TALE OF THREE MEGACITIES

E ARTH
m a t t e r s
Studies For Our Global Future

introduction

Megacities, defined as urban areas with more than 10 million inhabitants, are on the rise in our rapidly urbanizing world. In 1975 there were only three megacities on the planet.[1] According to the United Nations, there were 33 megacities by 2018 and this number is expected to rise to 43 by 2030.[2] This rapid rise of megacities is just part of a larger global pattern of **urbanization.** Since the Industrial Revolution, people have been leaving the countryside and flooding city centers in search of better healthcare, living conditions, education, social interactions, and employment opportunities.

While the rise of the megacity is a global trend, it is most prevalent in **developing countries**. Of the 33 megacities, 26 were located in developing countries, and nine of the 10 cities expected to become megacities by 2030 are all in developing nations.[3] In **developed countries** such as the United States, urban growth has stabilized in places and slowed in others.[4]

Urban areas, and especially megacities, face a number of challenges, from pollution to traffic jams to inadequate infrastructure. In addition, the world's cities tend to be areas of greatest inequality, where the gap between rich and poor is most pronounced.[5] Especially when urbanization occurs quickly, **informal settlements** can develop as housing policies fail to keep up with a growing population. However, there are benefits to the rise of cities, such as improved public transit, decreased use of personal vehicles, a greater variety of job opportunities and innovation, and, in some cases, better access to healthcare, education, sanitation and improved water sources. Both the positive and negative results of urbanization vary widely across cities, depending especially on the level of development and economic status.

Vocabulary: developed country, developing country, informal settlement, megacity, urbanization

materials

- City Station Items (provided)
- Personal computer/tablet (optional)
- Student Worksheet 1: Lagos
- Student Worksheet 1: Tokyo
- Student Worksheet 1: São Paulo
- Student Worksheet 2

concept

Rapid urbanization and the rise of megacities around the world contribute to social and environmental challenges, but can also provide important benefits for urban inhabitants.

objectives

Students will be able to:

- Identify patterns in population distribution over time and explain the global trend towards urbanization.
- Consider potential causes and effects of rapid urbanization on a local and global scale.
- Read and interpret graphs, images, and article excerpts on an assigned megacity.
- Distinguish the major issues faced by megacities in developing versus developed countries.
- Identify the environmental, social, economic, and political impacts of urbanization.

subjects

AP Human Geography, Geography, English Language Arts
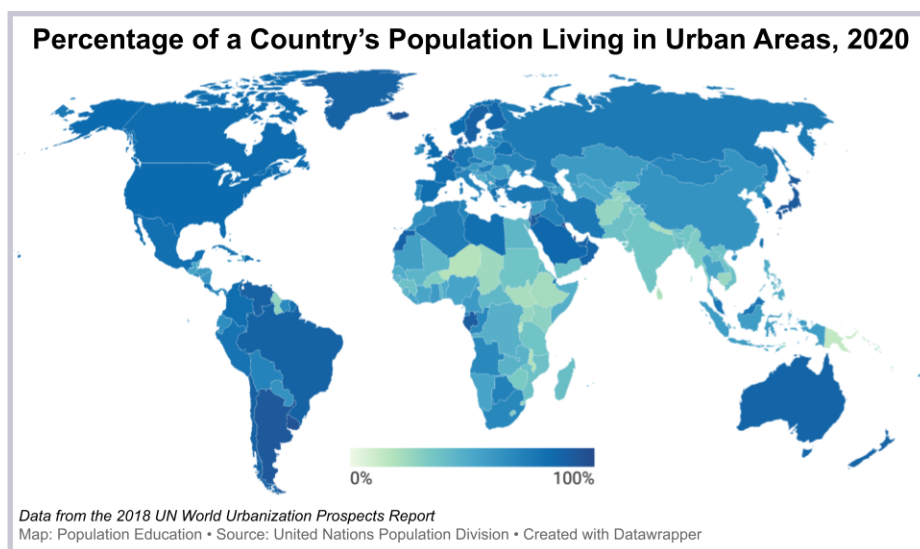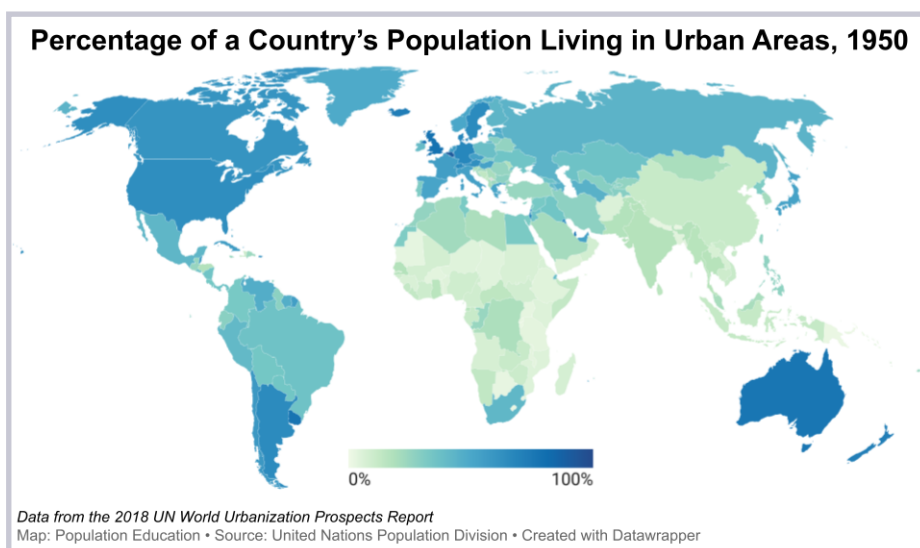
skills

Analyzing maps, guided research, interpreting graphs, understanding cause and effect, reading and listening comprehension, critical thinking, communicating, comparing and evaluating, analyzing costs and benefits

method

Students analyze data and images about three megacities, identifying challenges and benefits of growing urbanization, and then collaborate in small groups to compare and contrast social, political, economic, and environmental issues across the cities.

procedure

1. Before class, set up three distinct City Stations, one for each megacity studied in the lesson: Lagos (Nigeria), Tokyo (Japan), and São Paulo (Brazil). Print and hang the provided City Station Items, ensuring there is enough room for 2-3 students to view each Item at once. If you have a computer or tablet, set it up in the Tokyo station area and load the video from Tokyo Station Item #3 using the link provided. (Alternatively, provide print copies so that students can read the article in Option 2.)

2. Display the following maps, simultaneously if possible, for students to view.

Percentage of a Country's Population Living in Urban Areas, 1950

0%   100%

Data from the 2018 UN World Urbanization Prospects Report
Map: Population Education • Source: United Nations Population Division • Created with Datawrapper

Percentage of a Country's Population Living in Urban Areas, 2020

0%   100%

Data from the 2018 UN World Urbanization Prospects Report
Map: Population Education • Source: United Nations Population Division • Created with Datawrapper

3. Ask students to divide a piece of scratch paper into three columns labeled "See," "Think," and "Wonder." Provide students with one minute to complete each column, using the following guiding questions:

a. **See** – What do you observe? Do not make inferences or value judgments at this stage. What are these maps showing? What does the key tell you? Describe any trends or patterns, as well as any outliers or exceptions.
b. **Think** – What might be causing the trends you see? What are possible effects (positive or negative) of these trends? What connections can you make to prior knowledge or units of study?
c. **Wonder** – What questions do you have after viewing this? What additional data or visuals would you like to explore?

4. Review students' answers, or complete a class chart on the board (sample chart below). Students should recognize the key point that urbanization is increasing worldwide, especially in developing nations.

