EUROPEAN CONFERENCE ON QUALITY IN OFFICIAL STATISTICS
2024 ESTORIL - PORTUGAL

Traffic and Mobility Indicators from Innovative Data

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Traffic and Mobility lab project

Aim: Develop experimental transport indicators on traffic and mobility using innovative data & establish new ways of processing and sharing innovative data to produce statistics

- Joint project with Eurostat's Unit A5*
  Project started in 2022, expected end in 2024
- 2022: landscaping study to identified promising new data sources for meaningful transport indicators
- 2023: select 3 use cases for transport indicators,
  develop agreements with relevant partners to get access to the data and develop methodology for producing indicators
- 2024: pilot indicator methodology Objective: Use Eurostat quarterly statistics and EMSA data for improving timeliness of maritime statistics – publish port calls few weeks after a reference quarter instead of a year later

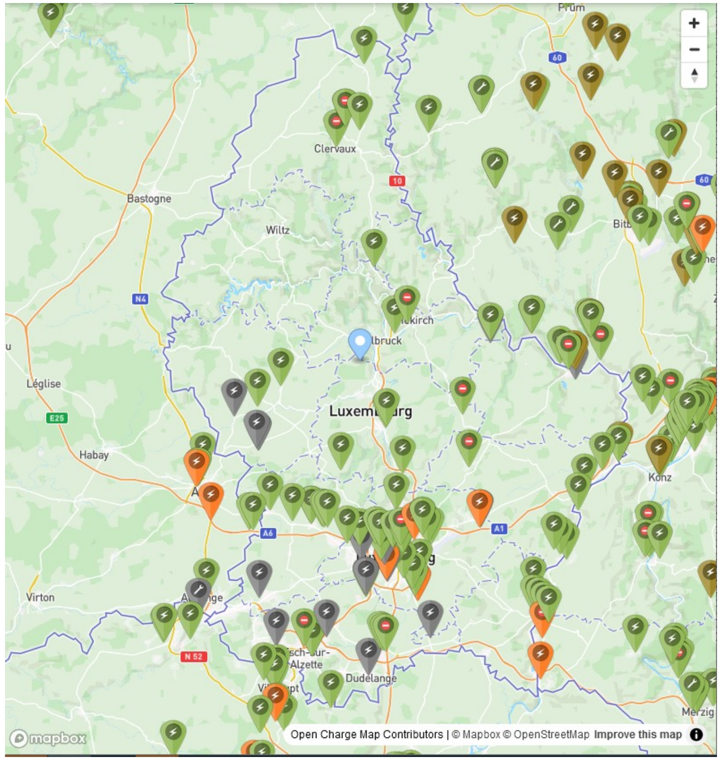
* supported by a contract with PwC

Traffic and Mobility – Selected Use Cases

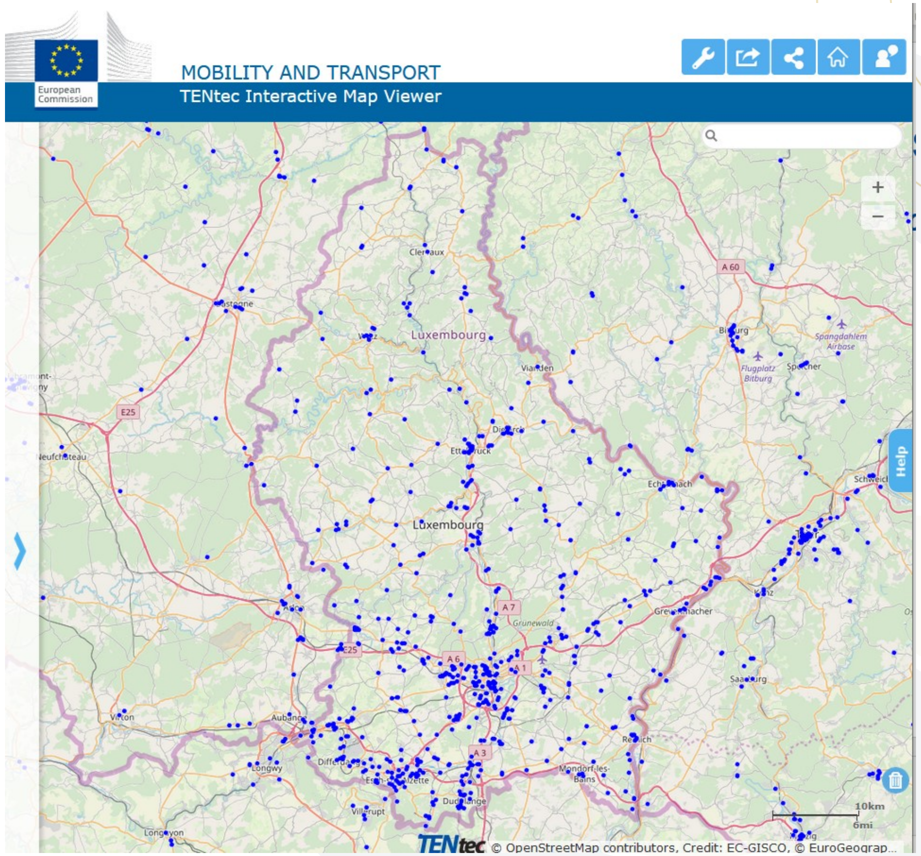
Use Case 1: Adoption of Alternative Fuels	Use Case 2: Availability of Public Transport	Use Case 3: Air Quality Traffic Pollutants Levels
Measuring distribution and capacity of publicly available alternative fuels infrastructure (recharging stations) based on crowdsourced data in NUTS 2/3 regions.	Measuring availability of public transport using GTFS and crowdsourced data in NUTS 2/3 regions.	Measuring average concentration of selected air pollutants at peak traffic times and their variation based on the European Environment Agency air quality database and TomTom traffic data.
Indicators:		
Indicator 1.1 ➢ Charging infrastructure density Indicator 1.2 ➢ Charging infrastructure network capacity Indicator 1.3 ➢ Charging infrastructure distribution	Indicator 2.1 ➢ # of stops / (population and/or area km^2) ➢ Average # of lines serving public transport stops per NUTS 2/3 region ➢ Times of day when public transport is available Indicator 2.2 ➢ Travelable distance via public transport in a given time frame (in terms of % of region area and/or % of population reached)	Indicator 3.1 ➢ Average level of air pollutant at peak traffic times (over day/week/working days/ month per City or NUTS 2/3 region) ➢ Average difference of level of air pollutants between peak traffic times and baseline Indicator 3.2 ➢ # of Km with both high traffic and high air pollutant concentration

1. Charging infrastructure for alternative fuels

Crowd-sourced or commercial data?



