

Distanz schafft Klarheit

Ein fernerkundlicher Blick auf die Urbanisierung
unseres Planeten

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Earth Observation Center (EOC)

Deutsches Zentrum für Luft- und Raumfahrt (DLR)

GIS-Forum,
Dresden, 31.01.2019





*„On the way to the moon we'd
discovered the Earth“*

(Eugene Cernan, commander Apollo 17)





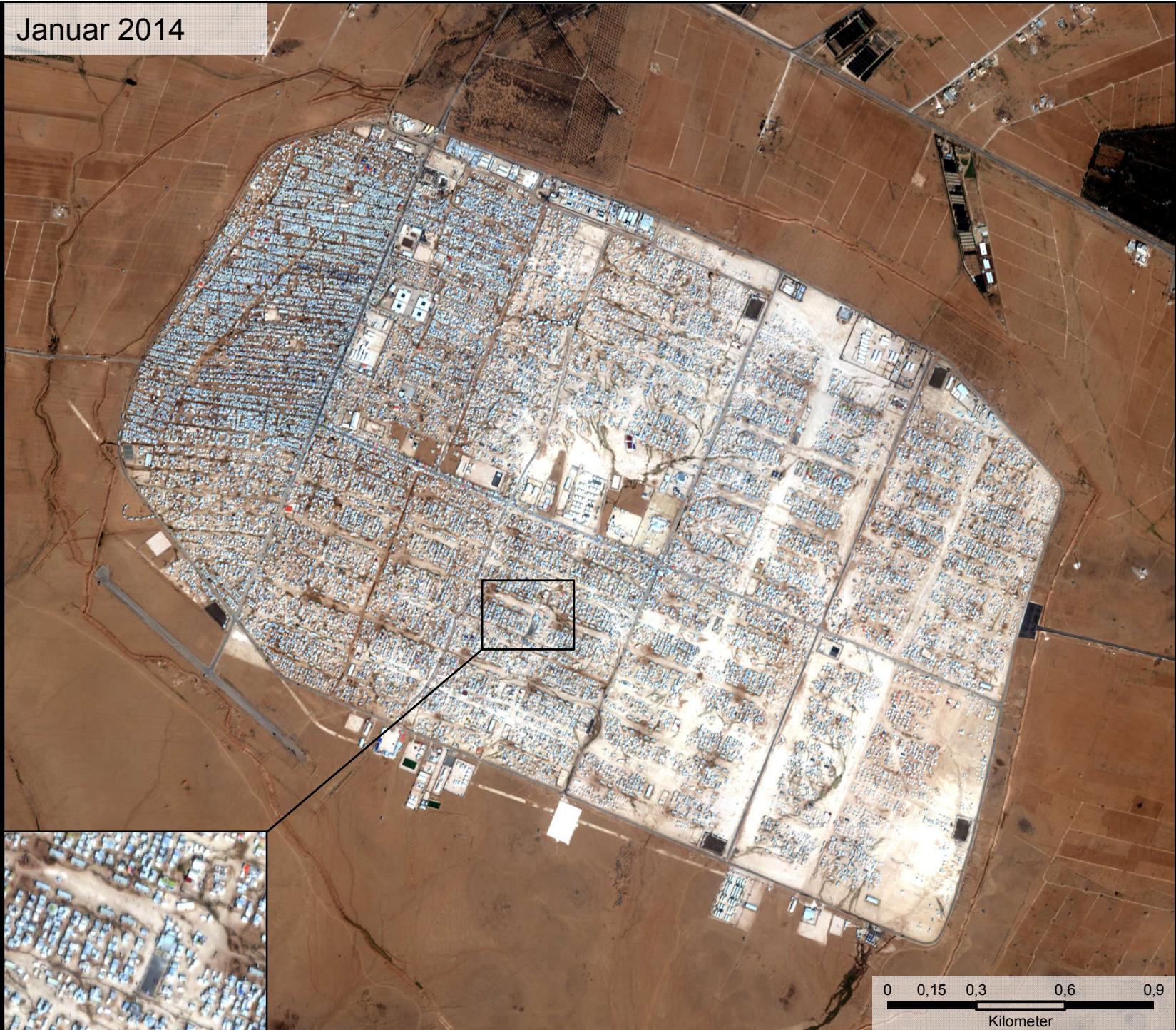




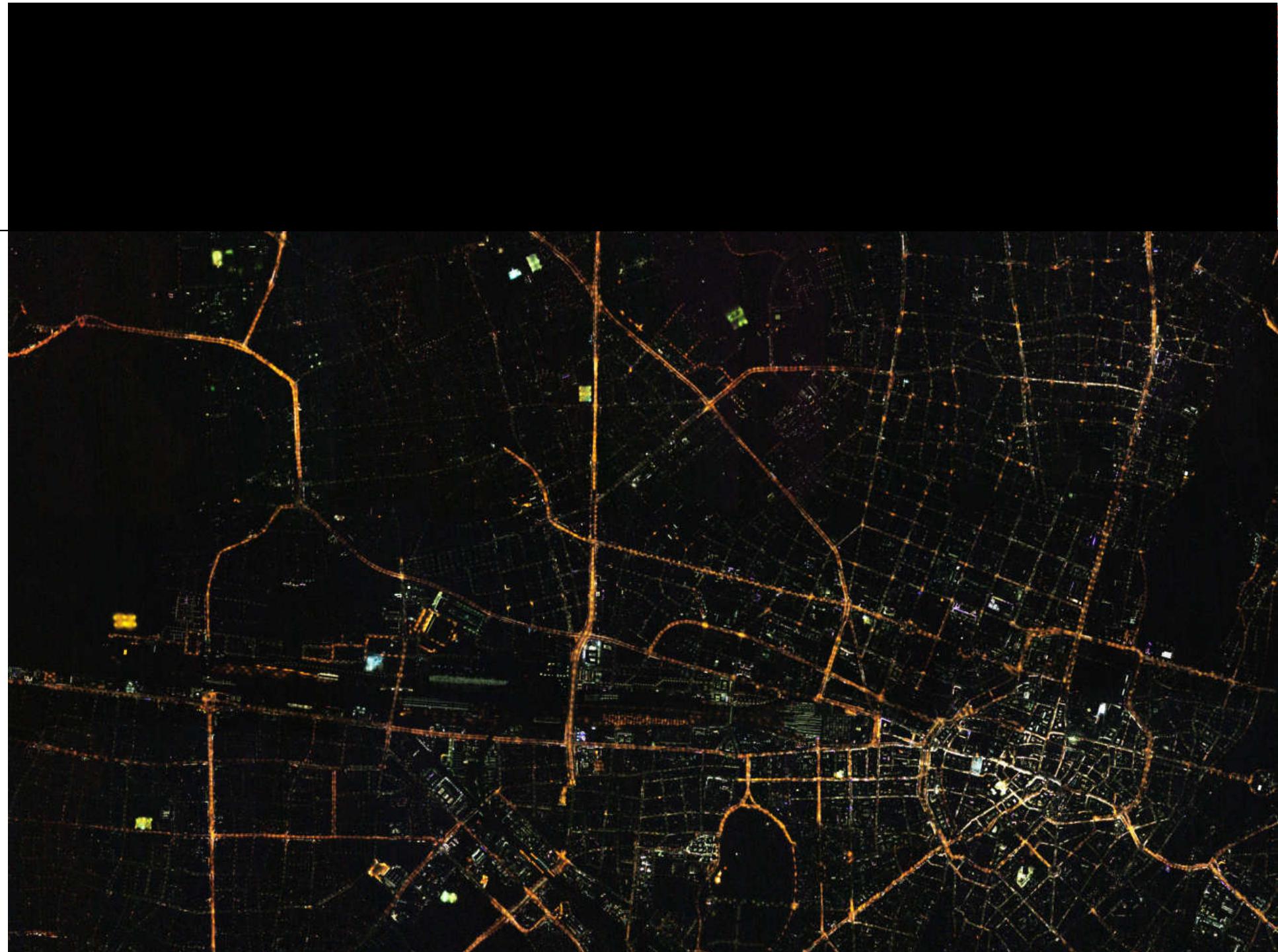




Januar 2014

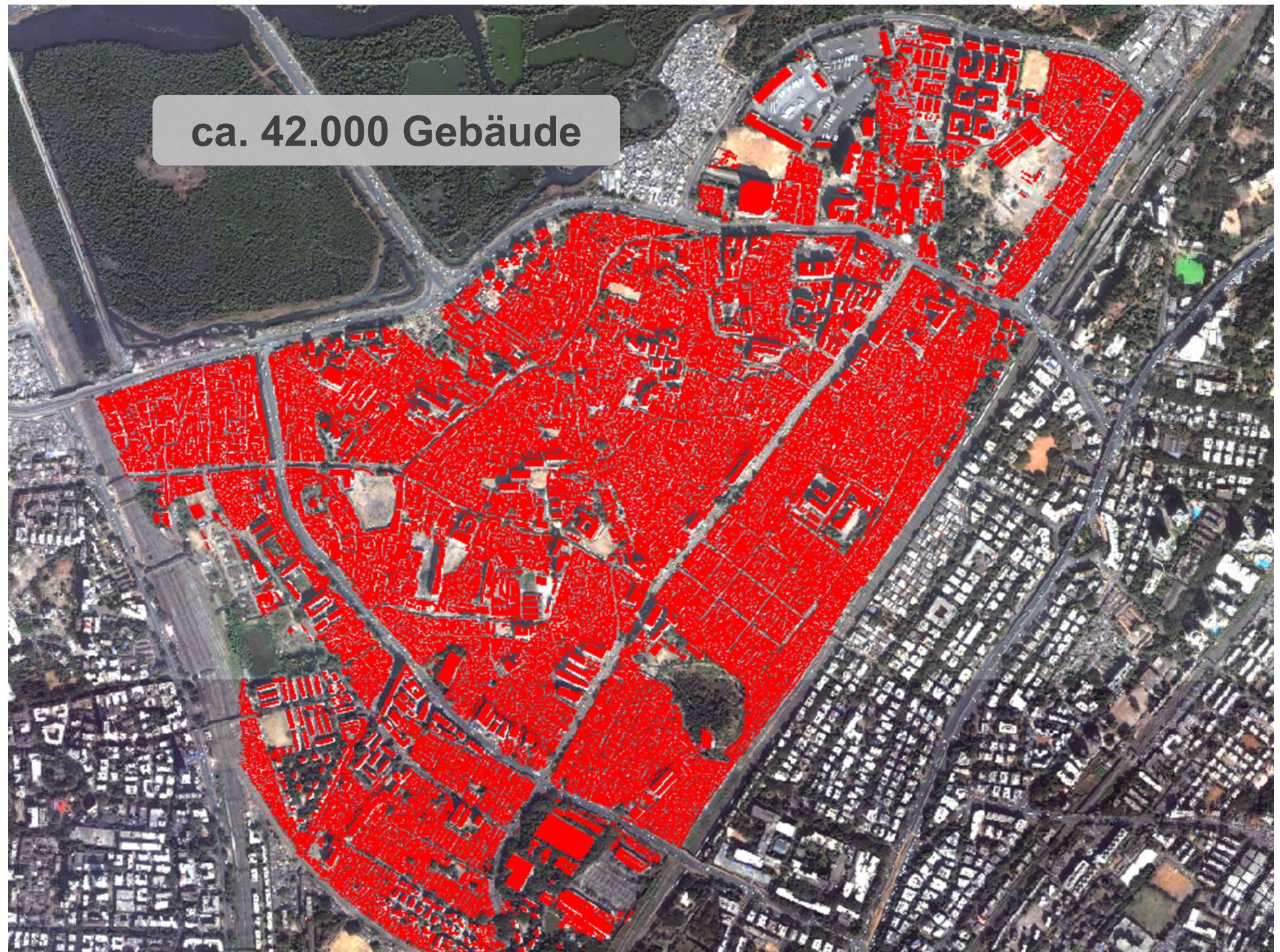


Daten sind noch keine
Information



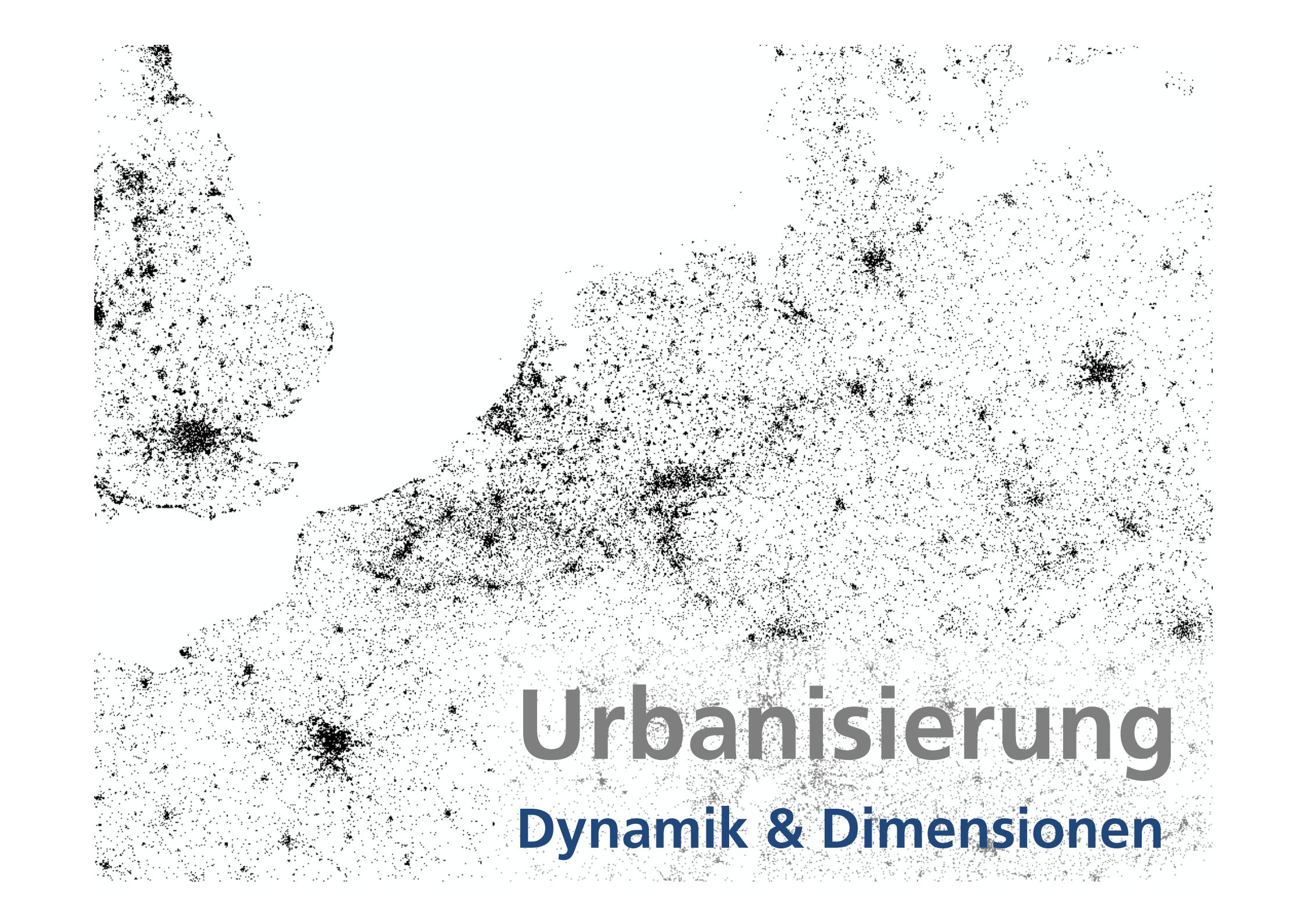
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		VV/VH scale contr.			VV/VH CBR 19
HH/VV k1 2nd_m	HH/VV OBR/CBR 31		HH/VV CBR 31	HH/VV k7 2nd_m	VV/VH k1 en
VV/VH OBR/CBR 27		HH/VV OBR/CBR 23	HH/VV scale var.		HH/VV OBR/CBR 19
R 19 VV/VH k3 homog.	VV/VH k3 mean	VV/VH OBR/CBR 3			HH/VV k1 var. HH/VV k3 2nd_
var.	HH/VV OBR/CBR 3	VV/VH k3 var.	HH/VV dia. contr.	VV/VH dia. 2nd_m	HH/VV pol. conti
	VV/VH k7 mean	VV/VH OBR 35	VV/VH OBR 3	VV/VH CBR 27	
HH/VV ret. contr.	HH/VV k0 entr.	VV/VH OBR 11	VV/VH CBR 35		HH/VV dia. var.
2nd_m	HH/VV ret. var.	VV/VH pol. homog.	VV/VH k1 2nd_m		VV/VH abs. va
HH/VV dia. mean	HH/VV OBR 7	VV/VH ret. contr.	HH/VV k3 var.		VV/VH ret. mean
var.	HH/VV k7 homog.	VV/VH k7 2nd_m	HH/VV scale homog.	VV/VH k0 2nd_m	VV/VH pol. va
. homog.	VV/VH k1 dissim.	VV/VH k7 contr.	VV/VH k7 mean	VV/VH k7 mean	VV/VH scale me
35 HH/VV pol. 2nd_m	VV/VH k1 entr.	VV/VH scale 2nd_m	VV/VH pol. 2nd_m	VV/VH k7 mean	
CBR 15 VV/VH abs. entr.	VV/VH k3 2nd_m	VV/VH dia. dissim.	VV/VH k1 mean	VV/VH abs. homog.	
CBR 7 VV/VH dia. homog.	VV/VH k7 dissim.	VV/VH OBR 15	VV/VH k3 dissim.	VV/VH pol. va	
le mean	HH/VV k7 dissim.	VV/VH OBR 23	VV/VH k1 dissim.	VV/VH k1 homog.	VV/VH dia. dissim
VV/VH k1 contr.	HH/VV OBR/CBR 11	VV/VH scale dissim.	VV/VH k3 mean	VV/VH ret. mean	
contr.	VV/VH scale homog.	VV/VH abs. dissim.	VV/VH k1 mean	VV/VH scale va	
OBR/CBR 35	VV/VH OBR/CBR 7	VV/VH abs. dissim.	VV/VH OBR 31	VV/VH k3 dissim.	VV/VH k3 dissin
3 VV/VH ret. var.	HH/VV CBR 7	VV/VH k0 entr.	VV/VH k1 dissim.	VV/VH k0 homog.	VV/VH dia. hom
R 19 VV/VH CBR 23	HH/VV k0 contr.	VV/VH OBR 3	HH/VV k3 dissim.	VV/VH k0 homog.	
r. VV/VH scale entr.	VV/VH OBR/CBR 31	HH/VV k0 mean	VV/VH k1 mean	VV/VH pol. contr	VV/VH k1 homog
CBR 11 VV/VH OBR/CBR 19	HH/VV k0 var.	VV/VH OBR 31	VV/VH k1 mean	VV/VH OBR/CBR 2	
homog.	VV/VH pol. mean	VV/VH k7 var.	VV/VH k0 contr.	VV/VH CBR 3	VV/VH dia. mean
VV/VH ret. homog.	HH/VV OBR 11	VV/VH k7 dissim.	VV/VH CBR 3	VV/VH ret. dissim.	VV/VH k7 entr.
2 R�m abs. homog.	HH/VV k3 contr.	VV/VH OBR 23	VV/VH k0 var.	VV/VH OBR 7	VV/VH k7 contr.
abs. mean	HH/VV CBR 11	VV/VH CBR 7	VV/VH OBR/CBR 15	VV/VH OBR/CBR 15	HH/VV k3 entr.