See	Think	Wonder
• There are two maps showing the percentage of the population that is urban by country. The first map is from 1950 and the second is from 2020. • Darker blue color means a higher percentage of the population lives in urban areas. • In 1950, there are only a few highly urbanized countries (e.g. Australia, Belgium, Uruguay, the U.K., etc.). • The 2020 map is much darker blue, indicating a higher percentage of people live in cities worldwide now than in the past. • In 2020, South America, Africa, and East Asia all show high increases of urbanization compared to 1950.	• People around the world are moving from rural areas to urban areas, perhaps seeking out better jobs or opportunities. • Basic needs such as clean water, sanitation and sewers, trash removal, and access to healthcare might be easier to access in cities. • Cities that grow rapidly may have trouble keeping up with the infrastructure needed, leading to informal settlements. • Developing countries located in South America, Africa, East Asia, and Southeast Asia appear to have changed the most over the past 70 years.	• How will the growth of cities affect our overall population? • How do we define "urban areas" for the sake of this map and dataset? • Which countries have the highest number of people in cities, rather than the greatest percentages? • Will cities continue to grow this rapidly, and is there a maximum capacity? • What is the biggest city in the world? • Is this a steady trend or has the percentage of urban dwellers fluctuated in the time between 1950 and 2020?

5. Explain to students that as rapid urbanization continues on a global scale, the number of megacities is increasing. A megacity is an urban area with more than 10 million inhabitants. Share the following visualization tool with students:

[Bright lights, big cities: Urbanisation and the rise of the megacity](#) from "The Economist"

a. Press play to show students how the number, size, and location of megacities (the red dots) have changed from 1950 until 2030 (projected). You may wish to do another See-Think-Wonder chart.
b. Point out Lagos, Tokyo, and São Paulo on the map by clicking on their respective red bubbles. After clicking, the city's name, population, and country will be displayed in the bottom left corner. Make sure all students have an understanding of where in the world each city is located.

6. Tell students they will be studying one of the three megacities you just identified on the map. Divide students into three groups, one for each of the cities. Provide each student with the appropriate version of Student Worksheet 1 for their assigned city.

7. Each student should answer the questions on their Worksheet 1 to become an expert on their assigned megacity. To do this, they will explore their City Station, examining a series of City Station Items such as graphs, photos, infographics, and article excerpts.

   • Every City Station Item is numbered and corresponds with analysis questions on Student Worksheet 1 (e.g. Station Item #1 matches questions 1.a. and 1.b).
   • Students may discuss the City Station Items with their peers at the same City Station, but they are each responsible for completing Worksheet 1 independently.
   • The City Station Items can be viewed in any order. Students should spread themselves out amongst their respective Station Items so that all members are not huddled around one.
   • Some City Station Items are more time-intensive than others, so students should pace themselves accordingly. There will be no timer indicating that they should switch to the next Station Item.

8. Provide students with 30-45 minutes to visit all Items in their City Station and complete the guided research on their assigned megacity.

9. Instruct students to form groups of three where each member of the group visited a different City Station. Every new group should include at least one representative from each city, more if necessary to ensure each student is in a group and each group includes all three cities.

10. In the new groups, students should complete Student Worksheet 2. This requires all members to contribute the knowledge gained from the City Stations and collaborate as a team to compare and contrast all three megacities.

discussion questions

1. What are some positive effects of increased urbanization? Are any of these positives evident in all three of the megacities studied?

   Answers may include: more job opportunities, growth of a middle class or a country's GDP, more educational opportunities and increased literacy, better public transit and feasibility of walking and biking (which decreases greenhouse gas emissions), etc. Students may also note that cities are often social and creative hubs, with benefits like restaurants, night life, and street art.

2. What are some negative effects of increased urbanization? Are any of these negatives evident in all three of the megacities studied?

   Answers may include: the growth of informal settlements when city resources and infrastructure can't keep up with rapid migration to cities, an increase in housing and food costs leading to a rise in homelessness, a widening gap between rich and poor, harmful impacts on ecosystems taken over by urban sprawl, the urban heat island effect, etc.

3. The world's population is expected to reach 9 billion by the middle of the century. How do you think rapid global population growth combined with increasing urbanization will impact existing megacities?

The impacts of population growth will vary depending on the region. In developed countries, it is likely that urban and suburban sprawl will increase, which can have negative impacts on the environment and available arable land. In developing countries which tend to have higher fertility rates, rapid population growth combined with urbanization may exacerbate some of the problems identified in Question #2. In all cases, in order to reap the benefits of urbanization, cities must be well-designed and managed, which can be difficult if population growth is happening at a fast pace.

assessment

Ask students to return to their original See-Think-Wonder charts and choose one item/question from their own Wonder column. Students should write a paragraph addressing it, using as much information from their guided research as possible. Collect the paragraphs for accuracy and use of evidence from the research.

follow-up activities

1. Students use the internet to find a new City Station Item for their assigned city and write analysis questions for the Item. Then, students swap these Station Items with peers and answer each other's analysis questions.

2. Students engineer potential solutions to the challenges they identified on Student Worksheet 2 and create an action plan for how these could be implemented to improve megacity life.

[1,2,3] United Nations Department of Economic and Social Affairs. (2019). *World Urbanization Prospects: The 2018 Revision.* New York: United Nations. Retrieved from https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf

[4] Westcott, L. (2014). More Americans Moving to Cities, Reversing the Suburban Exodus. *The Atlantic.* Retrieved from https://www.theatlantic.com/national/archive/2014/03/more-americans-moving-to-cities-reversing-the-suburban-exodus/359714/

[5] Adomaitis, K. (2013). The World's Largest Cities Are the Most Unequal. *Euromonitor International.* Retrieved November 1, 2017 from http://blog.euromonitor.com/2013/03/the-worlds-largest-cities-are-the-most-unequal.html

Lagos Station Item #1

Nigeria (2020)
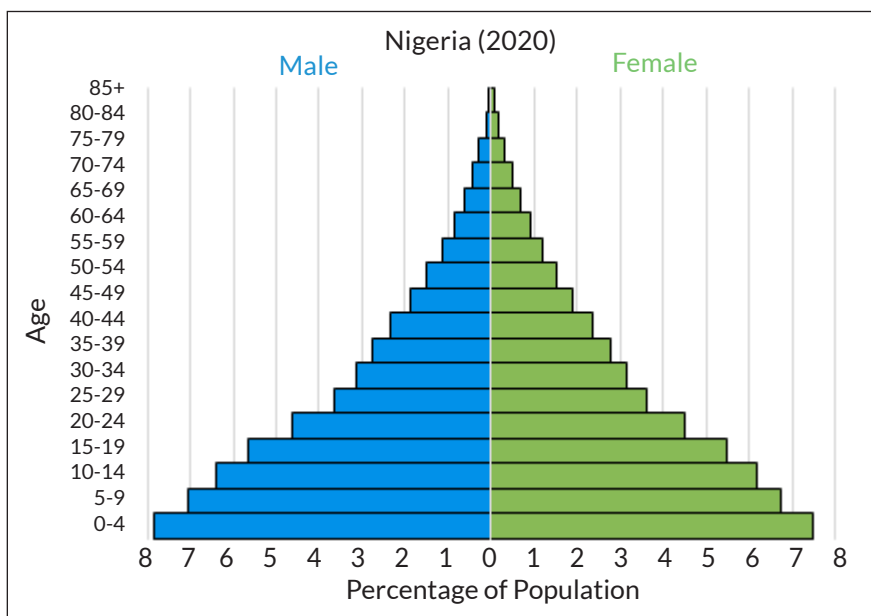
Source: United States Census Bureau, International Database

Lagos Station Item #2

Nigeria

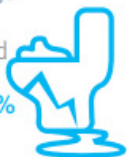**Human Development Index rank out of 188 countries[vi]** **152**

For every one urban dweller reached with sanitation in Nigeria since 2000, two people were added to the number living without.[vii]

58,920,000
Number and percentage of urban population living without improved sanitation
67.2%

13,588,000
Number of urban-dwellers practising open defecation

44,000+
Annual child deaths from preventable diarrhoeal diseases

33%
Percentage of children under five who are stunted

Nigeria has the biggest population in Africa and nearly half (48%) live in urban areas.[viii] Sanitation is not prioritised by the Nigerian government. Except in the capital Abuja and some areas of Lagos, there are no sewer systems across communities. Instead, sanitation is usually seen by government as the responsibility of individual households, who cannot afford to make improvements.

