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UNDERSTANDING RISK
GLOBAL FORUM 2024

TRADITION • INNOVATION • RESILIENCE

City Scan

Building Urban Profiles from Global Datasets

Rui Su

Urban Resilience and Climate Change



Why invest in urban resilience?

Investing in urban resilience boosts **long-term economic, social, and physical sustainability** by safeguarding the gains from current developments for future generations

Greater urban resilience builds the capacity of local governments to help households, communities, and enterprises **manage and avoid disaster shocks and stresses**



Why invest in urban resilience?

Key questions

- Which **hazards and climate conditions** pose the greatest resilience challenges?
- What are the **opportunities and trends** that could amplify investment impacts?
- How might investment priorities **differ** in different parts of the city?



What is the City Scan?



A **rapid, low-cost geospatial assessment** of how urbanization affects the resilience of various urban forces, networks, and people

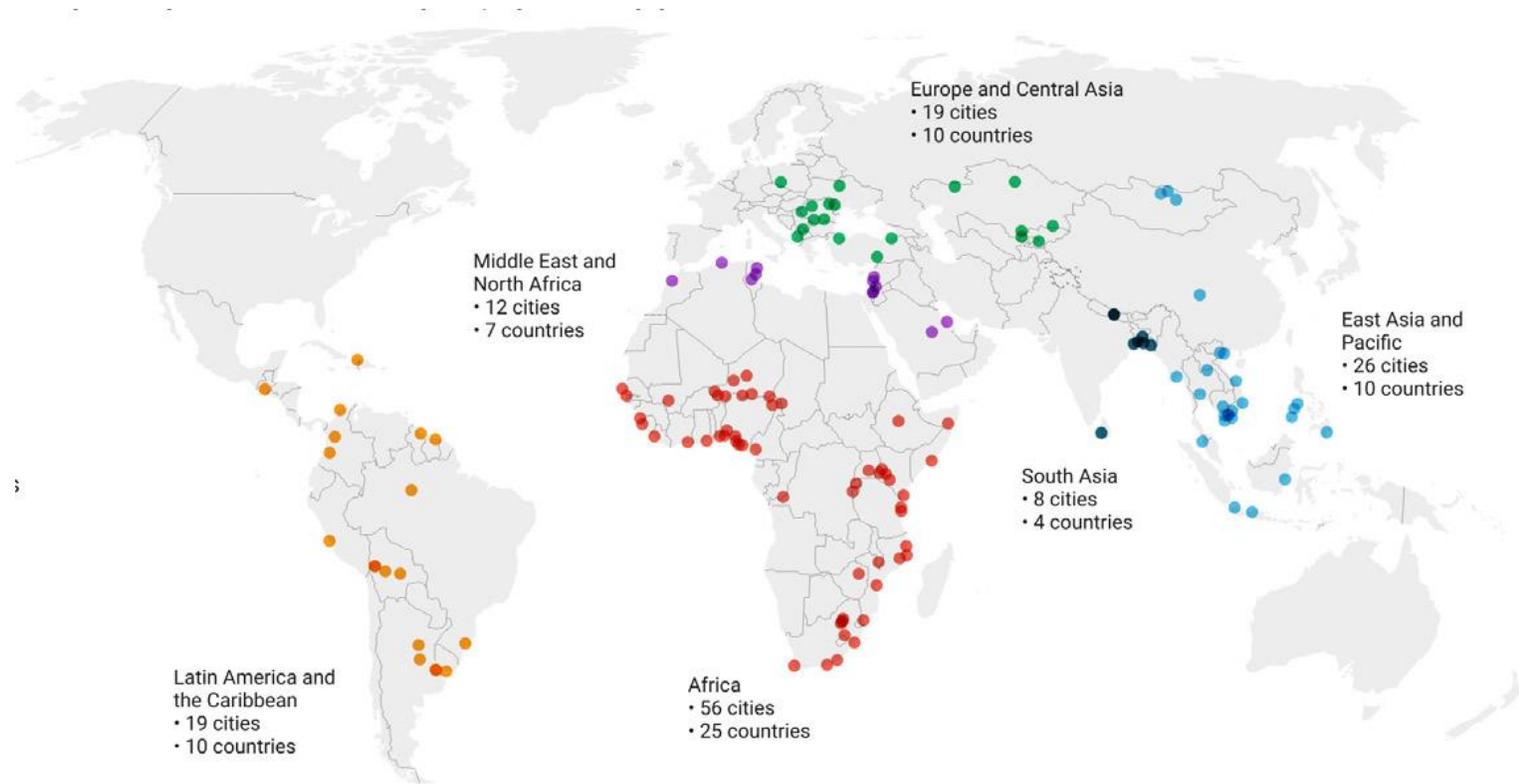


Uses the best **publicly available** global datasets and **open-source** tools, which can be further elaborated with detailed local studies



Intended as a **conversation starter** to support operational teams in building dialogue around a city's most pressing resilience challenges and risk-informed investment proposals

What is the City Scan?



