

# Megatrend Urbanisierung

## Mit Daten aus dem All zur Umsetzung zukunftsfähiger Städte

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Knowledge for Tomorrow

**Urbanisation** is among the major  
**global challenges** of our time...



# The **future** is **urban**...

**66 %** of the global population will be living in cities by 2050

**1.5 million** people are currently added to urban population per week

**83 %** of cities are highly vulnerable to disaster-related mortality

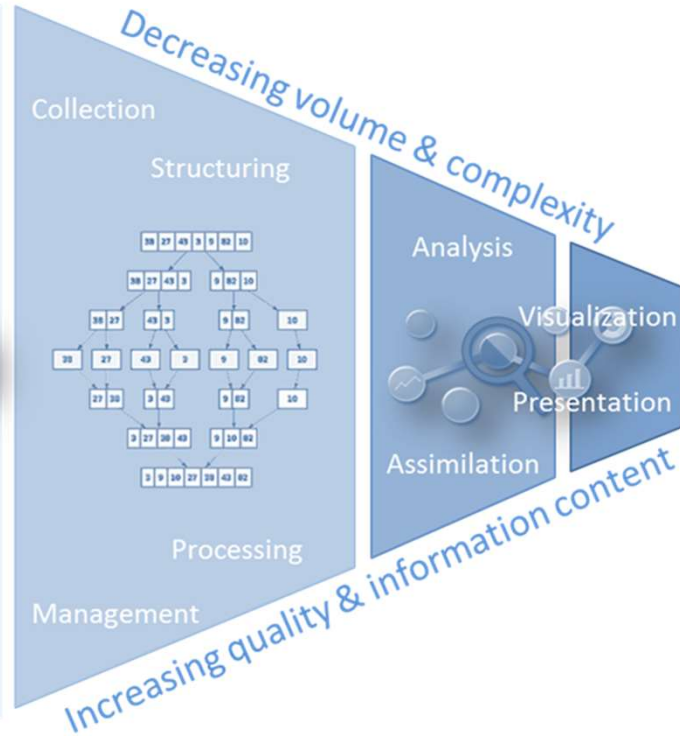
**80 %** of worldwide gross domestic product is generated in cities

# Monitoring Global Urbanization from Space

Sensor Systems & Networks  
 Topographic Data  
 Citizen Science

Transport Geographical Cultural  
 Natural Scientific  
 Meteorological Financial  
 Statistical

Social Media  
 Socioeconomic Statistics  
 Volunteered Geographic Information



Technology and Data for Sustainable and Resilient Future Cities



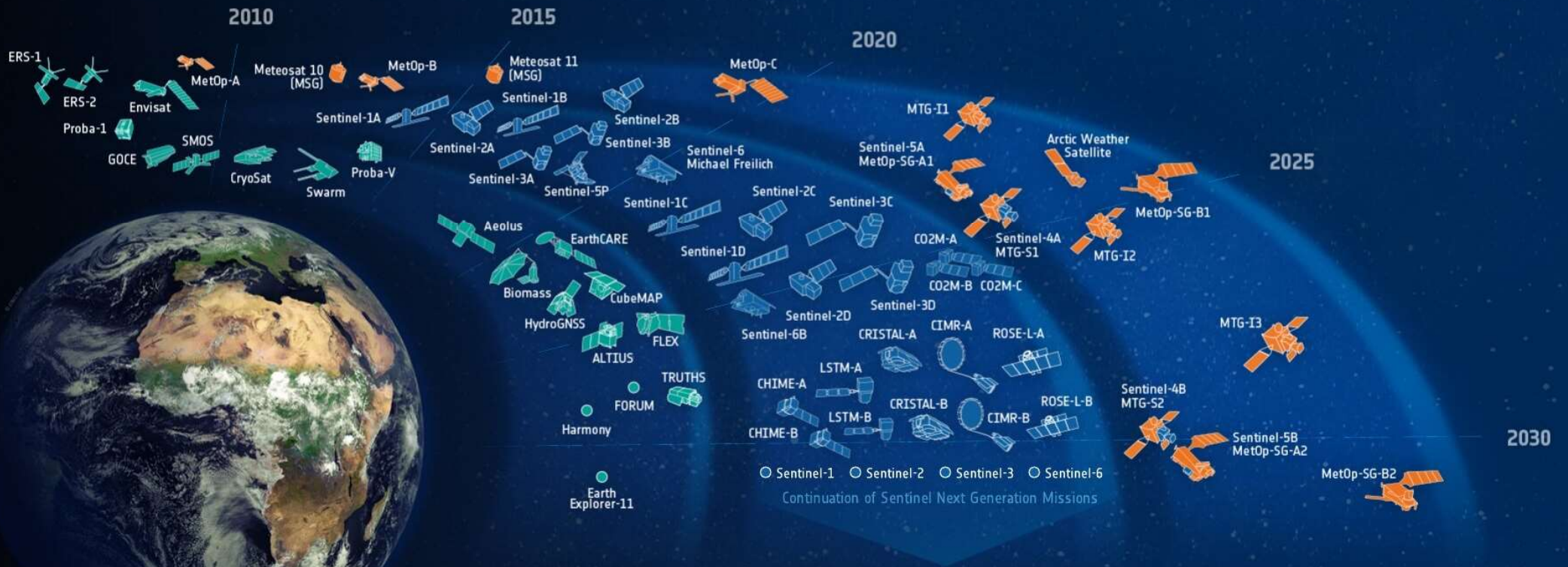
Big Earth Data

Smart Data Analytics

Actionable Information



# ESA-DEVELOPED EARTH OBSERVATION MISSIONS



Science

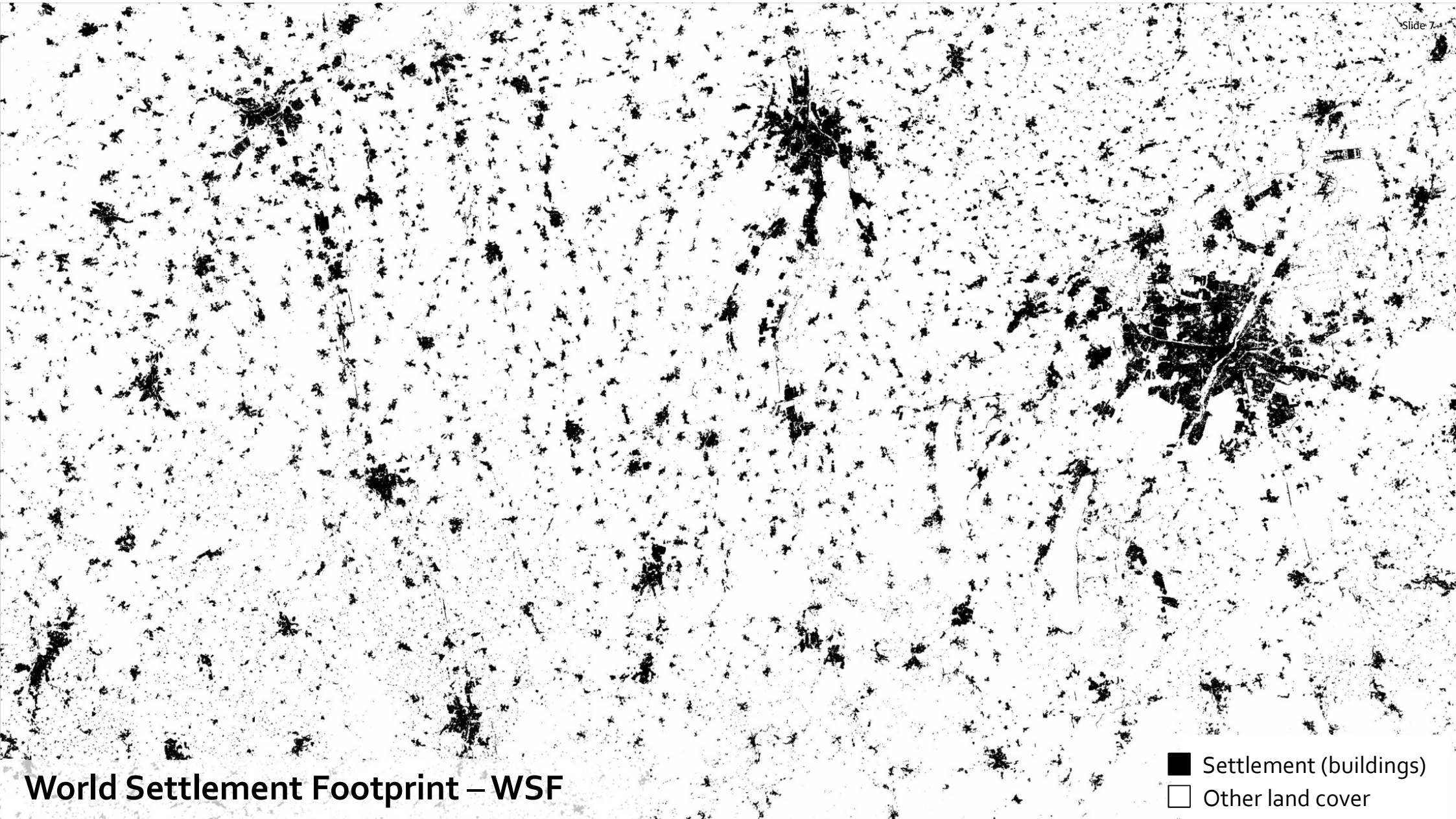
Copernicus

Meteorology

# World Settlement Footprint – WSF




WSF	Settlement extent 2015, 2019	Sentinel 1, Sentinel 2	10 m ground resolution
WSF imperviousness	Percent impervious surface 2019	Sentinel 2, WSF	10 m ground resolution
WSF population	Population distribution 2019	WSF imp, population stats	10 m ground resolution
WSF evolution	Settlement growth 1985 – 2015 (annual)	Landsat, WSF	30 m ground resolution
WSF 3D	Building area, height, volume 2019 (2012)	TanDEM-X, WSF	90 m ground resolution