Source: WaterAid, Nigeria's sanitation crisis, 2016 World Toilet Day Nigeria supplement

Lagos Station Item #3

"Designed by the Nigerian architect Kunlé Adeyemi, the Floating School was the winner of multiple awards for architecture and urbanism, attracting great international attention and acclaim...

At 10:30 a.m. on Tuesday, the Floating School collapsed during a heavy seasonal thunderstorm. When I visited two days later, a group of men and children cleared debris from what was left behind: a wooden platform supported by floating plastic barrels and a few broken stilts. Other people sat in canoes, waiting to cart away doors, windows and piles of wood to be used elsewhere in this precarious community.

Photo credit: Akintunde Akinleye

No casualties were recorded in the collapse of the school.

....Adeyemi designed the school using locally sourced wood and bamboo, and floated it atop 250 plastic barrels. The concept won multiple awards and was hailed as reflective of a new style of architecture, created to meet local needs and the practical environmental considerations of this waterfront community.
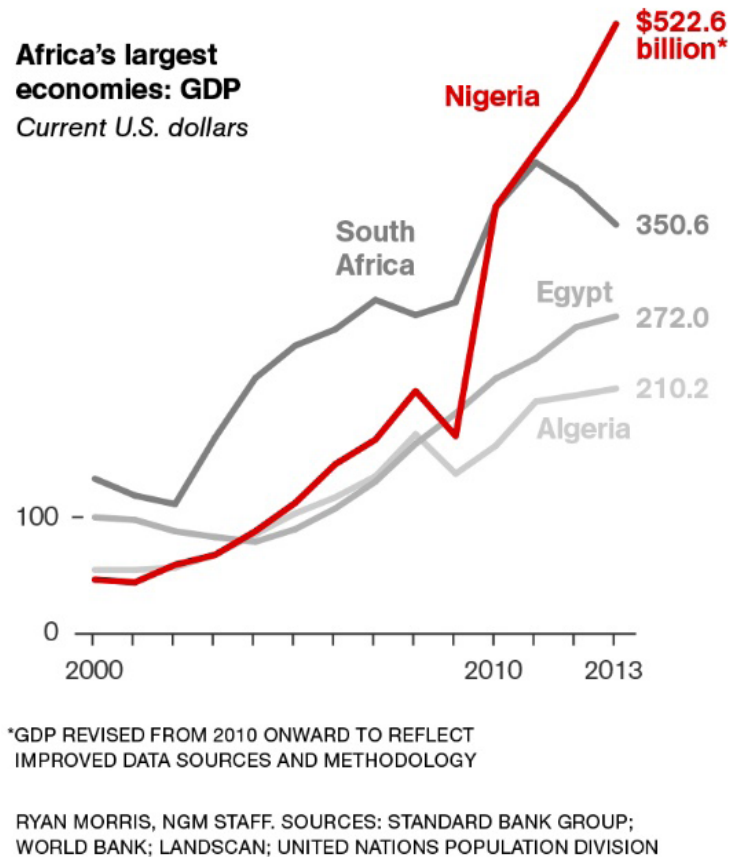

Photo credit: Akintunde Akinleye

It also arrived at a crucial time for the city. In 2012, the Lagos state government declared Makoko illegal, and tried to evict its residents in order to raze the entire floating slum. Officials argued Makoko's living conditions were unsanitary and that it violated environmental legislation. Critics of the demolition countered that its prominent presence on the waterfront embarrassed local officials, and said Makoko was a vibrant community of up to 300,000 people who had adapted to waterfront living with an ingenuity that deserved to be celebrated and assisted."

Excerpt from: Okoroafor, C. (2016). Does Makoko Floating School's Collapse Threaten the Whole Slum's Future? *The Guardian.* Retrieved from
https://www.theguardian.com/cities/2016/jun/10/makoko-floating-school-collapse-lagos-nigeria-slum-water
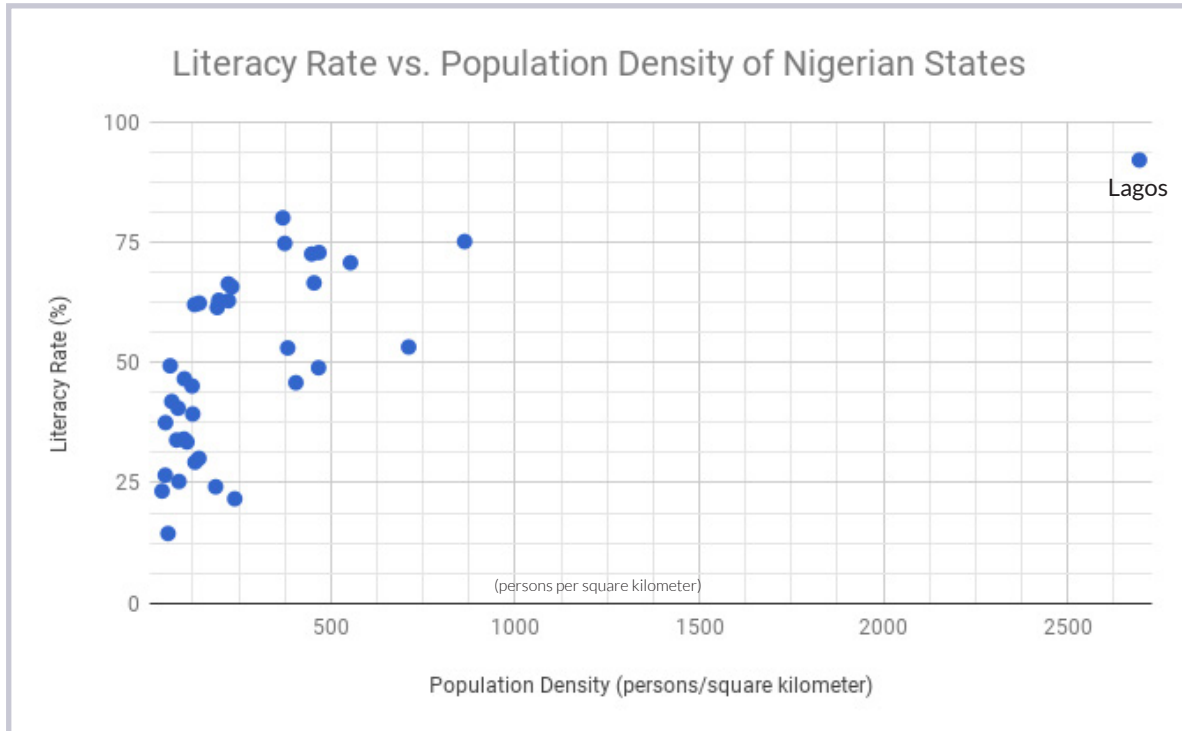
Lagos Station Item #4

Africa's largest economies: GDP
Current U.S. dollars

Nigeria — $522.6 billion*

South Africa — 350.6

Egypt — 272.0

Algeria — 210.2

*GDP REVISED FROM 2010 ONWARD TO REFLECT IMPROVED DATA SOURCES AND METHODOLOGY

RYAN MORRIS, NGM STAFF. SOURCES: STANDARD BANK GROUP; WORLD BANK; LANDSCAN; UNITED NATIONS POPULATION DIVISION

Note: The data in this graph covers the entirety of Nigeria, the country where Lagos is located.