Source: Open Charge Map



Source: EAFO/ Eco-Movement data visualized in TENtec Interactive Map Viewer

1. Charging infrastructure for alternative fuels

Data sources

Open Charge Map *(open-source)*

European Alternative Fuels Observatory *(proprietary)*

Open Street Map

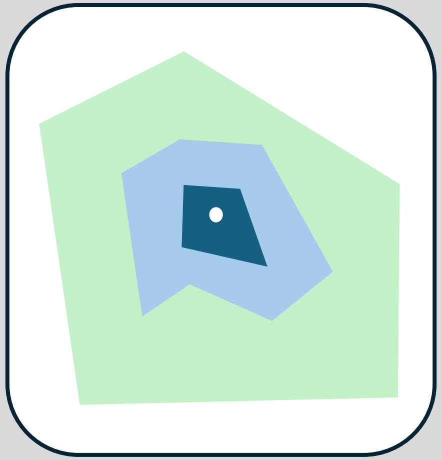
NUTS raw data

Calculation

Attribution of recharging station to NUTS region

Origin-destination pairs
-> distance between recharging stations

Isochrone polygons
-> Percentage of a NUTS region covered within a set travel time



Output

Use Case 1: Charging infrastructure distribution

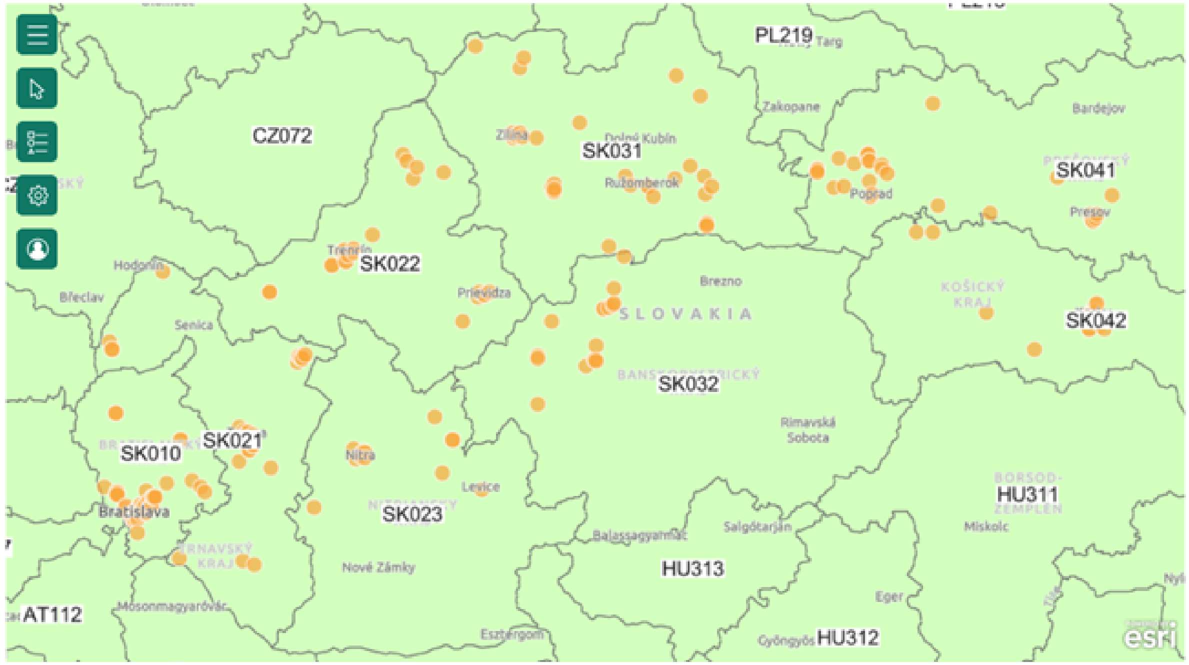
Summary: The goal of *Use Case 1* is to measure the distribution and capacity of recharging stations in NUTS 2/3 regions.

View: **Distribution** | Density | Coverage by time | Full coverage time

Legend:

Charging station

Distribution of individual charging stations



Source: Preliminary project results implemented in Power BI using ArcGIS and based on Open Charge Map data

Use Case 1: Charging infrastructure distribution

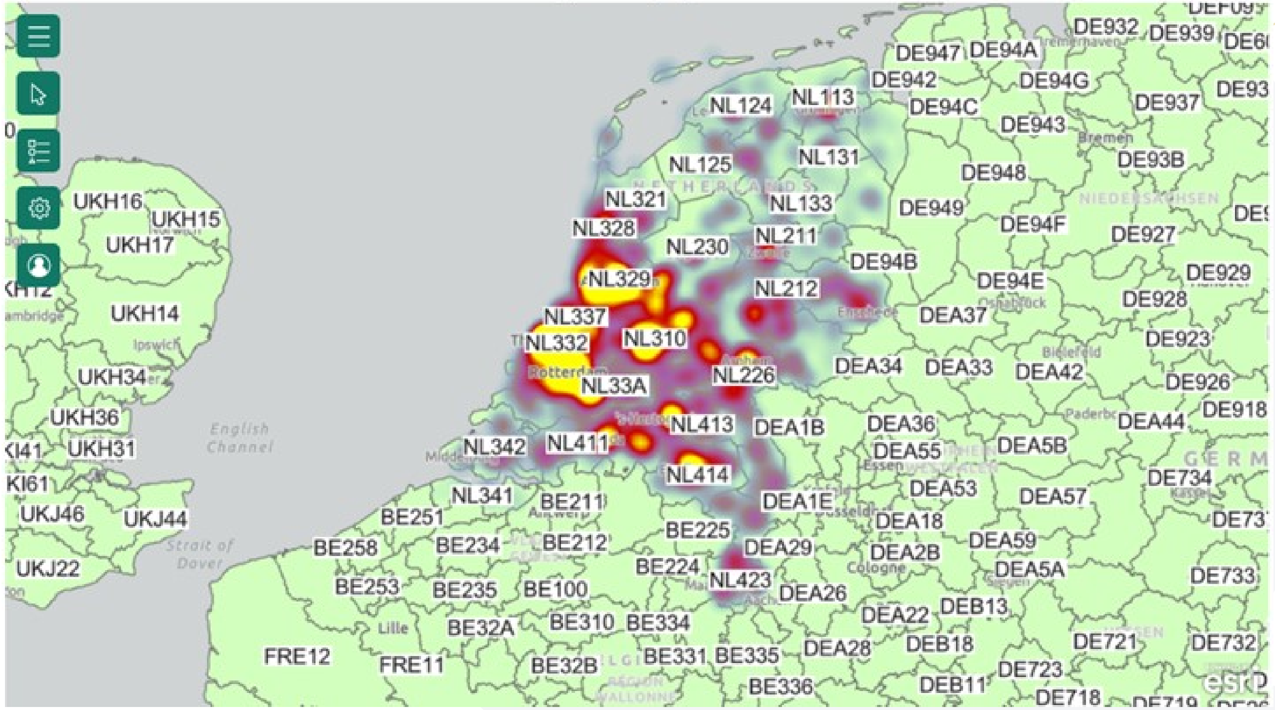
Summary: The goal of *Use Case 1* is to measure the distribution and capacity of recharging stations in NUTS 2/3 regions.