# World Settlement Footprint – WSF

- Settlement (buildings)
- Other land cover

 Lagos

Slide 8

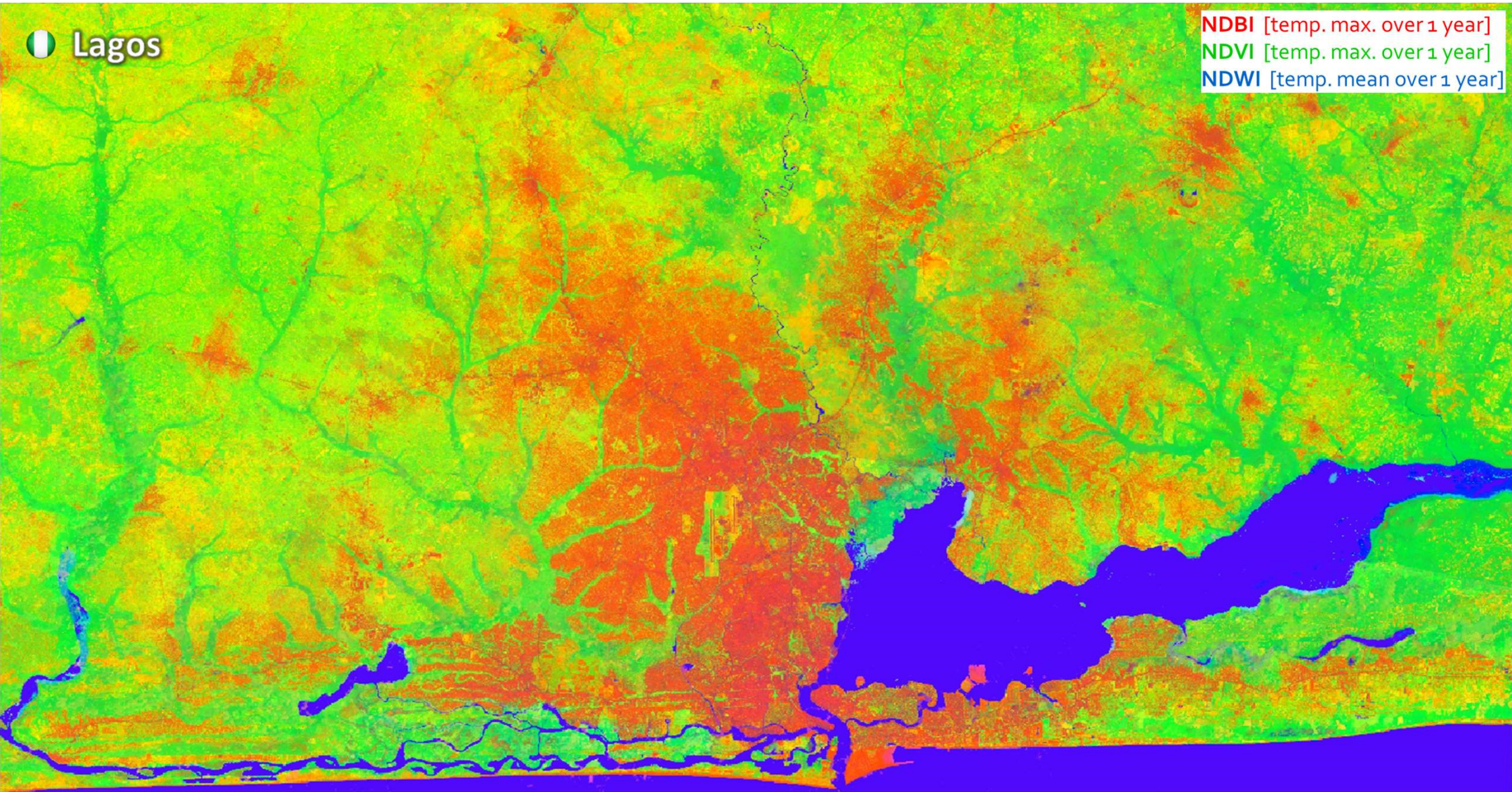


**Sentinel 2** (multispectral) – single scene



 Lagos

NDBI [temp. max. over 1 year]  
NDVI [temp. max. over 1 year]  
NDWI [temp. mean over 1 year]



**Sentinel 2** (multispectral) – multitemporal composite

 Lagos

S1A IW GRDH VV backscattering temporal mean



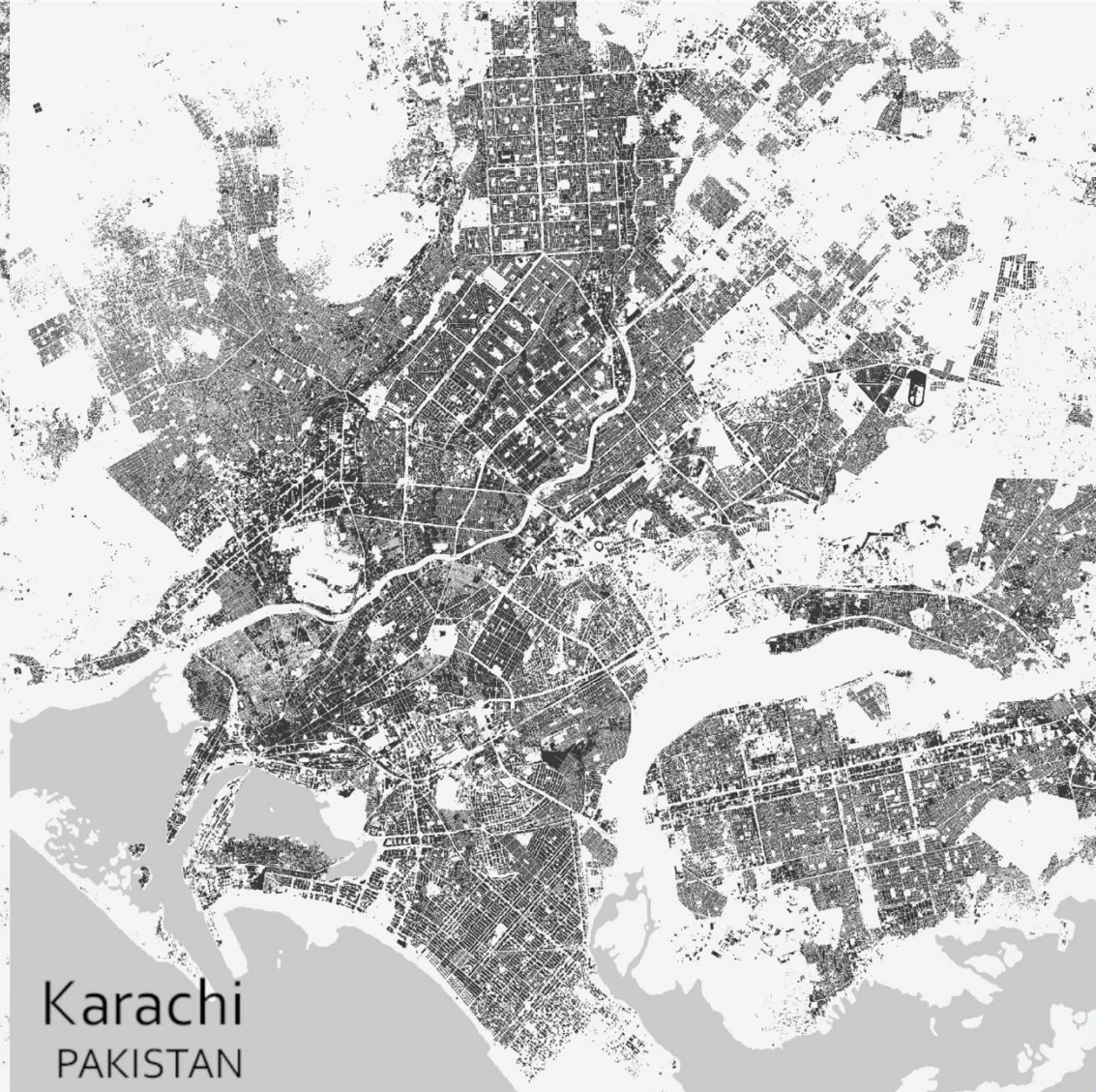
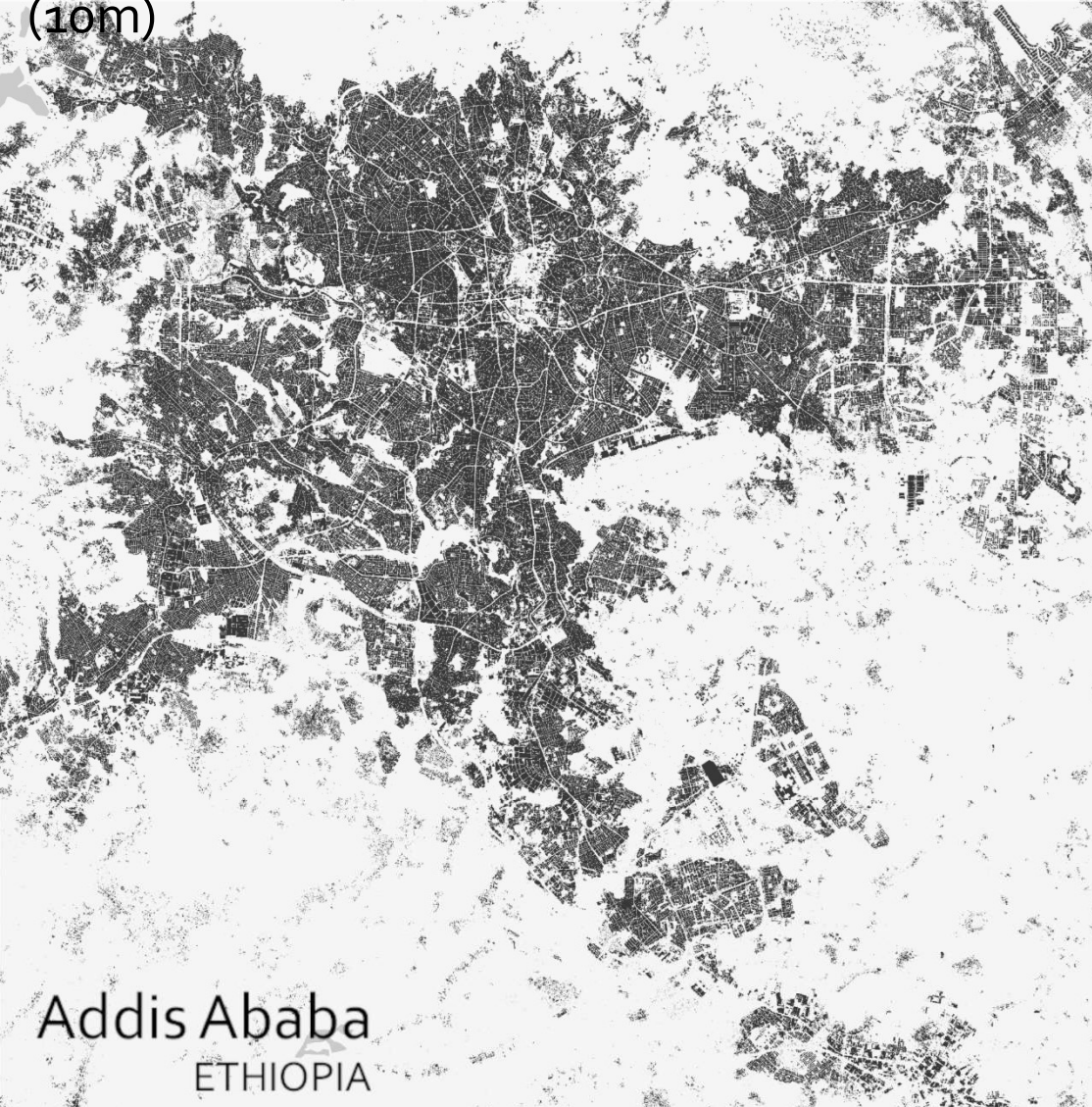
**Sentinel 1** (Radar) – multitemporal composite



