

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.

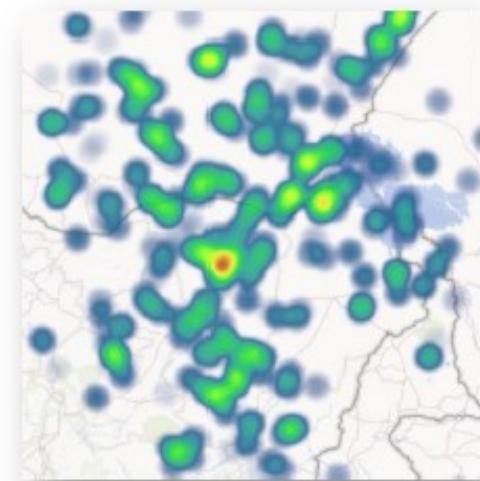
Spatial analysis is a process to gain insight from location-related data and solve location-related problems.

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

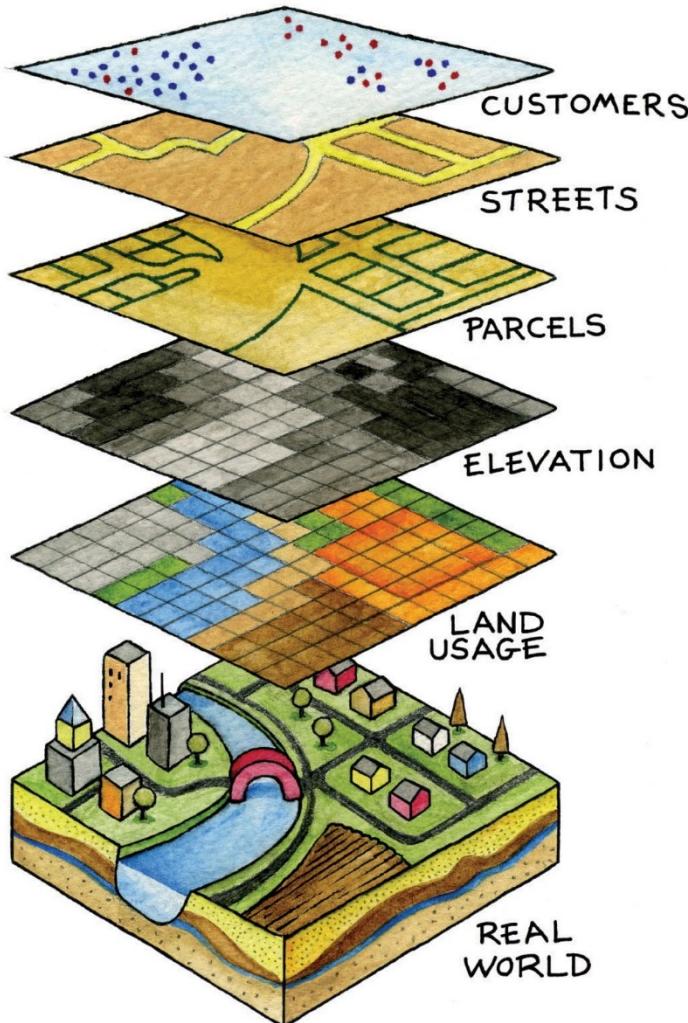
Map

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



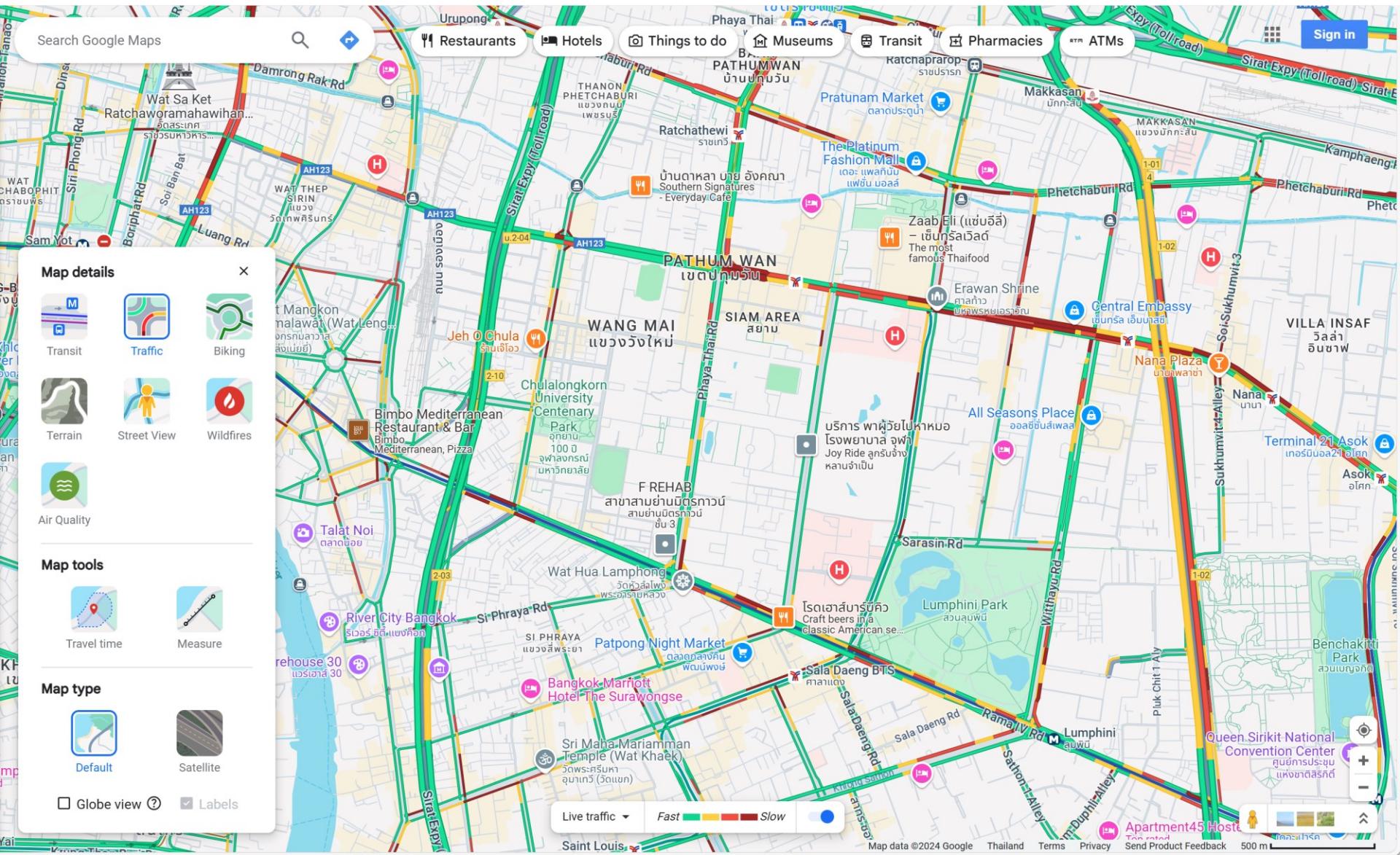
All geospatial datasets refer to locations on Earth.