"In Lagos, Nigeria's commercial center, "Be Very Rich" has all but become the city's motto. The country recently recalculated its gross domestic product to take into account sectors of the economy that barely existed two decades ago. As a result, Nigeria determined that its GDP surpassed South Africa's in 2012 to become the continent's largest economy. About 15,700 millionaires and a handful of billionaires live in Nigeria, more than 60 percent of them in Lagos.

As with other African metropolises, oil-enriched Lagos has long nurtured an elite class only marginally inconvenienced by the squalor enveloping the city as a whole. Now the upper class is expanding, and despite persistent income inequality, so is the middle class. The growth of the latter in Nigeria, according to a 2013 survey by Ciuci Consulting, a strategy and marketing firm in Lagos, is driven by the expanding banking, telecommunications, and services sectors, particularly in Lagos. Nigeria's middle class grew from 480,000 in 1990 to 4.1 million in 2014, or 11 percent of households. Seemingly overnight, Lagos has transformed itself into a city of Davids clamoring to become Goliaths."

Data and excerpt from: Draper, R. (2015). Africa's First City. *National Geographic*. Retrieved from http://ngm.nationalgeographic.com/2015/01/lagos/draper-text

Lagos Station Item # 5

Literacy Rate vs. Population Density of Nigerian States

Y-axis: Literacy Rate (%), from 0 to 100

X-axis: Population Density (persons/square kilometer), from 0 to 2500

(persons per square kilometer)

Lagos

A National Literacy Survey (2010) conducted by the National Bureau of Statistics in Nigeria estimates the adult literacy rate as 56.9 percent, with huge variations between states (Lagos 92% and Borno only 14.5%), regions (urban 74.6 % and rural 48.7%,) and sex (male 65.1% and female 48.6%)....There are also 3.5 million nomadic school-aged children with only 450,000 of them accessing any form of schooling. Nigeria is further saddled with the largest number of out-of-school-children estimated at over 7 million (10% of the global total).

Data and excerpt from: UNESCO. (2012). Action Plan: Nigeria. Retrieved from http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/pdf/Nigeria.pdf

Lagos Station Item #6

Aerial images of the city of Lagos from 1985, 2002, and 2015 (in that order).
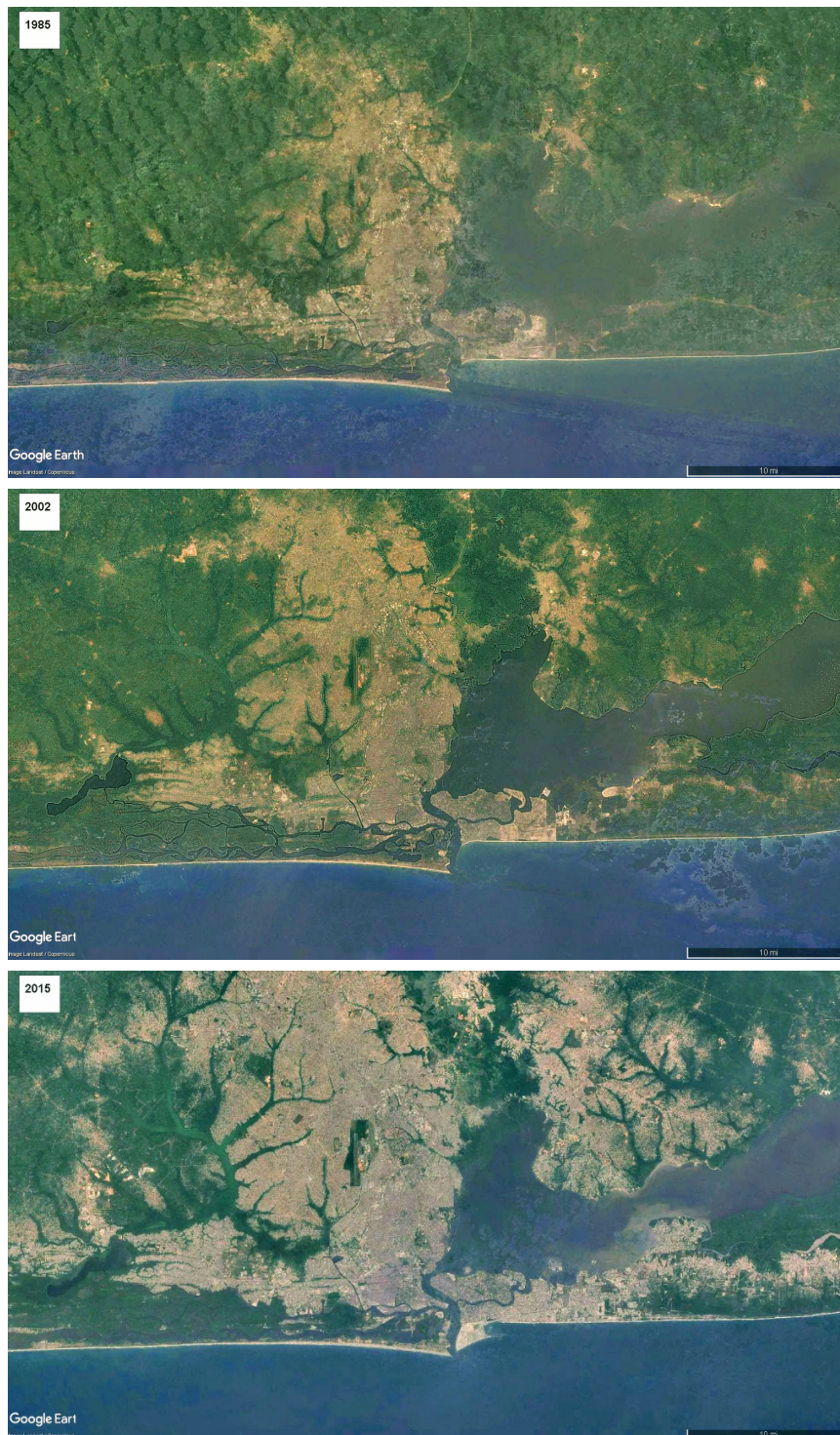
Source: Google/Landsat/Copernicus

Lagos Station Item #7

Photo Credit: peeterv/istockphoto.com

"While the 'go-slow' traffic jams do still occur, the drive from the financial district on Victoria Island to the Lagos State government offices in Ikeja takes 30 minutes, rather than 90 minutes as it may have done a few years ago…

