

# AMSTERDAM

Xuexin, Hanqi, Yunfei, Stella

# TABLE OF CONTENTS

01

Buildings

02

Transportation

03

Water

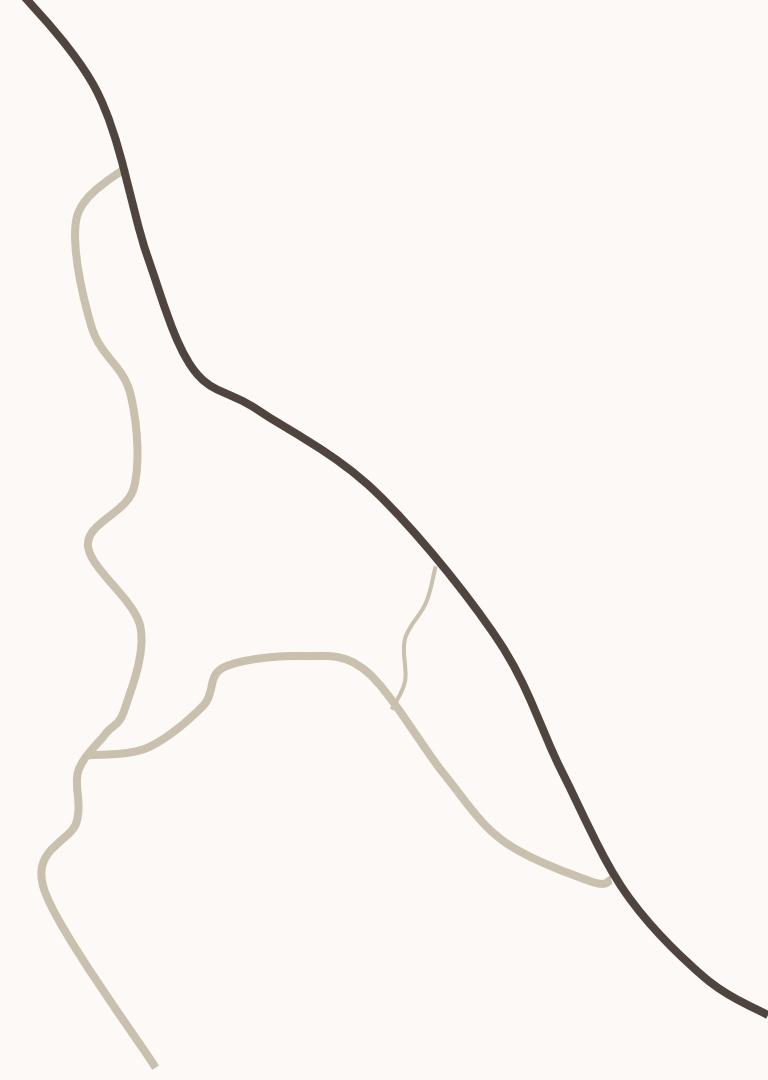
04

Waste

01

# Buildings

The Buildings in Amsterdam



## Node

Buildings themselves  
are nodes.

## Agent

Residents  
Builders  
City planners

## Flow

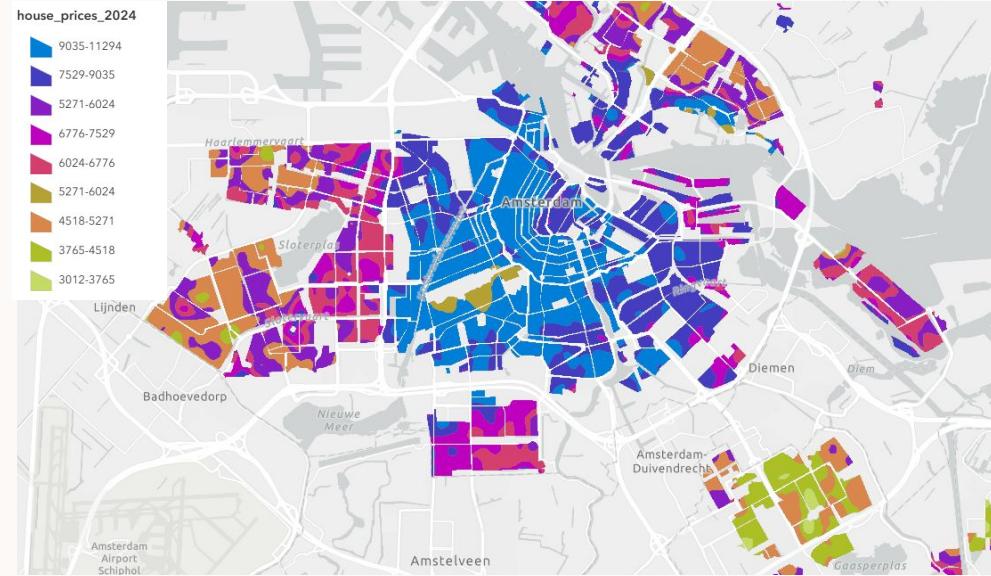
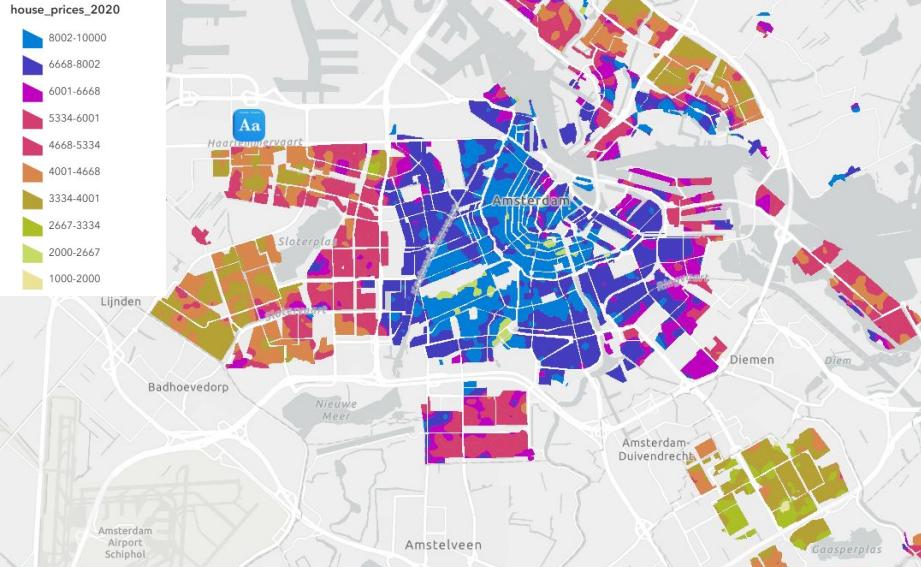
The price, age and other  
attributes of the building  
imply the flow of  
population.

## Network

A large number of  
buildings form a network  
of urban layout, which  
can reflect the planning  
style of the city.

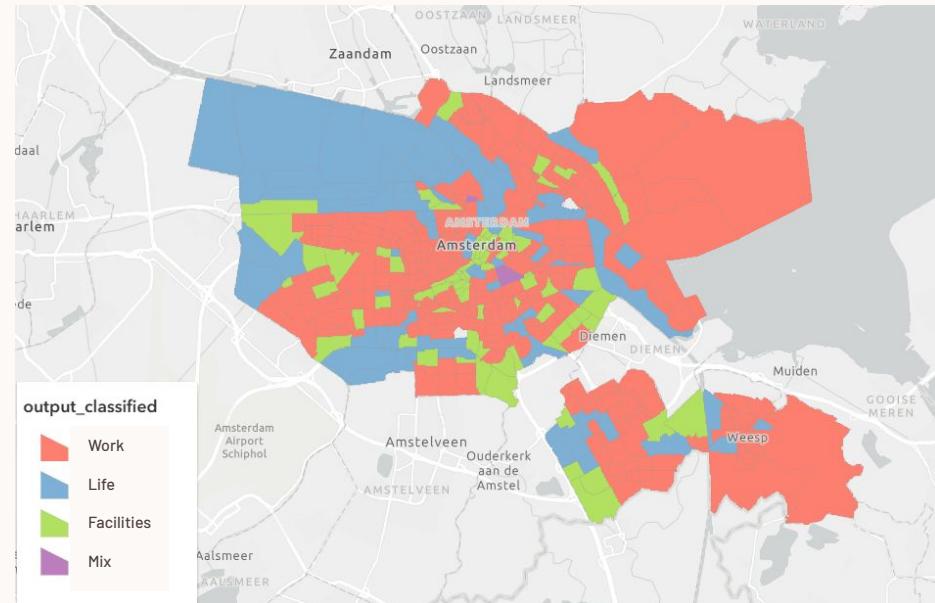
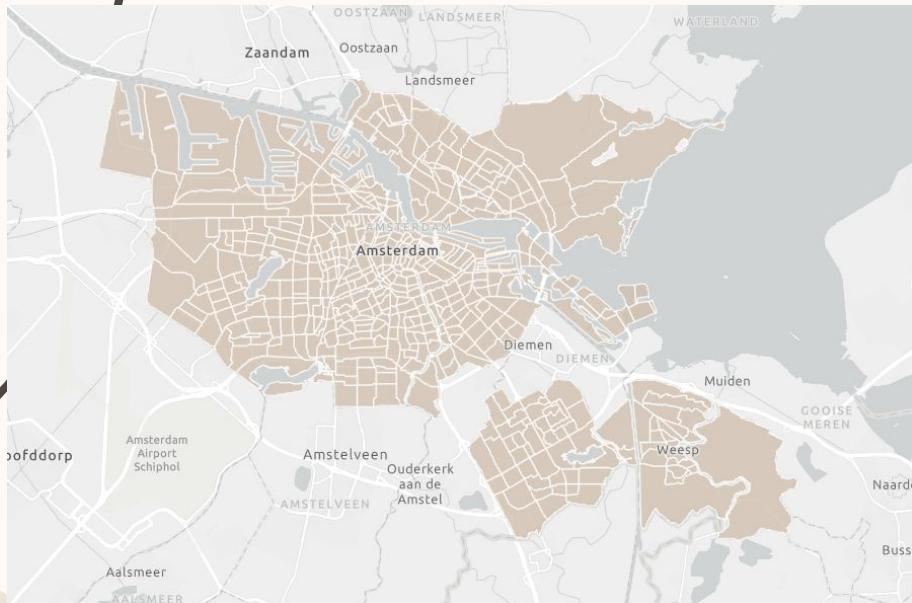