So, they can be **overlaid**.

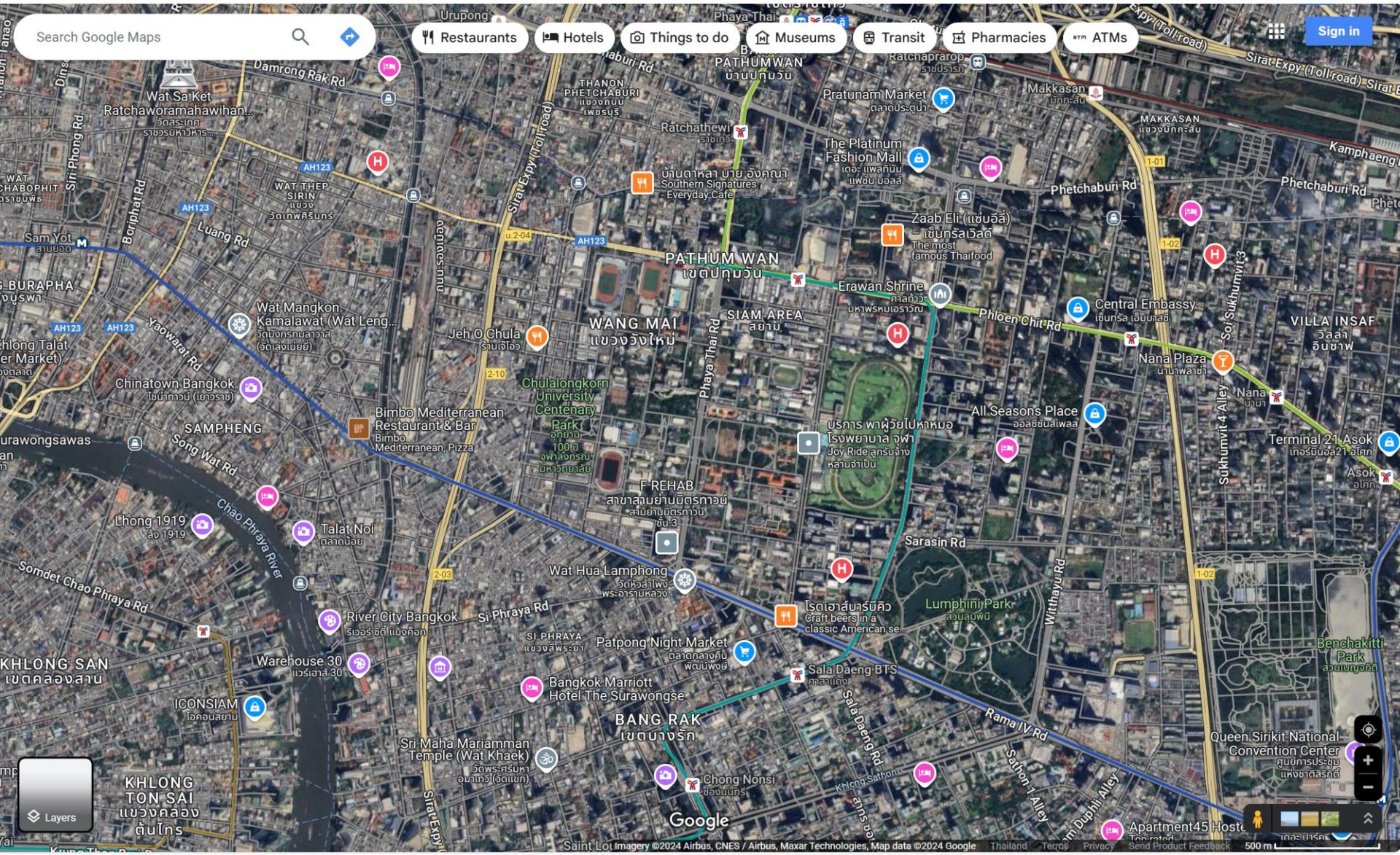
Basic Types of Spatial Data

- Points
- Lines
- Polygons
- Raster (image)

