

Spatial Analysis and Visualization

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Spatial Analysis

Most human activities and interests are related to locations.

Areas and buildings have specific purposes.

So, most created data are related to location in some way.

Location-related data is also called spatial data or geospatial data.

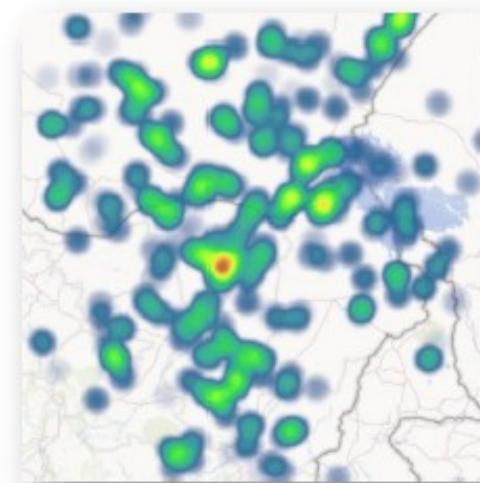
Spatial analysis is a process to gain insight from location-related data and solve location-related problems.

“Everything is related to everything else, but near things are more related than distant things.”
The first law of geography, Waldo Tobler, 1970.

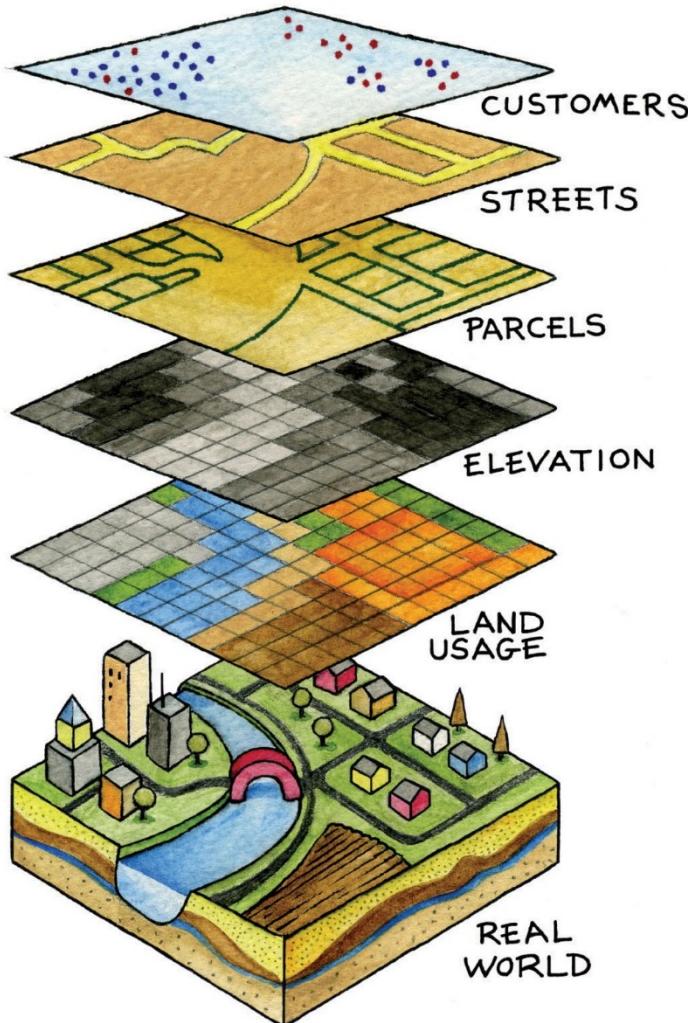
Map

Map is the primary visualization method for spatial data and an effective tool for spatial analysis.

Latitude	Longitude	PlaceName	Death
13.58801	11.0956	P1	0
9.878124	12.55918	P2	4
14.65398	10.18044	P3	0
15.22057	9.993003	P4	5
13.16265	12.96319	P5	4
13.80617	8.889046	P6	2
13.10214	10.56081	P7	4
11.00403	11.86713	P8	2



