

Public Toilet Finder – Kiel

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Geographical Web Applications

HAW Kiel

Winter Semester 2025/26

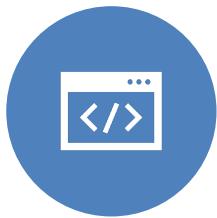
Instructor: Hendrik Oenings

Project Motivation

Public toilets are a critical part of urban infrastructure and accessibility.

This project provides a modern web-based GIS solution to visualize and explore public toilets in Kiel.

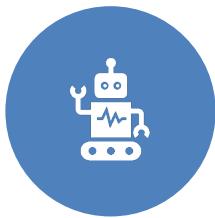
Project Objective



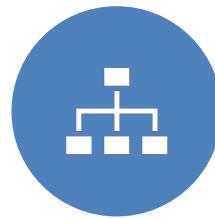
HTML5 (SEMANTIC STRUCTURE)



CSS3 (RESPONSIVE DESIGN)



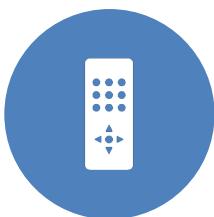
TYPESCRIPT (APPLICATION LOGIC)



VUE 3 (FRAMEWORK)



OPENLAYERS (WEB MAPPING)



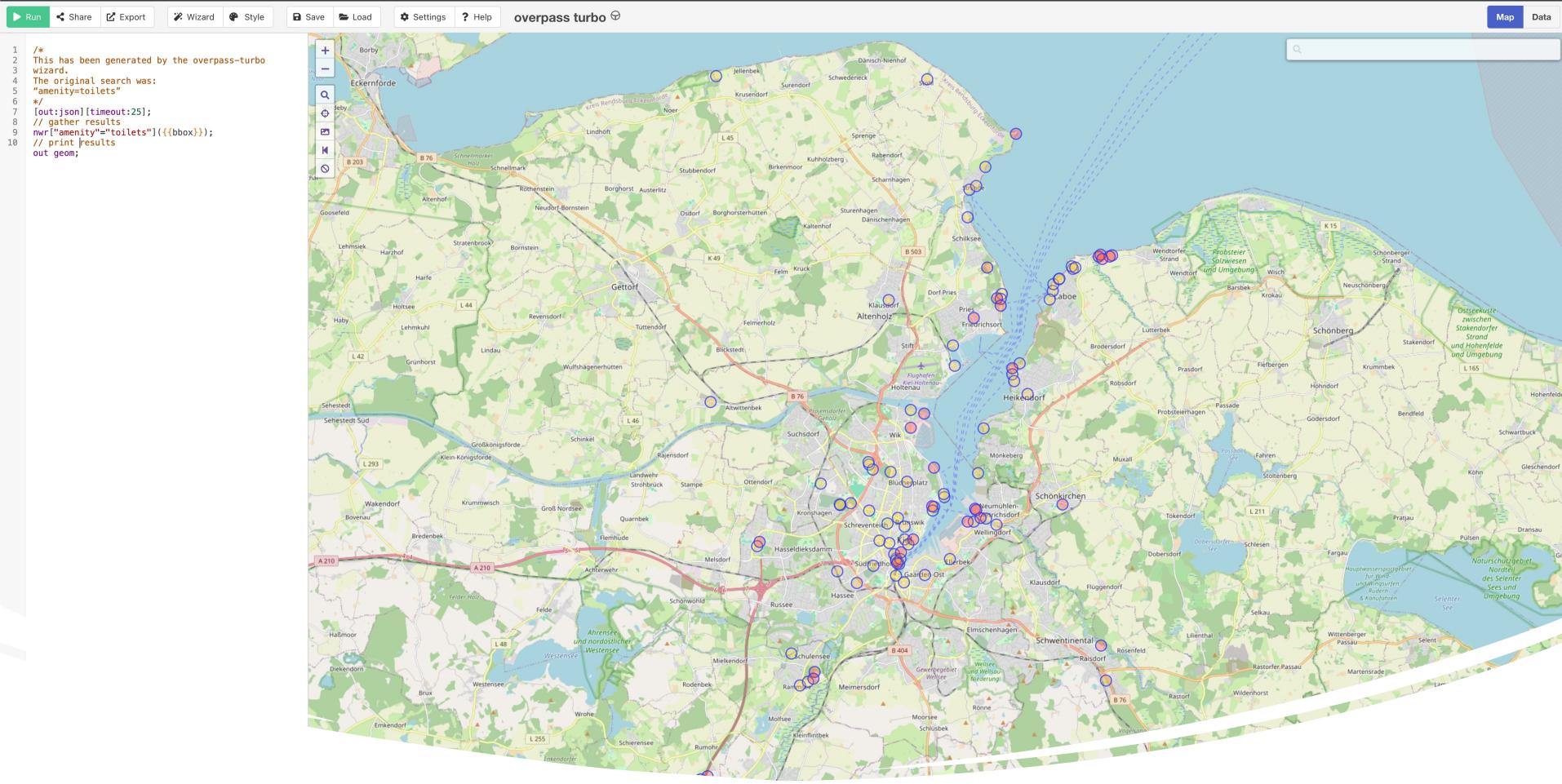
GEO SERVER (WMS & WFS)



