Rethinking density in growing cities

December 6, 2019

AGENDA

- 5 mins introduction
- 30 mins presentation
- 25 Q&A

REMEMBER

- Mute yourself

- If you are joining by phone, mute your computer audio

- Use the chatbox to write questions or unmute yourself during the Q&A session

Patrick Lamson-Hall is an urban planner and a research scholar at the NYU Marron Institute of Urban Management.

- Contributed to the development of the Atlas of Urban Expansion: 2016 Edition, a groundbreaking and original study of the dynamics of global urban growth.

- Manages the India Urban Expansion Observatory, a 30-person research facility located in Mumbai, India.

- New York-based coordinator of the Ethiopia Urban Expansion Initiative, a project to implement long-term spatial plans in 16 Ethiopian cities.

- Coordinates the Climate Smart Cities: Grenada program, a collaboration with the Green Climate Fund to promote mitigation and adaptation in the cities of Small Island Developing States (SIDS).

OVERVIEW

DENSITY IN CONTEXT

- *Cities as labor markets*
- *Density and GHG emissions*
- *Global trends in density*
- *Urban population growth*

MAKING ROOM FOR POPULATION GROWTH

- *The Making Room Paradigm*
- *Densification*
- *Orderly urban expansion*

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DENSITY IN CONTEXT

- Cities as labor markets
- Density and GHG emissions
- Global trends in density
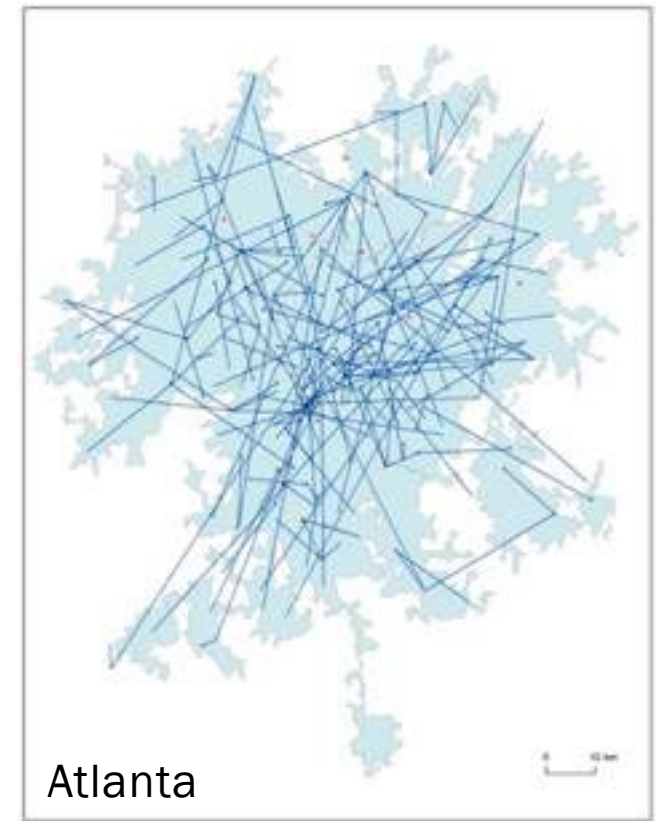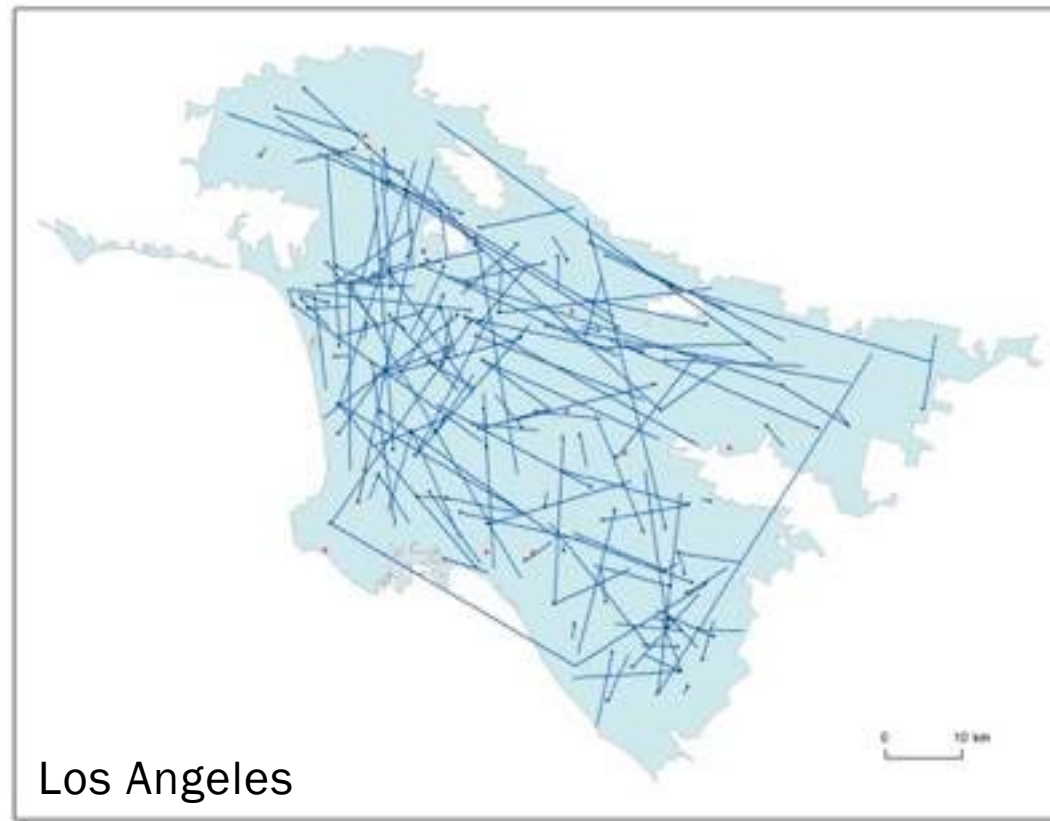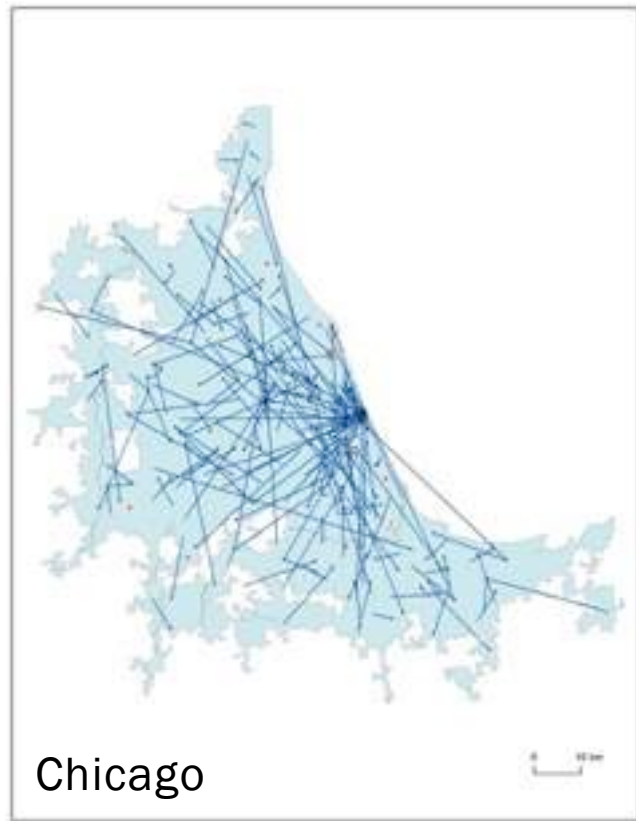- Urban population growth

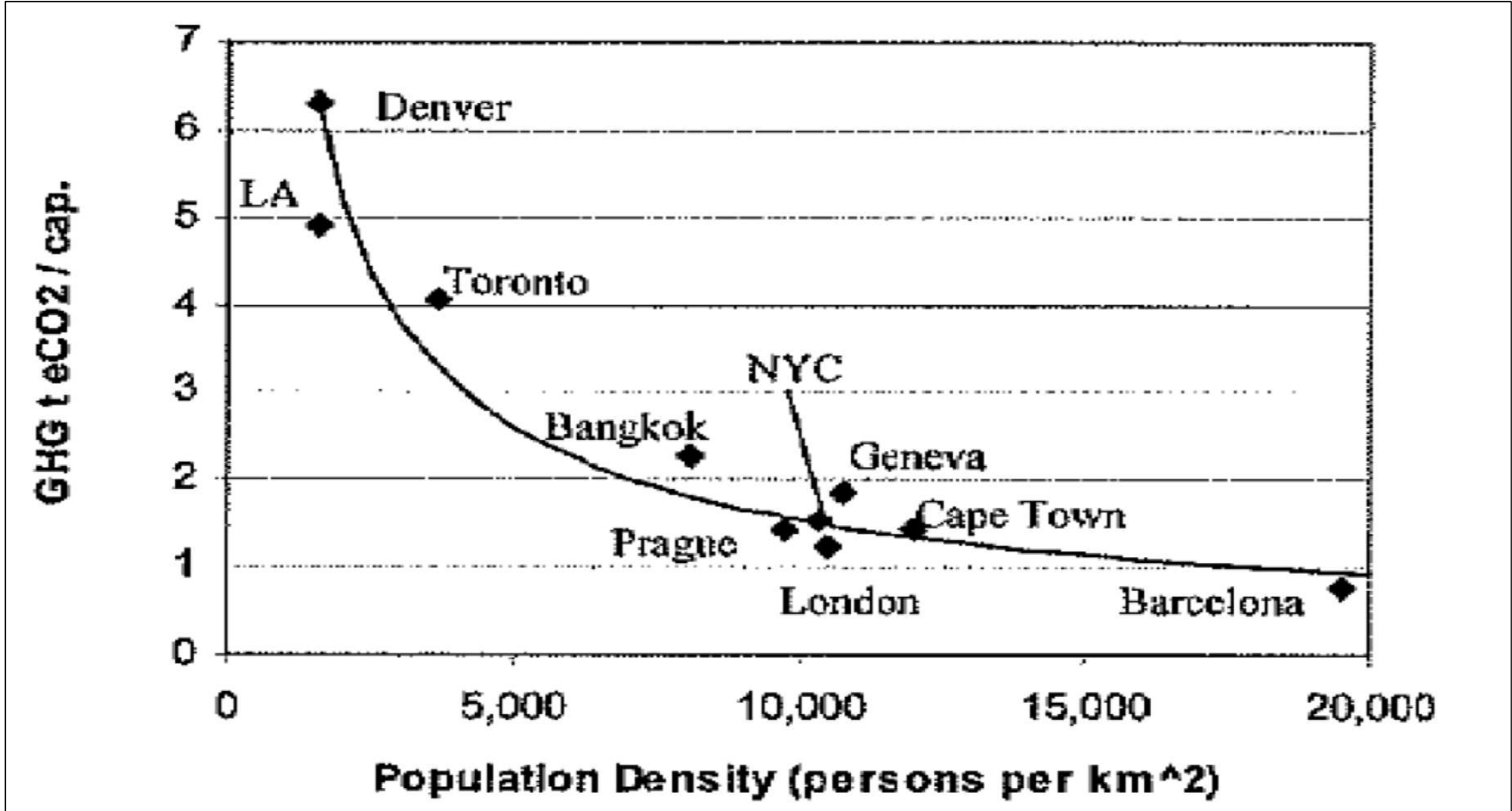NYU | Marron Institute Of Urban Management

Density and urban form: Dhaka; Los Angeles; Hong Kong; New Jersey.

Chicago

Los Angeles

Atlanta

Focus on urban agglomerations: Contemporary cities are integrated metropolitan labor markets: People live everywhere and work everywhere.

Greenhouse Gas Emissions are higher in cities that have lower densities

A scatter plot with the y-axis labeled "GHG t eCO2 / cap." (ranging 0 to 7) and the x-axis labeled "Population Density (persons per km^2)" (ranging 0 to 20,000). Data points: Denver (~6.3), LA (~4.9), Toronto (~4.0), Bangkok (~2.2), NYC (~1.5), Geneva (~1.8), Cape Town (~1.5), Prague (~1.4), London (~1.2), Barcelona (~0.8). A curved trendline decreases from upper left to lower right.