Geospatial Data Layers



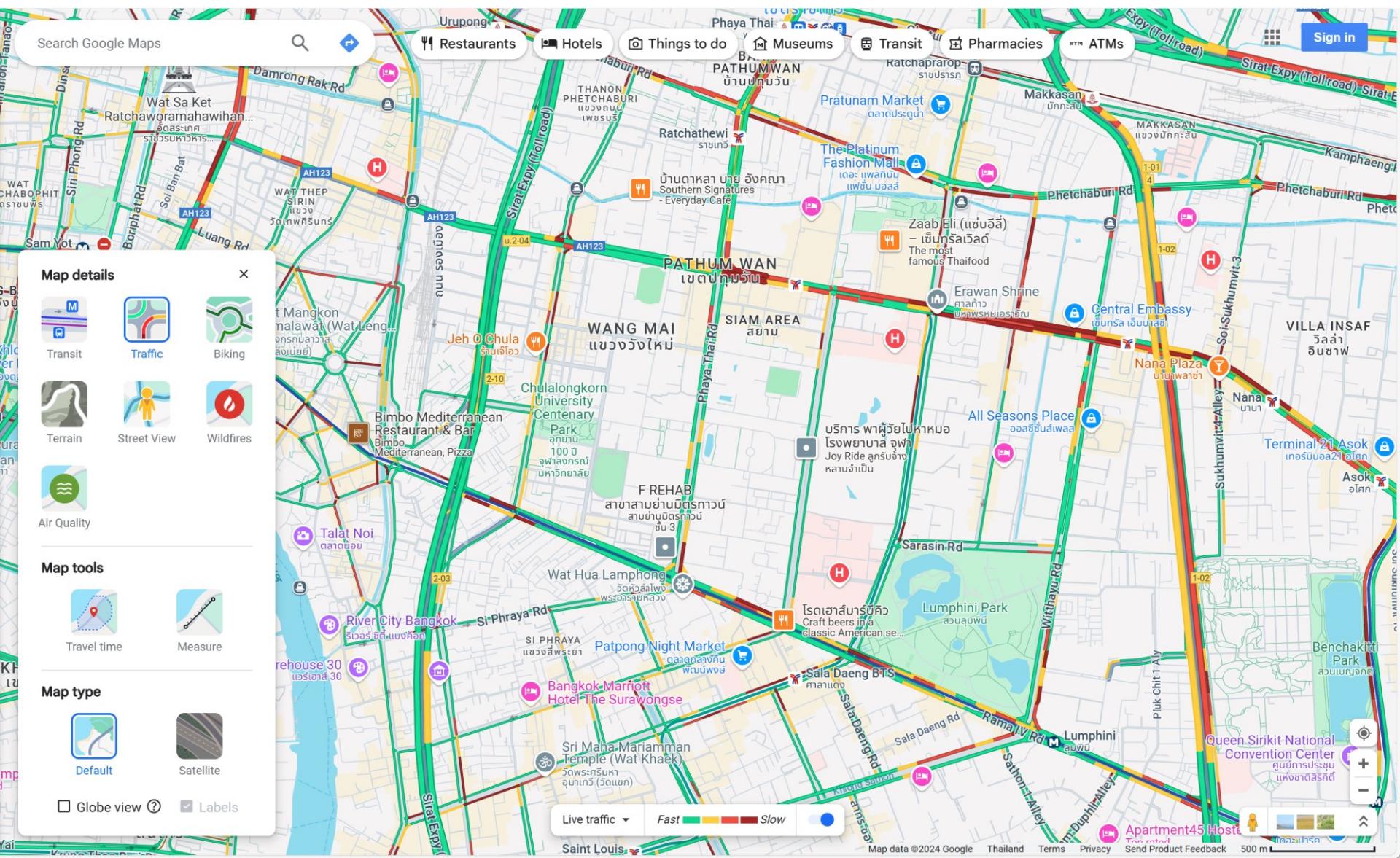
All geospatial datasets refer to locations on Earth.

So, they can be **overlaid**.