# Buildings Node: House Price



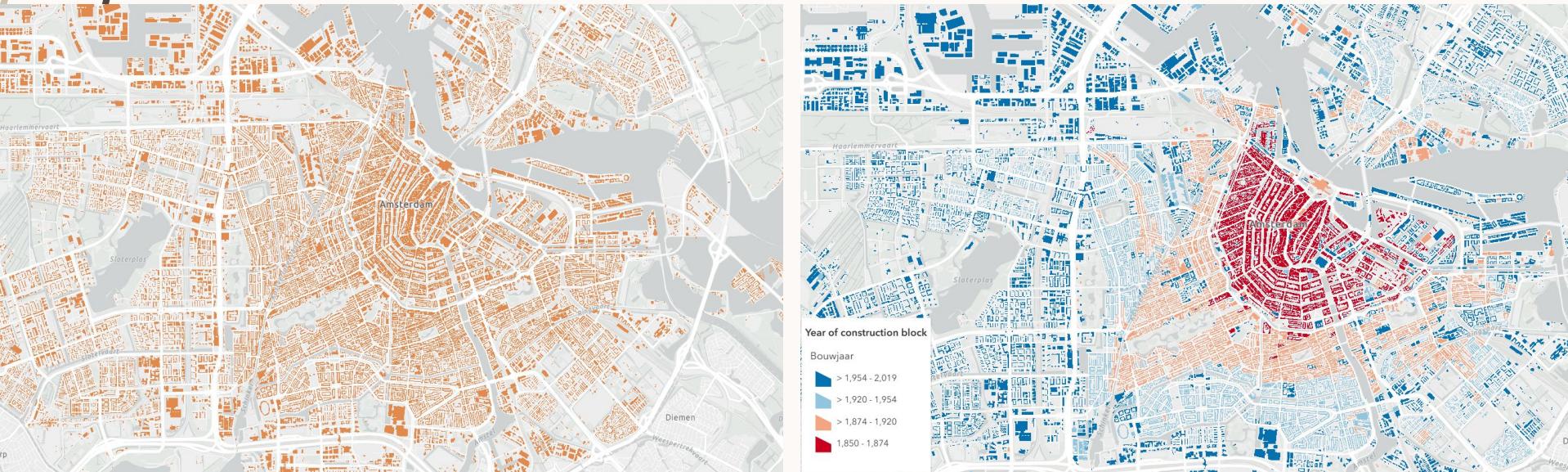
1. Reinforcement of nodes
2. Intensified population flow

# Buildings Network: Regional functions



1. Working areas are concentrated, and residential and facility areas are dispersed
2. Equilibrium distribution of facility areas

