eMOTIONAL Cities

Mapping the cities through the senses of those who make them

NOTE SUPPORTING
DELIVERABLE 6.6

Baseline scenario model development II and Georeferenced model II

FEBRUARY | 2025

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Main authors	Carlos Lima Azevedo (DTU), climaz@dtu.dk Ata Chokhachian (CLIMA), ata@climateflux.com Sevval Durmazbilek (CLIMA), sevval@climateflux.com Paulo Morgado (IGOT), paulo@campus.ul.pt Ana Bonifácio (IGOT), anabonifacio@edu.ulisboa.pt Bruno Miranda (FMUL), bruno.miranda@campus.ul.pt
Contributors	Sevval Durmazbilek (CLIMA), sevval@climateflux.com
Reviewers	IGOT
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1. Summary and context

The eMOTIONAL Cities project collected several datasets that supported the development of baseline scenario models and vizualisations across the project's different work packages. Deliverable 6.6 (non-report format) consists precisely of the availability of these datasets and models on the platforms for data management and interaction developed within eMOTIONAL Cities and beyond. With this short technical note, we aim to summarise all developed datasets and models along with their whereabouts, hopefully easing the review and dissemination of our project outputs.

The baseline scenarios portray how cities, specifically the urban environment, impact people's mental and physical health and travel behaviour from a space-time perspective. The models are in visualisation or mathematical representation forms and were developed across WP4 to WP7. The project delivers all the collected information scattered across a georeferenced platform, a spatial data infrastructure (SDI), and a set of reports (deliverables).

2. Data Sets

2.1 Summary

The eMOTIONAL Cities project has gathered a large amount of both spatial - and individual - unit data. Figure 1 provides an overview of the complete dataset collected throughout the project (in WP4 and all five experiments in WP5), highlighting key attributes such as source, context, timeframe, and availability. This report also references the documents (deliverable and technical reports) where the details of such data are available.