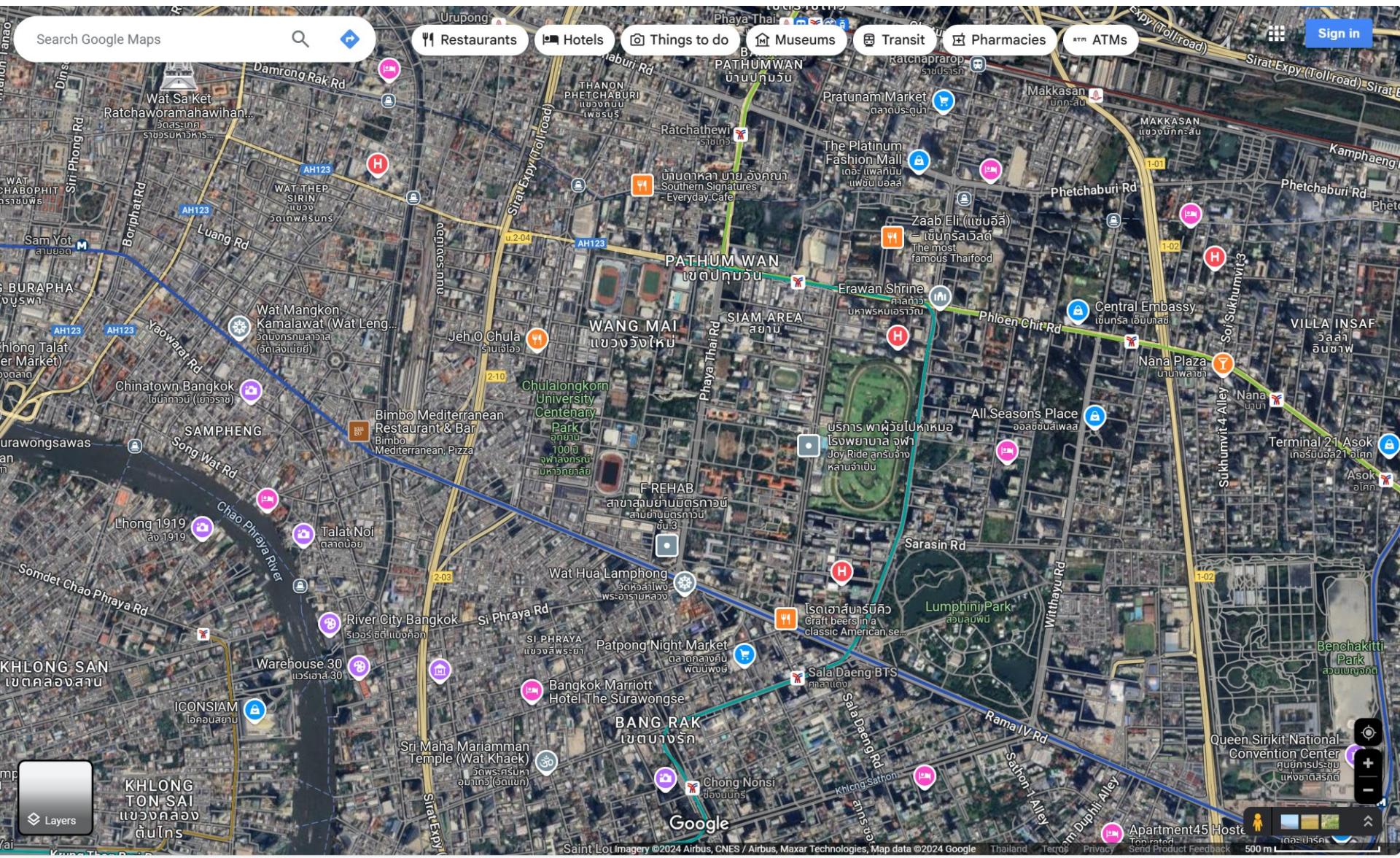
Basic Types of Spatial Data

- Points
- Lines
- Polygons
- Raster (image)