OPENSTREETMAP DATA



Git Version Control



Data Source - OpenStreetMap

<https://overpass-turbo.eu/#>

Toilet features
extracted using the
tag:

amenity = toilets

Attributes include
wheelchair, fee,
opening hours,
gender, access, etc.

Data Processing Workflow

- Public toilet data was extracted from OpenStreetMap using the tag **amenity = toilets**.
 - The extracted features were converted into **GeoJSON format** for web compatibility.
 - The GeoJSON dataset was uploaded and published in **GeoServer** as a vector layer.
 - The layer is exposed through:
 - **WMS** for raster visualization
 - **WFS** for dynamic vector feature access
 - The Vue + OpenLayers frontend consumes the WFS service and renders the data interactively.

```
pretty-print > localhost:8080/geoserver/ptl/ows?service=WFS&version=1.1.0&request=GetFeature&typeName=toilets_kiel

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  "type": "FeatureCollection",
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      "type": "Point",
      "coordinates": [10.229965, 54.4111242]
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    {
      "geometry_name": "geom",
      "properties": {
        "name": "Toiletten 79968",
        "id": "node/29979868",
        "access": null,
        "amenity": "toilets",
        "building": null,
        "seamark:small_craft_facility:category": null,
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      }
    }
  ]
}

EXPLORER
PUBLIC-TOILET-FINDER
  > 📁 vscode
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  > 📁 dist
  > 📁 node_modules
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  > 📁 screenshots
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    > 📁 assets
    > 📁 components
      > 📁 icons
        > AppFooter.vue
        > AppHeader.vue
        > MapView.vue
    > 📁 config
      > App.vue
      > main.ts
    > .gitattributes
    > .gitignore
    > index.html
  > 📁 package.json
  > README.md
  > tsconfig.json
  > vite.config.ts

< toilets_kiel.geojson >
data > toilets_kiel.geojson > [] features > {} 1>
  > you, 2 days ago | answer (you)