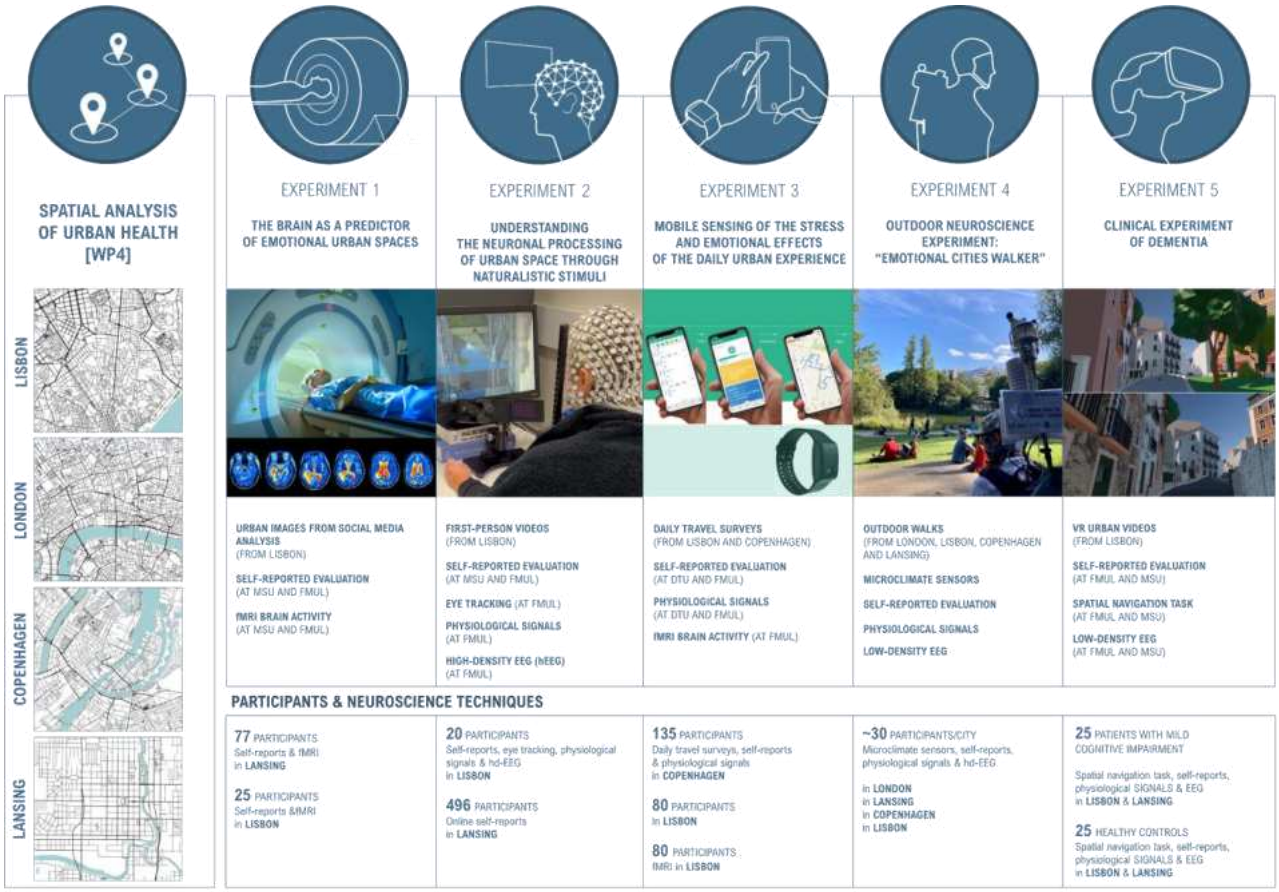

Figure 1. Summary of Data collection efforts

2.2 Data at the spatial unit (WP4)

In the next sections, we list all the variables collected during WP4 at the spatial unit level. We point to the following documents for detailed information about the variables:

- London: Deliverable 4.2 “Quantitative/Qualitative Mapping Urban health across the pilot studies and for specific sites identified as ‘hot spots' during the analysis”:

https://emotionalcities-h2020.eu/wp-content/uploads/2024/03/eMC_2023.01_D4.2_V03_RF_compressed-1.pdf

- Lisbon: Technical Report "Methodological report for mapping hotspots in Lisbon": https://emotionalcities-h2020.eu/wp-content/uploads/2023/12/eMC_WP4_hotspots_Lisbon.pdf
- Copenhagen: Technical Report "Methodological report for mapping hotspots in Copenhagen": https://emotionalcities-h2020.eu/wp-content/uploads/2023/12/eMC_WP4_hotspots_CPH-.pdf

2.2.1 Health Determinants

Physical Environment

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Average age of buildings	National Statistics	Y	N	N	N	Y	Y	SDI
Buildings with repair needs ratio	National Statistics	Y	N	N	N	Y	Y	SDI
Average building height	Local government authorities	Y	N	N	N	Y	N	-
Building area ratio	Local government authorities	Y	N	N	N	Y	N	-
Walkability index	Combined	Y	N	Y	N	Y	Y	SDI
Altimetry	National Statistics	Y	N	N	N	N	Y	SDI
Beds / customers in tourist accommodations	National Statistics	Y	N	N	N	Y	Y	SDI
Normalized Difference Vegetation Index	EU or National Data bank	Y	Y	Y	N	Y(LIS)	Y	SDI
Distance to green spaces	EU Data bank	Y	N	N	N	Y	Y	SDI
Noise level	National or Local government authorities	Y	N	N	N	Y	Y	SDI
Particulate Matter ($PM_{2.5}$)	National or Local government authorities	Y	Y	N	Y	Y	Y	SDI
Nitrogen Dioxide (NO_2)	National or Local government authorities	Y	Y	N	Y	Y	Y	SDI
Mean temperature	EU Data bank	Y	N	N	N	Y	Y	SDI
Vulnerability to excessive heat	Local government authorities	Y	N	N	N	N	Y	SDI

index								
Vulnerability to flash floods index	Local government authorities	Y	N	N	N	N	Y	SDI
Vibrancy index	OSM / Web	Y	N	N	N	Y	Y	SDI
Density of fast-food outlets	OSM / Web	Y	N	Y	N	Y	Y	SDI
Proportion of population with access to public open space	National or government authorities	N	Y	N	N	Y	Y	SDI
Particulate Matter (PM_{10})	National or Local government authorities	N	Y	N	Y	Y	Y	SDI
Annual average noise levels of rail noise	National government authorities	N	Y	N	Y	Y	Y	SDI
Risk of flooding from rivers and seas	National government authorities	N	Y	N	N	Y	Y	SDI
Major summer heat spots	Local government authorities	N	Y	N	N	N	Y	SDI
Distance to Public Transportation	National government authorities	N	N	N	Y	Y	N	SDI
Cycling routes density map	Local government authorities	N	Y	Y	N	Y	Y	SDI
Land use diversity	National government authorities / Web	N	Y	Y	Y	Y	Y	SDI