Financial and structural issues compound the problem of providing public transportation to low density cities
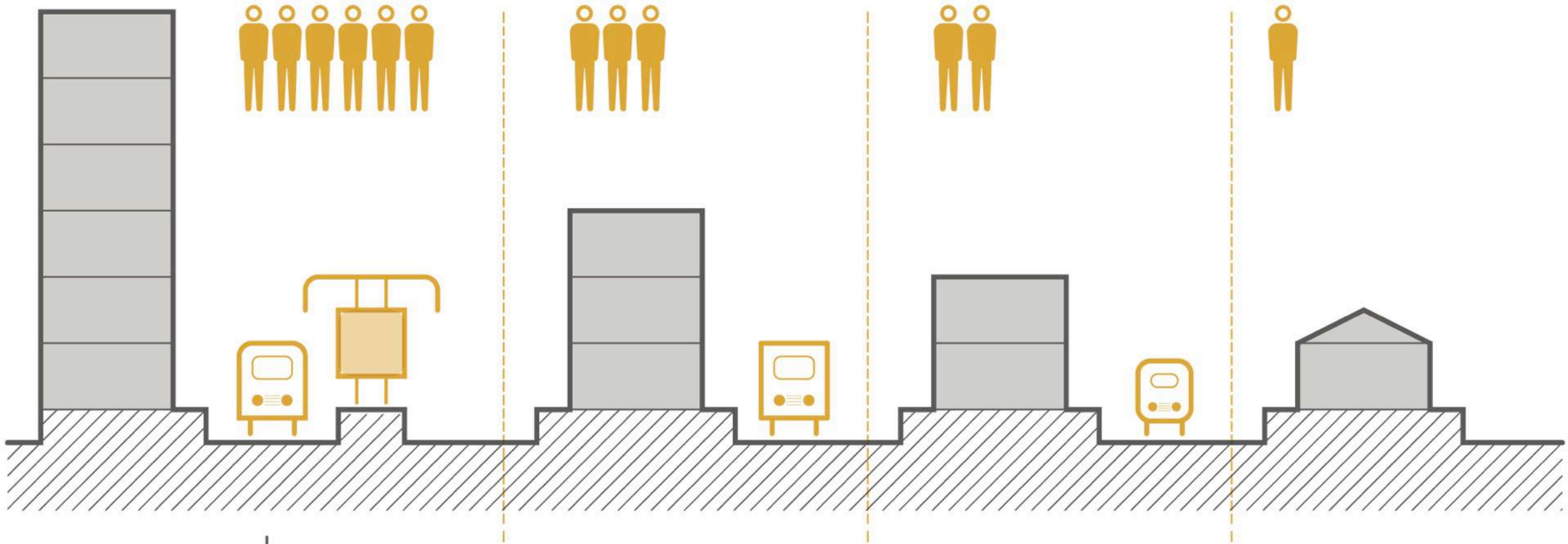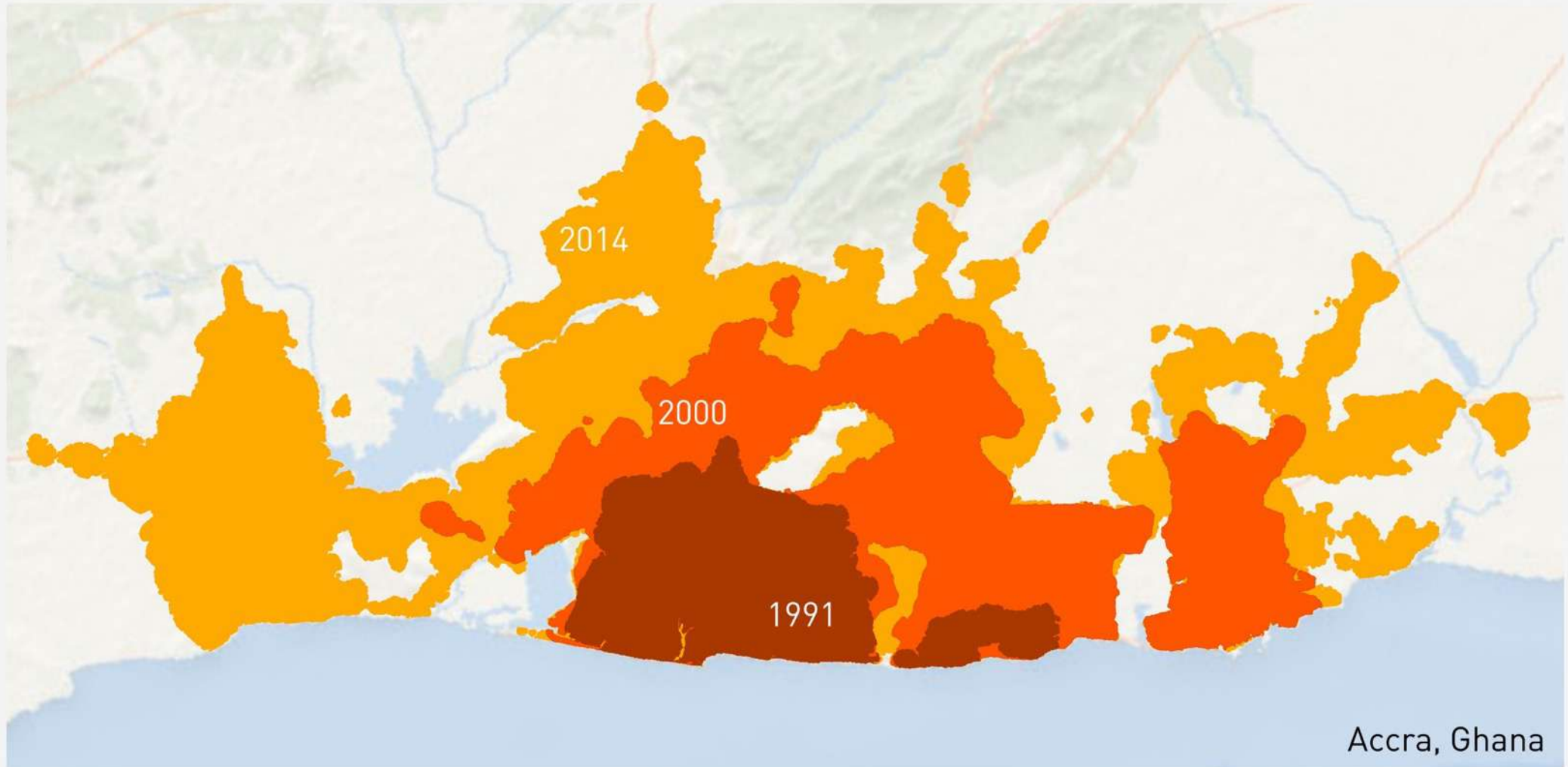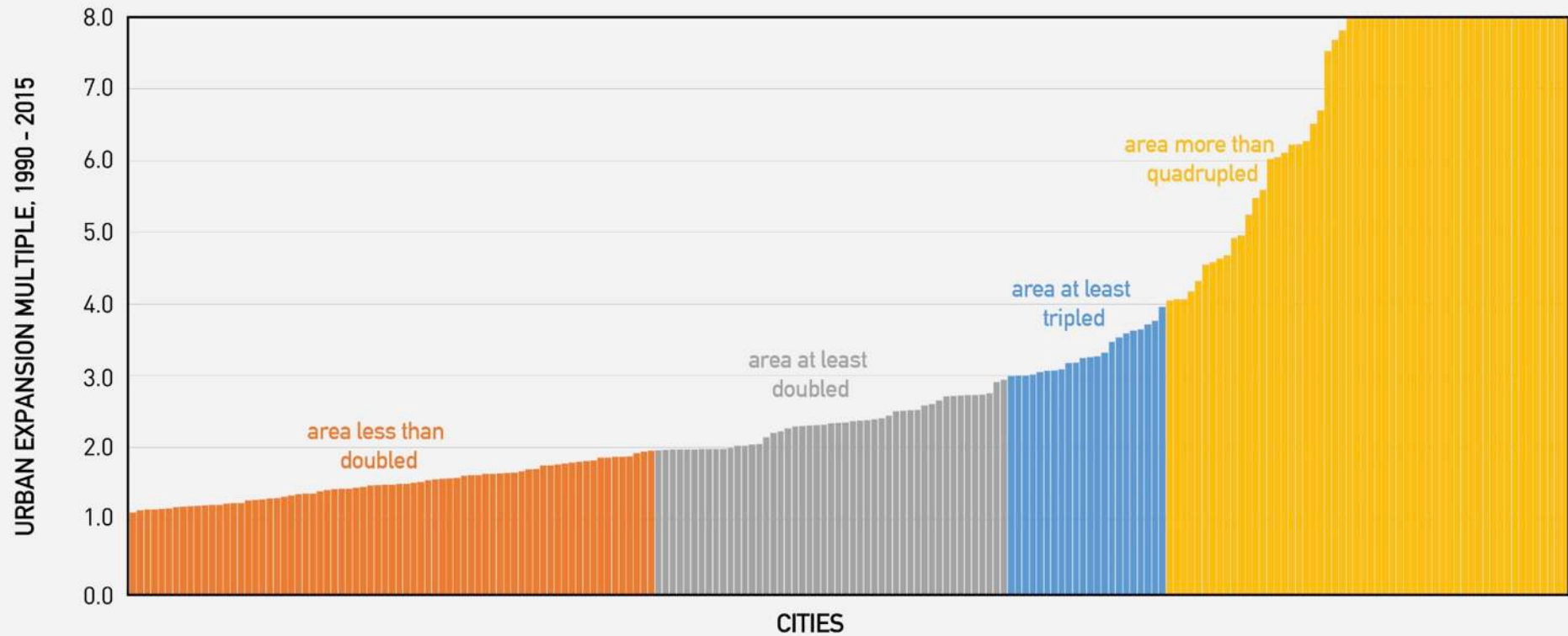
We measured the urban extent of cities at three periods, circa 1990, circa 2000, and circa 2015. On average, cities exhibited a **1.9-fold increase in population** and a **2.5-fold increase in** area

Urban extent density

Population / urban extent (persons/hectare)

98 — 1990

81 — 2000

67 — 2014
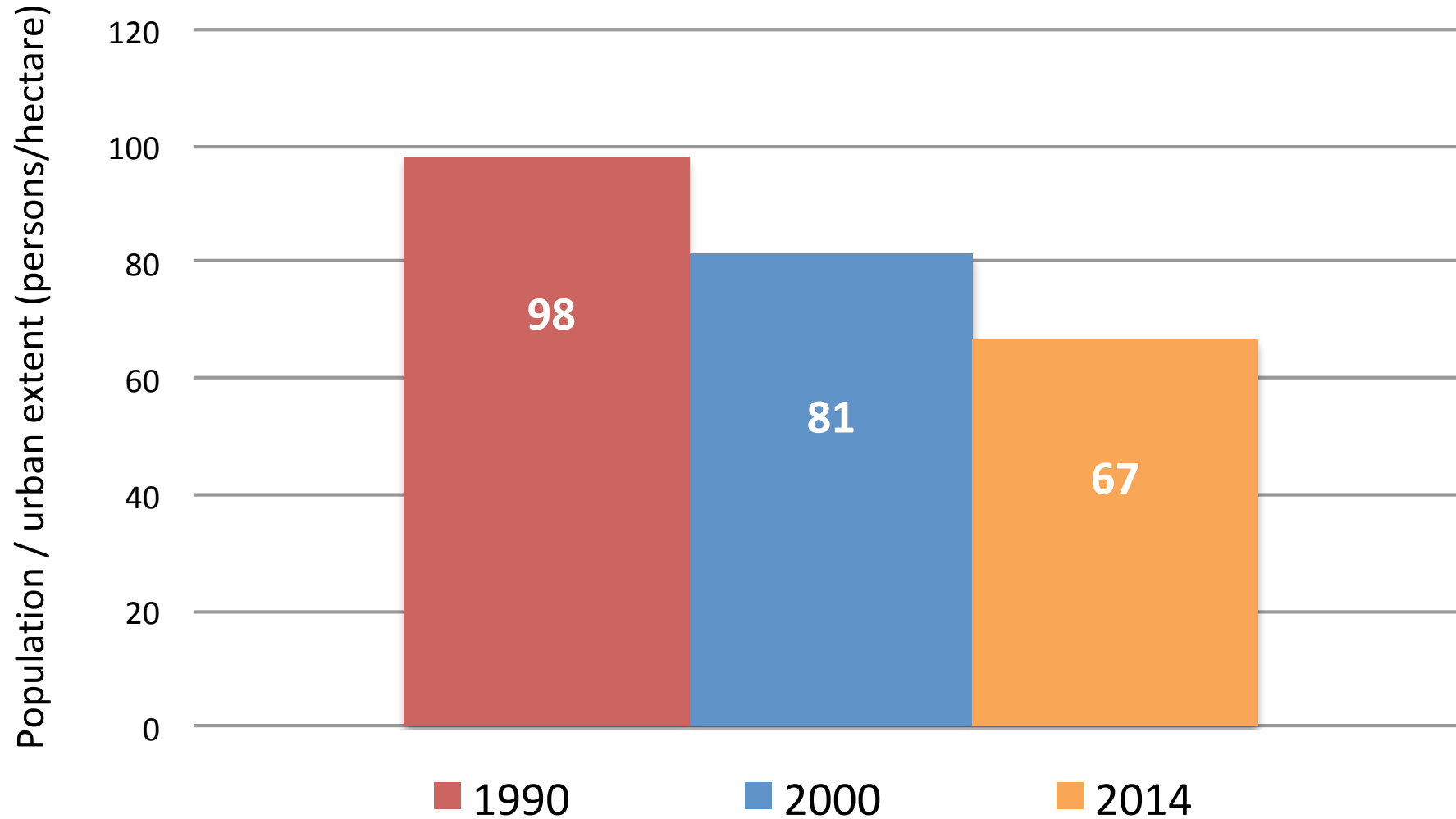
Between 1990 and 2014, the average urban extent density in the cities of the world dropped from 98 to 81 persons per hectare.
Between 2000 and 2014 it fell again, from 81 to 67 persons per hectare.

URBAN EXPANSION MULTIPLE, 1990 – 2015

area more than quadrupled

area at least tripled

area at least doubled

area less than doubled

CITIES

FACT

Cities are expanding at different rates, and some are growing very rapidly. 64% of cities have at least doubled the areas occupied by their built up area and open space since 1990. 28% of cities have at least quadrupled their areas.
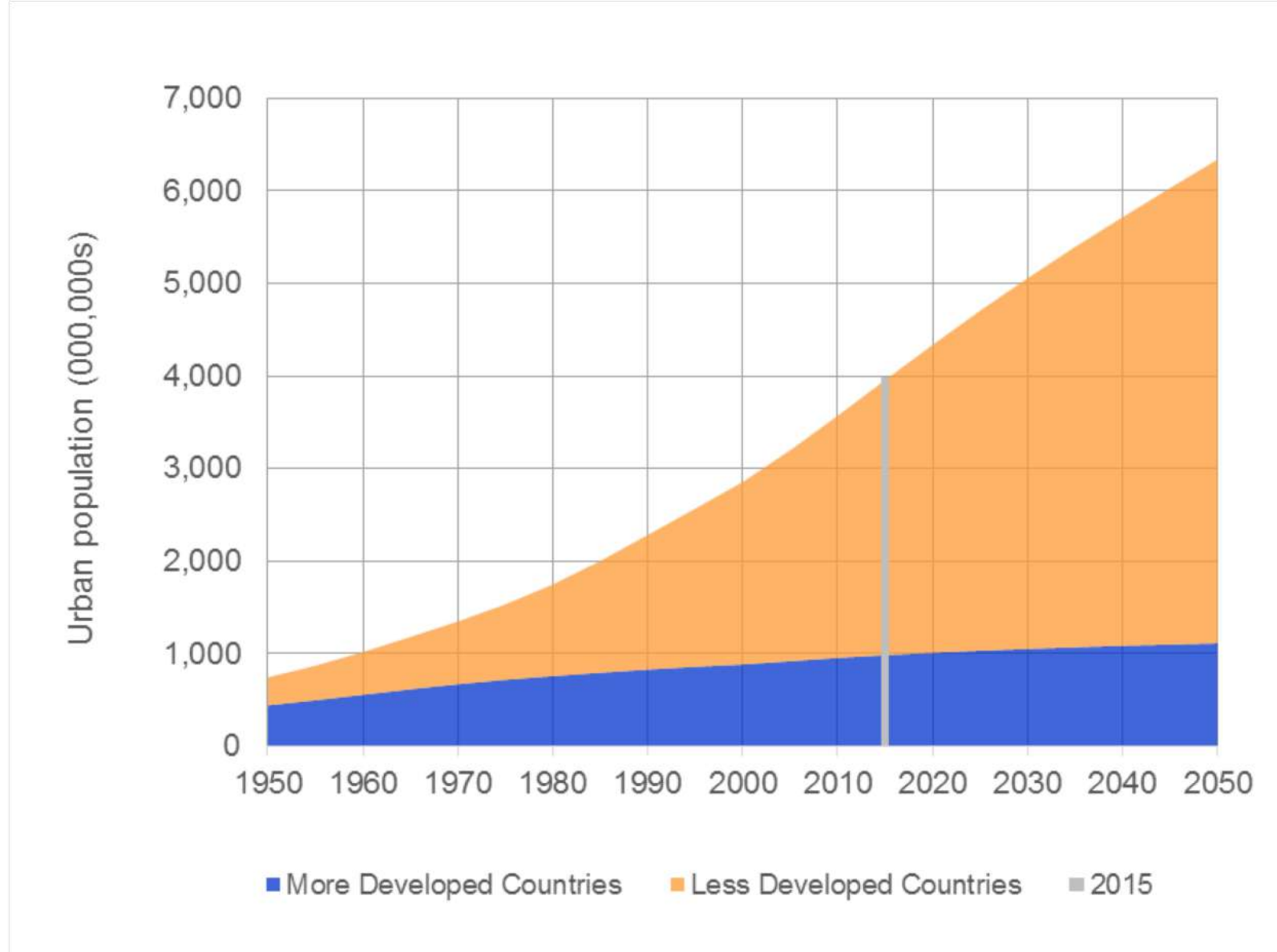
Lagos, Nigeria, 2015
Population: 11.4 million
City GDP: US$58 billion

