

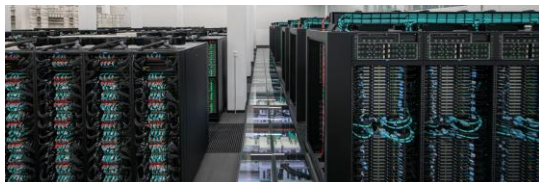


vCity: human-centric digital twins

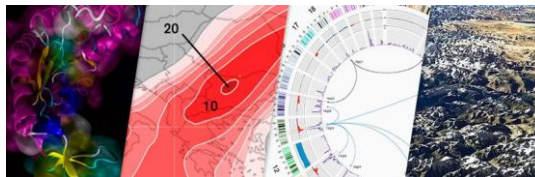


**Barcelona
Supercomputing
Center**

Centro Nacional de Supercomputación



Supercomputing services for
researchers in Europe



R&D in Computer Science, Life
Sciences, Earth Sciences and
Engineering



PhD programmes,
Tech transfer

MARENOSTRUM 5

A EUROPEAN PRE-EXASCALE
SUPERCOMPUTER

Total investment: ~350 M€

314 Petaflops peak performance (314×10^{15})
Will facilitate world-changing scientific
breakthroughs like the creation of digital twins and
the advancement of precision medicine.



HOSTING
CONSORTIUM:

Spain Portugal Turkey



The acquisition and operation of the EuroHPC supercomputer is funded jointly by the EuroHPC Joint Undertaking, through the European Union's Connecting Europe Facility and the Horizon 2020 research and innovation programme, as well as the Participating States Spain, Portugal, and Turkey



Euro HPC: Towards European HPC Technologies



EuroHPC-Ju members

Austria, Belgium,
Bulgaria, Croatia, Cyprus, Czech
Republic, Denmark, Estonia,
Finland, France, Germany,
Greece,
Hungary, Iceland, Ireland, Italy,
Latvia, Lithuania, Luxembourg,
Malta, the Netherlands,
Norway, Poland, Portugal,
Romania, Slovakia, Slovenia,
Spain, Sweden and Turkey.



EuroHPC
Joint Undertaking



"A new legal and funding structure – the EuroHPC Joint Undertaking – shall acquire, build and deploy across Europe a world-class High-Performance Computing (HPC) infrastructure.

It will also support a research and innovation programme to develop the technologies and machines (hardware) as well as the applications (software) that would run on these supercomputers."

AI Factories

Seven consortia selected to establish AI factories which will boost AI innovation in the EU

Press corner

Available languages: English

PRESS RELEASE | Dec 10, 2024 | Brussels | 2 min read

The European High Performance Computing Joint Undertaking (EuroHPC) has selected seven proposals to establish and operate the first AI Factories across Europe. This is a major milestone for Europe in building a thriving ecosystem to train advanced AI models and develop AI solutions. The EU is now one step closer to realising President Ursula von der Leyen's commitment to setting up the first AI Factories.

The first AI Factories will represent a €1.5 billion investment, combining national and EU funding. Half of this amount will be funded by the EU through the Digital Europe Programme for AI infrastructure and Horizon Europe for AIF services. The selected AI Factories will be hosted at leading research and technology hubs across Europe:

- Barcelona, Spain: "BSC AIF" at the Barcelona Supercomputing Centre
- Bologna, Italy: "IT4LIA" at CINECA - Bologna Tecnopolo
- Kajaani, Finland: "LUMI AIF" at CSC
- Bissen, Luxembourg: "Meluxina-AI" at LuxProvide
- Linköping, Sweden: "MIMER" at the University of Linköping
- Stuttgart, Germany: "HammerHAI" at the University of Stuttgart

The 2025 AI Index Report | Stanford University Human-Centered Artificial Intelligence

4. The U.S. still leads in producing top AI models—but China is closing the performance gap.

In 2024, U.S.-based institutions produced 40 notable AI models, significantly outpacing China's 15 and Europe's three. While the U.S. maintains its lead in quantity, Chinese models have rapidly closed the quality gap: performance differences on major benchmarks such as MMLU and HumanEval shrank from double digits in 2023 to near parity in 2024. Meanwhile, China continues to lead in AI publications and patents. At the same time, model development is increasingly global, with notable launches from regions such as the Middle East, Latin America, and Southeast Asia.

Performance of top United States vs. Chinese models on LMSYS Chatbot Arena

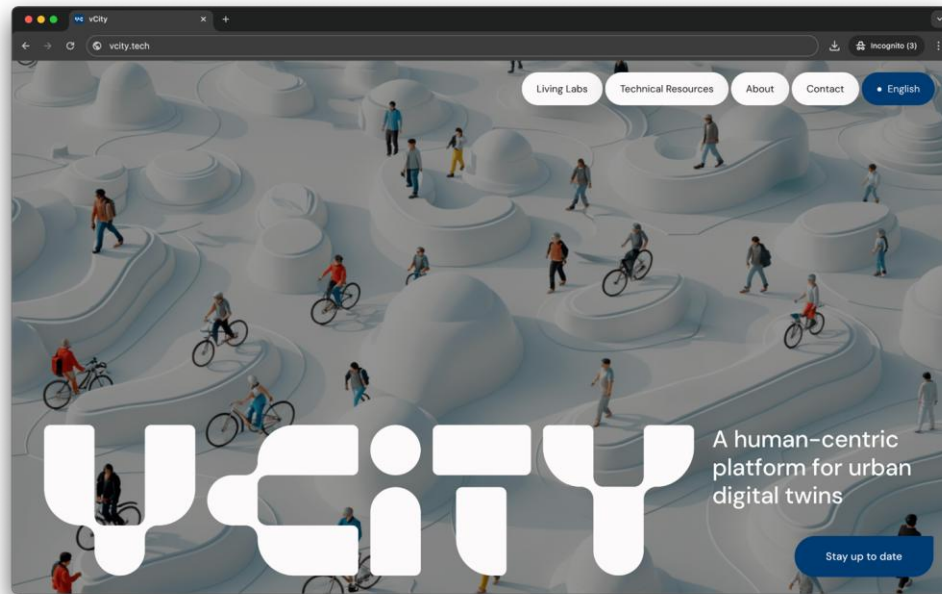
Source: LMSYS, 2025 | Chart: 2025 AI Index report

Month	United States Score	China Score
2024-Jan	1,220	1,100
2024-Feb	1,250	1,150
2024-Mar	1,260	1,160
2024-Apr	1,280	1,240
2024-May	1,280	1,240
2024-Jun	1,280	1,240
2024-Jul	1,300	1,240
2024-Aug	1,350	1,240
2024-Sep	1,340	1,280
2024-Oct	1,360	1,280
2024-Nov	1,370	1,320
2024-Dec	1,375	1,350
2025-Jan	1,385	1,362

vCity

Planning an urban future that puts citizens first.