Google Maps



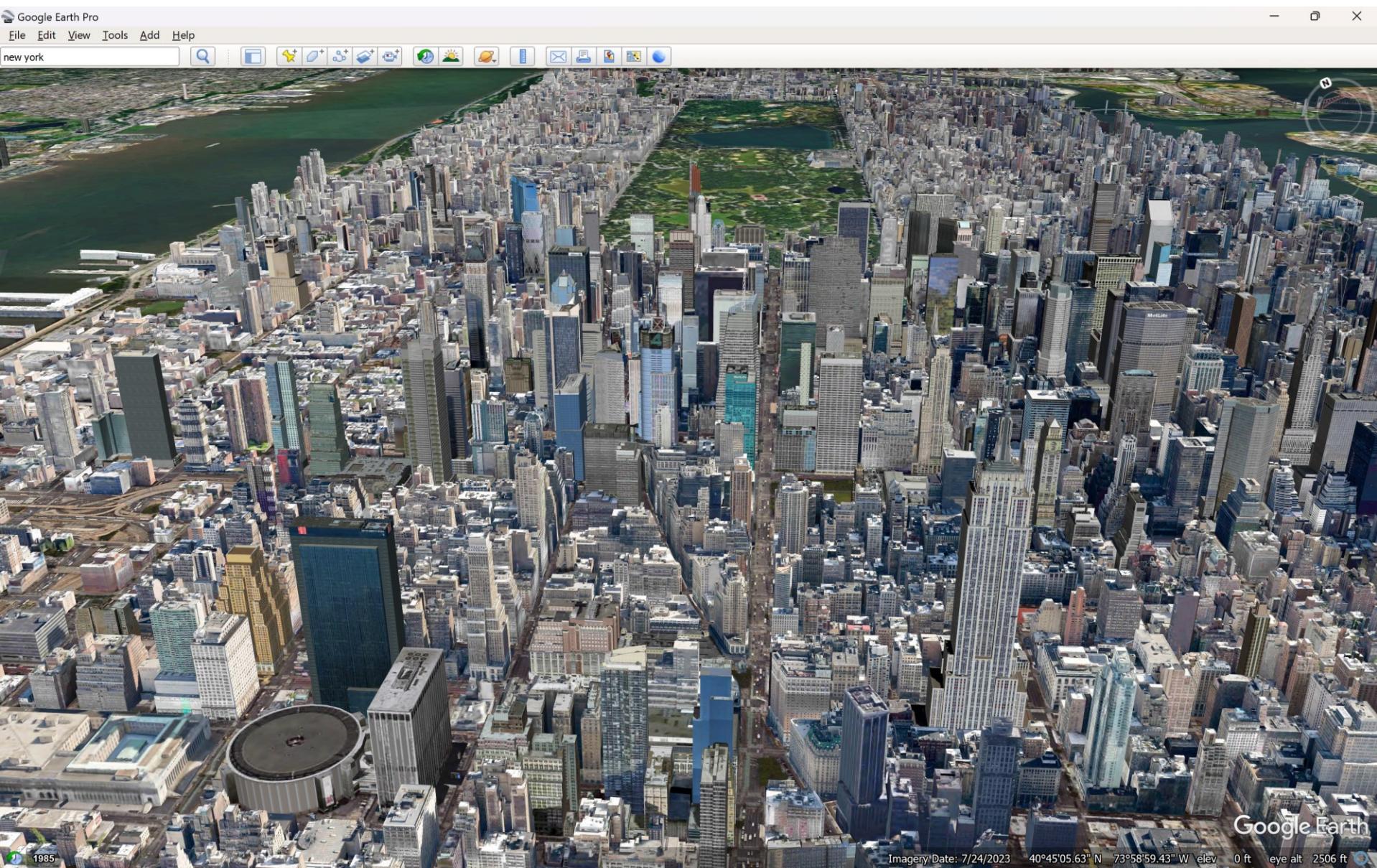
Google Maps: Satellite Basemap



Google StreetView: 360° images



Google Earth: 3D Buildings



ระบบค้นหารูปแปลงที่ดิน (กรมที่ดิน): Land Parcels

<https://landsmaps.dol.go.th/>

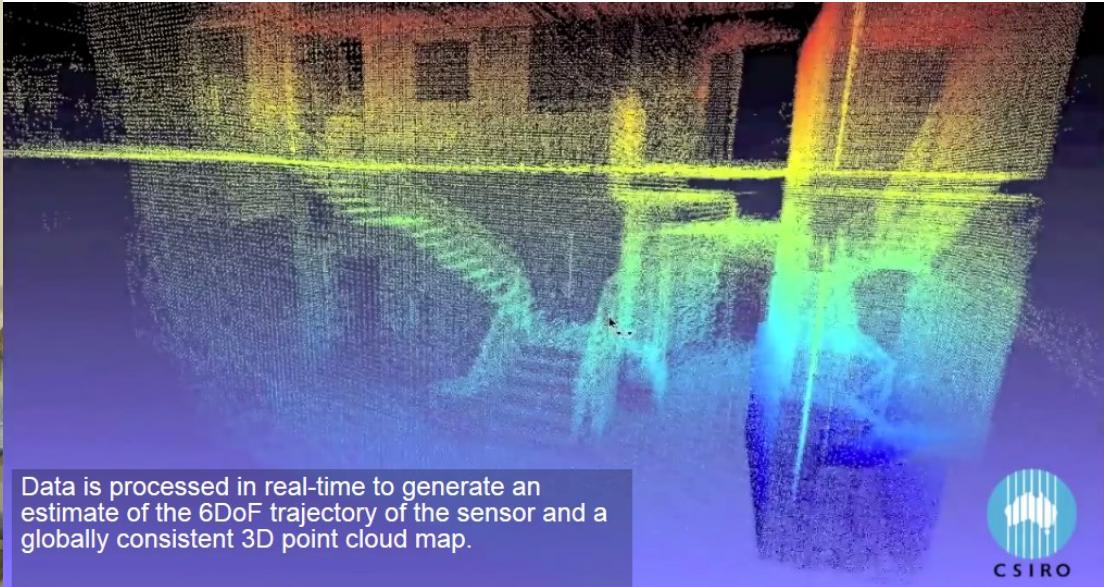
The screenshot shows a detailed map of a specific area in Bangkok, Thailand, overlaid with a grid of red lines representing land parcels. A red pin marks a specific location on the map. A tooltip window is open at this location, displaying the following information:

เลขโฉนดที่ดิน	xxxxx15
หน้าสำรวจ	xxxx85
เลขที่ดิน	xxxxx03
ระวัง	5136 III 6418-15 (1000)
ตัวบล	บางรัก
อำเภอ	บางรัก
จังหวัด	กรุงเทพมหานคร
เนื้อที่	1 ไร 0 งาน 43.0 ตารางวา
ราคาประเมินที่ดิน (กรมธนารักษ์)	350,000 บาทต่อตารางวา หรือต่อตร.ว.ส่วนผ่านทาง
ค่าพิสดารแปลง	เว็บไซต์กรมธนารักษ์ หรือติดต่อสำนักงานที่ดิน 13.73237654,100.52647472
ข้อมูลการเดินทาง	จากที่นี่ไปยังแปลงที่ดิน จากแปลงที่ดินไปยังสำนักงานที่ดิน

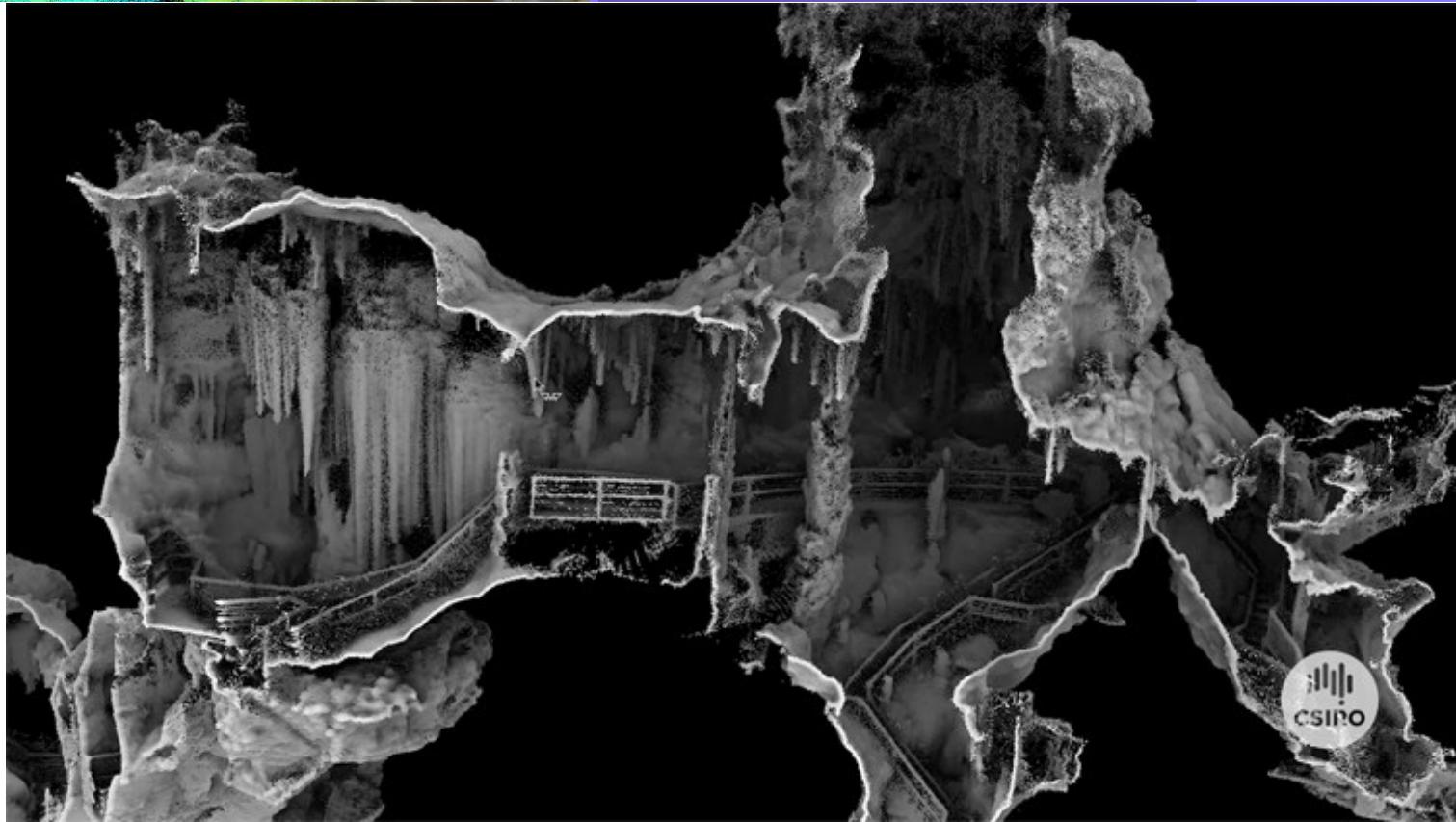
The map also features several labels for nearby landmarks and businesses, such as Samyan Mitrowin Shopping mall, Somboon Seafood, Sam Yan, Big C Foodplace, Nisit Clothing Store, Urban Jungle Hotel, Wat Hua Lamphong, and various restaurants like Sodapong Noodle, Samyan Story boutique hotel, and Poo Tee Shrimp Wonton Noodle.

