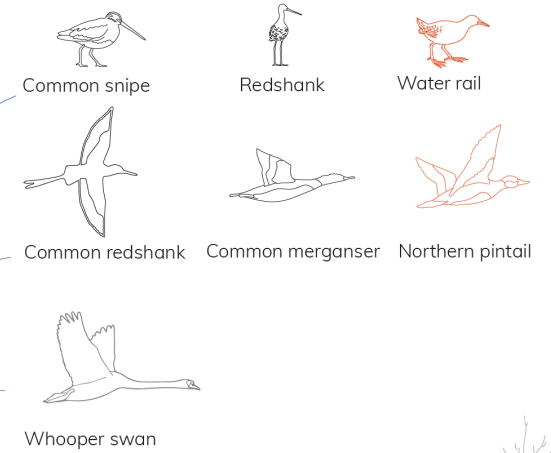
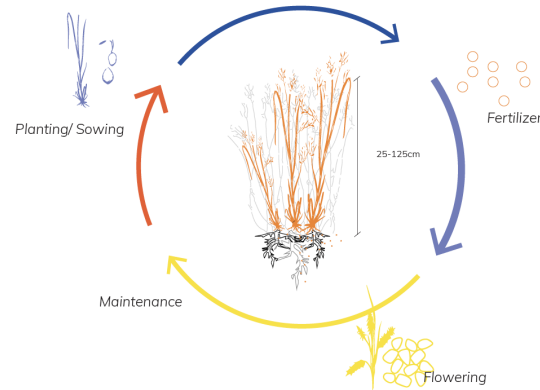
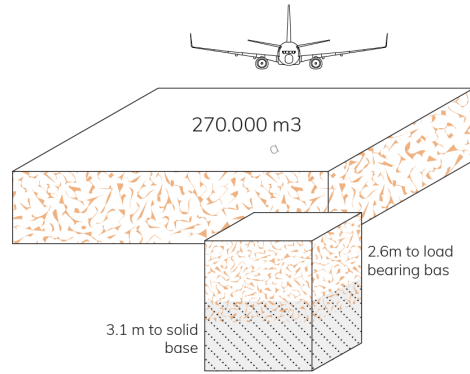
Surface constructed wetlands



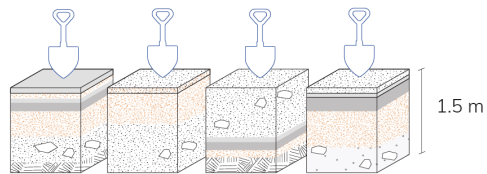
From landfill to wetland

Carex Lyngbyei

Lyngbye's sedge used to grow in the area for centuries. It is a pioneer colonizer and has been used successfully in wetlands restoration and creation programs.



Time



Carex rostrata
Bottle sedge

Myriophyllum alterniflorum
Alternate water-milfoil

Carex Lyngbyei
Lyngbye's sedge.

Deschampsia cespitosa
Tufted hairgrass

Poa pratensis
Smooth Meadow-grass

Excavated landfill material: Mainly red gravel, asphalt, concrete and other inorganic & organic material. Some re-usable but some with too high concentration of contamination

First years: seeding, planting of plugs and the use of fertilizer. Carex rostrata planted in wet areas along banks and Carex Lyngbyei in slightly drier zones. Water milfoil eventually emerges in the wetland

5+ years: More sediments & organic matter forms and other species will germinate/spread