CRP has conducted City Scans for

163

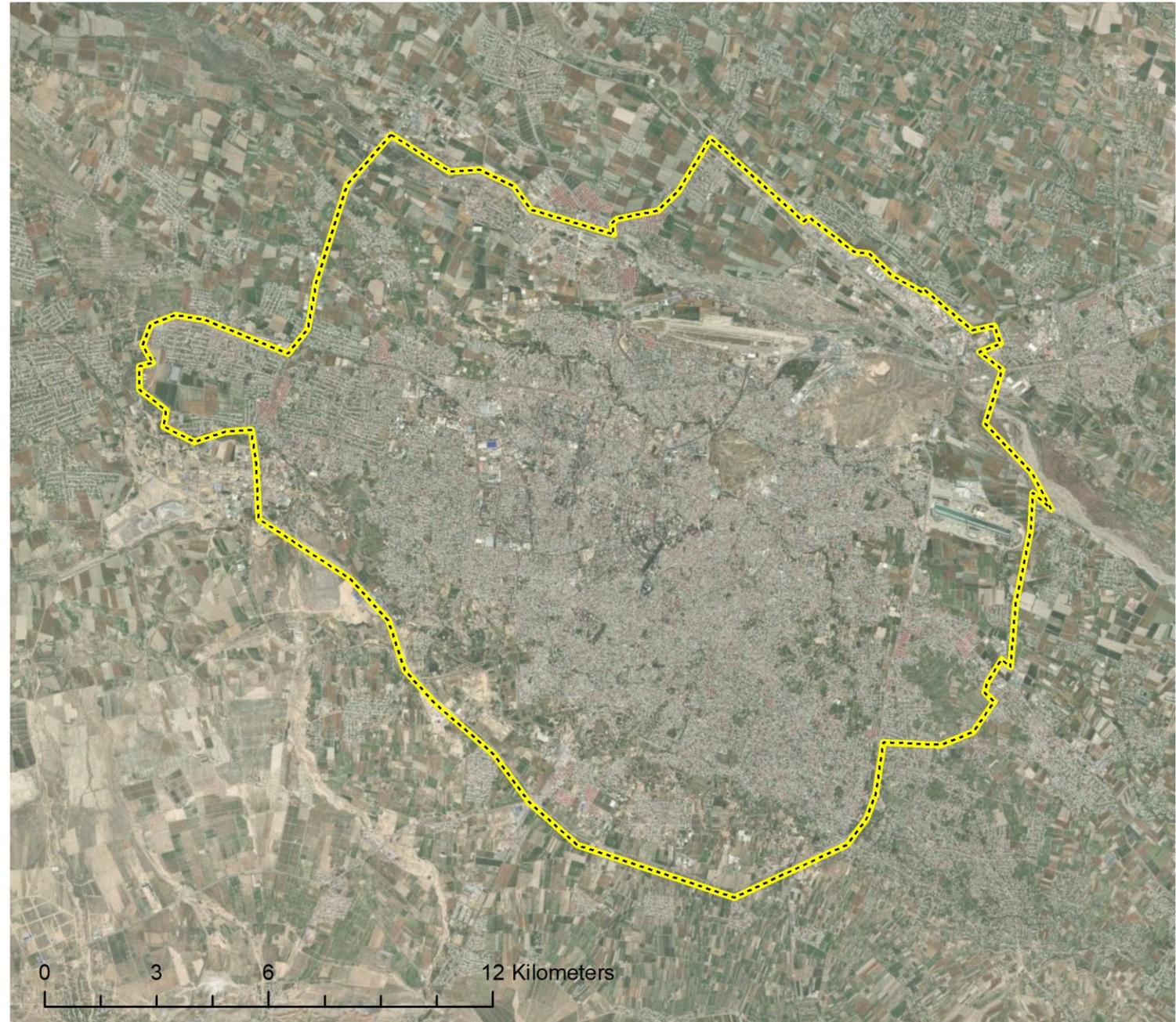
cities as of June 2024,
including

15

cities in Central Asia

Case Study: Samarkand, Uzbekistan

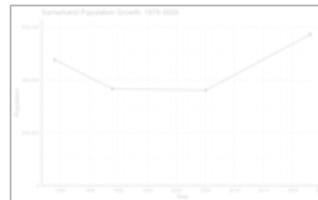
- A city located in southeastern Uzbekistan
- Population: 572,835
- Area: 298.4 square km
- The city's historic section was designated a UNESCO World Heritage Site in 2001



Population Demographic Trends

- How are population and wealth distributed within the city?

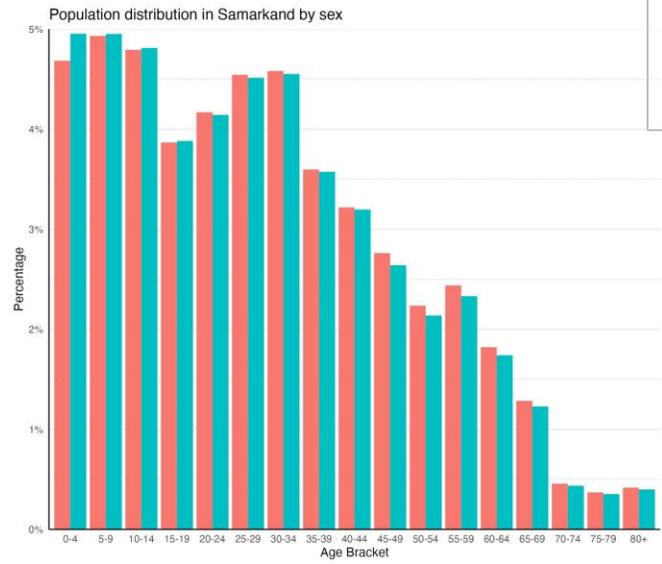
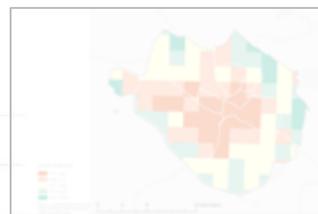
Population growth



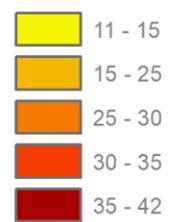
Population density



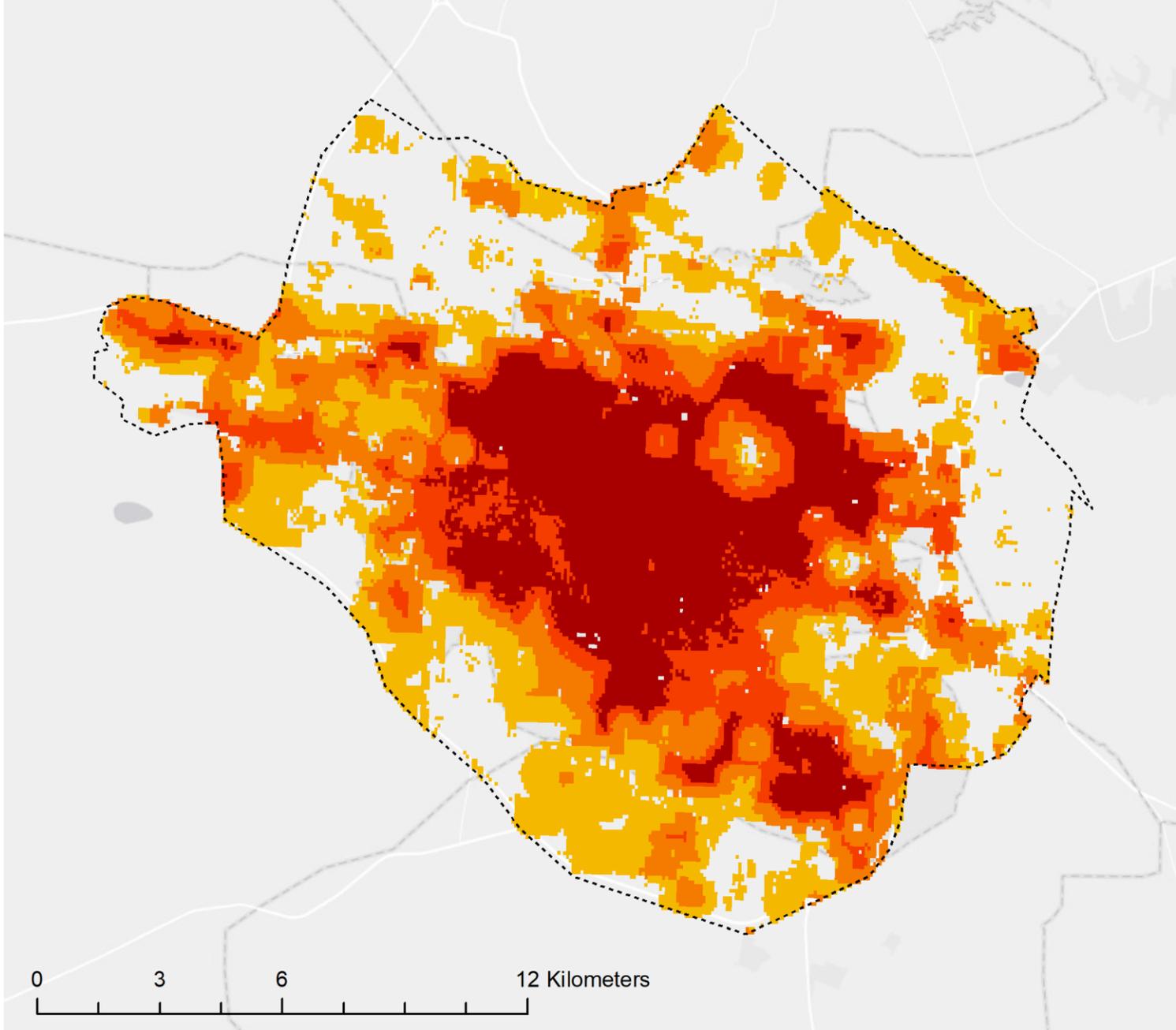
Relative Wealth Index



Number of persons per 10,000 sq. m.



Data Source: WorldPop
<https://www.worldpop.org/>



Population Demographic Trends

- How are population and wealth distributed within the city?
- How has the city's population changed over time?
- How does its population density compare with similar cities?