- vCity: evidence-based platform to help assess the impact of new interventions on all aspects of city life.
- human-centric, modular, adaptable
- 20+ multidisciplinary team
- 30+ subcontractors



GOBIERNO DE ESPAÑA

VICERRENCIA PRIMERA DEL GOBIERNO MINISTERIO DE ASUNTOS ECONÓMICOS Y TRANSFORMACIÓN DIGITAL



Funded by the European Union NextGenerationEU



UNICO I+D Cloud

Platform + Use cases + studies

Co-creation process

- With the cities involved
 - Barcelona, Spain
 - Viladecans, Spain
 - Kobe, Japan
- Use cases
 - scenarios
 - indicators
- UI/UX

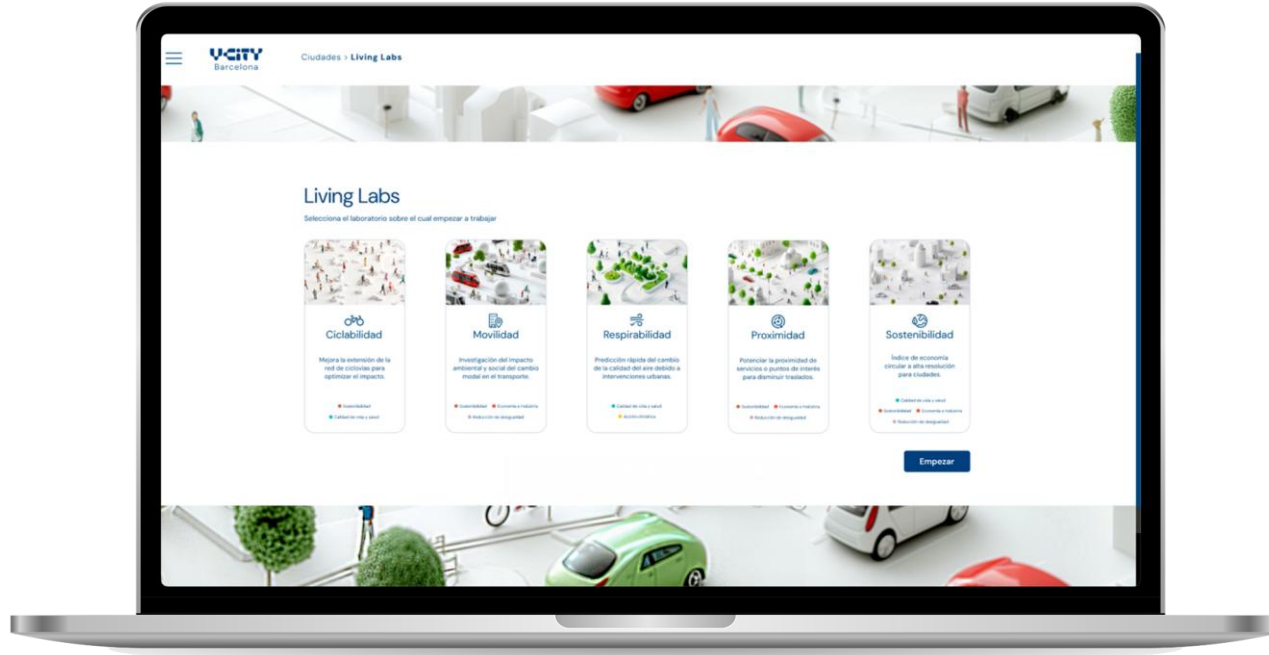


vCity

Planning an urban future that puts citizens first.

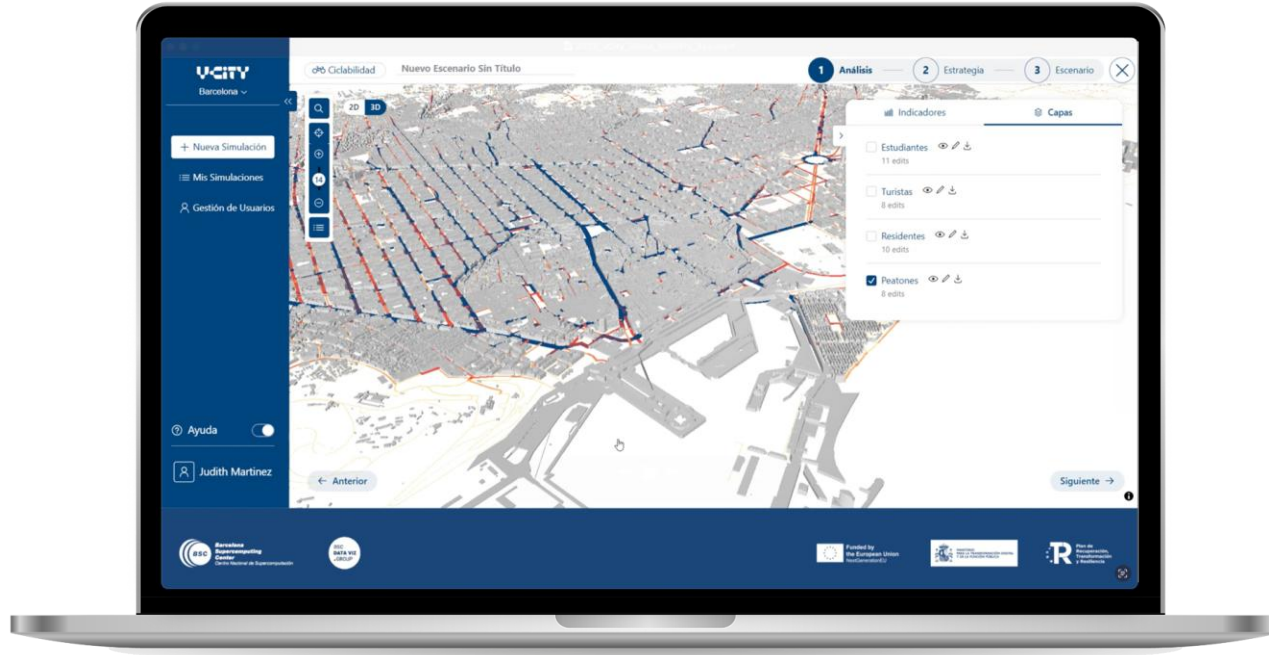


Planning an urban future that puts citizens first.



vCity

Planning an urban future that puts citizens first.



vCity

Planning an urban future that puts citizens first.