Paris, France, 2015
Population: 11.2 million
City GDP: US$557 billion
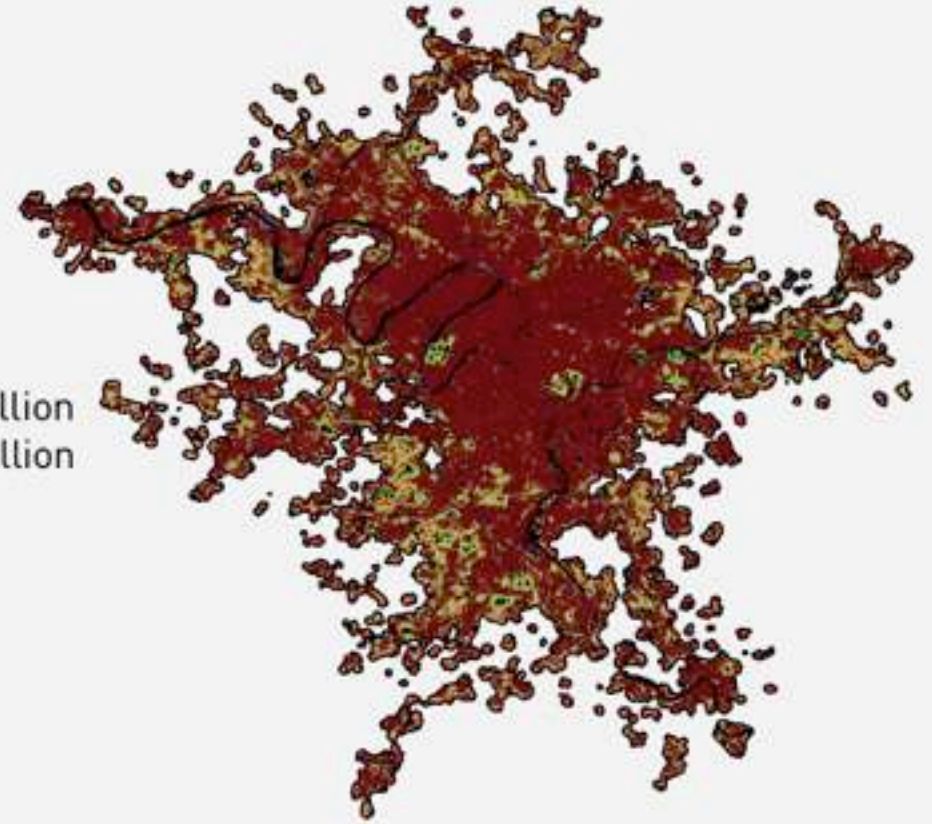
In 2015, Paris had almost the same population but 10 times the GDP as that of Lagos. As a consequence Paris had 3.5 times the urban extent of Lagos.

Population growth in Less Developed Countries will greatly exceed the growth in More Developed Countries in the 21st century.

MAKING ROOM FOR POPULATION GROWTH

POPULATION GROWTH IS A CHALLENGE IN ALMOST EVERY CITY IN THE WORLD, THE QUESTION IS HOW CAN WE FACE IT?

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DENSIFICATION

MAKING ROOM WITHIN THE EXISTING CITY

ORDERLY URBAN EXPANSION

MAKING ROOM IN NEW AREAS

MAKING ROOM PARADIGM

Images via: Skyscraper City, Brian Gratwicke

Credit: *Over Hong Kong* (2007), Kaysan Bartlett

Densification vs. expansion: The outward and upward growth of Panama City, Panama, 1930 – 2009 (left) and Shenzhen, China, 1982 – 2007 (right).

Of the added population between 1990 and 2015:
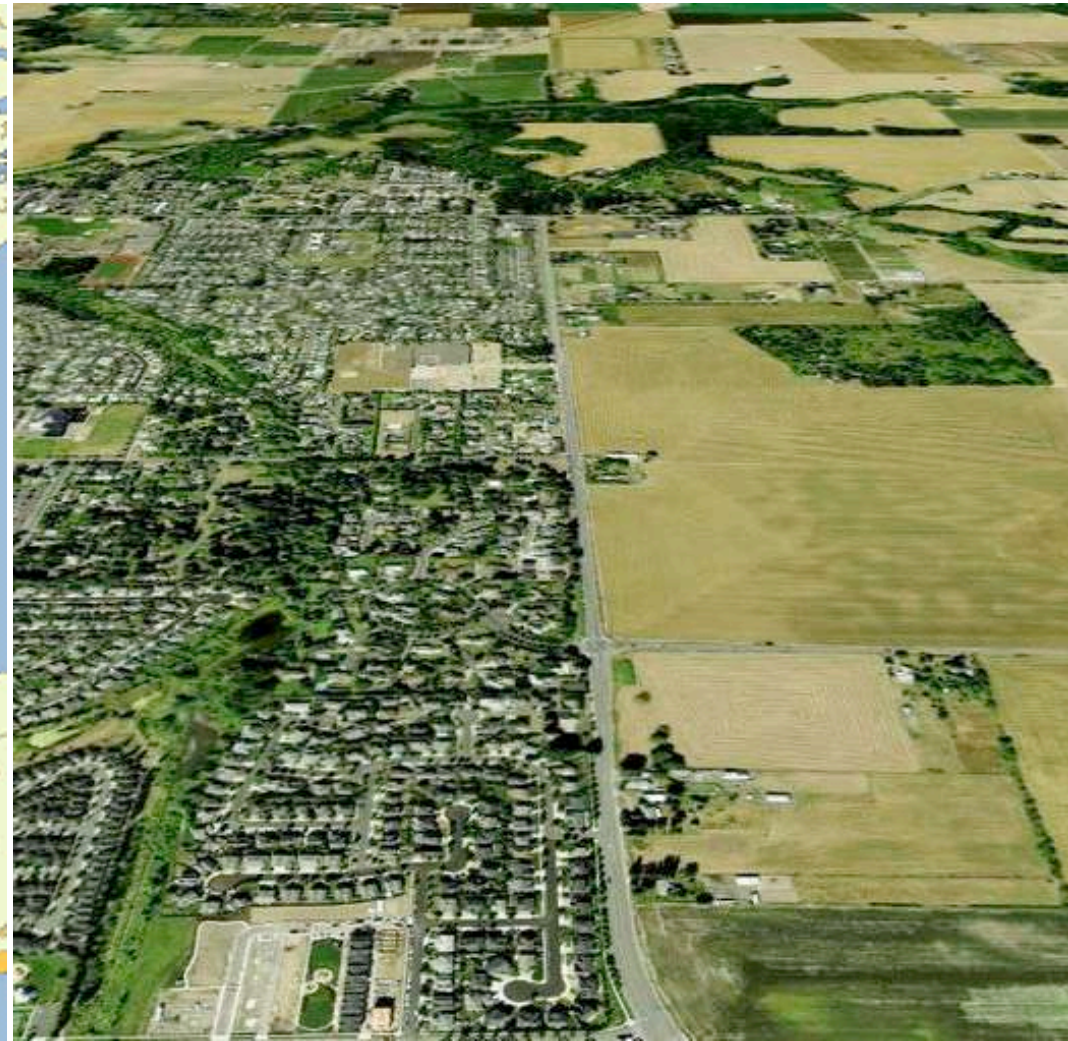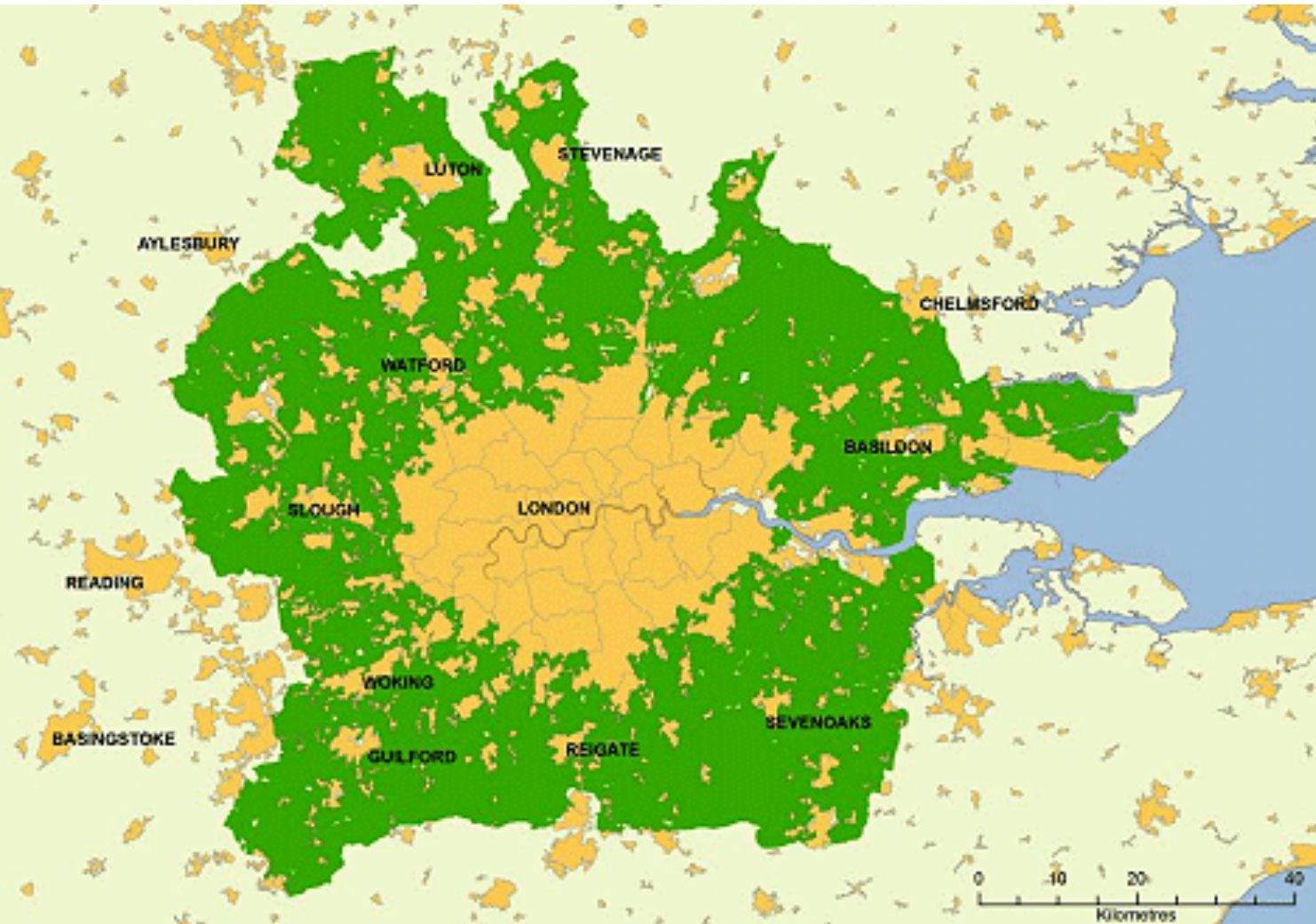
65%   35%

Urban Expansion   Densification

DENSIFICATION

Efforts at Densification

Left: The London greenbelt. Right: The Urban Growth Boundary (UGB) of Portland, USA. *Not pictured: Transit Oriented Development, Smart Growth, New Urbanism, Walkable Neighborhoods, Micro-apartments.*

**The sample of cities (black) and cities that increased density (colored circles)**

Cities in the global sample that densified using regulations

	1990	2014
Auckland	: 20.2	26.6 p/ha
Portland	: 13.5	14.8 p/ha
London	: 43.2	44.7 p/ha
Los Angeles	: 11.9	12.2 p/ha
Shanghai	: 51.4	52.0 p/ha
Zwolle	: 24.8	25.0 p/ha