Ecological gradients

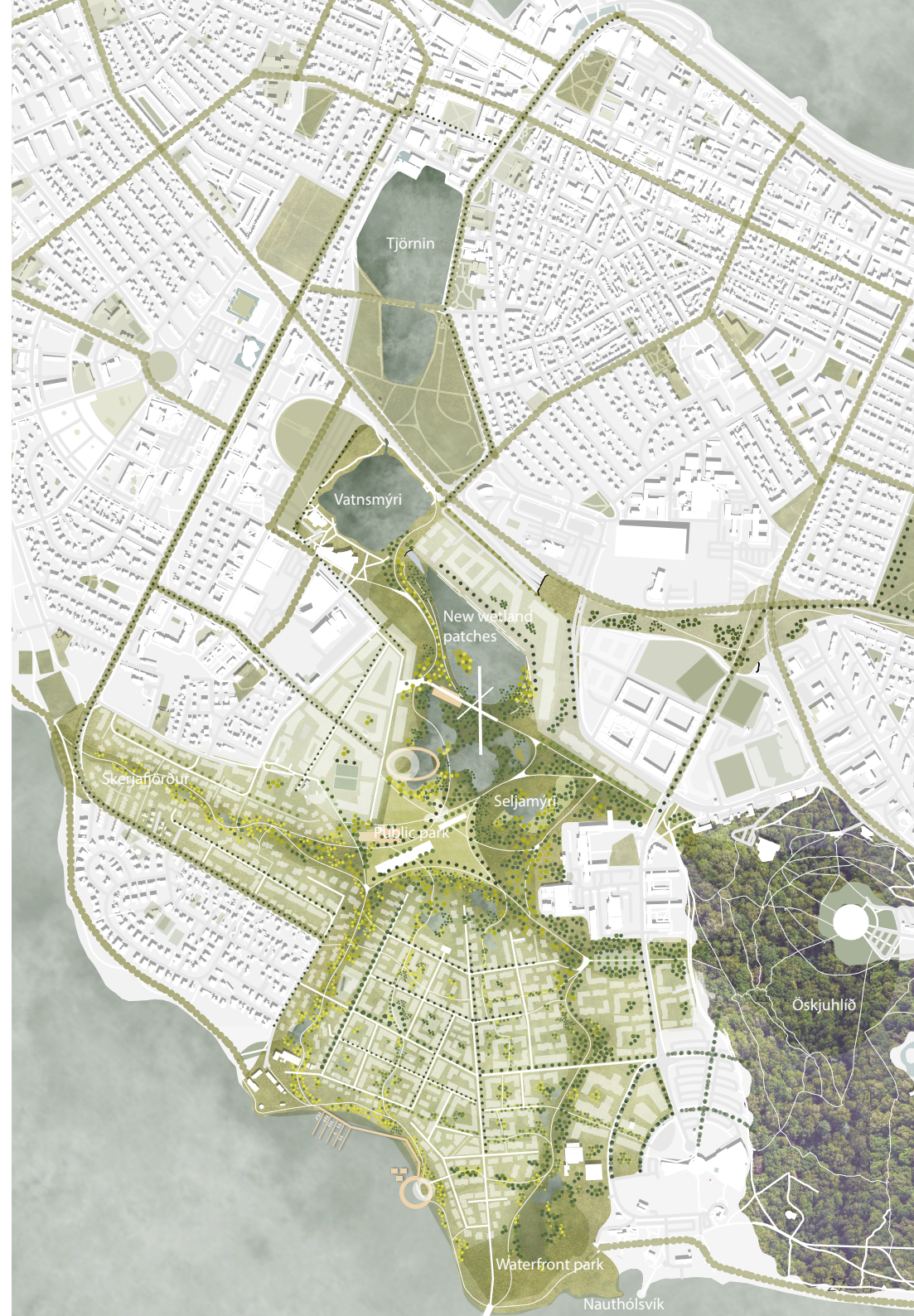
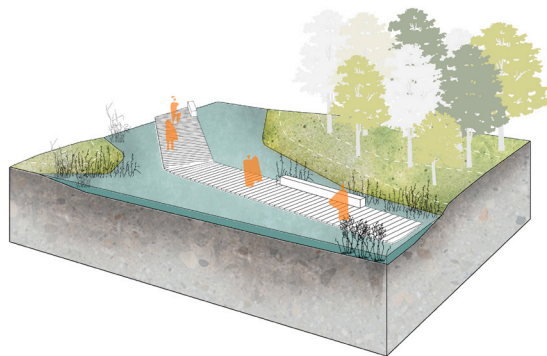
Increased landscape resiliency

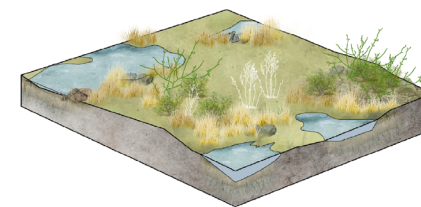
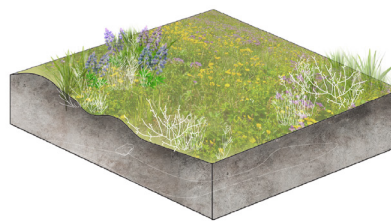
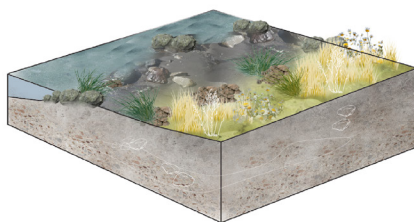
Ecosystem services

Biodiversity

Mitigate flooding and other hazards,

Enhanced function of local ecosystems





Sea Rocket
Cakile arctica

Sea Sandwort
Honckeya peploides

Sea Plantain
Plantago maritima

Sea Marjoram
Tripheurospermum maritimum

Sea Blauwbes
Mertensia maritima

Lyme Grass
Leymus arenarius



Water Awns
Genium rivale

Woodland Geranium
Geranium sylvaticum

Meadow Buttercup
Ranunculus acris

Moorland Spotted Orchid
Dactylorhiza maculata

Lady's Bedstraw
Galium verum

Northern Dock
Rumex Longifolius

Common Dandelion
Taraxacum officinale



Creeping Sedge
Carex chondrorhiza

Lynbret's Sedge
Carex lyngbyei

Beaked Sedge
Carex rostrata

Black Sedge
Carex nigra

Cottongrass
Eriophorum angustifolium

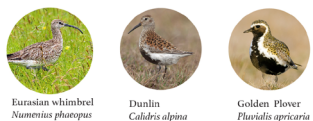
Meadowsweet
Filipendula ulmaria

Wild Angelica
Angelica sylvestris

Coastal

Grassland & meadows

Wetlands



Northern bilberry
Vaccinium uliginosum

Moss campion
Silene acaulis

Sea Thrift
Armeria maritima

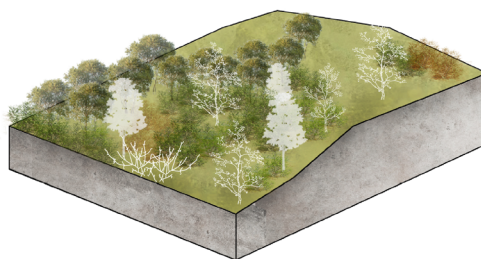
Mother of Thyme
Thymus praecox

Common Yarrow
Achillea millefolium

Common Bearberry
Arctostaphylos uva-ursi

Alpine Blue Grass
Poa alpina

Heathland



Siberian Larch
Larix sibirica

Tea-leaved Willow
Salix phylicifolia

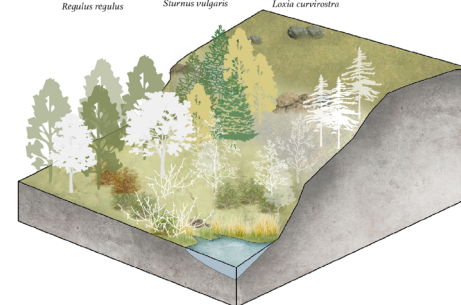
Quaking Aspen
Populus tremula

Woolly Willow
Salix lanata

Dwarf Birch
Betula nana

Downy Birch
Betula pubescens

Native birch forest



Siberian Larch
Larix sibirica

Black Cotton Wood
Populus balsamifera ssp.