tausende Bildmerkmale



ca. 42.000 Gebäude

**Information ist noch
keine Erkenntnis**

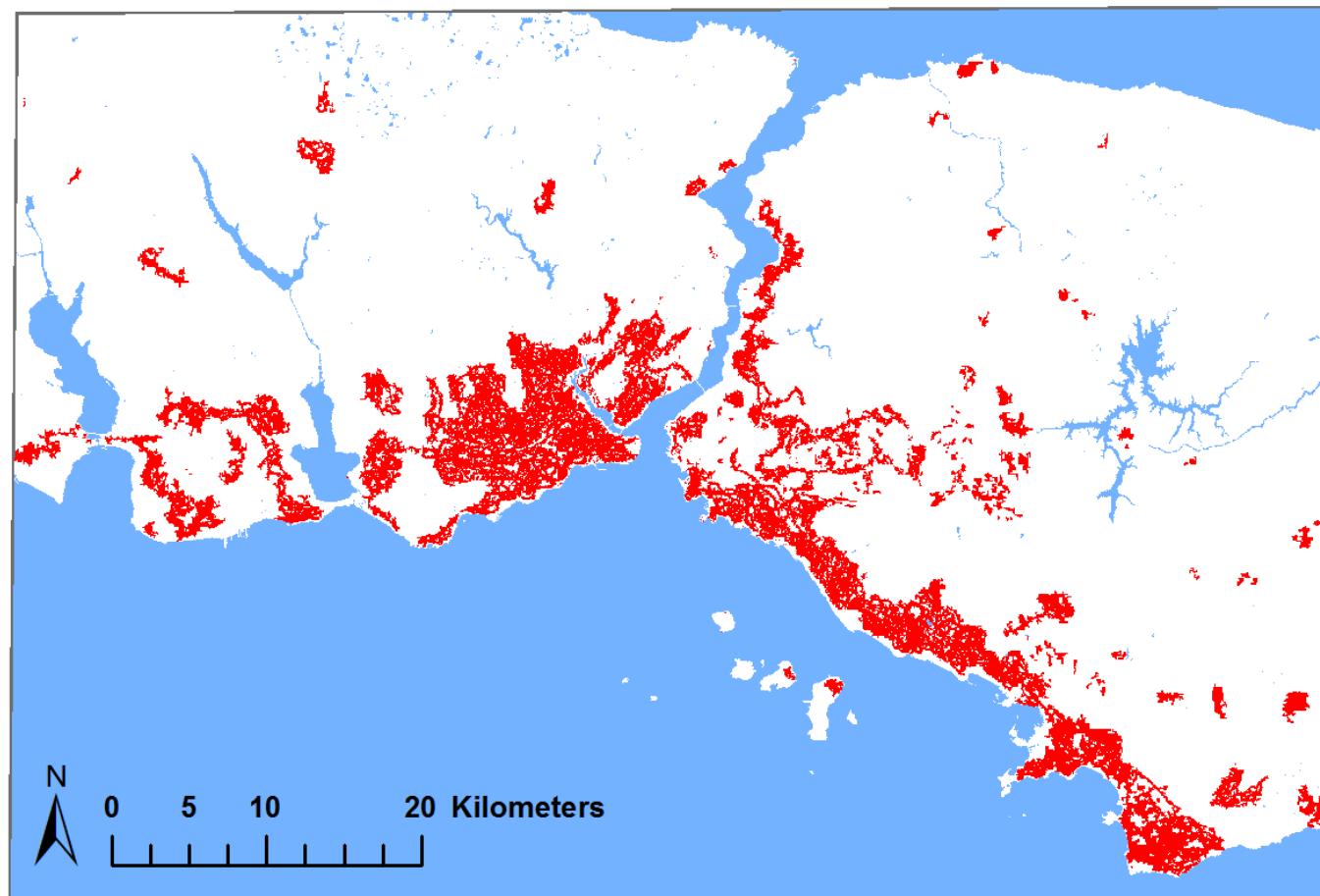


Urbanisierung

Dynamik & Dimensionen

Urban Growth

Istanbul 1975



Taubenböck H, Esch T, Felbier A, Wiesner M, Roth A & Dech S (2012): *Monitoring of mega cities from space*. In: Remote Sensing of Environment, vol. 117, pp. 162-176.



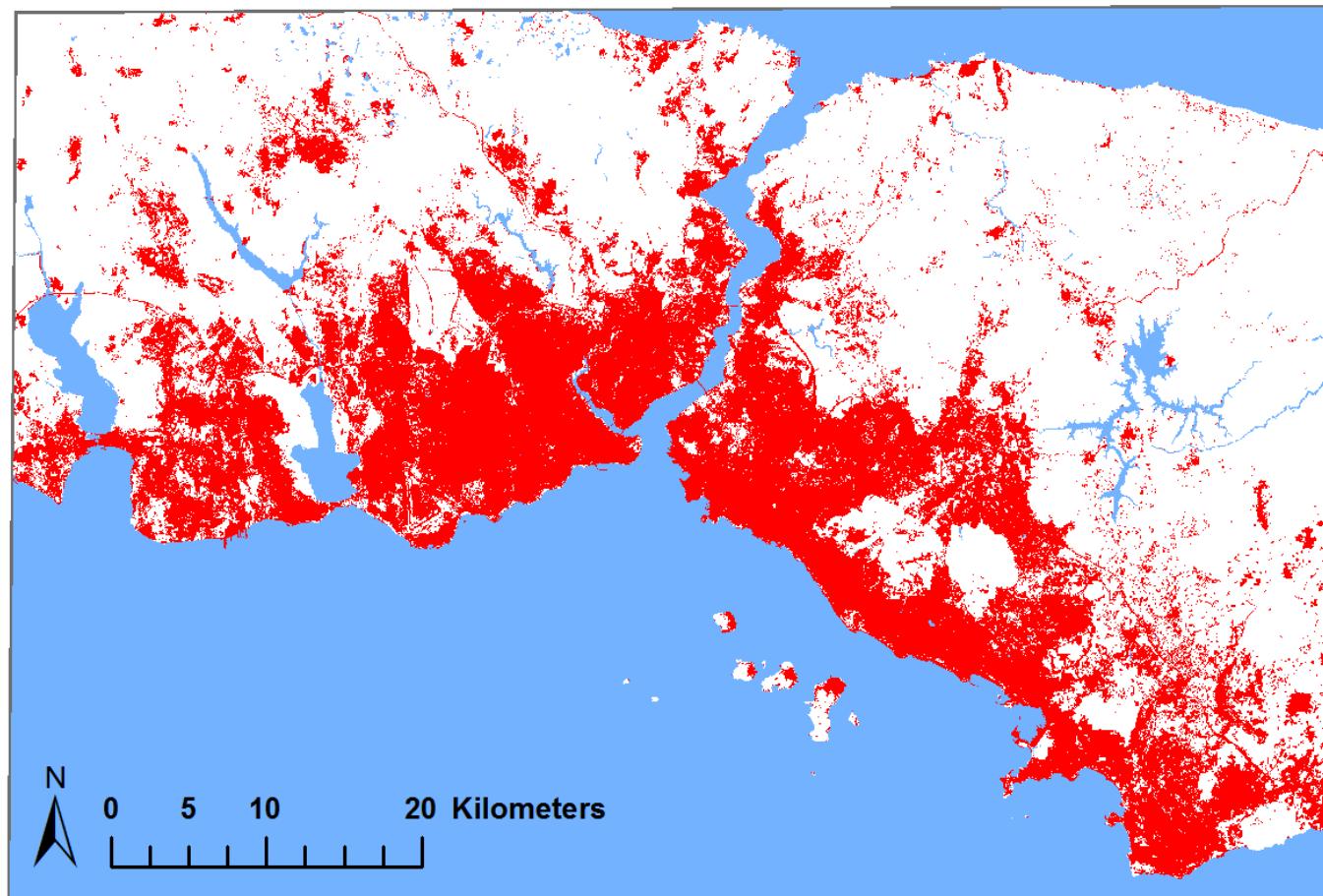
Urban Growth

Istanbul 1975

Istanbul 1990

Istanbul 2000

Istanbul 2010

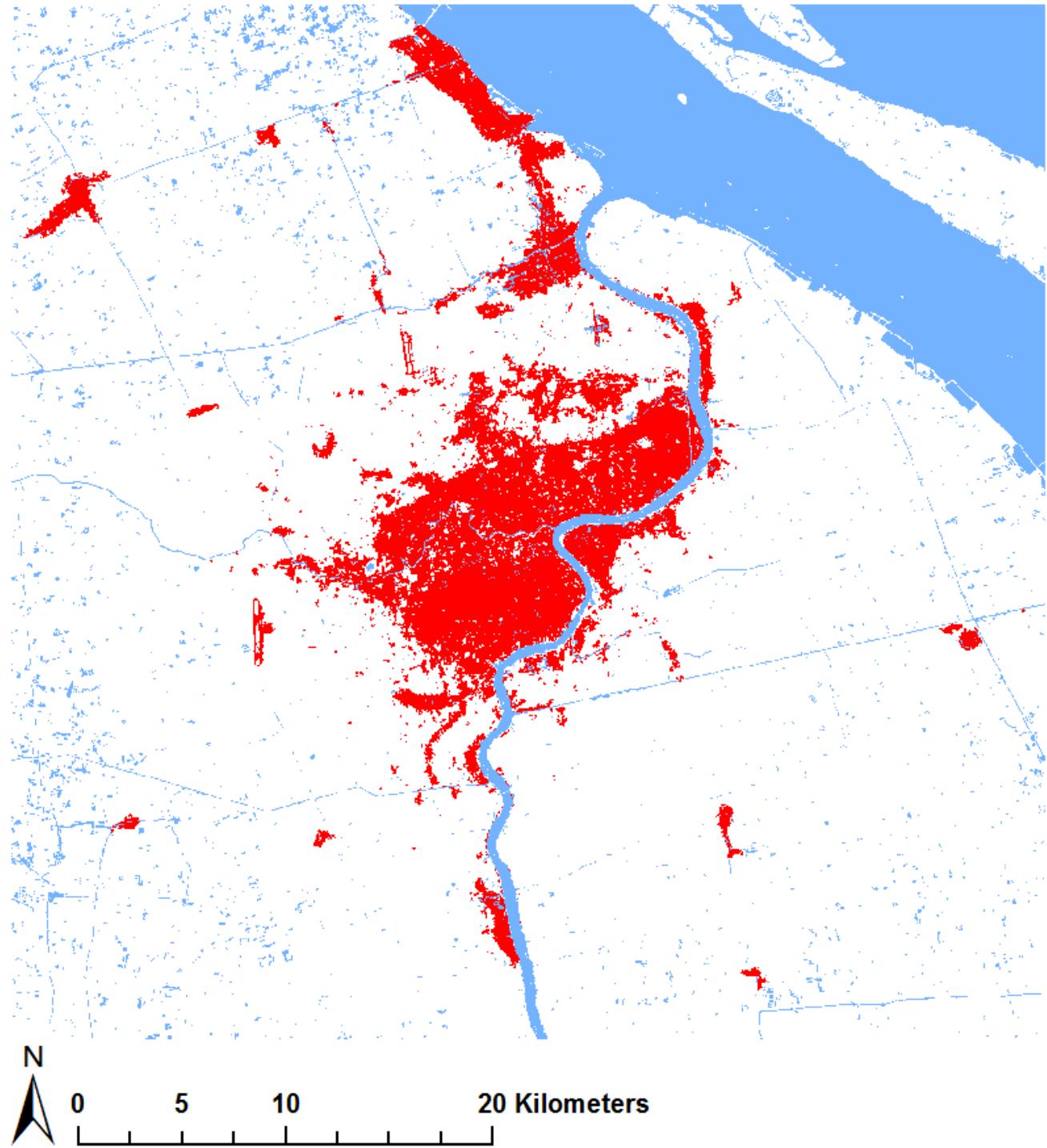


Taubenböck H, Esch T, Felbier A, Wiesner M, Roth A & Dech S (2012): *Monitoring of mega cities from space*. In: Remote Sensing of Environment, vol. 117, pp. 162-176.