Google Maps



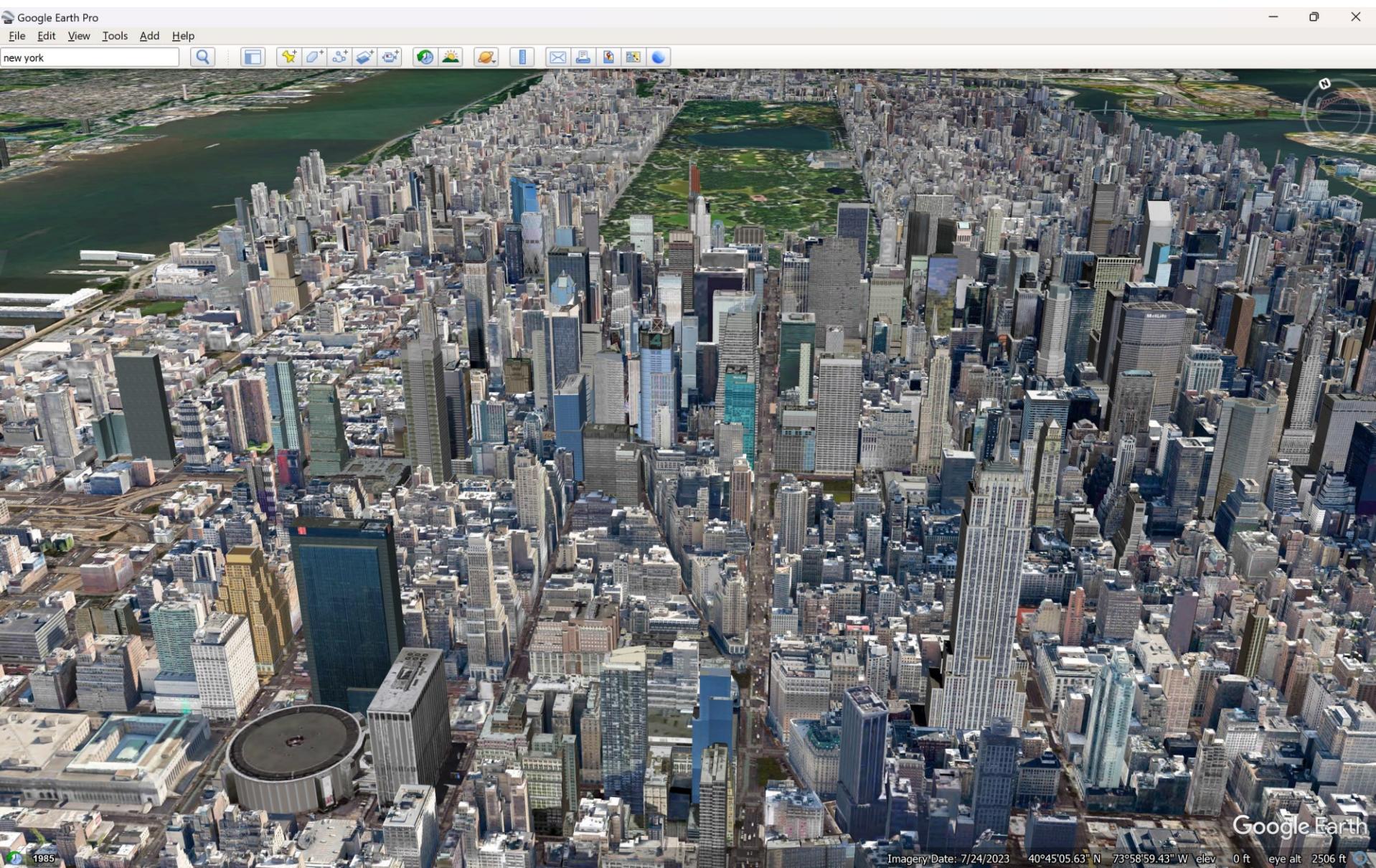
Google Maps: Satellite Basemap



Google StreetView: 360° images



Google Earth: 3D Buildings



ระบบค้นหารูปแปลงที่ดิน (กรมที่ดิน): Land Parcels

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

The screenshot shows a map interface for land parcels in Bangkok, Thailand. The map displays a grid of red-outlined parcels over a background of streets and landmarks. A specific parcel is highlighted with a red pin and a callout box containing the following information:

เลขโฉนดที่ดิน	xxxxx15
หน้าสำรวจ	xxxx85
เลขที่ดิน	xxxx03
ระวาง	5136 III 6418-15 (1000)
ตัวบล	บางรัก
อำเภอ	บางรัก
จังหวัด	กรุงเทพมหานคร
เนื้อที่	1 ไร 0 งาน 43.0 ตารางวา
ราคาประเมินที่ดิน (กรมธนารักษ์)	350,000 บาทต่อตารางวา หรือติดต่อสำนักงานที่ดิน
ค่าพิสดารแปลง	13.73237654,100.52647472
ข้อมูลการเดินทาง	จากที่นี่ไปยังแปลงที่ดิน จากแปลงที่ดินไปยังสำนักงานที่ดิน