Affordability and Densification

Failing to make room for urban population growth destroys the homes of the poor and puts new housing out of reach for most people. Decent housing for all can be ensured only if urban land is in ample supply.
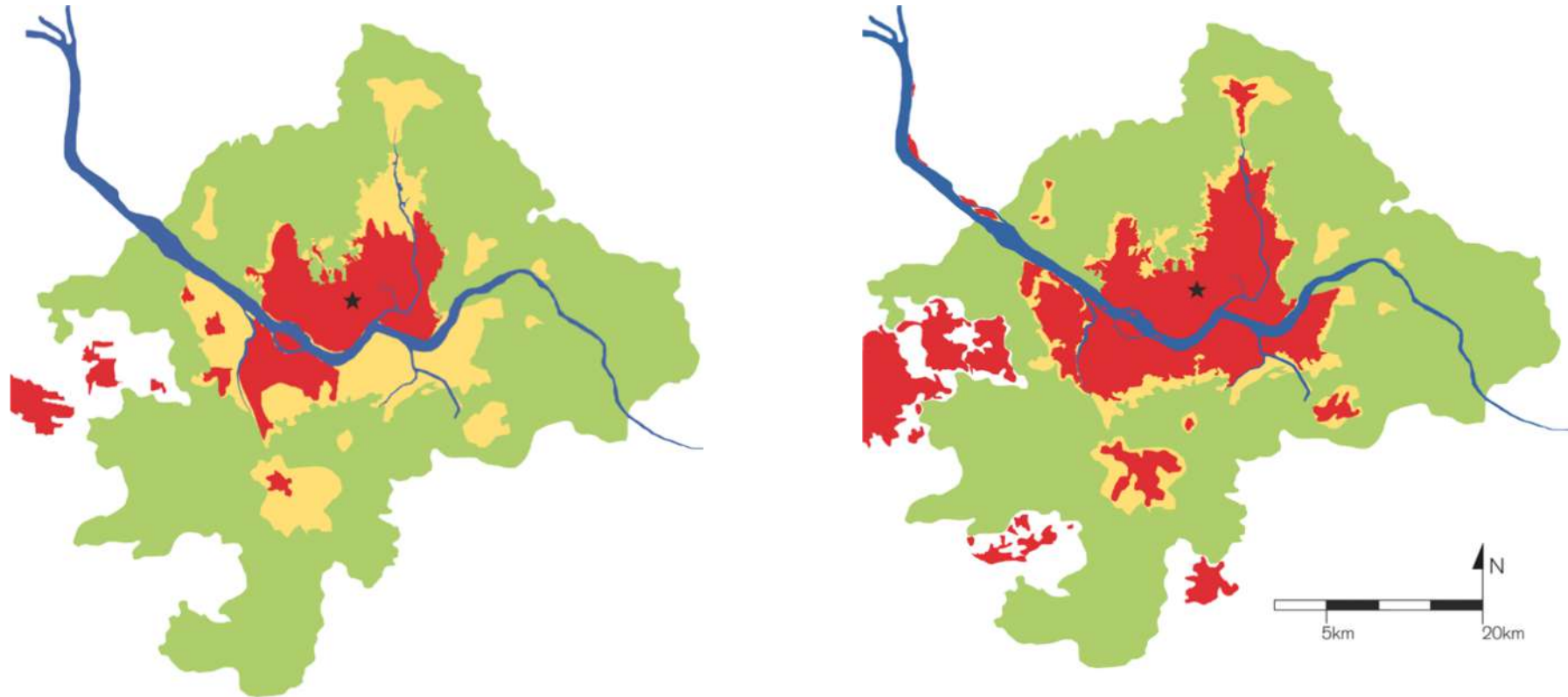
Seoul, Korea's Greenbelt and Its Built-up Area, 1972 and 1989
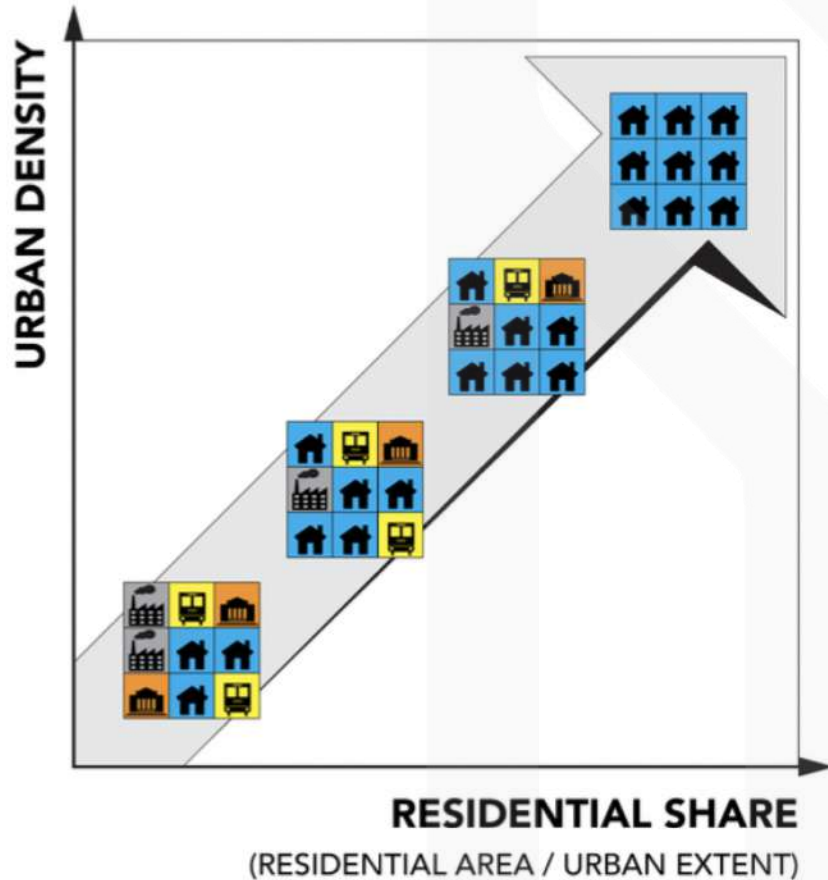
Residential Share
Residential Plots / Built-up Area

The Carriage Factory Lofts in New York. Conversion of industrial buildings into apartments is one way to increase the residential share in the city

1 Increase Residential Share: Increase the share of residential and mixed-use areas in the city, while limiting the loss of residential areas to other land uses.

URBAN DENSITY

RESIDENTIAL SHARE
(RESIDENTIAL AREA / URBAN EXTENT)

Accelerate conversion to residential use: Accelerate the conversion of brownfield sites, empty buildings, and underused lands held by public agencies to residential use.

Encourage mixed use in commercial areas: Facilitate the conversion of commercial areas into mixed-use areas with structures containing housing and offices above stores.

Avoid over-allocation of lands for industrial use: Remove the fiscal incentives that push municipalities to allocate too much land for industrial use.

Encourage safe building on steeper slopes: Replace restrictions that prevent residential construction on steeper slopes with regulations that make such construction safe.

Introduce a vacant land tax: Bring lands that are being held vacant for speculative purposes into active residential use by imposing an annual tax on such lands.

Plot Coverage
Building Footprints / Residential Area

Left: A new neighborhood in Cairo, Egypt, with plot coverage of 60%.
Right: Plot coverage in the residential super blocks in Brasilia, Brazil, is 16%.

2

Increase Plot Coverage: Remove or redesign regulations that limit the share of the area of residential plots that building footprints can occupy.

URBAN DENSITY

PLOT COVERAGE
(BUILDING FOOTPRINTS / RESIDENTIAL AREA)
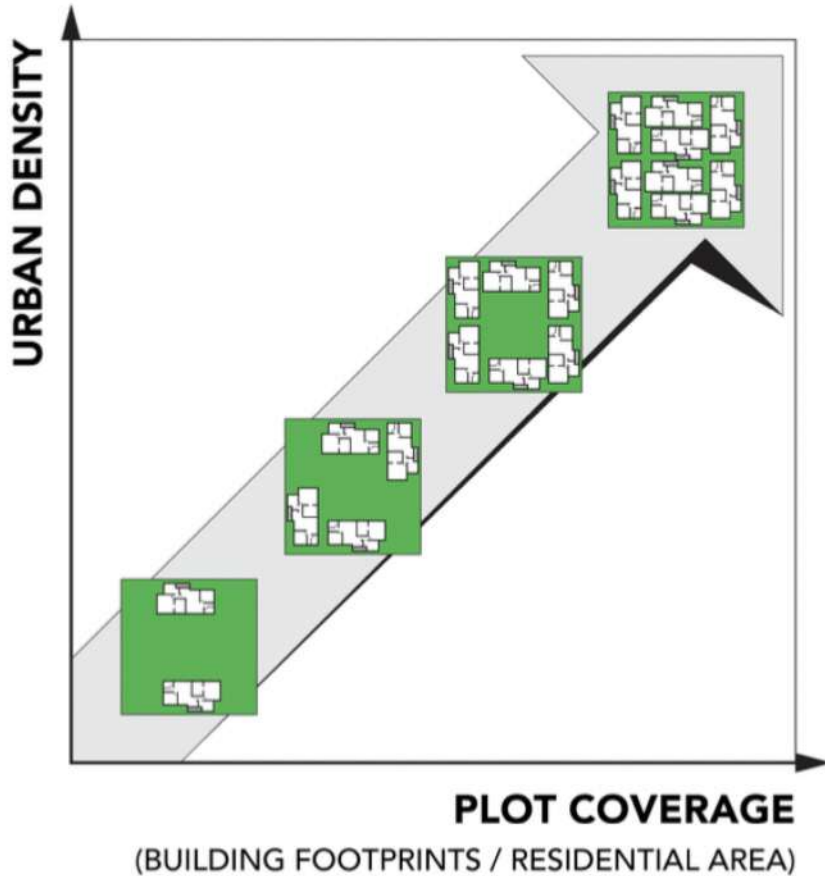
Reduce minimum plot size for single-family homes: Allow single-family homes to be built on small plots, removing zoning restrictions that mandate large plot sizes.

Relax setback regulations: Increase the share residential areas where no setbacks are required on the front and sides of plots and narrow setbacks are permitted in back.

Allow multiple units on single-family plots: Relax regulations that limit the construction of dwelling units on a residential plot to a single unit.

Increase allowable Floor Area Ratios: Revise local zoning regulations that restrict the maximum allowable Floor Area Ratio (FAR) on residential plots.
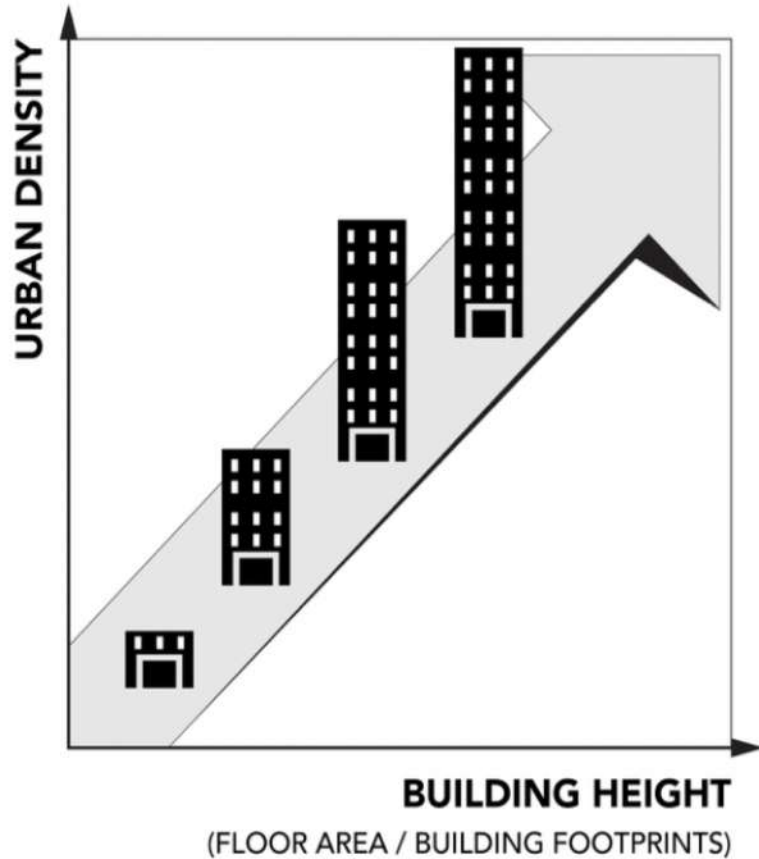
Building Height

Floor Area / Building Footprints

4-story condominium (left) being rebuilt as a 9-story structure (right) with residents renting off-site apartments during reconstruction, Tel Aviv, Israel, 2015

3

Increase Building Height: Revise regulatory barriers and incentives that prevent the increase of residential floor place with taller multi-story buildings.

Relax building height restrictions: Revise local zoning regulations that restrict the maximum height of buildings.

Allow adding floors on existing roofs: Relax restrictions that prevent the addition of floors to existing residential buildings.

Increase access to construction finance: Remove barriers that block access of the residential sector to financial markets and prevent the construction of tall buildings.

Increase allowable Floor Area Ratios: Revise local zoning regulations that restrict the maximum allowable Floor Area Ratio (FAR) on residential plots.

Expand zoning for multi-family buildings: Increase the share of areas where multi-family buildings are permitted in residential zones.

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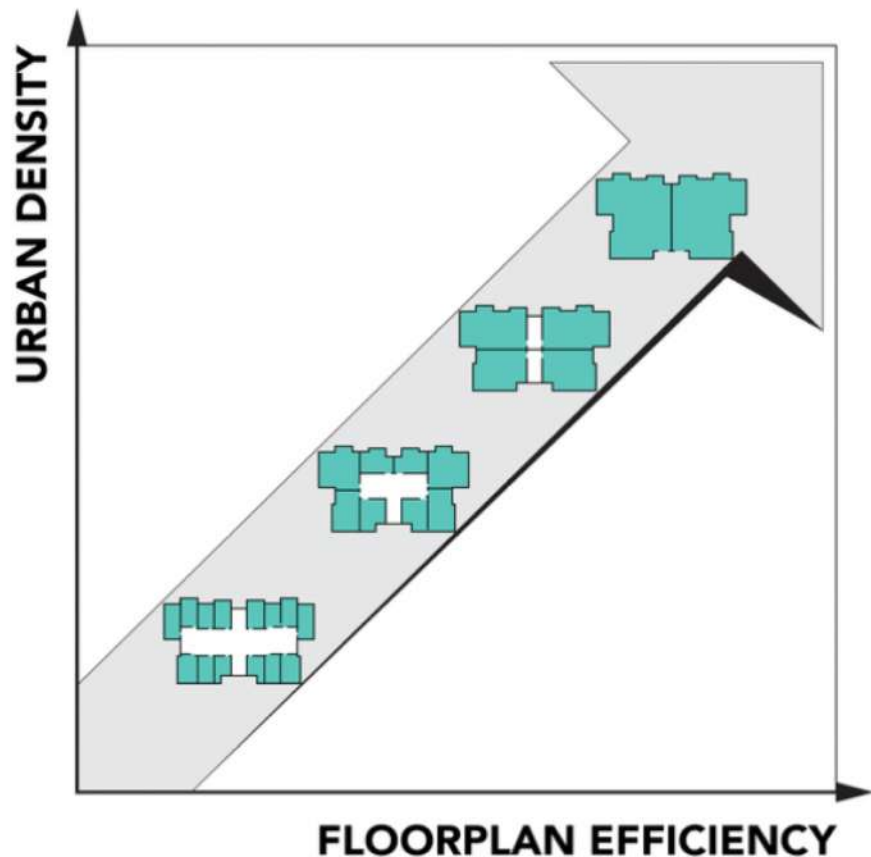
Floorplan Efficiency

Living Area / Total Residentia Area

Left: Typical single-family house in the United States, with 100% of its area in private use.
Right: Lobby of a large apartment building, with floorplan efficiency of 83%

4

Increase Floor Plan Efficiency: Remove barriers and incentives that lower the share of living areas in the total residential floor area under construction.

URBAN DENSITY

FLOORPLAN EFFICIENCY

Encourage lightweight construction: Support research and dissemination of building technologies that reduce the structural footprint in typical floor plans.

Improve high-rise building design: Increase awareness of Floor Plan Efficiency in the design of floor plans in high-rise buildings with a view to maximizing the share of salable living areas.

Reduce parking requirements: Relax zoning regulations that mandate on-site parking space minimums and place maximums on allowable on-site parking spaces.

Occupancy rate
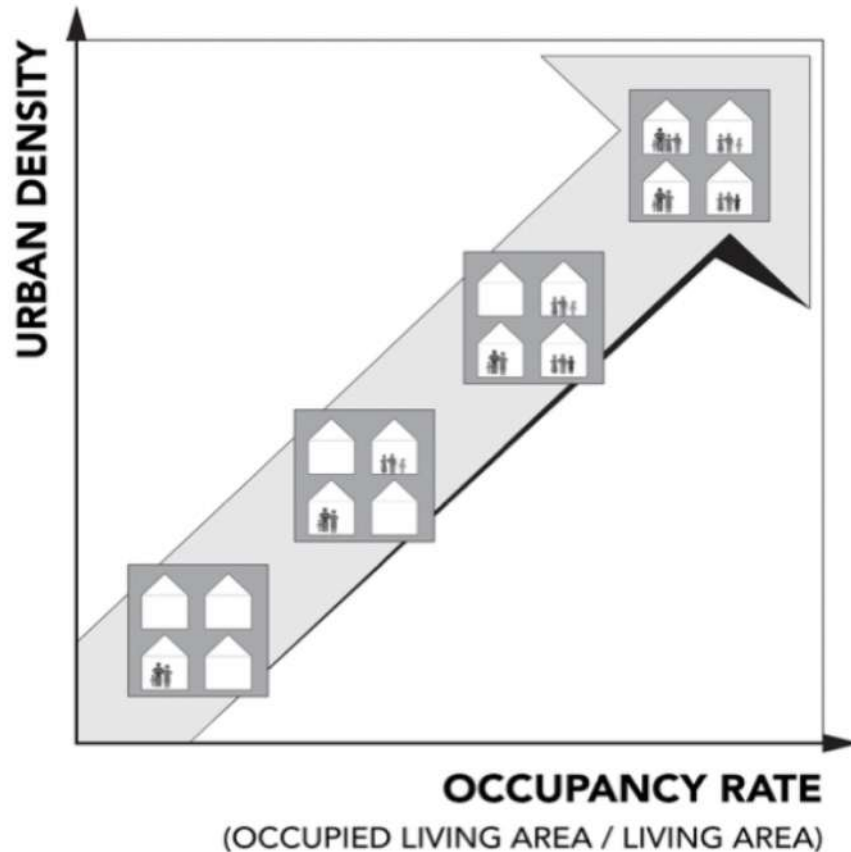
Occupied residential area/ Total residential area

Left: No Vacancies at Belevedere Apartments in Toronto, Canada.
Right: Kangbashi, China's biggest ghost city.