Platform + Use cases + studies



Cycling

Plan and implement an efficient network of cycle lanes.



Breathing

Rapid prediction of air quality changes due to urban interventions.



Mobility

Investigate the environmental and social impacts of different dimensions of multimodal transport.



Sustainability

Extend the circular economy index to high resolution for cities.



Proximity

Promote the proximity of services or points of interest to reduce transfers.

Quality of life and health

Industry and economy

Sustainability

Reduction of inequalities

Climate Action

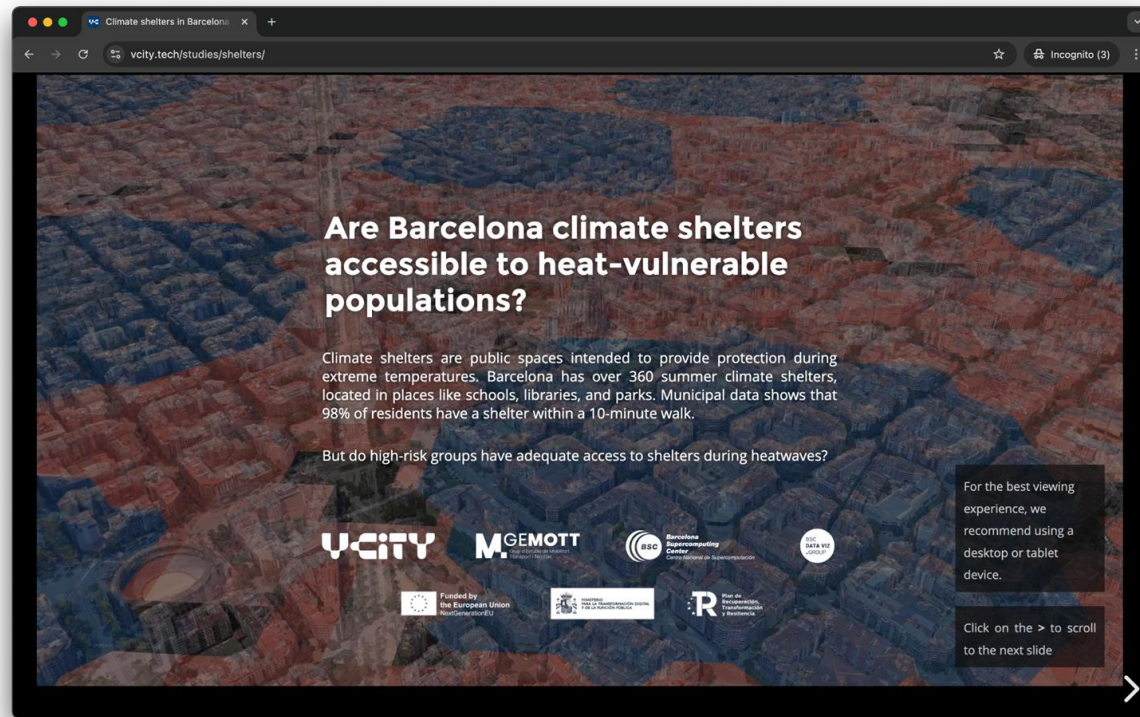
Platform + Use cases + **studies**

vCity studies: circular city index



<https://www.vcity.tech/studies/circular>

vCity studies: climate shelters



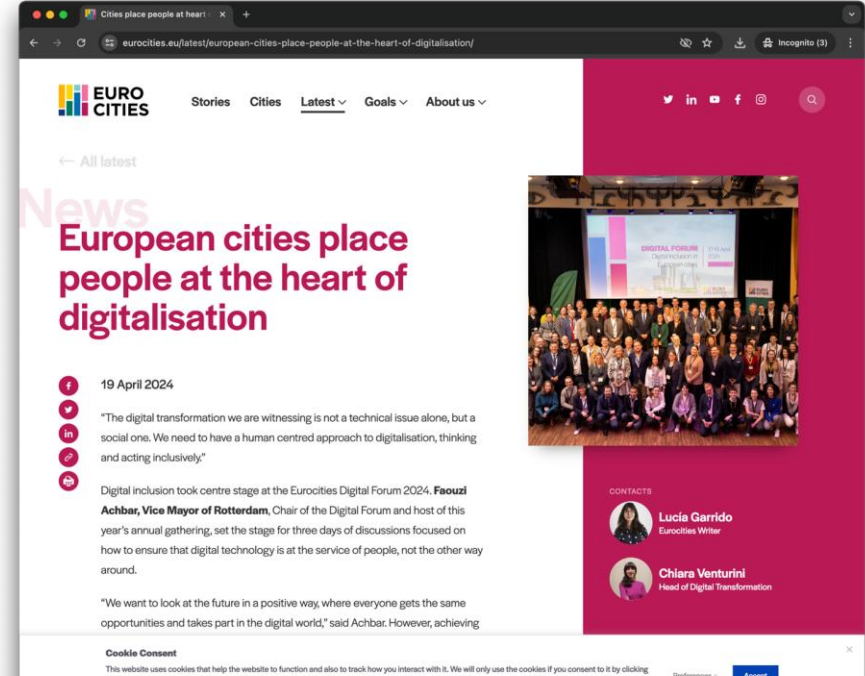
<https://www.vcity.tech/studies/shelters>