Data sources

- WorldPop
- Meta Relative Wealth Index
- Oxford Economics

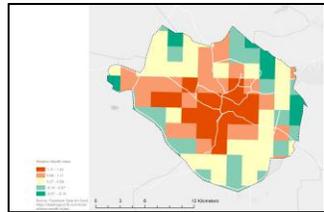
Population growth



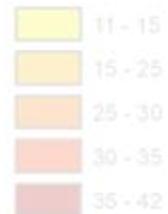
Population density



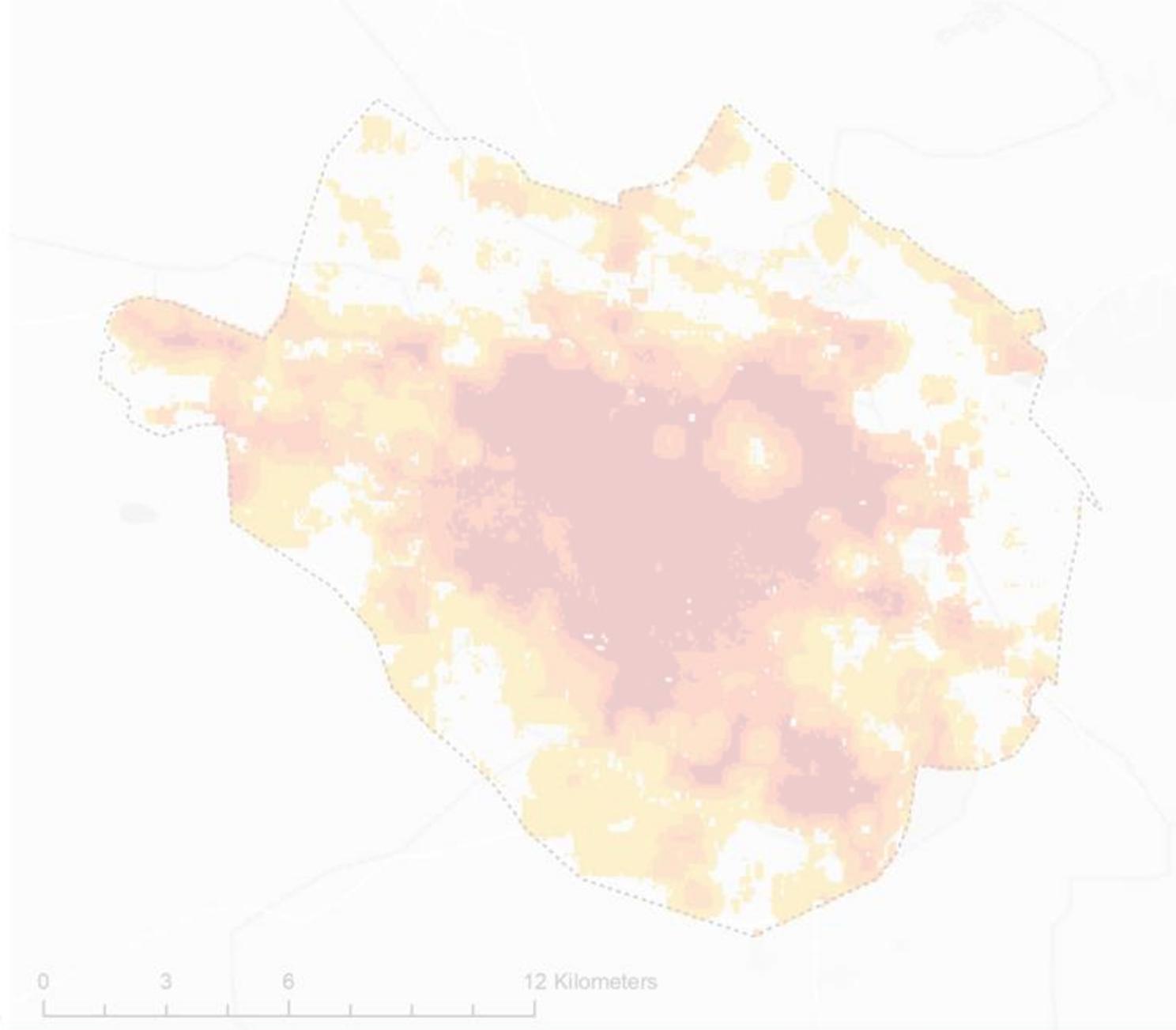
Relative Wealth Index



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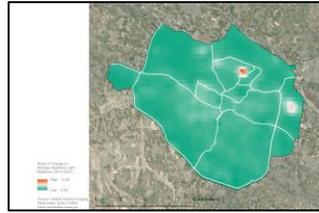
Data Source: WorldPop
<https://www.worldpop.org/>



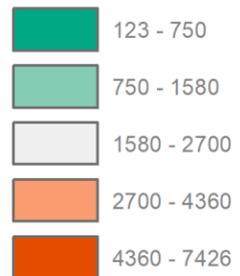
Economic Activity

- How are economic activities distributed within the city?
- Where are economic activities increasing or decreasing?

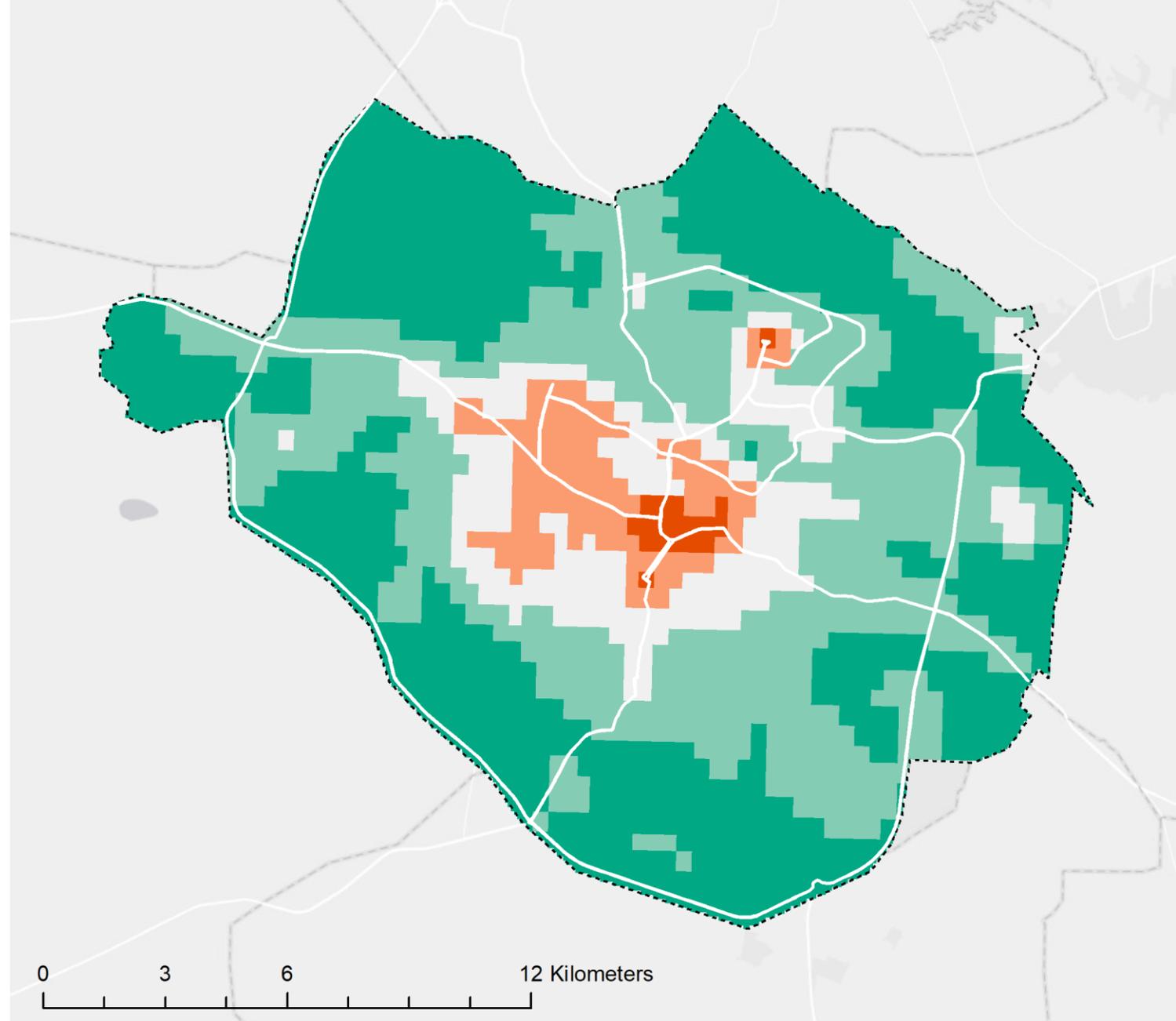
Change in economic hotspots



Composite Monthly Average Nighttime Light Radiance



Source: Visible Infrared Imaging Radiometer Suite (VIIRS), https://www.ngdc.noaa.gov/eog/viirs/download_ut_mos.html