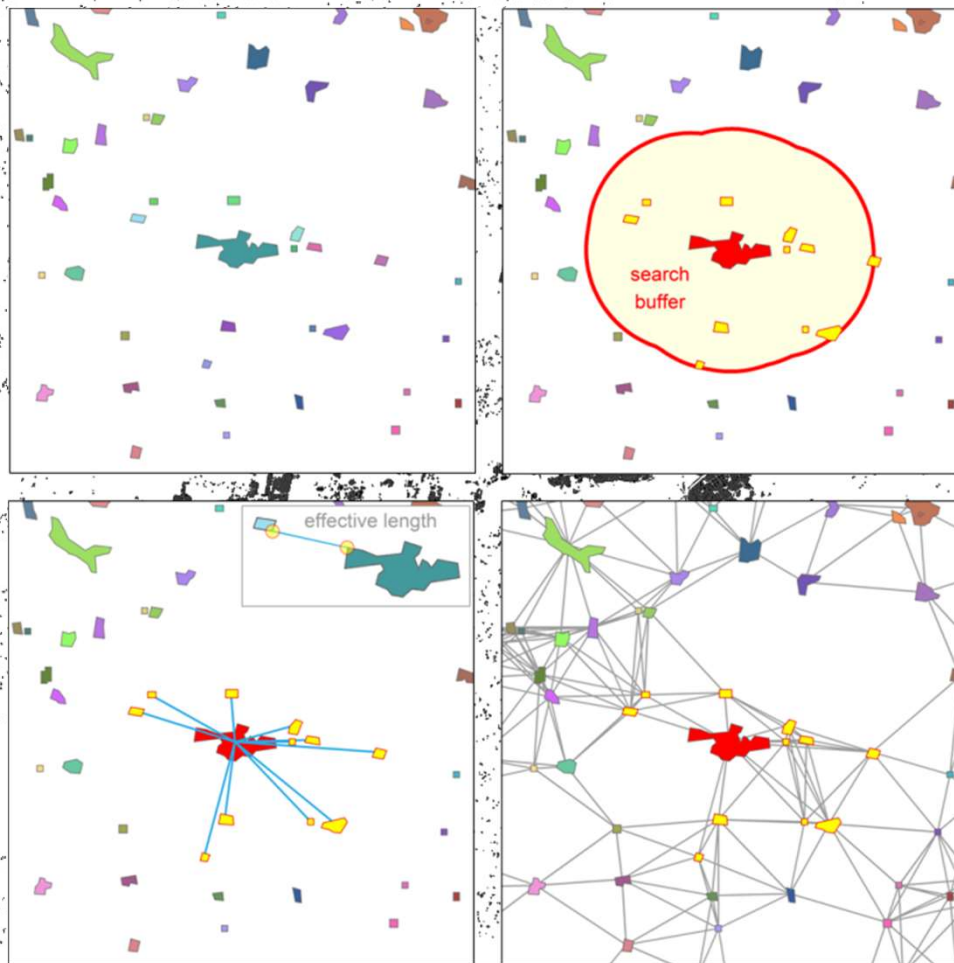
**World Settlement Footprint – WSF**

# World Settlement Footprint 2019 (WSF 2019)

(10m)

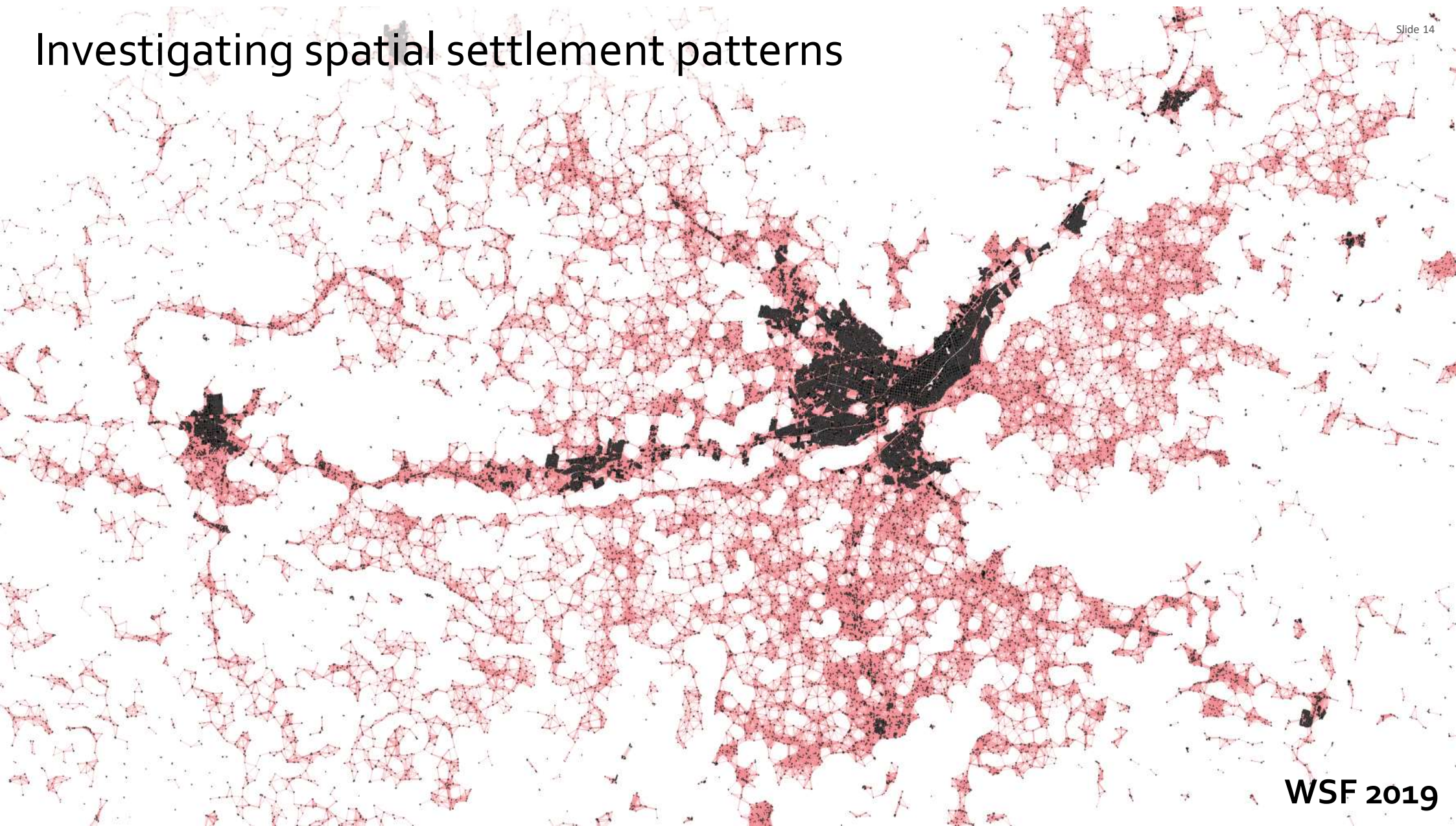


# Investigating spatial settlement patterns



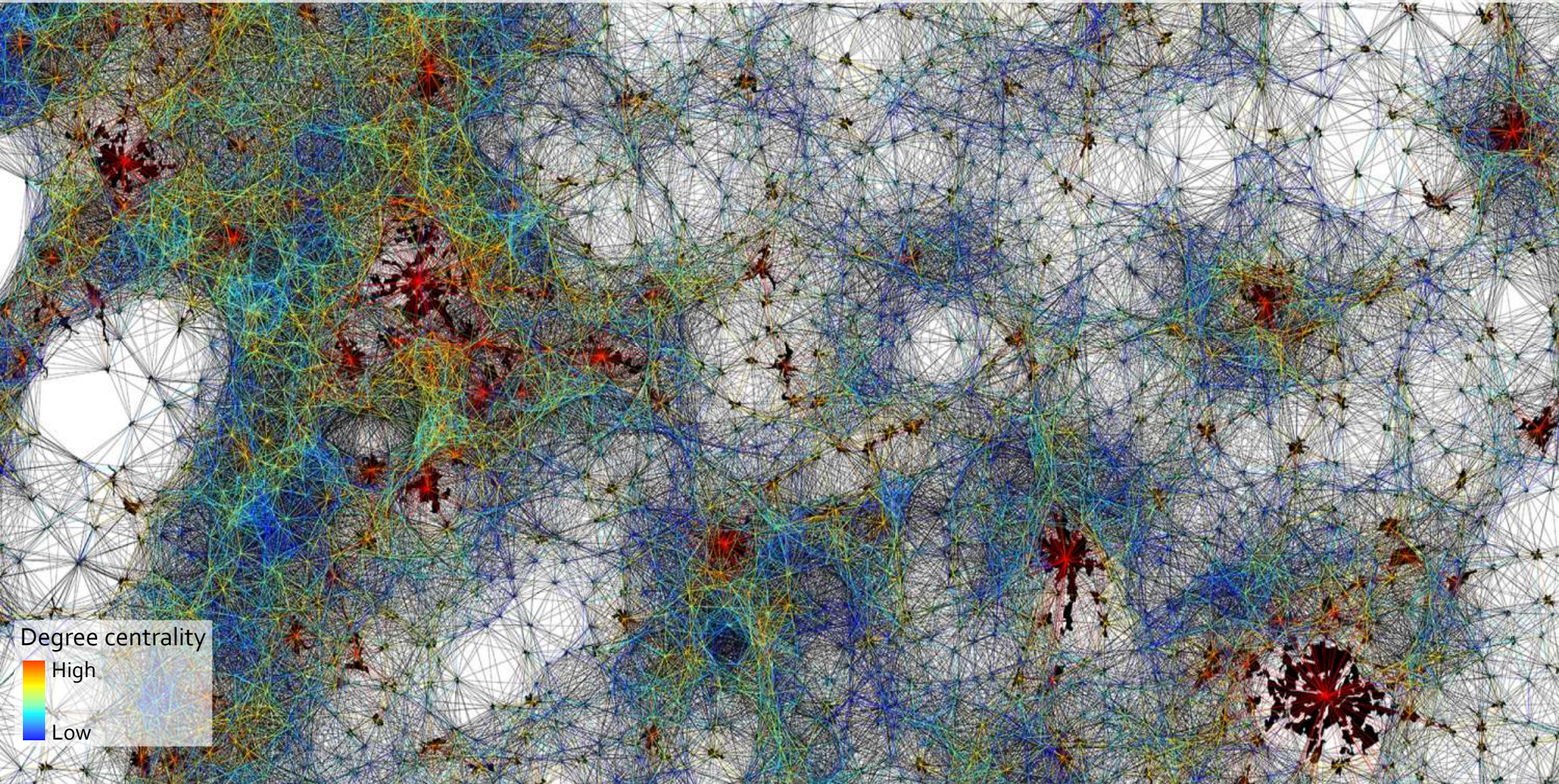
# Investigating spatial settlement patterns