Much of the spending has focused on transport infrastructure. In 2008, the bus rapid transport system was launched under a private-public partnership. The state built the depots, terminals and lanes. Private operators provided the buses. Every day 200,000 people use the system, cutting journey and waiting times by 30 percent compared with unregulated public transport, says Dayo Mobereola, managing director of Lagos Metropolitan Area Transport Authority. The multibillion light-rail project, which may eventually include seven lines, is even more ambitious. The China Civil Engineering Construction Company is building the terminals and tracks, which run on elevated rails above the traffic in some areas. A private consortium, Eko Rail, will supply the trains and operate the network for 25 years. It is hoped the network will carry many hundreds of thousands of passengers a day. 'We are trying to build capacity that can cope with the demands in 10 or 15 years' time,' Mr. Mobereola says."
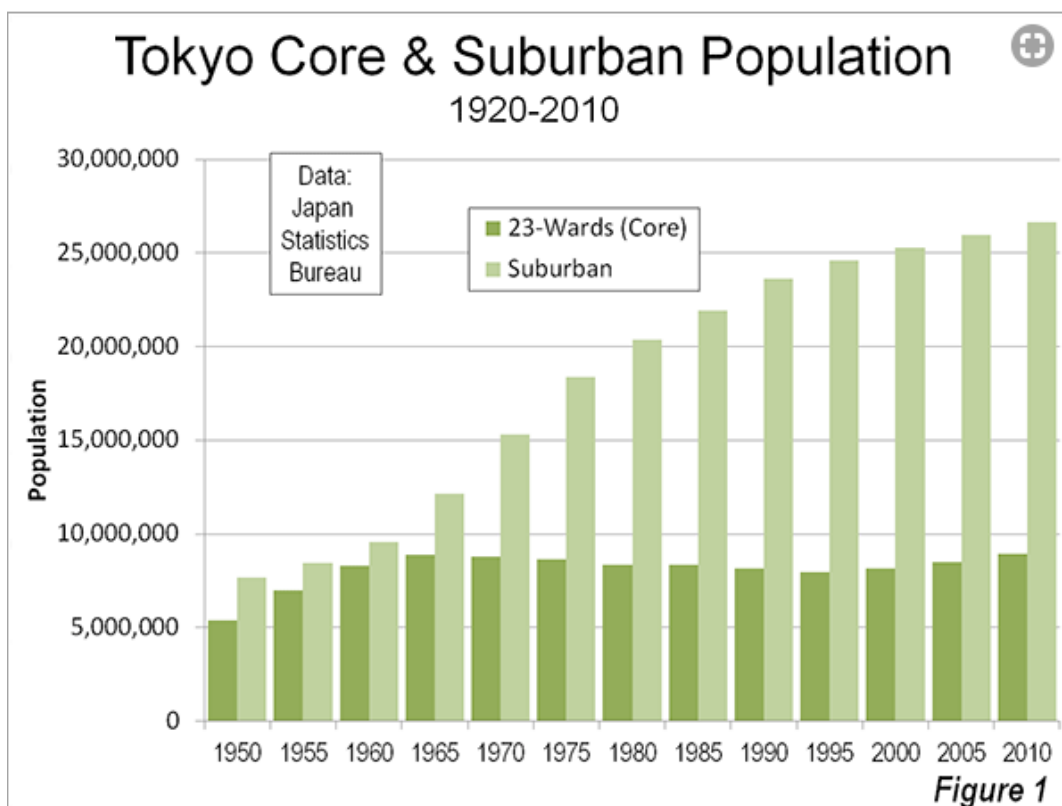
Excerpt from: Rice, X. (2012). Africa: Lessons from Lagos. *Financial Times.* Retrieved from https://www.ft.com/content/8b24d40a-c064-11e1-982d-00144feabdc0

Tokyo Station Item #1
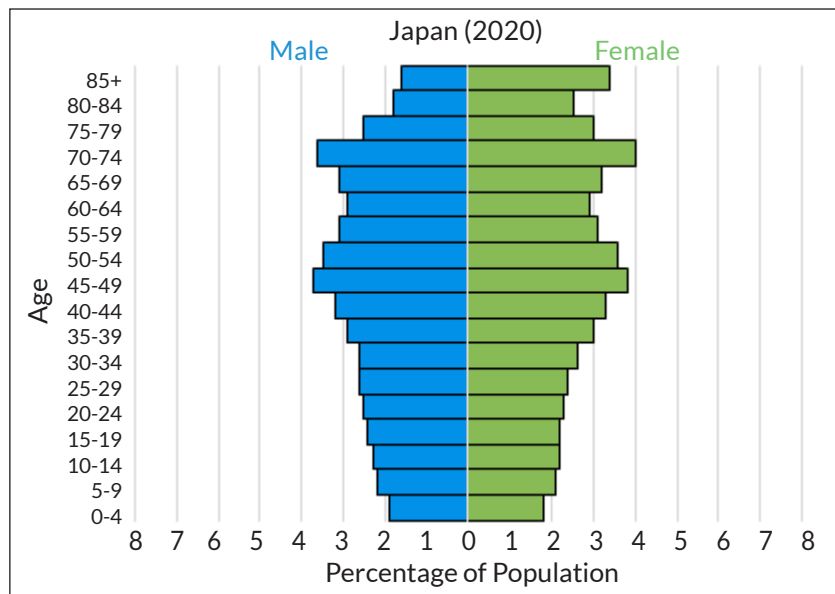
Source: United States Census Bureau, International Database

Tokyo Station Item #2

Source: Cox, W. (2012). The Evolving Urban Form: Tokyo. *New Geography*.
Retrieved from http://www.newgeography.com/content/002923-the-evolving-urban-form-tokyo

Tokyo Station Item #3

Japan's Disposable Workers: Net Café Refugees

Option 1
Click the link to watch the video: https://vimeo.com/121705174. The sound is not required, but make sure to click "CC" and choose "English" so there are subtitles, since the video is in Japanese.

Option 2
If you don't have access to a computer to watch the video, read the following article from the film's makers:

"The first time Fumiya, 26, spent a night at the internet cafe, other people's snoring and footsteps kept him awake throughout the night. Since that sleepless night, ten months have passed and little noises like that no longer bother him. Once he got used to sleeping with a blanket over his face to block out the fluorescent lights that stay on through the night, he says living in an internet cafe is "not so bad."

Internet cafes have been around in Japan for over a decade, but around the mid-2000s, a new type of internet cafe which people also use as the accommodations sprang up and people started living there. These internet cafes are equipped with a tiny private booth for guests, showers, and laundry service, with a reasonably priced package for overnight users.

Fumiya started living at an internet cafe after he left his job with a dormitory. He looked for an apartment, but it was more than he could afford. He was initially renting a private booth for 12 hours just to sleep, but he soon realized that he could actually live there. For the internet cafe he lives in, Fumiya chose a discounted monthly package and pays 1,920 yen (U.S. $25) a day, which comes down to a monthly rent of about U.S. $750. Still, it is cheaper than renting an apartment because he does not have to pay for utilities. It is clean and offers unlimited free drinks, blankets, and cushions. The booth is partitioned by about 5.9 foot walls and a door, and Fumiya can enjoy his bathtub size privacy of a 5.9 foot by 3.9 foot space, which is big enough to sleep without bending his knees.

He currently works 8 hours a day, 6 days a week as a security guard and makes about 230,000 yen (U.S. $2,900) a month. He says he needs about one million yen ($13,000) to pay for security deposits, realtor fees, and furniture for an apartment in Tokyo because a realtor usually asks for a lot of money in advance for people without a financial guarantor. Fumiya guesses it would take two to five years to save that much money. His job is too unstable to plan ahead as he doesn't know when his job changes or where his next job would be. He says, "We need a place like an internet cafe. Without it, there would be many more people who have jobs but no homes."

According to the survey by the Ministry of Health, Labor and Welfare in 2007, 60,900 people spent a night at an internet cafe at any given day and an estimated 5,400 people live there because they have no home. Out of these long-term users, 2,200 were unemployed and 2,700 people were irregular workers like Fumiya. Called "internet cafe refugees" by the media, they have drawn attention to the plight of irregular workers whose salary is not enough to pay for their own apartment."

Video created by: Fukada, S., Living in Internet Café. *Japan's Disposable Workers/The Pulitzer Project*. Retrieved from http://disposableworkers.com/?page_id=37

Tokyo Station Item #4

Photo Credit: JakeAdelstein

Run for cover: As summer kicked in last week, so did Tokyo's heat-island effect, which caused this picturesque 'guerrilla storm' as seen from Roppongi Hills.

Residents of Japan's big cities, and of Tokyo in particular, are well aware of the heat-island effect — especially now with the onset of summer.

The effect occurs because concrete and asphalt retain radiant energy, making the whole city a vast absorber and then emitter of convected heat, which creates powerful thermals that trigger sudden "guerrilla storms" — and renders the nights barely more agreeable than the stifling, claggy days. And if you think summers have been getting worse — you're right.

Figures from the Japan Meteorological Agency (JMA) show that annual average air temperatures nationwide rose by a rate equivalent to 1.15°C per century between 1898 and 2010. This is considerably higher than the global average temperature rise of 0.74°C over the last century (according to the Intergovernmental Panel on Climate Change's "Climate Change 2007: Synthesis Report Summary for Policymakers").