View: Distribution | **Density** | Coverage by time | Full coverage time

Legend:

Density of charging stations
Lowest density — Highest density

Density of charging stations



Source: Preliminary project results implemented in Power BI using ArcGIS and based on Open Charge Map data

Use Case 1: Charging infrastructure distribution

Home

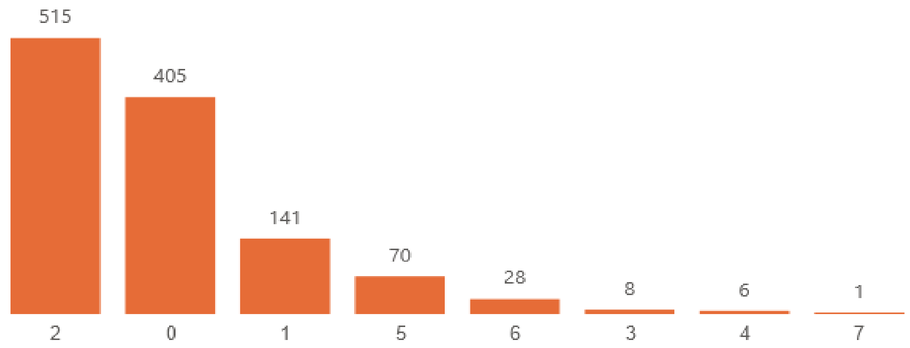
Summary: The goal of *Use Case 1* is to measure the distribution and capacity of recharging stations in NUTS 2/3 regions.

View: 1.1 - Charging stations by Region | **1.2 - Charging stations by Category** | 1.3 - Distribution of charging stations

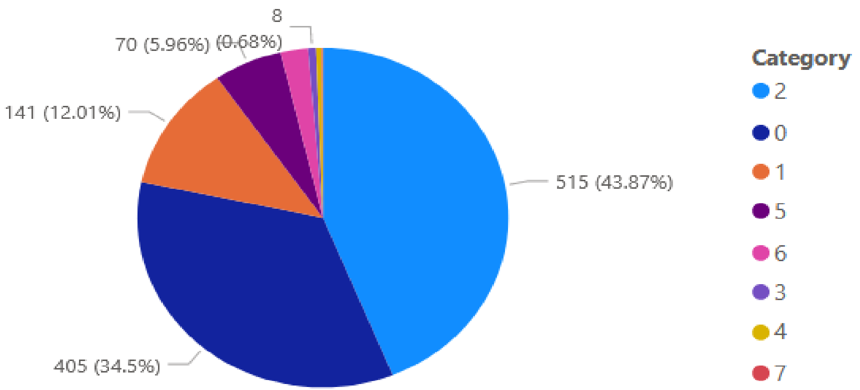
Indicator 1.2 overview

NUTS ID	Category	# Charging stations
BE234	2	97
BE211	2	79
BE100	2	73
BE234	0	63
BE211	0	44
BE241	0	39
BE100	0	37
BE251	2	31
BE242	2	27
BE211	1	22
BE241	2	22
BE242	0	21
BE224	2	19
BE328	0	19
BE212	2	17
BE224	0	17
BE212	0	16
BE251	0	15
BE310	2	15
BE332	0	14
BE213	0	13
BE213	2	13
BE254	0	12
BE223	2	11
BE211	5	10
BE213	1	10
Total		**1,174**

of Recharging stations by Category



of Recharging stations by Category



KPIs

Total charging stations	Total number of NUTS
1,174	39

Filters

Source
- EAFO
- OCM (selected)

Country
- BE (selected)
- NL
- SK

NUTS Level
- NUTS 2
- NUTS 3 (selected)

NUTS ID
- BE100
- BE211
- BE212
- BE213
- BE223

Category of Charger
- 0. Unknown
- 1. Slow AC recharging point, single-phase
- 2. Medium-speed AC recharging point, triple-phase
- 3. Fast AC recharging point, triple-phase
- 4. Slow DC recharging point
- 5. Fast DC recharging point
- 6. Ultra-fast DC recharging point (Level 1)
- 7. Ultra-fast DC recharging point (Level 2)

Source: Preliminary project results implemented in Power BI and based on Open Charge Map data

Use Case 1: Charging infrastructure distribution

Home

Summary: The goal of *Use Case 1* is to measure the distribution and capacity of recharging stations in NUTS 2/3 regions.

View: 1.1 - Charging stations by Region | 1.2 - Charging stations by Category | **1.3 - Distribution of charging stations**

Indicator 1.3 - %Coverage at current time radius

NUTS ID	Time radius (minutes)	NUTS covered%
BE100	10	100.00
BE211	10	83.92
BE212	10	92.28
BE213	10	65.43
BE223	10	56.12
BE224	10	75.19

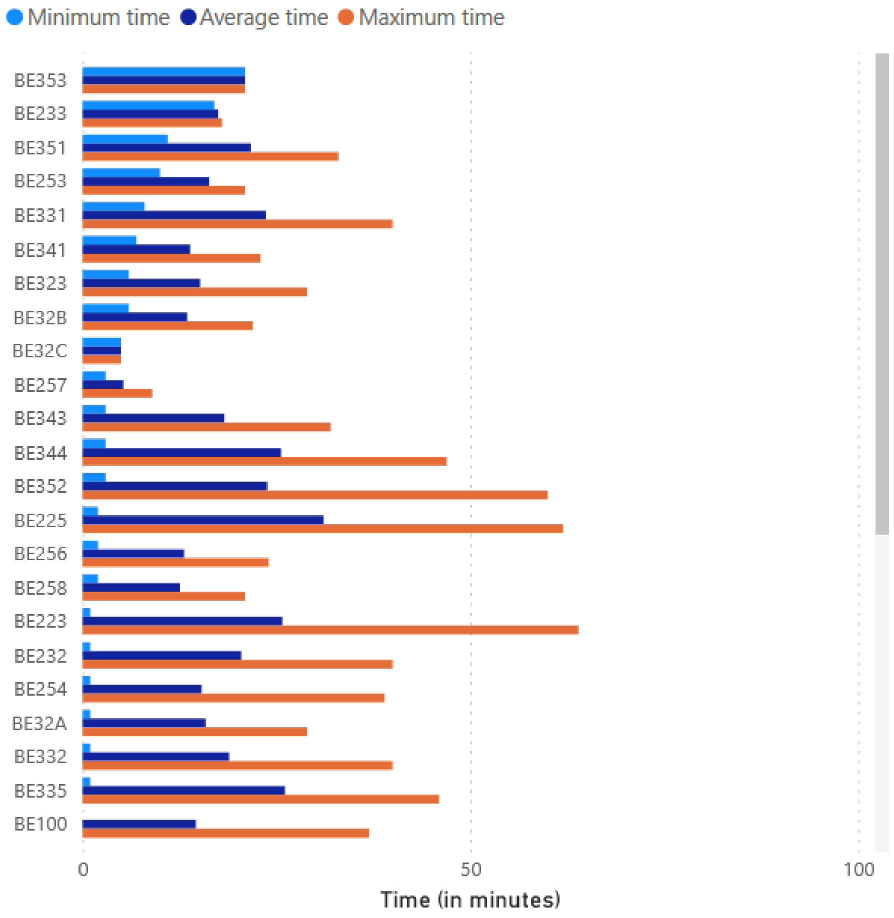
Indicator 1.3 - Time needed to cover all points

