Urban Systems and Resource Sustainability: Informing Sustainability Science

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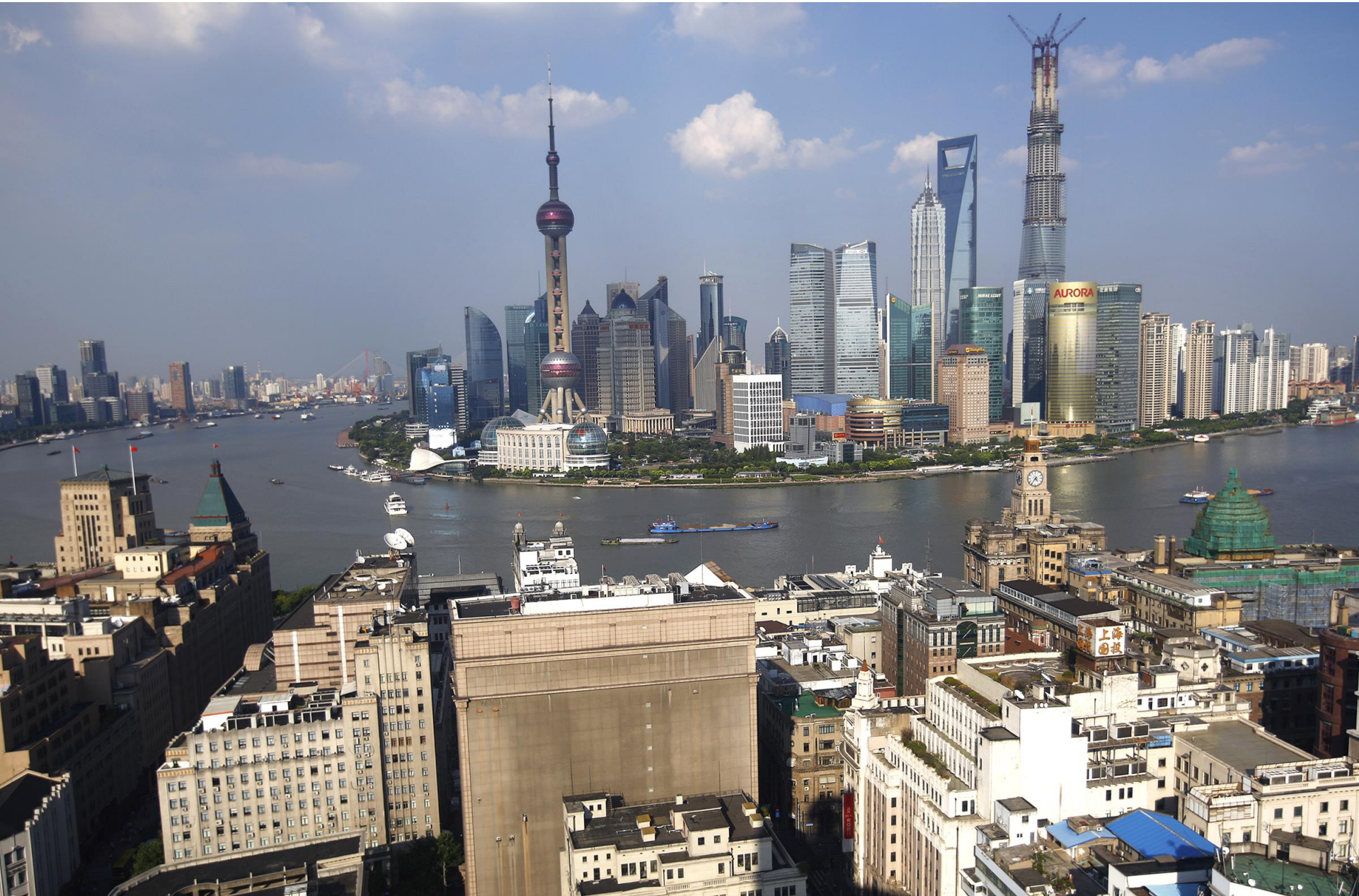
& Environmental Studies