Urban Growth

Shanghai 1975



Urban Growth

Shanghai 1975

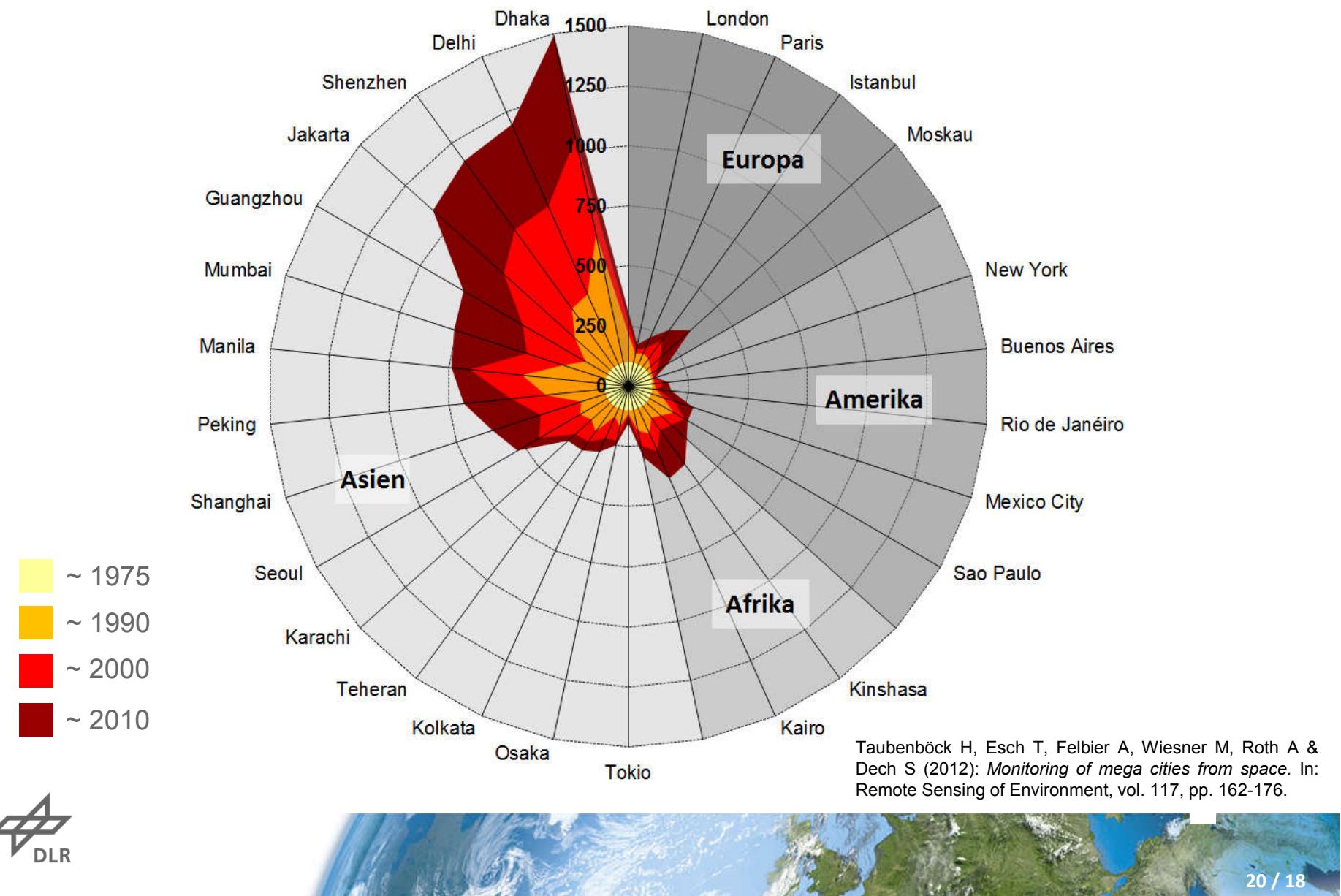
Shanghai 1990

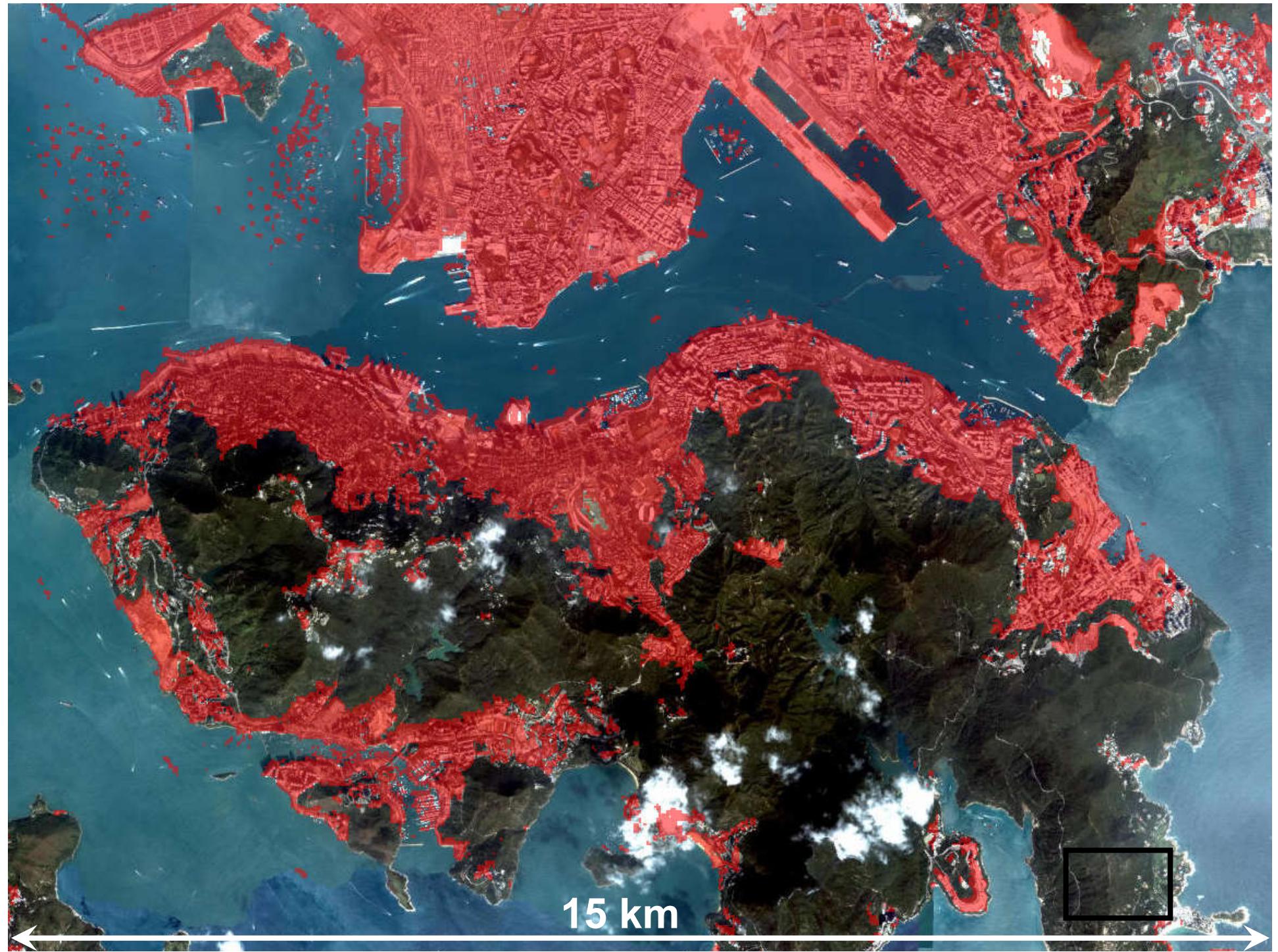
Shanghai 2000

Shanghai 2010

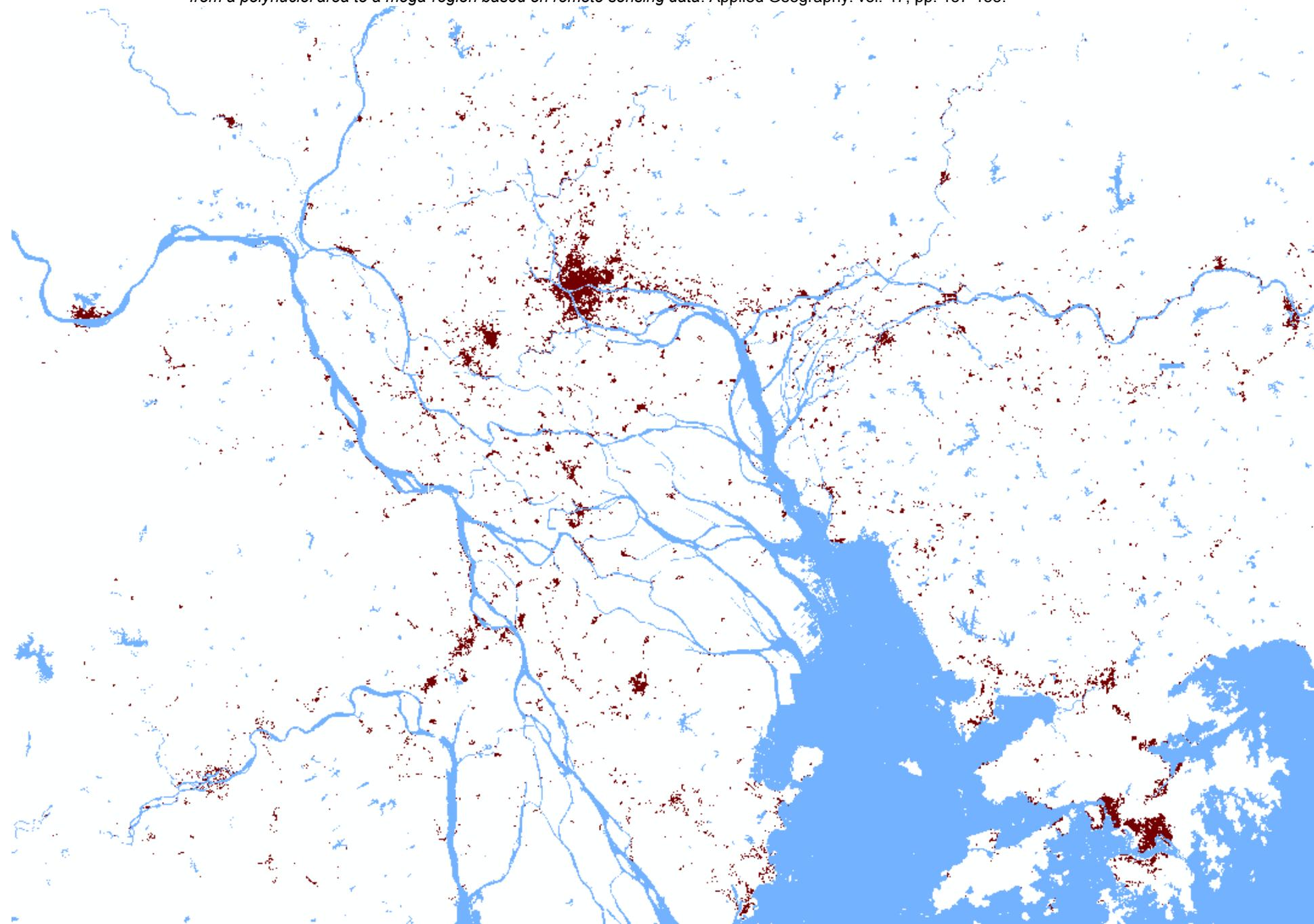


Relative spatial growth of mega cities

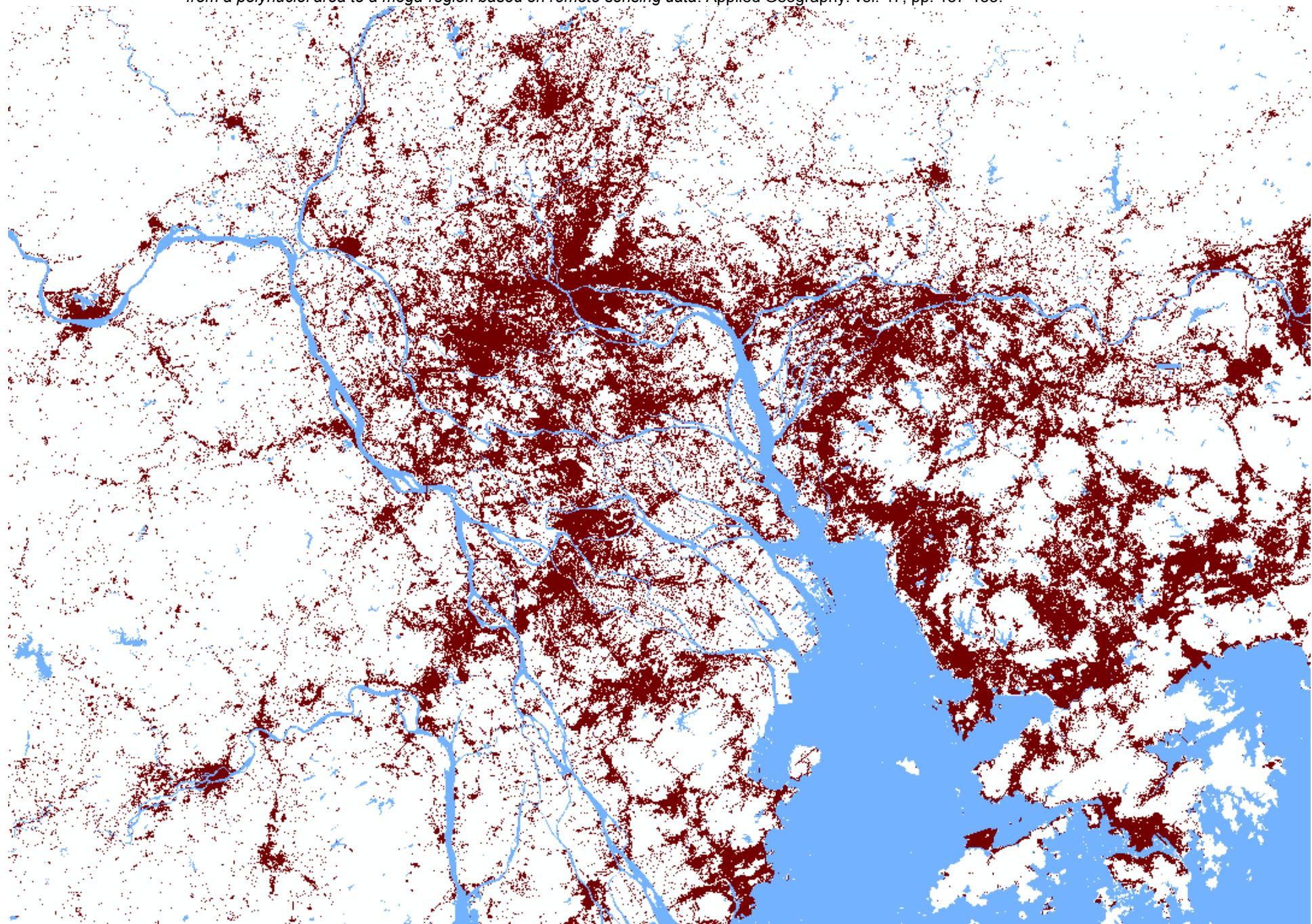




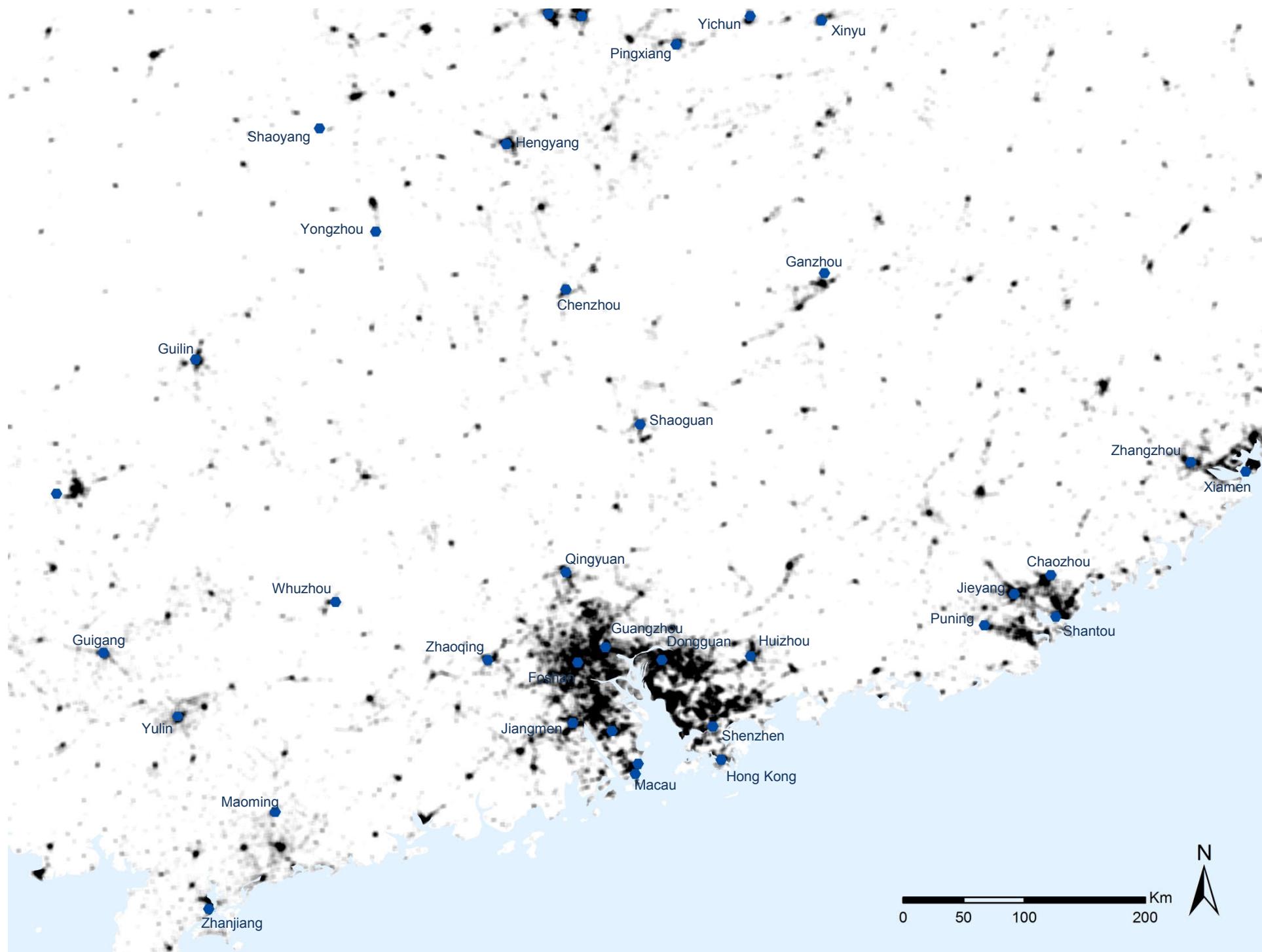
Taubenböck H, Wiesner M, Felbier A, Marconcini M, Esch T & Dech S (2014): *New dimensions of urban landscapes: The spatio-temporal evolution from a polynuclei area to a mega-region based on remote sensing data*. Applied Geography. vol. 47, pp. 137-153.

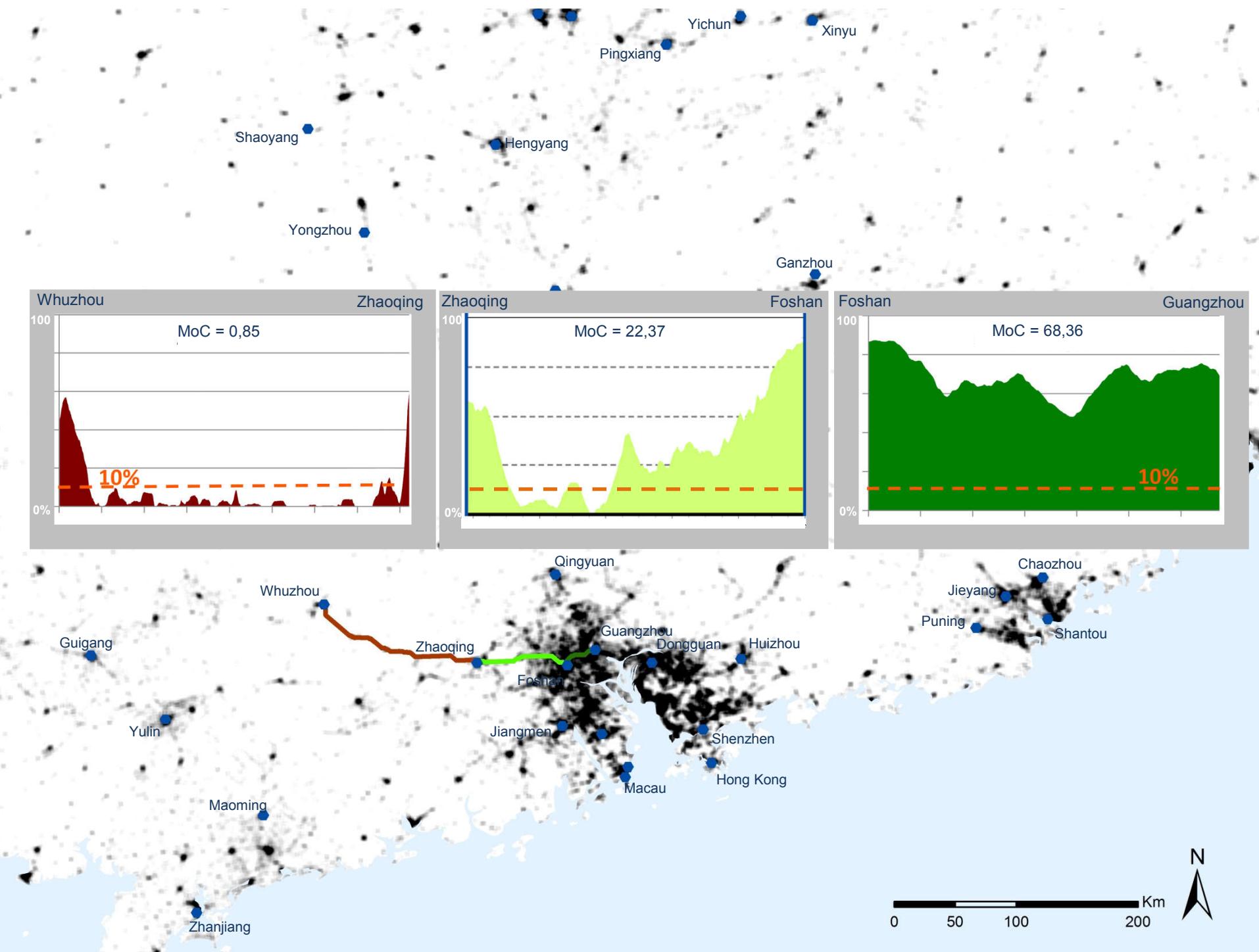


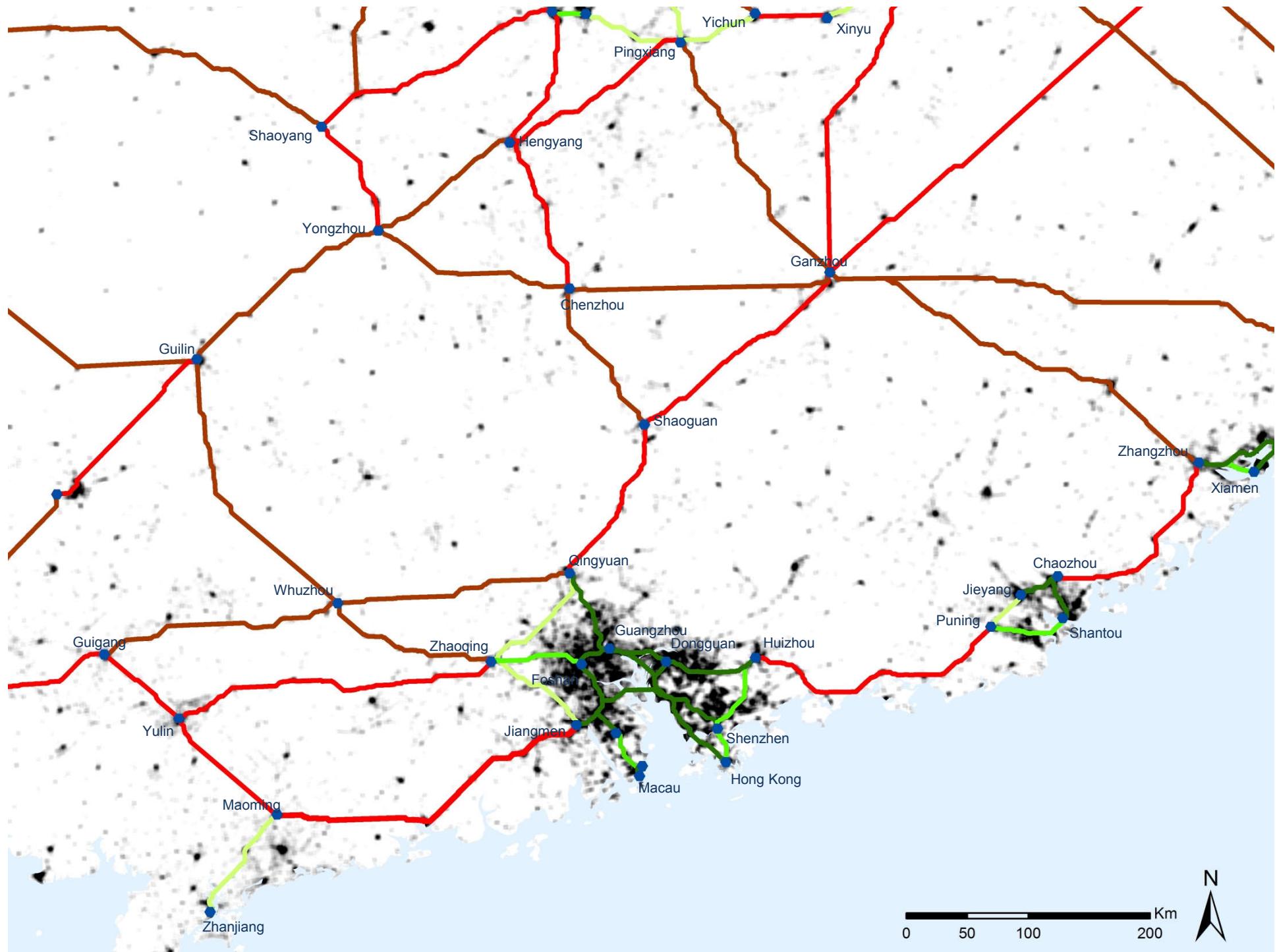
Taubenböck H, Wiesner M, Felbier A, Marconcini M, Esch T & Dech S (2014): *New dimensions of urban landscapes: The spatio-temporal evolution from a polynuclei area to a mega-region based on remote sensing data*. Applied Geography. vol. 47, pp. 137-153.