5 Increase the Occupancy Rate: Remove barriers and incentives that keep a larger-than-necessary share of the housing stock vacant.

URBAN DENSITY

OCCUPANCY RATE
(OCCUPIED LIVING AREA / LIVING AREA)

Introduce a vacancy tax: Introduce a properly targeted vacancy tax that would encourage absentee owners to rent out their units, thus making better use of the city's housing stock.

Permit leasing of vacant homes: Remove the restrictions imposed by building and neighborhood associations that forbid leasing of vacant homes and apartments.

Overcome reluctance to rent vacant units: Remove the risk to rental-unit owners of not being able to repossess them.

Avoid supply of units not in demand: Provide developers, investors, and speculators with reliable market information that can reduce the occurrence of ghost cities and an over-supply of unsold housing units.

Reverse central city abandonment: Remove bureaucratic obstacles and provide fiscal and financial incentives to facilitate the renovation of abandoned residential properties.

Crowding

People / Total occupied built-up residential living space

Left: Cage house in Hong Kong, with 7 people sharing one small room of less than 12 square meters (approximately 6667pa/ha)
Right: The living room of a single-family four-bedroom apartment in Manhattan, New York (approximately 66pa/ha)

6

Increase Living Area Density: Encourage people to reduce their consumption of floor area per person and to refrain from increasing it as they become better off.
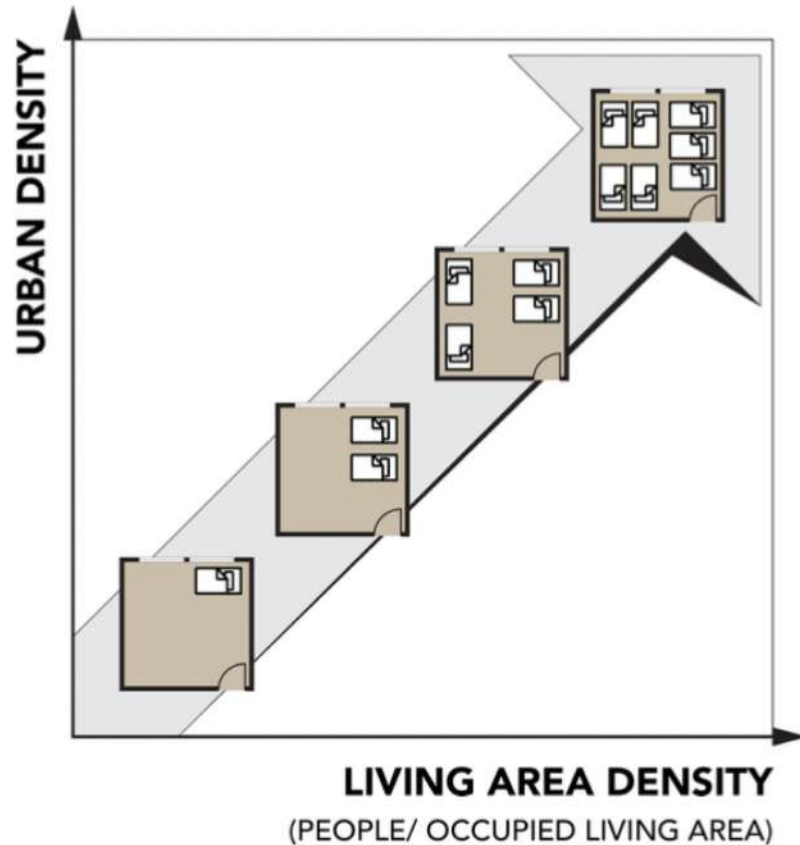
Allow the subdivision of dwelling units: Remove barriers to the subdivision of larger dwelling units into smaller ones, allowing the addition of kitchens and bathrooms.

Remove minimum size of apartments: Remove barriers to the minimum size of apartments and allow micro-apartments.

Eliminate lending bias: Remove financial and fiscal incentives that give preference to single-family homes over apartments and to owner-occupied units over rental ones.

Avoid displacement through urban renewal: Avoid urban renewal that displaces smaller homes inhabited by larger households by larger homes with smaller ones.

Encourage residential mobility: Remove regulatory and financial barriers to residential mobility that prevent older people from moving to smaller dwelling units.

ORDERLY
URBAN
EXPANSION

A BASIC PLANNING SCHEME

1
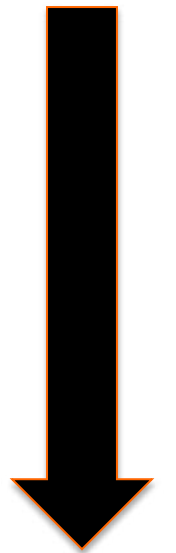Realistic Projections and Generous City Limits

2
Arterial Road Grid
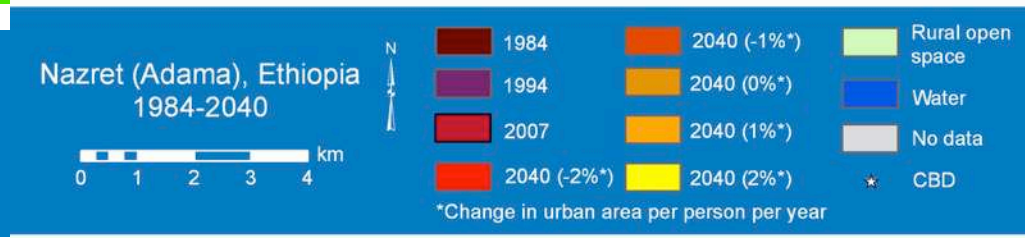
3
Protection of Open Spaces and Environmental Areas

4
Improved Subdivison Practices

Urban Growth Analysis

Future Growth Projection

Adama, Ethiopia
1989-2011

km
0   2   4   6

Study area
Urban extent
Urban built-up area
Suburban built-up area
Rural built-up area
Urbanized open space

Rural open space
Exurban built-up area
Exurban open space
Water
No data
CBD

Nov-1989

Dec-1998

Jan-2011

Nazret (Adama), Ethiopia
1984-2040

km
0   1   2   3   4

N

1984
1994
2007
2040 (-2%*)

2040 (-1%*)
2040 (0%*)
2040 (1%*)
2040 (2%*)

Rural open space
Water
No data
CBD

*Change in urban area per person per year

Arterial roads do not need to be built today, but the land should be protected from development – through purchase, easement, or other means.

In Colombia we planted the edges of the future roads with native trees.

This allowed farmers and others to continue using the land in the meantime, but framed out urban development and discouraged squatting on road rights of ways.

HAWASSA URBAN GROWTH MASTER PLAN

DEVELOPMENT PHASE OF BLOCKS

LAKE HAWASSA

N

PHASE ONE

PHASE TWO

PHASE THREE

PHASE FOUR

PHASE FIVE

Legend
- lake_area
- existing_built_up_area
- mountain
- hawassa_road
- AIRPORT
- tulla_town

PHASED_DEVELOPMENT

PHASES
- PHASE_FIVE
- PHASE_FOUR
- PHASE_ONE
- PHASE_THREE
- PHASE_TWO
- NEW BOUNDARY

Projected Coordinate System: Adindan_UTM_Zone_37N
Projection: Transverse_Mercator
False_Easting: 500000.00000000
False_Northing: 0.00000000
Central_Meridian: 39.00000000
Scale_Factor: 0.99960000
Latitude_Of_Origin: 0.00000000
Linear Unit: Meter

Geographic Coordinate System: GCS_Adindan
Datum: D_Adindan
Prime Meridian: Greenwich
Angular Unit: Degree

NEW EXPANSION AREA FOR 2040   =16,034 Ha   TO DILLA
EXISTING BUITUP AREA   =6957Ha
LAKE HAWASSA   =7712Ha
TOTAL AREA OF THE CITY AT 2040 =30703Ha

0   1,250   ,000   7,500   10,000
                                              Meters

City faced informal development and shortage of urban land

Developed macroblock plan and forecasts, identified phases of growth, aided with implementation and LDPs
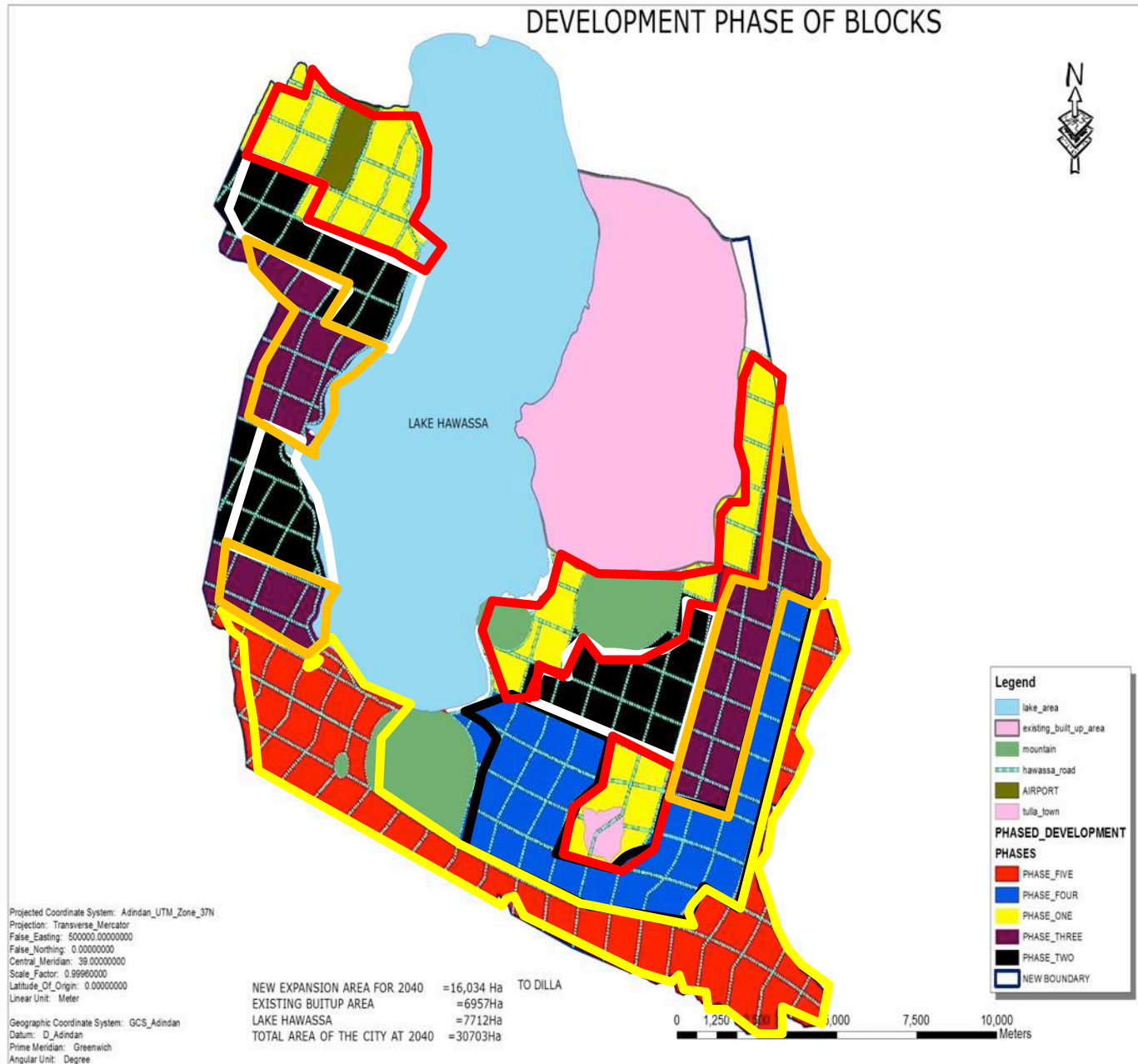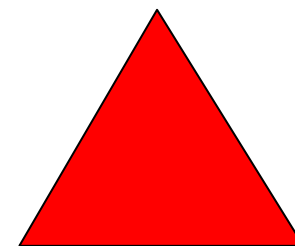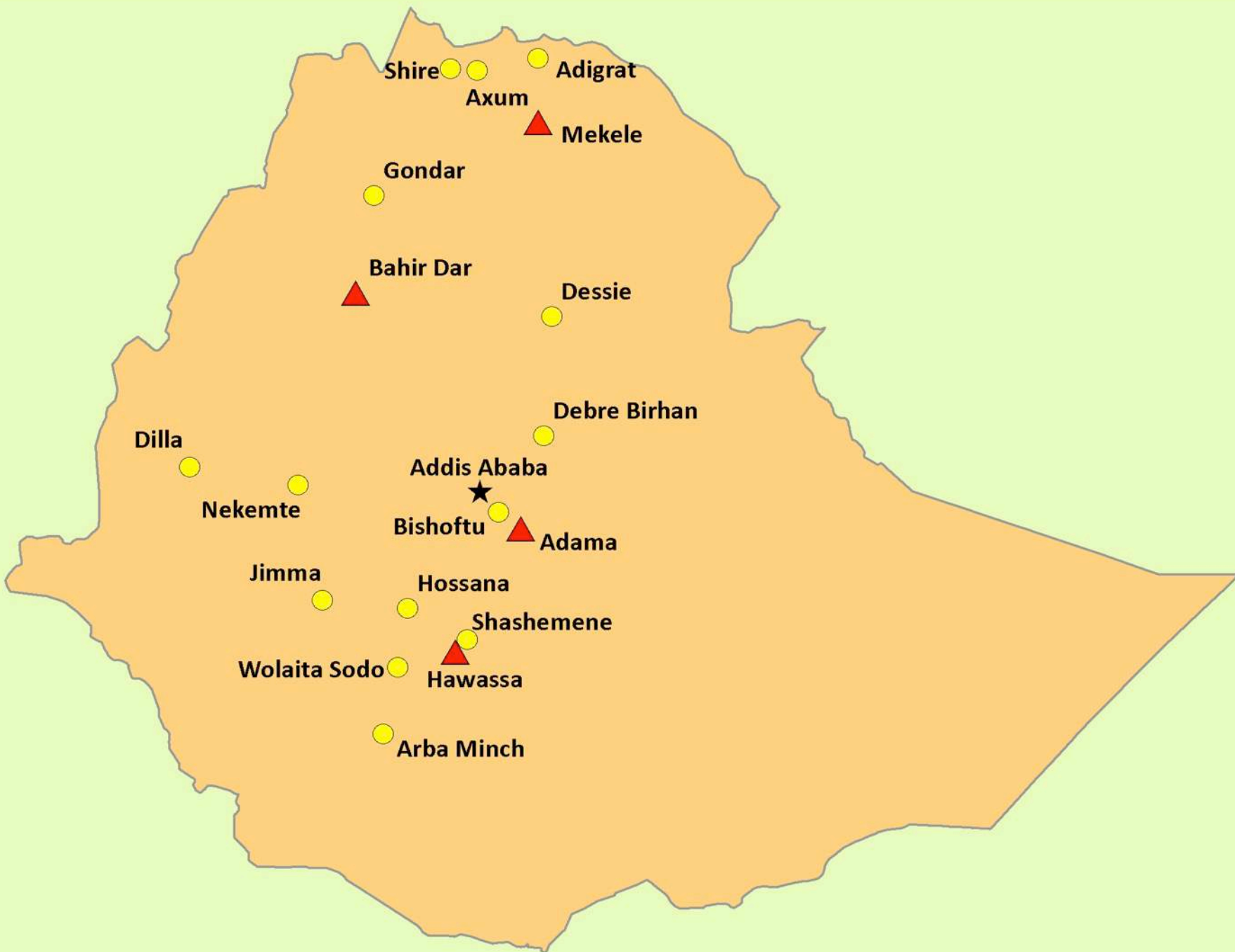
The arterial road grid should carry the future network of services – street lighting, water, and drainage and also have the capacity to carry public transportation.
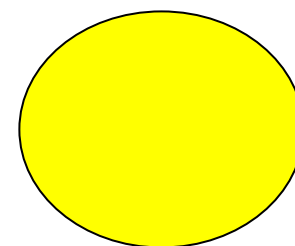
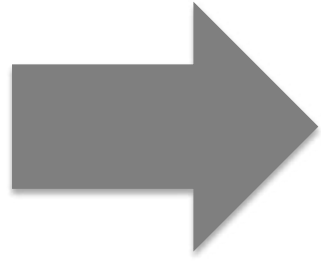# Implementing Urban Expansion in Ethiopia