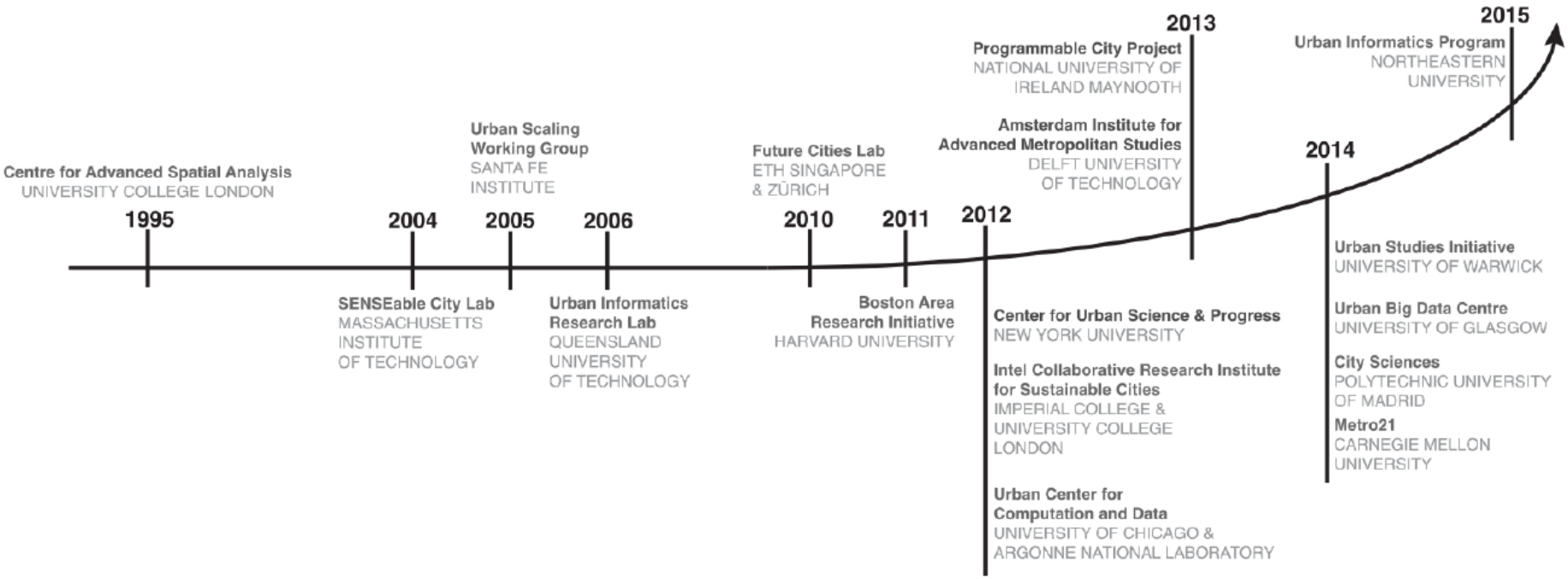

KENT
NEC
CASIO


AURORA

Dominant Conceptualization of Cities

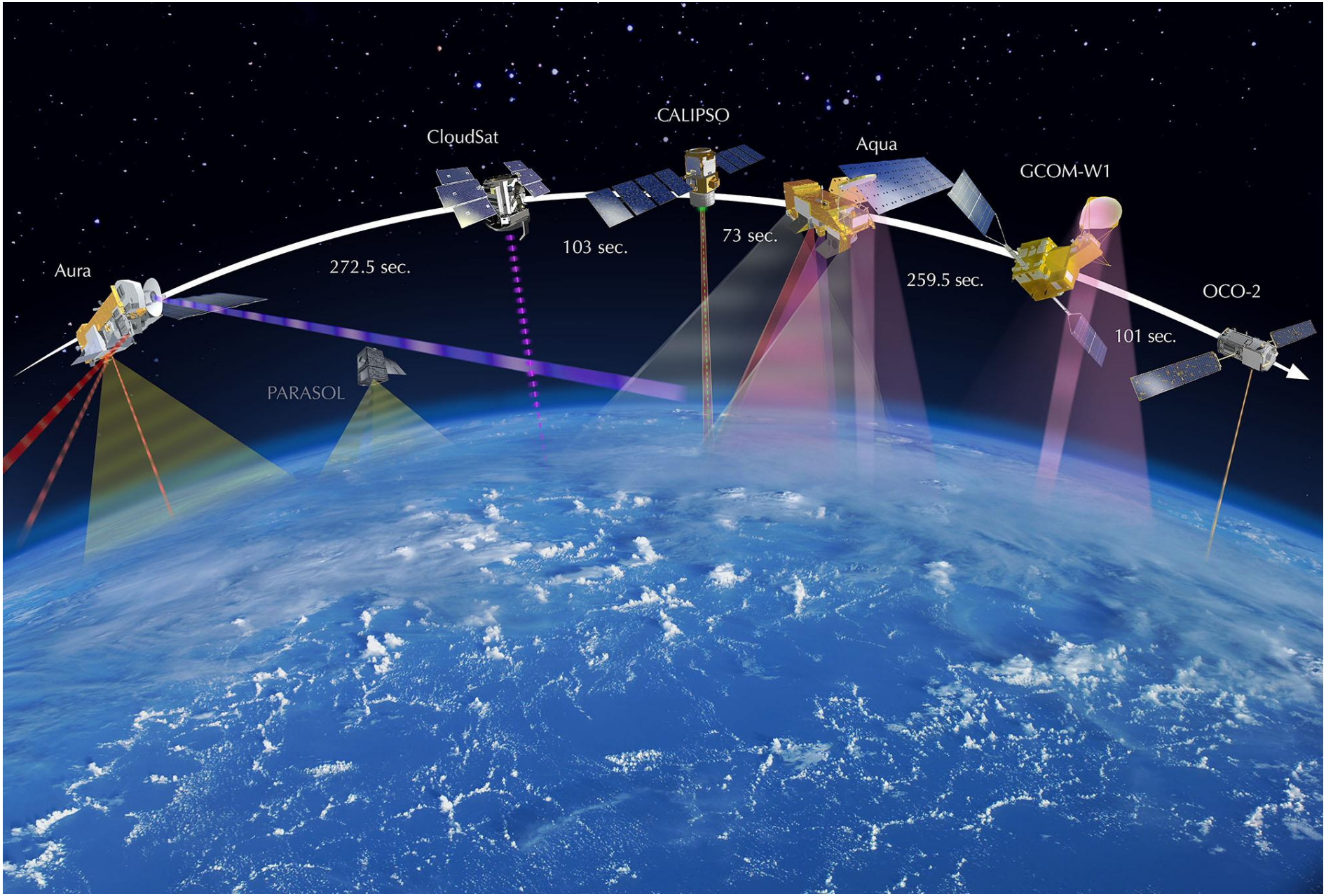
3. Classical Athens seen from the northwest. (Watercolor by Peter Connolly)

Sample of New Urban Science Institutions



NYU WAGNER rudin center for transportation policy & management

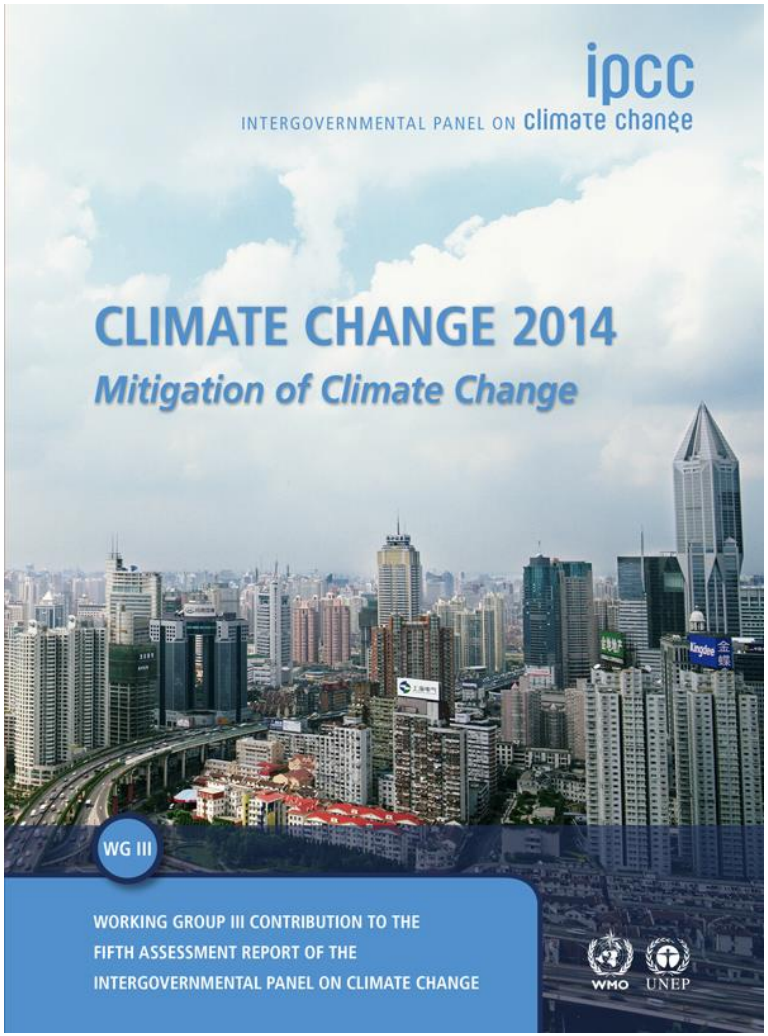
Host Institution	Center	Year Established	Current Director	Director's Primary Academic Field
University College London	Centre for Advanced Spatial Analysis	1995	Andrew Hudson-Smith	Urban simulation
MIT	SENSEable City Laboratory	2004	Carlo Ratti	Architecture, civil engineering
Santa Fe Insitute	Santa Fe Institute Cities, scaling and sustainability project	2005	Luis Bettencourt	Physics
Queensland University of Technology	Urban Informatics Research Lab	2006	Marcus Foth	Communication & Media
ETH	Future Cities Lab Singapore	2010	Peter Edwards	Plant ecology
Harvard University	Boston Area Research Initiative	2011	Robert Sampson	Sociology
Imperial College, University College London	Intel Collaborative Research Institute for Sustainable Connected Cities	2012	Duncan Wilson	Artificial intelligence
New York University	Center for Urban Science and Progress	2012	Stephen Koonin	Physics
University of Chicago	Center for Urban Computation and Data	2012	Charlie Catlett	Computer science
National University of Ireland Maynooth	Programmable City Project	2013	Rob Kitchin	Geography
Delft University of Technology, Wageningen University	Amsterdam Institute for Advanced Metropolitan Solutions	2014	N/A	N/A


CALIPSO
CloudSat
Aqua
GCOM-W1
Aura
272.5 sec.
103 sec.
73 sec.
259.5 sec.
OCO-2
101 sec.
PARASOL

SUSTAINABLE DEVELOPMENT GOALS


If the top 50 emitting cities were a single country, it would rank 3rd in emissions behind China and the U.S.