With modern mapping techniques,
everywhere, out-door and in-door,
will be on high-resolution map.





Data is processed in real-time to generate an estimate of the 6DoF trajectory of the sensor and a globally consistent 3D point cloud map.



OpenStreetMap

OpenStreetMap

Edit

History Export GPS Traces User Diaries Communities Copyright Help About

PomVeera

Edit feature

Feature Type: Building

Fields:

- Name: อาคารเจริญวิศวกรรม
- Multilingual Name:
 - English: Engineering 4 Building
- Building: yes
- Levels: 20
- Height (Meters): Unknown
- Address:
 - 123 Place
 - Street
 - Subdistrict
 - District

Point Line Area

Inspect Add Feature

Parking Lot 7

Na Baromma Roop Lawn

Prachumkorn ground

Engineering 3 Building

Phaya Thai Road

Chalandon Road

Henri Dunant Road

Gate 3

Gate 4

Gate 5

300 ft

Edits by Kri_itt, PingNattawoot, Earthkk, and 56 others

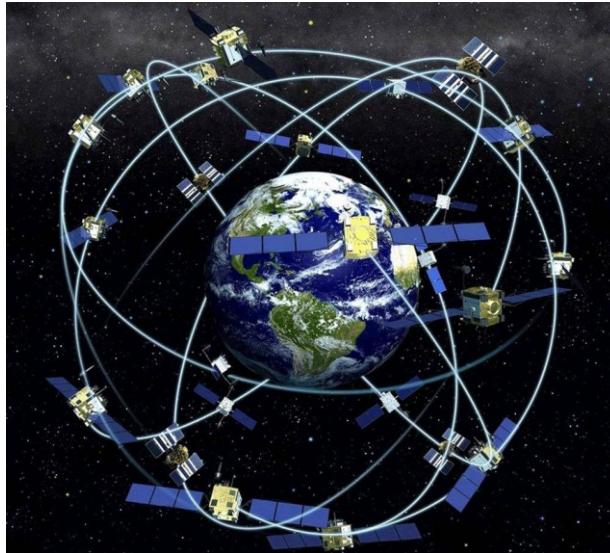
814 hidden features

A 2.30.4

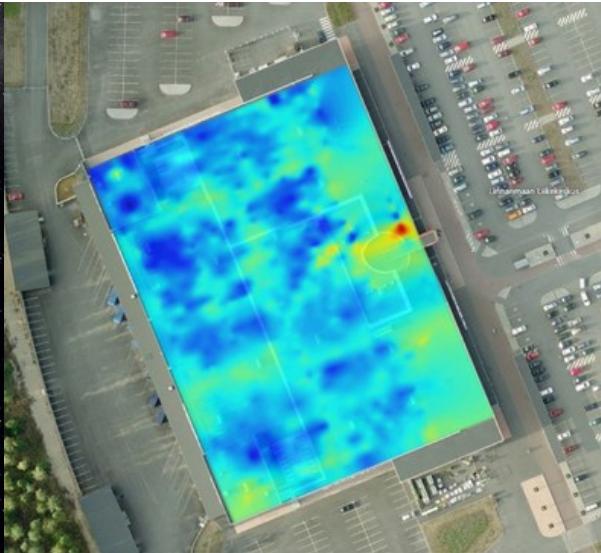
With modern positioning techniques,
everything can be located.

Location Technologies

GPS



WiFi



Bluetooth/Beacon



Any kind of smart devices with known locations can be used as **sensors** that collect geospatial data.

People as Sensors

Sprint 2:37 PM 29%

Back Share

Howling Wolf Taqueria

8.7 Mexican Restaurant, Art Gallery, M... Open until Midnight

\$\$\$\$ • Takes Credit Cards • Serves Brunc...

Save Check In Here

Map showing the location of Howling Wolf Taqueria, including nearby landmarks like the Count Orlok's Nightmare Gallery and the Pirate Museum.