04

People-centred solutions

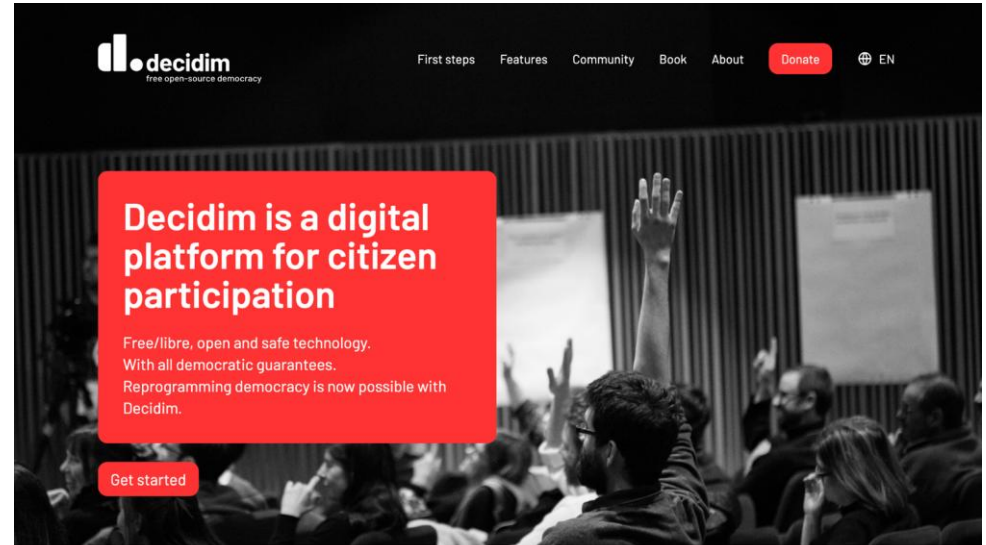
Eurocities Digital Forum 2024

- *"Digitalisation should be **people-centred**"*
- *"The **smartest** cities are the most **sustainable**"*
- Digital inclusion



Participatory democracy

- What do **citizens want** for their **city**?
- How citizens **feel** about their **city**?



05

Multidisciplinary effort

Data Analytics & Visualization Group



Fernando Cucchiatti



Patricio Reyes



Carlos García



Laura Roldán



Guillermo Marín



Sol Bucalo



David García



Jerónimo Calderón



Marzieh Karimi



Marta Esteban



Paula Fernández



Marc Heras



Raquel Barrachina



Adria Espinoza



Roger González



Alex Gil



Luca Liebscht



Tomás Andrade



M'riam Herrero



Paula Méndez

vCity advisors



Ana Freire
*Doctorado en Ciencias
Informáticas*

Diseño de metodología de
transparencia en uso de GD



Andy Kirk
*Experto en Visualización
de Datos*

Diseño de dashboards



Federica Bordelot
Directora de Política e Impacto

Diseño de metodología de reducción
en el sesgo en GD



Federico J. Fernández
*Investigador en Ciencias de la
Computación*

Ciencia de datos computacional



Francesca Bria
Profesora de Innovación

Diseño de políticas y estrategias
de implementación de GD en
ciudades



Francisco Rowe
*Laboratorio de Ciencia de
Datos Geográficos*

Diseño de aplicaciones e interfaces
para ciudadanía



Michael Szell
Profesor asociado

Diseño de aplicaciones e interfaces
para ciudadanía



Thais Ruiz de Alda
Experta en tecnología y digital

Perspectiva de género en Tecnología



Rossano Schifanella
Profesor asociado e investigador

Diseño de arquitectura de Casos de Uso



Tania Marcos
*Responsable de Calidad y Ciudades
Inteligentes y Sostenibles*

Diseño políticas de detección de sesgos



Vicente Gualart
Arquitecto

Estudio de aplicabilidad

Visitors



Serena Mombelli

*Universitat Autònoma de
Barcelona, Grupo GEMOTT,
España*



Yohsuke Murase

*Riken,
Japón*



Carmen Cabrera

*University of Liverpool,
Reino Unido*



Fabián Hernández

*TEC Monterrey,
México*



Alex Capilla

*Universitat de Barcelona,
España*



Roger González

*Universitat de Barcelona,
España*



Miguel Carrasco

*University of Los Andes,
Chile*



Tomás Andrade

*Universitat de Barcelona,
España*



Paula Benito

*Universitat Politècnica de Catalunya
(UPC), España*



Giovanni Mauro

*ISTI-CNR, IMT Alti Studi Lucca,
Italia*



Luca Liebscht

*Universitat Politècnica de
Catalunya (UPC), España*



Pablo Villar

*NIC Chile Research Lab,
Chile*

Collaborators



300.000 Km/s	ARUP	CARTO	CETAQUA	DECIDIM	DigitalFems	Domestic Data Streamers
Eurocities	Festival Cruilla	Festival Sonar	GeoSolutions	Guadaltel	Gualart Architects	IAAC
Idealista	INTRA	iThinkUPC	LIS Data	Logicalis	MCrit	Memorandum
MongoDB	Taller Estampa	TC-Street	TomTom	Universidad Autónoma de Barcelona	University of Bologna	University of Liverpool
Universitat Oberta de Catalunya	Universidad Pompeu Fabra	University of Torino	Urbanly	Wizzie	Yonder	



**Barcelona
Supercomputing
Center**
Centro Nacional de Supercomputación



**Funded by
the European Union**
NextGenerationEU



**Plan de
Recuperación,
Transformación
y Resiliencia**

The UNICO-GDU-HPC project, part of the UNICO I+D Cloud programme, has the Ministry for Digital Transformation and of Civil Service and the EU-Next Generation EU as financing entities, within the framework of the PRTR and the MRR.