IPCC Fifth Assessment Report
New chapter on urban mitigation of climate change



Human Settlements, Infrastructure, and Spatial Planning

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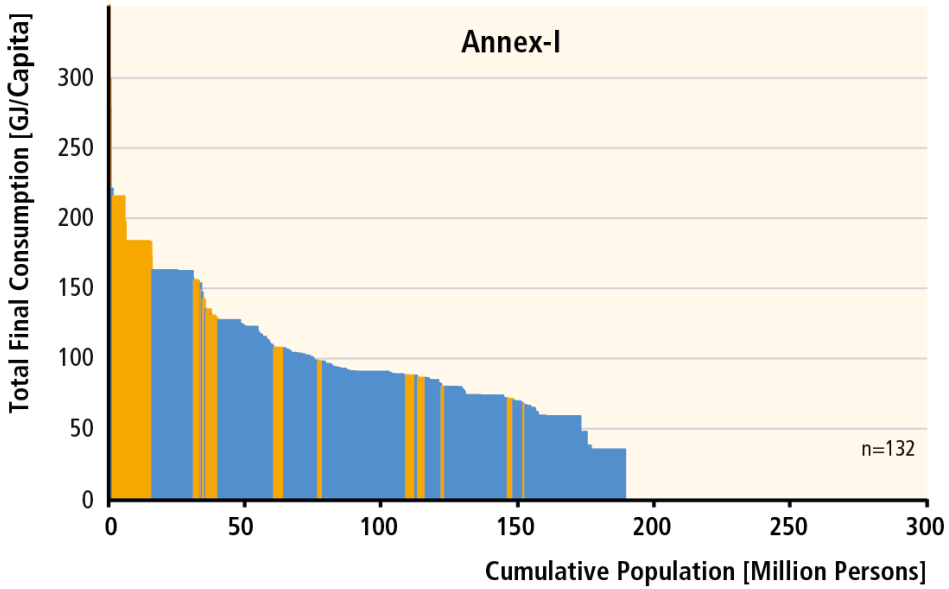
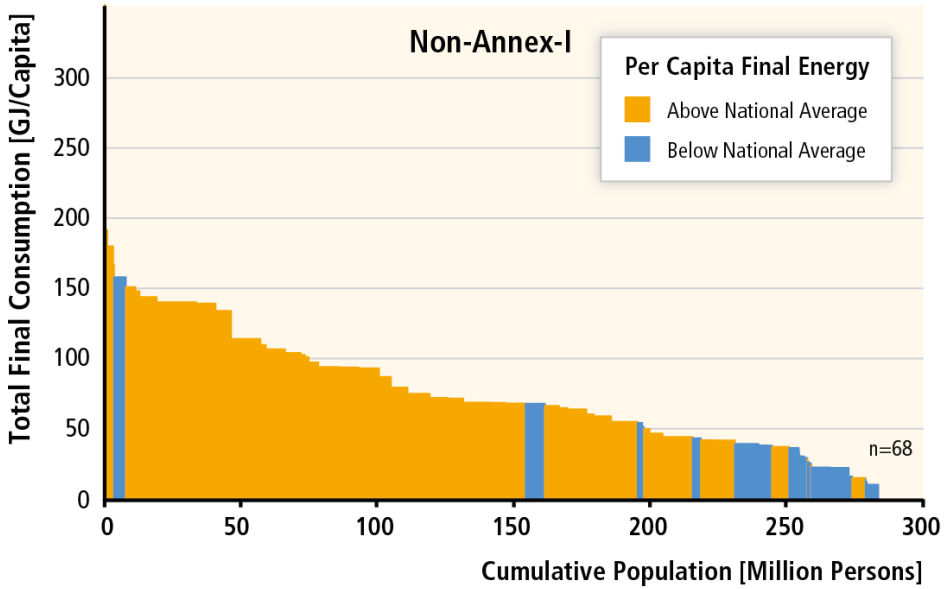
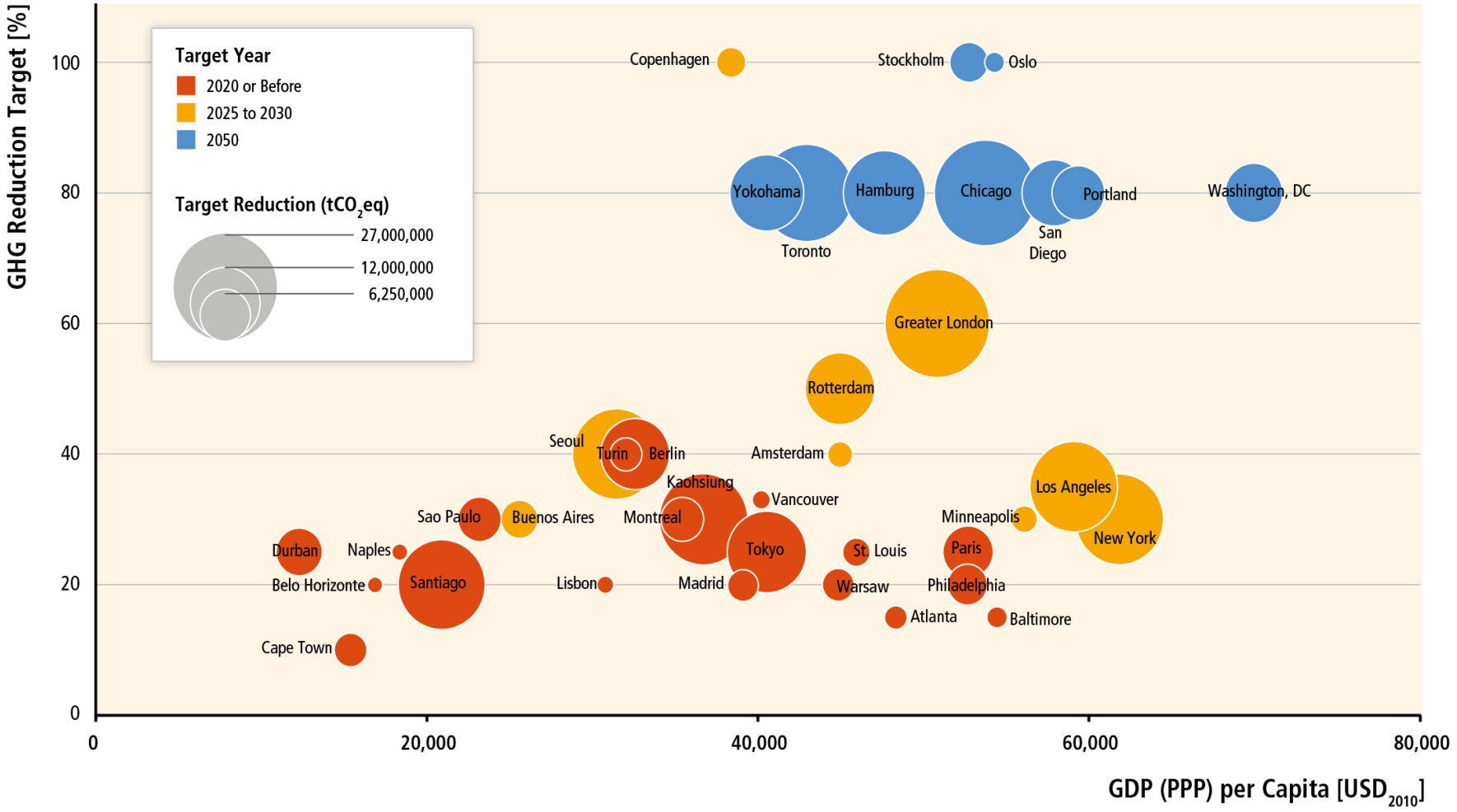
IPCC AR5: Significant variation in energy use across cities due to differences in economic structure and urban form