Population data

Variable	**Source**	**LIS**	**LDN**	**LAN**	**CPH**	**Single year**	**Public**	**Location**
Purchasing power / Income	National government authorities / Web	Y	N	N	Y	Y(LIS) N(CPH)	N	-
Unemployed people ratio	National Statistics	Y	N	N	N	Y	Y	SDI
People with low literacy level ratio	National Statistics	Y	N	N	Y	Y(LIS) N(CPH)	Y	SDI
Population density	National Statistics	Y	Y	Y	Y	N(CPH) Y(other)	Y	SDI
Gender ratio	National Statistics	Y	Y	Y	Y	N(CPH) Y(other)	Y	SDI

Youth people ratio	National Statistics	Y	N	Y	Y	N(CPH) Y(other)	Y	SDI
Elderly people ratio	National Statistics	Y	Y	Y	Y	N(CPH) Y(other)	Y	SDI
Index of Multiple Deprivation	National Statistics	N	Y	N	N	Y	N	SDI

Health Behaviour

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Patients with chronic alcohol abuse	National Statistics	Y	N	Y	N	Y	Y	SDI
Patients with tobacco abuse	National Statistics	Y	N	N	N	Y	Y	SDI
Ratio of active people	National Statistics	N	Y	Y	N	N	Y	SDI
Number of recorded crimes	National Statistics	N	Y	Y	N	N	Y	SDI

Perceptions

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Density of positive tweets	Twitter	Y	N	Y	Y	N	Y	SDI
Tweets emotions	Twitter	N	Y	Y	Y	N	N	-

2.2.2 Health Outcomes

Physical Health

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Patients with hypertension	National Statistics	Y	N	Y	Y	N(CPH) Y(other)	Y	SDI
Life births rate	National Statistics	Y	N	Y	Y	N(CPH) Y(other)	Y	SDI
Mortality rate	National Statistics	Y	N	Y	N	Y	Y	SDI
Patients with Diabetes Mellitus	National Statistics	Y	N	Y	Y	N(CPH) Y(other)	Y	SDI
Patients with	National Statistics	Y	Y	Y	Y	N(CPH)	Y	SDI

obesity						Y(other)		
Prevalence rates of cardiovascular diseases	National Statistics	N	Y	Y	Y	N(CPH) Y(other)	Y	SDI

Mental Health

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Patients diagnosed with dementia	National Statistics	Y	Y	Y	Y	N(CPH) Y(other);	Y	SDI
Patients diagnosed with anxiety disorder	National Statistics	Y	N	Y	Y	N(CPH) Y(other)	Y	SDI
Patients diagnosed with depressive disorder	National Statistics	Y	Y	Y	Y	N(CPH) Y(other)	Y	SDI
Drug prescription of anxiolytics (N05B)	National Associations	Y	N	N	N	Y	N	-
Drug prescription of antidepressants (N06A)	National Associations	Y	N	N	N	Y	N	-
Drug prescription of antidementia (N06D)	National Associations	Y	N	N	N	Y	N	-
Prevalence rates of mental health issues	National Statistics	N	Y	Y	Y	Y	Y	SDI

2.3 Data at the individual level(WP5)

2.3.1 Experiment 1: Brain as predictor of emotional urban places.

In this section we list all the variables collected during Experiment 1 (WP5) at the individual unit level. We point to the following documents for detailed information about the variables:

- Deliverable 5.3 “Report on the results of the indoor lab experiments”: https://emotionalcities-h2020.eu/wp-content/uploads/2024/03/eMC_2024.02_D5.3_Report_results_indoor_lab_experiments.pdf

Physical Environment

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Geotagged urban space images	Flickr website	Y	N	N	N	N	Y	Open Science Framework
Normalised popularity of the urban space images	Flickr website	Y	N	N	N	N	Y	Open Science Framework
Number of photographs taken in each area (cell) of the city	Flickr website	Y	N	N	N	N	Y	Open Science Framework
NDVI in each area (cell) of the city	Satellite imagery (Sentinel-2)	Y	N	N	N	N	Y	Open Science Framework