NUTS ID	Time needed (minutes)
BE100	10
BE211	30
BE212	20
BE213	30
BE223	60
BE224	20
BE225	50

Indicator 1.3 - Travel time between stations in minutes

NUTS ID	Minimum	Average	Maximum
BE310	0	25.45	81
BE213	0	26.85	72
BE223	1	25.77	64
BE241	0	22.21	63
BE225	2	31.13	62
BE212	0	22.26	60
BE352	3	23.84	60
BE224	0	19.77	51
BE234	0	15.18	49

Min, Average, and Max travel time between stations in a given NUTS



Filters

Source
- ○ EAFO
- ◉ OCM

Country
- ■ BE

NUTS Level
- ○ NUTS 2
- ◉ NUTS 3

NUTS ID
- ☐ BE100
- ☐ BE211
- ☐ BE212
- ☐ BE213
- ☐ BE223

Time radius (minutes)
- ◉ 10
- ○ 20
- ○ 30
- ○ 40
- ○ 50
- ○ 60

Source: Preliminary project results implemented in Power BI using Open Street Map and based on Open Charge Map data

Considerations

- NUTS delimitation:
  - precision requires scale -> scale affects calculation time
  - OSM data is structured in polygons that need to be wholly included
    -> roads segments might slightly cross NUTS borders
- Computation time for infrastructure distribution is high (OCM: 10h, EAFO: 3 days)

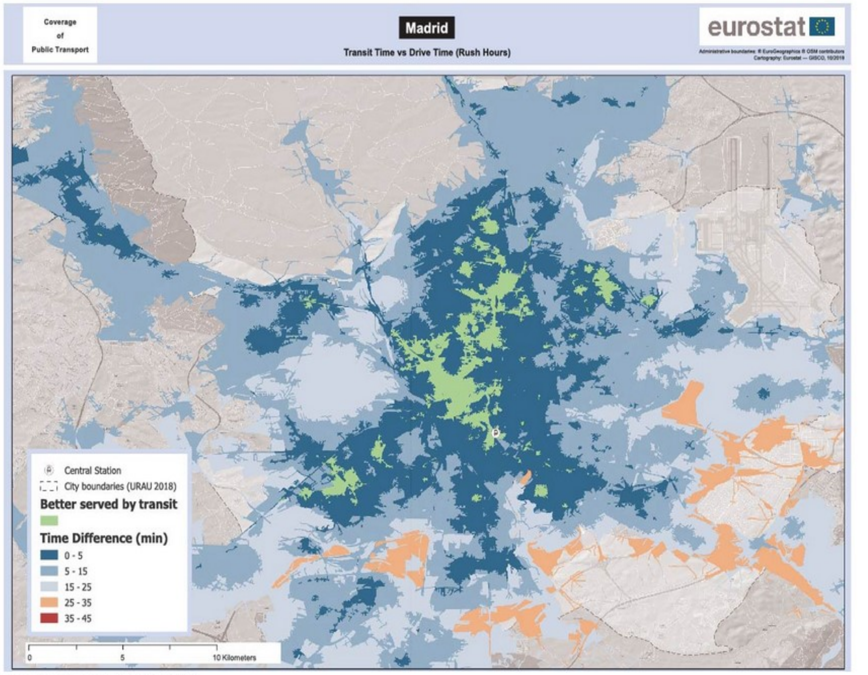
Areas for future development

- Indicators currently fully piloted for one MS (BE, partially for NL and SK)
- Data orchestration (data ingestion, transformation and indicator calculation) could also be used for hydrogen infrastructure

2. Public Transport

	Indicators
2.1	**Availability of public transport stops per NUTS2 and NUTS3 region** i.e. the average number of stops and lines serving these stops, the frequency, and the percentage of time during the day that public transport is available
2.2	**Efficiency of public transport** i.e. percentage of region area and the percentage of population that can be reached in certain amount of time ***& Comparison with other mode (car)***

Comparative accessibility of Madrid Atocha train station by car and by public transport (transit)



Source: Eurostat analysis on behalf of ECA.