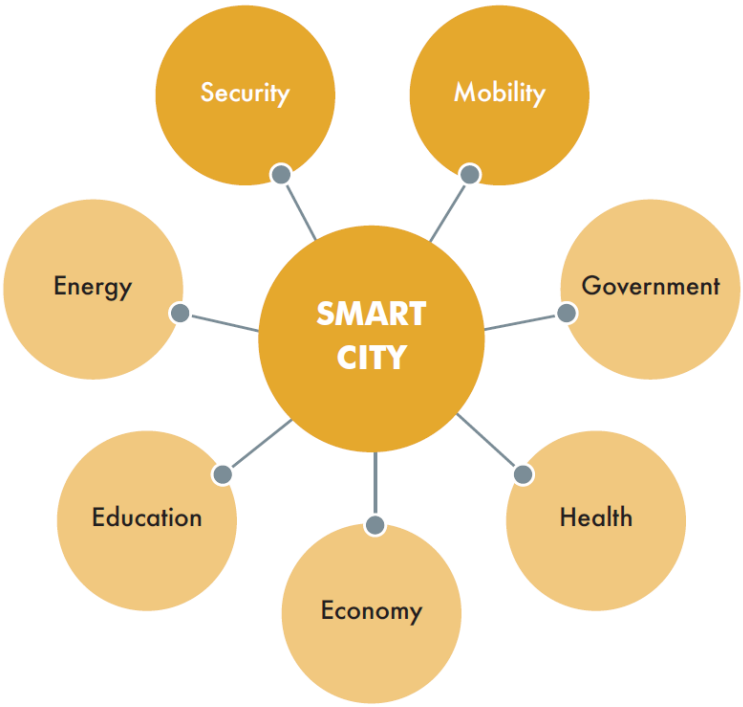


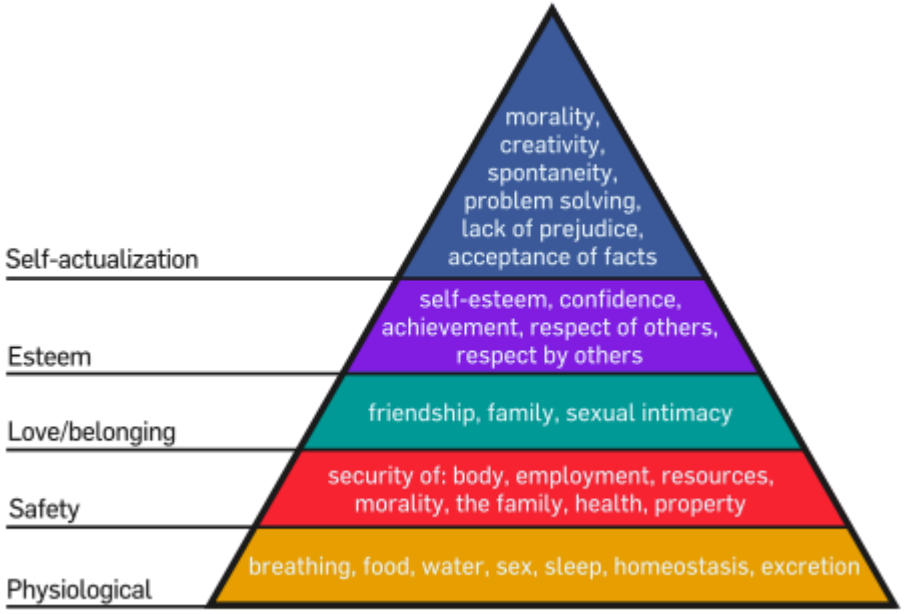


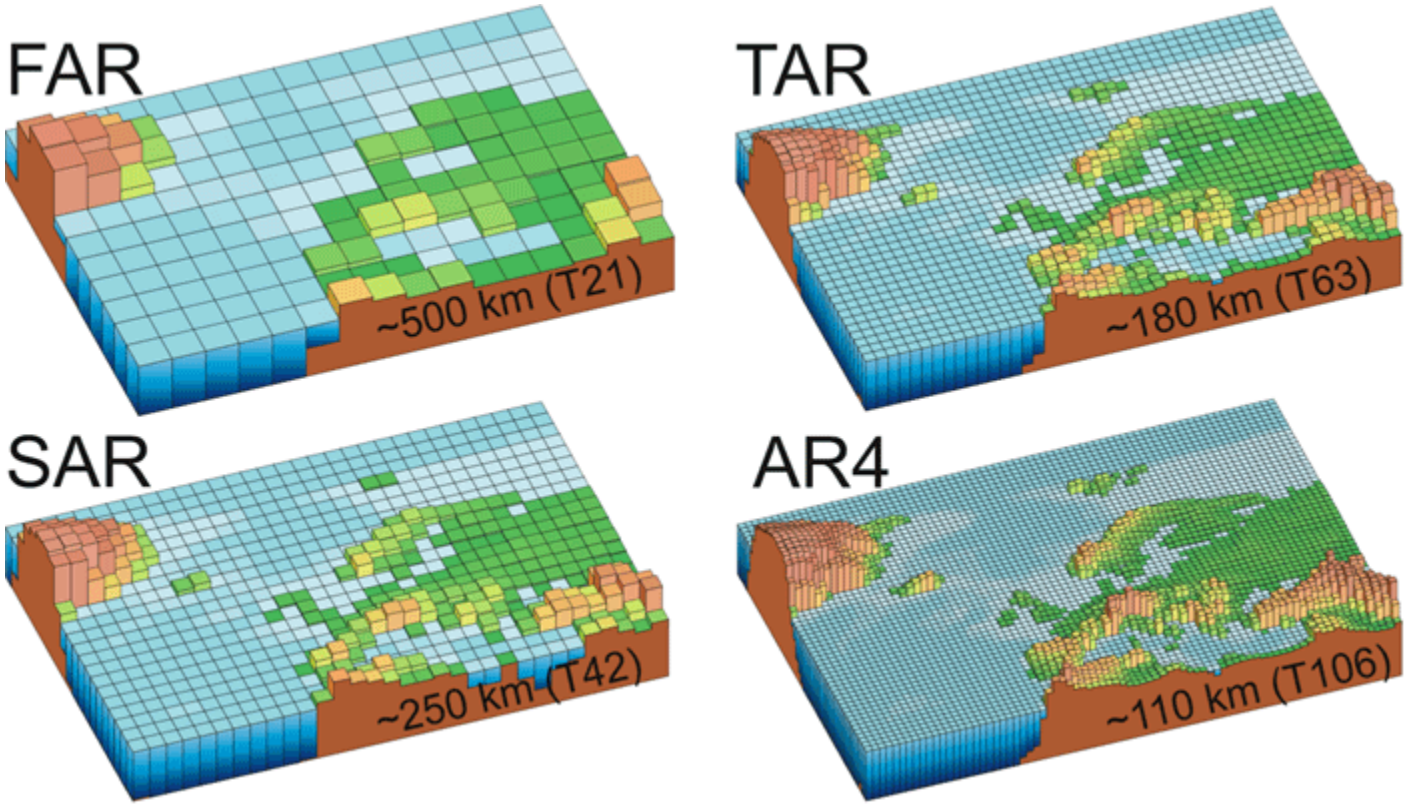
IPCC AR5 Result: Thousands of cities undertaking climate action plans, but impact on urban emissions is uncertain



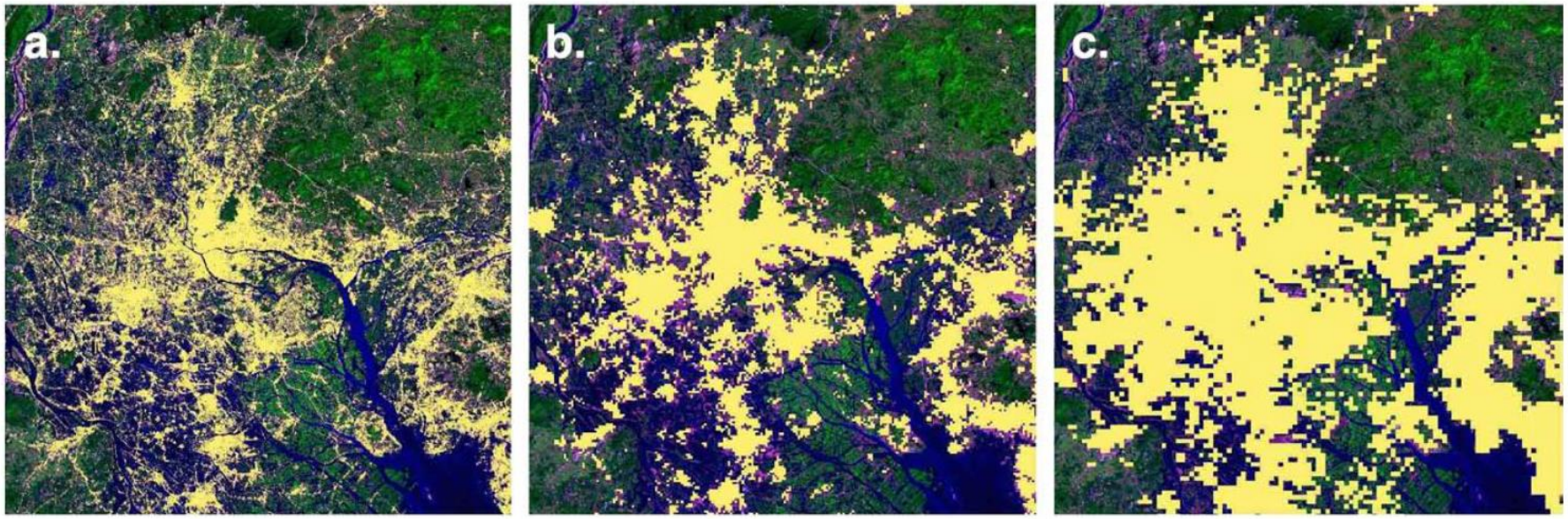
Moving from “smart” cities to well-being





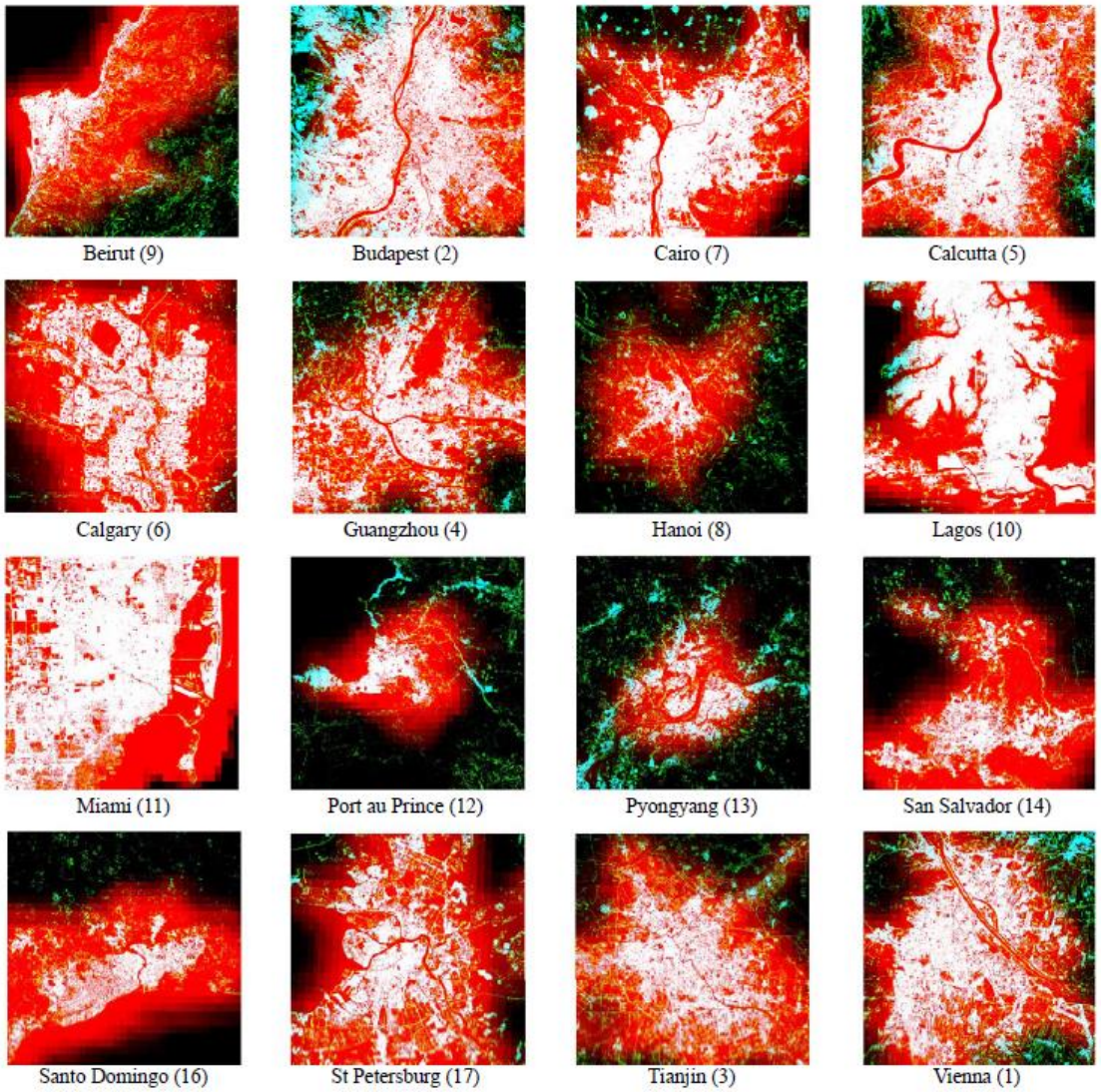

FAR
~500 km (T21)
TAR
~180 km (T63)
SAR
~250 km (T42)
AR4
~110 km (T106)