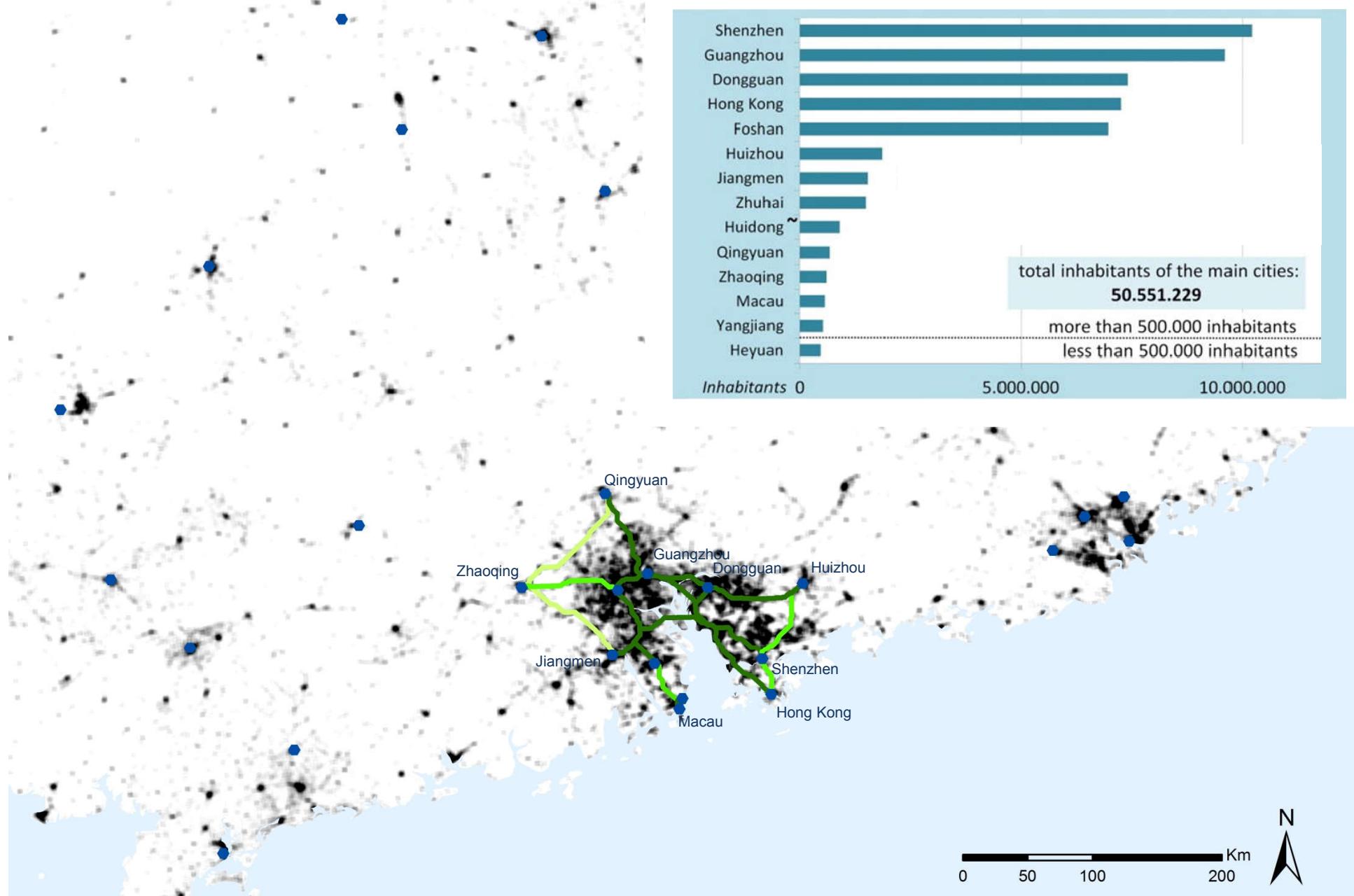




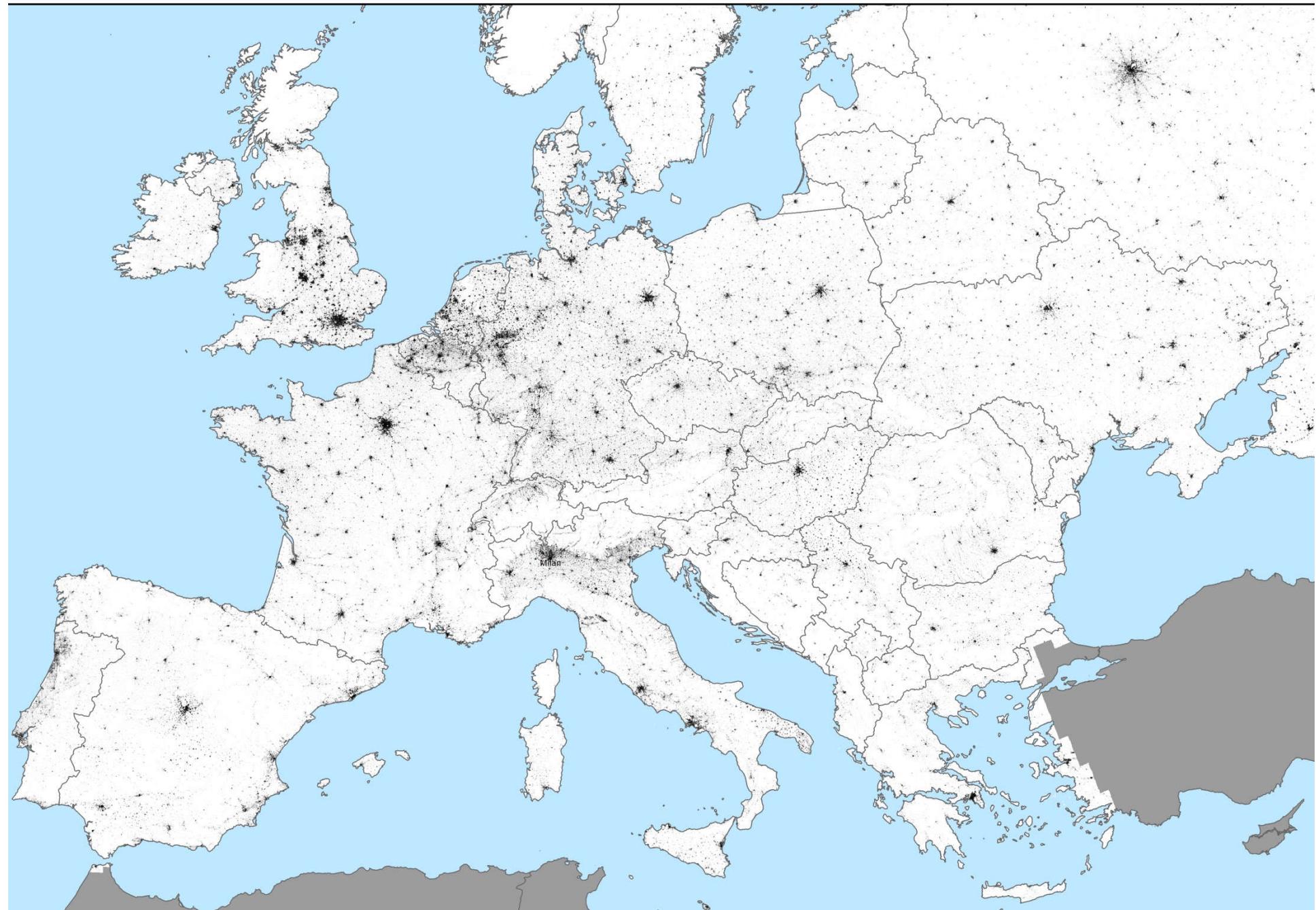




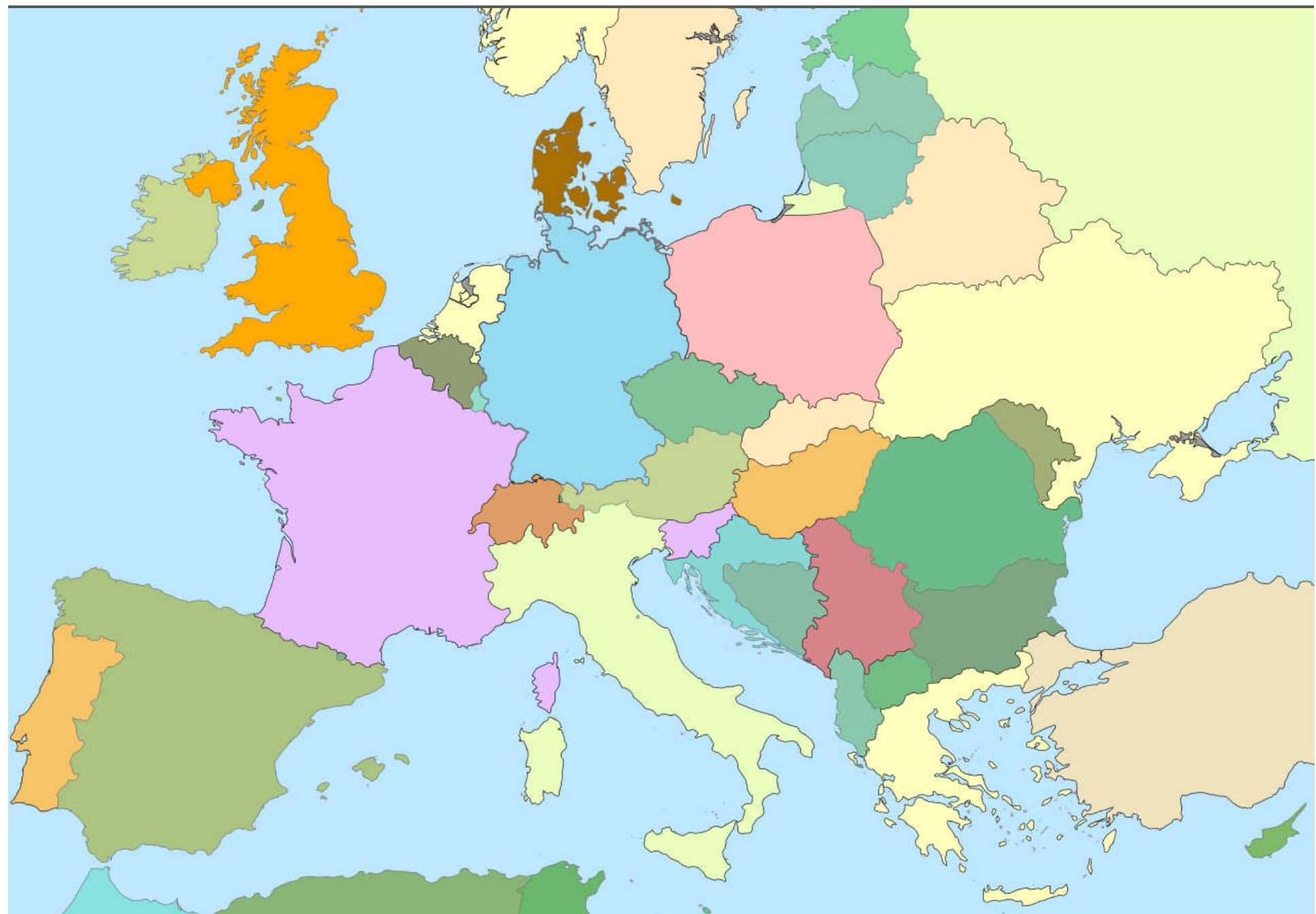
Taubenböck H & Wiesner M (2015): *The spatial network of megaregions – Types of connectivity between cities based on settlement patterns derived from EO-data*. Computers, Environment & Urban Systems. vol. 54, pp. 165-180.