Shore Pine
Pinus contorta

Mugo Pine
Pinus mugo

Sitka Spruce
Picea sitchensis

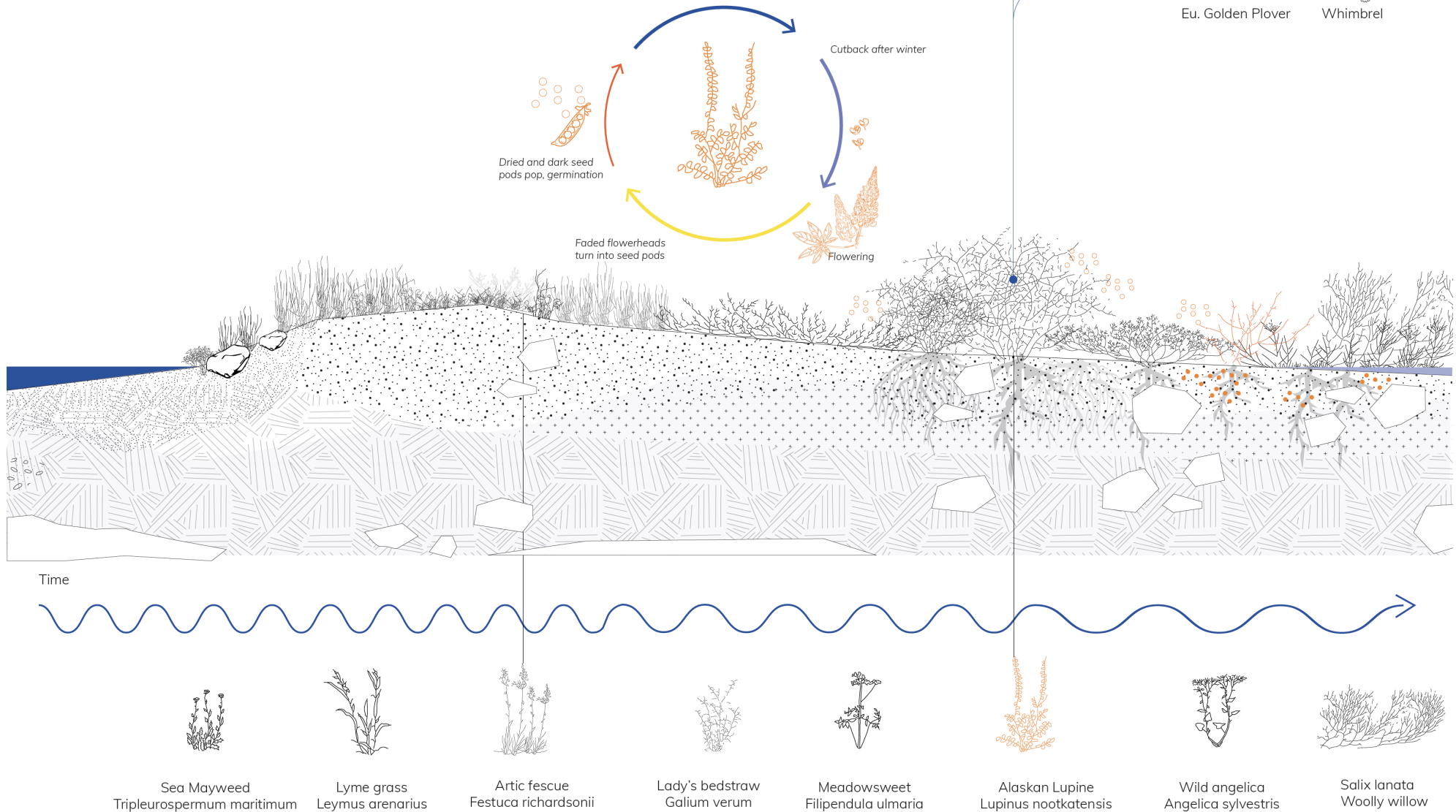
Rowan/Mountain Ash
Sorbus aucuparia

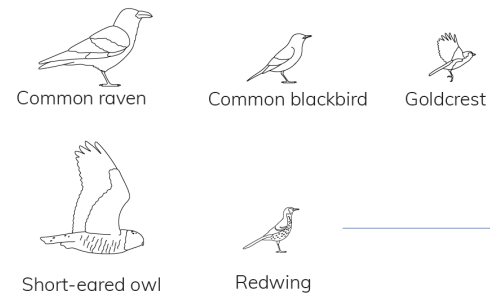
Recreational forest

Phytoremediation

Lupinus nootkatensis

The lupine is a controversial plant in Iceland. Its deep roots help to bind and fertilize the soil and have nitrogen binding/fixing capabilities. The plant is good for cleaning up contaminated soil and a good preparation plant for other growth to take over.