Urban land cover mapping with MODIS



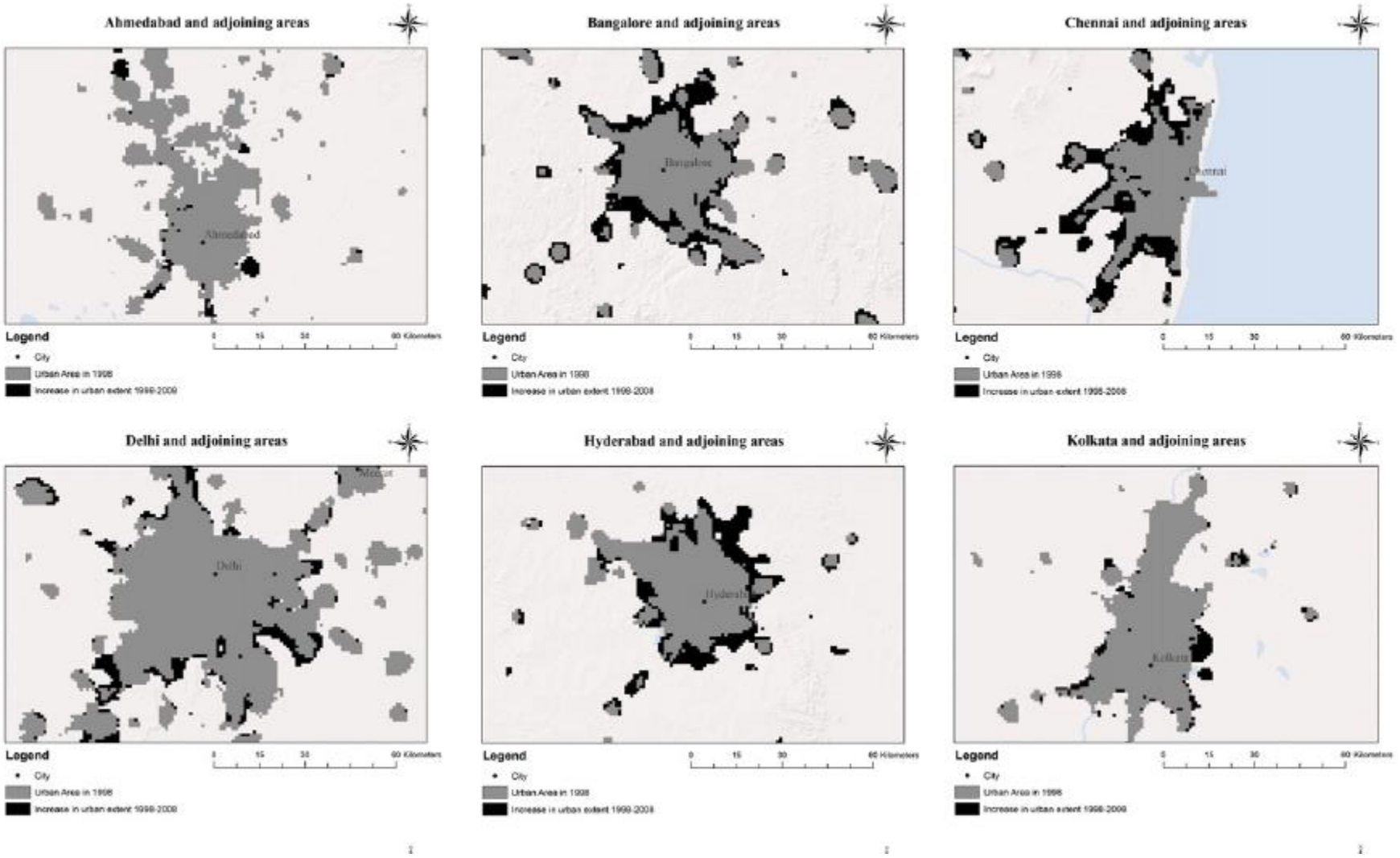
(Friedl et al., 2010)