Shire

Adigrat

Axum

Mekele

Gondar

Bahir Dar

Dessie

Debre Birhan

Dilla

Addis Ababa

Nekemte

Bishoftu

Adama

Jimma

Hossana

Shashemene

Wolaita Sodo

Hawassa

Arba Minch

Pilot Cities

National Program

By 2045:

5x ➡ 7x

Population   Area

PROPOSED_ROAD

Roadwidth

— 30M

— 40M

— 60M_Ring Road

— Right of _ way

MAJOR ROAD FRAME

Road_width

— 30

— 40

SATELLITES TOWN

GONDER PROPOSED 10 YEAR PLANNING BOUNDARY

LONG TERM BOUNDARY OF GONDER CITY REGION

SCALE -1:52000

Kilometers

3   1.5   0   3   6   9   12
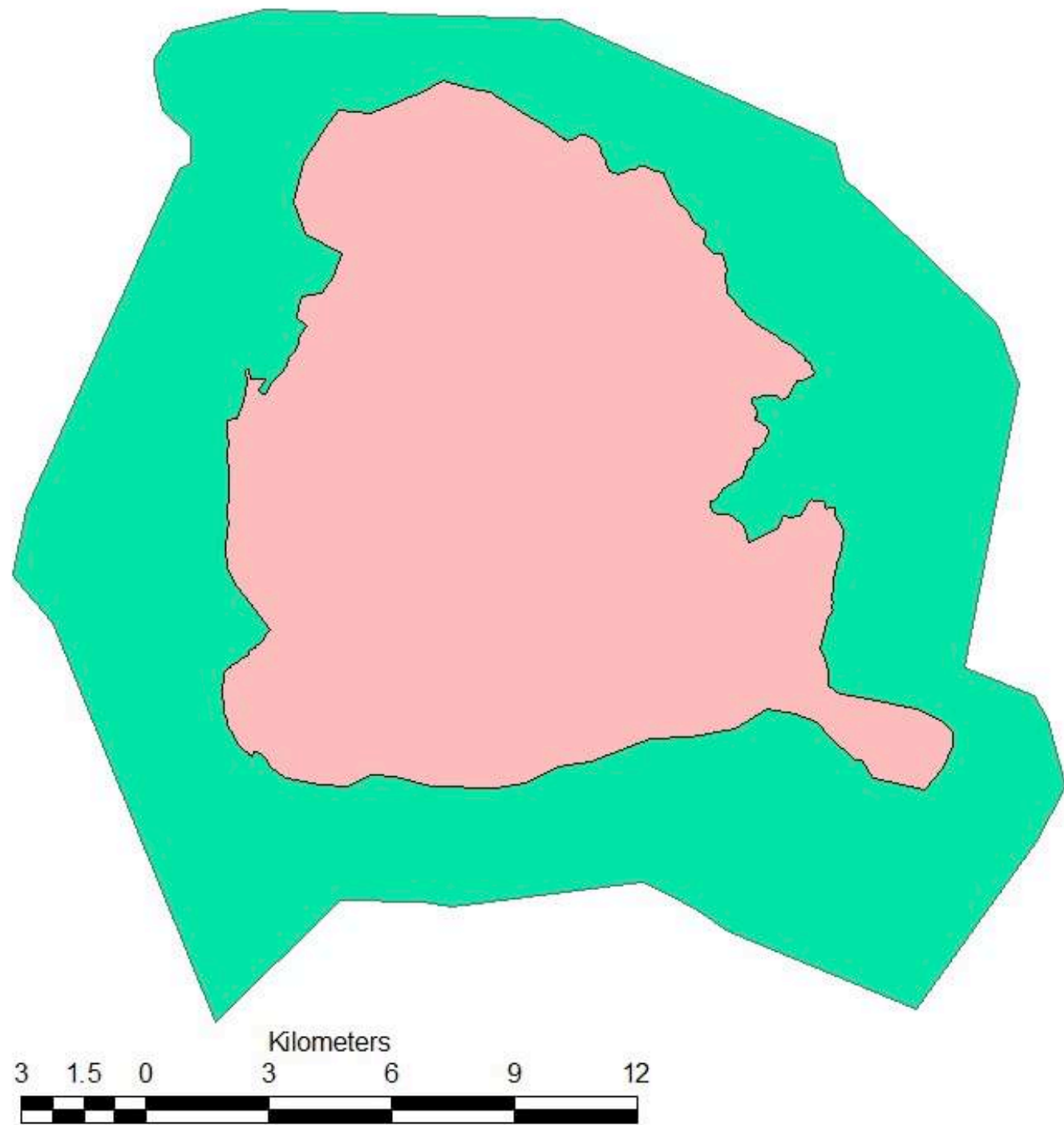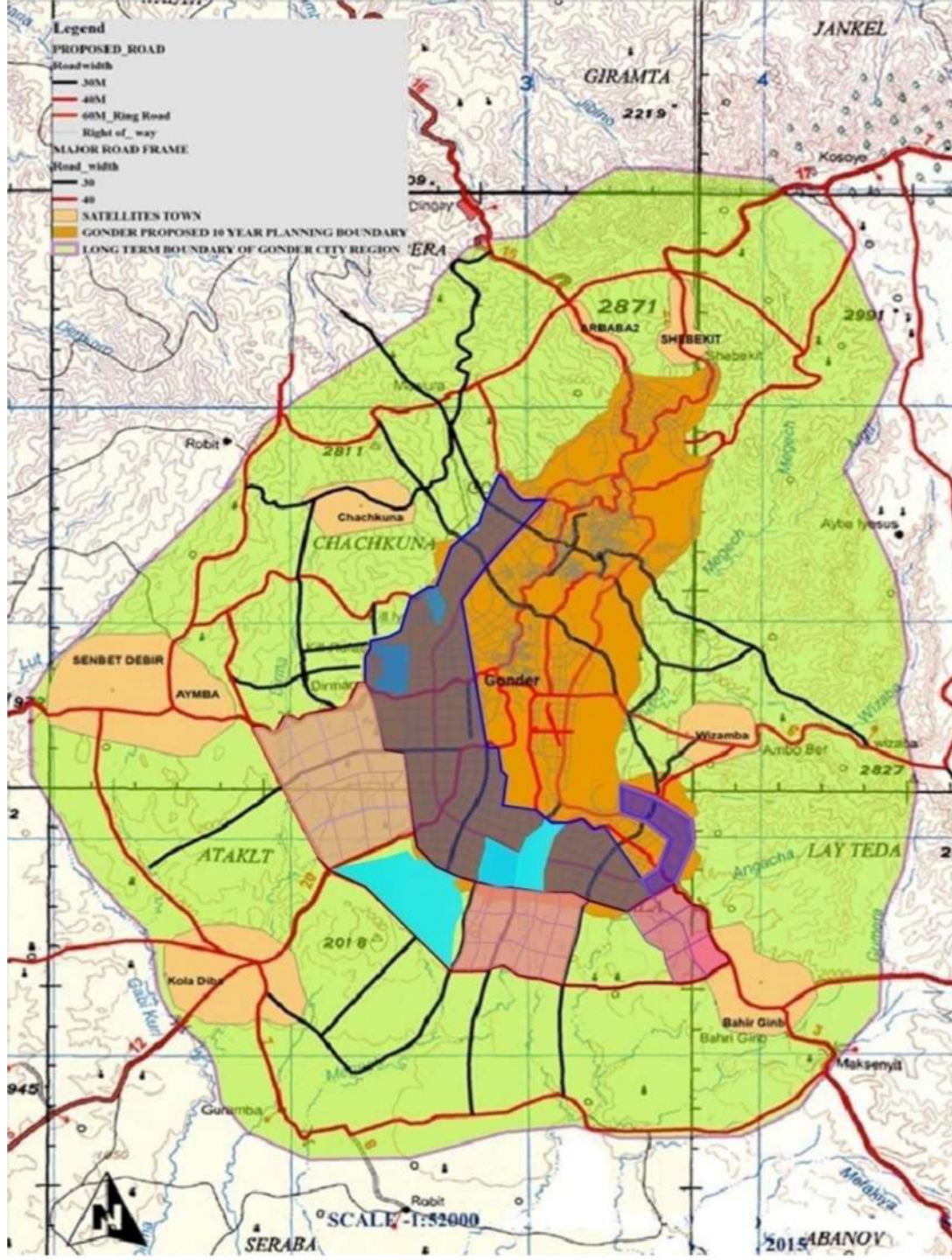
Widened road in regularized informal settlement in Hawassa

Road widening through urban expansion plan facilitated:

1) Regularization of informal area (titling)
2) Drainage installation
3) Piped water to houses

New middle class housing under construction in Hawassa urban expansion area

Land for future public space is reserved in the center

Locally developed industry park in the expansion area of Bahir Dar
Planning for urban expansion can also support industrial development by relieving the land supply bottleneck for firms
In Ethiopian cities that participated in the program more than 50,000 jobs have been created in the expansion areas of cities

New housing development in Bahir Dar, Ethiopia

This development has a mix of low-income and middle-income housing

Mixed use development on the block edges includes 4-5 story buildings and apartments as well as shops

CONCLUSION: MAKING ROOM

- Regardless of the preferences of planners, cities will grow!
- Cities can estimate how much land they will consume in the future
- Global data can make these estimates more realistic
- With that information, cities can plan strategies for densification and urban expansion
- While densification can accommodate population growth and reduce per capita emissions, it is complex and expensive, and isn't a silver bullet
- Whatever population growth cannot be accommodated through densification will need to be accommodated through expansion