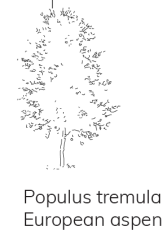
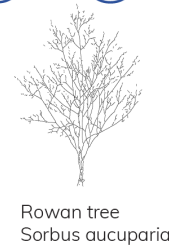
Natural succession

Betula pubescens

Betula pubescens is a pioneer colonizer and only native, forest forming tree in Iceland which used to cover the island. The protection and restoration of birch forests is an urgent action to protect the forests as an ecosystem and save endangered species



Time



The birch forest ecosystem,
it only takes few years for a birch
forest to start forming

Other introduced species will
emerge and intergrate with the
forest





Urban landscape typologies

Landscape based urbanism

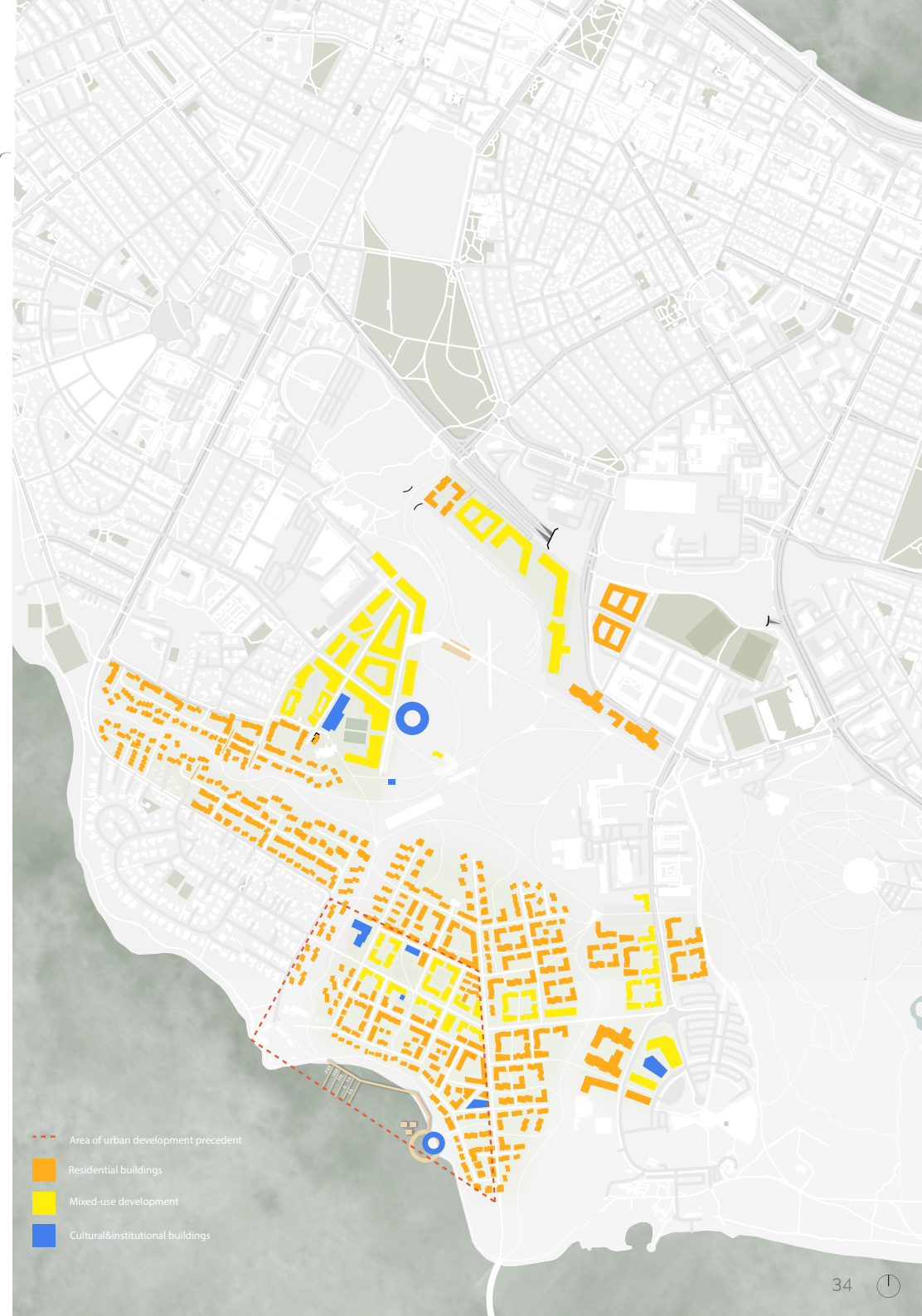
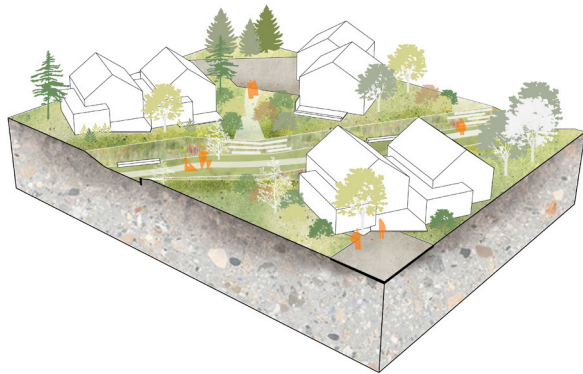
Integration of natural systems and ecological processes