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GeoServer

About & Status

- [Server Status](#)
- [Geoserver API](#)
- [Contact Information](#)
- [About GeoServer](#)

Data

- [Layer Preview](#)
- [Workspaces](#)
- [Stores](#)
- [Layers](#)
- [Layer Groups](#)
- [Styles](#)

Services

- [WMTS](#)
- [WCS](#)
- [WFS](#)
- [WMS](#)

Settings

- [Global](#)
- [Image Processing](#)
- [Raster Access](#)

Tile Caching

- [Tile Layers](#)
- [Caching Details](#)
- [Grids](#)
- [Disk Quota](#)
- [WebStores](#)

Security

- [Settings](#)
- [Authentication](#)
- [Passwords](#)
- [Users, Groups, Roles](#)
- [Data](#)
- [TLS Checks](#)
- [Content Security Policy](#)
- [Services](#)

Demos

Tools

Edit Layer

Edit layer data and publishing

ptf:toilets_kiel

Configure the resource and publishing information for the current layer

Data	Publishing	Dimensions	Title Caching	Security
------	------------	------------	---------------	----------

Edit Layer

Basic Resource Info

Store Name: toilets_kiel_gpkg?

Native Name: toilets_kiel

Name: toilets_kiel

Enabled

Advertised

Title: I18n toilets_kiel

Abstract: I18n

Keywords

Current Keywords

features toilets_kiel Remove selected

New Keyword:

Vocabulary:

[Add Keyword](#)

Metadata links

No metadata links so far

[Add link](#) Note only FGDC and TC211 metadata links show up in WMS 1.1.1 capabilities

Data links

No data links so far

[Add link](#)

Coordinate Reference Systems

Natural SRS: EPSG:4326 EPSG:WGS 84...

Projected SRS: EPSG:3035 Projected CRS

SRID: EPSG:WGS 84...

SRS Setting: Force defined?

Coordinate Reference Systems

Native SRS: EPSG:4326 EPSG:WGS 84...

Derived SRS: EPSG:3035 Projected CRS

SRID: EPSG:WGS 84...

SRS Setting: Force defined?

Bounding Boxes

Native Bounding Box

Min X: 9.810207	Min Y: 54.27120300000000	Max X: 10.302029	Max Y: 54.444321
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Curved Bounding Box

Curved Min X: 9.810207 Min Y: 54.27120300000000 Max X: 10.302029 Max Y: 54.444321

Curved Min Y: 54.27120300000000 Max Y: 54.444321

Curved Max X: 10.302029 Max Y: 54.444321