Thanks!

www.vcity.tech
hello@vcity.tech

Patricio Reyes
Head of Urban Data Science
Data Analytics and Visualization
Group
BSC

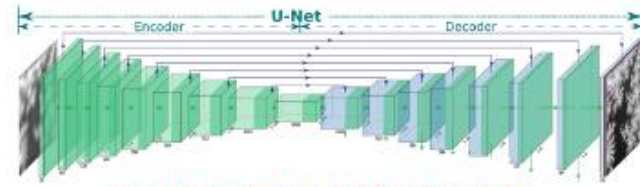


Fast prediction of air quality change due to urban interventions

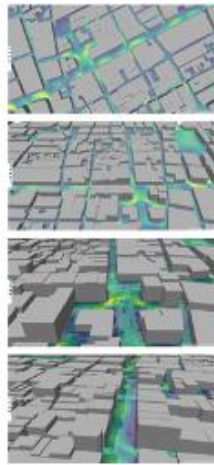
AI prediction of wind speed
Mobility provided emission map
Simplified contaminant advection
Demographics data/models (w/mobility)



Input: Geometry



CFD-based training dataset



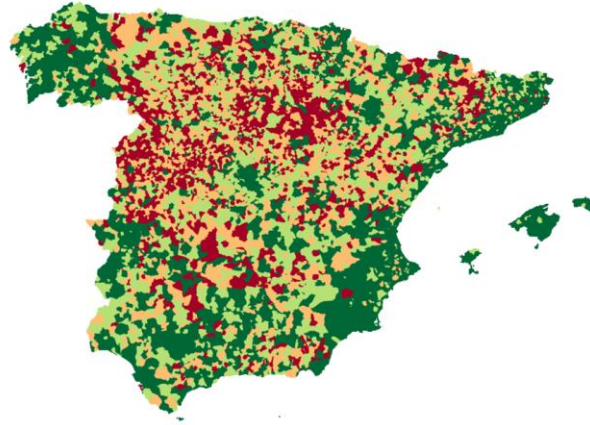
Output: Wind Field

⇒ Breathing



Compute scenarios of the circular city index at sub-city resolution

Data on 15 categories to estimate index
(Publicly available datasets homogeneous for 16K municipalities in Spain and Italy)
Demographics growth model for scenarios



[Circular City Index: An Open Data analysis to assess the urban circularity preparedness of cities to address the green transition -- A study on the Italian municipalities.](#) Muscillo et al

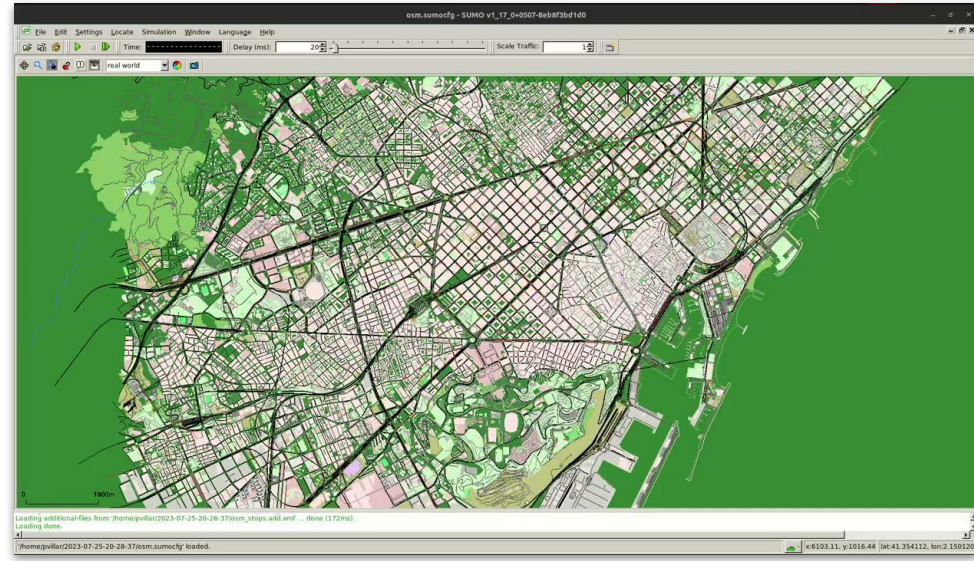


Sustainability



Pedestrian flow prediction

OD matrix prediction (from data and models)
Multi-modal mobility simulation (SUMO) from OD matrix