New residential areas

Mixed-use development

Cultural, service & institutional buildings

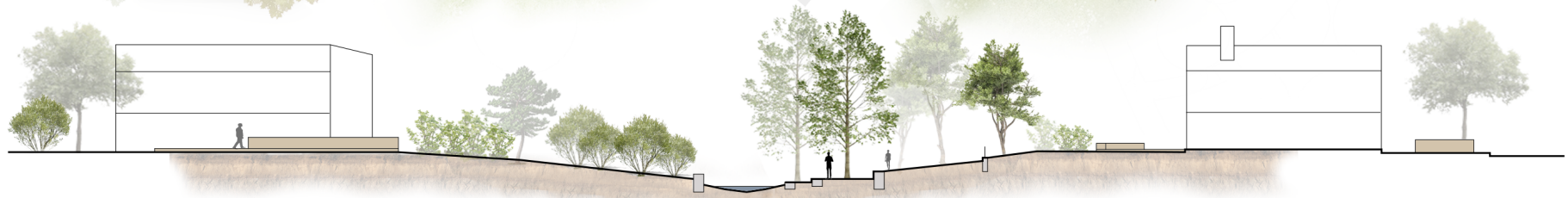
Central wetland area



- Area of urban development precedent
- Residential buildings
- Mixed-use development
- Cultural&institutional buildings