2 friends have been here

Lafayette St New-Derby St



Sensors in Transportation



Air4Thai รายงานสภาพอากาศ (กรมควบคุมมลพิษ)

<http://air4thai.pcd.go.th/>

Air4Thai

หน้าแรก

รายการ

ข้อมูลย้อนหลัง

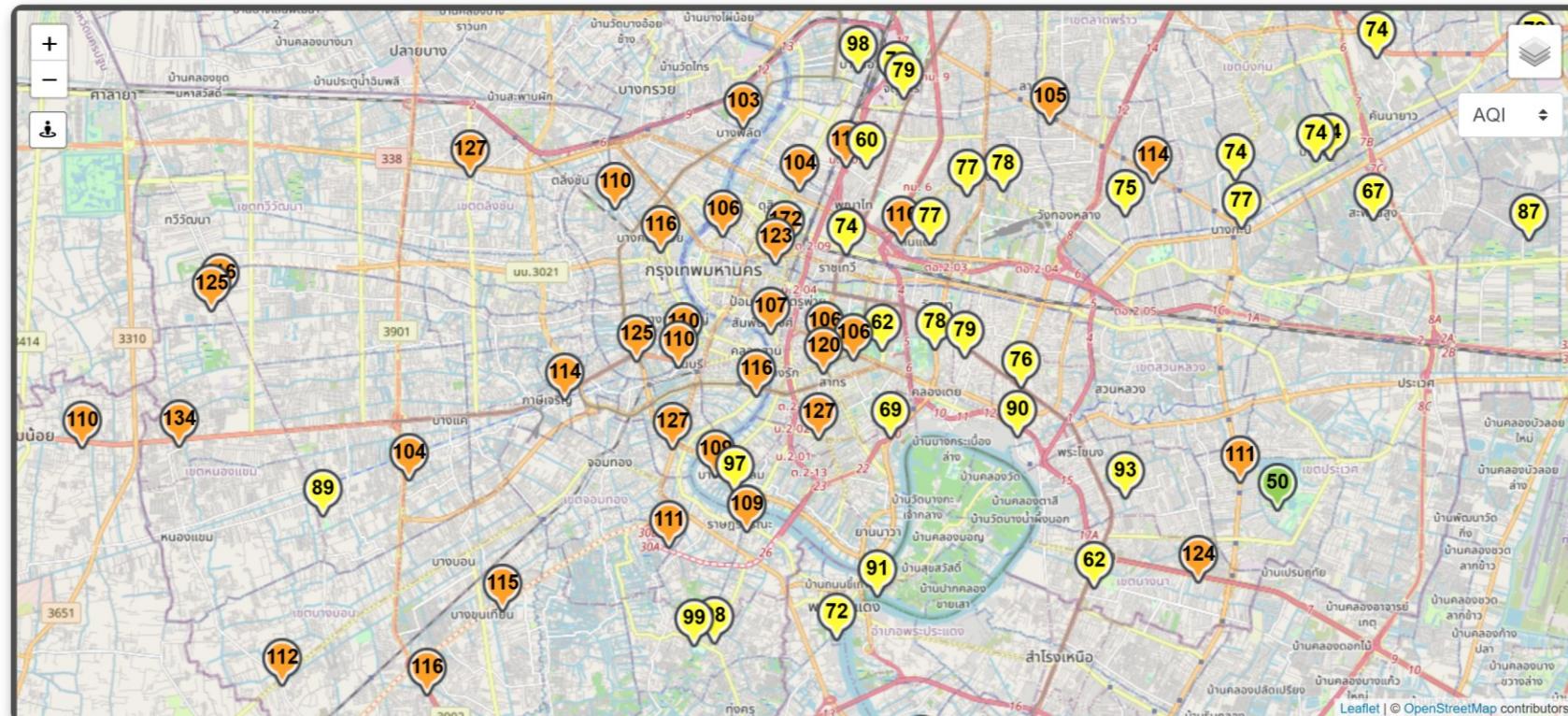
เที่ยวบินคุณภาพอากาศ

ดาวน์โหลด

คำนำที่เพ็บบอย



ประจำวันพฤหัสบดี ที่ 14 พ.ย. 2567 เวลา 22:00 น.