2. Public Transport

Data sources

General Transit Feed Specifications data *(open source)*

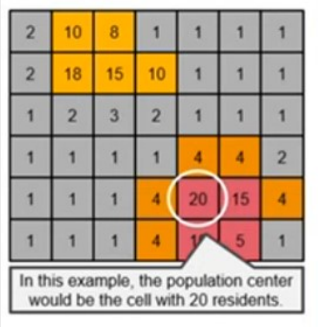
Open Street Map *(open source)*

EU population data

NUTS raw data

Calculation

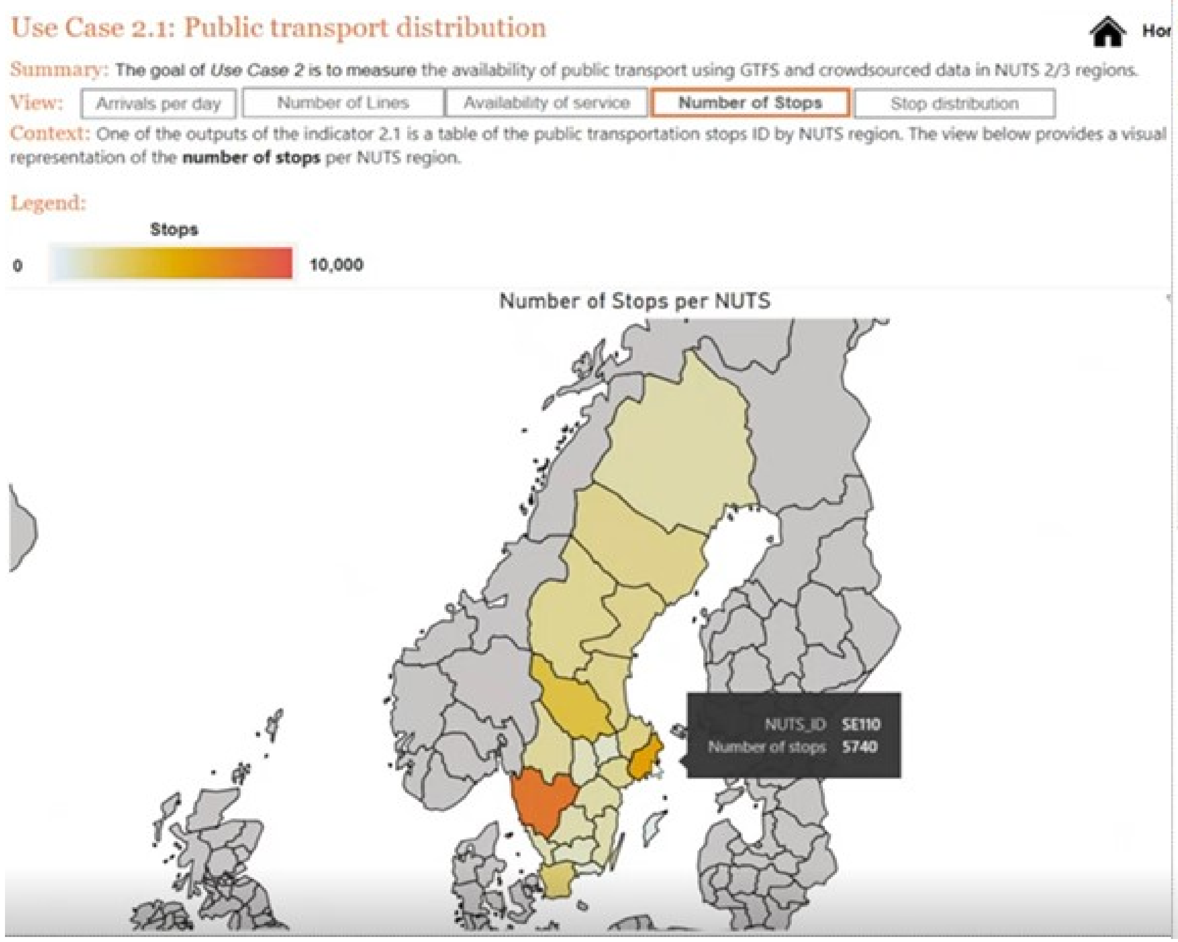
Attribution of stops to NUTS region and aggregation of lines, stops and departures



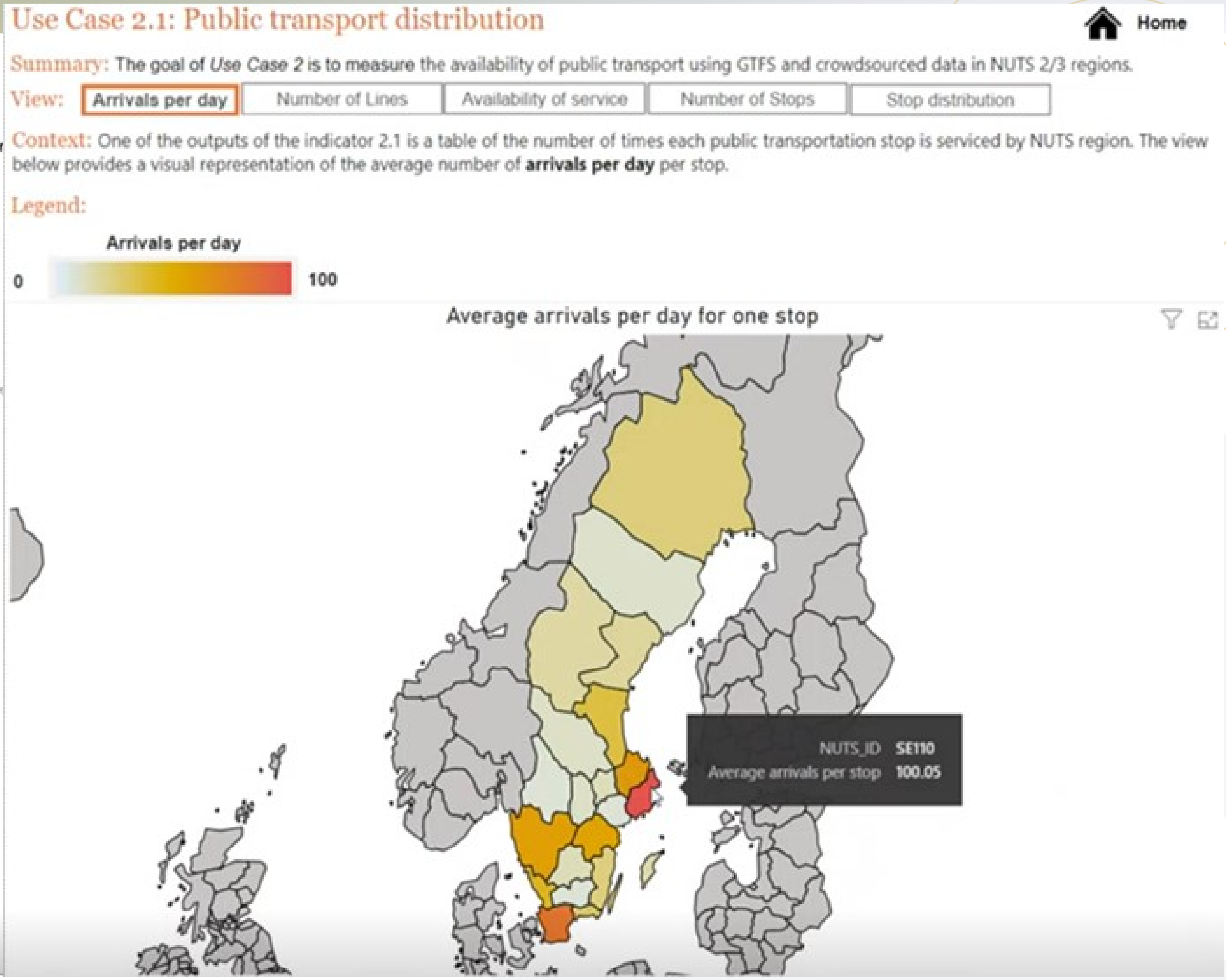
Clustering algorithm to determine population center = origin point for analysis of reach

Isochrone polygons
-> Percentage of a NUTS region and population reached within a set travel time