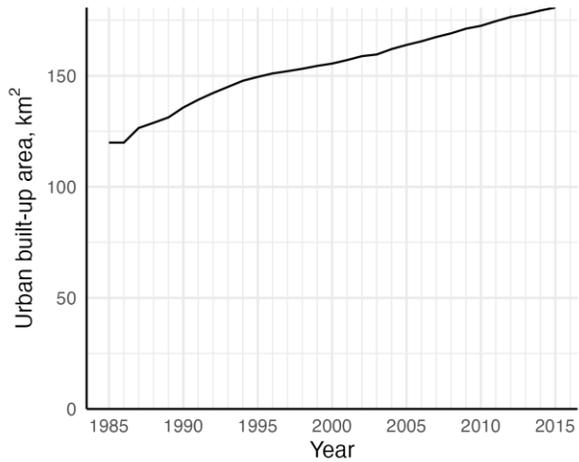


Data sources

- NOAA VIIRS nighttime light

Built Form

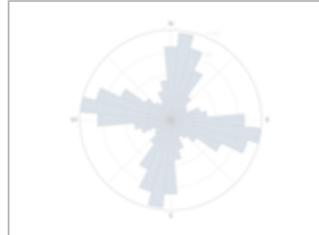
- Where has urban expansion occurred?



Land cover



Road network orientation



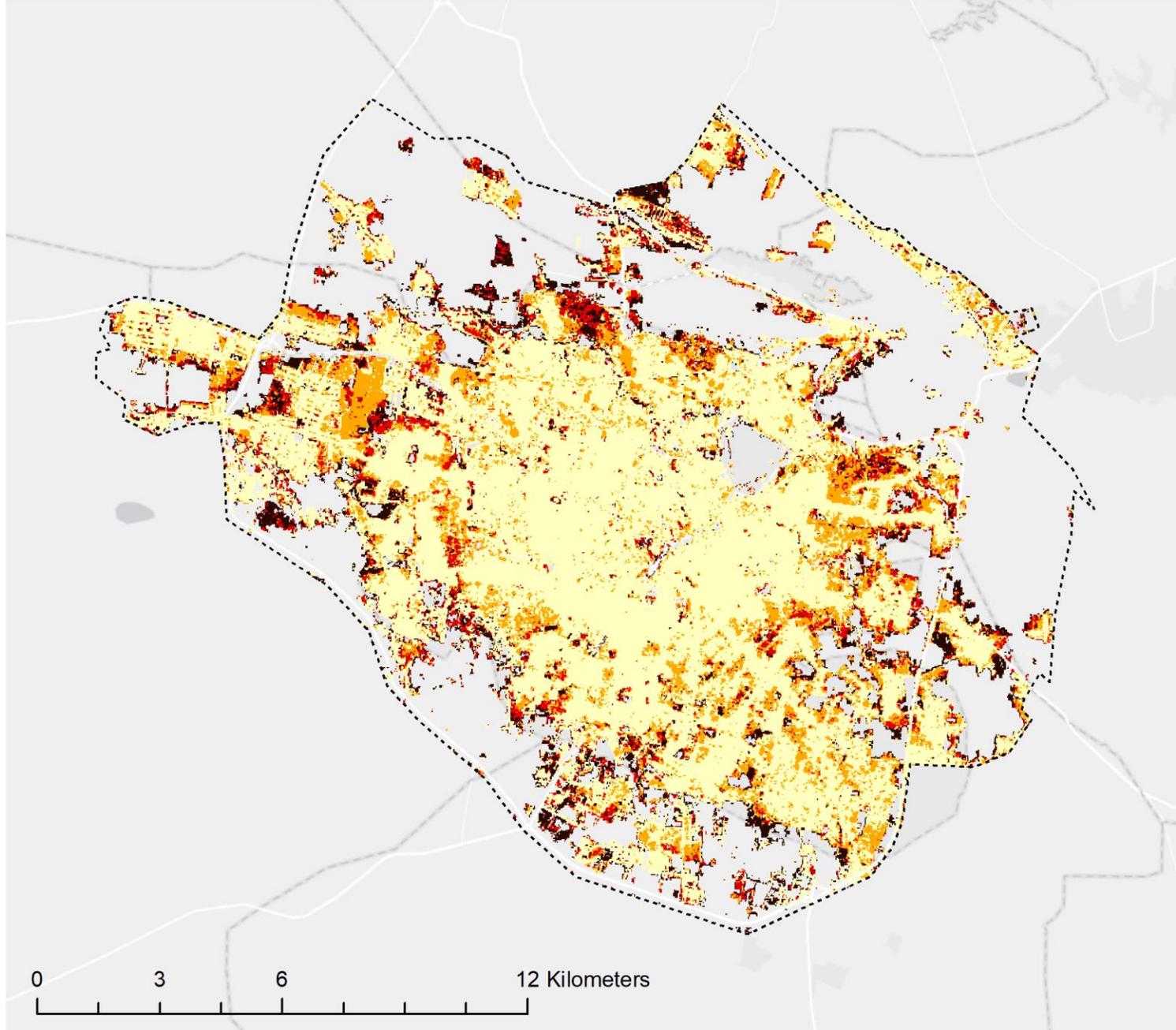
Access to schools



Built-up Area



Source: World Settlement Footprint Landsat 5/7"



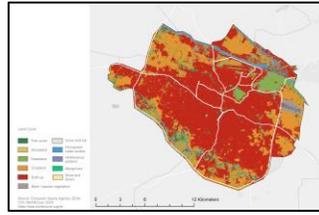
Built Form

- Where has urban expansion occurred?
- What does the city's road network say about its planning history?
- Do residents across the city have good access to schools and hospitals?