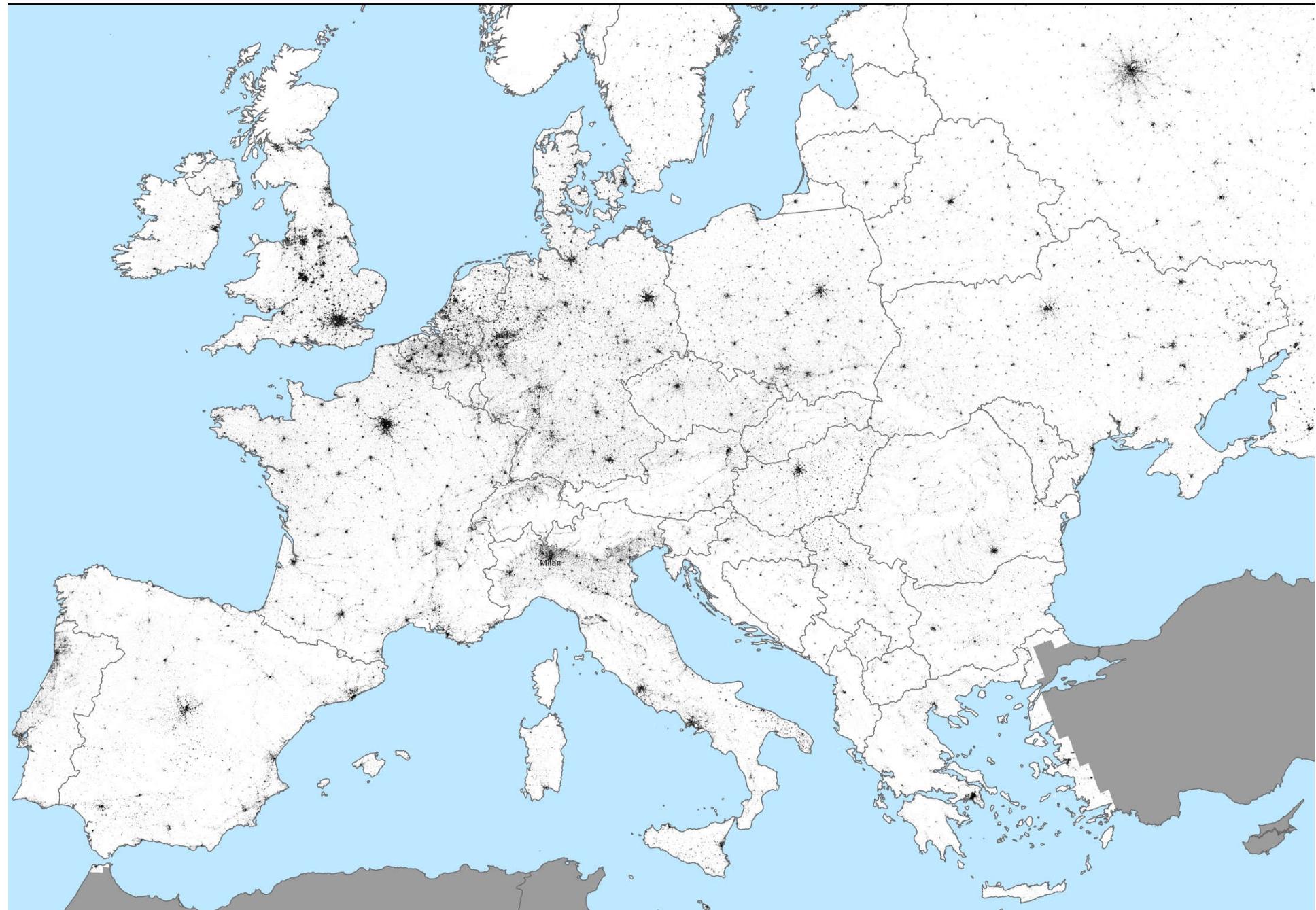
Global Urban Footprint – Europe



Nation States – Europe



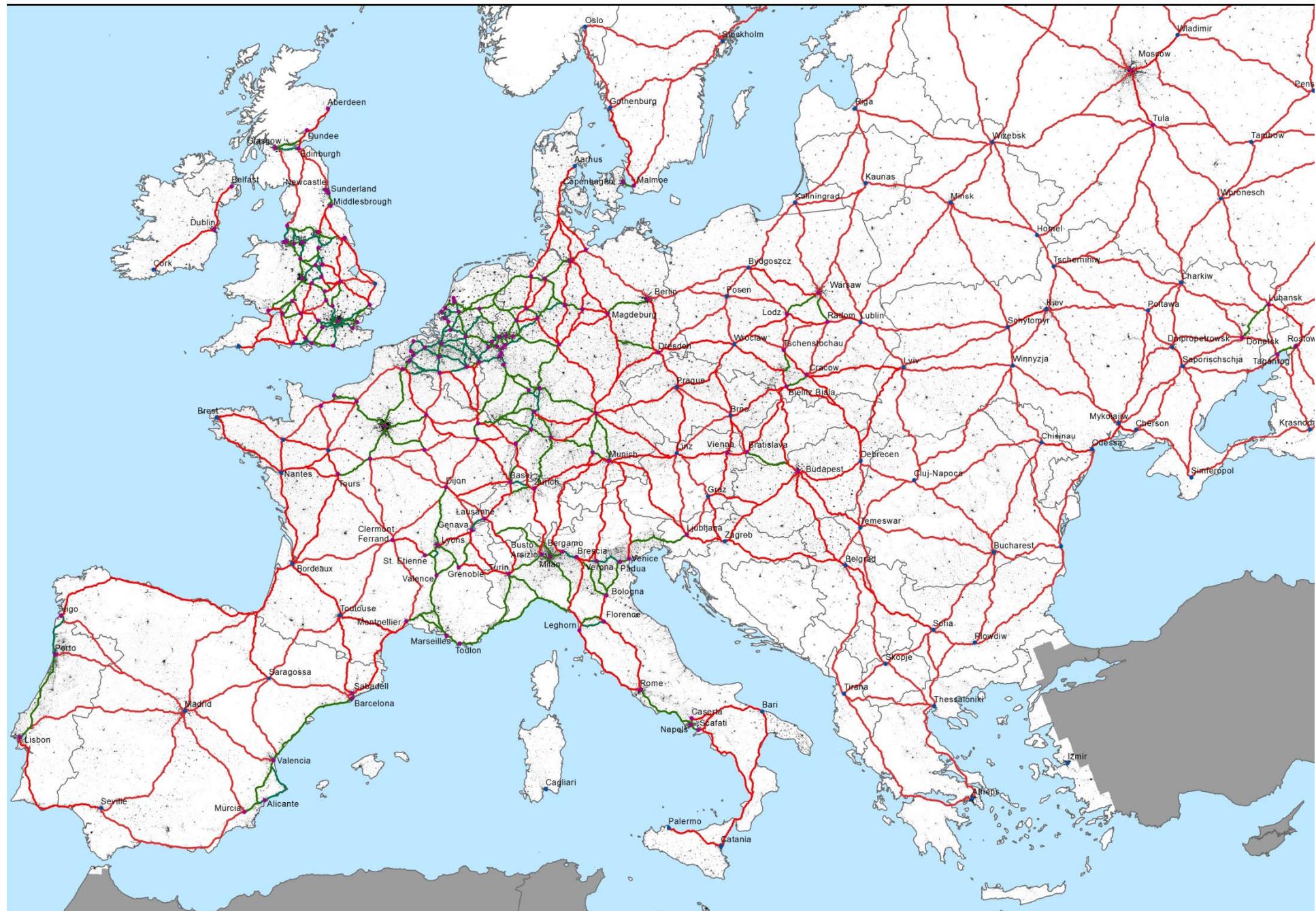
Global Urban Footprint – Europe



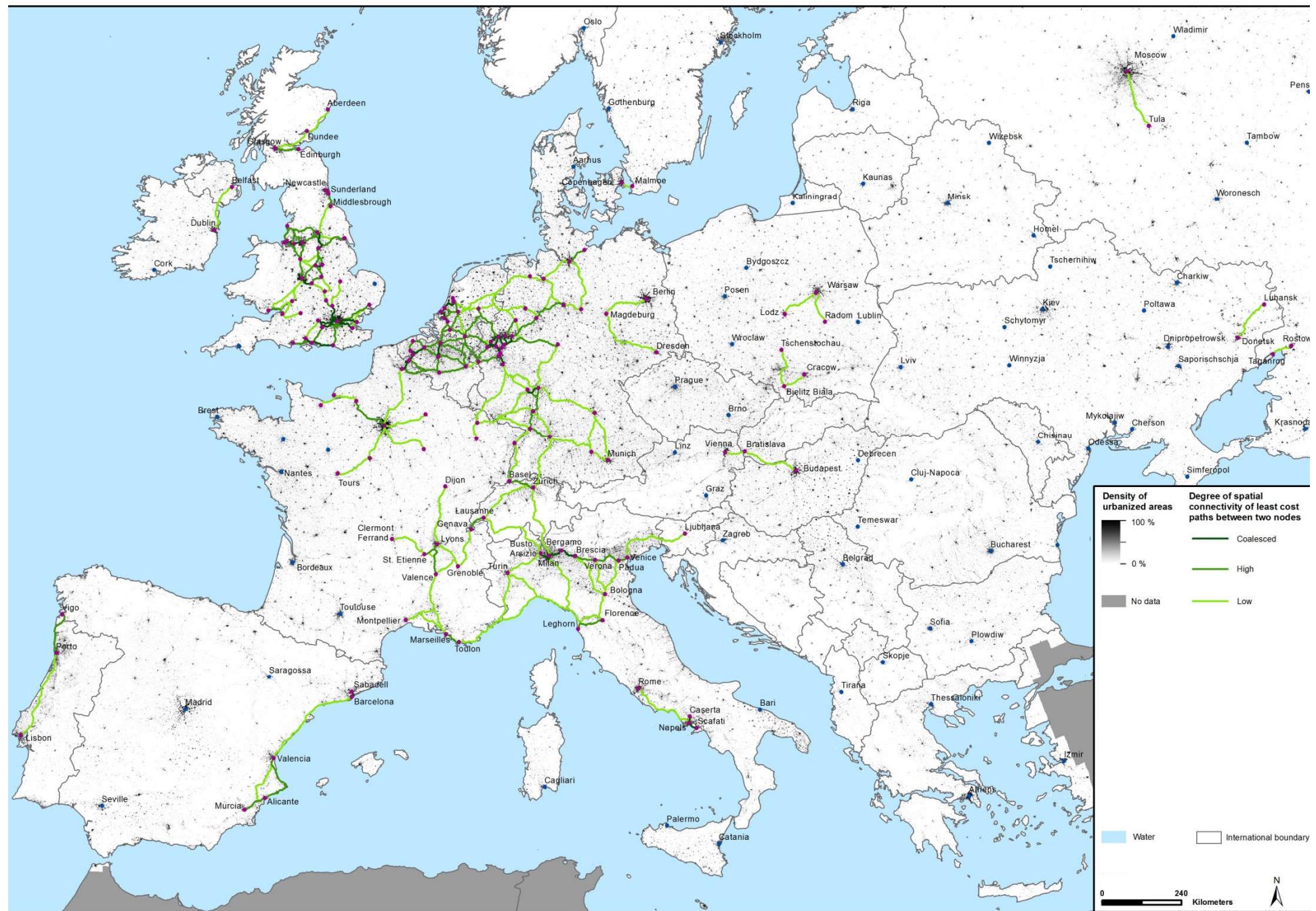
Urban nodes



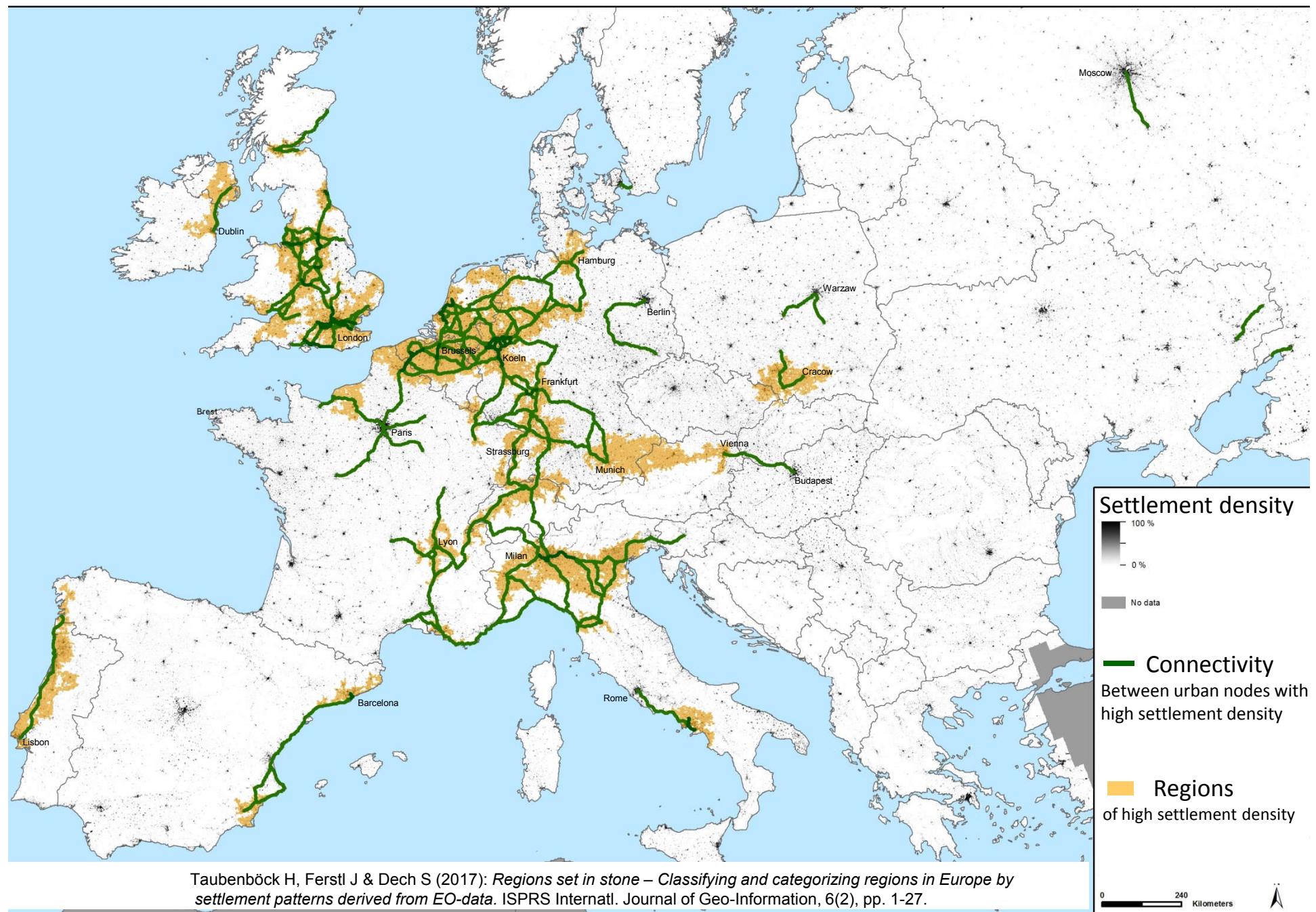
Spatial Connectivity vs. No Spatial Connectivity



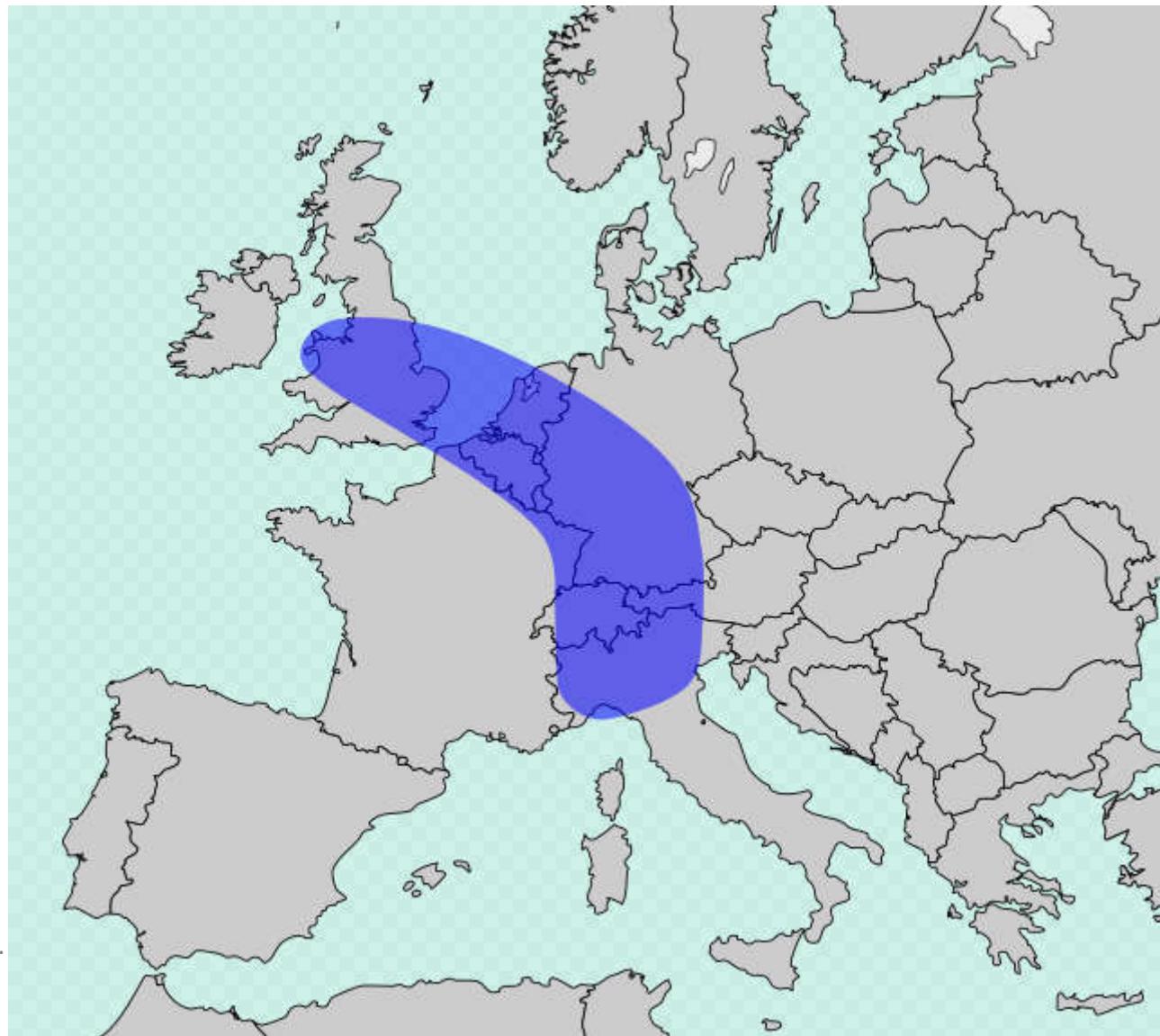
Focal connectivity in Europe



Regions and connections across Europe



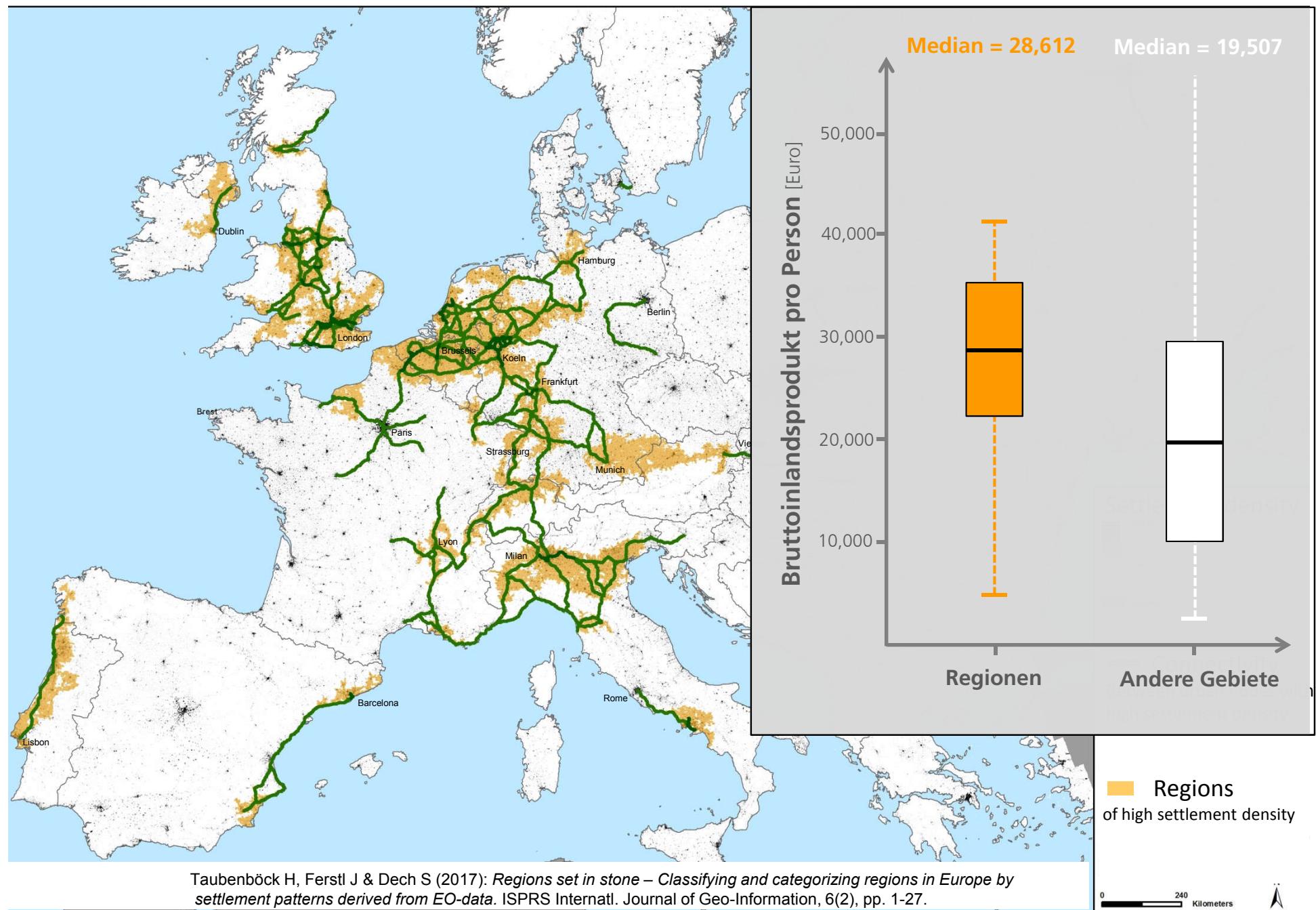
Blue Banana



RECLUS (1989) Les Villes
Européennes. Report DATAR.
Paris: La Documentation
Française.

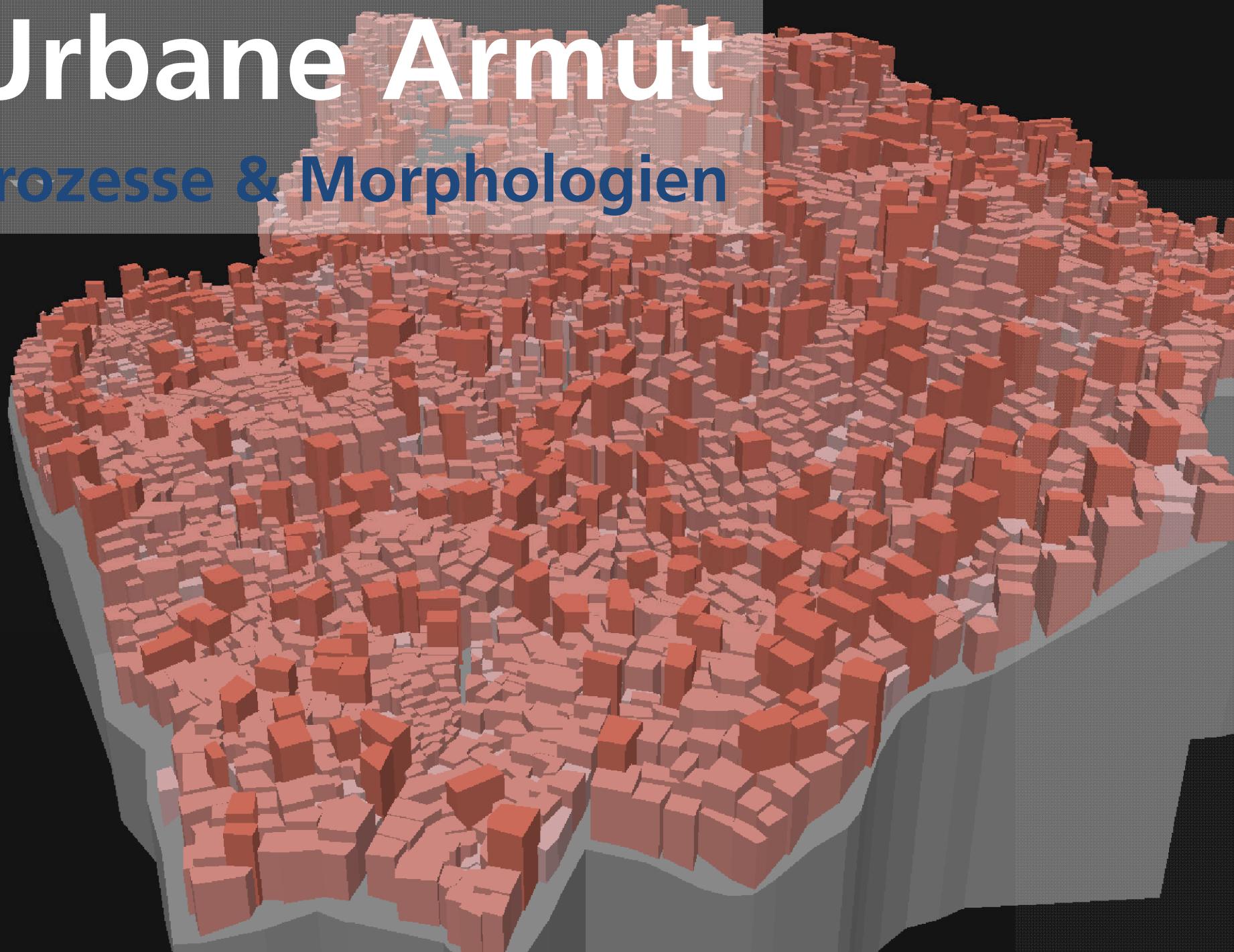


Regions and connections across Europe



Urbane Armut

Prozesse & Morphologien



jede Woche migrieren

1,4 Millionen

Menschen in die Städte

33%

der globalen Stadtbevölkerung leben in Slums





Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Image IBCAO
Image U.S. Geological Survey