ดีมาก

ดี

ปานกลาง

รึ่นเมืองกระบกต่อสุขภาพ

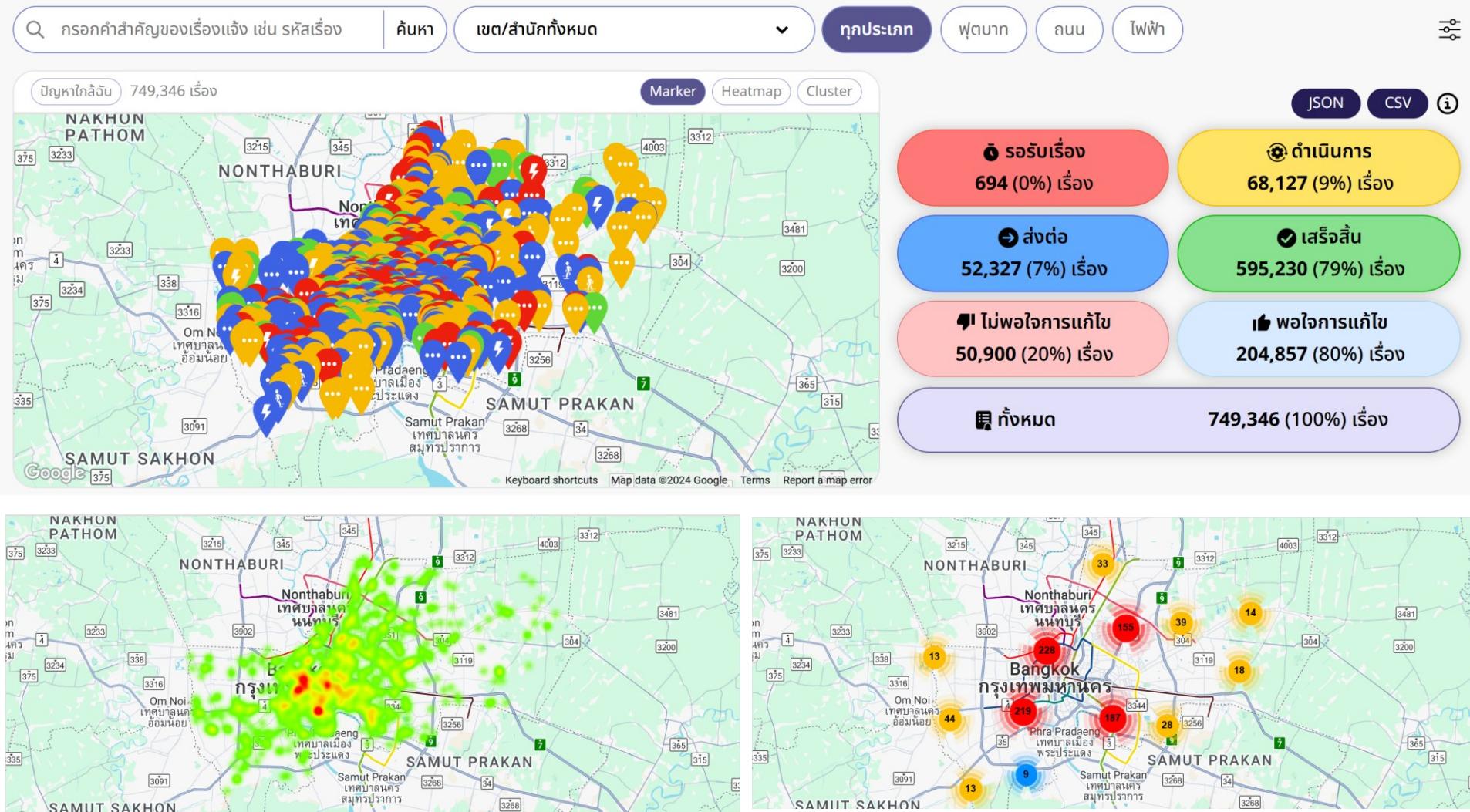
มลพิษกระบกต่อสุขภาพ

Types of Location Data

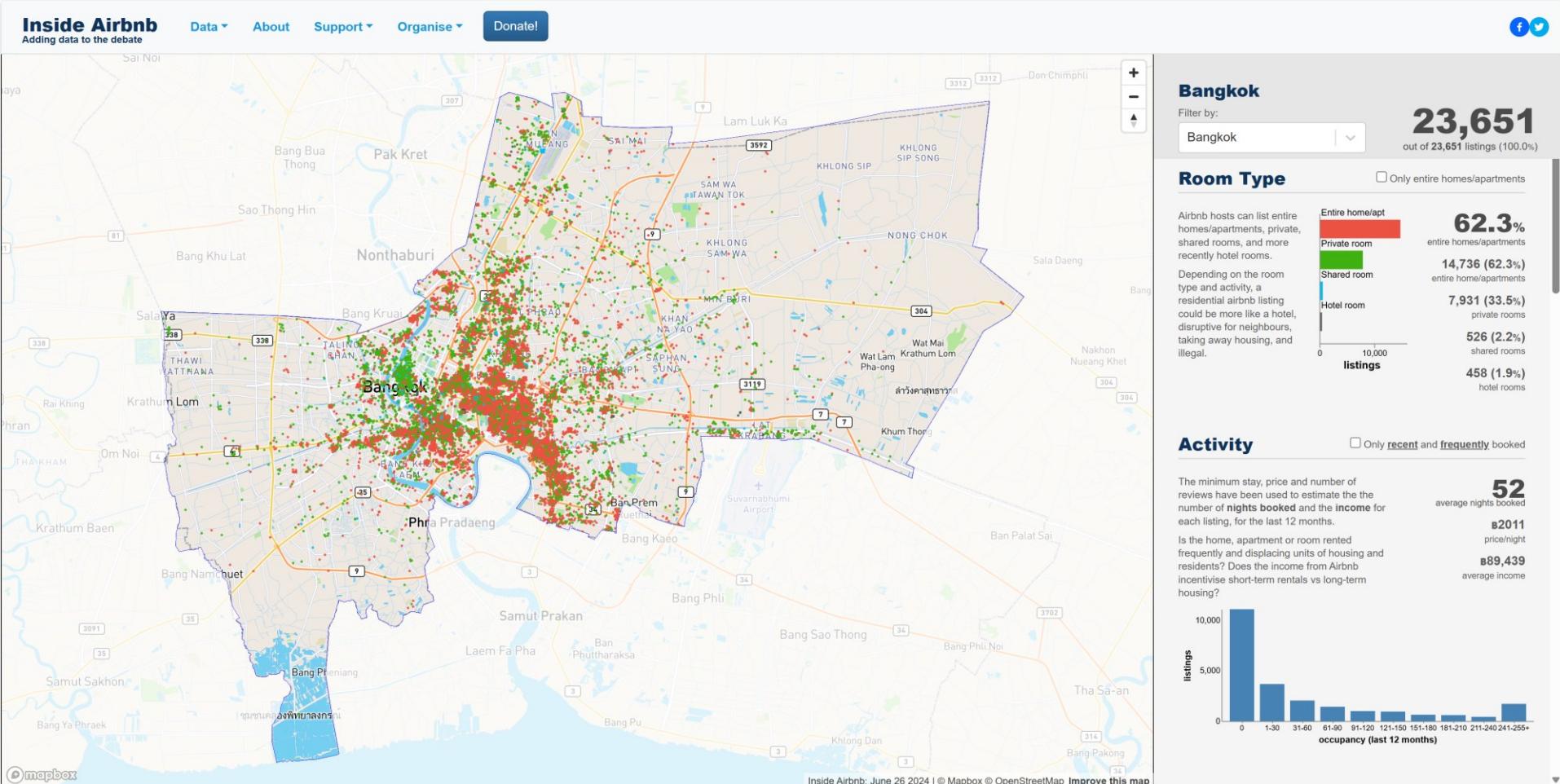
- Coordinates (latitude, longitude)
- Place name, street address
- Proximity of reference point (WiFi access point id, cell tower id)
- Location + Time → changes, movement