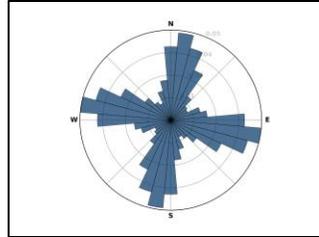
Data sources

- World Settlement Footprint
- ESA WorldCover
- OpenStreetMap

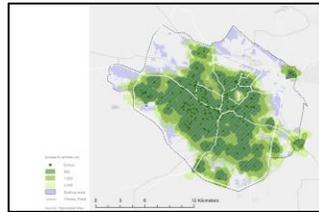
Land cover



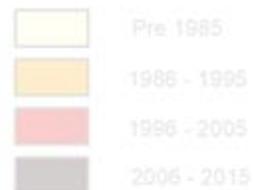
Road network orientation



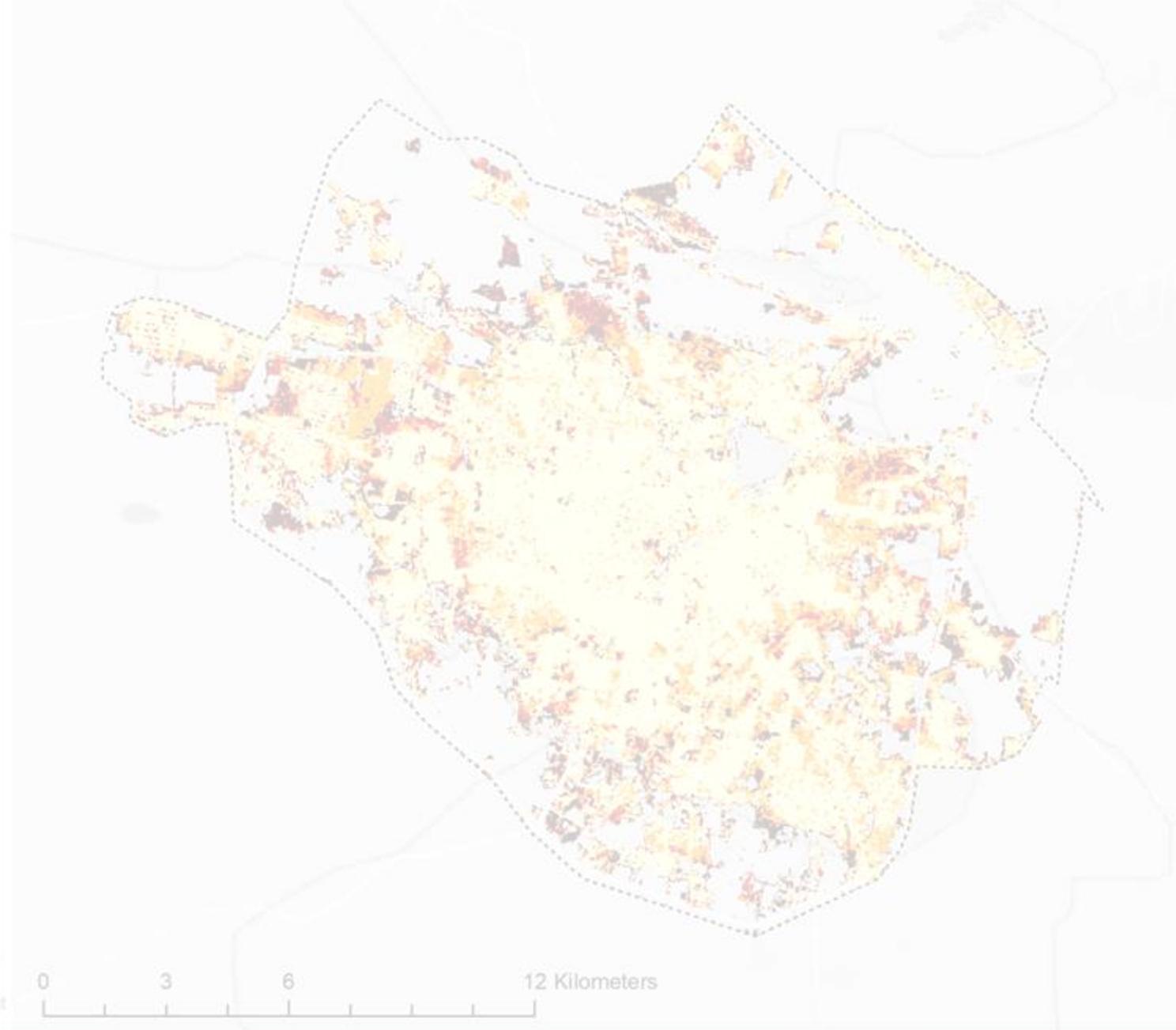
Access to schools



Built-up Area



Source: World Settlement Footprint Landsat 5/7*



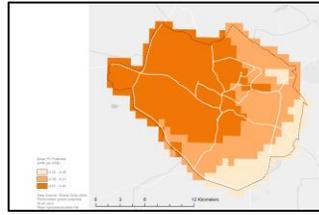
Climate Conditions

- Is there an Urban Heat Island effect in the city, and how does it relate to the land cover?
- What are the main climate impacts and mitigation potential?

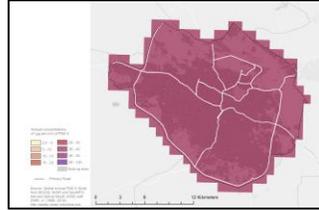
Data sources

- Global Solar Atlas
- Global Annual PM2.5 Grids
- Landsat
- Normalized Difference Vegetation Index
- Global Forest Change

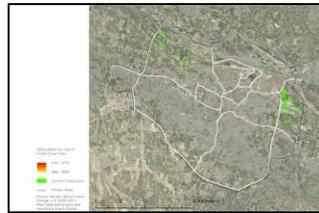
Solar potential



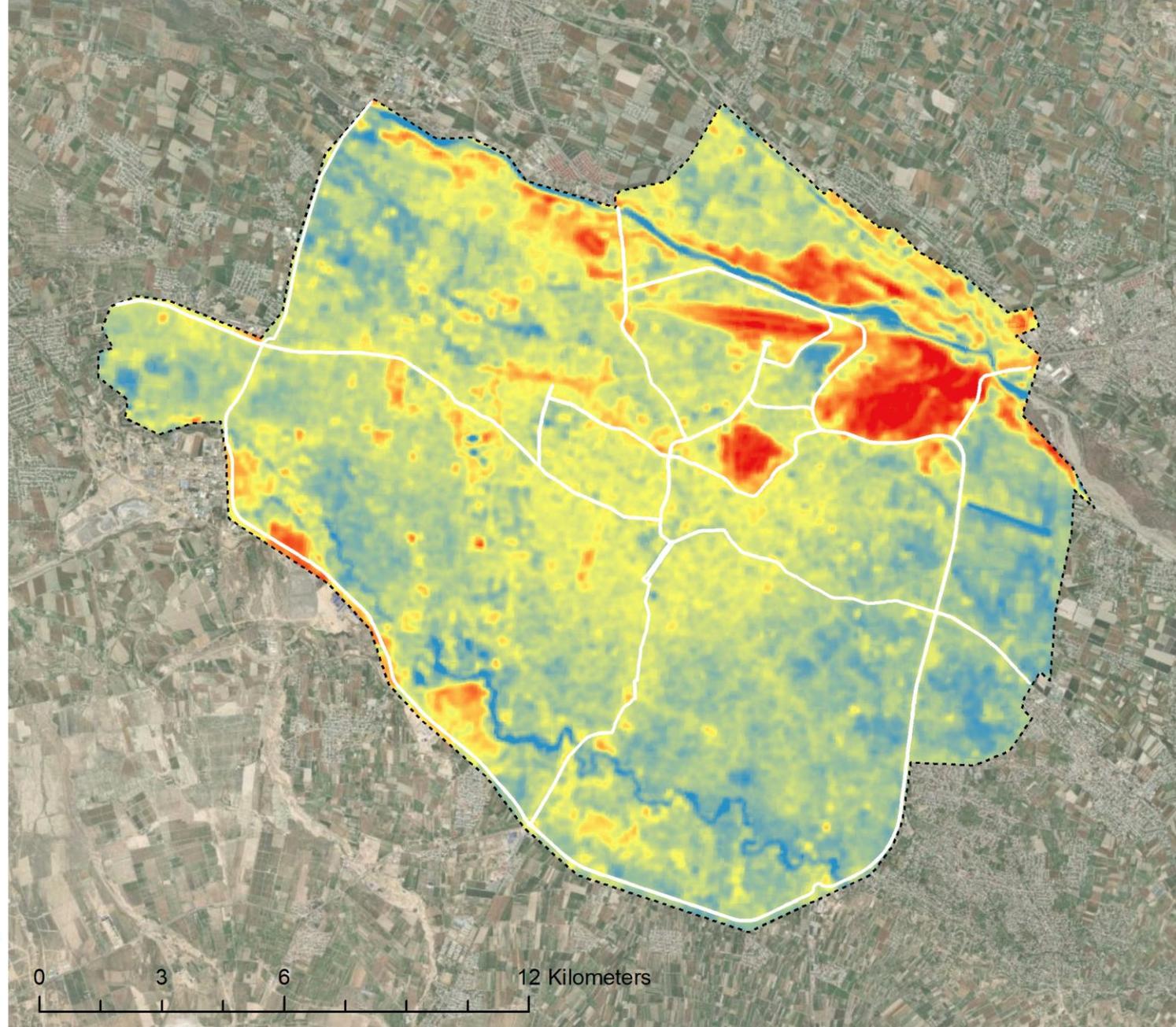
Air quality



Deforestation



Summer Surface Temperature (C)