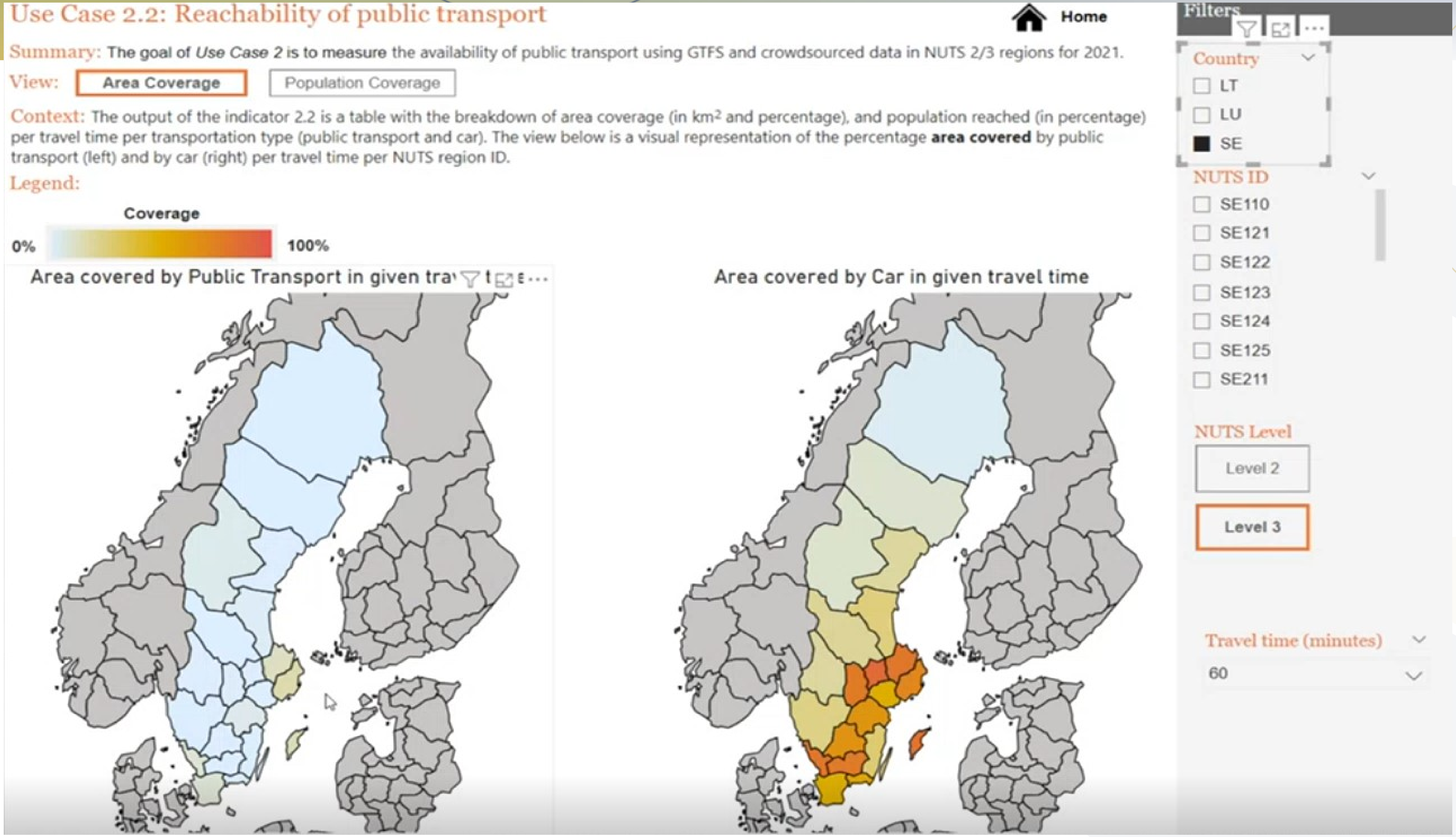
Output



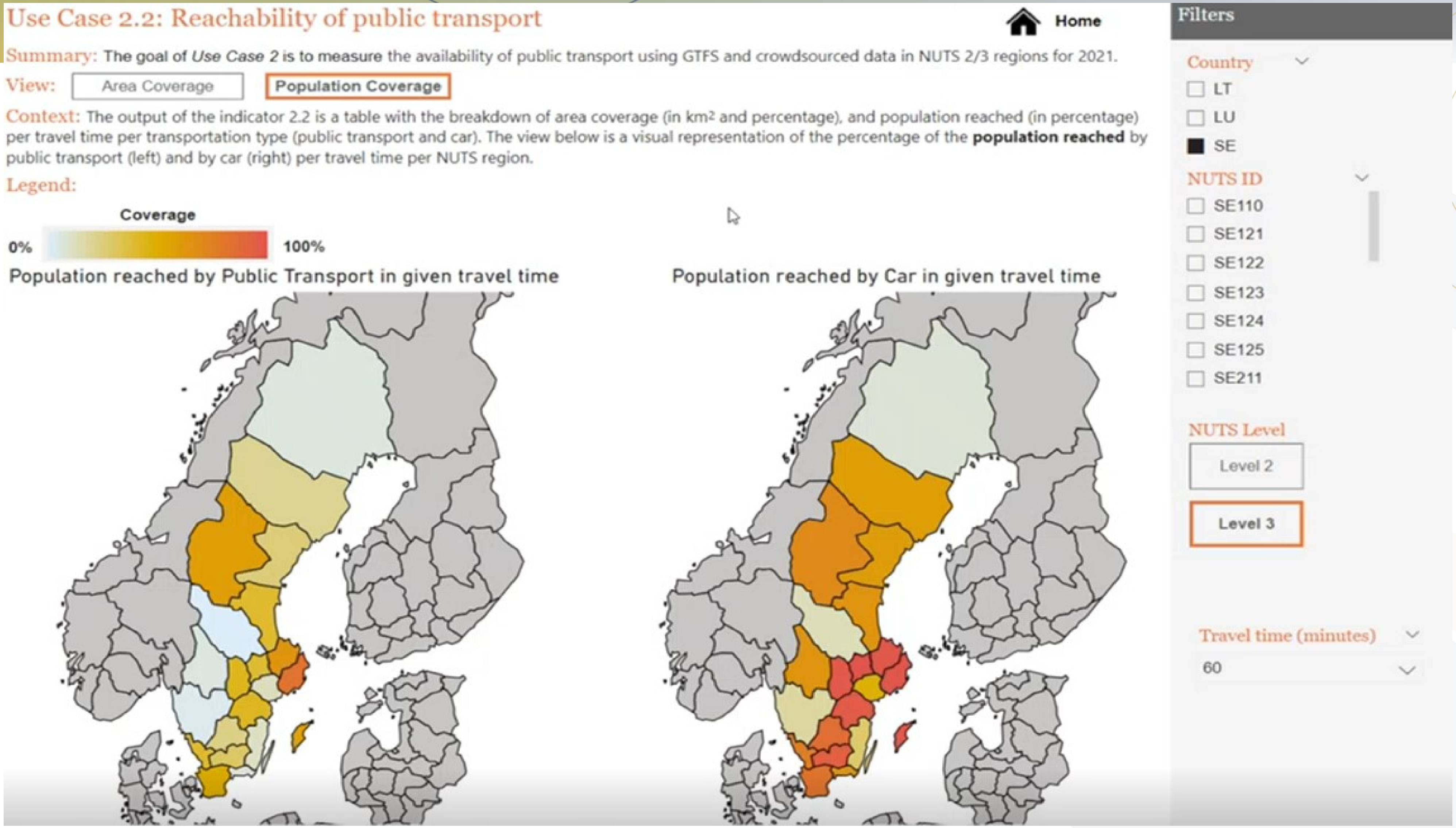
Source: Preliminary project results in Power BI using ArcGIS based on GTFS data