Slide 14



**WSF 2019**

# Investigating spatial settlement patterns

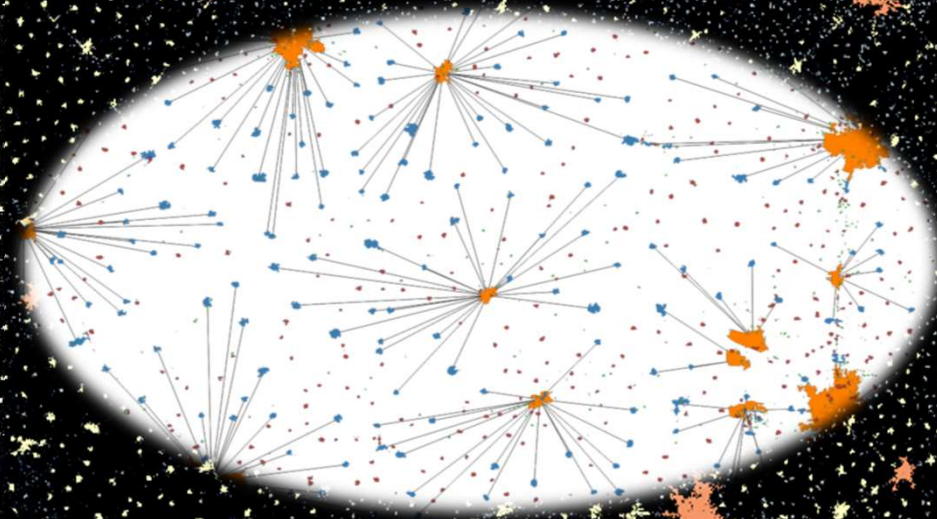


# Investigating spatial settlement patterns

Size category

- XL
- L
- M
- S
- XS

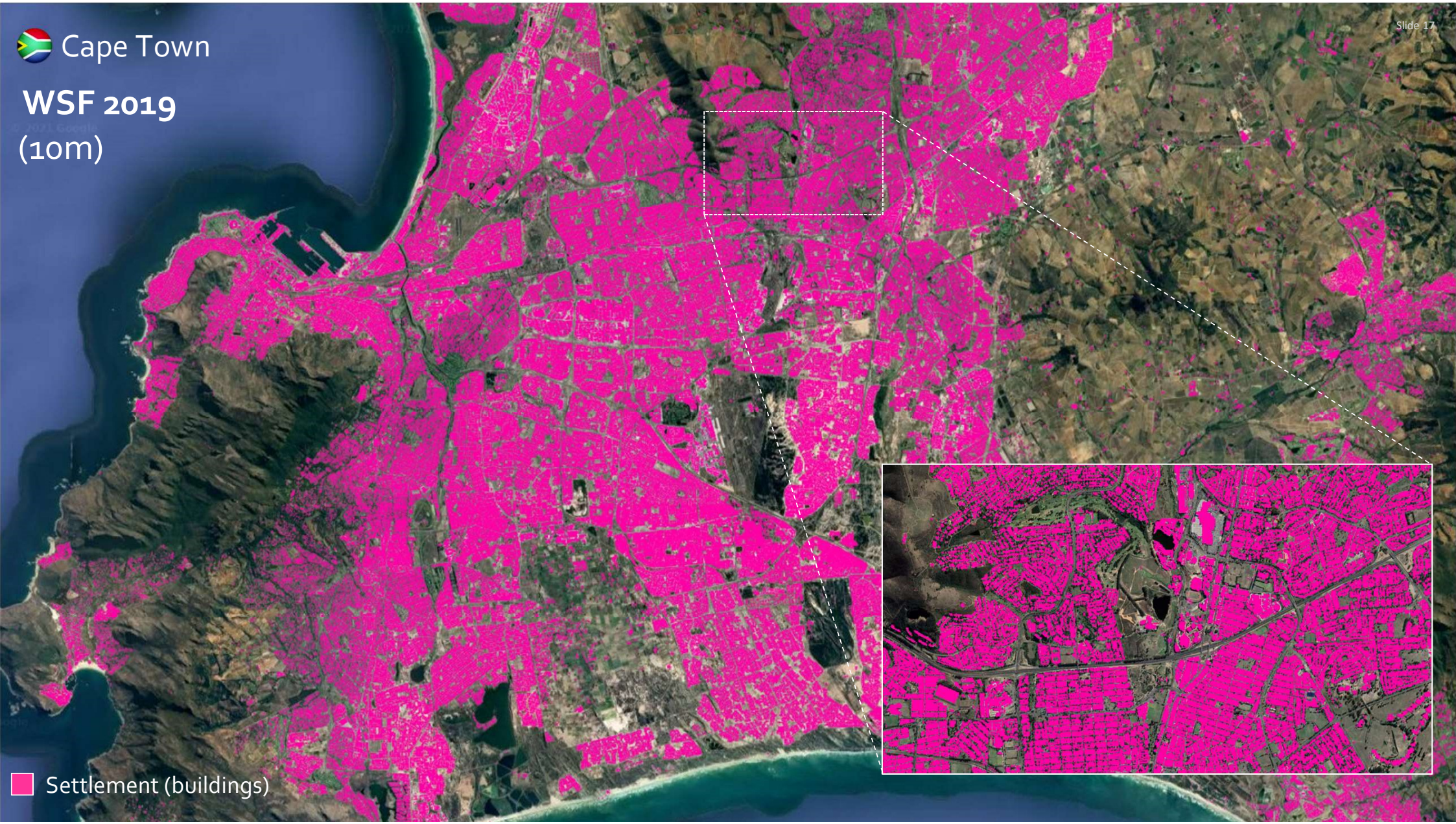
Definition of settlement hierarchies and neighborhood relations






 Cape Town

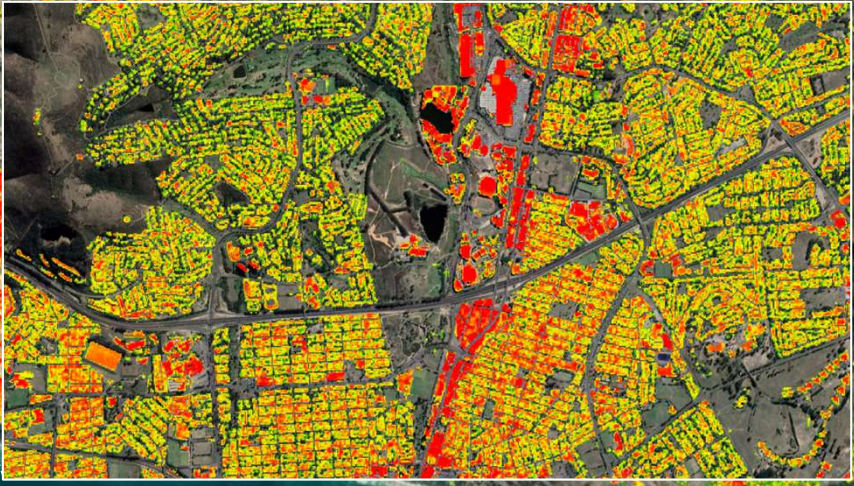
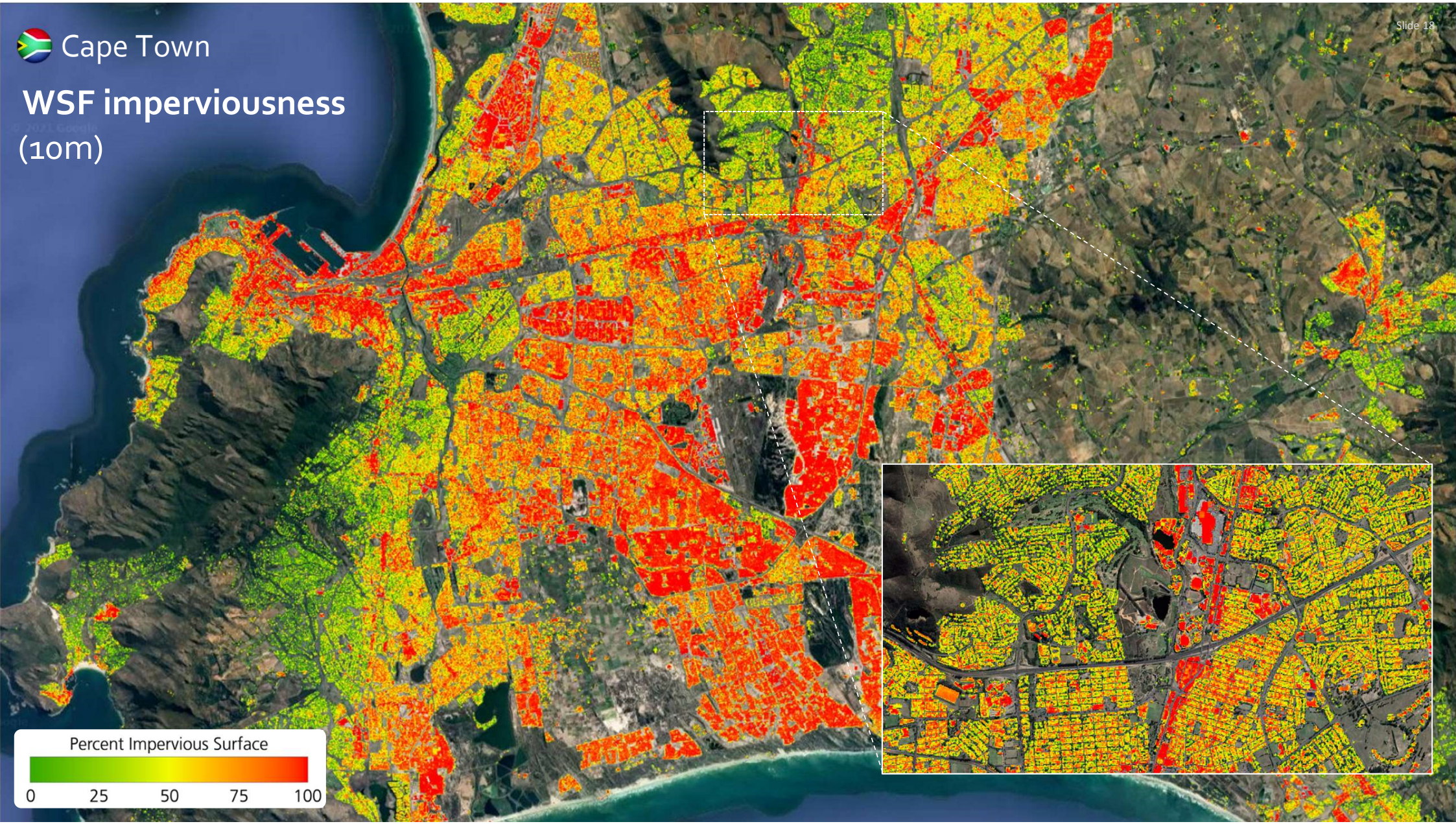
WSF 2019  
(10m)