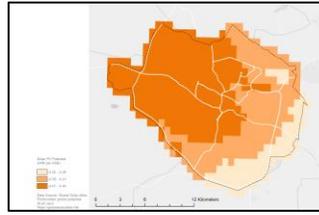
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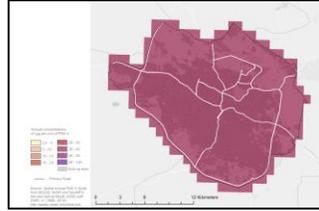
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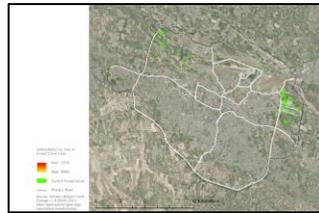
Solar potential



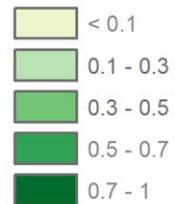
Air quality



Deforestation

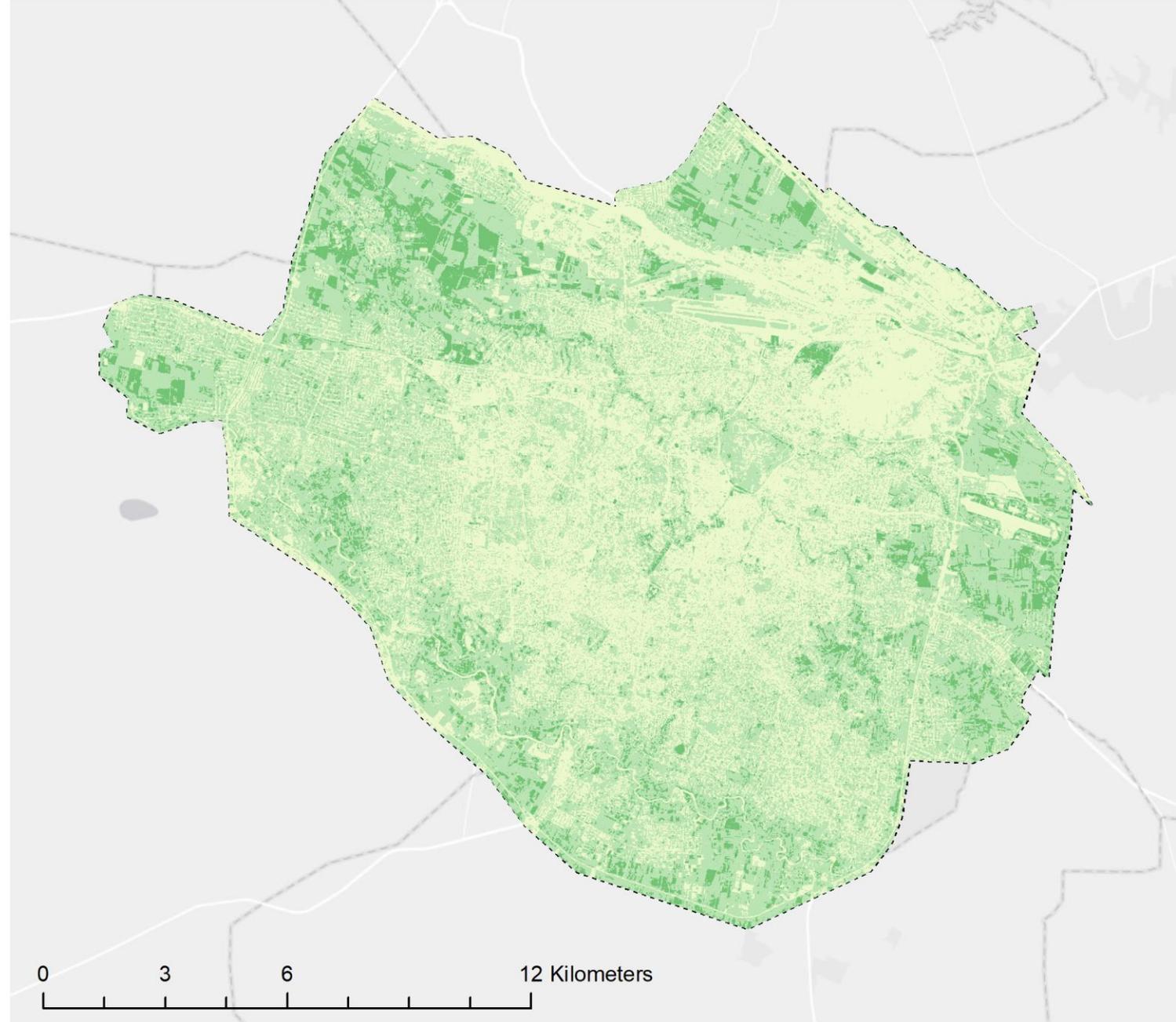


Green Spaces



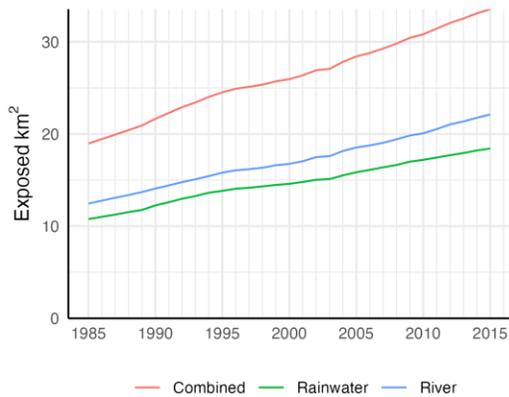
Vegetated Areas, based on Normalized Difference Vegetation Index (NDVI)

Source: Sentinel-2 MSI: Multispectral Instrument



Risk Identification

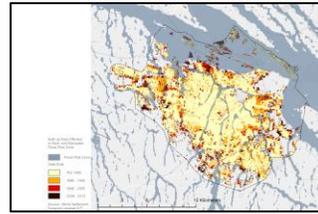
- Which parts of the city are most exposed to flooding?