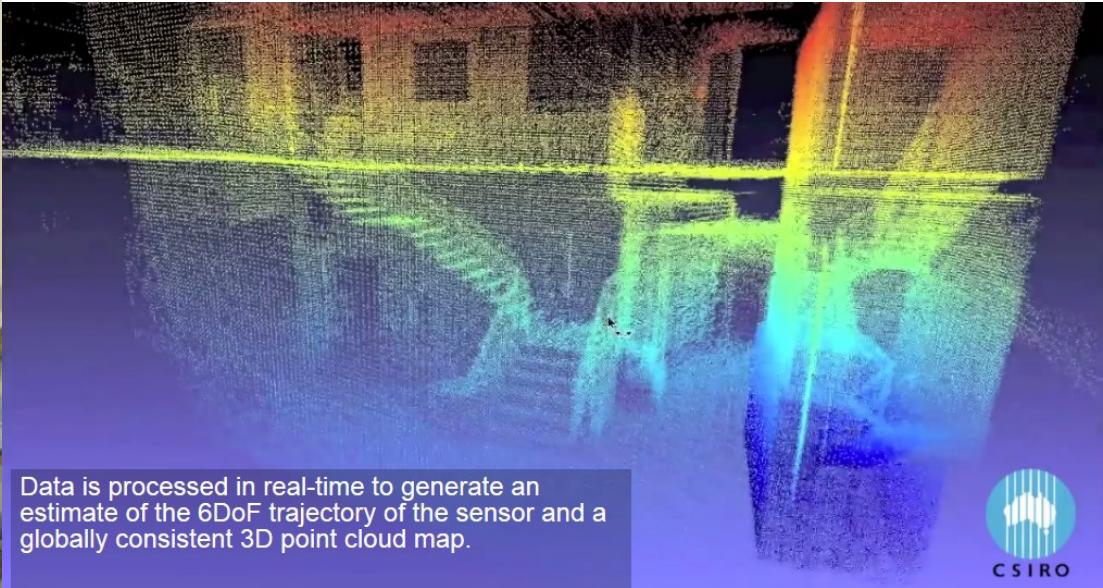
The map also features several labels for nearby locations, including:

- Rama IV Rd
- Sukhumvit Rd
- Samyan Mitrtown Shopping mall
- Somboon Seafood Sam Yan
- Chulalongkorn Business School
- Chamchuri Square Shopping mall
- dtac Hall (5G)
- AKIYOSHI Japanese
- Poo Tee Shrimp Wonton Noodle
- Ashton Chula-Silom
- Wat Hua Lamphong
- Urban Jungle Hotel
- Holiday Inn Bangkok Sab Condominium
- Bed By City Hotel
- The Pasha
- Magical Touch Massage Bangkok
- Samyan Serene Hotel
- Big C Foodplace
- Chula-Samyan Noodle Shop
- Seafood Noodle
- Office

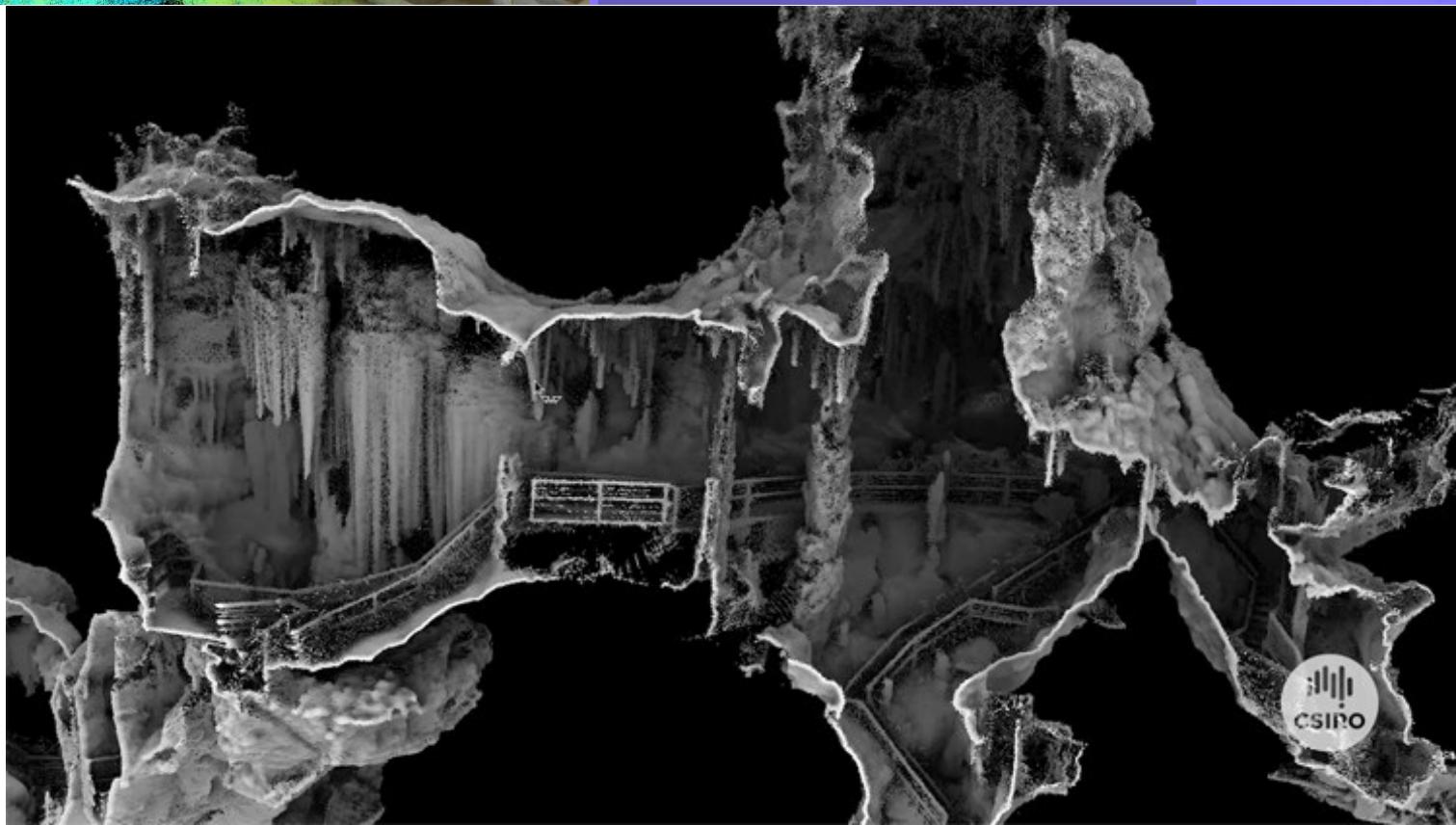
At the top of the screen, there are navigation tabs for "LandsMaps", "กรุงเทพมหานคร", "กรุงเทพมหานคร", "เลขที่ดิน", and a search bar. On the right side, there are language options for "TH" and "EN".