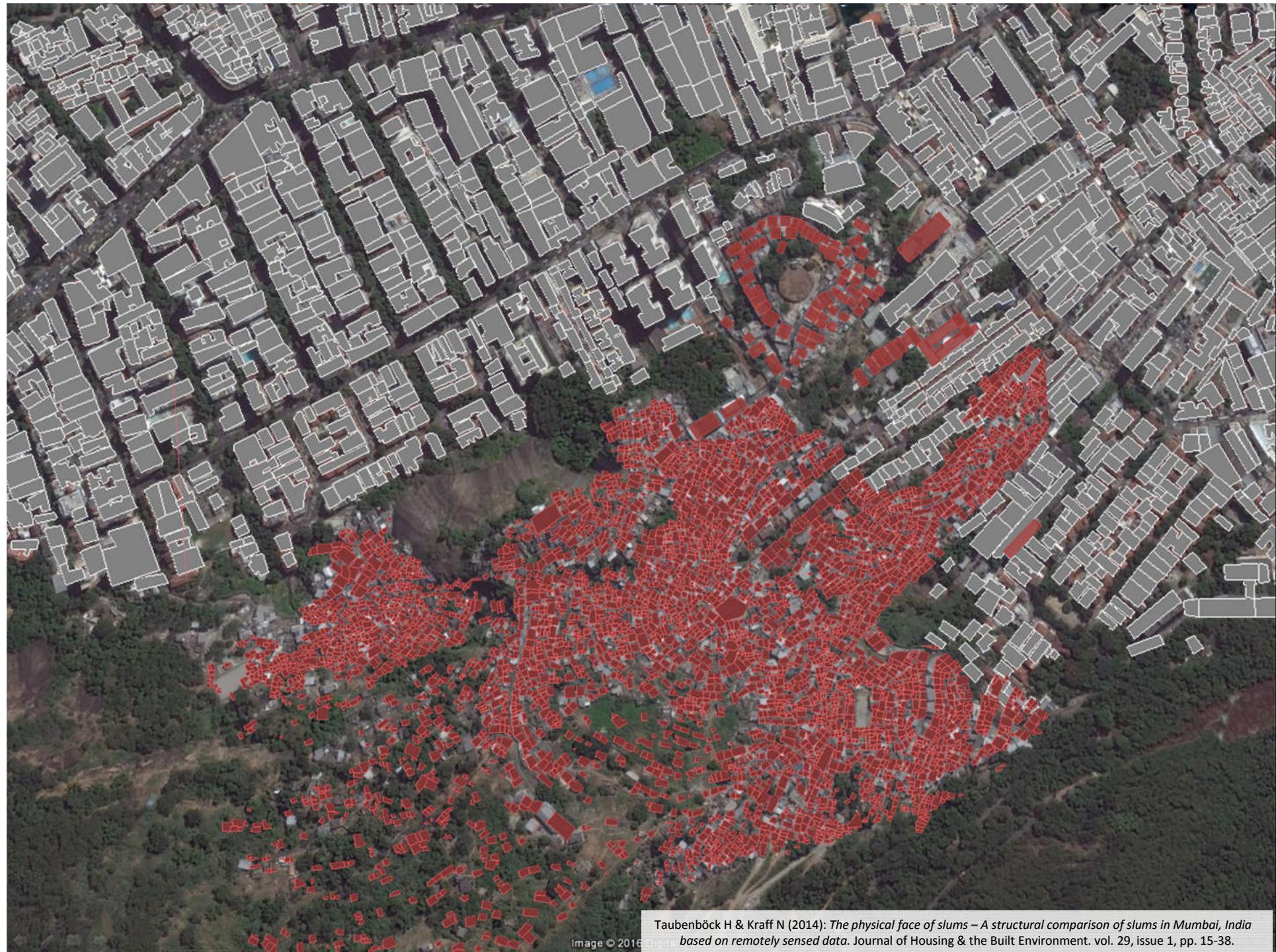
Google™ earth



Image © 2016 DigitalGlobe

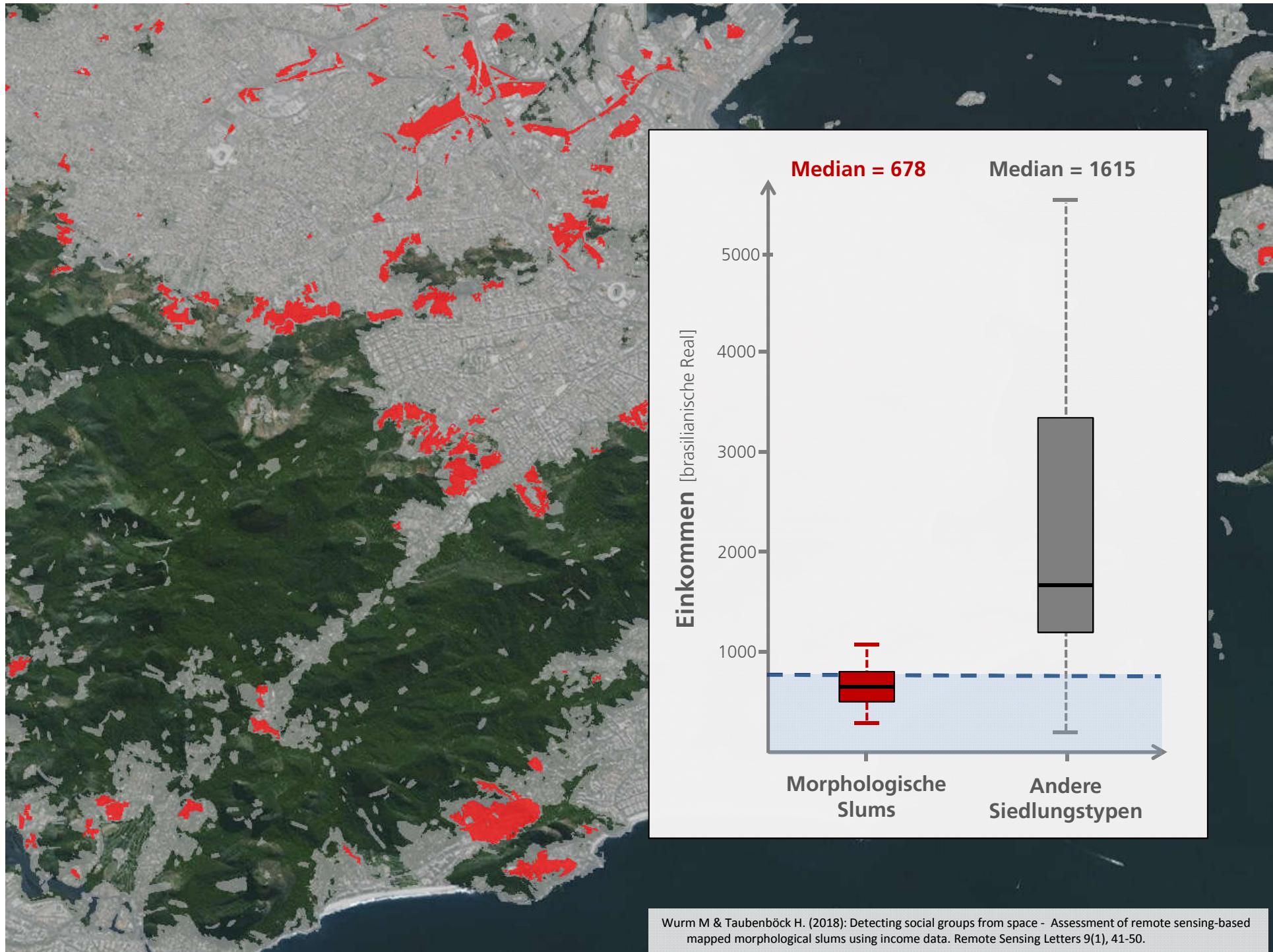


Image © 2016 DigitalGlobe

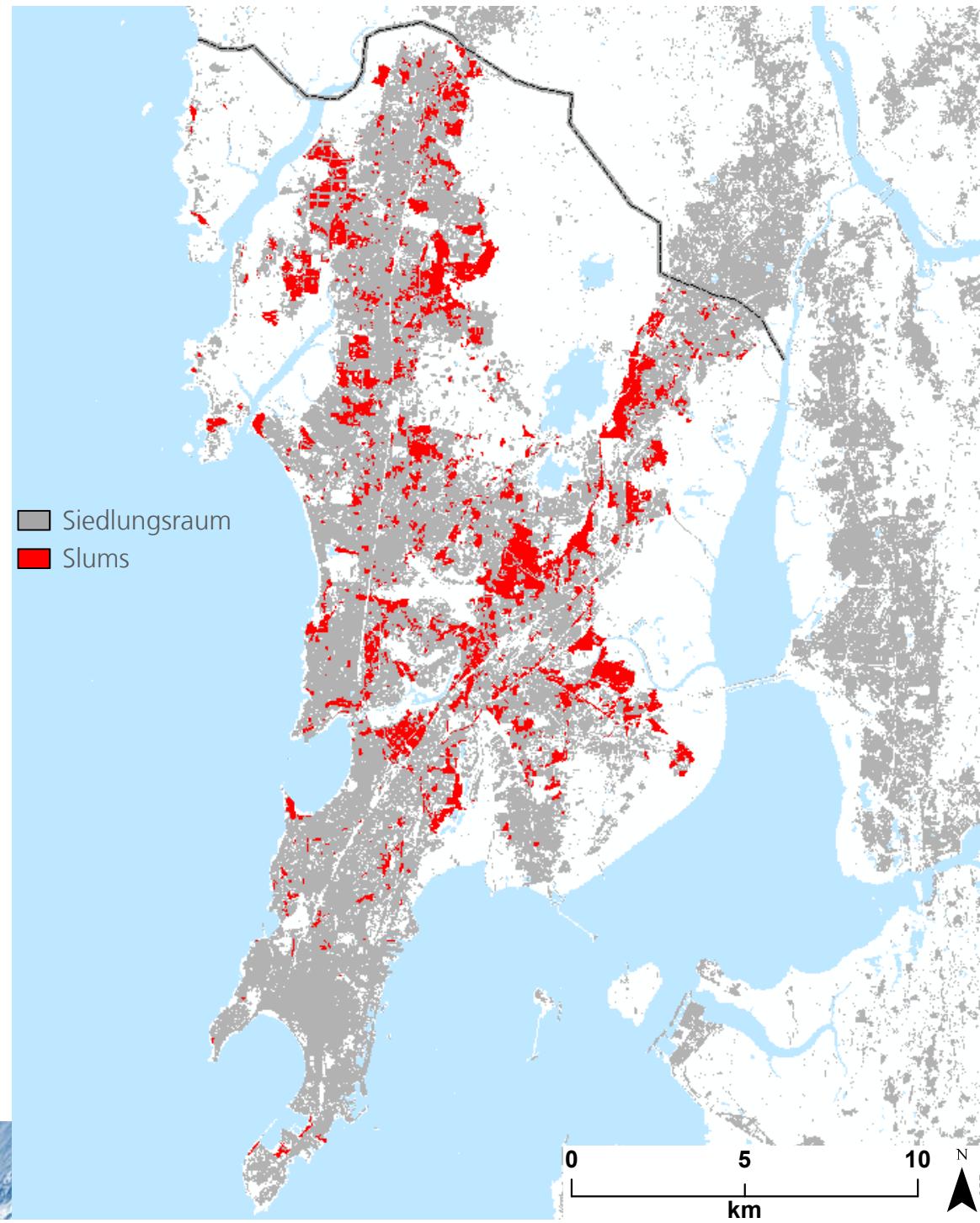


Taubenböck H & Kraff N (2014): *The physical face of slums – A structural comparison of slums in Mumbai, India based on remotely sensed data*. Journal of Housing & the Built Environment. vol. 29, issue 1, pp. 15-38.
Image © 2016 DigitalGlobe





Mumbai, Indien



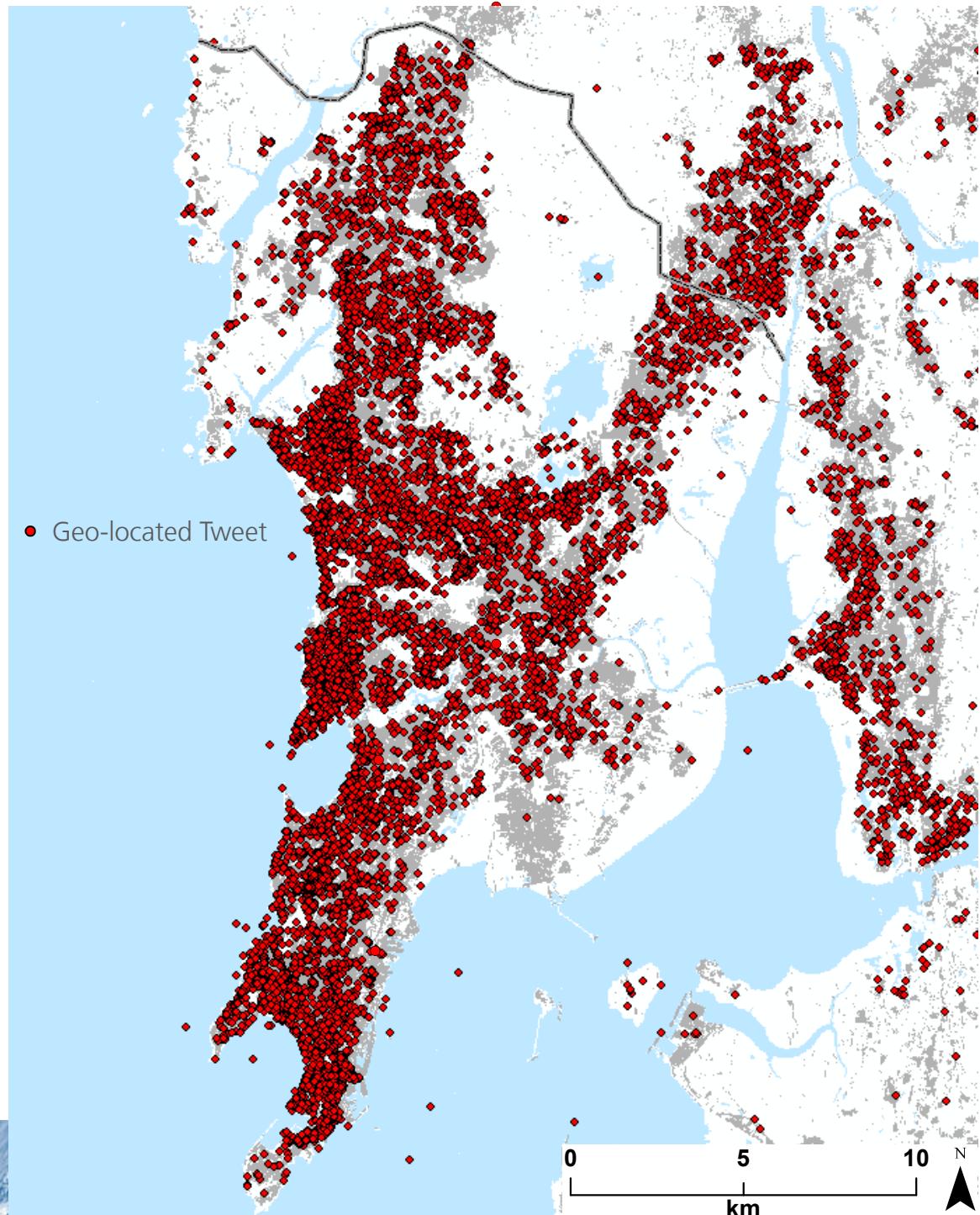


Daten

Location-based Social Network data

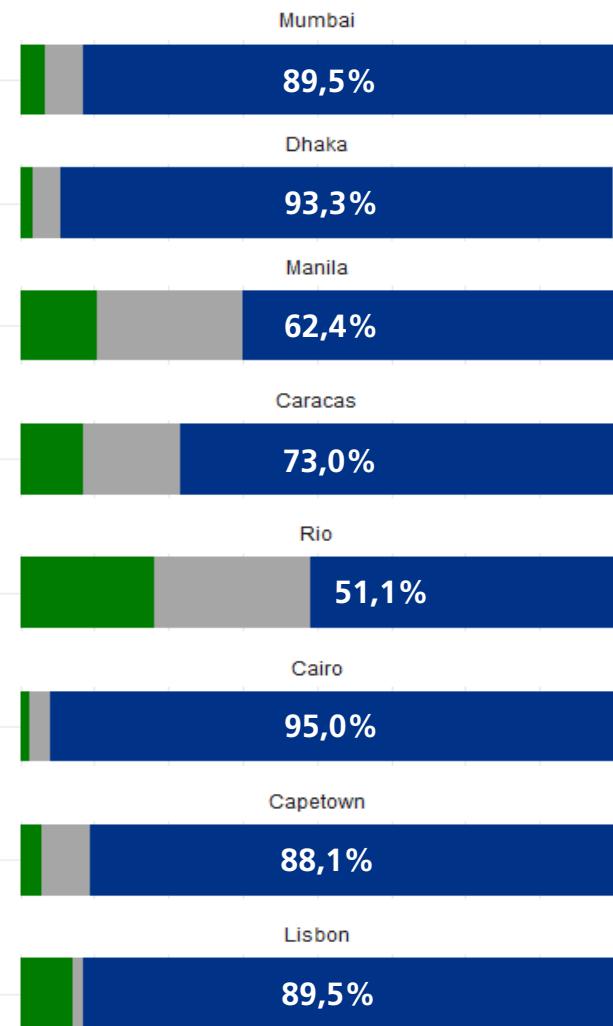
Stichprobe:

- 18-Wochen (06/2016 – 10/2016)
= 128 000 geolocated tweets

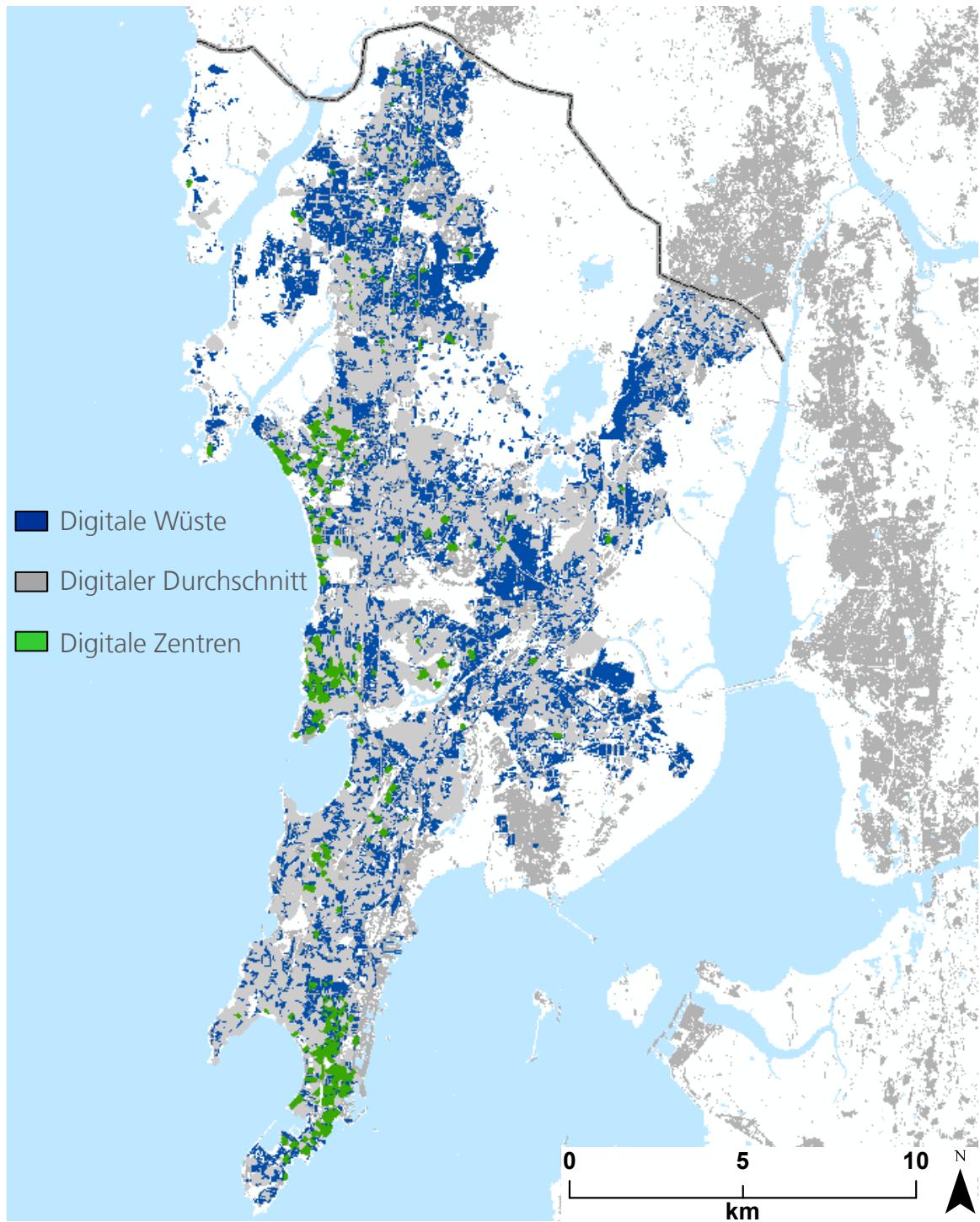


Digitale Footprints

Slums



Taubenböck H, Staab J, Zhu X, Geiß C, Dech S & Wurm M (2018): Are the poor digitally left behind? Analyzing urban divides using remote sensing and twitter data. ISPRS International Journal of Geo-Information. vol. 7(8), 304, pp. 1-18.





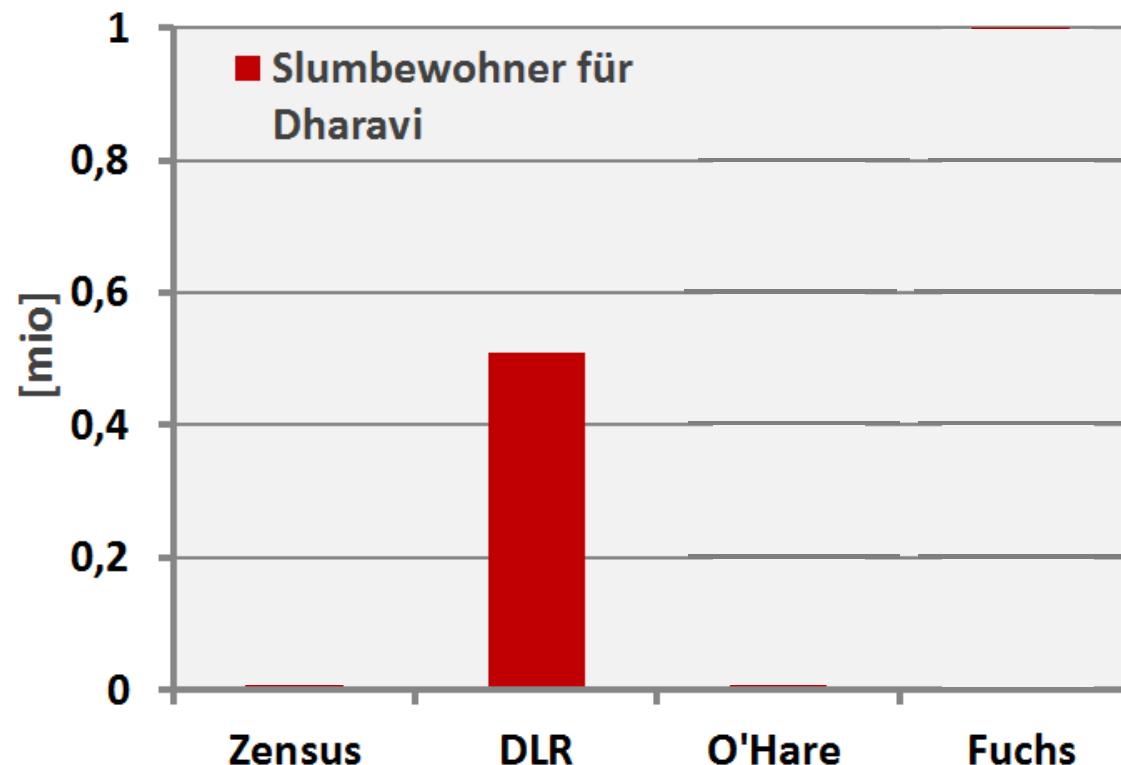
Bevölkerungsschätzung

Dharavi, Mumbai

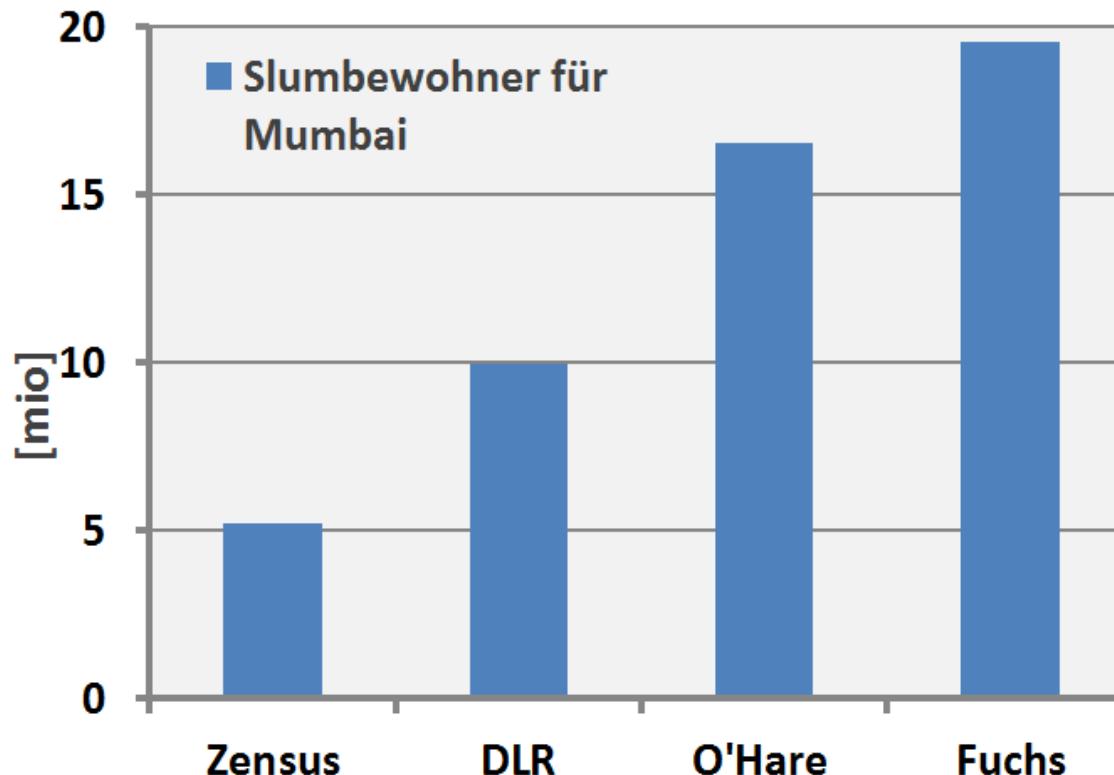


Bevölkerungsschätzung

Mumbai, Dharavi



Bevölkerungsschätzung für Slums in Mumbai



Taubenböck H & Wurm M (2015): *Ich weiß, dass ich nichts weiß – Bevölkerungsschätzung in einer Megacity*. SpringerSpektrum. S. 171-178.