 Settlement (buildings)

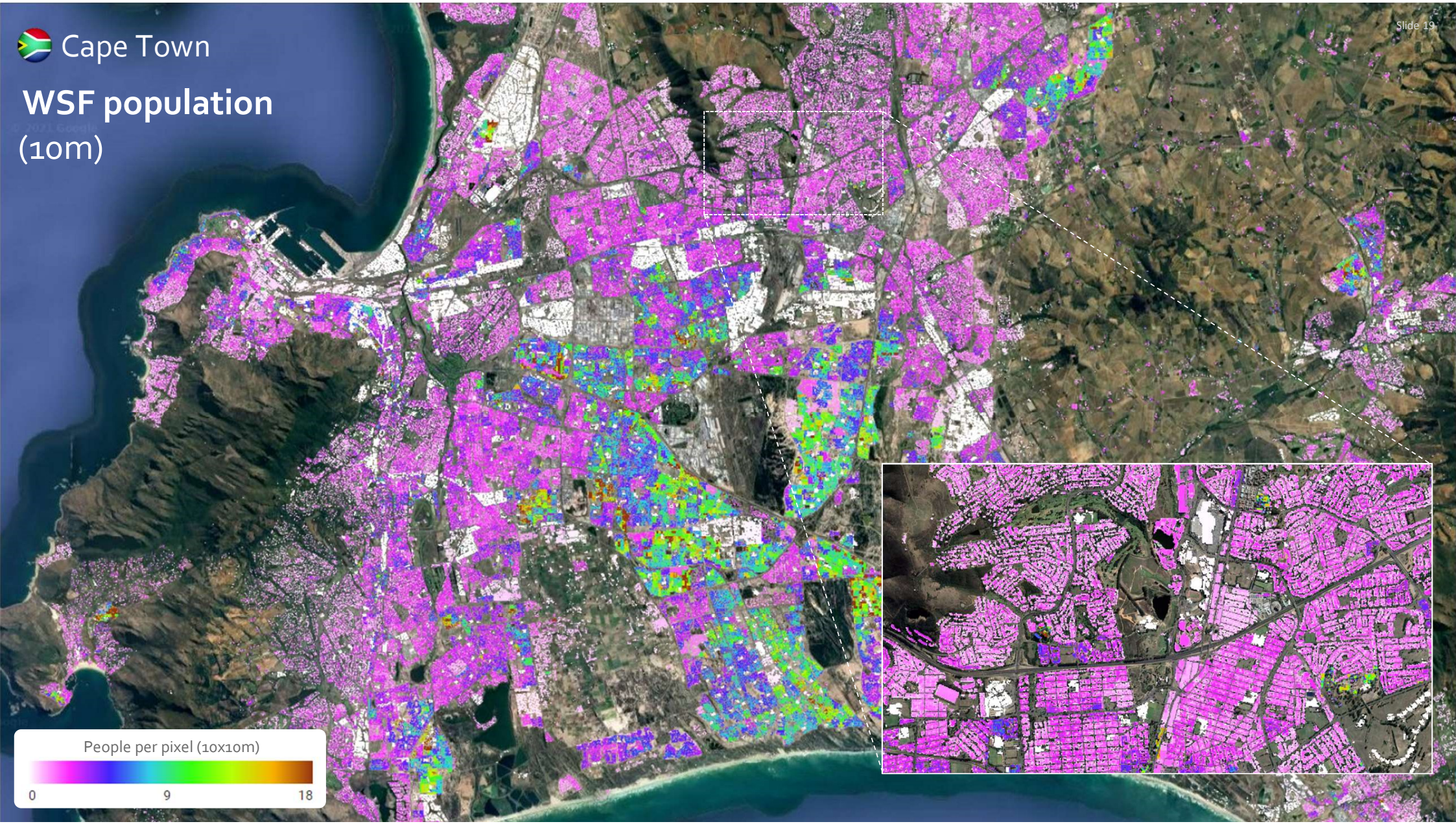
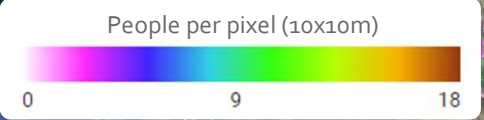
 Cape Town

# WSF imperviousness (10m)

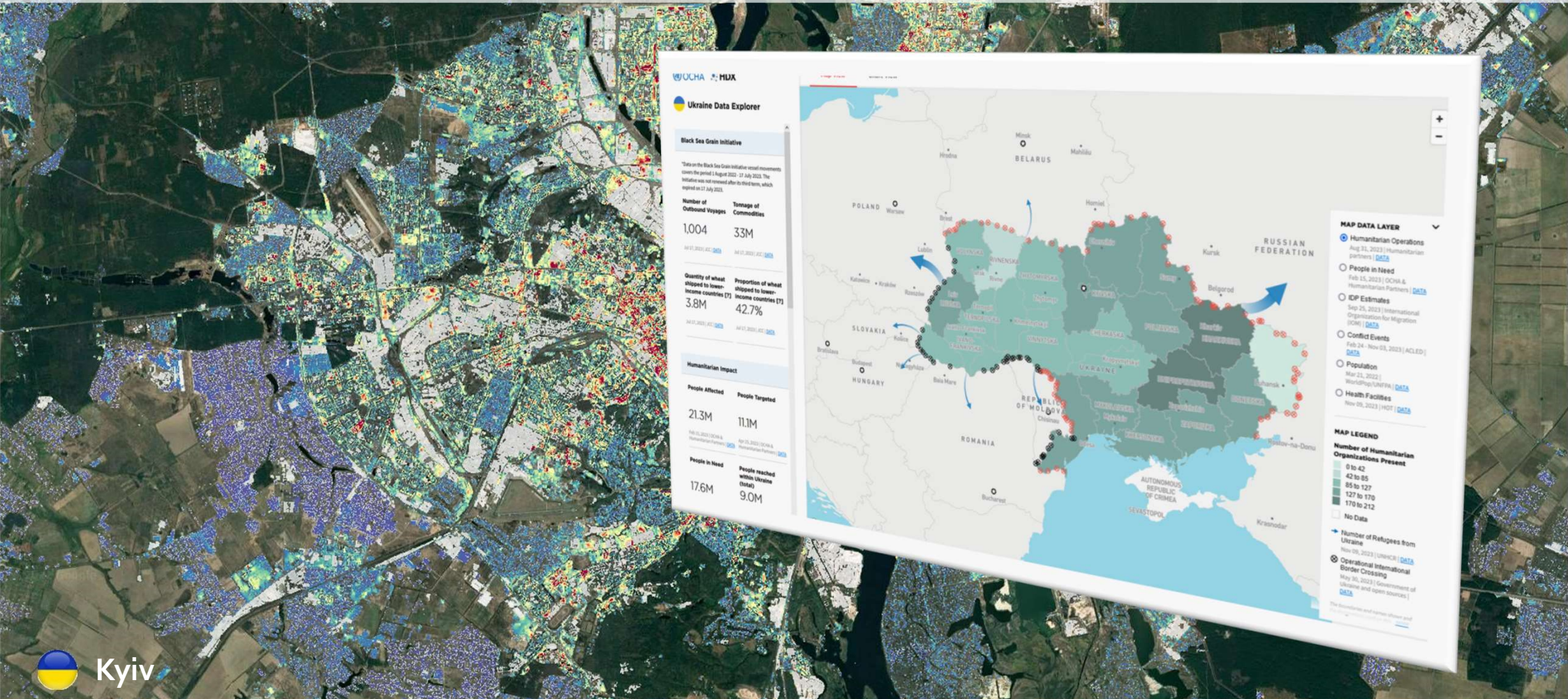


 Cape Town

WSF population  
(10m)



# Humanitarian aid for Ukraine: Up-to-date population distribution



**Ukraine Data Explorer**

**Black Sea Grain Initiative**

\*Data on the Black Sea Grain Initiative vessel movements cover the period 1 August 2022 - 17 July 2023. The initiative was not renewed after its third term, which expired on 17 July 2023.

Number of Outbound Voyages	Tonnage of Commodities
1,004	33M

Quantity of wheat shipped to lower-income countries [?] 3.8M

Proportion of wheat shipped to lower-income countries [?] 42.7%

**Humanitarian Impact**

People Affected	People Targeted
21.3M	11.1M

People in Need 17.6M

People reached within Ukraine (total) 9.0M

**MAP DATA LAYER**

- Humanitarian Operations (Aug 22, 2023) | OCHA & Humanitarian Partners | [Data](#)
- People in Need (Feb 15, 2023) | OCHA & Humanitarian Partners | [Data](#)
- IDP Estimates (Sep 25, 2023) | International Organization for Migration (IOM) | [Data](#)
- Conflict Events (Feb 24 - Nov 03, 2023) | ACLED | [Data](#)
- Population (Mar 21, 2022) | WorldPop/UNFPA | [Data](#)
- Health Facilities (Nov 03, 2023) | HOT | [Data](#)

**MAP LEGEND**

Number of Humanitarian Organizations Present

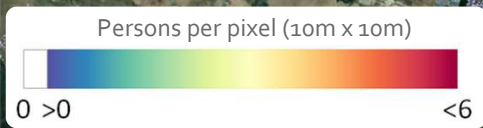
- 0 to 42
- 42 to 85
- 85 to 127
- 127 to 170
- 170 to 212
- No Data

Number of Refugees from Ukraine (Nov 09, 2023) | UNHCR | [Data](#)

Operational International Border Crossing (May 30, 2023) | Government of Ukraine and open sources | [Data](#)