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

300 ft

Edits by Kri_itt, PingNattawoot, Earthkk, and 56 others

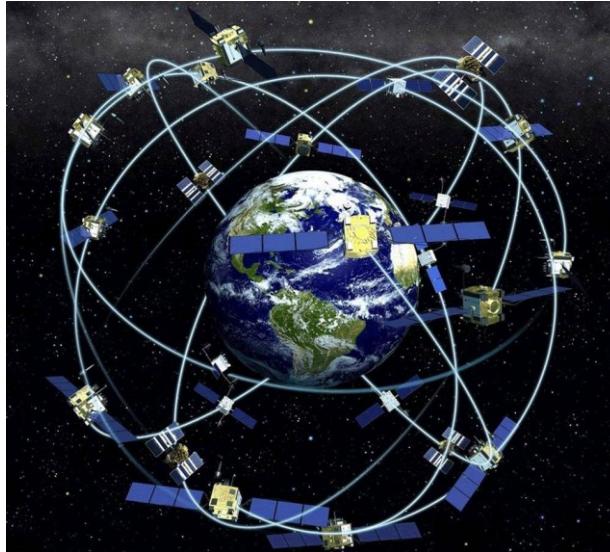
814 hidden features

2.30.4

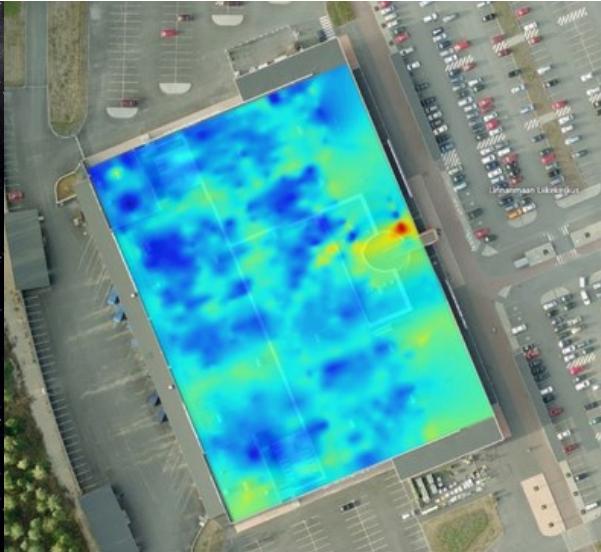
With modern positioning techniques,
everything can be located.