# Buildings Network: Construction period

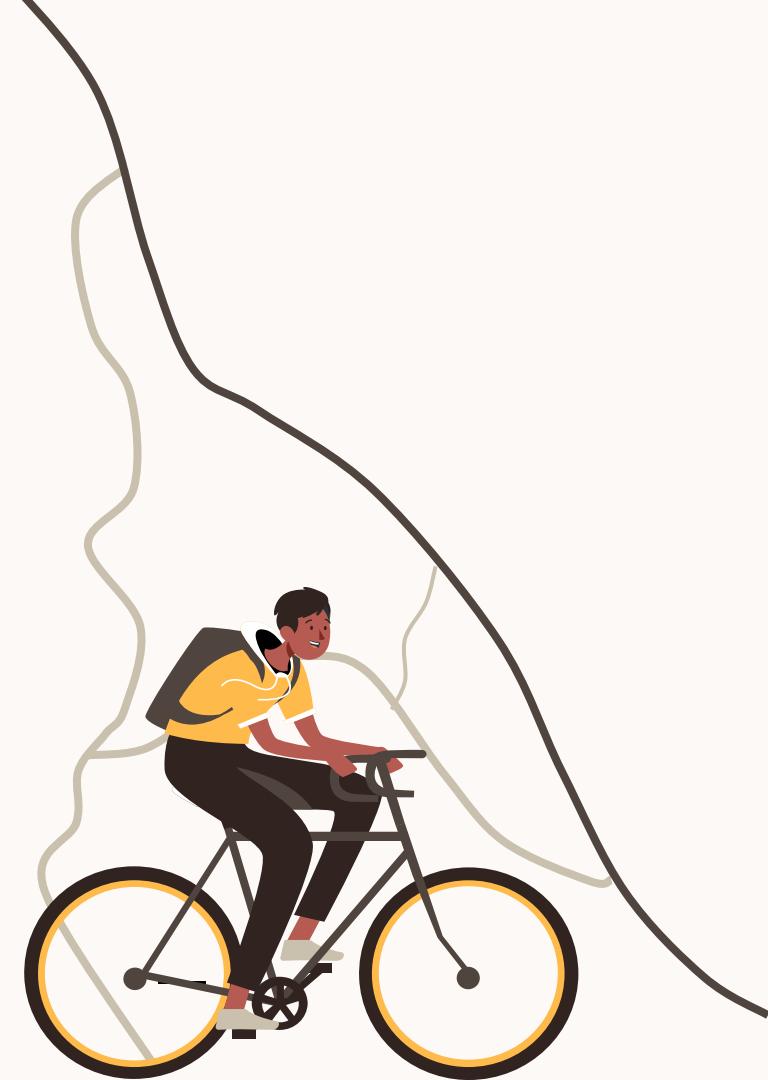


1. Concentric circles expanding outward from the center
2. Progress in planning

02

# Transportation

The Bicycle System in Amsterdam



# Background Research



Adobe Stock | #460841437



**400 +**

Amsterdam has 400 kilometers of  
bike paths



**11,000**

2 Underwater bicycle parking  
garages located near Amsterdam  
Central Station

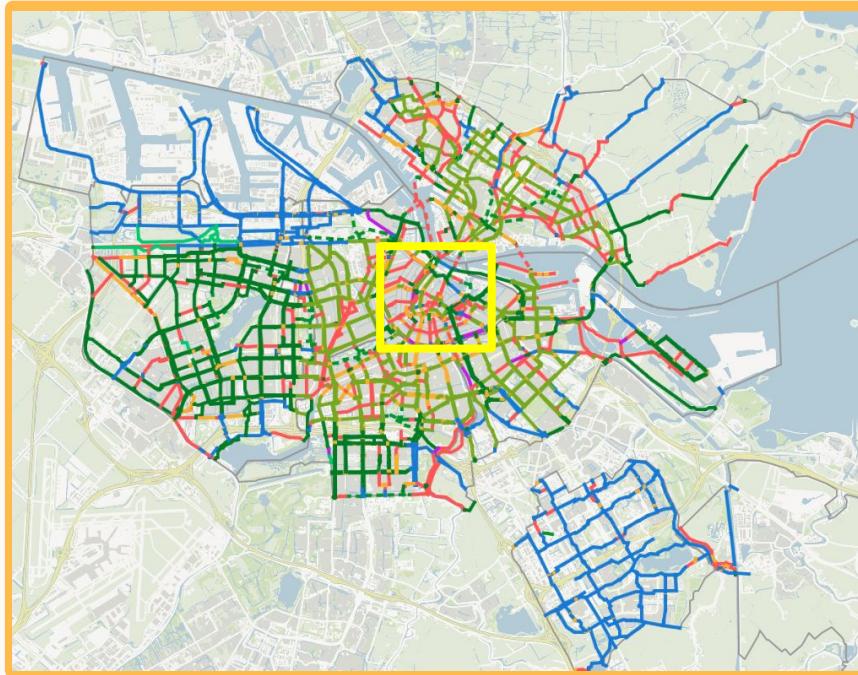


**80,000 -150,000**

Bicycle theft in Amsterdam is  
widespread

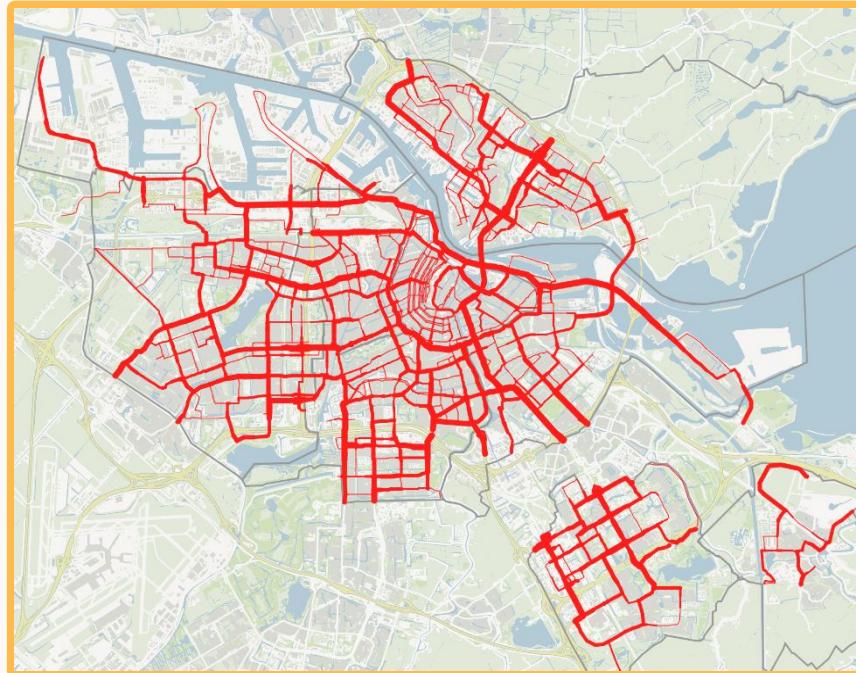
# Networks

- Bike path
- Cycle path (mopeds not allowed)
- Bicycle path (optional)
- Moped/Bicycle path
- Bicycle lane
- Bicycle street
- Bicycle on roadway
- Shared space
- Bicycle crossing
- Connection



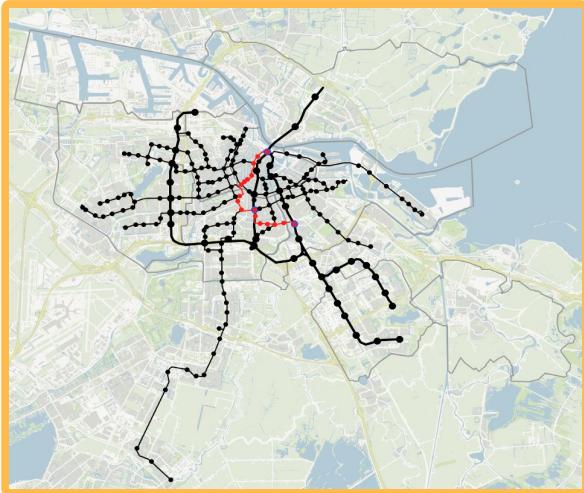
The moped/bicycle paths (24.7%) and bicycle on roadway (20.2%) segments are significant. This shows that a large portion of cyclists share space with mopeds or cars, potentially highlighting areas where segregated cycling infrastructure could be improved.

# Flows

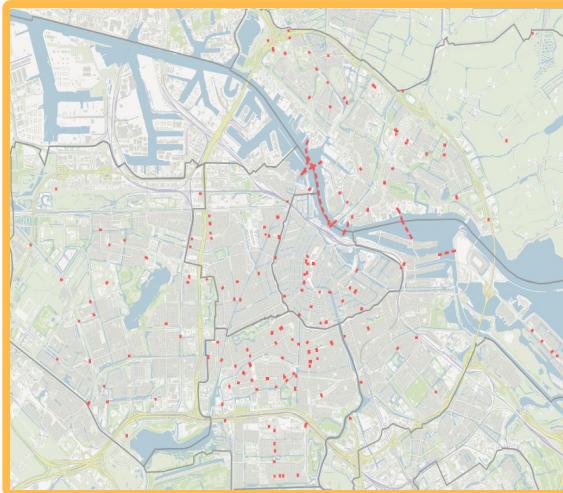


Major roads in the city center, particularly around the canals and key transport hubs (e.g., Centraal Station), have very high projected use, emphasizing the need for continued maintenance and perhaps expansion of these networks to accommodate the volume.

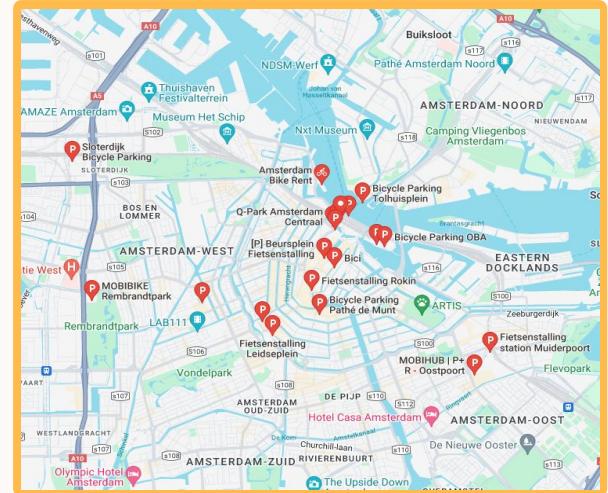
# Nodes



Cycling Hubs



Intersections



Parking Stations

# Agents



Cyclists



Government  
and City  
Planners



Bike-sharing  
Companies



# Findings



## Multiple Purpose Path tend to lead to more Incident

Creating dedicated cycling paths without mopeds will significantly improve safety for cyclists by reducing potential collisions and conflicts on shared lanes.



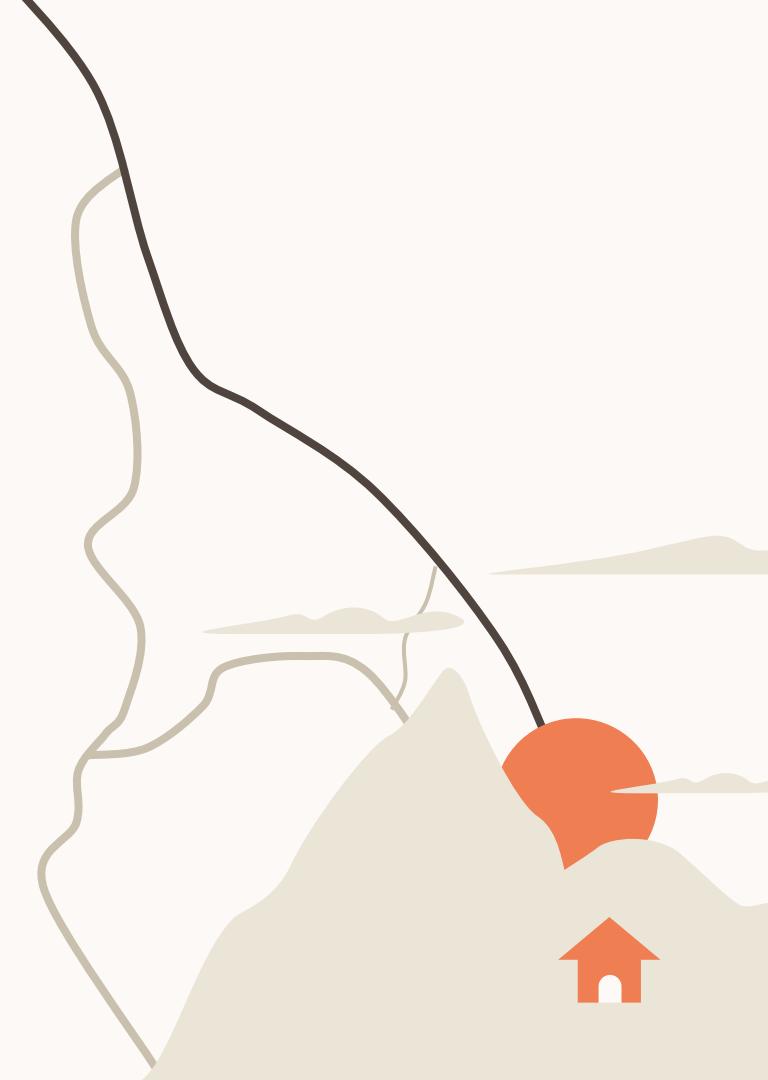
## Limited Cycling Parking

Expanding the availability of cycling parking spaces is essential to accommodate the increasing number of cyclists and prevent overcrowding in existing facilities.

03

# WATER

The Water System in Amsterdam





# Introduction to water system in Amsterdam

The Netherlands means "Low Country". It is located in the lower reaches of the Rhine (De Rijn) and the Maas River. Since most of its area is below sea level, the development of the Dutch water system has become a core element of national security and economic development.