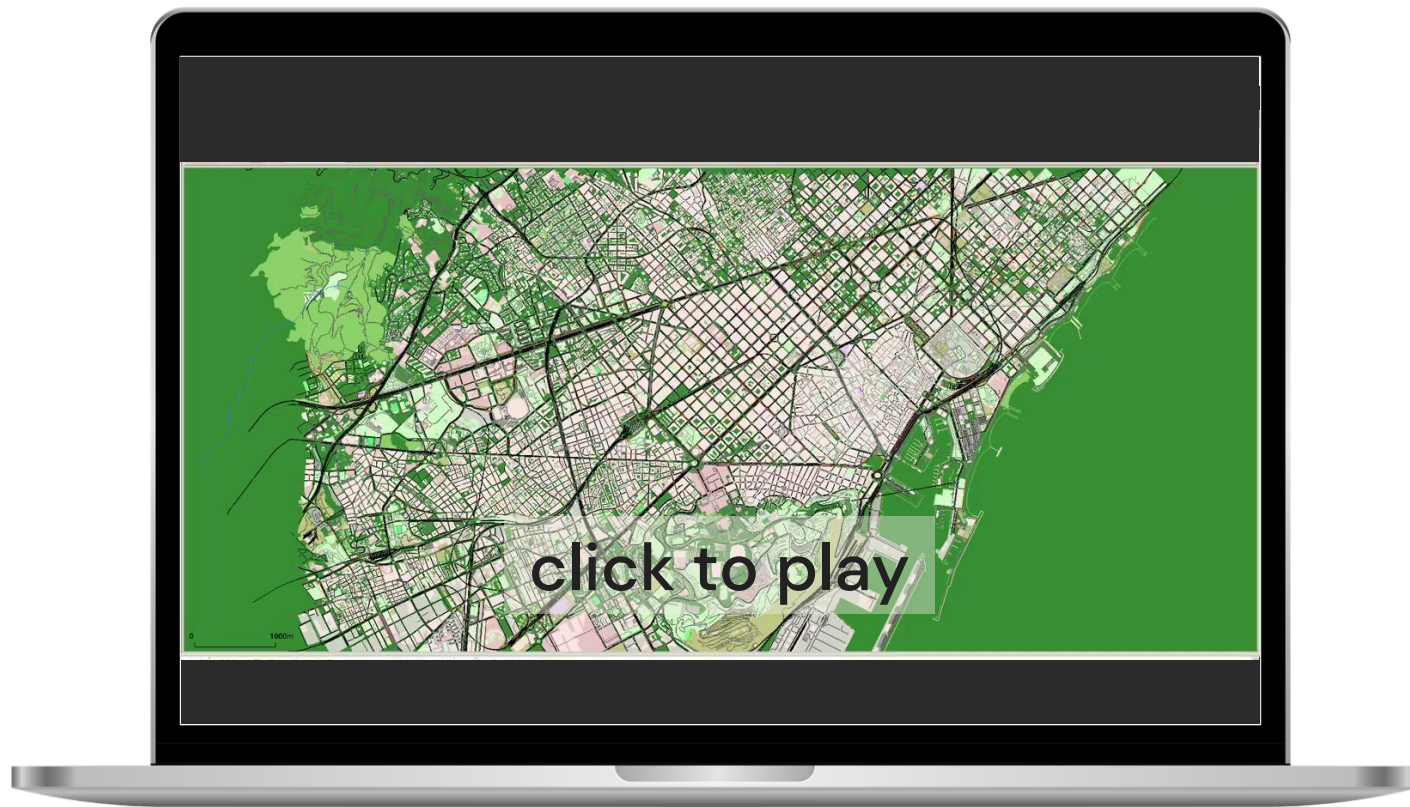


Mobility





Urban mobility



source:
vCity

Improve accessibility to daily needs.

Demographics models

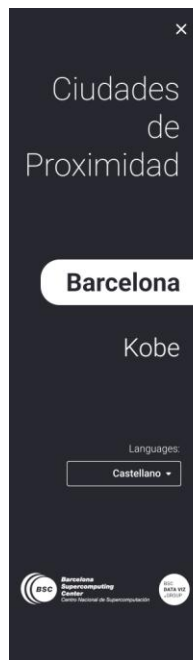
Daily routines data

Mobility models

Proximity estimation

Relocation algorithm (in collaboration with Sony CSL)

 Proximity



¿Es **Barcelona** una ciudad de proximidad?



El mapa muestra las áreas en **Barcelona, Barcelona, España** desde las que se puede llegar a una instalación de tipo **biblioteca** en **15 minutos a pie**.

Tipo de instalación



Medio de transporte



Tiempo máximo para llegar a una instalación (en minutos)



Para más información sobre los tipos de instalaciones disponibles, ver [OpenStreetMap](https://openstreetmap.org) wiki. © openrouteservice.org por HERE | Datos del mapa colaboradores de © OpenStreetMap. Isorunas basadas en OpenRouteService Streamlit-city-coverage, v0.17.0. Equipo de Análisis de Datos y Visualización, Barcelona Supercomputing Center, BSC.



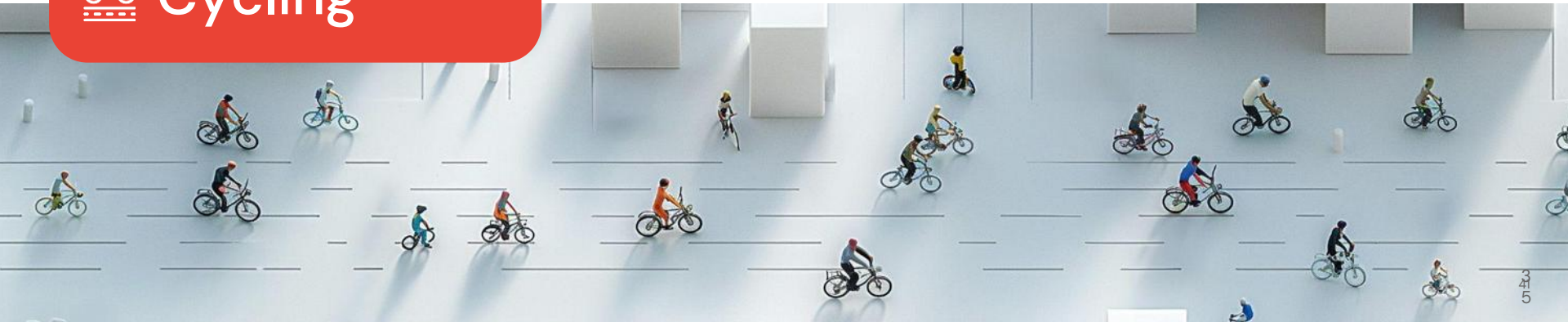
Optimizing impact and ROI on bike network expansion

Based on data-driven graph-network optimization (M. Szell et al)

Incorporates socio-demographics and preference data to guide priorities in optimization.