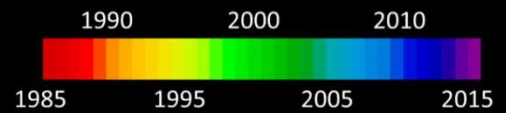
Kyiv

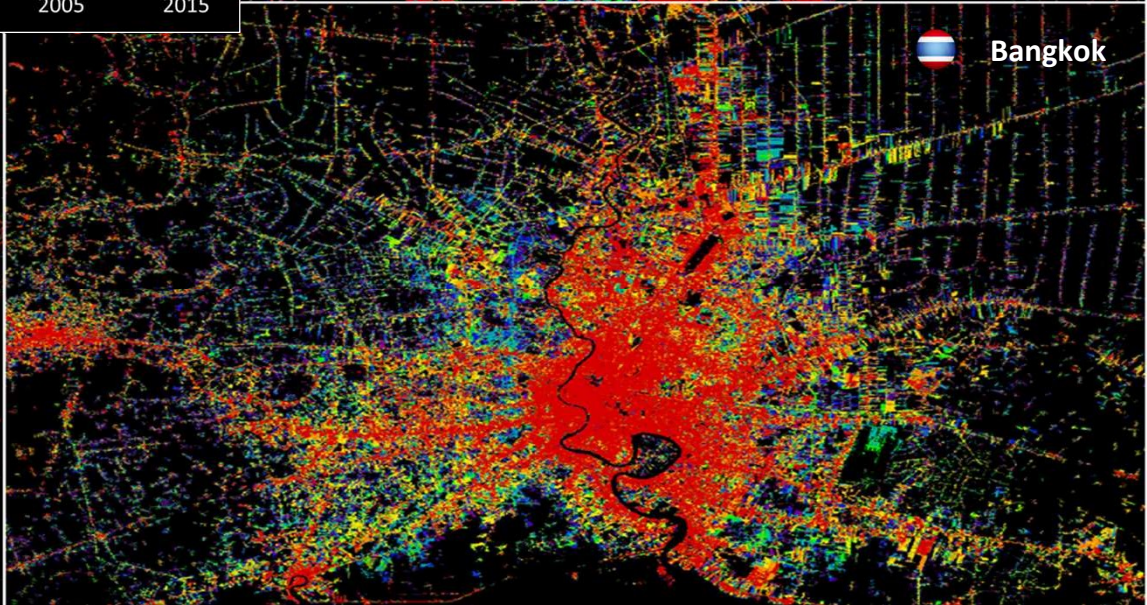
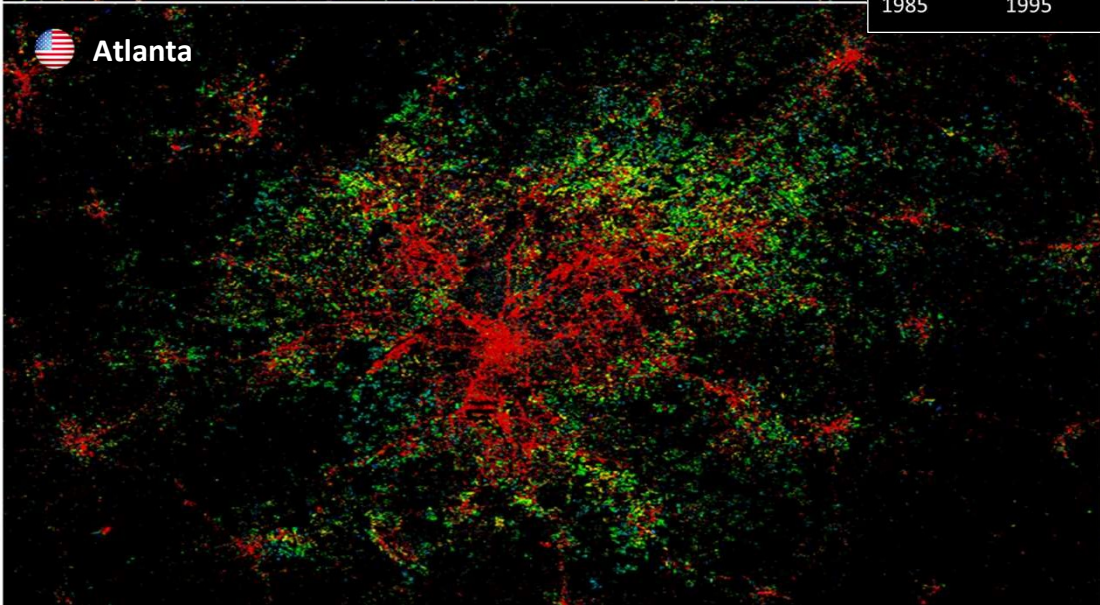
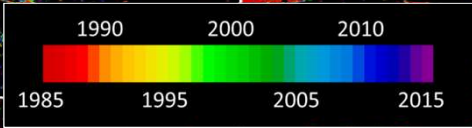
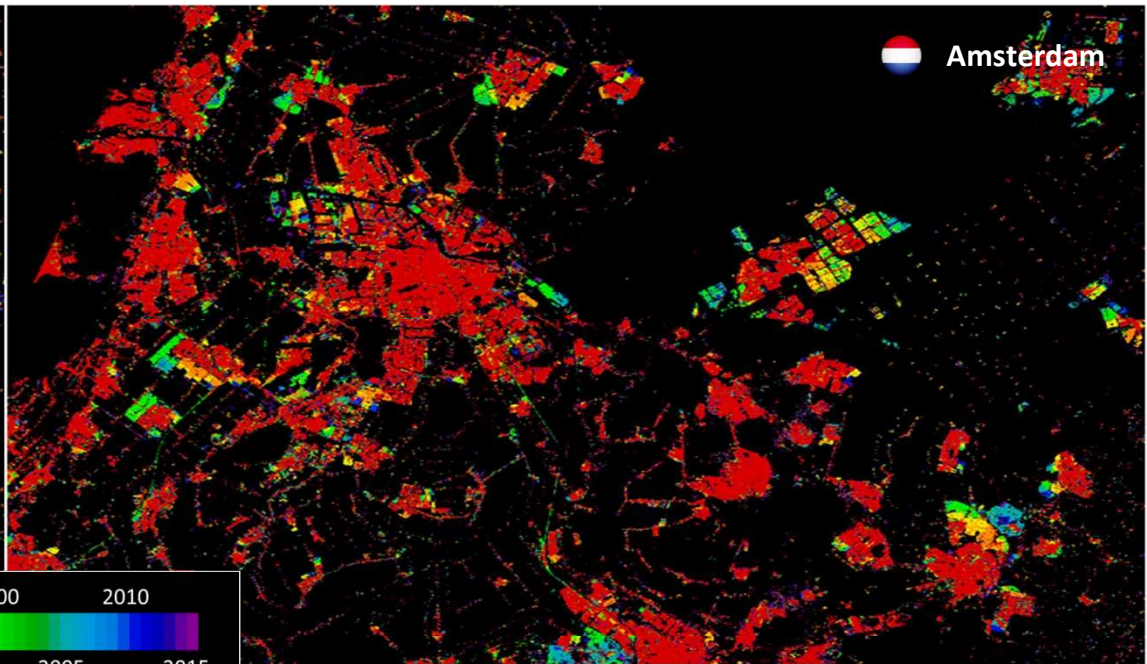
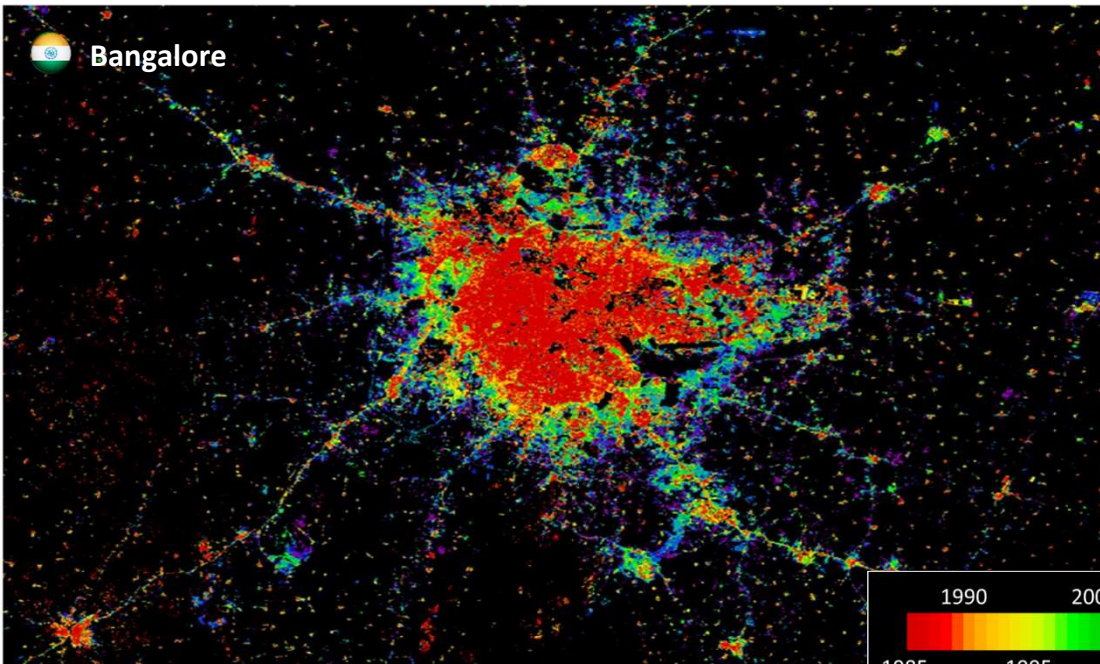





 Cairo

WSF evolution 1985-2015  
(30m)