Location Technologies

GPS



WiFi

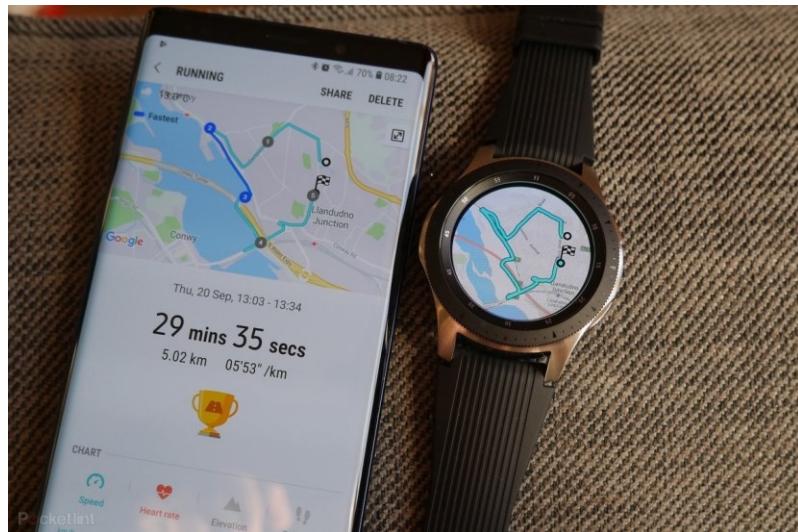
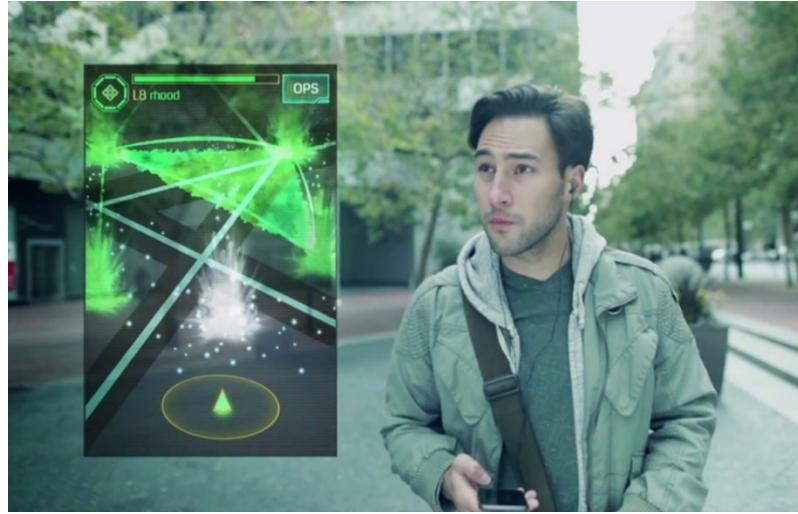
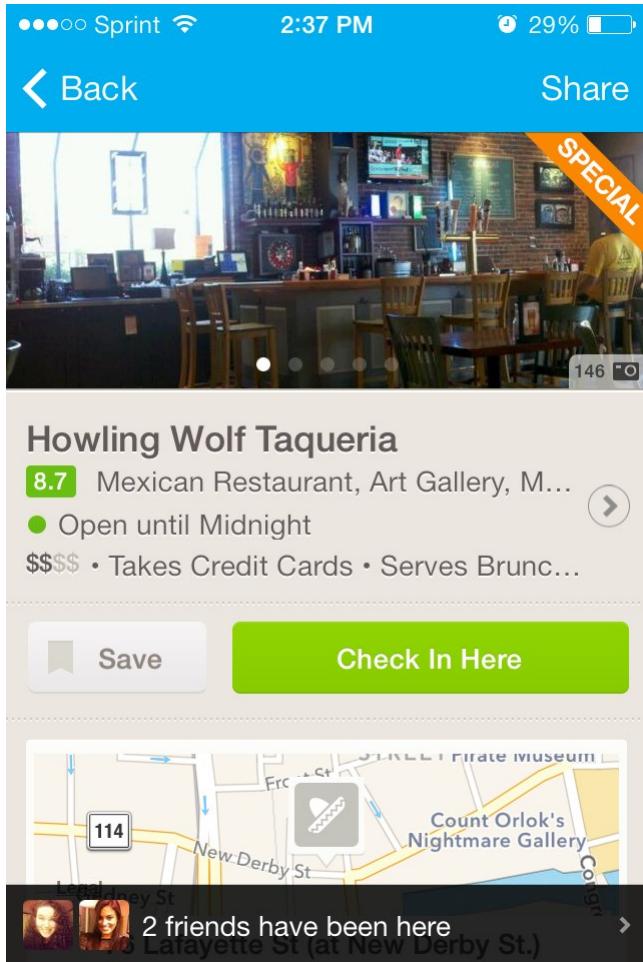