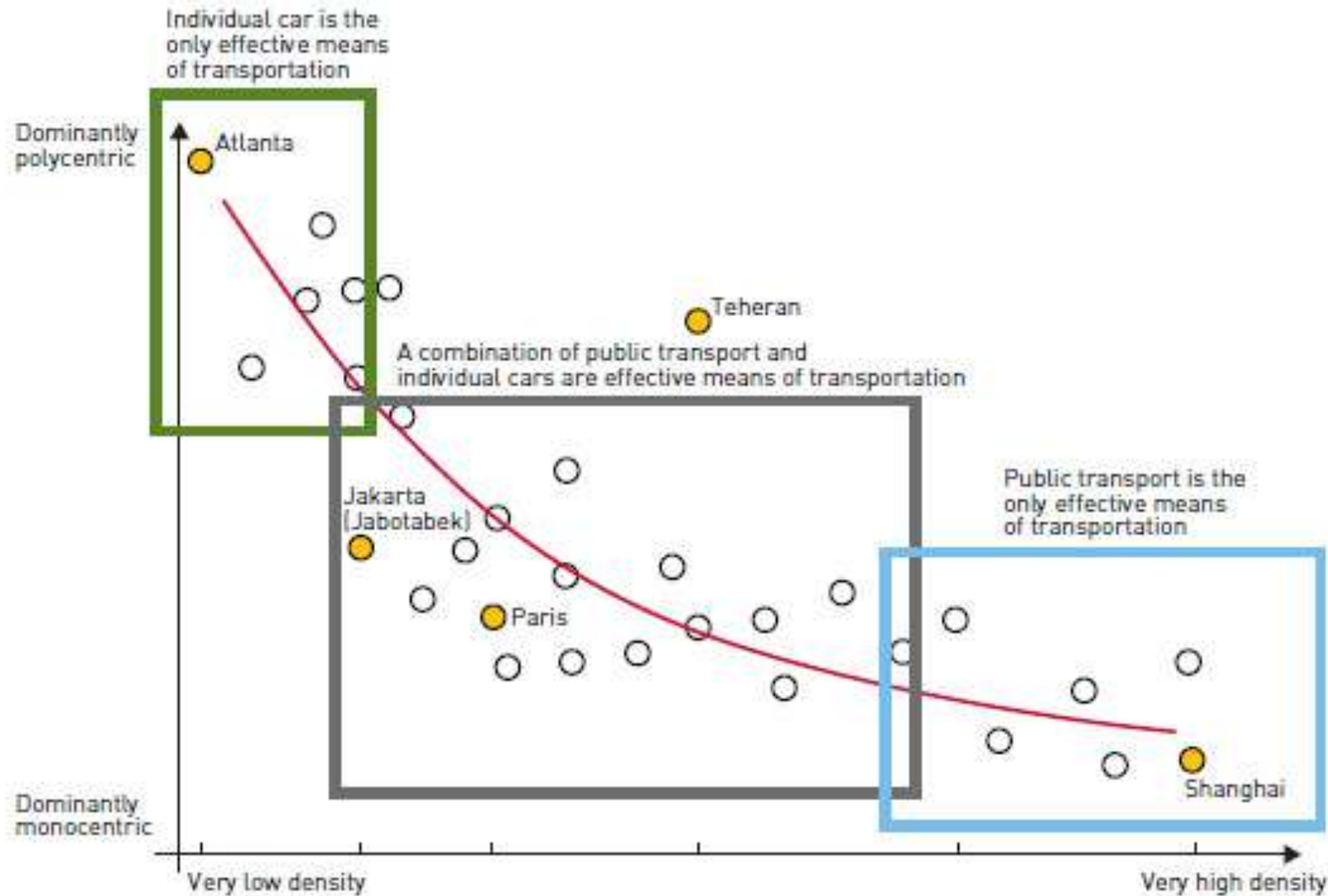NYU | Marron Institute Of Urban Management
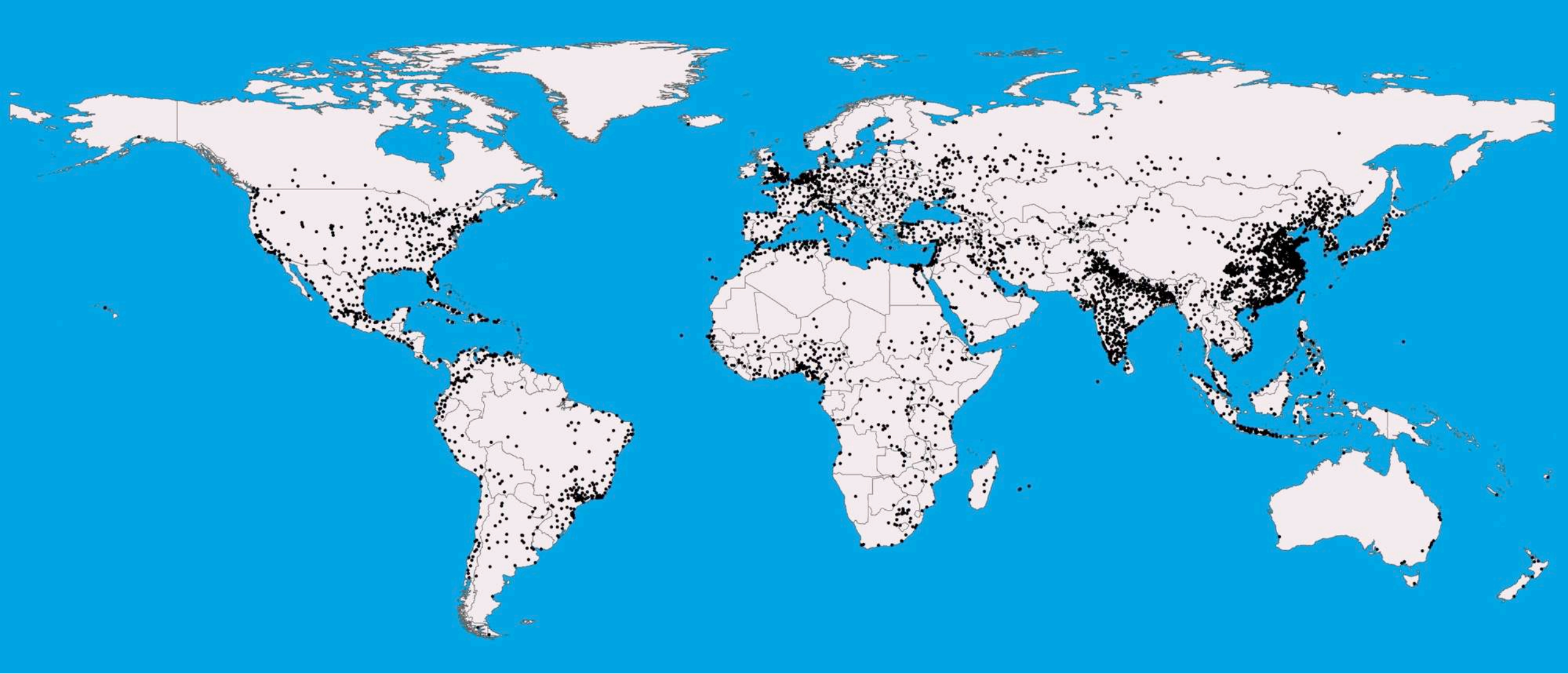
Thank you!

Any questions?

ANNEX

Structural issues prevent the use of public transportation in cities that have lower densities

Relationship between spatial structure and the effectiveness of public transportation
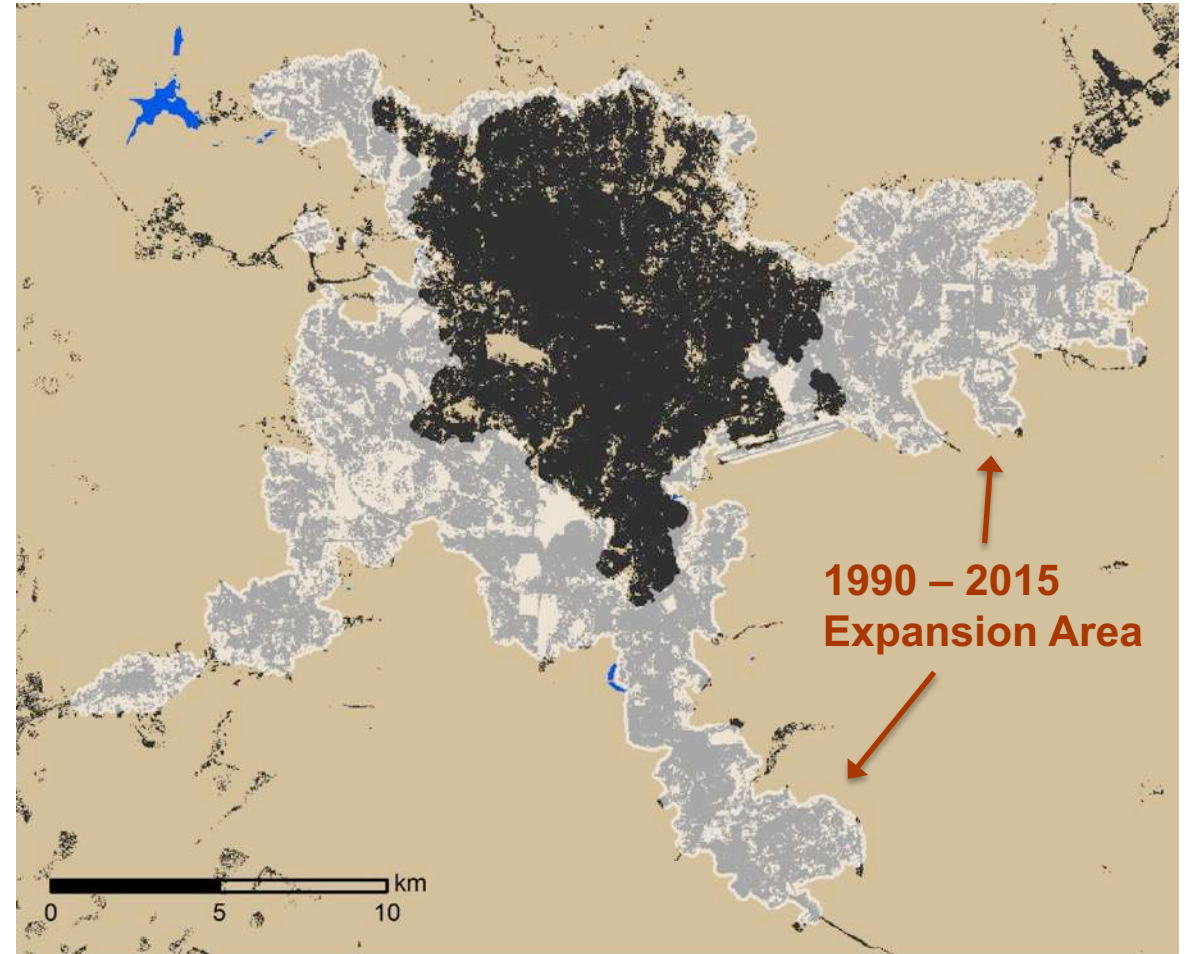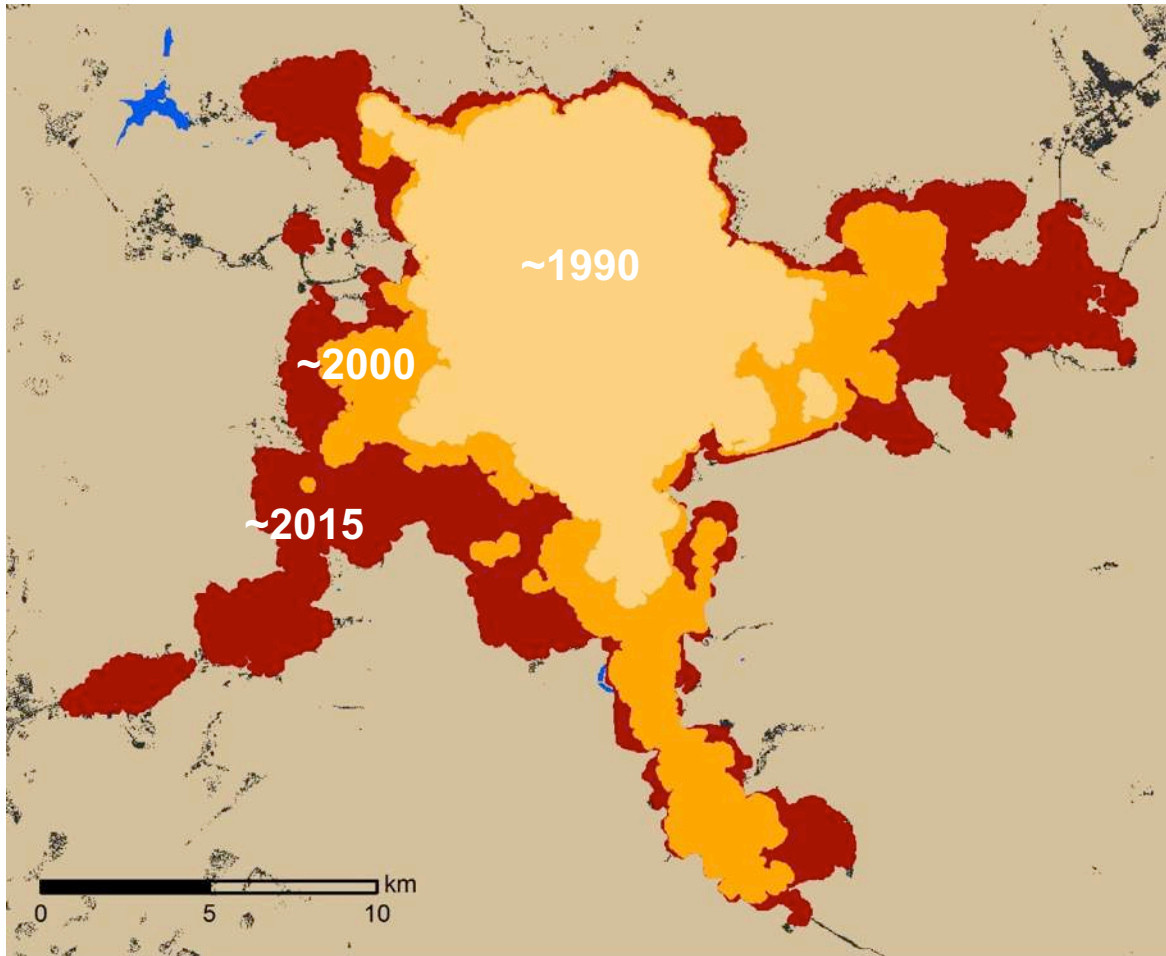
There were 4,231 cities in the world with populations of at least 100,000 in the year 2010
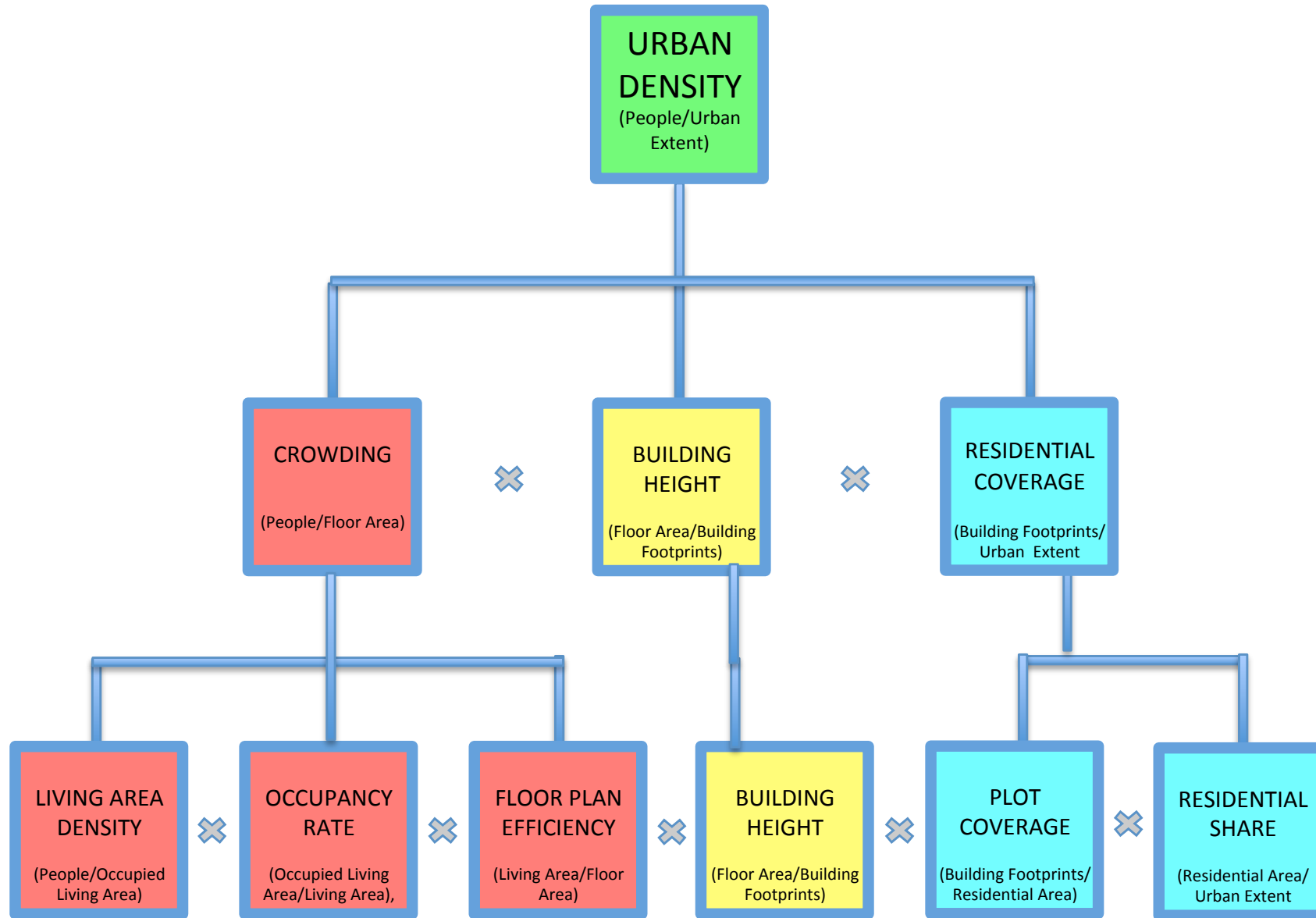
To study global and regional patterns in the universe of cities we identified a stratified global sample of 200 cities. The sample is stratified by region, city size, and number of cities in country.