Global urban mapping with DMSP

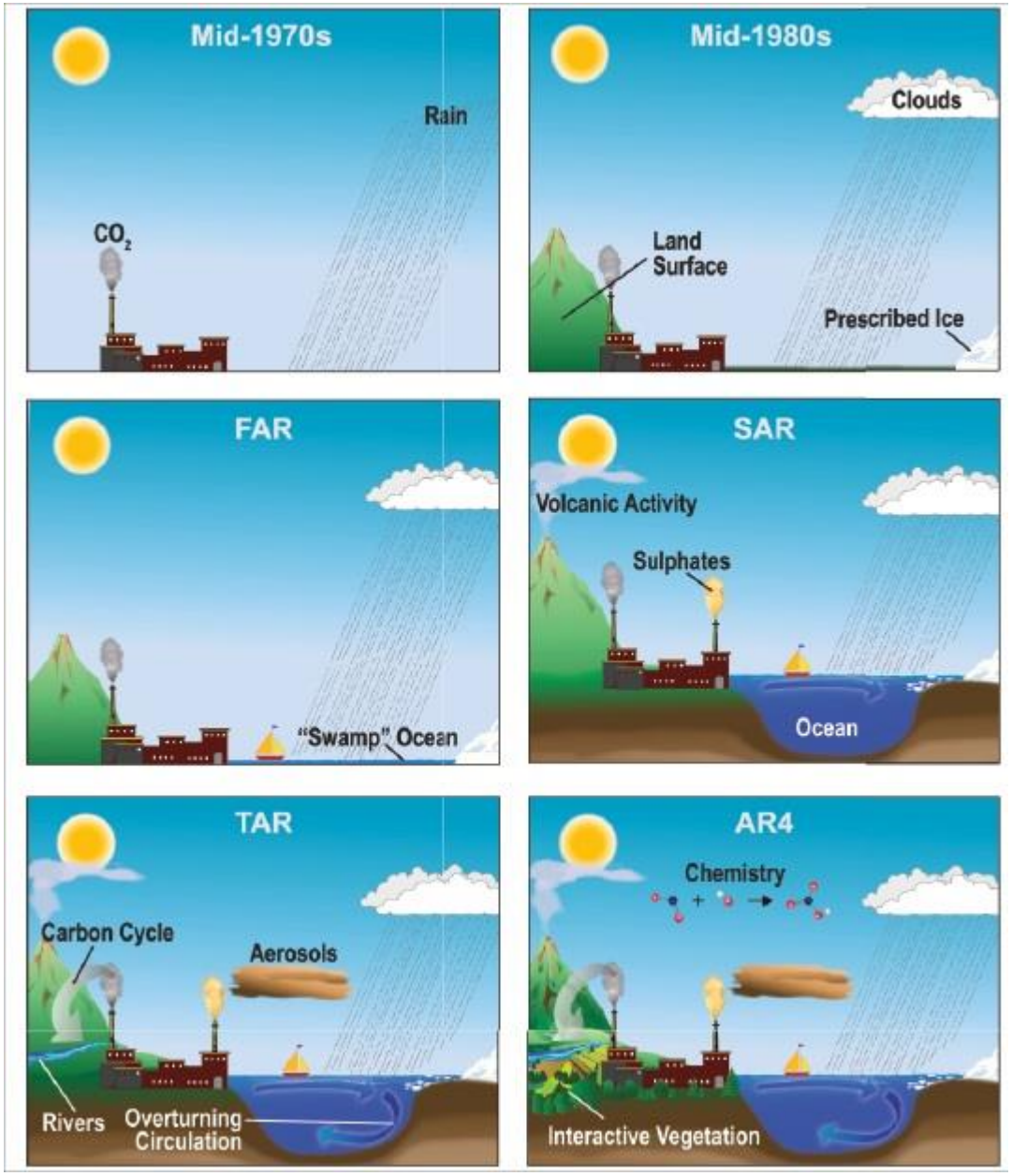


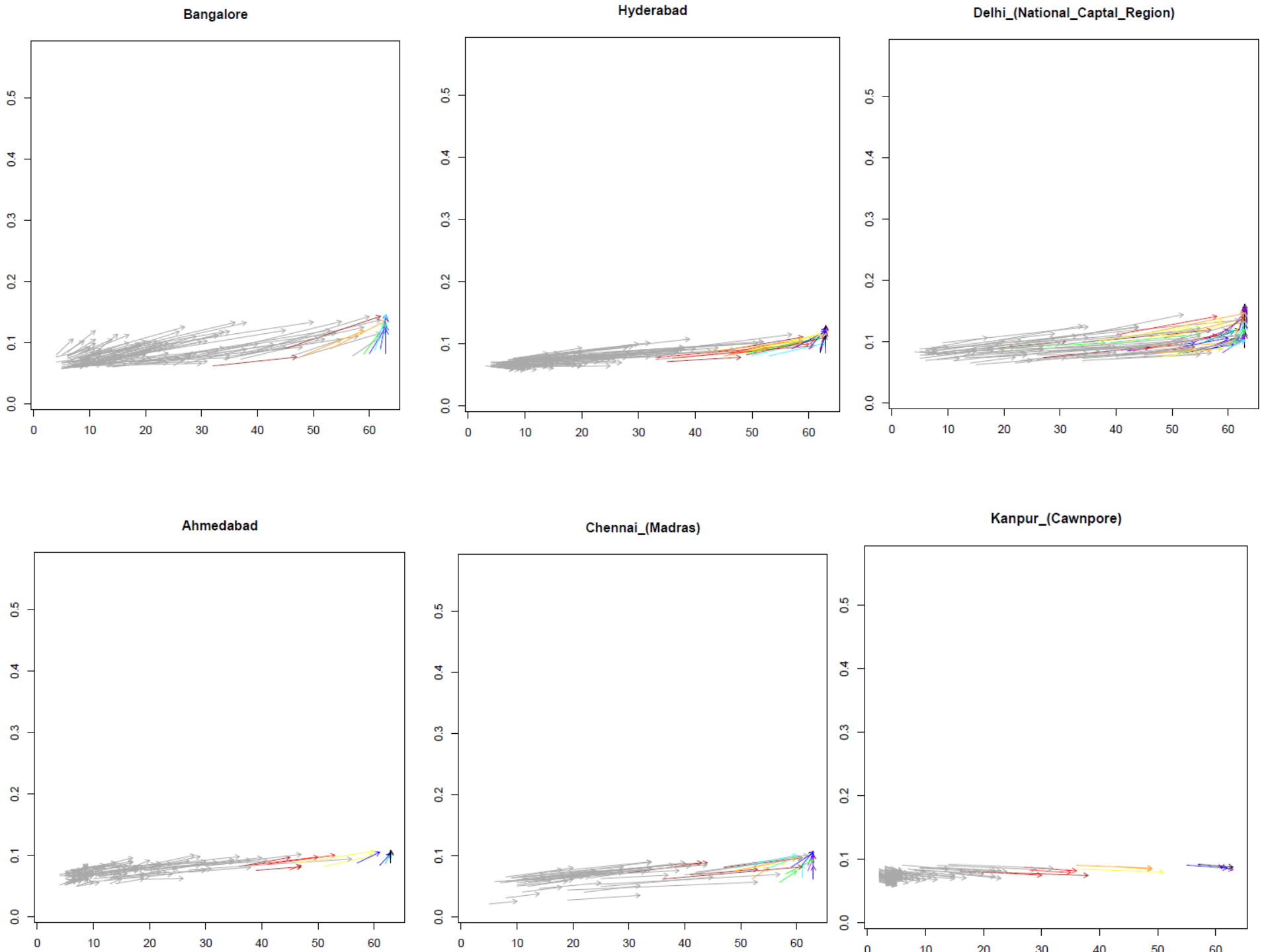
(Small et al., 2005)