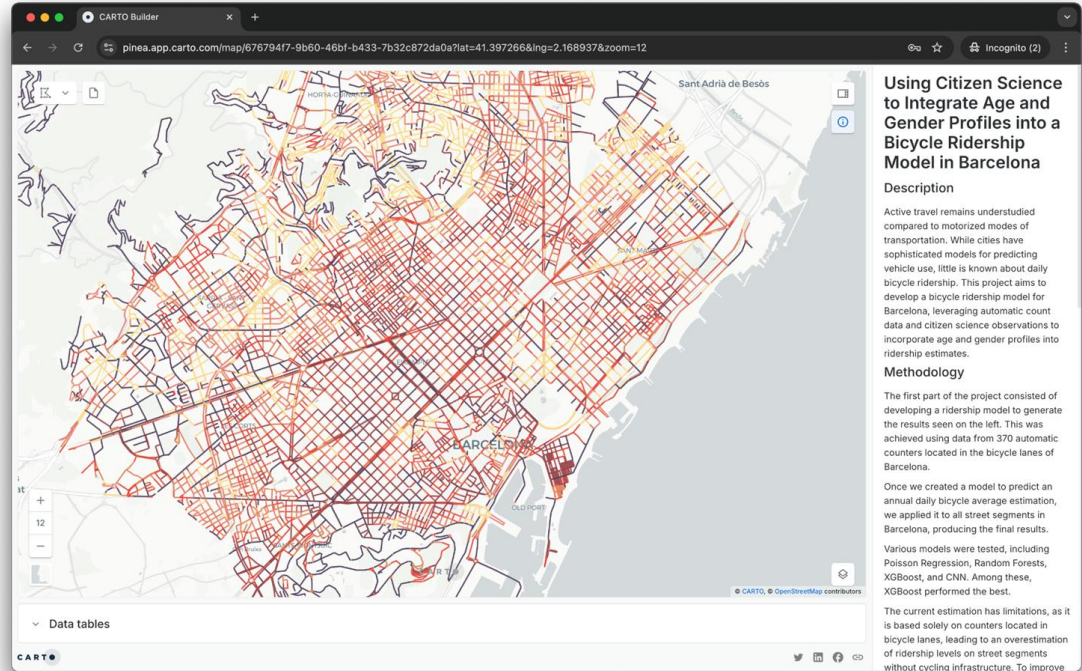
Cycling



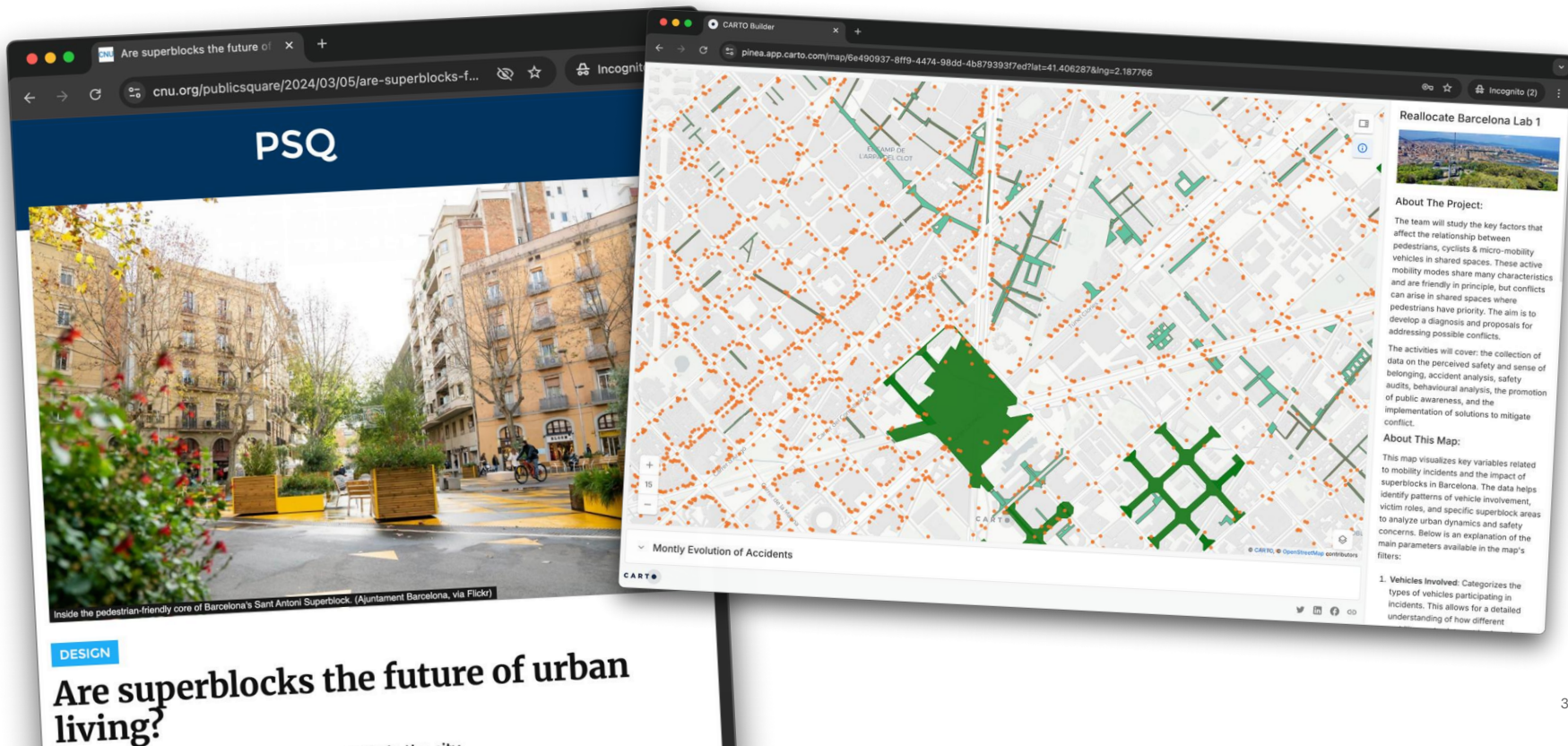
Projects related

Cyclepath traffic modeling

- Cyclepath categorization
- Data source:
 - Bike counters from city council
- External collaborators:
 - Jordi Honey-Roses (UAB)
 - Mintu Miah (SafeTREC, UC Berkeley)