Not only have temperatures been rising in Japan, but they've been rising faster here than they have elsewhere — with some of that difference accounted for by the heat-island effect found in cities and dense urban areas.

Excerpt from: Hooper, R. (2013). Effects will become more obvious as Japan's climate changes. *The Japan Times.* Retrieved from https://www.japantimes.co.jp/news/2013/07/13/national/science-health/effects-will-become-more-obvious-as-japans-climate-changes/

Tokyo Station Item #5

Source: GineersNow. (2017). You Should See the World's Busiest Underground Network – The Tokyo Metro Rush Hour. Retrieved from https://www.gineersnow.com/industries/train/tokyo-metro-worlds-busiest-underground-network.

Tokyo Station Item #6

Photo credit: 7maru/istockphoto.com

Restaurants and bars in Tokyo, like the ones in the Yurakucho district shown in this photo, serve meals until late at night, one of the reasons why Tokyo was chosen as the world's most livable city by the magazine Monocle.

"For the second straight year Tokyo has topped the list of the most livable cities in the annual Quality of Life Survey conducted by the British lifestyle magazine Monocle. According to the survey recently released on the magazine's website, Tokyo came first due to 'a balance of hi-tech efficiency and traditional neighborhood values.'

'It might be a megalopolis but life in the Japanese capital is a master class in low-rise, leafy, pedestrian-friendly living,' it said. This year the survey focused not only on how cities function during the day but also evaluated nightlife. Tokyo scored well for having many restaurants that 'still serve a good meal after 10 p.m., as well as transport that keeps going throughout the night.'
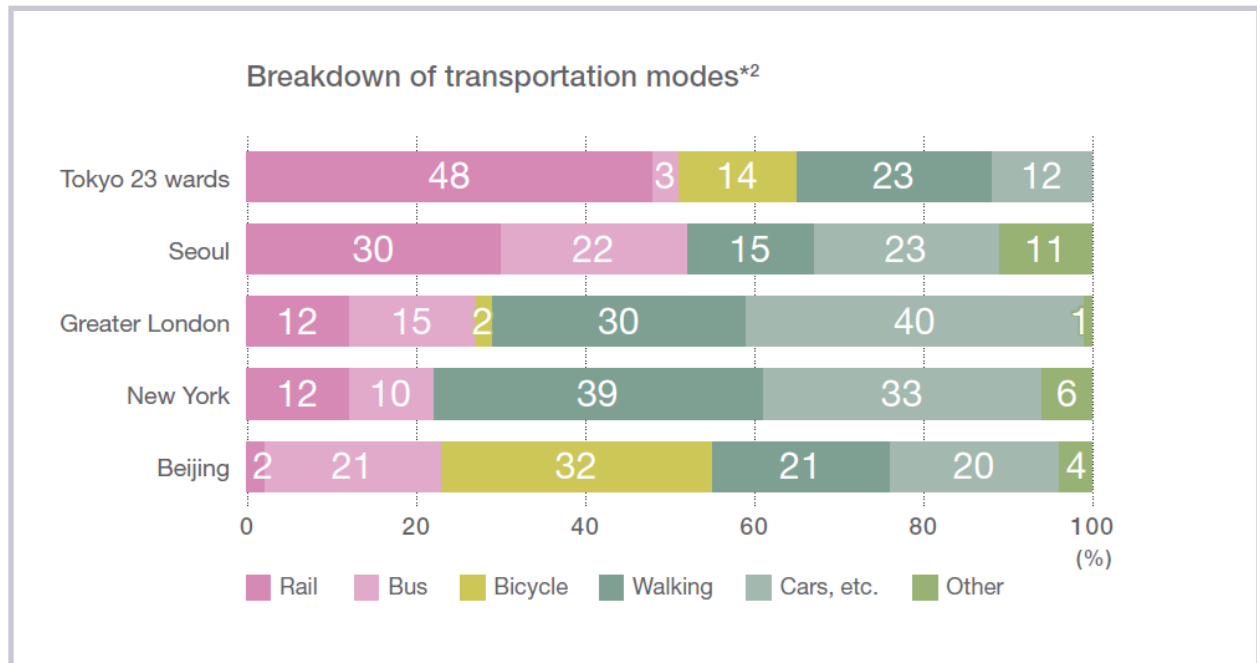
'Where other cities talk a good game about being 24/7, Tokyo delivers,' the magazine's editor-in-chief Tyler Brule said in a statement.

This year it also took into account factors such as a conveniently located international airport, which is open 24 hours a day, all-night restaurants, convenience stores, cheap hotel options including capsule hotels, and a well-established public transport system. Cities in the survey are graded based on metrics such as public-transport networks, international connections, general safety, the quality of urbanism and architecture."

Excerpt from: Osumi, M. (2016). Tokyo chosen as most livable city by Monocle; Mercer ranks it among most expensive. *The Japan Times.* Retrieved from https://www.japantimes.co.jp/news/2016/06/24/national/tokyo-chosen-livable-city-monocle-mercer-ranks-among-expensive/#.WgTS01tSyUk

Tokyo Station Item #7

"Tokyo has a substantial rail network that includes two loop lines in the central area. Most of central Tokyo is within walking distance from a station, making the trains and subways indispensable to economic and human activity."
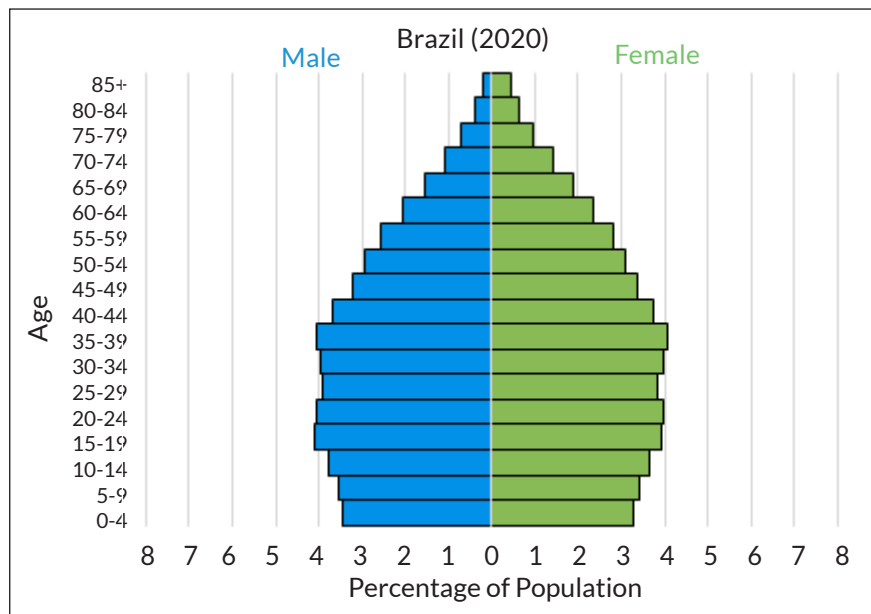
Breakdown of transportation modes[2]

City	Rail	Bus	Bicycle	Walking	Cars, etc.	Other
Tokyo 23 wards	48	3	14	23	12	
Seoul	30	22		15	23	11
Greater London	12	15	2	30	40	1
New York	12	10		39	33	6
Beijing	2	21	32	21	20	4

Source: Tokyo Metropolitan Government. *City View Tokyo.*

The above graph shows the breakdown of transportation modes taken by people in Tokyo (top) compared to a number of other large world cities. In Tokyo, 48% of trips are taken by rail.

Data: Bureau of Social Welfare and Public Health, Tokyo Metropolitan Government, "Progress in Making Public Facilities Barrier-free in Tokyo at the End of FY 2014"; Ministry of Land, Infrastructure, Transport and Tourism, "FY 2012 Annual Report (White Paper) on Infrastructure Provision in the National Capital Region" (June 2013) Retrieved from http://www.metro.tokyo.jp/ENGLISH/ABOUT/CITY_VIEW/

São Paulo Station Item #1

Brazil (2020)

Population pyramid showing Male (blue) and Female (green) populations by age group from 0-4 to 85+. Y-axis: Age. X-axis: Percentage of Population (0 to 8 on each side).