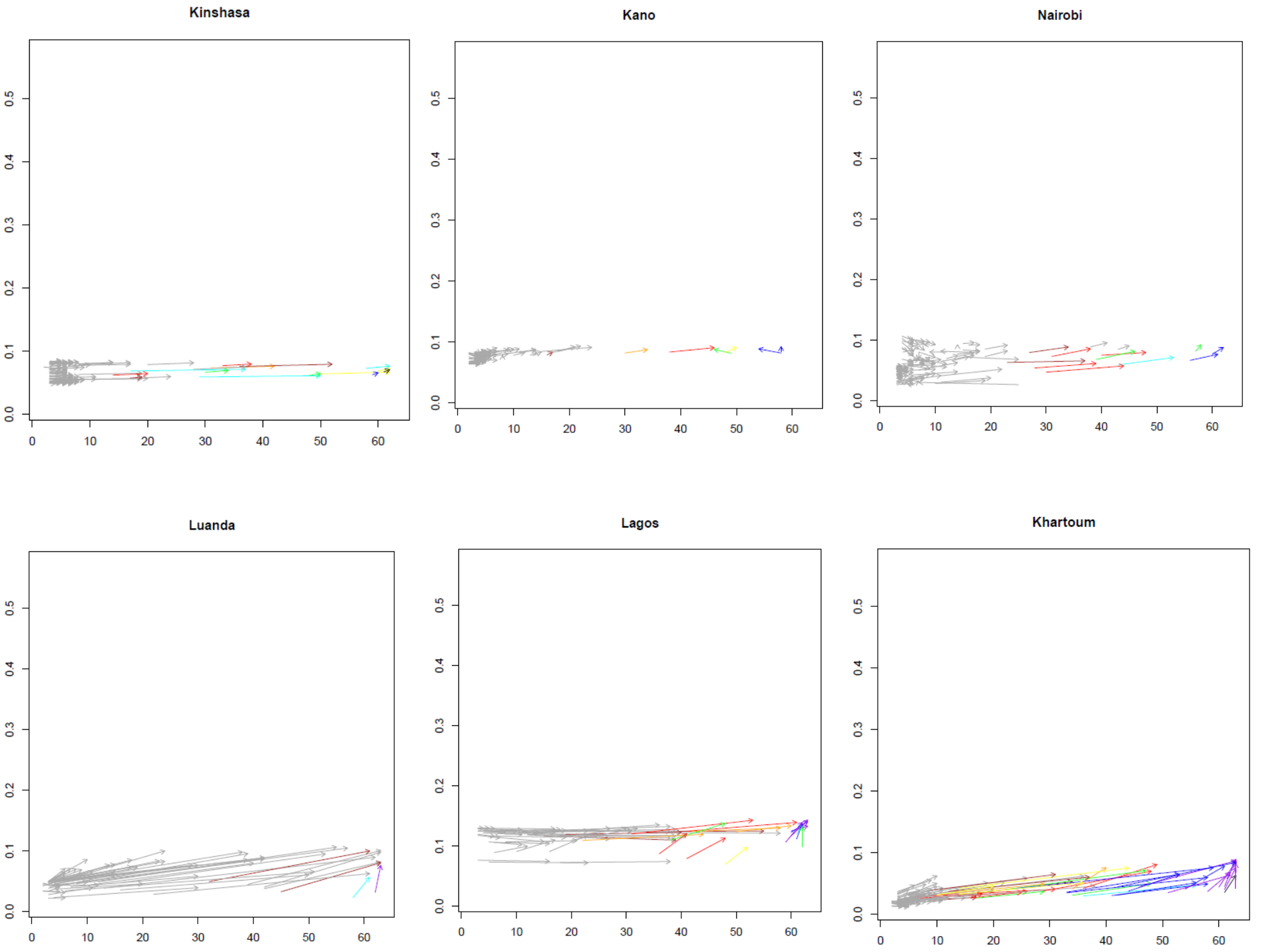
Urban mapping with DMSP + SPOT-VGT

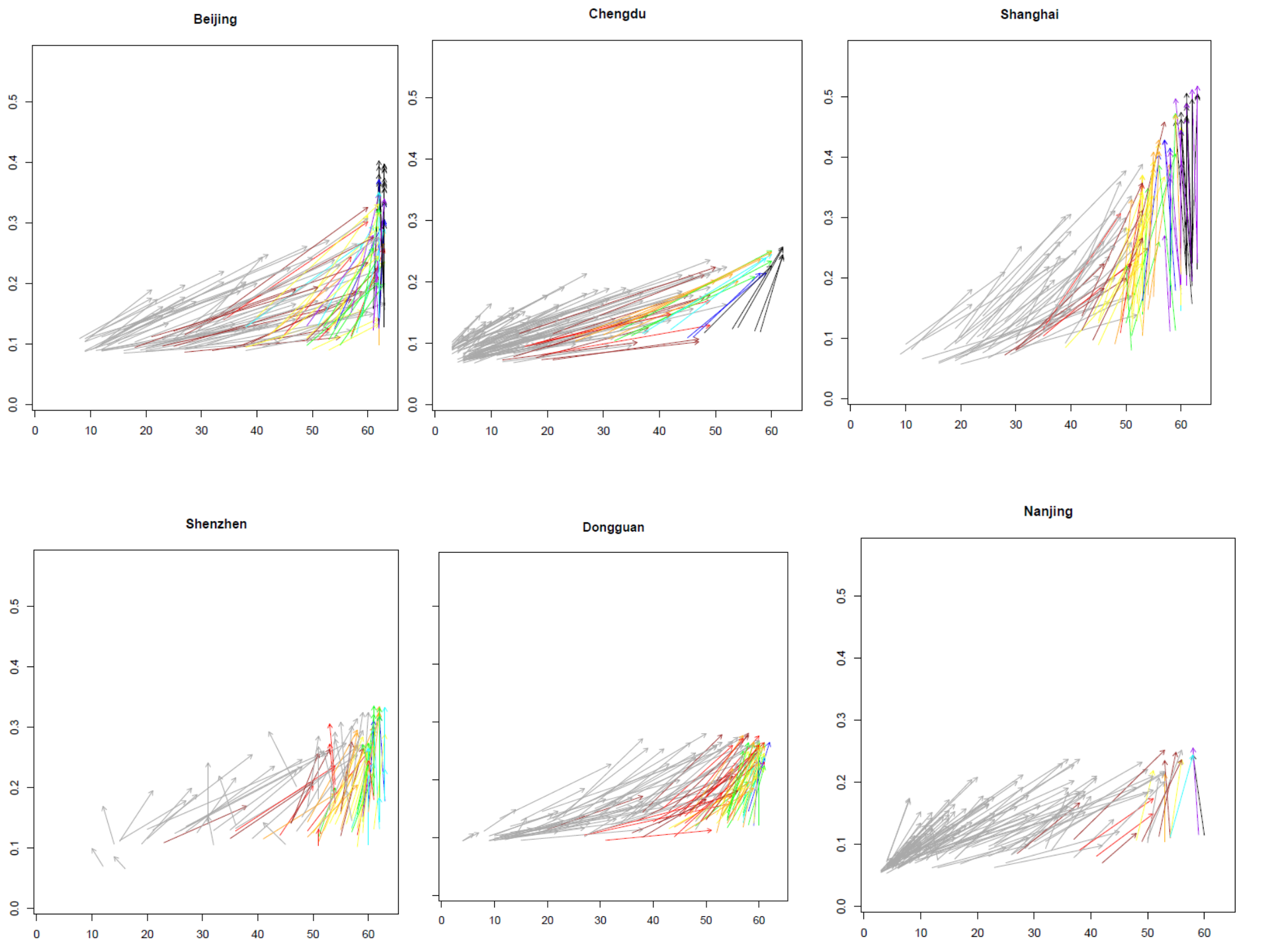


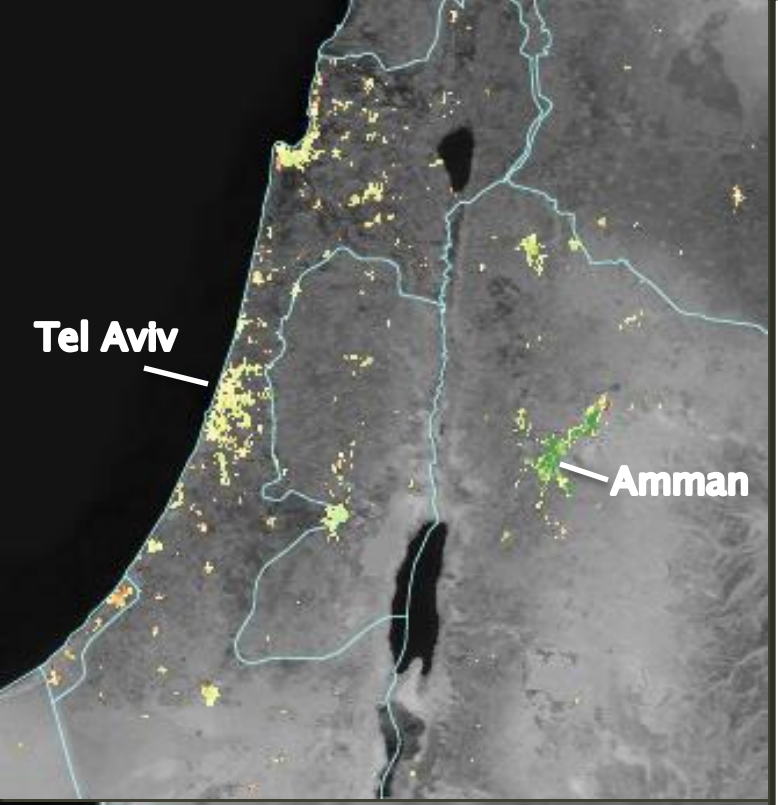
(Pandey et al., 2013)


Mid-1970s
Rain
CO_2
Mid-1980s
Clouds
Land Surface
Prescribed Ice
FAR
"Swamp" Ocean
SAR
Volcanic Activity
Sulphates
Ocean
TAR
Carbon Cycle
Aerosols
Rivers
Overturning Circulation
AR4
Chemistry
Interactive Vegetation

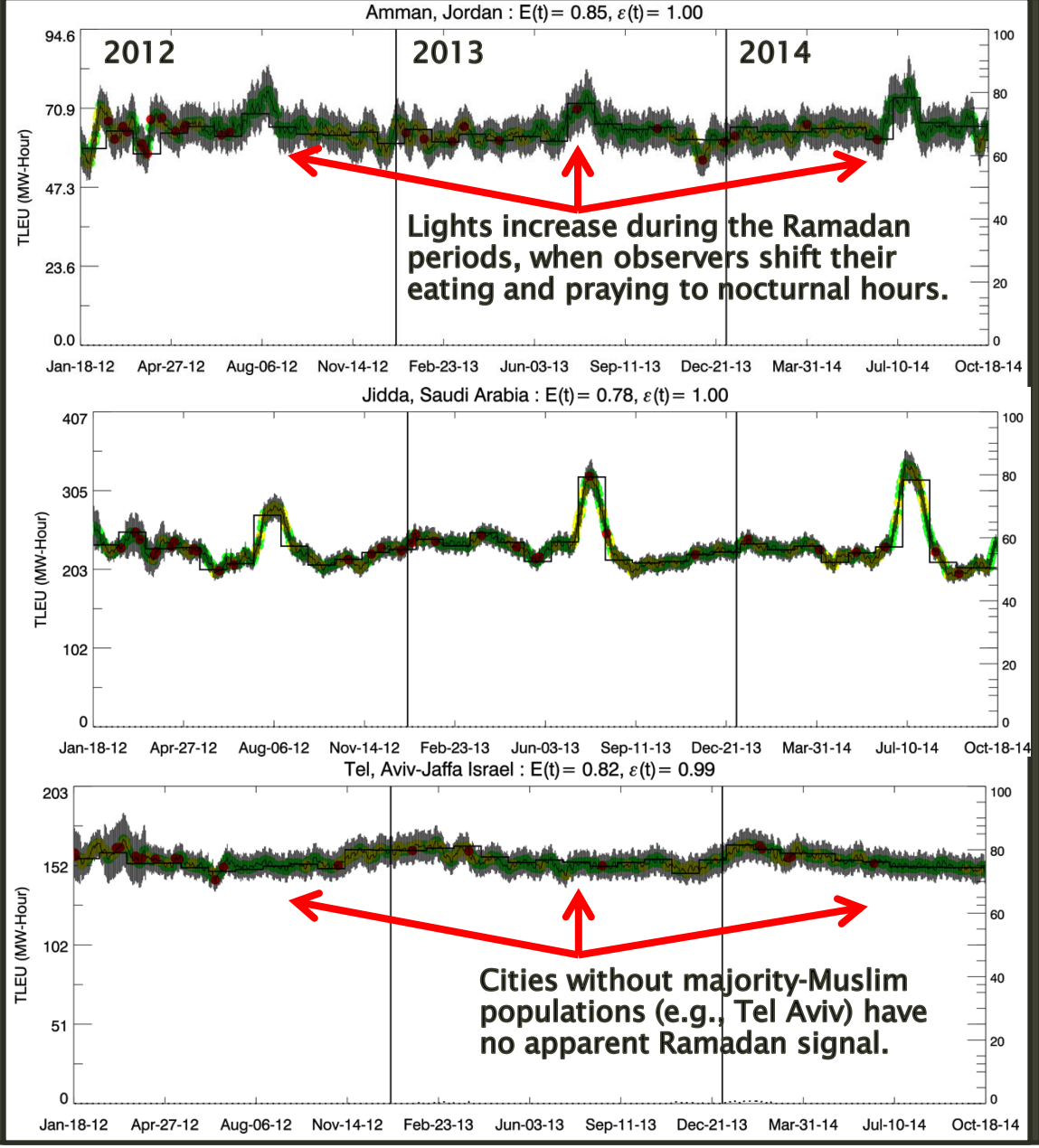

Bangalore
Hyderabad
Delhi_(National_Captal_Region)
Ahmedabad
Chennai_(Madras)
Kanpur_(Cawnpore)