The Netherlands is well-known for its excellent water management projects, with complete flood control facilities, advanced water supply systems and efficient sewage treatment networks. These water conservancy projects not only protect cities and agriculture from flood threats, but also promote

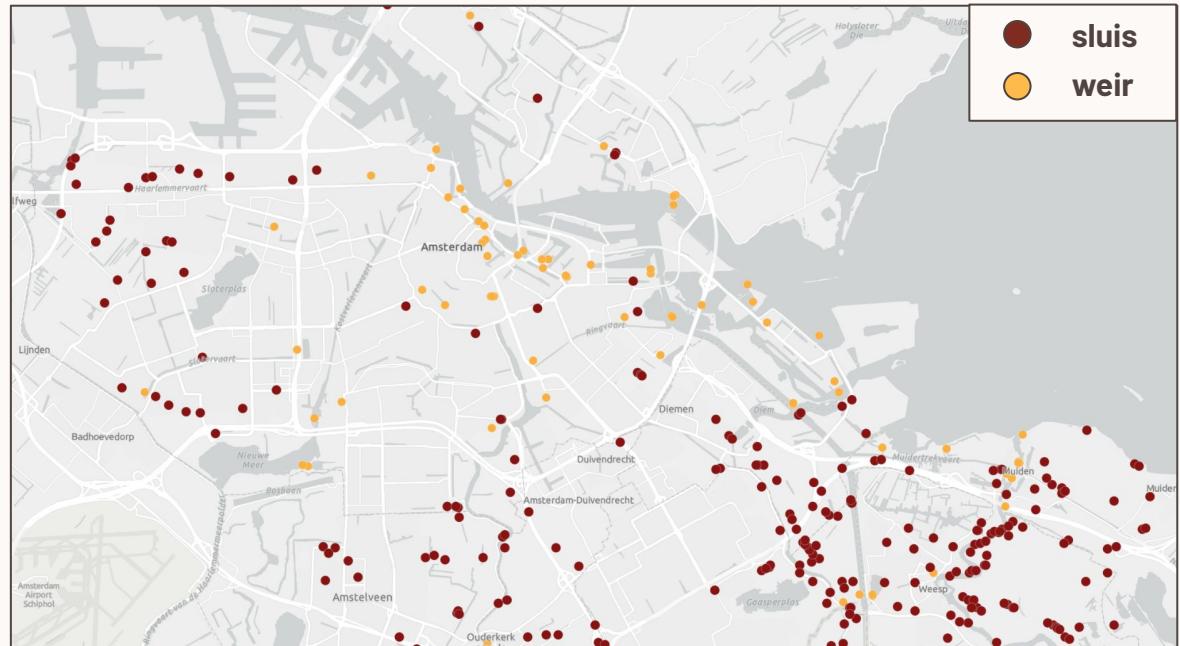
Next, we will analyze the Dutch water system from the following four aspects.

# Nodes

Nodes are key functional points in water systems that connect and influence the direction and use of water. In Amsterdam, most nodes have highly automated control functions and can manage water volume in a timely manner according to water level changes.

The map demonstrates the key nodes in the water system including **sluice and weir**.

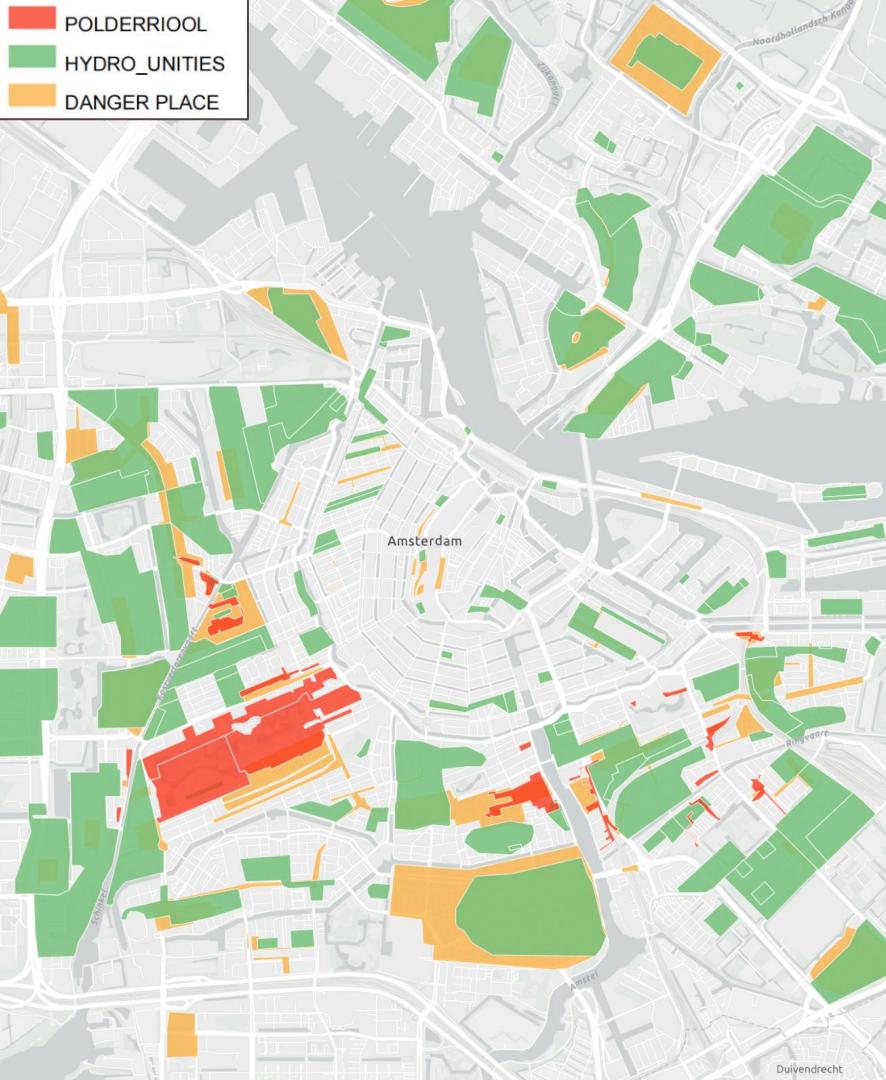
For Amsterdam, sluice gates and pumping stations are important nodes for regulating water flow and water level, especially during heavy rain or high tide, to prevent flooding from threatening the city. Dams are not only key nodes for flood control, but also regulate the exchange of seawater and freshwater, such as Afsluitdijk.



# Netflow

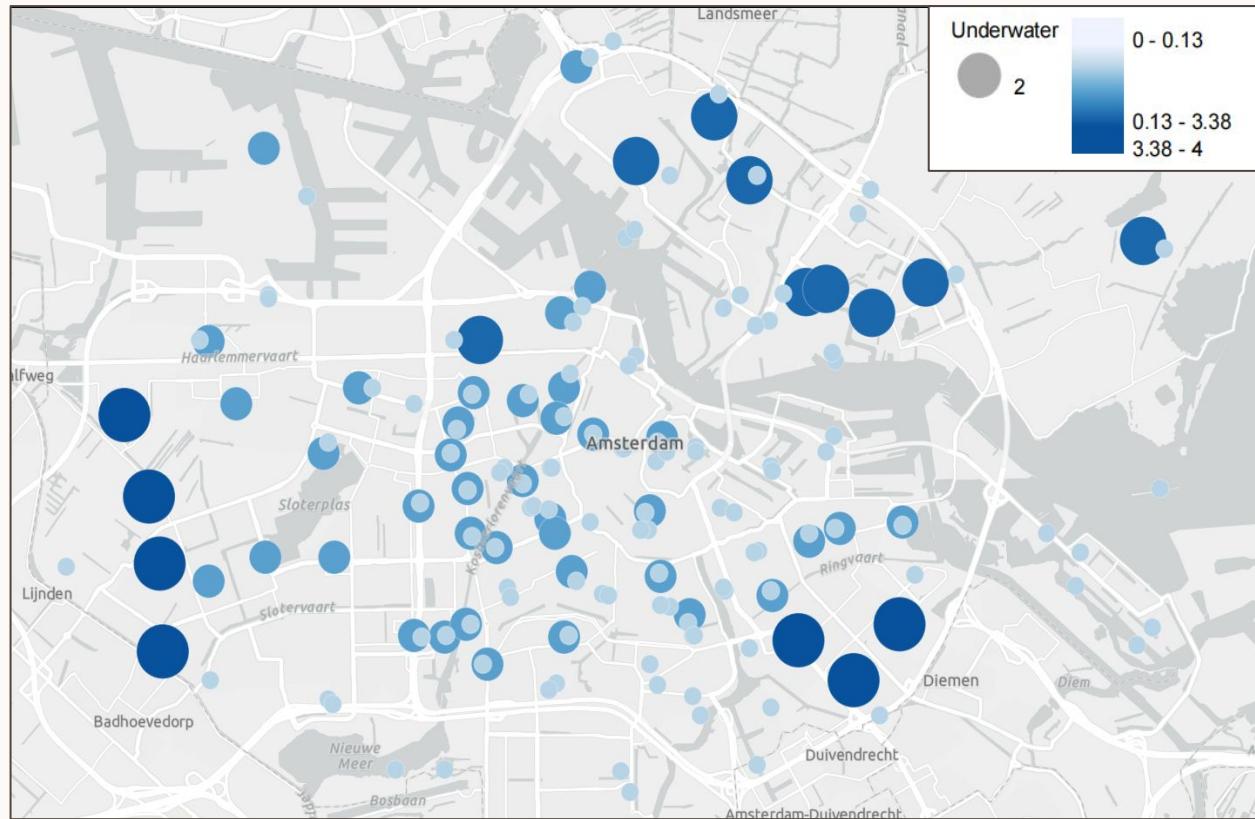
The water system in Amsterdam consists of multiple interconnected water bodies and infrastructure, including rivers and canals, sewage systems, stormwater drainage systems and flood management networks. Notably, Amsterdam's flood management network and stormwater drainage system are important.