Curved Max Y: 54.444321

Curved Min X: 9.810207 Min Y: 54.27120300000000 Max X: 10.302029 Max Y: 54.444321

Curved Max Y: 54.444321

Curved geometries control

Linear geometries can contain circular arcs
 Unconstrained tolerance (useful only if your data contains curved geometries)

Feature Type Details

Customize attributes

Property	Type	Nullable	Min/Max Qty
geom	Point	True	0/1
id	String	True	0/1
id2	String	True	0/1
access	String	True	0/1
amenity	String	True	0/1
building	String	True	0/1
sewerage_and_sewage_treatment	String	True	0/1
sewerage_type	String	True	0/1
name	String	True	0/1
note	String	True	0/1
operator	String	True	0/1
source	String	True	0/1
wheelchair	String	True	0/1
wheelata	String	True	0/1
shower	String	True	0/1
fee	String	True	0/1
opening_hours	String	True	0/1
maxsize	String	True	0/1
opening_hours_satcheck	Date	True	0/1
table**	Text	True	0/1

System Architecture Overview



The application follows a **client–server architecture**.



The **frontend** is a Single Page Application (SPA) built with **Vue 3**.



The **backend** is **GeoServer**, providing spatial data via:



WMS for map visualization



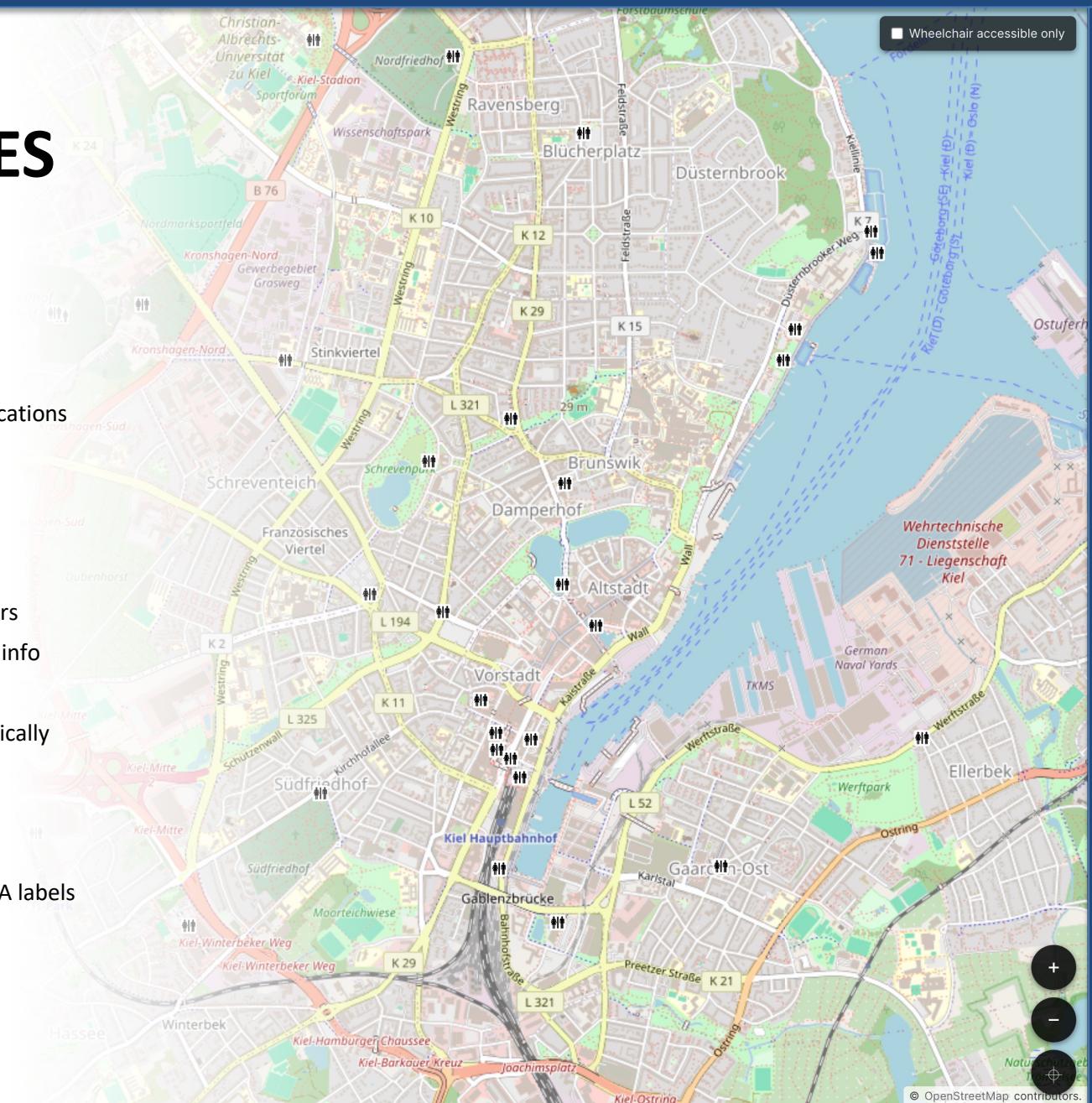
WFS for interactive vector features



Communication is handled via **HTTP-based OGC services**.

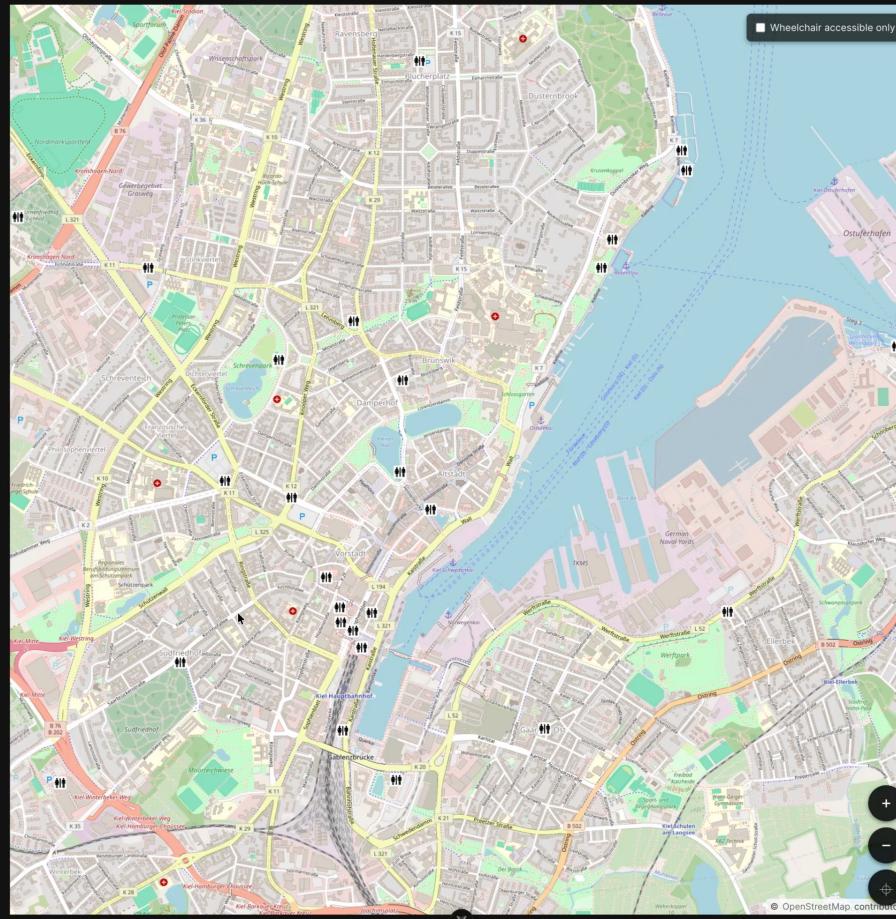
CORE FEATURES

- **Interactive Map**
- Pan and zoom using OpenLayers
- Real-time rendering of public toilet locations
- **WMS + WFS Visualization**
- WMS for base visualization
- WFS for interactive vector features
- **Popup Information**
- Price, wheelchair access, opening hours
- Gender type and baby changing table info
- **Wheelchair Filter**
- Displays only accessible toilets dynamically
- **Custom Map Controls**
- Zoom in / zoom out
- Recenter map to Kiel
- Keyboard-accessible buttons with ARIA labels



Public Toilet Finder

Find public toilets in Kiel using OpenStreetMap data.



Accessibility

Keyboard Navigation

All interactive elements are fully usable via keyboard (Tab, Enter).

High Contrast UI

High contrast color scheme ensures clear visibility.