Kinshasa
Kano
Nairobi
Luanda
Lagos
Khartoum
0.0
0.1
0.2
0.3
0.4
0.5
0
10
20
30
40
50
60


Beijing
Chengdu
Shanghai
Shenzhen
Dongguan
Nanjing



Román and Stokes (2015)



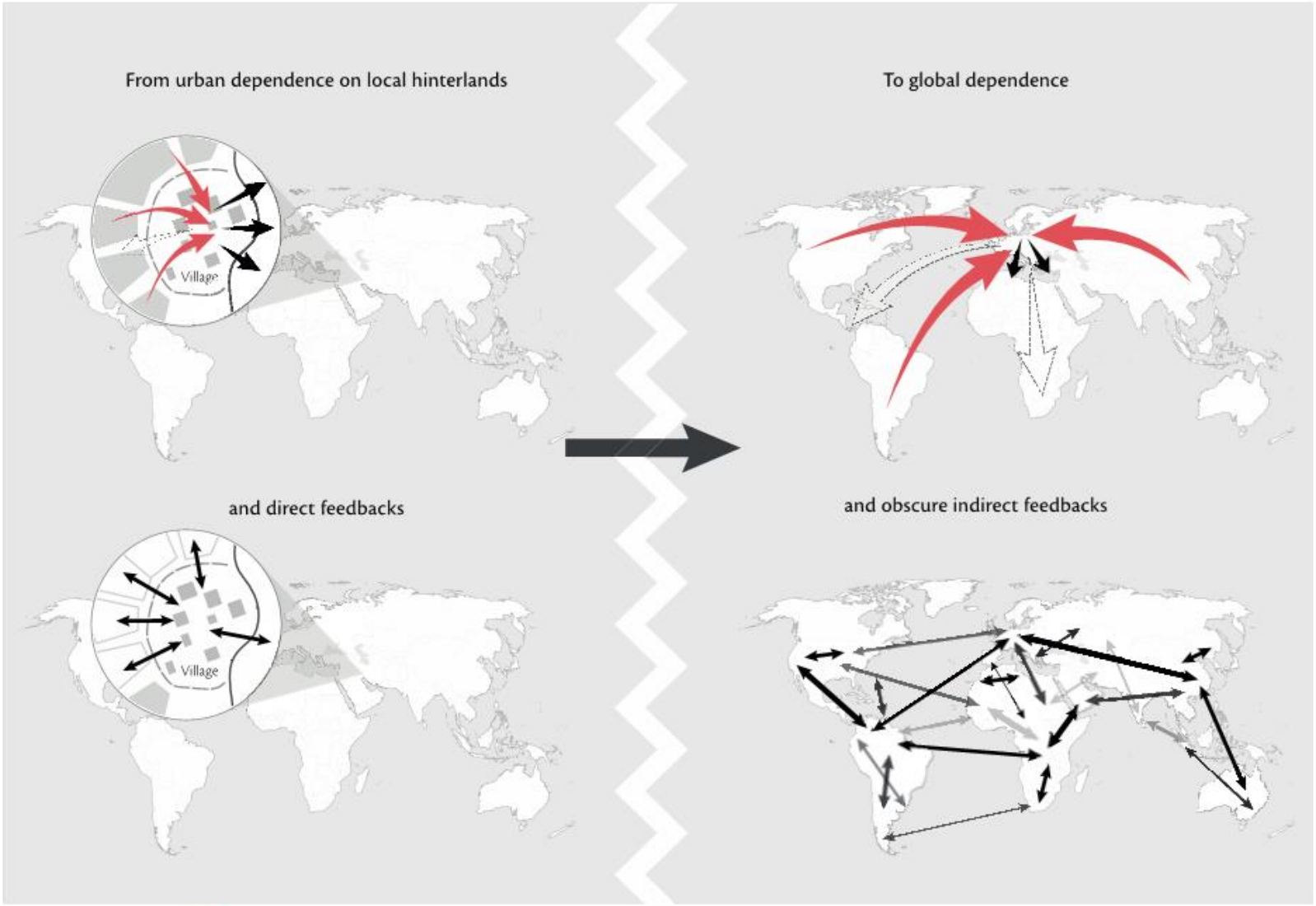
Holiday Lighting

less equal more

Energy use is shaped by social and cultural identities.

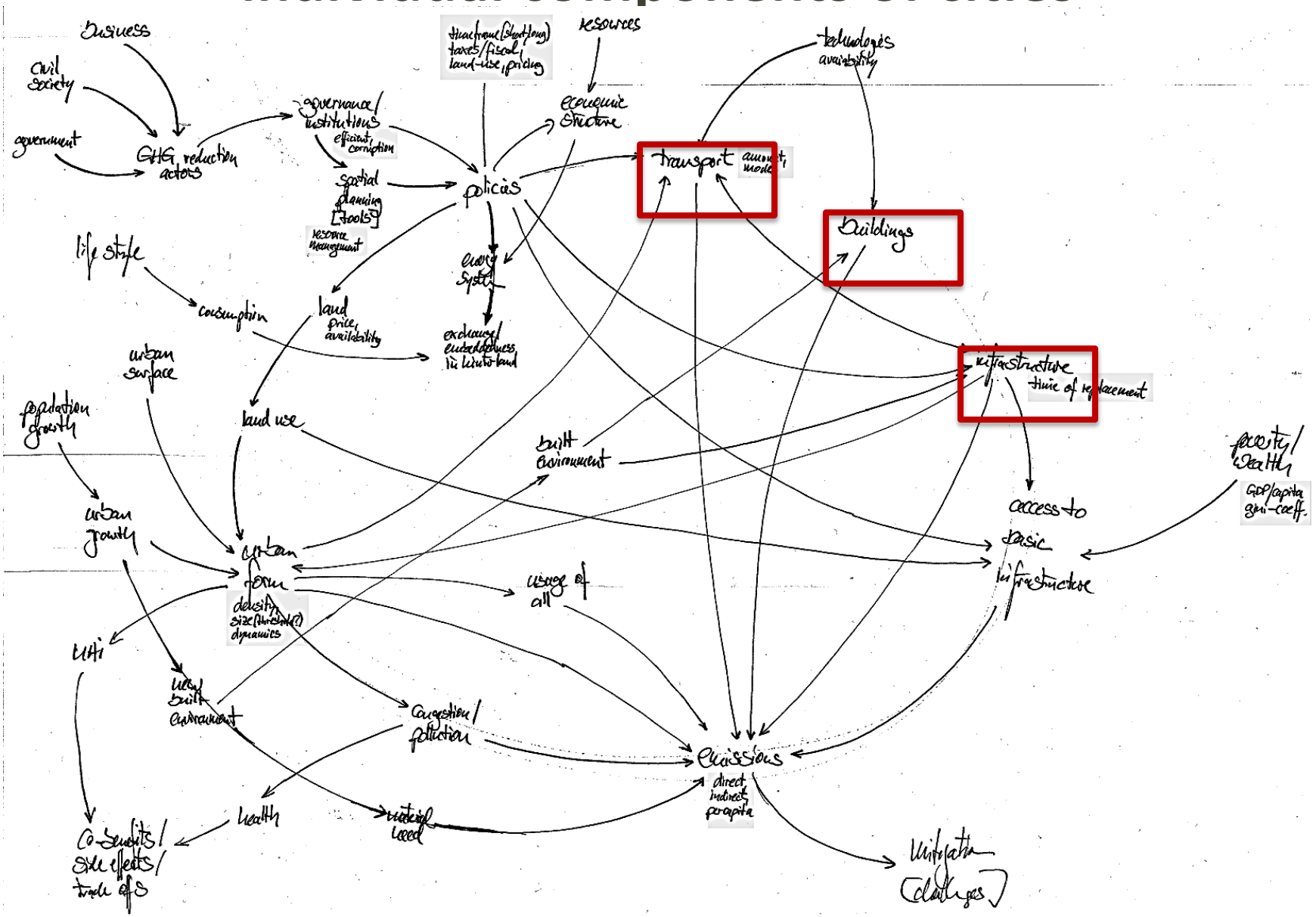
More science on the interplay between social and environmental dimensions of urbanization

Planetary urbanization requires rethinking urban impacts and sustainability



(Elmqvist et al. 2013)

Strong scientific understanding of individual components of cities



Weak scientific knowledge of complexities, dynamics, and interdependencies among components