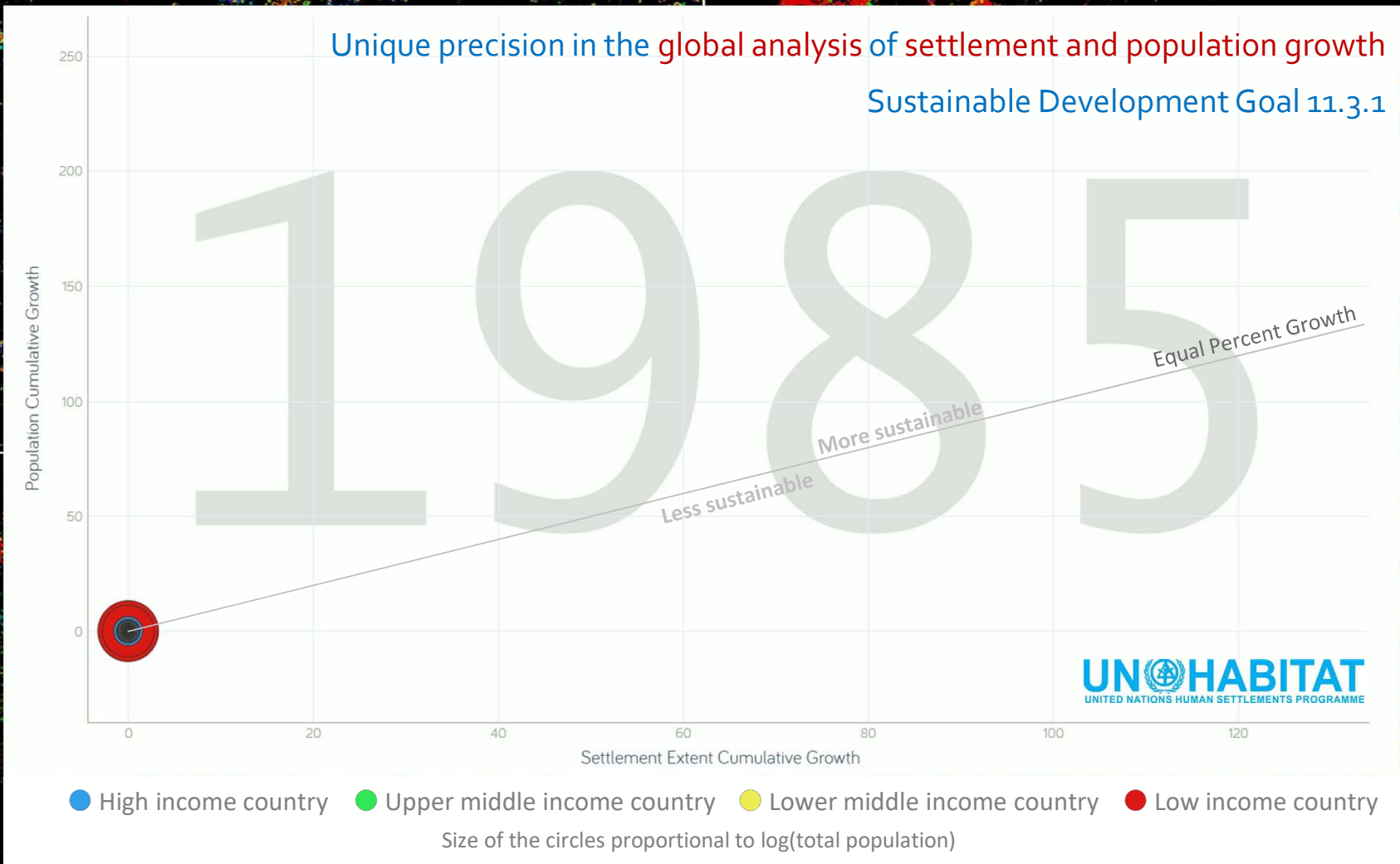


 Bangalore

 Amsterdam

 Atlanta

 Bangkok





# World Settlement Footprint 3D (90m)



Building Height [m]



First worldwide 3D mapping of entire built environment

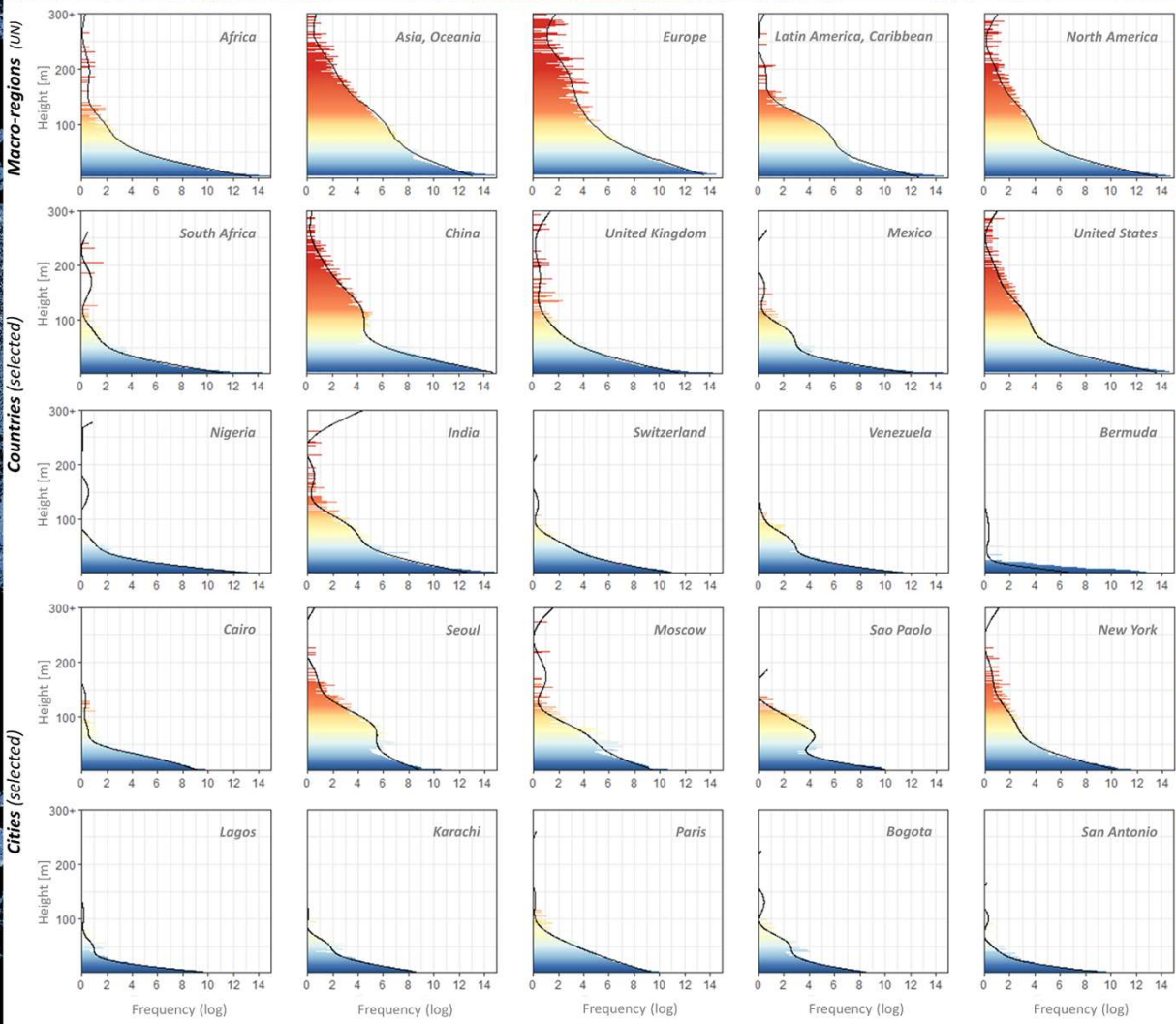
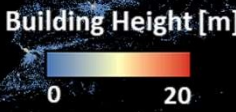
# World Settlement Footprint 3D (90m)

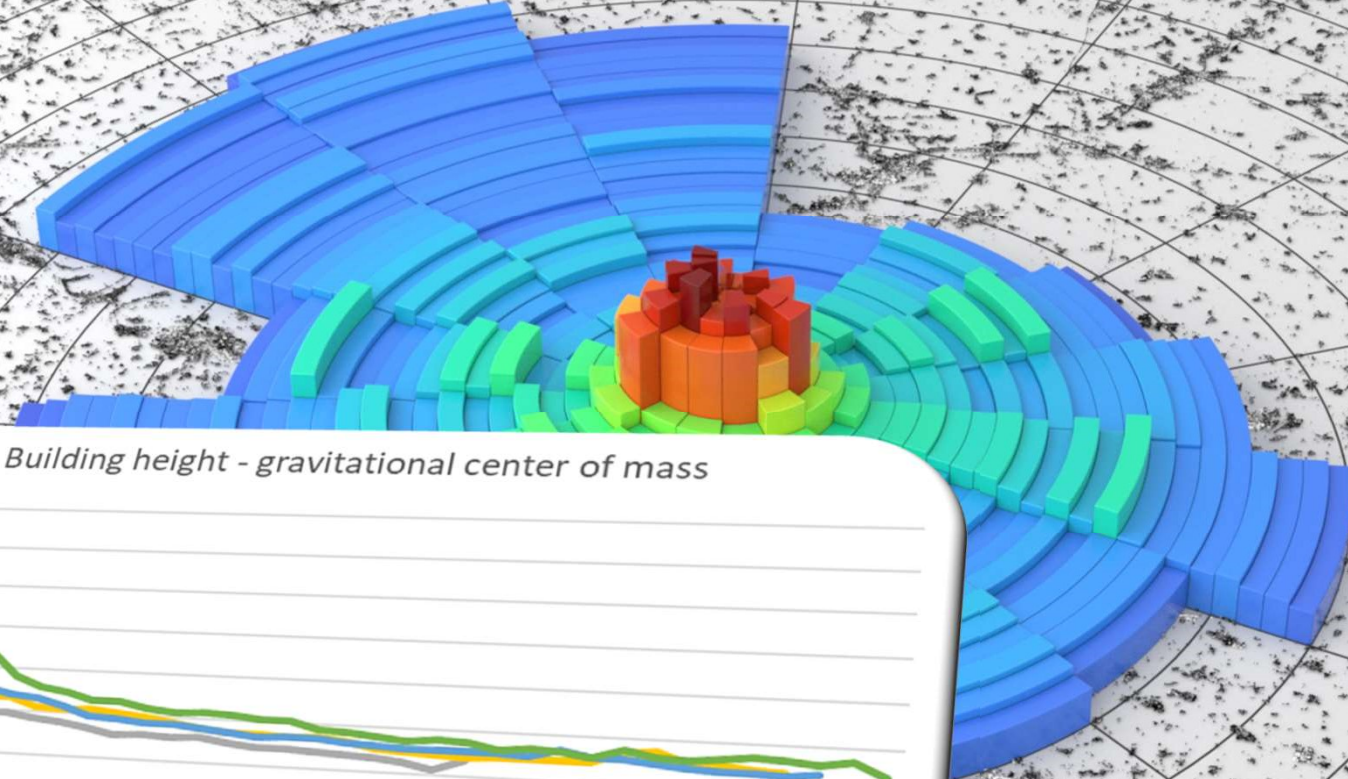
Dar es Salaam [TAZ]

Building Height [m]