Examples

Traffy Fondue



Airbnb



<https://insideairbnb.com/bangkok/>

Taxi GPS Data

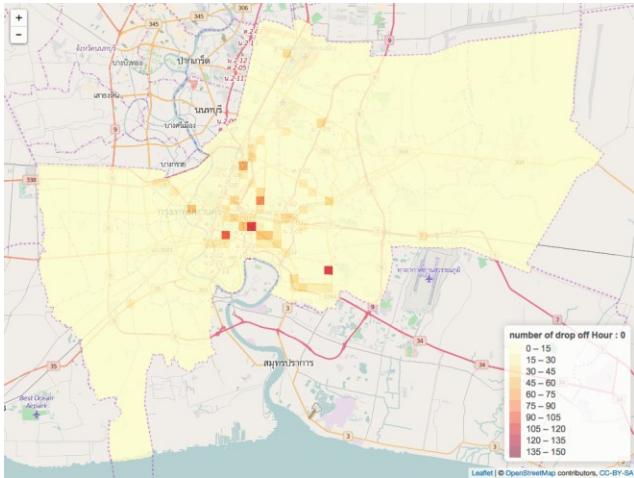


Density map of taxis over time

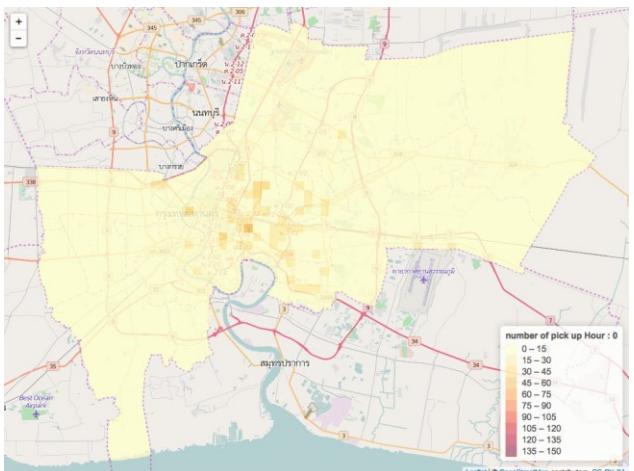


Taxi Heatmap

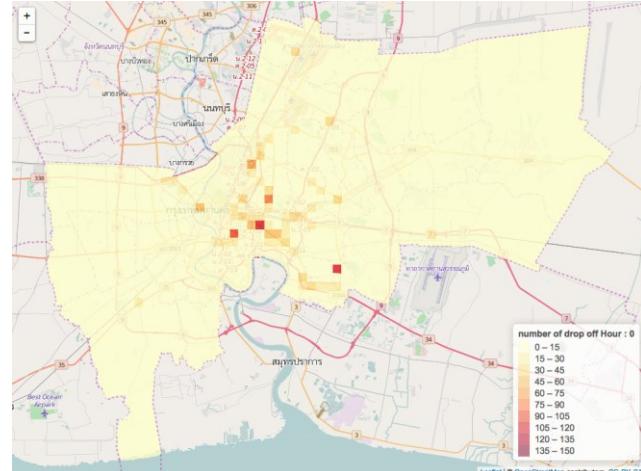
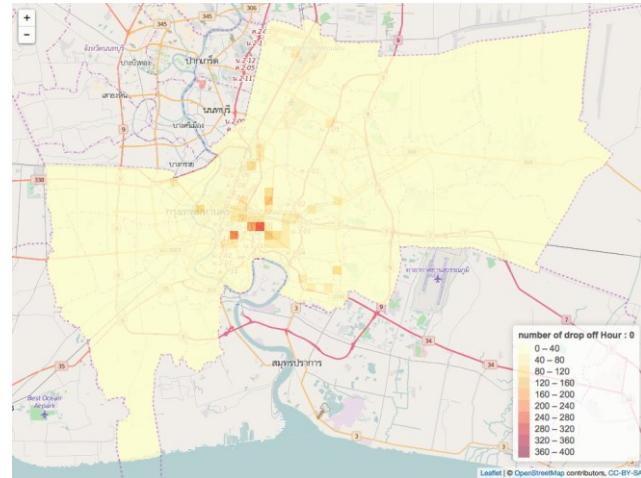
Weekdays



Weekends



Pick-up



Drop-off

Traffic Analysis using Taxi GPS Traces

<https://public.tableau.com/app/profile/veera.muangsin/viz/CongestionbasedonTravelTimeIndex/TravelTimeIndexTTIDashboard>



Geospatial Applications

- Navigation, route planning
- Customer geodemographic segmentation
- Targeted marketing
- Branch/facility location selection
- Real estate valuation / risk assessment
- ...