Source: United States Census Bureau, International Database

São Paulo Station Item #2

As Brazil's Largest City Struggles With Drought, Residents Are Leaving

"The dishes are piled high in the sink when we arrive at Renata Trindade's house in a poor neighborhood in the north part of the city. Since she works during the day, she says she has to be creative about doing chores: She lets dishes and clothes pile up to make sure she and her boyfriend have enough water for other things like bathing or flushing the toilet.

For her and many other São Paulo residents, this is the new normal.

And this city is not alone. Brazil's second largest city, Rio de Janeiro, is also facing water troubles, as are other coastal areas. It's been an enormous shock to Brazilians, who are used to their country being called "the Saudi Arabia of Water" — historically, it has had as much water as that Middle Eastern country has oil.

Kainaz Amaria/NPR

Renata Trindade, 26, lives in a northern neighborhood of São Paulo with her boyfriend. She says the government has been rationing water, so she sets aside dirty dishes to conserve water for bathing and flushing toilets. On weekdays, she gets water from 4 a.m. to 1 p.m. and on weekends, from 7 a.m. to 2 p.m.

But not anymore. Satellite data from NASA shows that the drought in much of southeast Brazil — also home to the region's breadbasket — is much worse than originally believed. Some recent studies suggest that the lack of rain on Brazil's coasts may be linked to deforestation in the Amazon."

Excerpt from: Garcia-Navarro, L. (2015). As Brazil's Largest City Struggles With Drought, Residents Are Leaving. *NPR*. Retrieved from https://www.npr.org/sections/parallels/2015/11/22/455751848/as-brazils-largest-city-struggles-with-drought-residents-are-leaving

São Paulo Station Item #3

Photo credit: luciasba/istockphoto.com

The Minhocão (Elevado Presidente João Goulart), an elevated highway in São Paulo, Brazil. On Sundays the highway is closed to car traffic, turning to a public space for pedestrians and cyclists. October, 2016.

"Three and a half kilometres in length, the elevated highway cuts through the city centre joining eastern and western communities. But at weekends it is closed to traffic, turning into a playground for runners, skaters, street artists and strolling couples.

….The Minhocão's closure – on weekday evenings, Saturday afternoons and all day Sundays – has given a semblance of peace and quiet to central São Paulo. Such schemes are helping residents to reclaim streets from motor vehicles, and Teter believes this is just the first step in an ongoing revolution…..

According to Brazil's Instituto Saúde e Sustentabilidade (Health and Sustainability), fine-particle (PM2.5) pollution in the city stands at an estimated 20 to 25 micrograms per cubic metre of air (more than twice the acceptable limit set by the World Health Organisation). A study by the institute claimed 4,655 people died in São Paulo in 2011 as a result of air pollution."

Excerpt from: Gatinois, C. (2015). São Paulo's cars take a back seat on Sundays. The Guardian. Retrieved from https://www.theguardian.com/world/2015/nov/10/sao-paulo-brazil-highway-sunday-closure

São Paulo Station Item #4
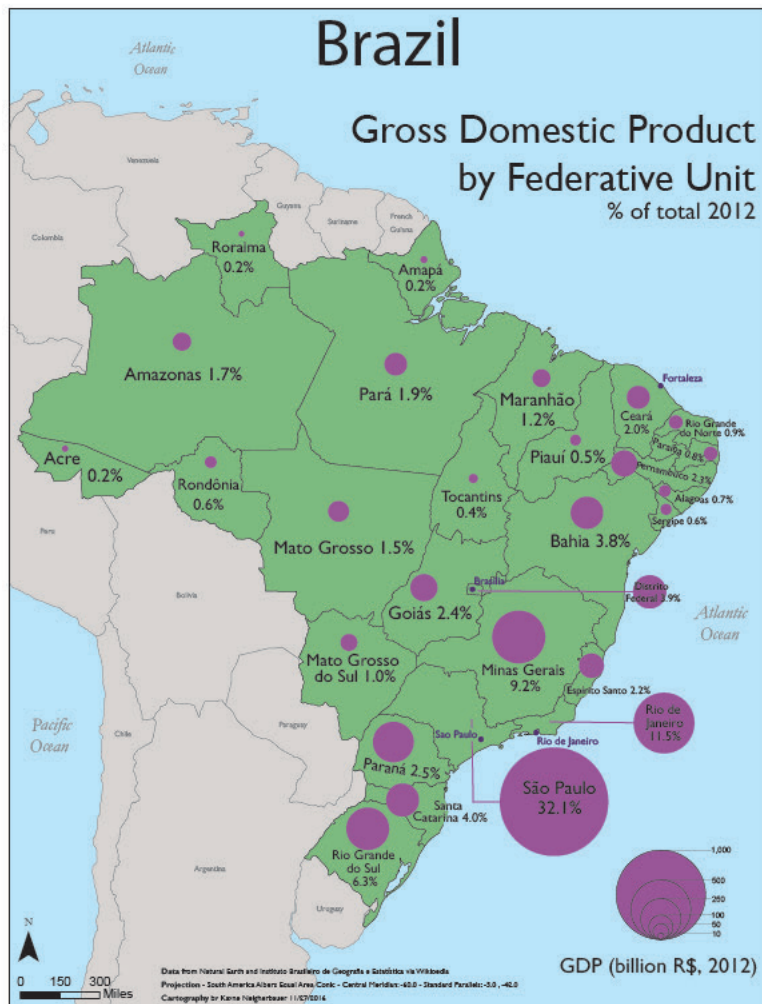
Source: Map of Brazil Percent Gross Domestic Product by Federative Unit.
Cartography: Kayne Neigherbauer. (2016) Retrieved from
https://commons.wikimedia.org/wiki/File:Brazil_-_%25_GDP_by_Federative_Unit.jpg

Note: Federative Unit is another term for "state."

São Paulo Station Item #5

Photo credit: Gabriel Vergani/Dreamstime.com

 "Left unchecked, the proliferation of outdoor advertising can consume a city. In the early 2000s, advertising grew exponentially in Brazil, and São Paulo began to suffocate under a smog of signage. Finding it difficult to control the number of ads through regulation, the city took the unprecedented step of banning them altogether. In 2007, Mayor Gilberto Kassab implemented the Clean City Law, labelling outdoor adverts a form of 'visual pollution.' In a single year, the city removed 15,000 billboards and 300,000 oversized storefront signs.

.... Nazia Du Bois, who was an advertising executive in São Paulo at the time of the ban, noted that when the ads first came down, the city went through something of an identity crisis. 'São Paulo is a pretty ugly concrete jungle, and the lack of outdoor advertising made that hard to ignore,' she says. 'It was made particularly unfortunate by the fact that many of the former sites of advertising were simply left bare ... collecting grime over the shadow of what they'd been. That was always a bit sad to see.'

It was also instructive: tearing down ads helped uncover previously hidden inequality within the city, exposing favelas that had previously been blocked by billboards. Without the perma-glow of advertising, people were forced to confront public space in a new light."

Excerpt from: Mahdawi, A. (2015). Can cities kick ads? Inside the global movement to ban urban billboards. *The Guardian.* Retrieved from https://www.theguardian.com/cities/2015/aug/11/can-cities-kick-ads-ban-urban-billboards

São Paulo Station Item #6

Photo credit: Rosanna Perroti/Divulgacão

"Prosecutors in Brazil's biggest city have opened an inquiry into a controversial plan to feed poorer citizens and schoolchildren with a flour made out of food close to its sell-by date that critics have described as 'human pet food.'