Amsterdam is at high risk of flooding due to its low-lying terrain, so it has a complex system of dikes, pumping stations and water storage facilities to manage flooding. The map shows areas that could flood due to breaches of major or regional flood protection systems and current flood protection facilities.



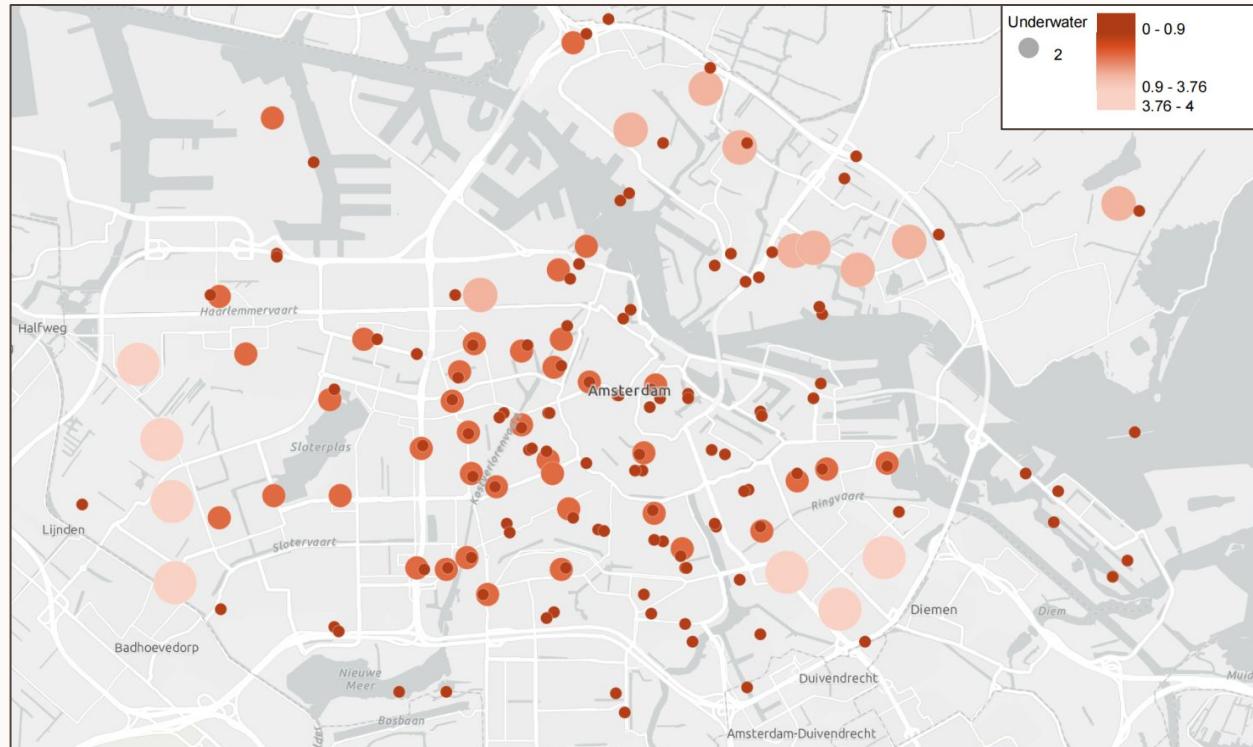
# Flow

Flow refers to the movement and transfer of water in a system, including different types of water flow and changes in water quality. Water flow in Amsterdam can be divided into the following types of water resource flow, sewage flow, flood and rainwater flow. Due to the high rainfall in Amsterdam, its groundwater flow monitoring is very important. Rainwater enters the groundwater bodies or drains into the canals through the city's drainage system or infiltration system.



# Flow

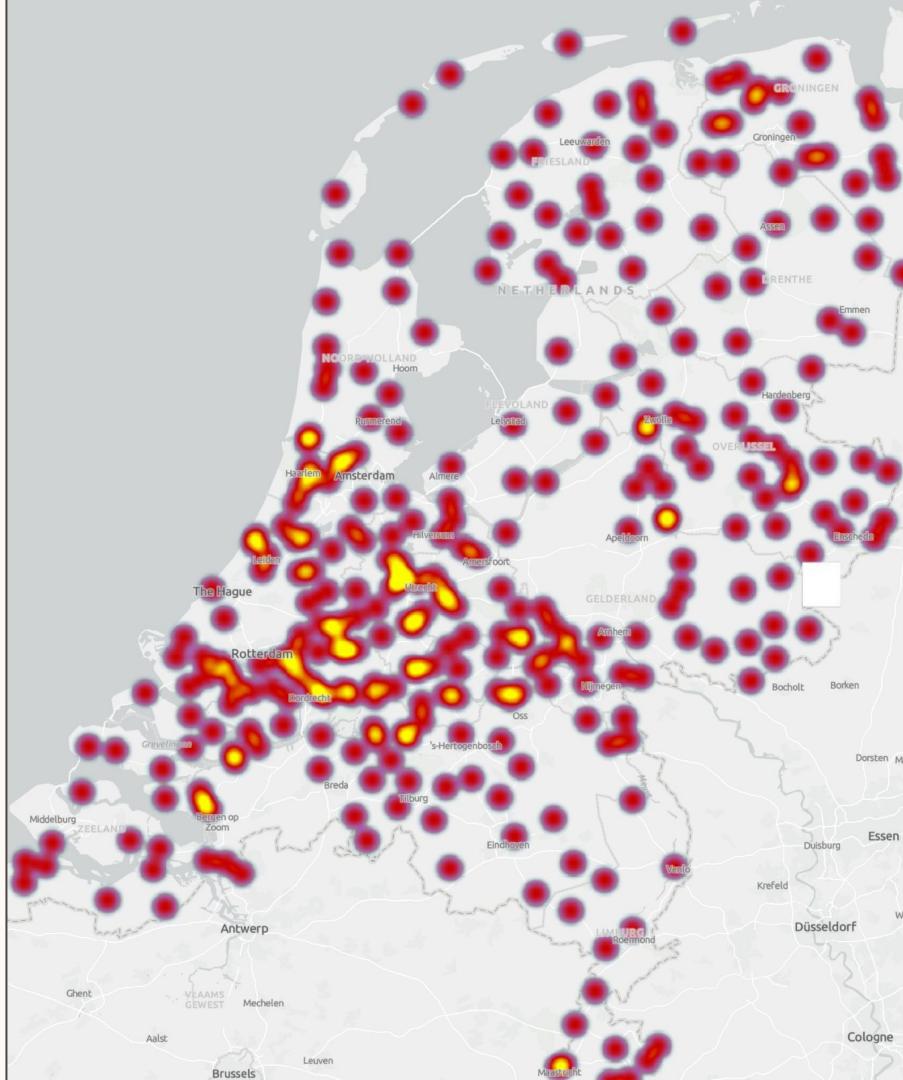
The map shows groundwater flow in Amsterdam. **The layer "High groundwater table" indicates areas in Amsterdam where the difference between the groundwater level and the surface water level is less than the required 0.90 meters.** Some stormwater protection measures, such as soil infiltration, are less suitable in these areas. In these areas, the solution lies in combining stormwater protection measures, public space design, and groundwater measures.



# Agents

Agents are those who have decision-making power or influence over the water system, including government agencies, businesses and residents.

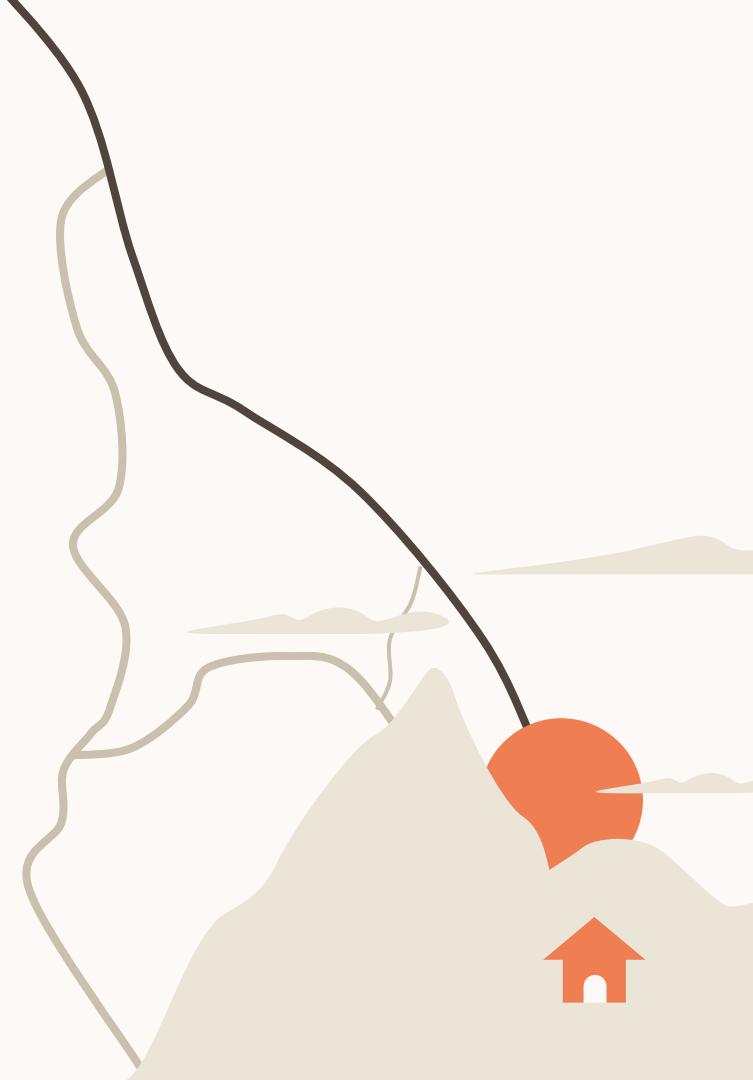
Governments and policymakers are responsible for formulating and implementing water management policies, maintaining infrastructure, and ensuring the sustainability of water resources. Businesses use water resources, but also discharge wastewater and participate in wastewater treatment processes. Urban residents are the main users of water systems, and their demand and use of water directly affect the allocation and consumption of water resources. At the same time, residents are also responsible for water conservation, garbage sorting and other behaviors to reduce pollution to water bodies.