Physiological metrics

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
fMRI	MRI	Y	N	Y	N	Y	N	On-request
ERPs	EGI GSN 256	Y	N	N	N	Y	N	On-request
Electrical Source Imaging	EGI GSN 256	Y	N	N	N	Y	N	On-request
EEG frequency bands (delta, theta, alpha, beta, gamma bands)	EGI GSN 256	Y	N	N	N	Y	N	On-request
Frontal alpha asymmetry	EGI GSN 256	Y	N	N	N	Y	N	On-request
Theta/beta ratio	EGI GSN 256	Y	N	N	N	Y	N	On-request

Population data

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Satisfaction with life scale	Self-report	Y	N	Y	N	Y	N	On-request
Behavioral inhibition and activation system	Self-report	Y	N	Y	N	Y	N	On-request

HEXACO	Self-report	Y	N	Y	N	Y	N	On-request
DASS-21	Self-report	Y	N	Y	N	Y	N	On-request
Elicited emotion by urban image (valence & arousal)	Self-report	Y	N	Y	N	Y	N	On-request

2.3.2 Experiment 2: Understanding the neural processing of urban space through naturalistic stimuli

In this section, we list all the variables collected during Experiment 2 (WP5) at the individual unit level. We point to the following documents for detailed information about the variables:

- Deliverable 5.3 "Report on the results of the indoor lab experiments": https://emotionalcities-h2020.eu/wp-content/uploads/2024/03/eMC_2024.02_D5.3_Report_results_indoor_lab_experiments.pdf

Physical Environment

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Geotagged first-person videos of urban trajectories	HD action camera	Y	N	N	N	N	N	On-request
NDVI of the urban trajectories	Satellite imagery (Sentinel-2)	Y	N	N	N	N	N	On-request

Physiological metrics

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
ERPs	EGI GSN 256	Y	N	N	N	Y	N	On-request
Electrical Source Imaging	EGI GSN 256	Y	N	N	N	Y	N	On-request
EEG frequency bands (delta, theta, alpha, beta, gamma bands)	EGI GSN 256	Y	N	N	N	Y	N	On-request
Frontal alpha asymmetry	EGI GSN 256	Y	N	N	N	Y	N	On-request

Theta/beta ratio	EGI GSN 256	Y	N	N	N	Y	N	On-request

Population data

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Satisfaction with life scale	Self-report	Y	N	N	N	Y	N	On-request
Behavioral inhibition and activation system	Self-report	Y	N	N	N	Y	N	On-request
HEXACO	Self-report	Y	N	N	N	Y	N	On-request
DASS-21	Self-report	Y	N	N	N	Y	N	On-request
Elicited emotion by urban trajectory (valence & arousal)	Self-report	Y	N	N	N	Y	N	On-request

2.3.3 Experiment 3: Mobile sensing of stress and emotional effects of daily urban

In this section, we list all the variables collected during Experiment 3 (WP5) at the individual unit level. We point to the following documents for detailed information about the variables:

- Deliverable 5.4 “Report on the results of the outdoor lab experiments”: https://emotionalcities-h2020.eu/resources/

Physical Environment

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
GPS traces	Phone	Y	N	N	Y	Y	N	On-request
POI	OSM	Y	N	N	Y	N	Y	On-request
Streetview	Mapillary	Y	N	N	Y	N	Y	On-request

Population data

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Socio-Demographic	Self-report	Y	N	N	Y	Y	N	On-request
Habits	Self-report	Y	N	N	Y	Y	N	On-request

Attitudes	Self-report	Y	N	N	Y	Y	N	On-request
Psychological Well-being	Self-report	Y	N	N	Y	Y	N	On-request
Personality	Self-report	Y	N	N	Y	Y	N	On-request
Mild cognitive impairment	Self-report	Y	N	N	Y	Y	N	On-request
Chronic Mental States	Self-report	Y	N	N	Y	Y	N	On-request

Health Behaviour

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Activities	Phone App	Y	N	N	Y	Y	N	On-request
Trips	Phone App	Y	N	N	Y	Y	N	On-request