A city's expansion area was determined by subtracting its 1990 extent from its 2015 extent.

THE ANATOMY OF DENSITY

This approach decomposes urban population density into six factors. The product of the factors is the urban density of the city.

The only way a city can densify is to **increase** one of these factors, while holding the others **constant**.

ESTIMATING CARRYING CAPACITY IN CITIES

- Each factor of density can be tied to specific policies in a city
- Based on these policies and regulations, we can build a model that tells us the number of new residents the city can absorb under current rules - this is called "Carrying Capacity."
- We can then change parameters in the policies to see how they will affect the carrying capacity
- We can also include population projections, and this will tell us how many people will need to be accommodated through orderly urban expansion versus densification.

City	Observed Population	Observed living area Density (p/ha)	Carrying Capacity Urban Density (p/ha)	Population Carrying Capacity Density	Population to incorporate	Expected Growth for the next 10 years	Additional area for expansion assuming constant density (ha)
Dhaka	13,609	594	372	13609	0	0	0
Hong Kong	4,322	617	352	4322	0	0	0
Kinshasa	10,226	2332	224	10226	0	0	0
Bogotá	7,802	315	196	7802	0	0	0
Cairo	15,735	335	115	15735	0	0	0
Baku	1,672	143	65	1672	0	0	0
Madrid	5,256	372	62	5256	0	0	0
Bangkok	14,011	246	48	14011	0	0	0
Wuhan	8,174	151	44	8174	0	0	0
Minneapolis	2,627	192	10	2627	0	0	0

Policy Drivers existing area	% Change
More Population	0%
More building height	0%
More Floor Space Efficiency	0%
More Saturation	0%
More Plot Coverage	0%
More Residential Share	0%
Increase urban extent	0%

Protestors opposing "upzoning" which would allow more units to be constructed in their neighborhood.

Protestors opposing increased saturation.

Protestors opposing an increase in building heights.

Protestors opposing the replacement of single-family homes with apartment buildings.

Protesters demanding affordable housing for all.

Nineteenth Century Visions of Urban Expansion:


Gouverneur Morris, 1811 Commission Chairman

Louis Risse, Chief Engineer, Topographical Department.

The 1811 New York City Commissioners' Plan and the 1900 Board of Public Improvement Plan for New York City

The Inevitable Expansion Proposition:

The expansion of cities that urban population and income growth entail cannot be contained. Instead, we must make adequate room to accommodate it.
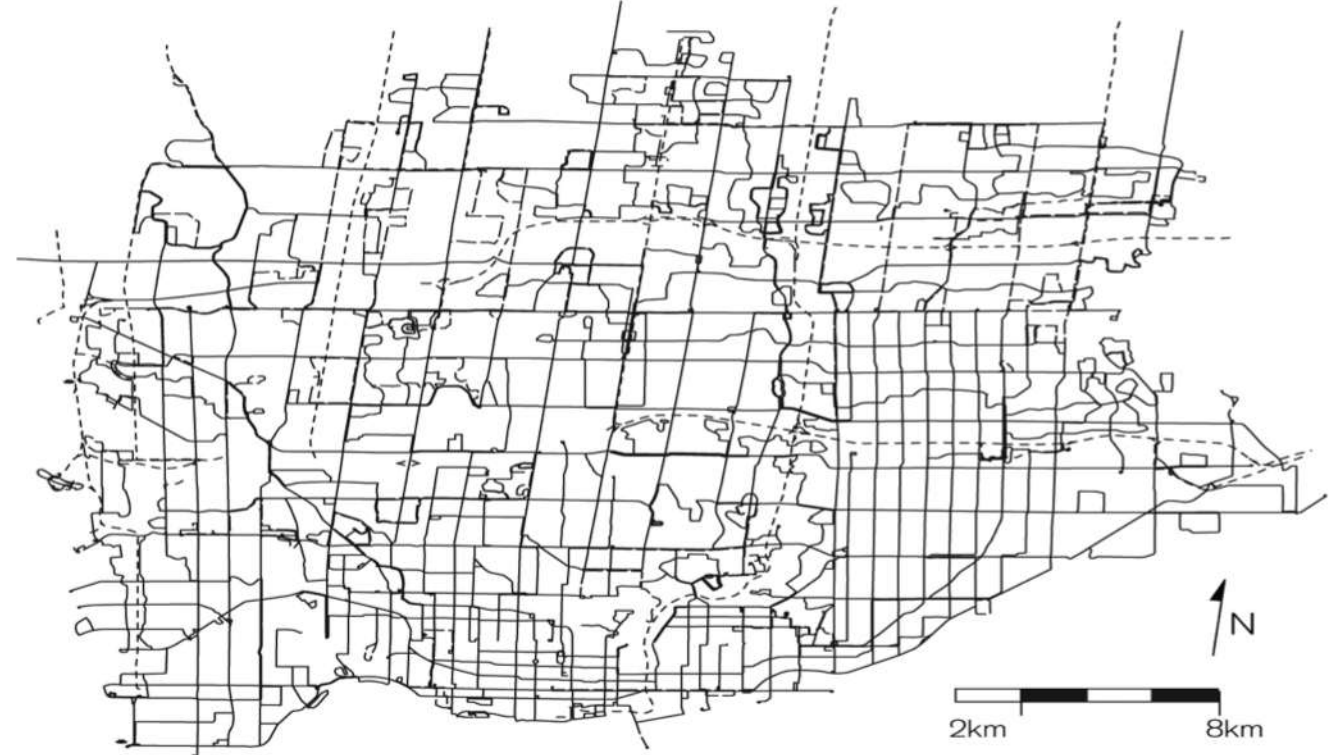

2000

1991

2014

Accra, Ghana
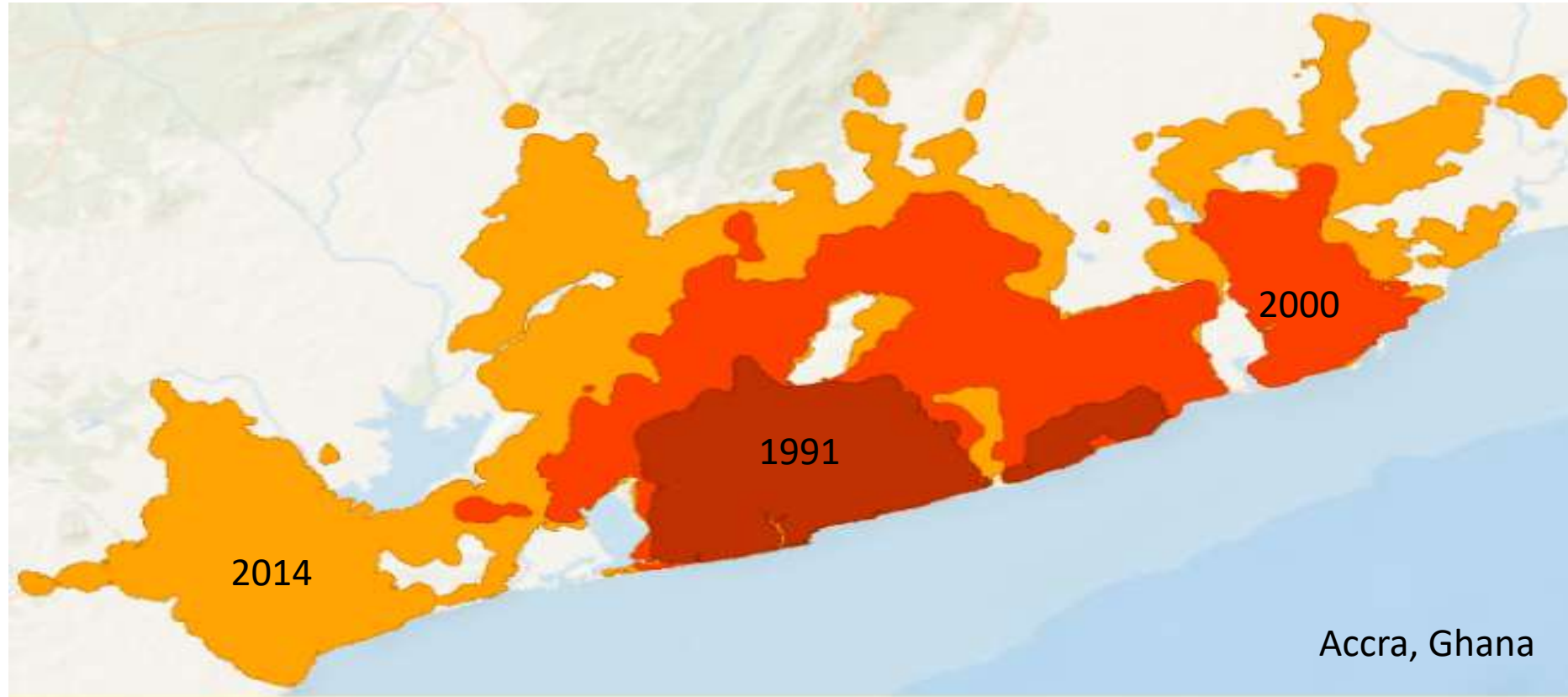
Multiples: Population – 3.4 times; Income – 3.3 times; built-up area – 6.1 times

The Public Works Proposition:

As cities expand, the necessary lands for public works and public open spaces must be secured in advance of development.
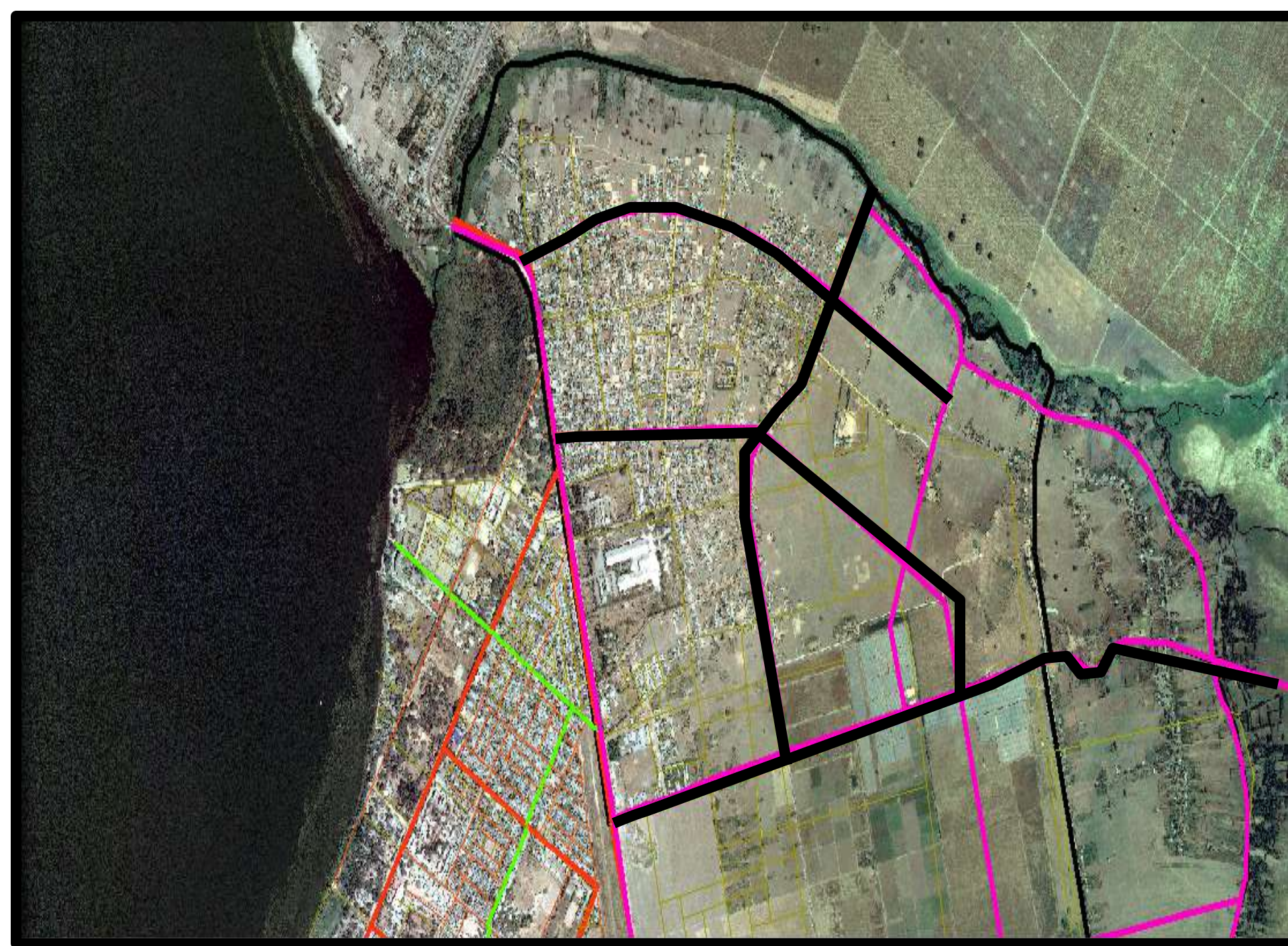

Arterial roads in a section of Bangkok, Thailand are spaced 8 kms. Apart; in Toronto, Canada, they are 1 mile apart.

HAWASSA
MACROBLOCK
LAYOUT PHASE I

10.19km of arterial
grid opened

651 hectares of land
under development

DATO NDP STREET NETWORK MAP

MUNICIPALITY OF HAWASSA CITY ADMINISTRATION URBAN PLAN PREPARATION AND MONITORING WORK PROCESS

Legend

DATO_GEN LAND USE

Ge_Landuse

- Administration
- Commercial
- Geerenary
- Manufacturing and industry
- Mixed
- Pure Residence
- Road and Transport
- Service
- Special Function

SOUTH NATION NATIONALITIES PEOPLES
REGINAL STATE BUEROU OF TRADE
INDUSTRY AND URBAN DEVELOPMENT
DEPARTMENT OF URBAN PLAN
PREPARATION AND MONITORING WORK PROCESS

PREPARED BY	MUNICIPALITY OF HAWASSA CITY
PLANNERS	1. CHERINET FILATE URBAN PLANNER SIGNITURE------------ 2. MESAY MATUSALA URBAN PLANNER SIGNITURE-------------
SURVEYORS	1. MEKONEN KABU SURVEYOR 2. ADANE KARISA SURVEYOR
GIS AND CAD BY	1. CHERINET FILATE URBAN PLANNER 2. MESAY MATUSALA URBAN PLANNER 3. MELKAMU ZELEKE DRAFTS MAN
CHECKED BY	1. TESFAYE FITORA URBAN PLANNER
APPROVED BY	ATO HASAMO HARISO KAKE DEPUTY MANAGER OF THE BURQUE AND URBAN PLAN PREPARATION AND MONITORING WORK PROCESS OWNER SIGNITURE _____ DATE _____

Adindan_UTM_Zone_37N

0   75   150   300   450   600
Meters

Adjustment of existing street network created space for green areas and additional residential and commercial spaces.

Dharavi, Mumbia, India (contemporary)

Lagos, Nigeria (early 2000s)