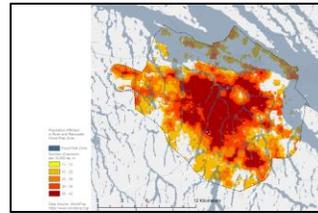
Data sources

- Fathom-Global 3.0
- OpenStreetMap
- World Settlement Footprint
- WorldPop

Built-up area exposed to flood



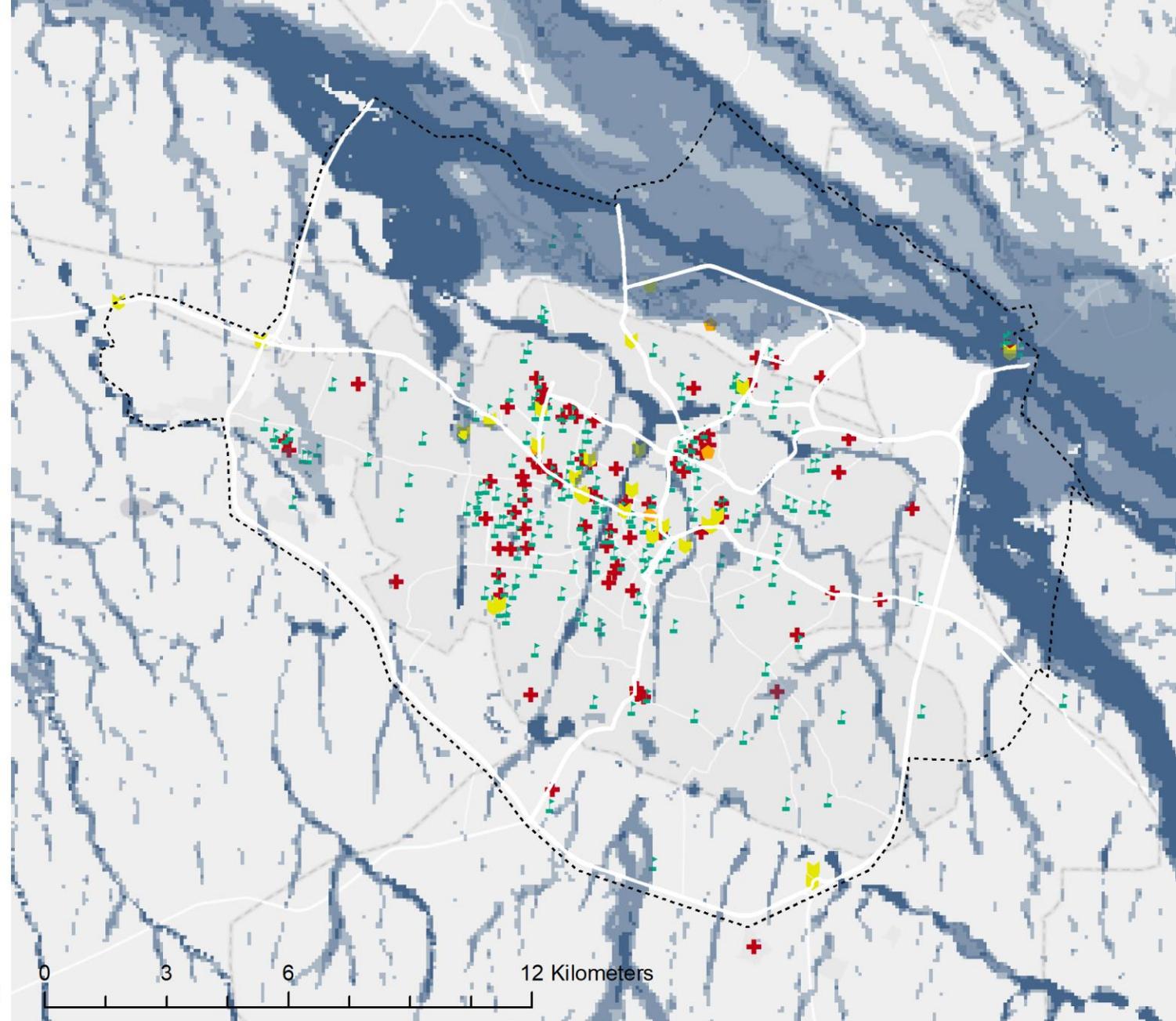
Population exposed to flood



Rainwater Flood Probability

- ▴ School
- ✚ Hospital
- ♣ Police station
- ♠ Fire station
- ▬ Primary Road
- ⋯ Administrative Boundary
- Light Blue: < 1% in any given year
- Medium Blue: 1-10% in any given year
- Dark Blue: > 10% in any given year

Data Source: SSBN 3 arc second (90 m)
Global Hazard Data (World Bank License)
*OSM data may not include all facilities



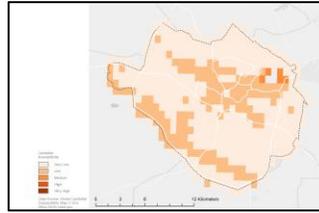
Risk Identification

- Which parts of the city are most exposed to landslides?
- Which road segments would disrupt connectivity the most if they became inaccessible?

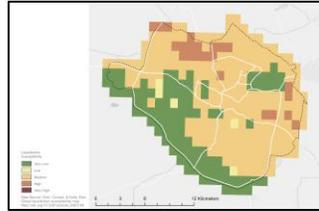
Data sources

- FABDEM
- NASA Landslide Susceptibility
- Zorn & Koks 2019
- Global Earthquake Model
- OpenStreetMap

Landslide susceptibility



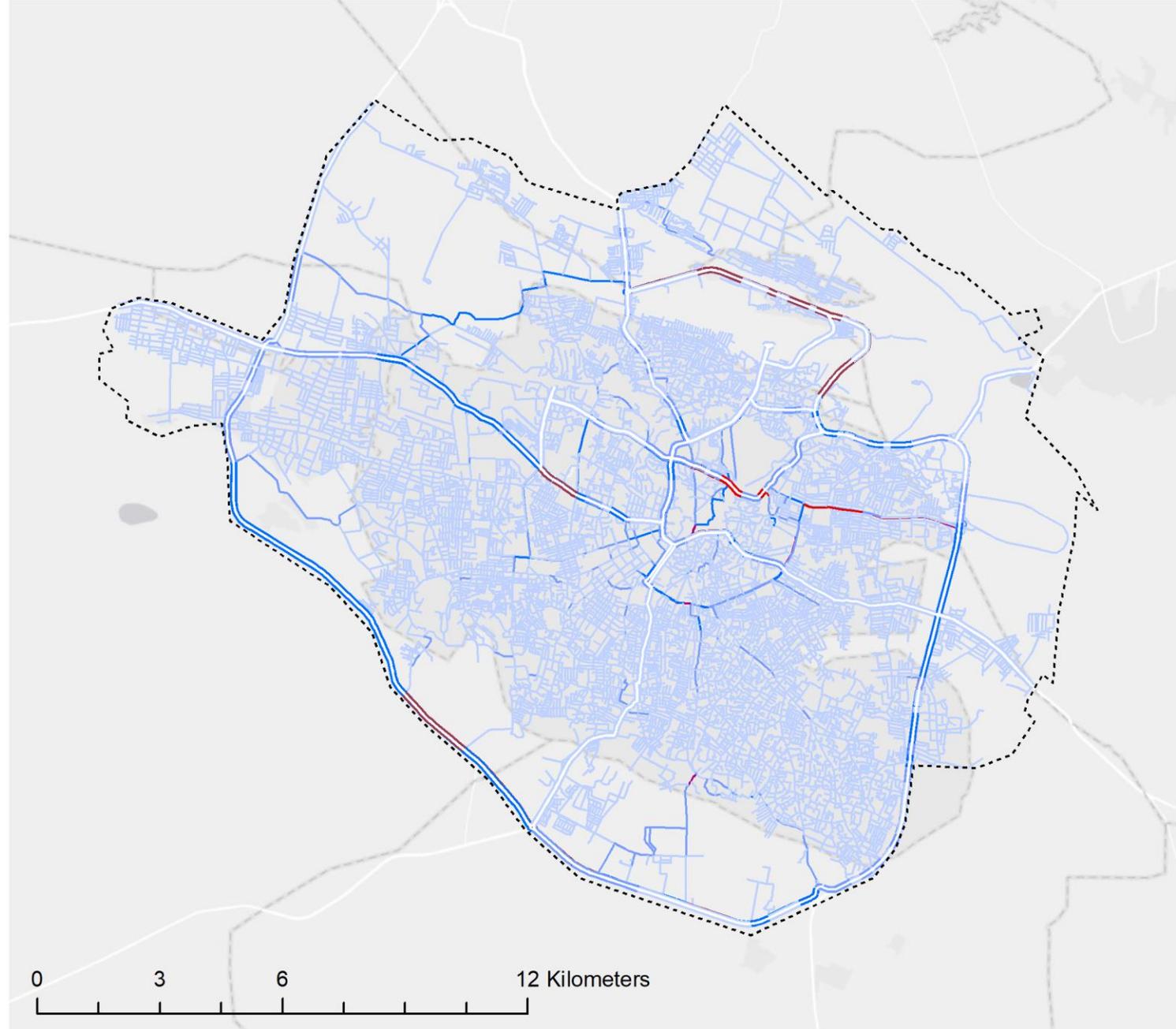
Liquefaction susceptibility



Critical Segments of Road Network (%)

primary roads	non-primary roads	betweenness centrality
		0.00 - 0.01
		0.01 - 0.03
		0.03 - 0.04
		0.04 - 0.05
		0.05 - 0.07
		Area of Interest

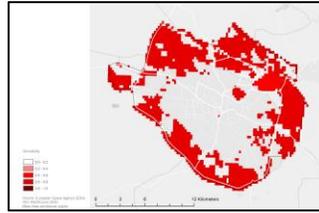
Source: OSM road network
www.openstreetmap.org



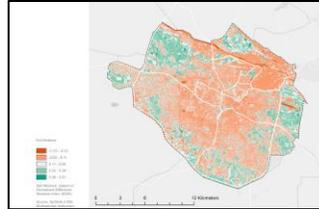
Risk Identification

- Is the city threatened by wildfires in the surrounding regions?
- When and where are wildfire risks highest?