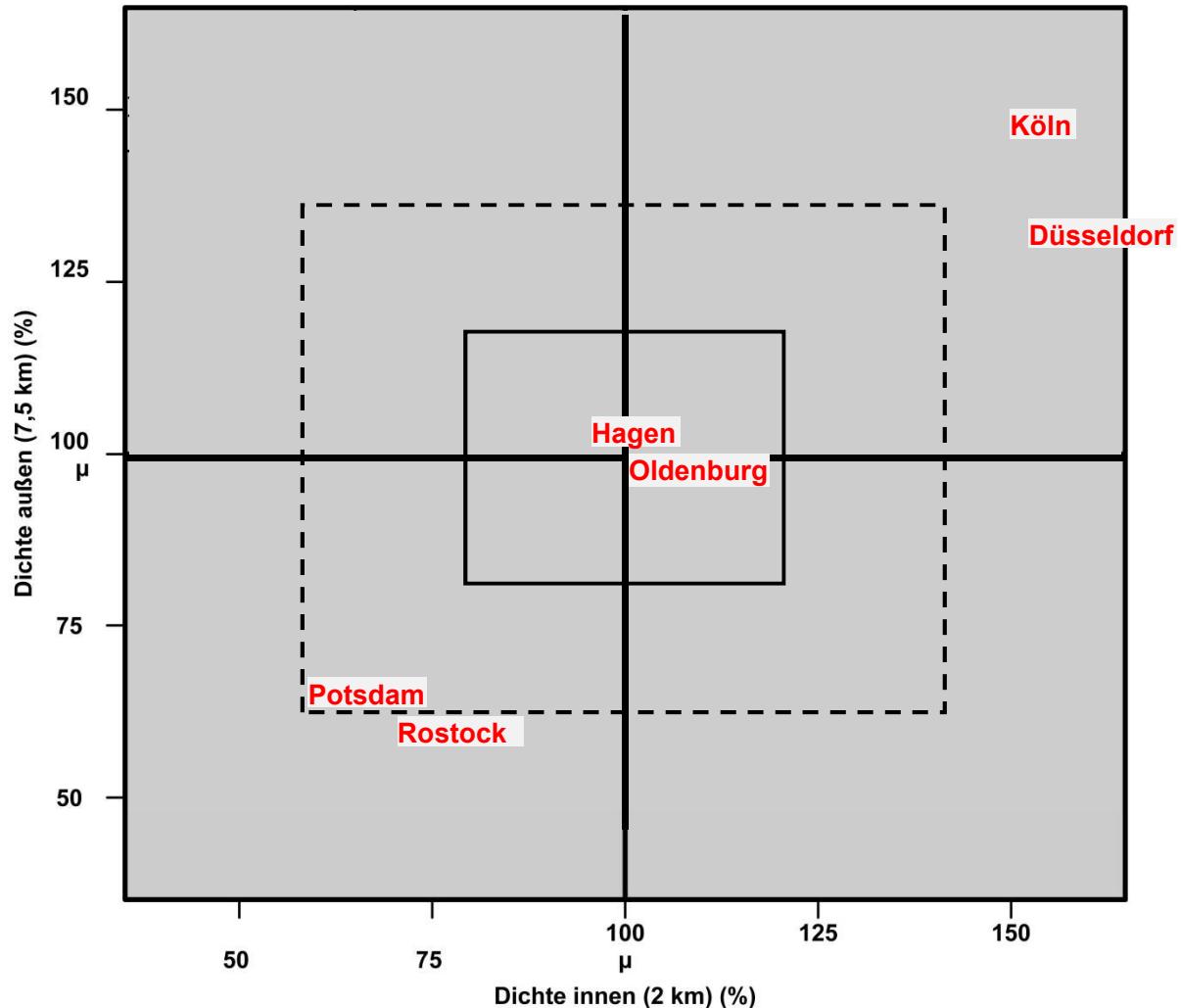


Der städtische Raum und Applikationen für Deutschland



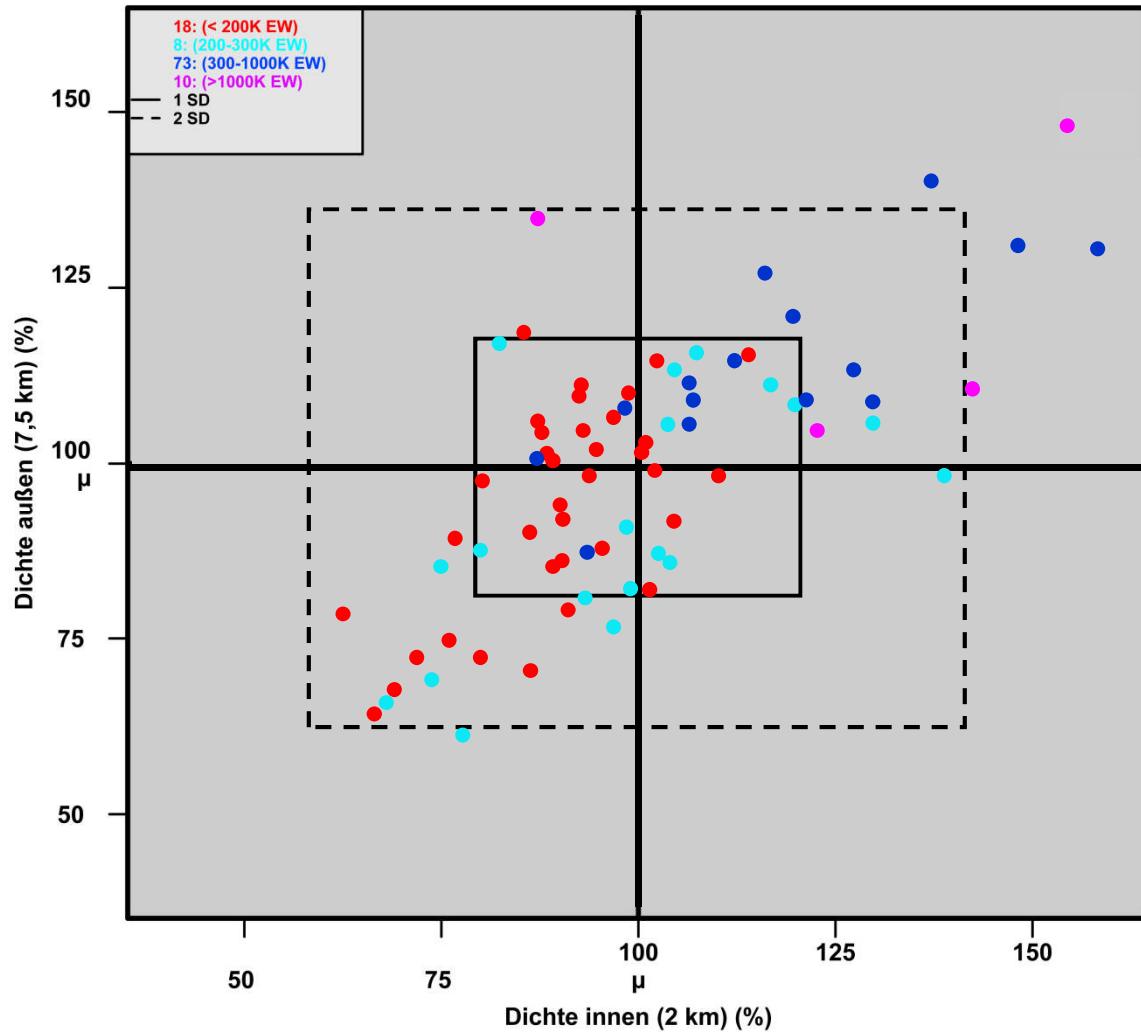
Dichte

in deutschen Großstädten



Dichte

in deutschen Großstädten



Wurm M & Taubenböck H (2015): *Die Morphologie deutscher Großstädte: Was die Dichte über die Struktur der Städte verrät*. SpringerSpektrum. S.127-133.





MÜNCHEN



STUTTGART

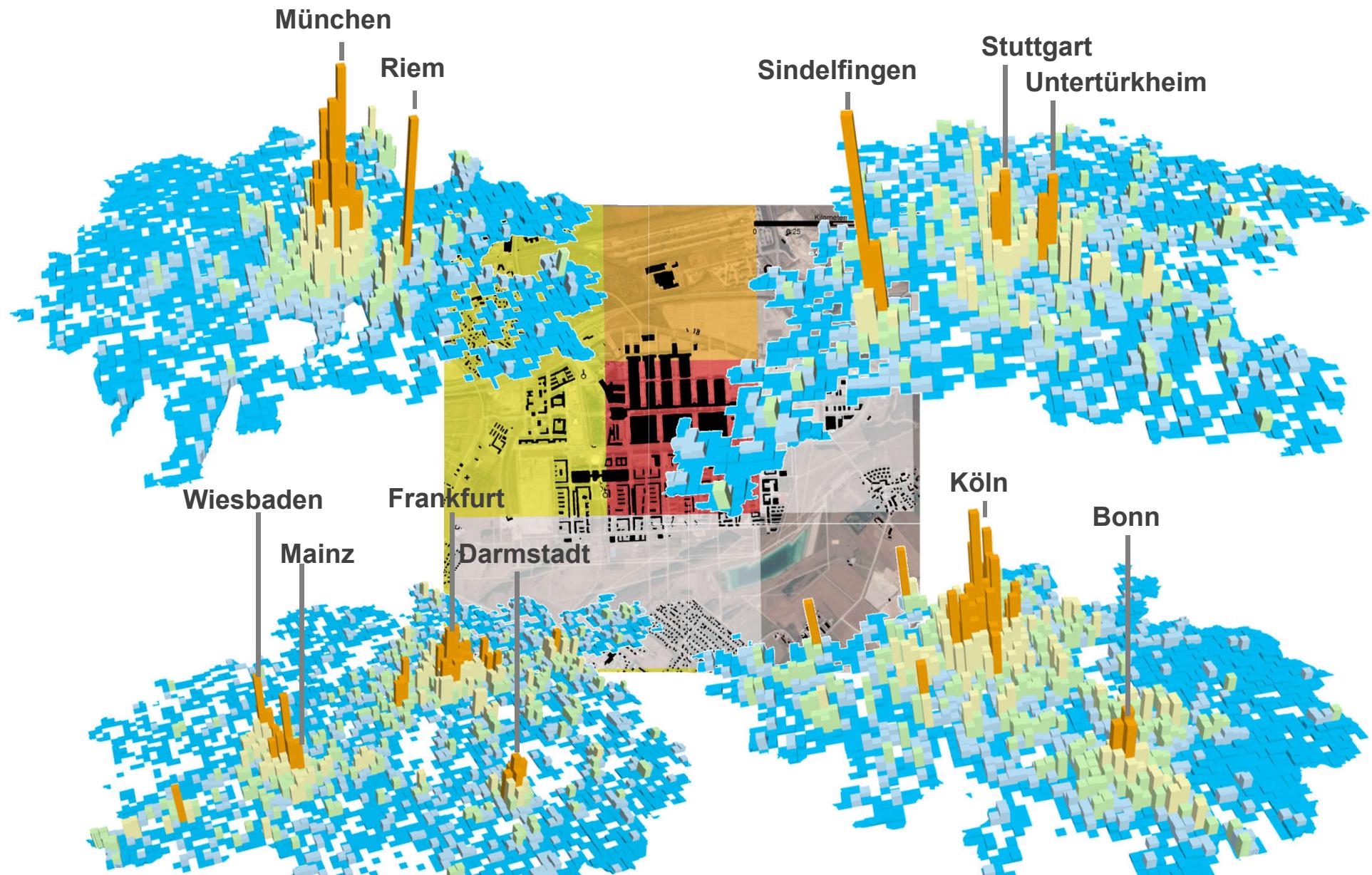


FRANKFURT

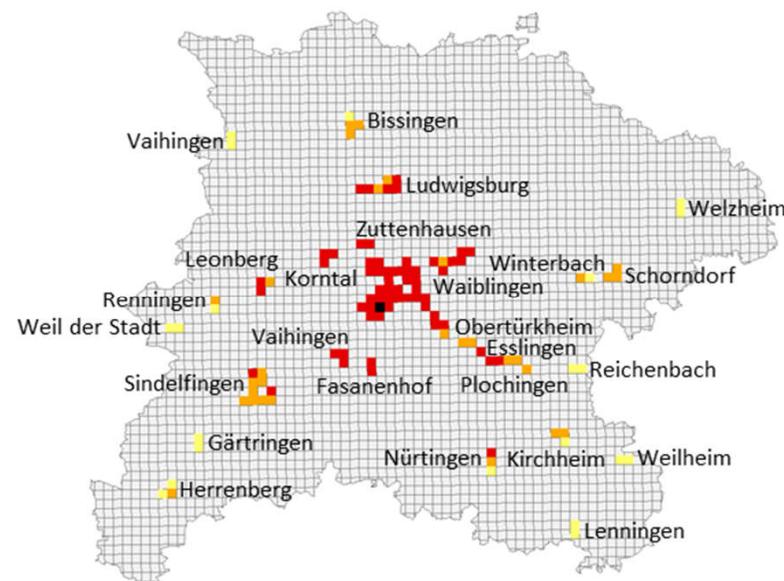
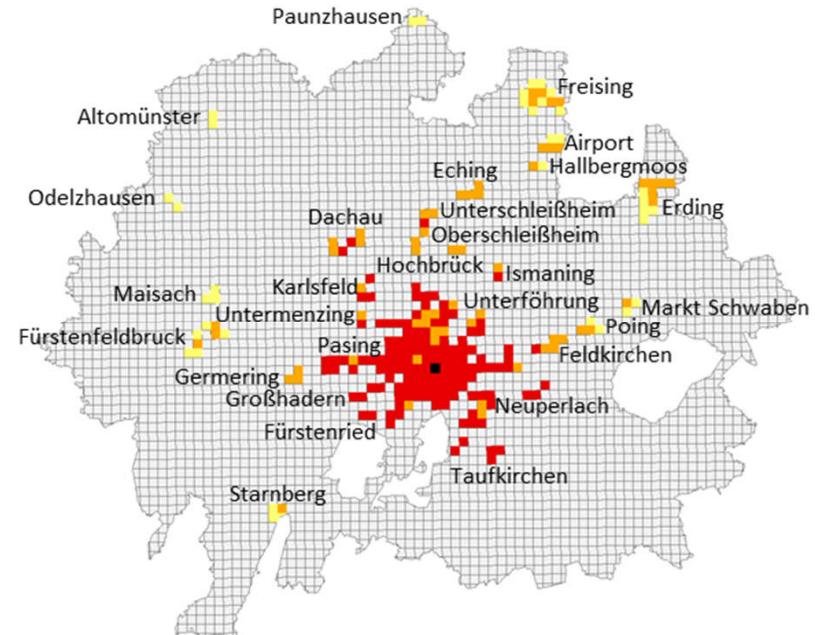
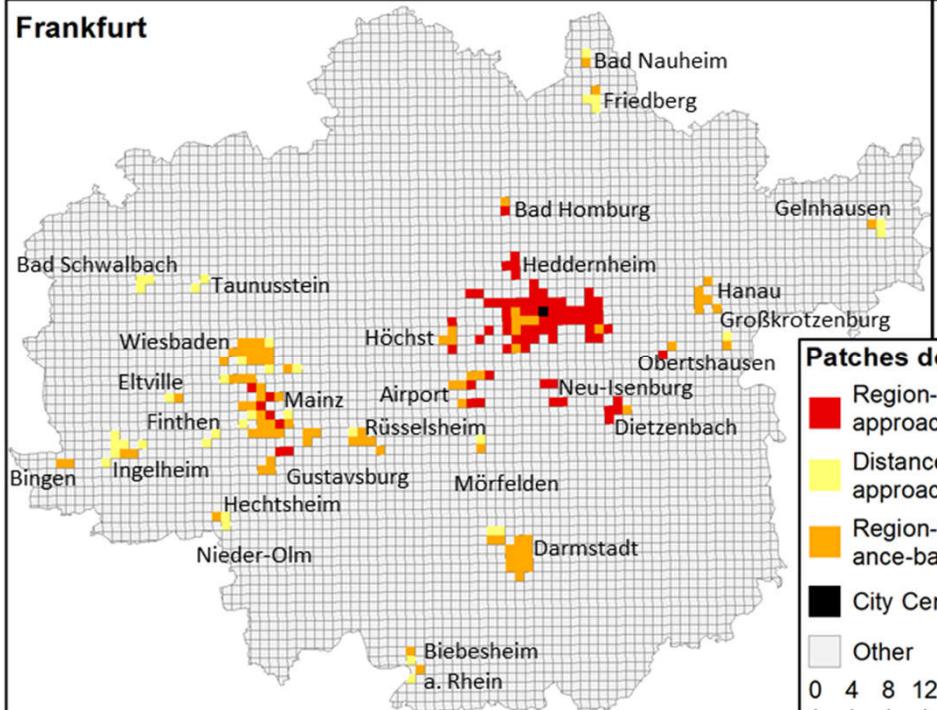
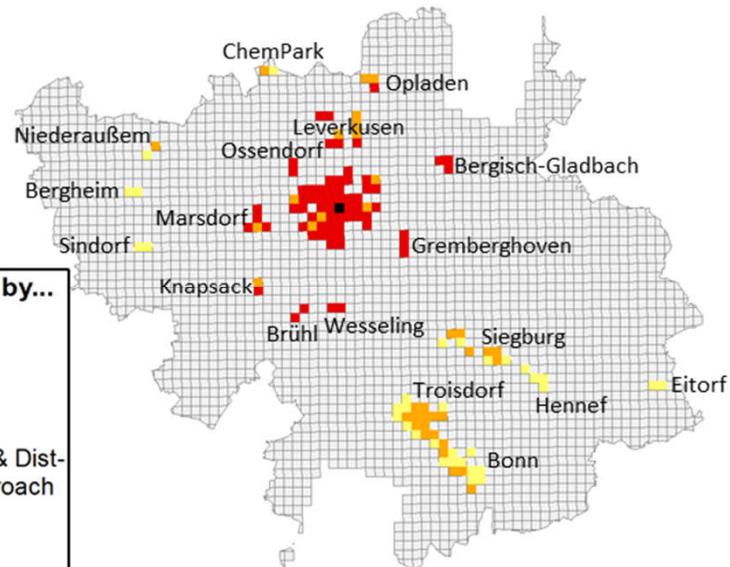