Source: Preliminary project results in Power BI using ArcGIS based on GTFS data



Source: Preliminary project results in Power BI using ArcGIS and Open Street Map based on GTFS data



Source: Preliminary project results in Power BI using ArcGIS and Open Street Map based on GTFS data

Considerations

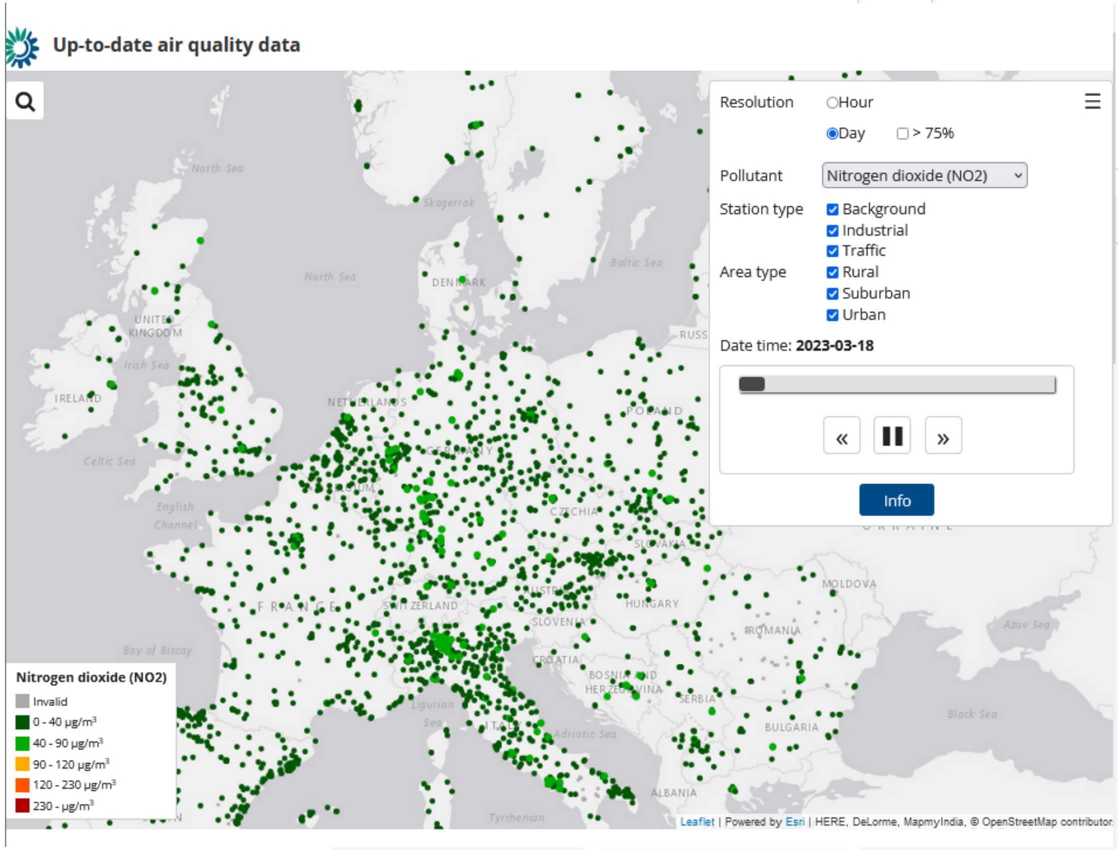
- GTFS data available for most, but not all MS
- Available GTFS data displays differing use of formats -> extra data treatment necessary
- Limitation: The determined origin point might require a "walk" to the nearest public transportation stop and a certain waiting time there for the public transport.
  This might result in XX minutes "spend" on a potentially inconsequential distance

Areas for future development

- Indicators currently piloted for three MS (LT, LU, SE)
- Results are very sensitive to
  - the origin point chosen (geometric center of the population center grid cell)
  - the origin time chosen (10am weekday)

3. Traffic and Air Quality

	Indicators
3.1	Average concentration of air pollutants (e.g. PM, NO_2) at rush hours and the difference from a baseline value
3.2	Number of kilometres with traffic and high air pollutant concentrations



Source: EEA's Up-to-date air quality data

3. Traffic and Air Quality

Data sources

EEA's hourly Air Quality data

e.g. NO2

(open source)

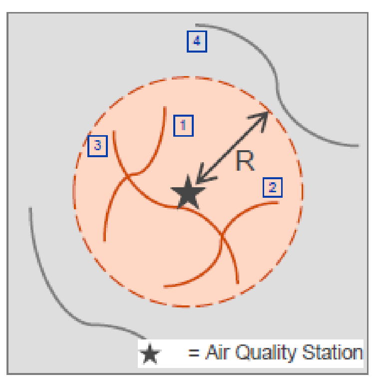
TomTom data

(proprietary)

NUTS raw data

Calculation

Calculate monthly baseline for average air pollutant concentrations per station



Identify roads around air quality station (R=100m)

Identify traffic on those roads (deviation from free flow <= 70%)

Calculate average air pollutant concentration during traffic and compute the difference to baseline

Output

Use Case 3.1: Average air quality during traffic

Home

Summary: The goal of *Use Case 3* is to measure the average concentration of selected air pollutants at peak traffic times and their variation based on the European Environment Agency air quality database and TomTom traffic data.

Context: The output of the indicator 3.1 is a table with the concentration at rush hour, the monthly concentration baseline, and the difference between these two figures per air pollutant, per day, and per air quality station ID for a given year and country. The view below provides an additional visual representation of the evolution by day of the difference between the concentration at rush hour and the monthly **average concentration per air pollutant** per air quality station ID.