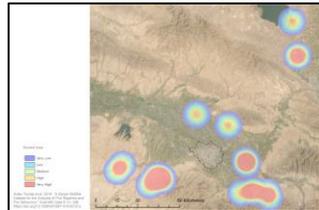
Land cover burnability



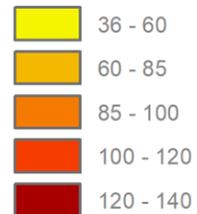
Soil moisture



Historical burnt area



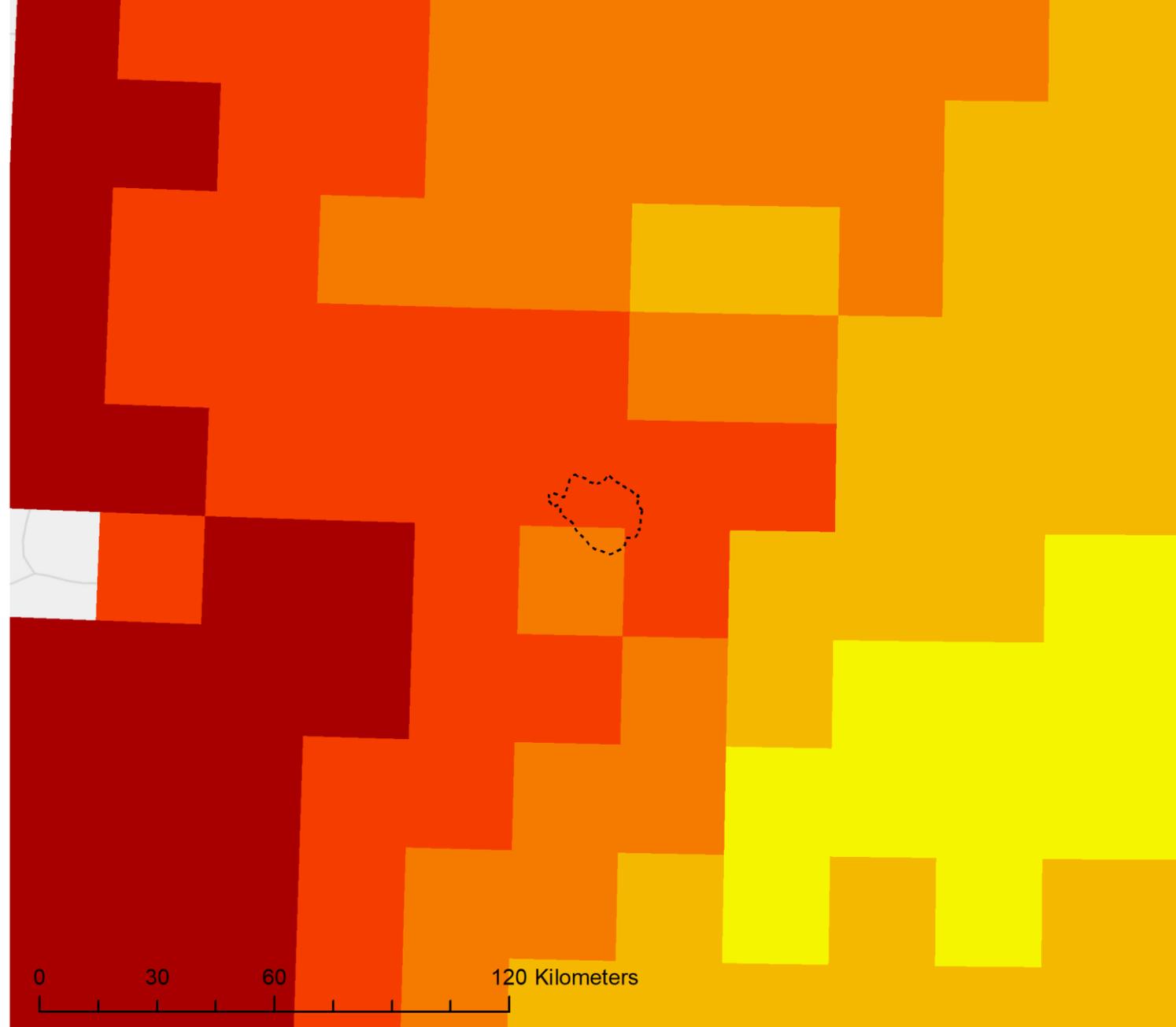
Fire Weather Index

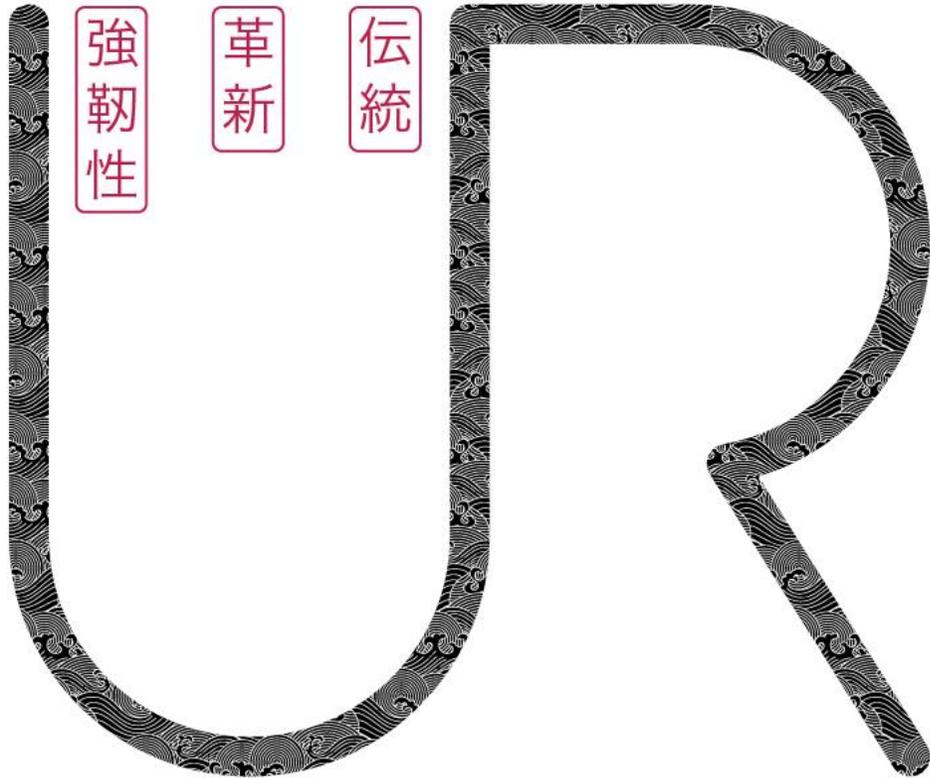


Source: European Space Agency (ESA)
10m WorldCover 2020
<https://esa-worldcover.org/en>

Data sources

- ESA Land Cover CCI
- Normalized Difference Moisture Index
- GlobFire
- NASA Global Fire Weather Database





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What patterns could a City Scan illuminate that you had not considered before?



How could a City Scan help you understand your city's critical development challenges?



What other information or analyses would you like to complement the City Scan?



How would you use the City Scan to prioritize investments in urban resilience?