Perceptions

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Ecological Momentary Assessment	Self-report	Y	N	N	Y	Y	N	On-request
Ecological Retrospective Assessment	Self-report	Y	N	N	Y	Y	N	On-request

Physical Health

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
BVP	Wristband	Y	N	N	Y	Y	N	On-request
Skin Temperature	Wristband	Y	N	N	Y	Y	N	On-request
Accelerometer	Wristband	Y	N	N	Y	Y	N	On-request
Impairments	Self-report	Y	N	N	Y	Y	Y	On-request

Mental Health

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
BVP	Wristband	Y	N	N	Y	Y	N	On-request
Skin	Wristband	Y	N	N	Y	Y	N	On-request

Temperature								
Accelerometer	Wristband	Y	N	N	Y	Y	N	On-request
EDA	Wristband	Y	N	N	Y	Y	N	On-request

Well-being

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Ecological Momentary Assessment	Self-report	Y	N	N	Y	Y	N	On-request
Ecological Retrospective Assessment	Self-report	Y	N	N	Y	Y	N	On-request

2.3.4 Experiment 4: Outdoor neuroscience experiments

In this section, we list all the variables collected during Experiment 4 (WP5) at the individual unit level. We point to the following documents for detailed information about the variables:

- Deliverable 5.4 "Report on the results of the outdoor lab experiments": https://emotionalcities-h2020.eu/resources/

Geographical and temporal data

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Time	GNSS ZED-F9R	Y	Y	Y	Y	Y	Y	SDI
Latitude	GNSS ZED-F9R	Y	Y	Y	Y	Y	Y	SDI
Longitude	GNSS ZED-F9R	Y	Y	Y	Y	Y	Y	SDI
Altitude	GNSS ZED-F9R	Y	Y	Y	Y	Y	Y	SDI

Physiological metrics

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
BVP	Wristband	Y	Y	Y	Y	Y	N	On-request
Skin Temperature	Wristband	Y	Y	Y	Y	Y	N	On-request
Accelerometer	Wristband	Y	Y	Y	Y	Y	N	On-request
EDA	Wristband	Y	Y	Y	Y	Y	Y	SDI
EEG	Enobio 32	Y	Y	Y	Y	Y	N	On-request

frequency bands (delta, theta, alpha, beta, gamma bands)								
Frontal alpha asymmetry	Enobio 32	Y	Y	Y	Y	Y	Y	SDI
Theta/beta ratio	Enobio 32	Y	Y	Y	Y	Y	Y	SDI

Environmental data

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Air Temperature	ATMOS22	Y	Y	Y	Y	Y	Y	SDI
Relative Humidity	Humidity Bricklet	Y	Y	Y	Y	Y	Y	SDI
Black Globe Temperature	Thermocouple Bricklet	Y	Y	Y	Y	Y	Y	SDI
Particulate Matter	Particulate Matter Bricklet	Y	Y	Y	Y	Y	Y	SDI
Noise	Sound Pressure Level Bricklet	Y	Y	Y	Y	Y	Y	SDI
Irradiance	Industrial Dual 0-20mA Bricklet	Y	Y	Y	Y	Y	Y	SDI
Air Pressure	Air Quality Bricker Bricklet	Y	Y	Y	Y	Y	Y	SDI
North Wind Speed	ATMOS22	Y	Y	Y	Y	Y	Y	SDI
East Wind Speed	ATMOS22	Y	Y	Y	Y	Y	Y	SDI
Gust Wind	ATMOS22	Y	Y	Y	Y	Y	Y	SDI

Urban Characterisation

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Public space typologies	Observation in situ and Digital cartography (.dwg) of the Municipality of Lisbon	Y	N	N	N	Y	Y	On-request
Slope	Digital cartography	Y	N	N	N	Y	Y	On-request

	(.dwg) of the Municipality of Lisbon							
Sidewalk width	Digital cartography (.dwg) of the Municipality of Lisbon	Y	N	N	N	Y	Y	On-request
System of views	Municipal Master Plan Regulation of the Municipality of Lisbon	Y	N	N	N	Y	Y	On-request

Population data

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Satisfaction with life scale	Self-report	Y	N	Y	N	Y	N	On-request
Behavioral inhibition and activation system	Self-report	Y	N	Y	N	Y	N	On-request
HEXACO	Self-report	Y	N	Y	N	Y	N	On-request
DASS-21	Self-report	Y	N	Y	N	Y	N	On-request
Positive and negative affect schedule	Self-report	Y	N	Y	N	Y	N	On-request