04

# WASTE

The Waste System in Amsterdam

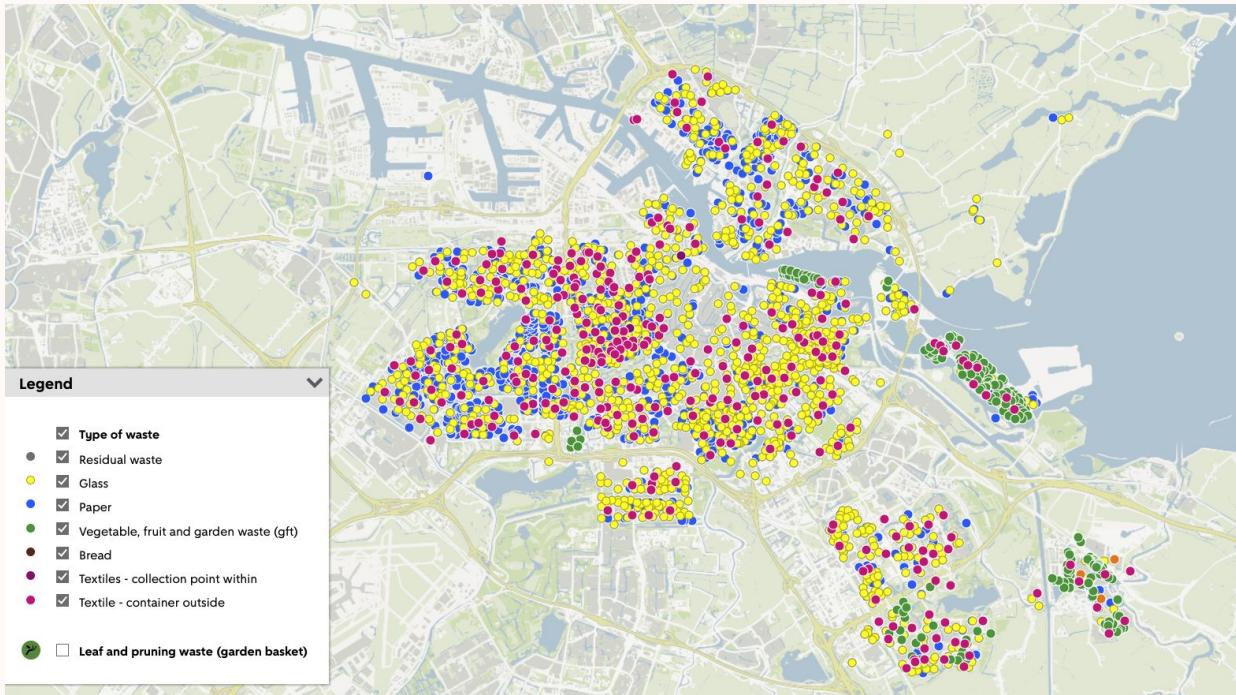


## Background

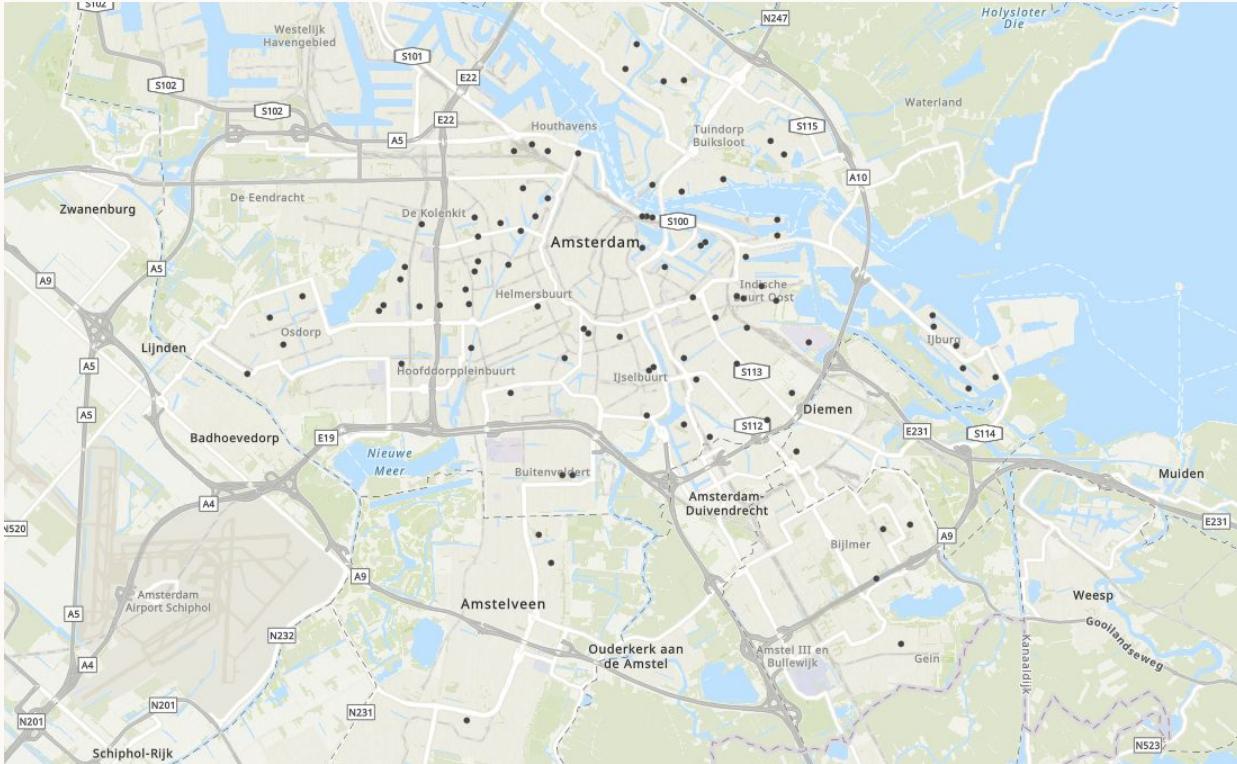
The curbside collection systems for recyclates employed vary across the Netherlands

Recyclable waste collected elsewhere

## Network 1: Waste Containers



## Network 2: Compost Sites



## Networks

1. Waste containers distribution
2. Compost sites distribution

## Nodes

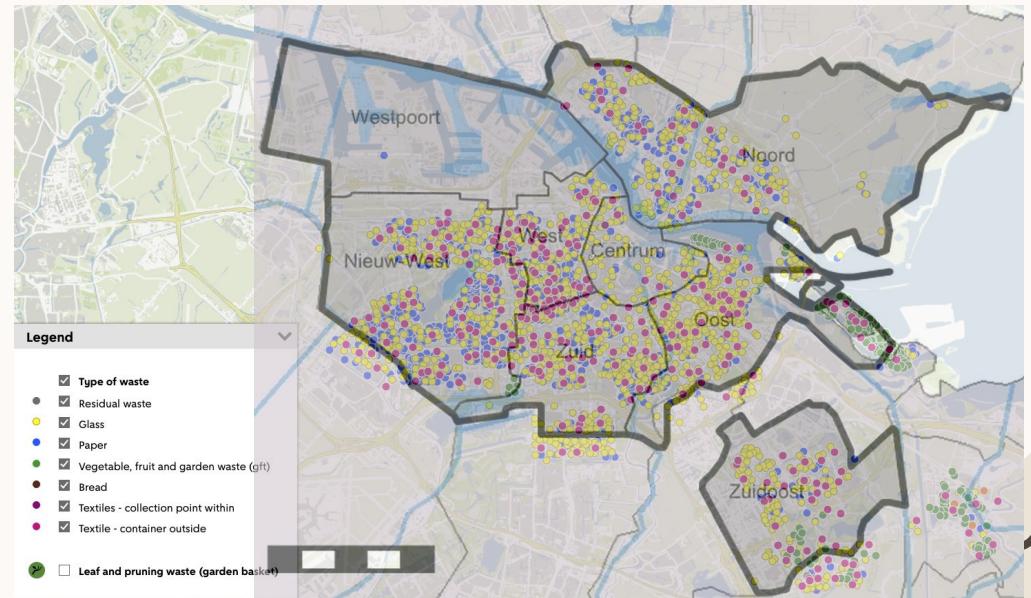
1. Nodes represent the locations of waste containers, color-coded by types of waste, mostly non-organic types like glass, paper, and textiles.
2. Nodes represent the locations of compost sites