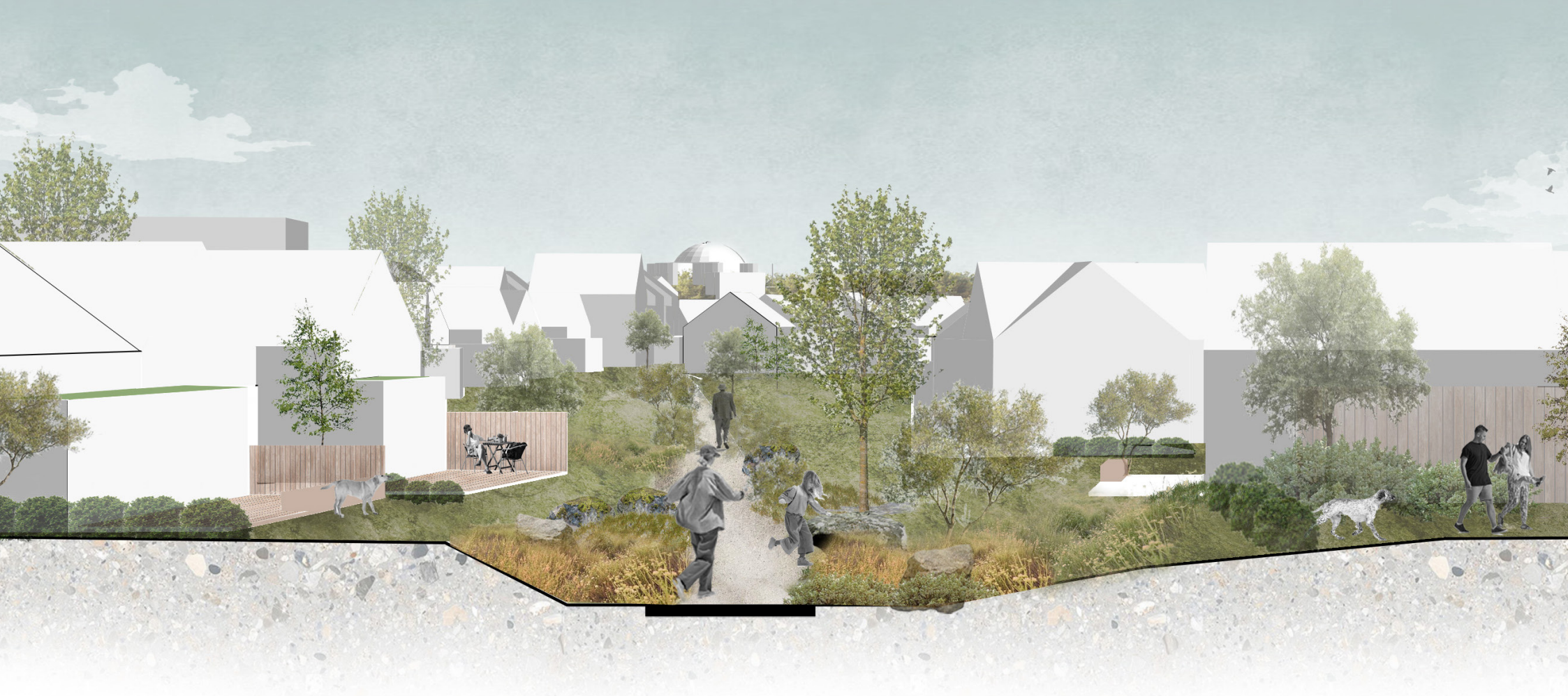


Birch forest corridor



1:500 10 20 50 m





Pocket park of evergreens

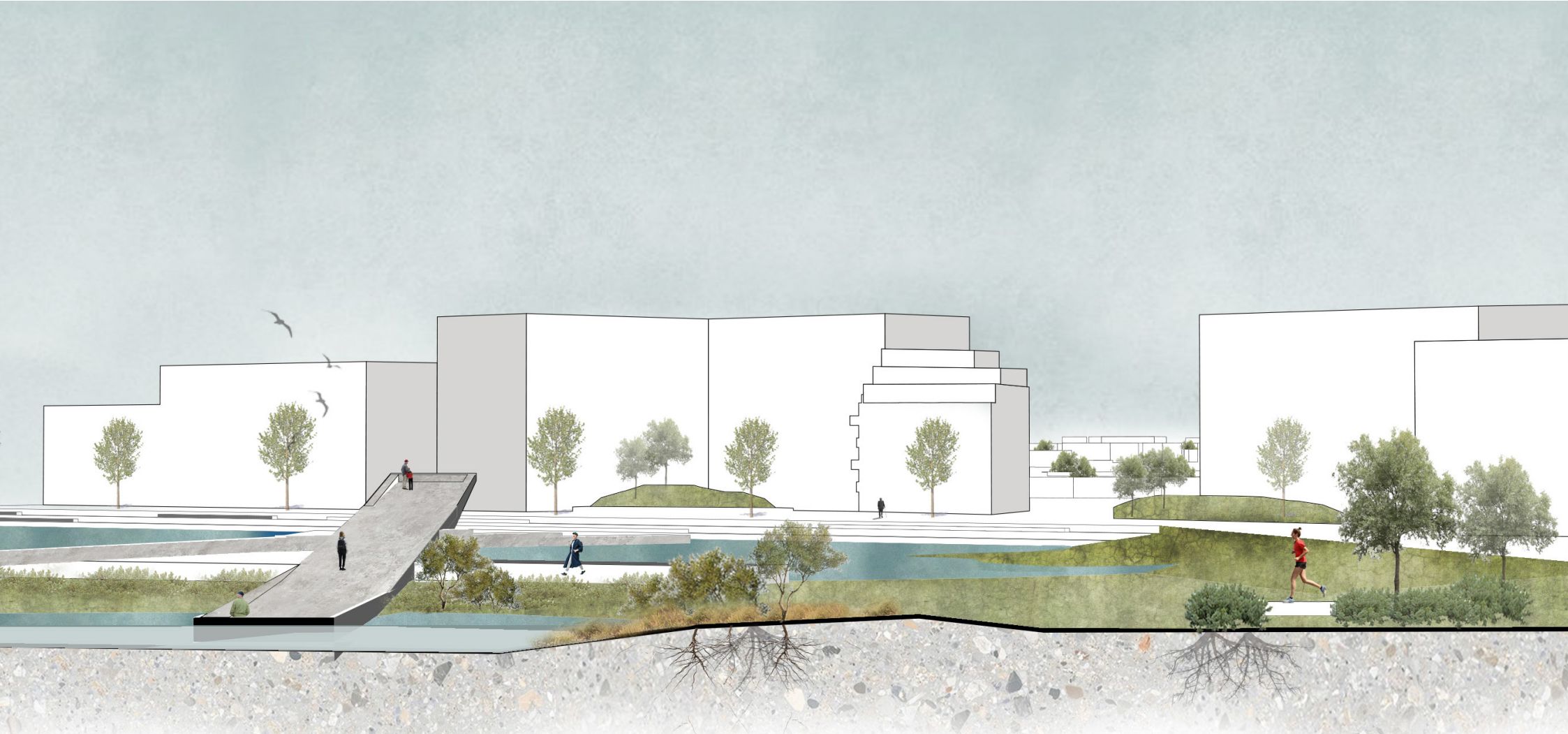


Central wetlands



1:2000 0 100 200 m







The new urban landscape typologies are intertwined into the blue green network, improving the connectivity through different urban spaces with and experienced through different landscape