Bluetooth/Beacon



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

People as Sensors



Sensors in Transportation

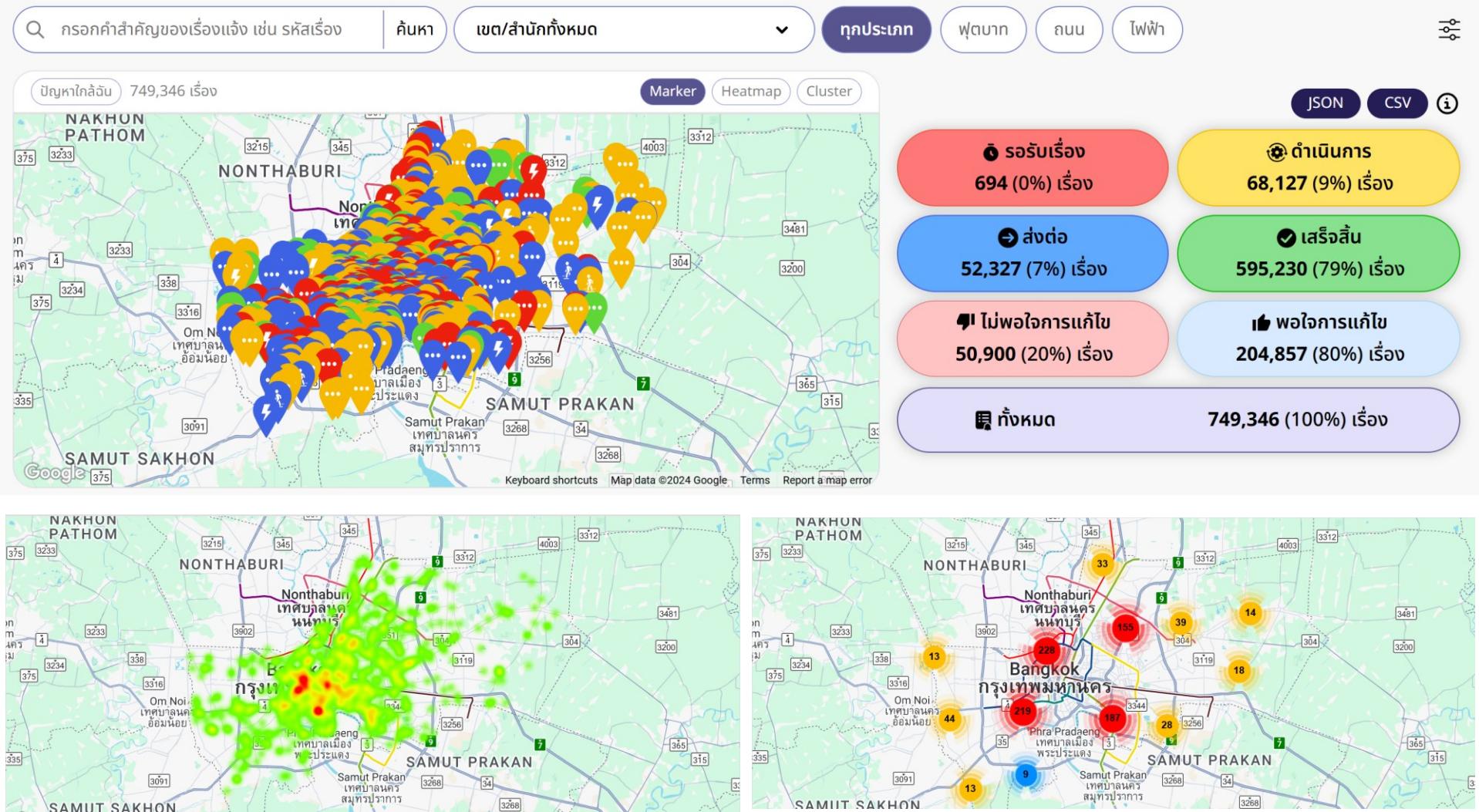


Types of Location Data

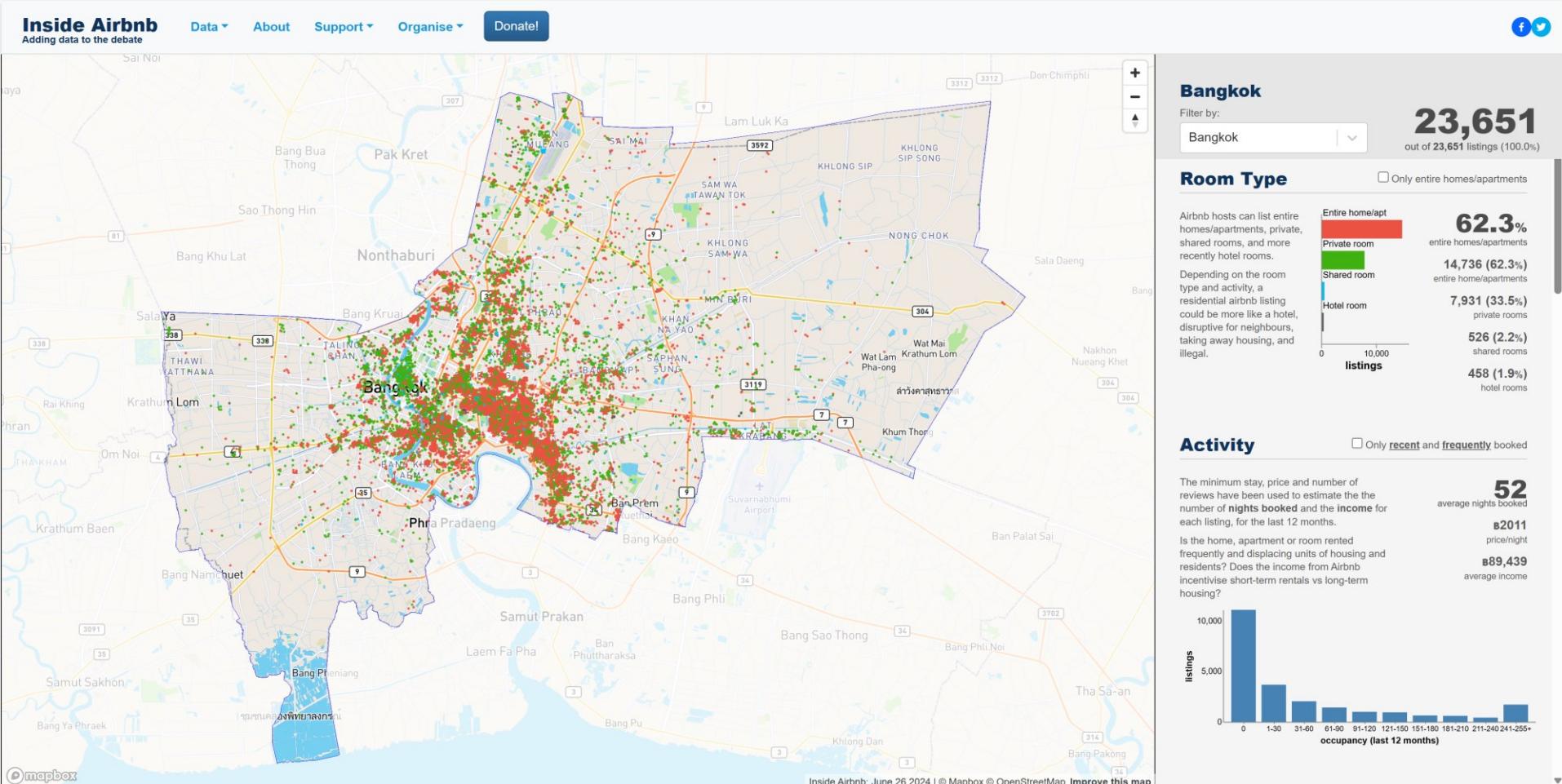
- Coordinates (latitude, longitude)
- Place name, street address
- Proximity of reference point (WiFi access point id, cell tower id)
- Location + Time → changes, movement