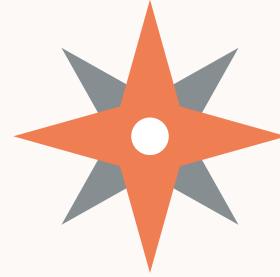
## Agents

1. Residents
2. Waste collecting trucks

## Findings

1. Low density in Centrum
2. Near absence in Westpoort, which is dominated by industrial and office areas as well as ports. Very few live there.
3. Some absence in Nieuw-West like IJtakmeerpolder, which is an agricultural area
4. Organic waste containers are only seen in few areas, which are the pilot areas for the organic kitchen waste collection program started in 2018





# Thank you!

# Citation

- <https://www.iamexpat.nl/lifestyle/lifestyle-news/municipality-amsterdam-giving-away-thousands-free-bikes#:~:text=Most%20of%20the%203.250%20bikes,again%20on%20a%20larger%20scale.>
- <https://uncloggedblog.com/2024/01/26/rolling-into-the-future-amsterdams-cutting-edge-cycling-infrastructure#:~:text=A%20second%20underwater%20garage%20debuted,%2C%20foot%2C%20ferry%20and%20bike.>
- <https://traveltalesoflife.com/amsterdam-cycling-not-bike-friendly/>
- <https://www.iamsterdam.com/en/travel-stay/getting-around/cycling-in-amsterdam>
- <https://eyesonplace.net/2023/12/22/24503/>
- Waterschappen Kunstwerken IMWA, <https://service.pdok.nl/hwh/kunstwerkenimwa>
- Maps Data, [https://maps.amsterdam.nl/open\\_geodata/](https://maps.amsterdam.nl/open_geodata/)
- <https://amsterdameconomicboard.com/en/news/groente-fruit-en-tuinafval-het-begin-van-iets-moois/>
- <https://www.dutchamsterdam.nl/1986-amsterdam-boroughs>
- <https://maps.amsterdam.nl/bouwjaar/>
- [https://maps.amsterdam.nl/open\\_geodata/](https://maps.amsterdam.nl/open_geodata/)

## HARD SYSTEM OF AMSTERDAM

**Group members:**

Xuexin He: xh427

Hanqi Guo: hg493

Yunfei Jiao: yj497

Stella Hong: sh2577

### **Buildings**

- **Background**

Buildings themselves are nodes.

A large number of buildings form a network of urban layouts, which can reflect the planning style of the city.

The price, age, and other attributes of the building imply the flow of population.

- **Housing price Node**

House prices in the city center continue to rise

Price increases in peripheral areas are significant

High housing prices have driven residents to move out

Reinforcement of nodes: As a high-priced area, the city center continues to maintain its position as an economic and cultural core, indicating that it is a major node that attracts a large number of commercial and tourist activities.

Intensified population mobility: Rising housing prices have prompted residents to move to peripheral areas, forming a commuting wave from the city center to the suburbs, demonstrating the importance of population mobility in the urban network.

- **Buildings age Network**

Concentric circles expanding outward from the center: The map shows a typical European urban development pattern, where the city expands outward from the historical center, forming a concentric expansion structure. This expansion pattern in Amsterdam reflects the natural development process of the city, starting with a dense central area and then gradually expanding outward to accommodate more residents and infrastructure.

Progress in planning: As can be inferred from the age of the buildings, Amsterdam's planning has gradually shifted from a more random urban expansion to a more systematic and modern urban layout at different times. Early building blocks were small and densely distributed, while the blocks and buildings became larger as they approached the modern area, and the urban design became more oriented towards automobile transportation and modern infrastructure.

- **Regional functional network**

Working areas are concentrated, and residential and facility areas are dispersed: Working areas are mainly concentrated in the center of Amsterdam, reflecting the high concentration of working areas, serving a large number of employment needs, and closely connected with residential areas through the transportation network.

Residential areas: obviously distributed in the peripheral areas away from the city center, forming a typical suburban layout. This reflects that many residents choose to live in quiet areas outside the city center.

Equilibrium distribution of facility areas: The facility areas are widely and evenly distributed, ensuring that every area of the city has sufficient service support, improving the overall quality of life and convenience.

## **Transportation**

- **Background research materials**

- Amsterdam is often referred to as the "bicycle capital of the world" due to the sheer volume of daily cyclists. Over 60% of residents use bicycles as their primary mode of transport for short-distance travel. It is common to see bicycles outnumber cars in the city center. The system is accessible to all age groups, from children to the elderly, and cycling is considered a socially inclusive activity. Tourists also benefit from the city's bike-friendly infrastructure, often renting bicycles to explore the city .

- **Network**

- Physical Network: Amsterdam's cycling system is built on a network of over 767 kilometers of dedicated cycling paths. These paths are connected by a series of bike-friendly streets, bridges, and tunnels. The network spans the entire city and its suburbs, ensuring that cyclists can travel seamlessly across different regions without interference from motor vehicles.

- **Flows**

- Passenger Flow: The flow of cyclists is primarily bidirectional along key arterial bike lanes that connect residential areas with commercial, educational, and

recreational zones. Flows are particularly high during peak hours (morning and evening commutes), with over 60% of Amsterdam residents commuting daily by bicycle. This creates predictable and stable traffic flows, which help city planners optimize infrastructure.

- **Nodes**

- Cycling Hubs: Key nodes in the cycling network include high-traffic areas like Amsterdam Central Station, where cyclists can park their bikes in large, dedicated facilities or continue their journeys using public transport. Other hubs include major business districts, university campuses, and tourist areas where bike traffic is concentrated.
- Intersections: Critical intersections in the cycling network are designed with cyclist priority in mind. Amsterdam has numerous bike-specific traffic signals and roundabouts that ensure smooth movement through busy intersections. These nodes act as important control points in managing the flow and safety of cyclists.
- Parking Stations: Parking is an essential node in the system. Amsterdam has multi-level bike parking facilities, with some located underground or next to public transport hubs. These nodes are where cyclists can transition from riding to other forms of transit or activities. The city's investment in these nodes helps maintain the fluidity of the cycling network.

- **Agents**

- Cyclists: The primary agents in this system are the cyclists themselves, who use the infrastructure daily. They range from local commuters to tourists and recreational riders. Cyclists contribute to the system by generating data on usage patterns, route preferences, and demand for bike parking.
- Government and City Planners: Amsterdam's municipal government is a critical agent in designing, maintaining, and expanding the bike network. Urban planners continuously monitor usage trends and adjust the cycling infrastructure to accommodate future needs, such as new lanes or improved safety measures.
- Bike-sharing Companies: Private companies like OV-fiets, which provide bike-sharing services, are also key agents in the system. They operate within the broader cycling network, offering flexible transportation options to residents and visitors. These companies help extend the network by making bikes available at key nodes (train stations, parking garages, etc.).

- **Findings**

- High traffic flow areas in Amsterdam, such as Dam Square, Leidseplein, and Rembrandtplein, experience frequent accidents due to the high concentration of cyclists, pedestrians, and vehicles. The congestion in these busy zones, particularly during peak hours, increases the likelihood of collisions. To reduce accidents, there is an urgent need for improved infrastructure, including better road conditions, smoother surfaces, clearer signage, and the expansion of

- dedicated bike lanes. Creating cyclist-only zones in high-risk areas and enhancing traffic signals for cyclists would also contribute to safer biking conditions.
- Bike theft is another significant issue, especially near high-traffic hubs like Amsterdam Central Station and tourist areas such as Museumplein. With a large number of bikes parked throughout the city, both tourists and commuters are common targets for theft. To address this problem, increasing city security through surveillance, improved lighting, and patrols in theft-prone areas is necessary. Additionally, redesigning bikes with better locking mechanisms and integrating tracking devices could help deter theft, while secure parking facilities around transport hubs could offer more protection.
  - Improper parking and bike removals are a growing concern in neighborhoods like Dam Square, the Red Light District, and De Pijp, where limited parking options force cyclists to park illegally. To solve this issue, the city must invest in creating more parking spaces, particularly multi-level or underground facilities in areas with high demand. Implementing smart parking systems to inform cyclists of available parking spots in real time would also help prevent overcrowding and reduce the frequency of bike removals.

## Water System

- **Background**

The Netherlands means "Low Country". It is located in the lower reaches of the Rhine (De Rijn) and the Maas River. Since most of its area is below sea level, the development of the Dutch water system has become a core element of national security and economic development.

The Netherlands is well-known for its excellent water management projects, with complete flood control facilities, advanced water supply systems and efficient sewage treatment networks. These water conservancy projects not only protect cities and agriculture from flood threats, but also promote.

- **Nodes**

Nodes are key functional points in water systems that connect and influence the direction and use of water. In Amsterdam, most nodes have highly automated control functions and can manage water volume in a timely manner according to water level changes.

The map demonstrates the key nodes in the water system including sluice and weir. For Amsterdam, sluice gates and pumping stations are important nodes for regulating water flow and water level, especially during heavy rain or high tide, to prevent flooding from

threatening the city. Dams are not only key nodes for flood control, but also regulate the exchange of seawater and freshwater, such as Afsluitdijk.

- **Networks**

The water system in Amsterdam consists of multiple interconnected water bodies and infrastructure, including rivers and canals, sewage systems, stormwater drainage systems and flood management networks. Notably, Amsterdam's flood management network and stormwater drainage system are important.