João Doria, the populist, conservative mayor of São Paulo, and the city's Catholic cardinal, Dom Odilo Scherer, have said that the product, called farinata (*farinha* is flour in Portuguese), will help alleviate hunger at no cost to the city's government.

But prosecutors have demanded more information about the nutritional content of the new food and what testing, if any, has been done after concerns were raised by the Regional Council of Nutritionists and other bodies.

….Poverty, homelessness and unemployment have risen in recent years as Brazil struggled with a debilitating recession. But nutritionists attacked the plan, arguing that nobody knows exactly what farinata is made of – nor even whether it is safe. 'It is not food, it is an ultra-processed product,' said Marly Cardoso, a professor of public health and nutrition at the Federal University of São Paulo. 'You don't know what is in it.'

Cardoso said given Brazil's obesity epidemic – caused in part by cheap and aggressively marketed fast food – the city should instead do more to encourage a people to choose a healthy diet. Last year São Paulo published a comprehensive plan to improve the city's diet with a detailed series of measures that included promoting street markets selling products produced by family farmers, and controlling the prices of fruit and vegetables. Cardoso described it as 'a model of managing nutritional problems in the 21st century.' But the plan was dropped by Doria's administration."

Excerpt from: Phillips, D. (2017). Brazil prosecutors investigate plan to give reconstituted food to poor people. *The Guardian.* Retrieved from https://www.theguardian.com/world/2017/oct/19/sao-paulo-brazil-human-pet-food-hunger

São Paulo Station Item #7

Photo Credit: C. Fernandes/istockphoto.com

Favela do Paraisópolis.

TALE OF THREE MEGACITIES | student worksheet 1: Lagos

Name: _____ **Date:** _____

1.a. What does the population pyramid for Nigeria look like?

_____

_____

1.b. What would you expect to see from Nigeria's population in the future (growing, declining, or stabilizing) and what evidence from the pyramid supports this?

_____

_____

1.c. How do you think the trends you see in the pyramid will impact Lagos, the largest city in the country?

_____

_____

2.a. Why do you think that the number of urban dwellers in Nigeria without sanitation access is increasing so quickly?

_____

_____

2.b. How are child deaths linked to a lack of improved sanitation?

_____

_____

3.a. How was the floating school unique to the needs of the informal settlement where it was built?

_____

_____

3.b. According to the article, why did the government plan to demolish Makoko?

_____

_____

3.c. Do you think that the collapse of the school will change the government's plans for Makoko?

_____

_____

_____

4.a. Describe at least two pieces of data that stand out to you from the graph and/or the article. Explain why these are surprising or interesting trends.

_____

_____

_____

4.b. What sectors of the economy are contributing to the growth of the middle class in Nigeria? What could this mean for the city of Lagos?

_____

_____

_____

5.a. What is the overall relationship between the population density (usually a good measure of how urban an area is) and literacy rate? Why might this be the case?

_____

_____

5.b. How does Lagos compare to the other states on the graph? Does it follow the trend?

_____

_____

5.c. How might increased literacy impact total fertility rate and population growth in Lagos and other urban areas of Nigeria?

_____

_____

_____

6.a. What do you notice about these aerial images of the city over time? Why is this the case?

_____

_____

6.b. What are some environmental impacts of these changes?

_____

_____

7.a. What are some of the projects Lagos has planned to address the traffic gridlock in the city?

_____

_____

7.b. Describe at least one potential benefit to these projects, as well as one potential downfall or challenge when implementing them.

_____

_____

_____

Name: _____ **Date:** _____

1.a. What does the population pyramid for Japan look like?

_____

_____

1.b. What would you expect to see from Japan's population in the future (growing, declining, or stabilizing) and what evidence from the pyramid supports this?

_____

_____

1.c. How do you think the trends you see in the pyramid will impact Tokyo, the largest city in the country?

_____

_____

2.a. What trends do you notice in the populations of the "core" of Tokyo compared to the outlying suburbs? Why do you think this is happening?

_____

_____

2.b. What are some drawbacks of urban sprawl (or the city spreading outward)?

_____

_____

3.a. Why do some people in Tokyo live in internet cafes instead of permanent housing, even though many of them are employed?

_____

_____

3.b. What are some possible problems with this sort of living situation?

_____

_____

4.a. What is the urban heat island effect?

_____

_____

4.b. How might the heat island effect contribute to Japan's rise in temperature compared to global climate change?

_____

_____

4.c. Consider potential impacts of climate change, such as sea level rise and increased frequency of severe weather events. Do you think that Tokyo's huge urban population size will make it or more or less difficult to deal with these impacts?

_____

_____

_____

5.a. What is happening in this picture?

_____

_____

5.b. What are some other parts of daily life in Tokyo that you think may be affected by its status as a megacity? Consider both positive and negative.

_____

_____

_____

6.a. What were some of the factors that helped Tokyo's Quality of Life rank so highly?

_____

_____

6.b. By population, Tokyo is the largest city (and megacity) in the world. Does it surprise you to learn that it won an award for most livable? Explain.

_____

_____

_____

7.a. What percentage of all trips in Tokyo are taken by rail, and how does this compare to other global cities?

_____

_____

7.b. Looking at Tokyo's modes of transit compared to other major cities on the graph, how do you think Tokyo's carbon emissions compare to other parts of the world? Explain.

_____

_____

_____

Name: _____ **Date:** _____

1.a. What does the population pyramid for Brazil look like?

_____

_____

1.b. What would you expect to see from Brazil's population in the future (growing, declining, or stabilizing) and what evidence from the pyramid supports this?

_____

_____

1.c. How do you think the trends you see in the pyramid will impact São Paulo, the largest city in the country?

_____

_____

2.a. How does the woman in the photo adjust her daily life to account for the limited water?

_____

_____

2.b. Is everyone in the city impacted equally by the drought? Explain.

_____

_____

2.c. How might the megacity and large concentrations of people living in the area contribute to water shortages and effects of a drought in Brazil?

_____

_____

_____

3.a. What are the impacts of closing the road one day per week?

_____

_____

3.b. How would you react if a large road near your home was closed one day per week? Would you consider this positive or negative overall? Explain.

_____

_____

_____

4.a. What does Gross Domestic Product (GDP) measure about a country or state?

_____

4.b. How does the GDP of the state of São Paulo compare to those of other states and of Brazil overall? Why might this be the case?

_____

_____

5.a. Do you think that removing the advertising had an overall negative or positive impact on the city?

_____

_____

5.b. The article notes that the removal of billboards uncovered previously unseen favelas (informal settlements where quality of living is very low for residents). Do you think that increasing visibility of poverty helps or hurts São Paulo?

_____

_____

_____

6.a. What are some potential benefits to this new plan for providing food to the hungry in São Paulo?

_____

_____

6.b. Why are many activists concerned about providing this new product to impoverished residents of the city?

_____

_____

7.a. What are some details that stand out from these two different neighborhoods/housing situations?

_____

_____

7.b. How do you think daily life differs for people living in each?

_____

_____

_____

7.c. Images like this are sometimes called examples of "eco-apartheid." The term apartheid originally referred to the system of government-enforced racial segregation in South Africa from 1948-1991. How do you think "eco-apartheid" applies here?

_____

_____

_____

TALE OF THREE MEGACITIES | student worksheet 2

Name: _____ **Date:** _____

1. For each city, the group member who studied it should provide a brief overview of some of the positive and negative aspects of life in that city. Be as specific as possible, using statistics or examples from your research and Worksheet 1. Record your own and your team members' answers below.

	Benefits (positive)	Challenges (negative)
Lagos		
Tokyo		
São Paulo		

2. Which challenges do you notice are similar across all three cities? Explain.

3. Choose one of the challenges described above and explain why you think this issue is faced by all three of these cities, despite their different locations and levels of development.

4. Identify a possible solution to the challenge you described and explain how it might be implemented.