Date

01/01/2021 – 31/12/2021

Filters

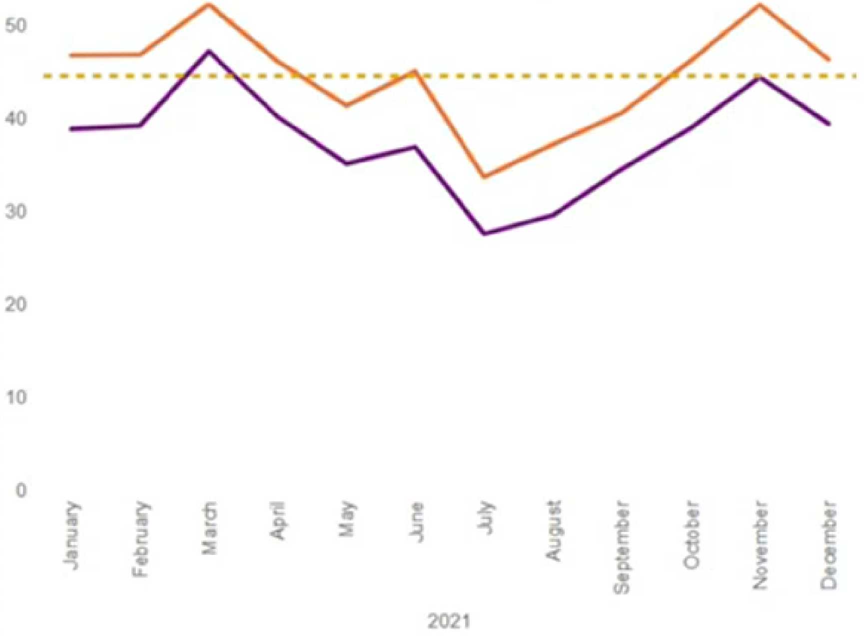
Air Pollutant

- C6H6
- NO2 (selected)
- SO2

Sampling Station ID

SPO-BETB001_00008_100

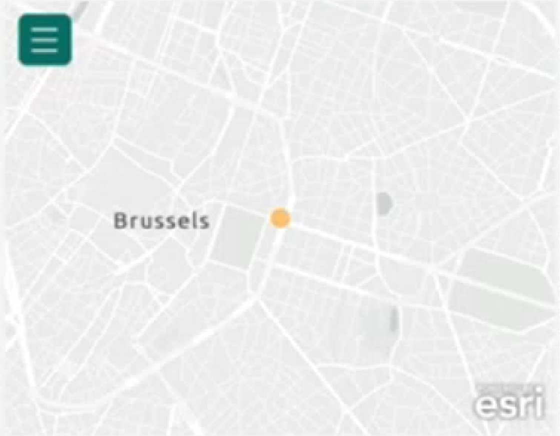
Concentration by Day



Monthly comparison of Air Pollutant Concentration

Month	Average Concentration at Rush hour	Concentration monthly average
January	46.74	38.82
February	46.79	39.17
March	52.21	47.17
April	46.08	40.14
May	41.33	35.09
June	45.02	36.89
July	33.66	27.55
August	37.17	29.57
September	40.55	34.52
October	46.16	38.93
November	52.17	44.38
December	46.29	39.37
Total	**44.48**	**37.61**

Location of Sampling Station



Source: Preliminary project results in Power BI using ArcGIS based on EEA data and TomTom Speedprofiles

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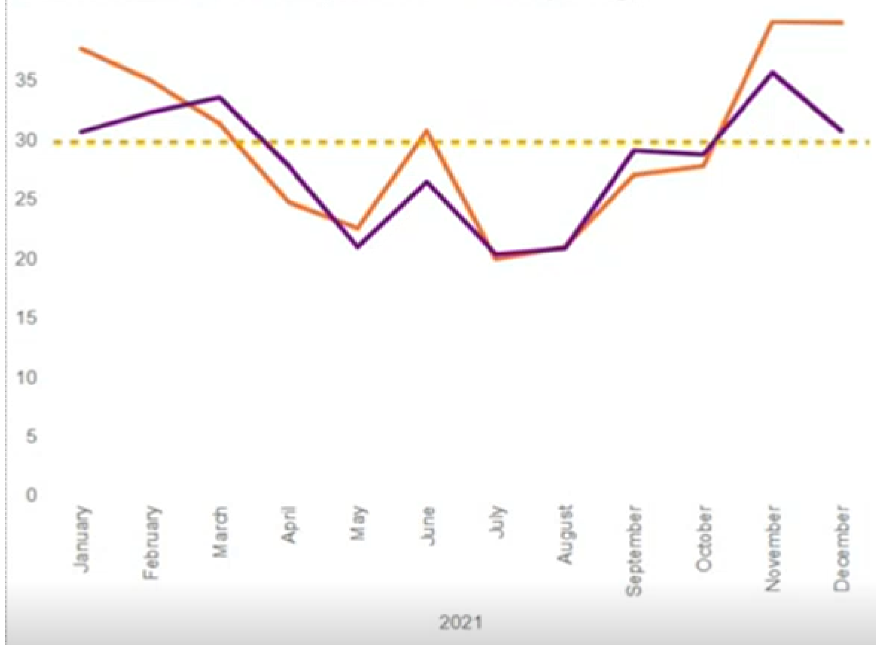


Monthly comparison of Air Pollutant Concentration

Month	Average Concentration at Rush hour	Concentration monthly average
January	37.63	30.61
February	34.97	32.25
March	31.32	33.52
April	24.69	27.76
May	22.48	20.91
June	30.72	26.41
July	19.91	20.31
August	20.93	20.79
September	26.99	29.06
October	27.73	28.72
November	39.92	35.63
December	39.83	30.70
Total	**29.71**	**28.05**

Filters

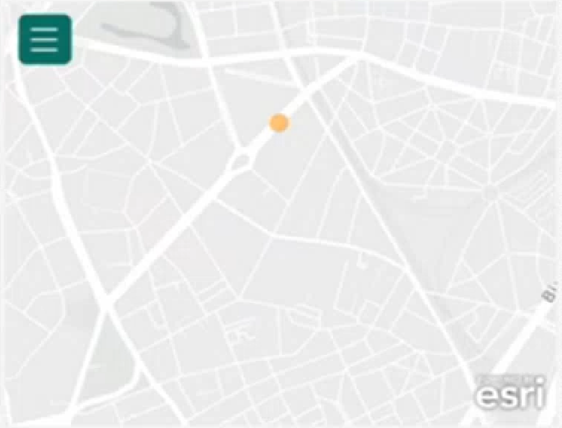
Air Pollutant

- ○ C6H6
- ● NO2
- ○ SO2

Sampling Station ID

SPO-BETR805_00008_100

Location of Sampling Station



Source: Preliminary project results in Power BI using ArcGIS based on EEA data and TomTom Speedprofiles

Considerations

- Considerable missing data in EEA data set
  -> completeness threshold:
  80% for computation of monthly average
- Number of traffic air stations rather limited (11 for BE)
  -> aggregation to e.g. city level currently not expedient

Areas for future development

- Indicators currently piloted for one MS (BE)
- Indicators piloted for year 2021

–> interpretation complicated given the unusual mobility patterns during the pandemic

Challenges & lessons learnt

- Commercial data set have better and richer content than free data sets, but they generate financial costs
- Public data is also not always easy to get, administrative agreements are time consuming
- Results are depended on harmonized input data
- Benchmarking of results and transparency of methods is key

- **Next steps:** –> scale-up
  –> present selection of indicators to METAC
  –> publish experimental statistics

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Thank you!

Further information:

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