Amsterdam is at high risk of flooding due to its low-lying terrain, so it has a complex system of dikes, pumping stations and water storage facilities to manage flooding. The map shows areas that could flood due to breaches of major or regional flood protection systems and current flood protection facilities.

In addition, due to climate change, Amsterdam is experiencing extreme rainfall. With the increasing number of buildings and paved roads, the capacity to drain rainwater quickly is diminished. This causes urban flooding. In particular, the polder sewer areas in Amsterdam require special attention to water management because these areas are low-lying and groundwater flows in from surrounding areas, often causing groundwater flooding. There are five options for dealing with rainwater in Amsterdam: interception and storage of rainwater; drainage; infiltration; use; and waterproofing structures.

- **Flows:**

Flow refers to the movement and transfer of water in a system, including different types of water flow and changes in water quality. Water flow in Amsterdam can be divided into the following types of water resource flow, sewage flow, flood and rainwater flow. Due to the high rainfall in Amsterdam, its groundwater flow monitoring is very important. Rainwater enters the groundwater bodies or drains into the canals through the city's drainage system or infiltration system.

The map shows groundwater flow in Amsterdam. The layer "High groundwater table" indicates areas in Amsterdam where the difference between the groundwater level and the surface water level is less than the required 0.90 meters. Some stormwater protection measures, such as soil infiltration, are less suitable in these areas. In these areas, the solution lies in combining stormwater protection measures, public space design, and groundwater measures.

- **Agents**

Agents are those who have decision-making power or influence over the water system, including government agencies, businesses and residents. Governments and policymakers are responsible for formulating and implementing water management policies, maintaining infrastructure, and ensuring the sustainability of water resources. Businesses use water resources, but also discharge wastewater and participate in wastewater treatment processes. Urban residents are the main users of water systems, and their demand and use of water directly affect the allocation and consumption of water resources. At the same time, residents are also responsible for water conservation, garbage sorting and other behaviors to reduce pollution to water bodies.

## **Waste system**

- **Background**

The curbside collection systems for recyclates employed vary across the Netherlands:

1. Biodegradable waste, "GFT" ("Groente-, Fruit-, en Tuinafval")
2. Paper/paperboard
3. Plastic/cans

Recyclable waste collected elsewhere

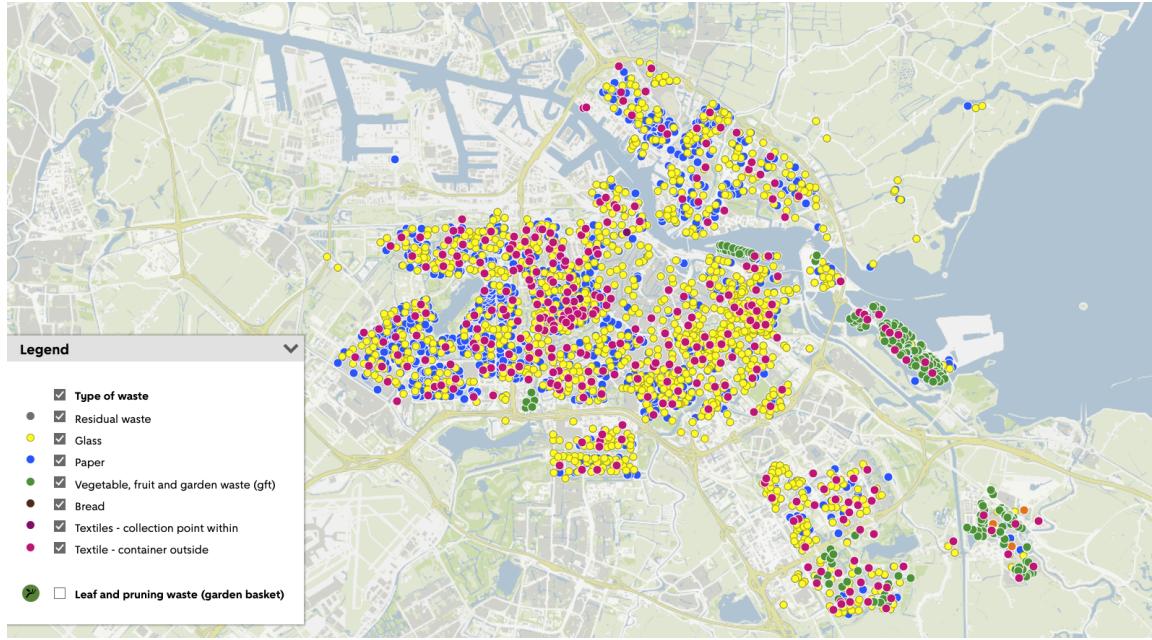
1. Glass jars and bottles
2. Textile – Textile containers in most cities

- **Networks:**

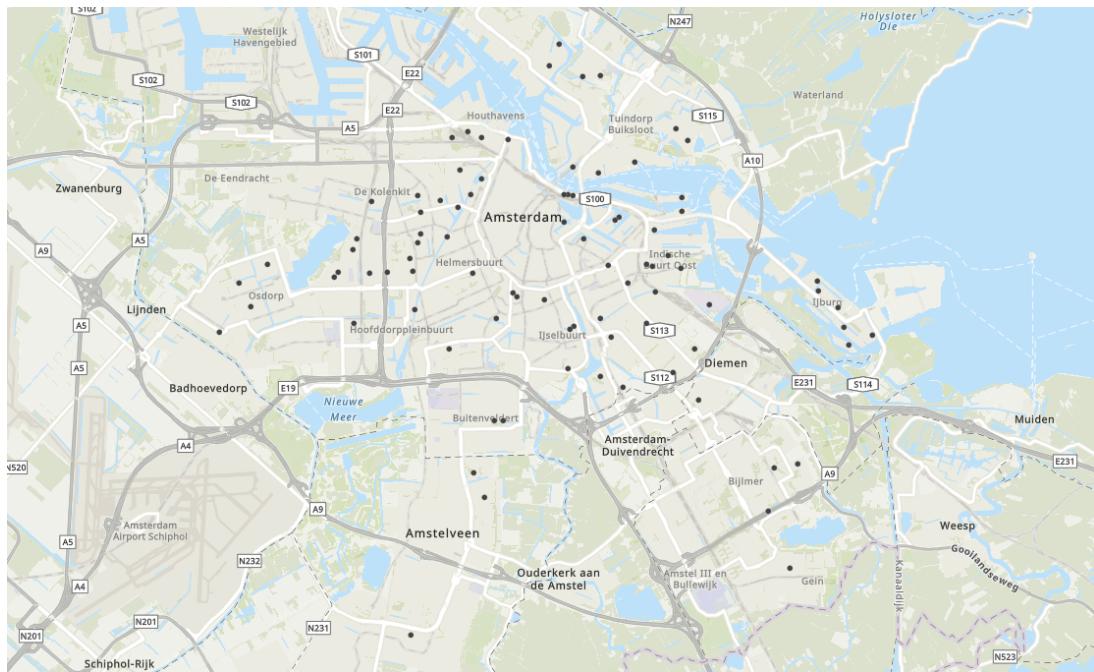
1. Waste containers distribution

Nodes represent the locations of waste containers, color-coded by types of waste, mostly non-organic types like glass, paper, and textiles.

Agents: Residents, Waste collecting trucks



## 2. Compost sites distribution



### Observations:

- Low density in Centrum
- Near absence in Westpoort, which is dominated by industrial and office areas as well as ports. Very few live there

<https://www.dutchamsterdam.nl/1986-amsterdam-boroughs>

- Some absence in Nieuw-West like lutkemeerpolder, which is an agricultural area
- Organic waste containers are only seen in IJburg district, Oostelijk Havengebied and Oostelijke Eilanden areas, which are the pilot areas for the organic kitchen waste collection program started in 2018

[Organic waste: the start of something beautiful | Amsterdam Economic Board](#)

### Citation

- <https://www.iamexpat.nl/lifestyle/lifestyle-news/municipality-amsterdam-giving-away-thousands-free-bikes#:~:text=Most%20of%20the%203.250%20bikes,again%20on%20a%20larger%20scale>.
- <https://uncloggedblog.com/2024/01/26/rolling-into-the-future-amsterdams-cutting-edge-cycling-infrastructure#:~:text=A%20second%20underwater%20garage%20debuted,%2C%20foot%2C%20ferry%20and%20bike>.
- <https://traveltalesoflife.com/amsterdam-cycling-not-bike-friendly/>
- <https://www.iamsterdam.com/en/travel-stay/getting-around/cycling-in-amsterdam>
- <https://eyesonplace.net/2023/12/22/24503/>
- Waterschappen Kunstwerken IMWA, <https://service.pdok.nl/hwh/kunstwerkenimwa>
- Maps Data, [https://maps.amsterdam.nl/open\\_geodata/](https://maps.amsterdam.nl/open_geodata/)
- <https://amsterdameconomicboard.com/en/news/groente-fruit-en-tuinafval-het-begin-van-iets-moois/>
- <https://www.dutchsterdam.nl/1986-amsterdam-boroughs>
- <https://maps.amsterdam.nl/bouwjaar/>
- [https://maps.amsterdam.nl/open\\_geodata/](https://maps.amsterdam.nl/open_geodata/)