Examples

Traffy Fondu



Airbnb



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

Taxi GPS Data

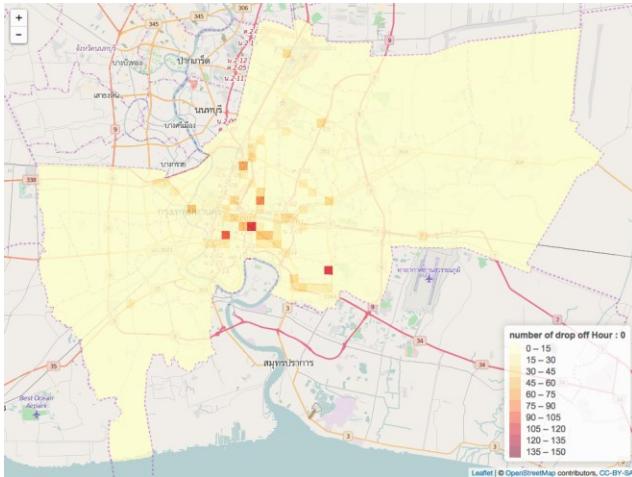


Density map of taxis over time

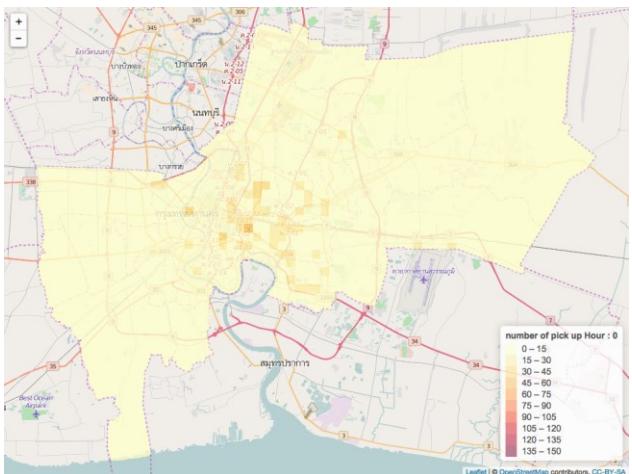


Taxi Heatmap

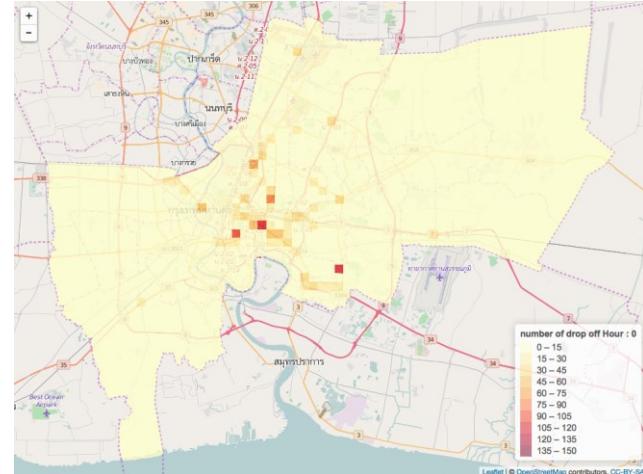
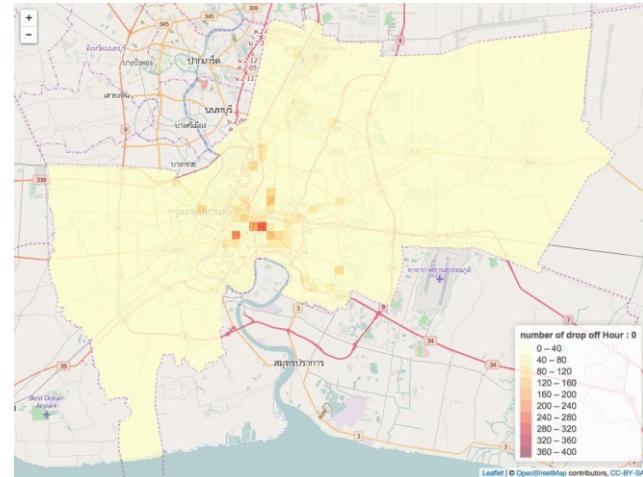
Weekdays



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
- ...