2.3.5 Experiment 5: Clinical experiment

In this section, we list all the variables collected during Experiment 5 (WP5) at the individual unit level. We point to the following documents for detailed information about the variables:

- Deliverable 5.4 “Report on the results of the outdoor lab experiments”: https://emotionalcities-h2020.eu/resources/

Physiological metrics

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
BVP	Wristband	Y	N	Y	N	Y	N	On-request
Skin Temperature	Wristband	Y	N	Y	N	Y	N	On-request
Accelerometer	Wristband	Y	N	Y	N	Y	N	On-request

EDA	Wristband	Y	N	Y	N	Y	N	On-request
EEG frequency bands (delta, theta, alpha, beta, gamma bands)	Enobio 32	Y	N	Y	N	Y	N	On-request
Frontal alpha asymmetry	Enobio 32	Y	N	Y	N	Y	N	On-request
Theta/beta ratio	Enobio 32	Y	N	Y	N	Y	N	On-request

Neuropsychological metrics

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Wechsler memory scale	Self-report	Y	N	Y	N	Y	N	On-request
Blessed dementia rating scale	Self-report	Y	N	Y	N	Y	N	On-request
Geriatric depression rating scale	Self-report	Y	N	Y	N	Y	N	On-request
Mini-mental state examination	Self-report	Y	N	Y	N	Y	N	On-request
Wechsler adult intelligence scale	Self-report	Y	N	Y	N	Y	N	On-request
Subjective memory complaints scale	Self-report	Y	N	Y	N	Y	N	On-request
BLAD - “Bateria de Lisboa para a avaliação de demência”	Self-report	Y	N	N	N	Y	N	On-request

Behavioural metrics

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Allocentric error	Self-report	Y	N	Y	N	Y	N	On-request
Egocentric error	Self-report	Y	N	Y	N	Y	N	On-request

Navigational metrics

Variable	Source	LIS	LDN	LAN	CPH	Single year	Public	Location
Navigational strategy questionnaire	Self-report	Y	N	Y	N	Y	N	On-request

3. Resources

The above open data is available in the project's SDI and visually accessible in the Dashboard.

4.1 SDI

The SDI is available online at https://emotional.byteroad.net/.

The description of the SDI is available in Deliverable 3.3, here: https://emotionalcities-h2020.eu/resources/. The document begins with an introduction and an overview of the showcased data. The main content is divided into three parts: data and metadata ingestion (how data enters the SDI), data publishing (configuring the SDI to publish data using selected standards), and using the SDI (accessing and utilising the published data with various tools).

4.2 Dashboard

The Emotion Dashboard is available online at https://geo.emotionalcities-h2020.eu/ and was updated every 3 months during the length of the project.

For more information on the process of constructing the dashboard, the reader is referred to Deliverable 6.5 - Open access geodatabase of eMOTIONAL Cities II (https://emotionalcities-h2020.eu/wp-content/uploads/2025/01/eMC_2024.09.09_D6.5_Open_Access_Geodatabase_II.pdf).

Finally, a public GitHub repository was established for sharing the code and the documentation of the Dashboard: https://github.com/emotional-cities/dashboard.

4.2 Data beyond the life of the project

The data collected in the various experiments extends its relevance far beyond the project's lifetime, serving as a valuable resource for future research, building knowledge, and policymaking. All data will be archived in a secure repository at a dedicated machine at the Technical University of Denmark, and, at the time of writing, efforts from its migration from the cloud architecture to the local server are underway by ByteRoad (developer and current SDI manager), DTU (host) and the eMOTIONAL Cities consortium lead. We hope that storing public and restricted data for the next 5 years will enable further studies within the scope of eMOTIONAL Cities and beyond. DTU data policy and the eMOTIONAL Cities DMP II (D3.5) meet the European Commission guidelines, GDPR, and H2020 requirements. In the next 5 years, the coordination

between DTU's contact point for data management, DTU's eMOTIONAL Cities team, Byteroad and the project leading team at FMUL and IGOT will continue to ensure ethical governance, transparency, and responsible secondary usage remain paramount to prevent potential misuse.