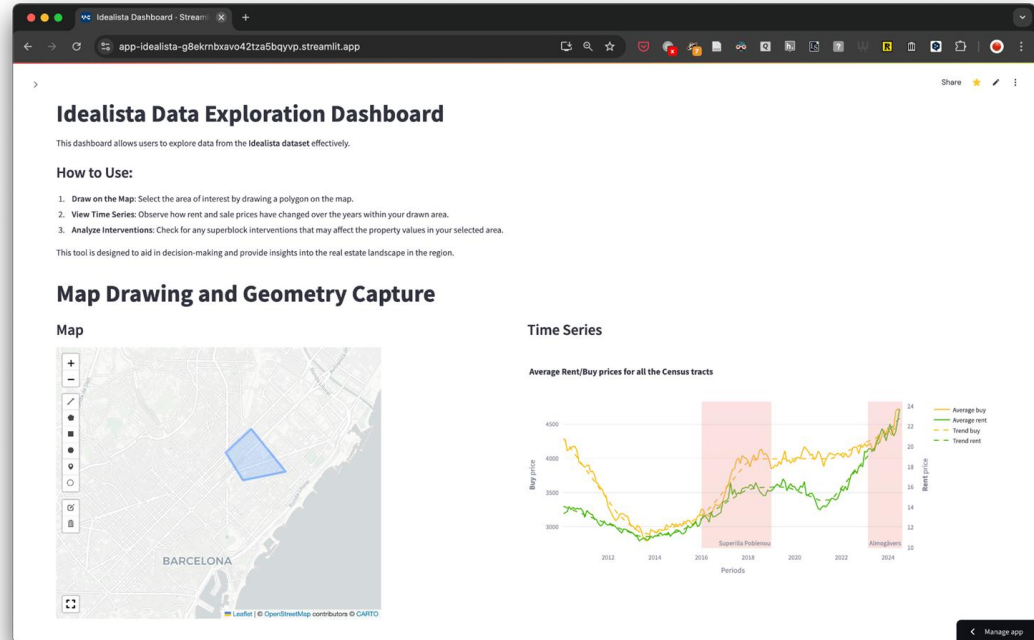


REALLOCATE: Urban interventions & accidents



Housing affordability

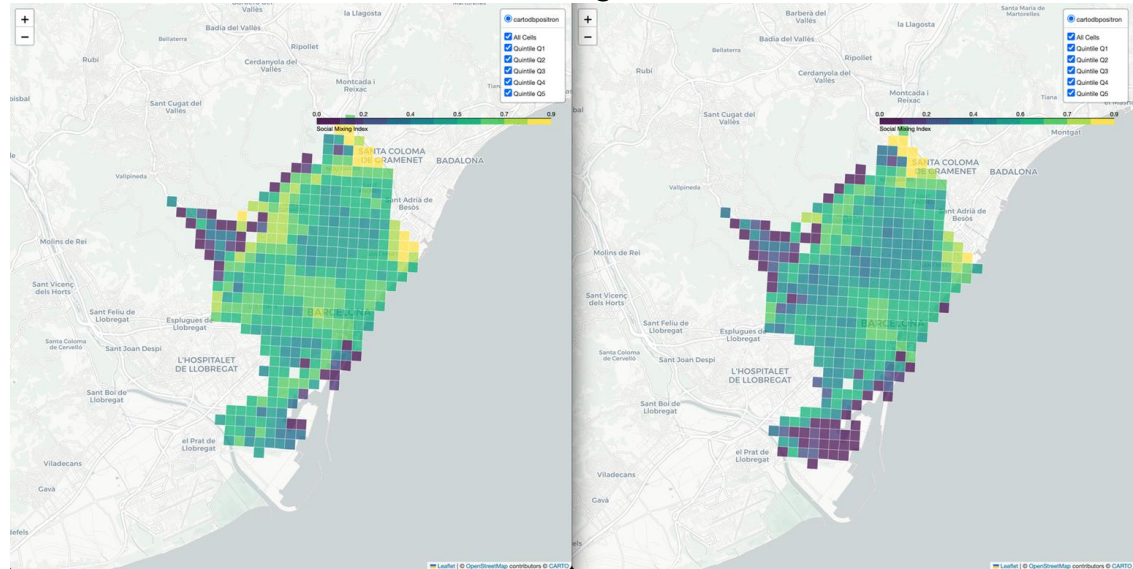
- Data: idealista.com
- buy/rent timeseries
 - 2010-2024
 - census-tracts (~1100)



Mobility justice & social-mixing

- Data: mobile phones
 - Spatio-temporal
 - 4h
 - 500m x 500m
 - home vs other activities

Social mixing indicator

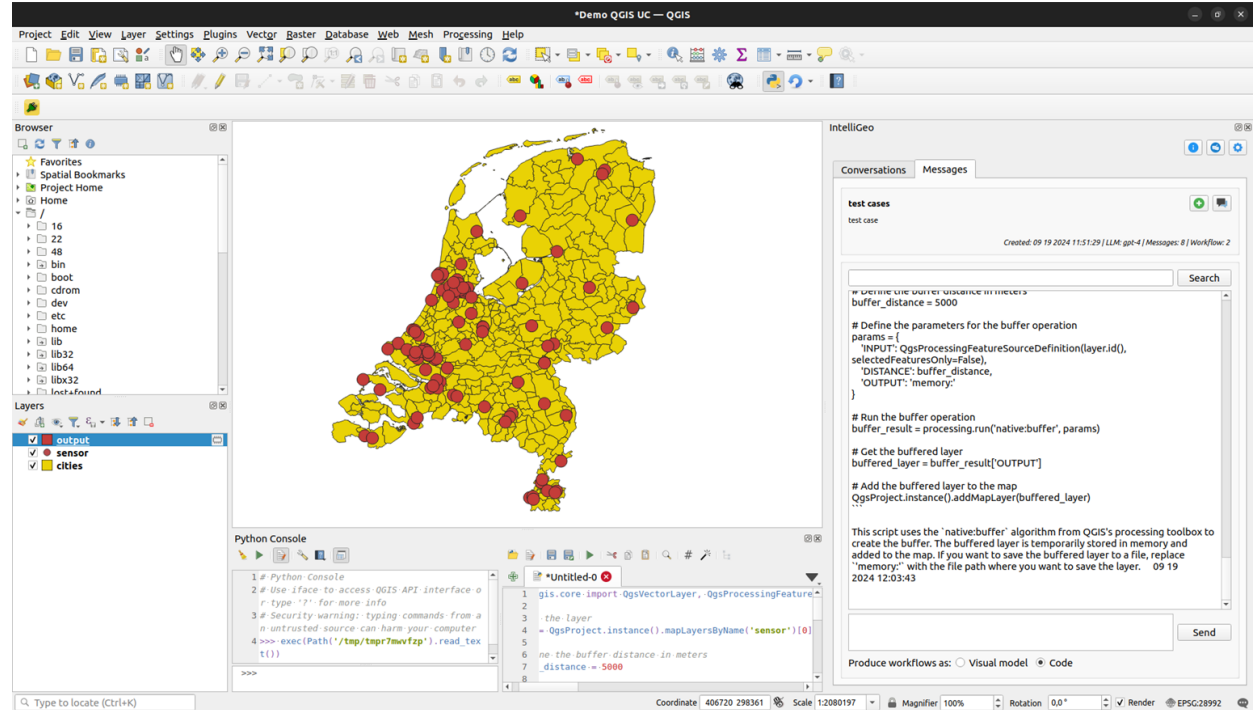


Monday to Friday

Saturday, Sunday

LLMs into GIS

- QGIS chatbot plugin
- www.intelligeogeo.org
- ITC, University of Twente



How to collaborate

- European research programme
- BSC AI-Factory
- 1-1 collaborations
 - Cities
 - Institutions