KÖLN

Untersuchungseinheit

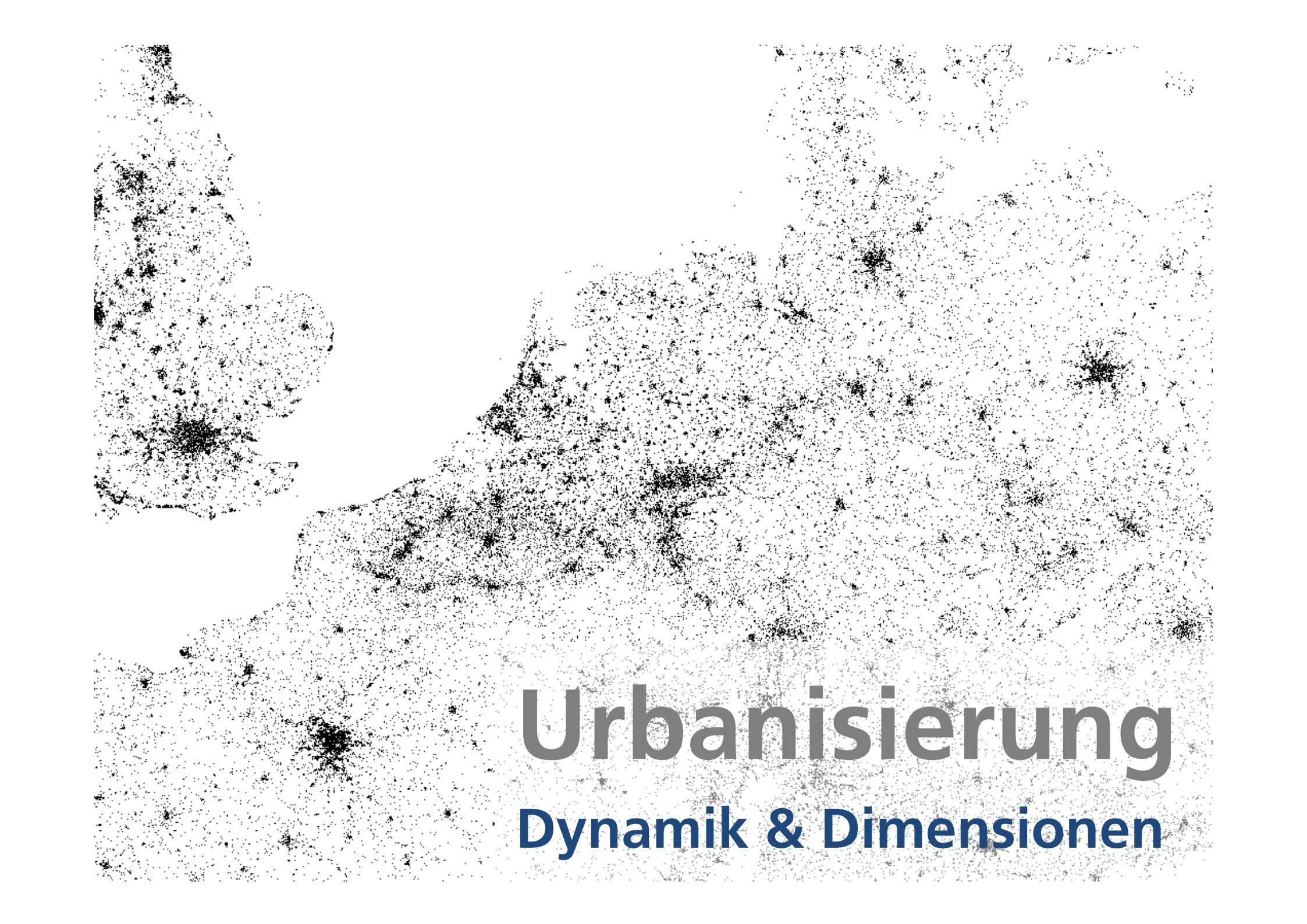


Taubenböck H, Standfuß I, Wurm M, Krehl A & Siedentop S (2017): *Measuring morphologic polycentricity – A comparative analysis of urban mass concentrations using remote sensing data*. Computers, Environment and Urban Systems, vol. 64, pp 42-56.

Stuttgart**Munich****Frankfurt****Cologne****Patches detected by...**

- Region-specific approach
 - Distance-based approach
 - Region-specific & Distance-based approach
 - City Center
 - Other
- 0 4 8 12 Kilometers

Schlussbetrachtungen

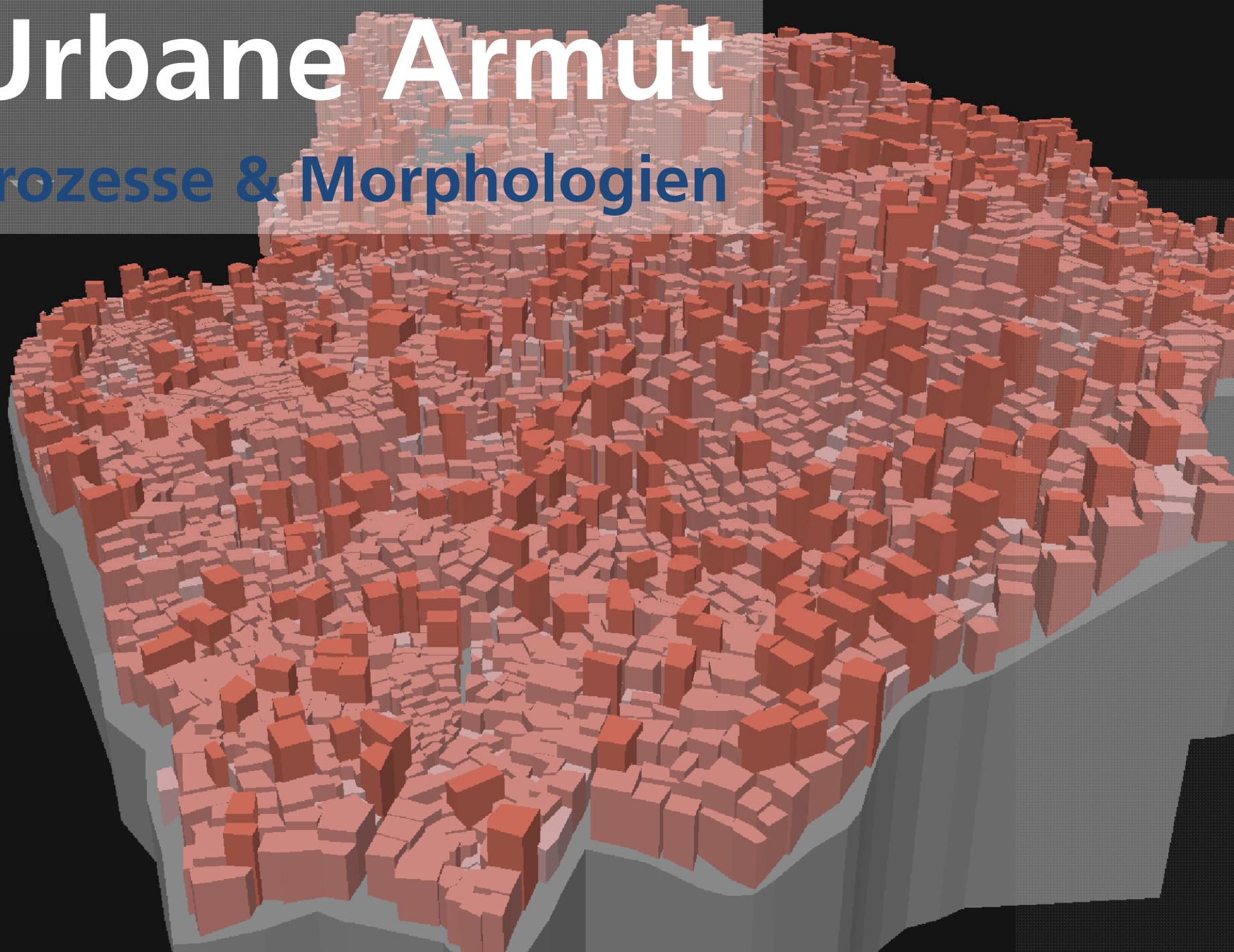


Urbanisierung

Dynamik & Dimensionen

Urbane Armut

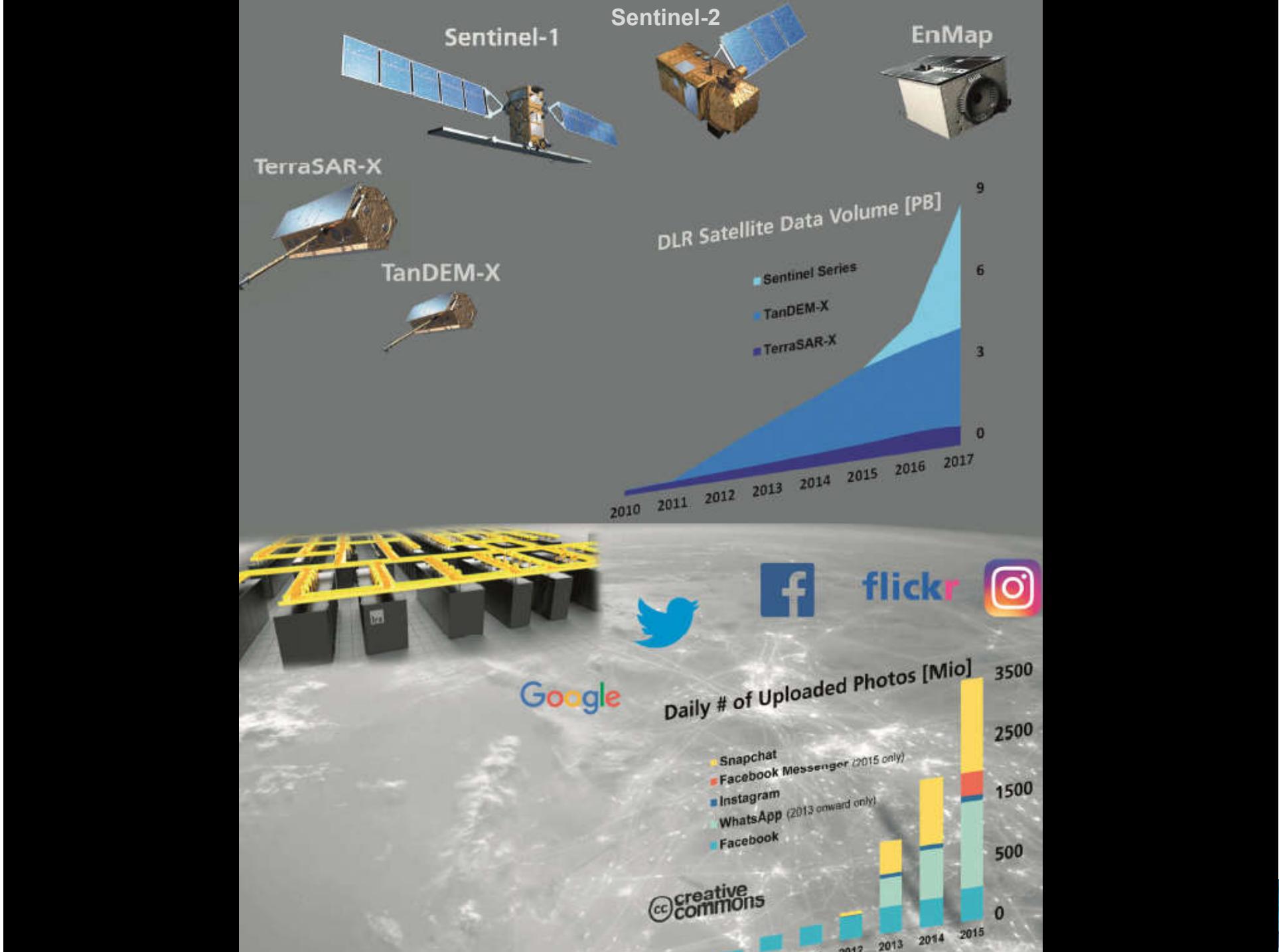
Prozesse & Morphologien



Der städtische Raum und Applikationen für Deutschland



1. Big, Big, Big Data





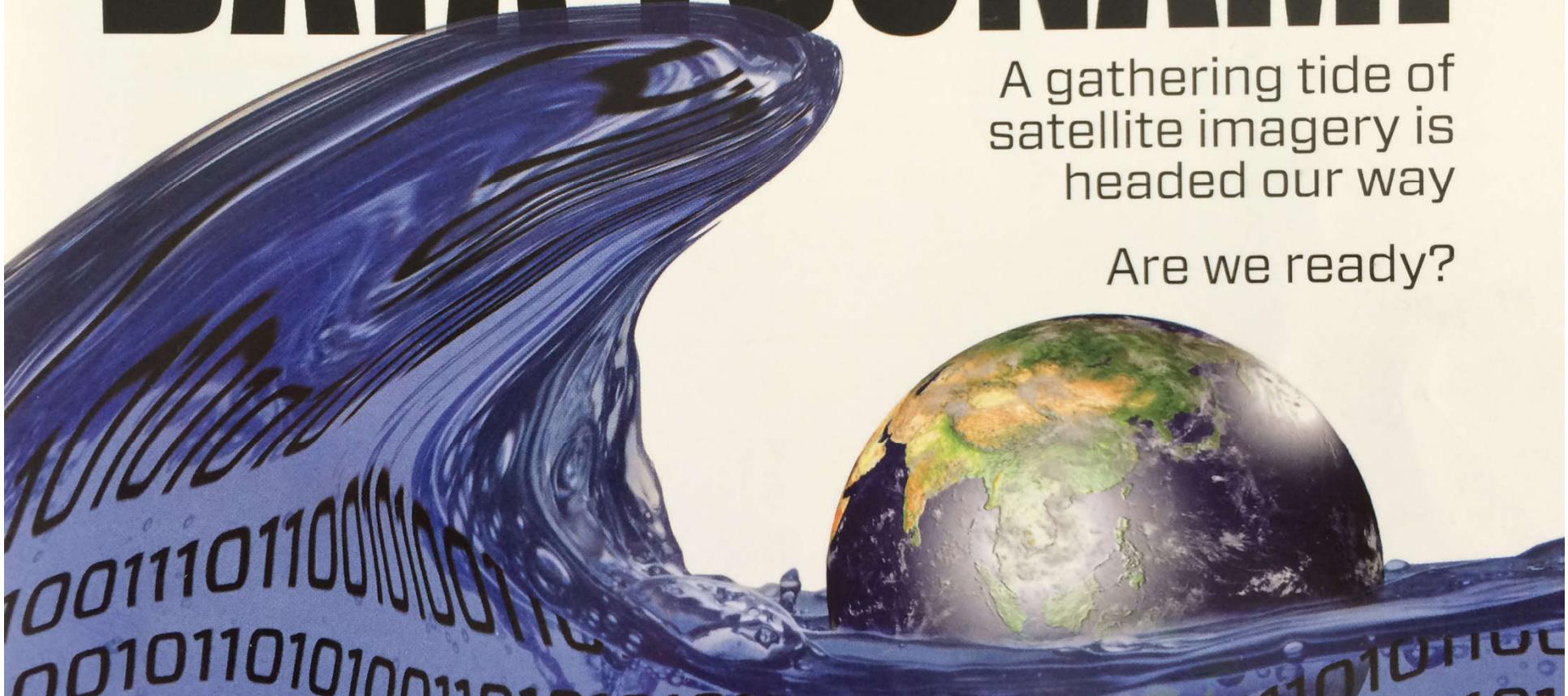
NEWS

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MAY 9, 2016

The Coming **DATA TSUNAMI**

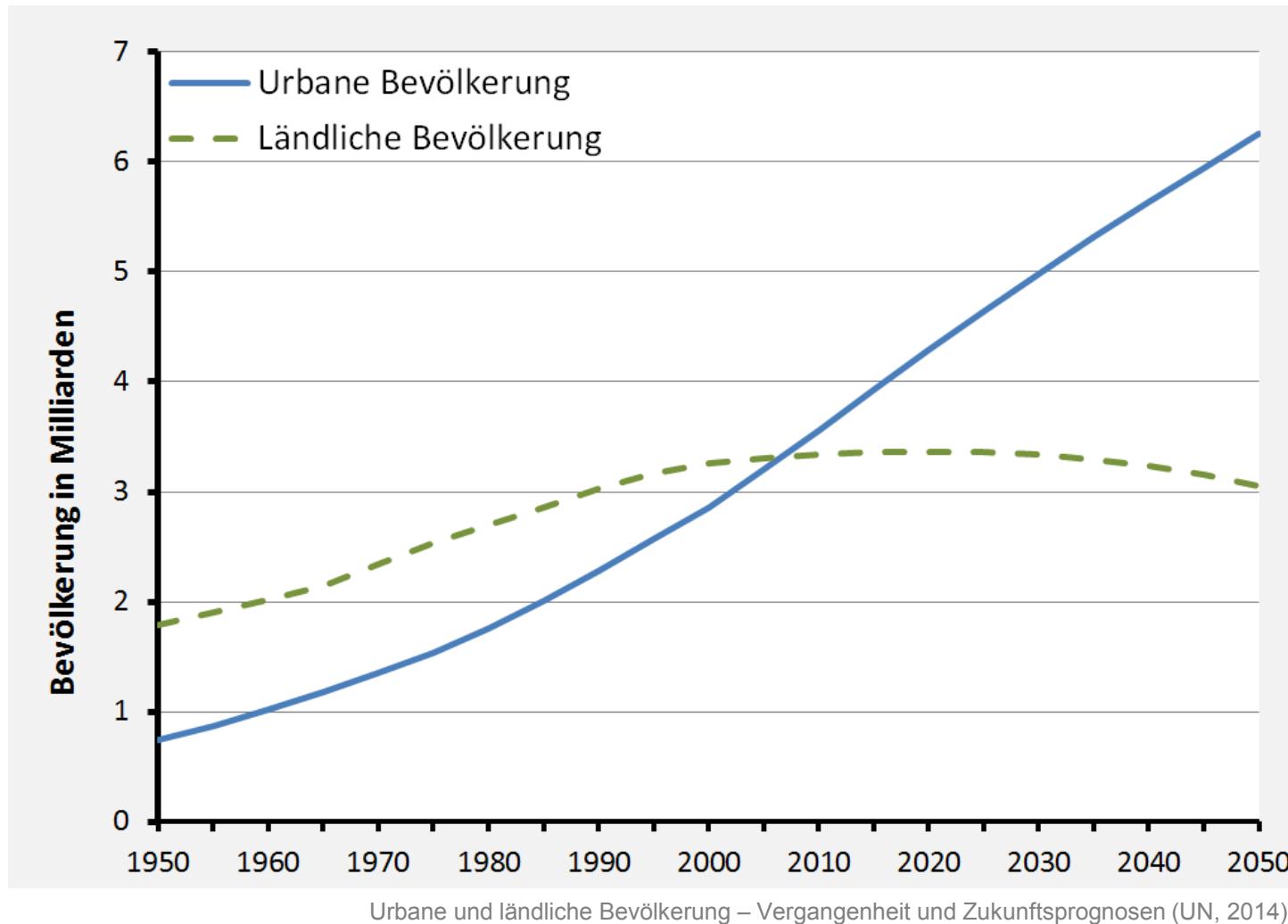


A gathering tide of
satellite imagery is
headed our way

Are we ready?

2. The future will be urban

Urban Planet



3. Ist Urbanisierung gut für uns?



Hannes Taubenböck
Michael Wurm
Thomas Esch
Stefan Dech Hrsg.

Globale Urbanisierung

Perspektive aus dem All



Deutsches Zentrum
für Luft- und Raumfahrt e.V.
in der Helmholtz-Gemeinschaft



Springer Spektrum

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hannes.taubenboeck@dlr.de