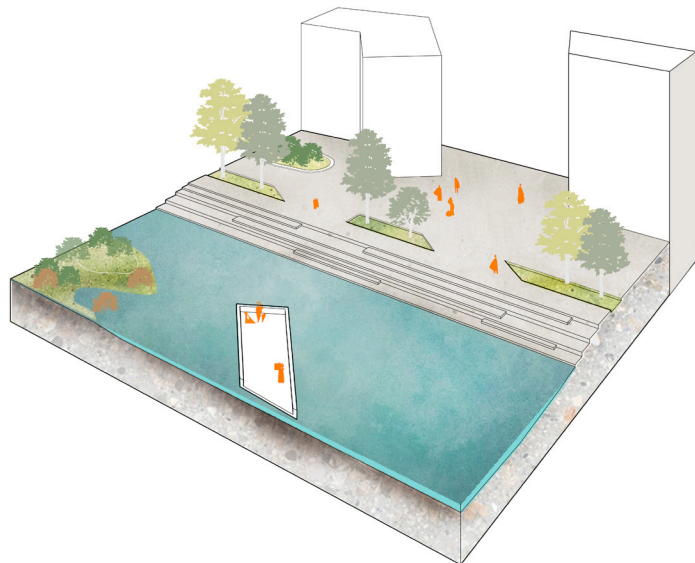
The new heart of Reykjavík

Host of new possibilities for Reykjavík

Various recreation & public spaces

Historic route

Focal element : landing strips as landscape icon



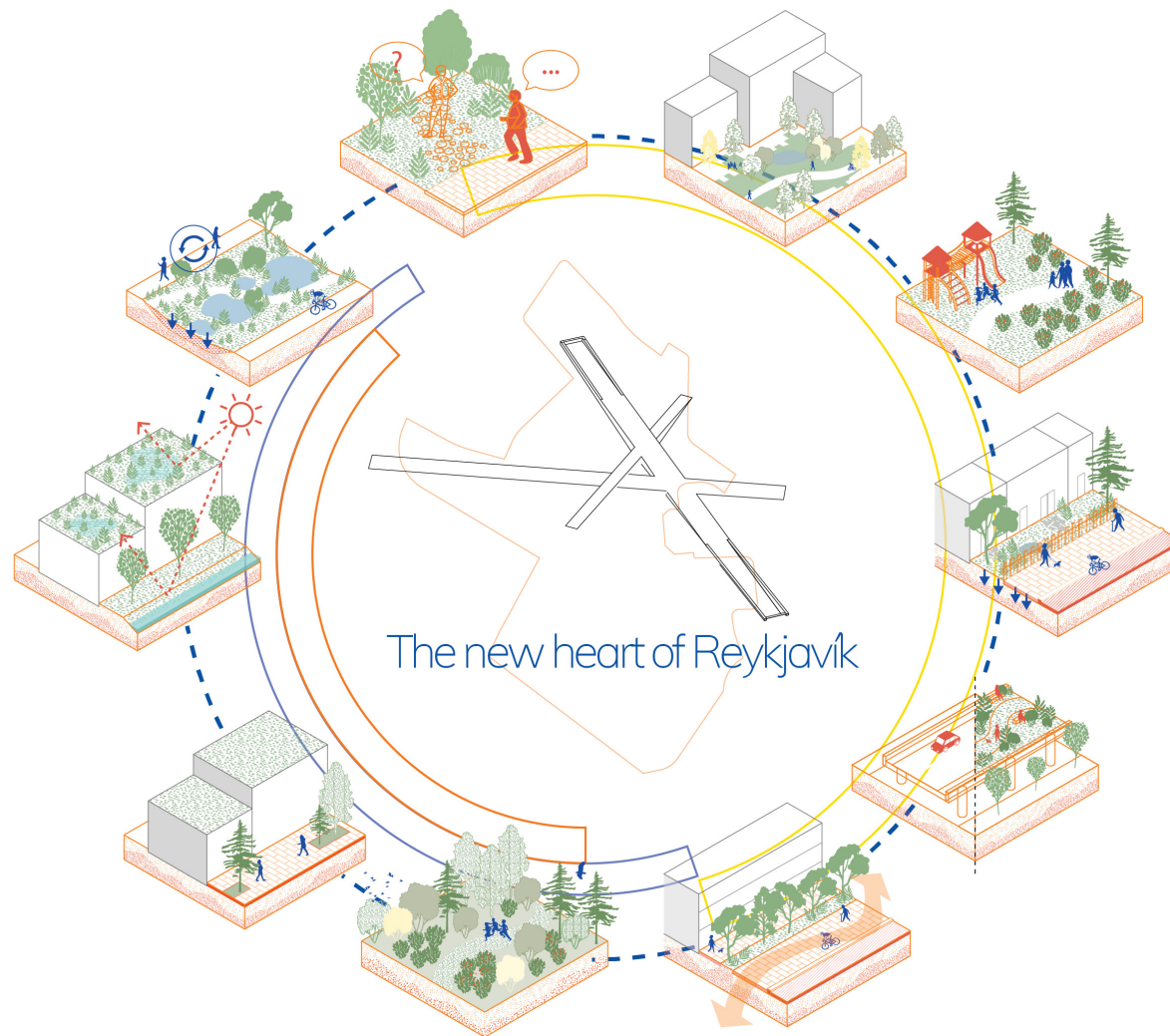
- Focal element
- Viewpoints
- Transportation nodes
- Public transportation
- Historic route



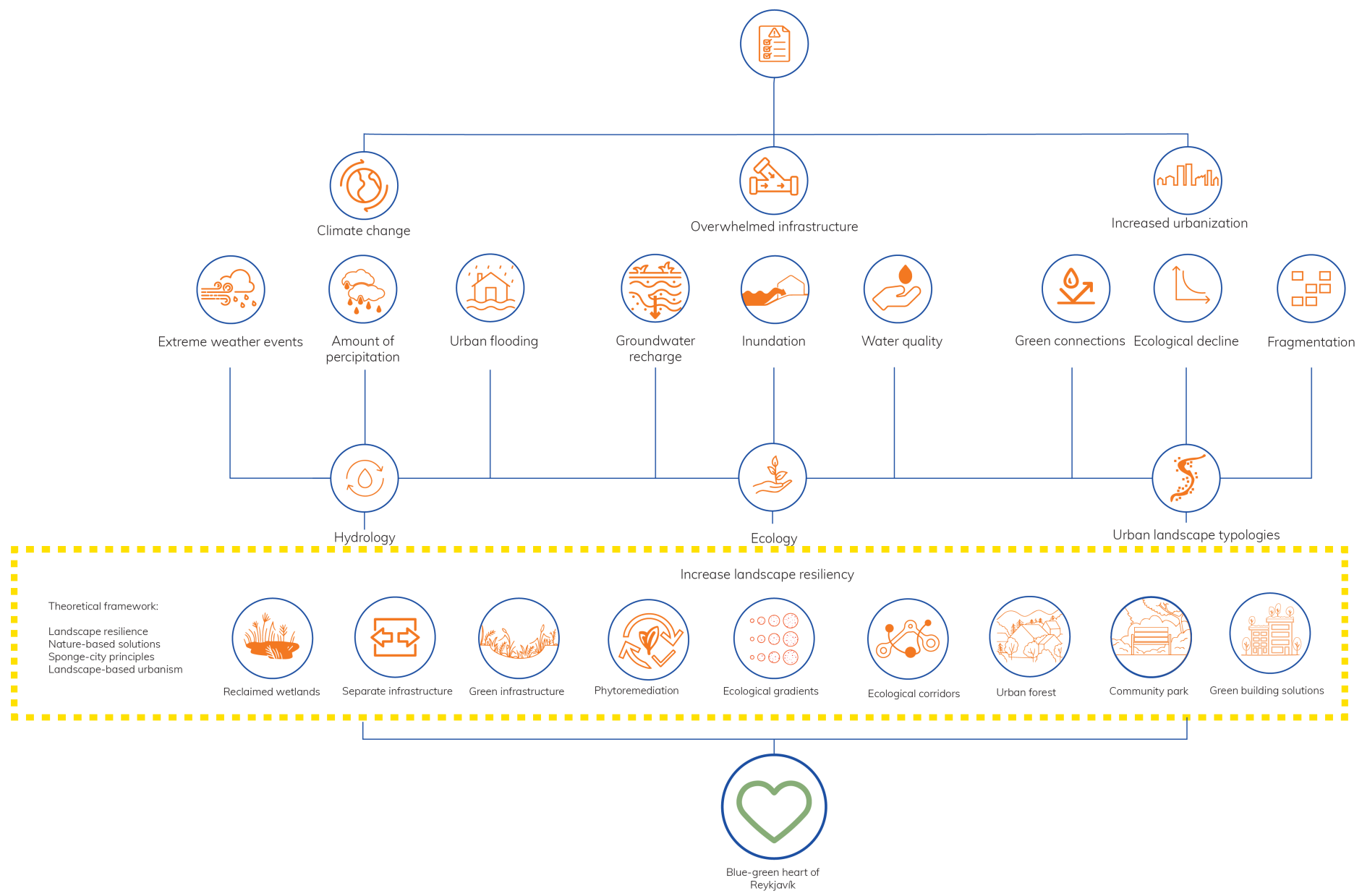
The park creates a host of new advocating possibilities for Reykjavík's residents and visitors. The parks' network provides gathering space and recreation while improving the overall connection in the city through a historic route embracing the local landscape and history.