ARIA Labels

All map controls include appropriate ARIA labels.

Screen Reader Tested

Tested with screen reader for accessibility compliance.

WCAG compliant & 100% Lighthouse accessibility score achieved.

Lighthouse Audit – Desktop & Mobile

Tested with Google Lighthouse
(Desktop & Mobile)

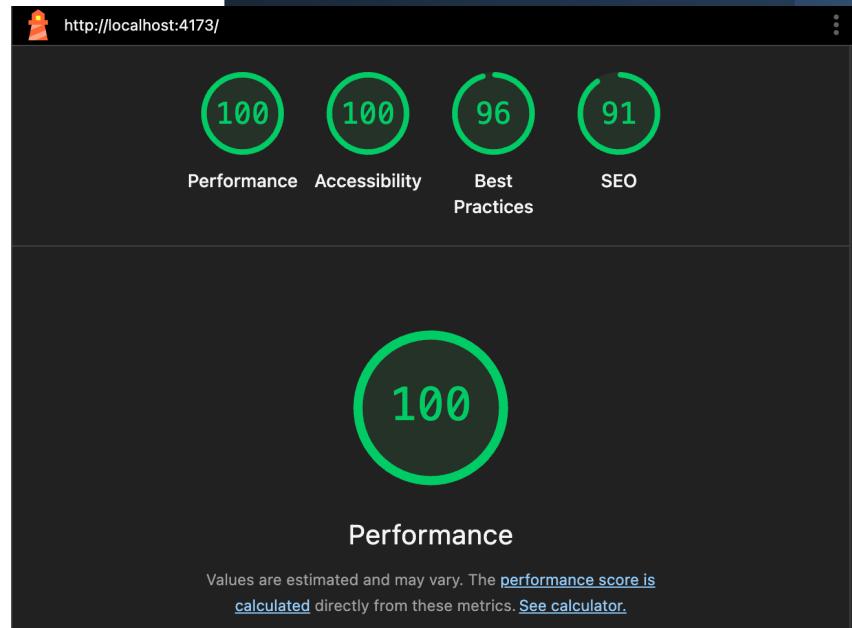
Accessibility score: 100%

Keyboard navigation fully supported

ARIA labels used on all custom controls

High contrast UI for better visibility

Responsive design verified on mobile
and desktop



Version Control

The screenshot shows a GitHub repository page for 'Public Toilet Finder'. The repository was created by 'coderfeye13' and has 14 commits. The commit history includes several initial commits from the user, followed by commits for adding files via upload, screenshots, and fixing markdown formatting. Other files visible include .vscode, data, public, reports, screenshots, src, .editorconfig, .gitattributes, .gitignore, LICENSE, README.md, env.d.ts, eslint.config.ts, index.html, package-lock.json, package.json, tsconfig.app.json, tsconfig.json, tsconfig.node.json, and vite.config.ts. The repository has 0 stars, 0 forks, and 0 watching. It has no releases published and no packages published. The Languages section shows HTML as the primary language (97.9%), followed by Vue (1.6%) and Other (0.5%). Suggested workflows include 'Jekyll using Docker image' and 'SLSA Generic generator'.

- Git used as the version control system
- Project hosted on public GitHub repository
- All development steps tracked with commits
 - README file includes:
 - Project description
 - Build & run instructions
 - Technologies used
 - Repository is publicly accessible for lecturer and classmates

Future Improvements



- Nearest public toilet routing using shortest path algorithms
- Marker clustering for dense urban areas



- WFS-T support for user-driven data updates
- Advanced filters (price, opening hours, gender-specific toilets)



Progressive Web App (PWA) support for offline usage

Real-time user feedback and ratings

Thank You

- Questions?