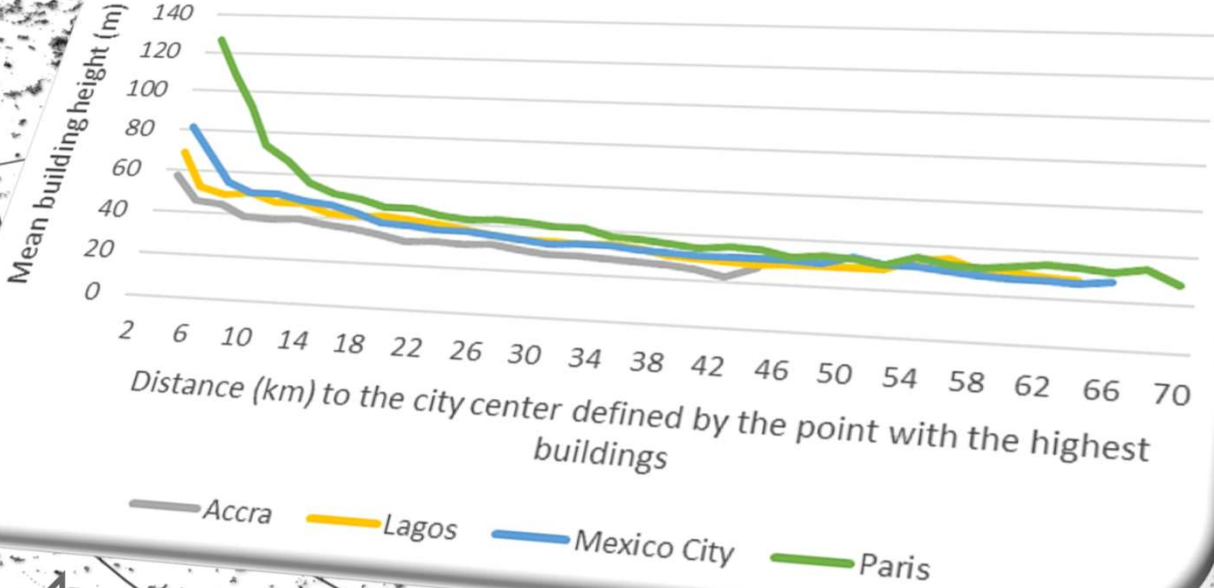


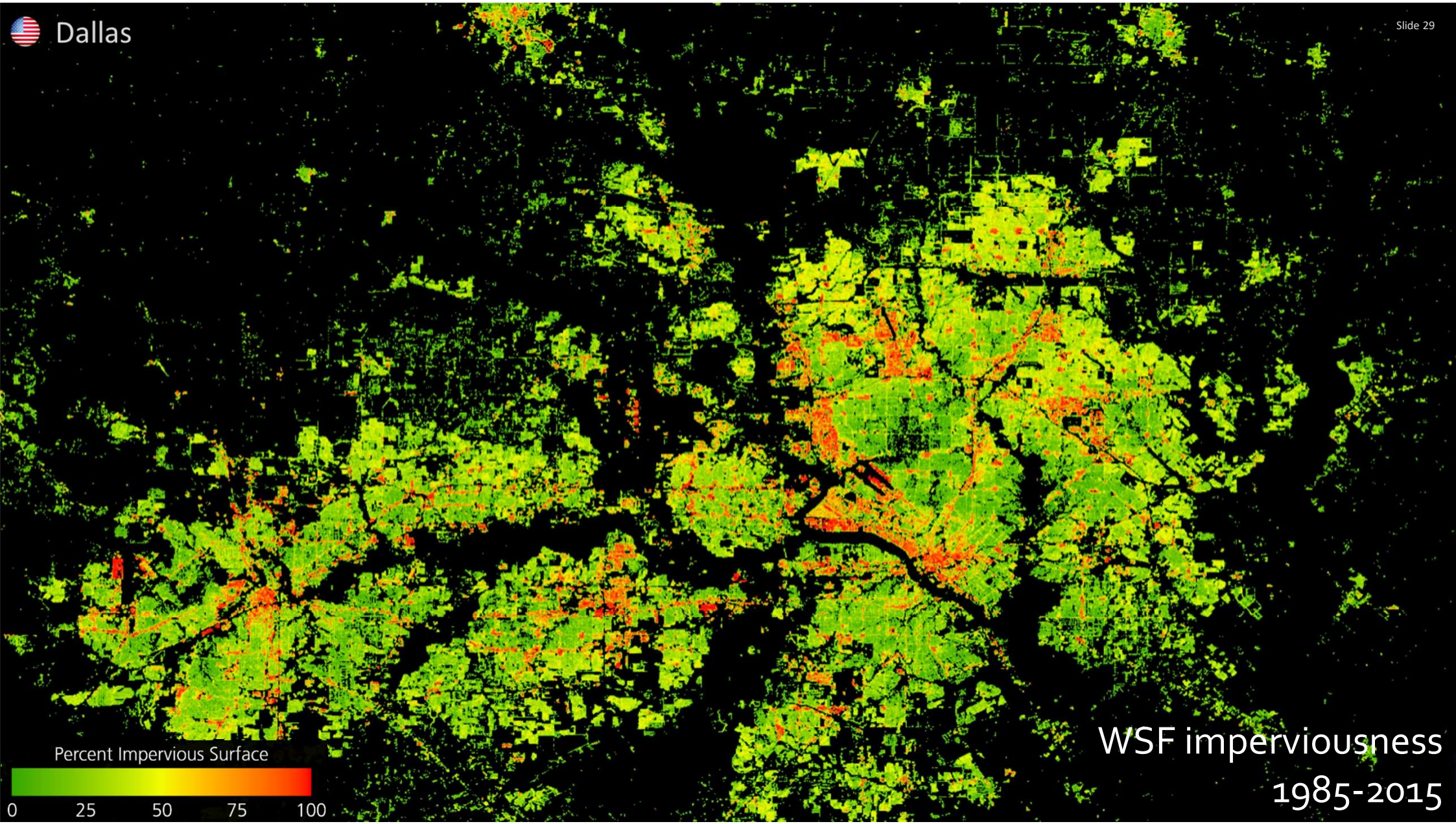
# World Settlement Footprint 3D (90m)





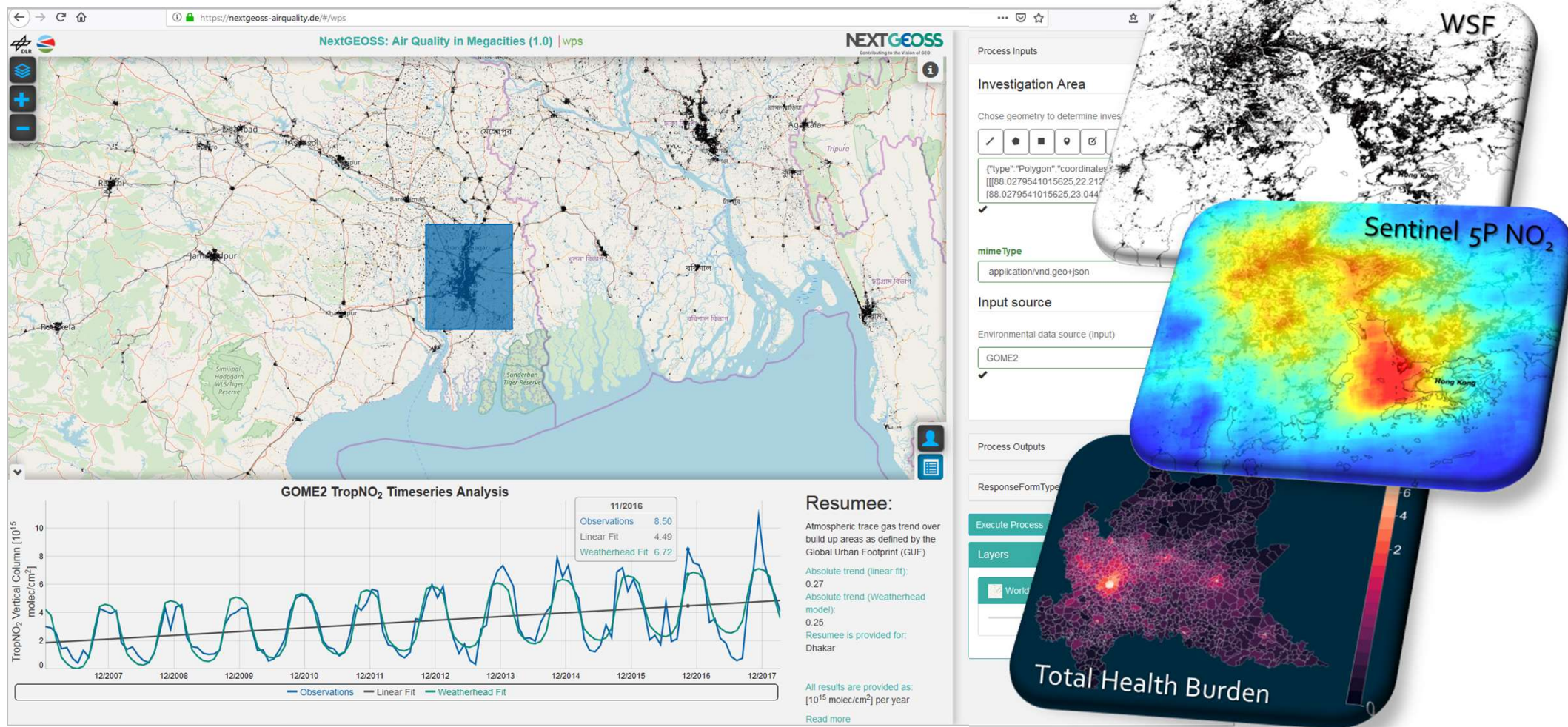
Building height - gravitational center of mass





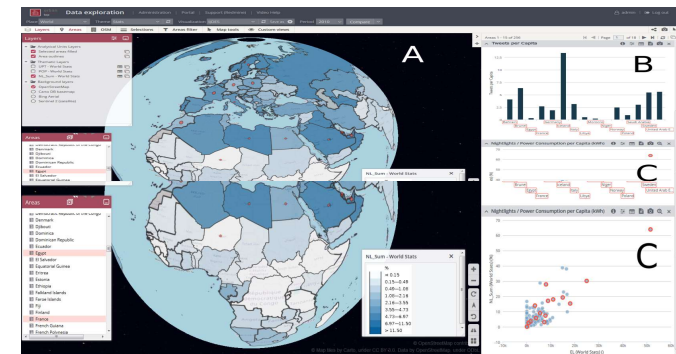
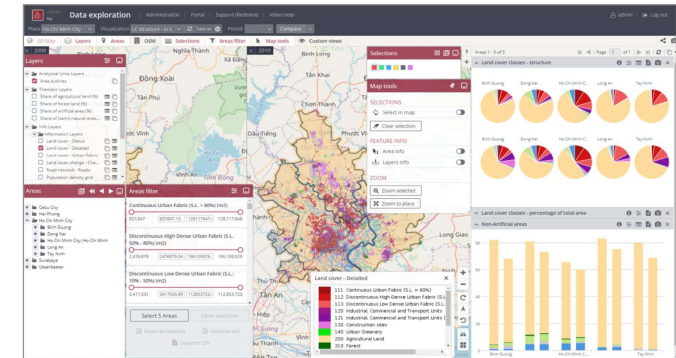
WSF imperviousness  
1985-2015

# Data and Information Fusion



# Enabling Technologies for Innovation and Knowledge Transfer

<https://urban-tep.eu>



Initiate a critical shift in the use of **Earth Observation data** by creating **open and participatory platforms** that enable any interested user from academia, business, planning, and government to query or generate **thematic information** on the state and evolution of the built environment



# Establishment of developments in science, planning and economy

Evidence-based policy advice and decision support

Knowledge and technology transfer







**Vielen Dank  
für Ihre Aufmerksamkeit!**

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