The heart of the blue-green network is located in proximity to the two universities in the city, a newly built hospital and the innovation/finance-district where culture and nature can thrive as a part of the historical center of Reykjavík



6. Reflection





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Purfum að e

hagkerfið

Leyla Acaroglu, hönnuð og frumkvöðull, segir hún núverandi mynd sinnar og það að níðast á n



Við þurfum 5.000 íbúðir á ári – ekki einungis 1.600

Sigurður Stefánsson skrifar

Til að mæta íbúðaskuldbindingu og vaxandi mannfjölda þarf að tvöfalda fjölda íbúða á höfuðborgarsvæðinu á næstu 15 til 20 árum

SKOÐUN ⌚ 18. júní 2024 kl. 10:01



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Ægisíðan verulega ógeðsleg - Vísir

Bjarni Brynjólfsson fyrrverandi umhlýsingastjóri Reykjavíkurborgar segir um slæmt gæðagæði og ólpleifar í ettpappír



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Skólpheinsunarmálum ábótavant

Skólpheinsunarmál á Íslandi hafa verið í lamasessi frá því að nýjar reglur tóku gildi árið 1999. Að mati Umhverfisstofnunar uppfylla 88% sveitarfélaga með 2.000 íbúa eða fleiri, samtals 326.000 íbúar, ekki skilyrði laga um lágmarkshreinsun skólpi



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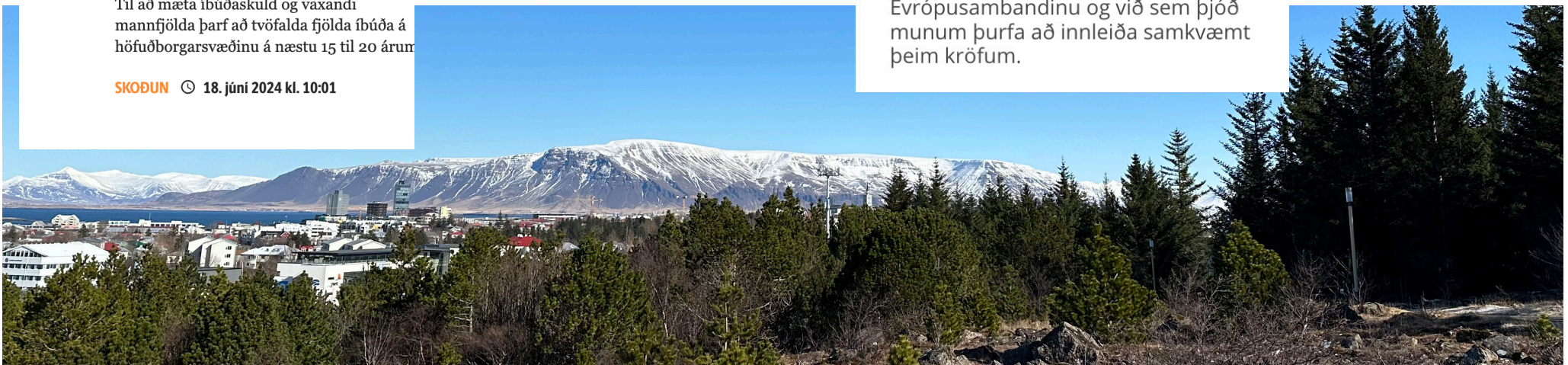
Landslagsmiðuð nálgun í fráveitumálum - Vísir

Í tveimur greinum sem birtust í fjölmiðlum 28. og 30. nóvember kom fram að ástand fráveitumála á Íslandi sé mjög slæmt. Fram kom að kröfur í fráveitumálum verði hertar hjá Evrópusambandinu og við sem þjóð munum þurfa að innleiða samkvæmt þeim kröfum.



uvatnið heima? - Vísir

Það hefur spunnist um mála á Íslandi í kjölfar irtist í Morgunblaðinu mber síðastliðinn. Þar ur meðal annars til iafa sitthvað eftir sér ðu fráveitumála á





Thank you