Adapting U.S. Foreign Assistance for a Rapidly Urbanizing World

Urbanization: scoping the challenges and opportunities for foreign assistance

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Appendix A
A Short History of Urbanization

Byblos (modern Jbail in Lebanon) has been continuously inhabited for ~ 10,000 years, with the earliest known walled fortifications appearing around 9000 years ago. Most of the early settlements would be called “urban” today, however. Eridu in Iraq is claimed to be the oldest city, dating to about 7000 years ago, but never exceeded a few thousand residents before it was abandoned (Mallowan, 1967). Rome is thought to have reached the one million resident mark first, around 2,000 years ago. As agriculture emerged, food surpluses allowed trading and professional specialization to arise. But problems also emerged early. Diamond (2005) identified overuse of natural resources, leading to their depletion, as a common cause leading to the collapse of organized societies. He lists (p. 48) salinization as contributing “to the decline of the world’s oldest civilizations, those of Mesopotamia.” Land degradation near the location of major ancient cities is a common phenomenon and remains a major problem in some locations today.

By the year 1,500, ten cities had reached the 300,000 mark: Istanbul, Tokyo, Beijing, Paris, London, Kyoto, Esfahan, Osaka, Bijapur, and Ahmedabad (Reba et al., 2016). Most of today’s major cities benefitted greatly from the industrial revolution. The population of Beijing and Greater London exceeded one million around 1800 and London surpassed 5 million by 1890. Shortly after 1920, the United States was the first country to become majority urban (Ritchie and Roser, 2019) and New York became the first city to exceed 10 million around 1935. Tokyo became the first to surpass 20 million about 1965. A visualization of urban development provided on-line (http://metrocosm.com/history-of-cities/) shows this gradual expansion (Figure A1).

Thirty years ago, the UN predicted that the world would be mostly urban by 2010 (United Nations, 1987) – a landmark the human population actually crossed a few years ahead of schedule. Some of the other predictions of the United Nations (1987), including faster population and urban growth rates in the developing world, and especially Africa and Asia, have also been borne by the facts. In the developed world (sometimes referred to as the Global North), urbanization has been accomplished well before 1960, when the World Bank’s World Development Indicators database data begin. Between 1960 and 2018, 114 countries and regions included in the database reached a threshold of 35% urban population. Throughout this period, the transition most often occurred at per-capita incomes that put countries and regions in the “lower middle-income,” as defined by the World Bank (in 2018, GNI per capita between $1,006 and $3,955). However, some outliers fit in the “low-income” (GNI of $1,025 or less in 2015) and a few fit in the “upper middle-income” (between $3,956 and $12,235) economies, as defined by the World Bank (Figure A2). Typically, urbanization occurs prior to a country reaching higher economic status.
Figure A1. A visualization of global city emergence produced by Max Galka and available at http://metrocosm.com/history-of-cities/. Larger cities are denoted by darker (redder) color. A: Cities begin appearing in the Fertile Crescent around 2,600 Before Christian Era (BCE). By 2,000 BCE they start spreading into Asia (B), first appearing in Europe and present-day China 300 years later (C). The first Central American cities emerge around 925 BCE (D), South America in 500 BCE (E), sub-Saharan Africa in 800 CE (F), North America in 1,000 CE (G), and Australia in 1,800 CE (H). By 2,000 CE (I), roughly half the human population lived in cities.

Until the turn of the century, countries and regions almost always reached the urbanization threshold examined here (chosen arbitrarily at 35%) when categorized as lower middle-income (Figure 2). However, this has changed and now they are usually categorized as lower income at the transition.

Figure A2. Per capita incomes in countries (black triangles) and regions (blue circles) which reached the 35% urban population mark between 1960 and 2017. A: GDP (61 countries and 20 regions) during the year of transition; B: GNI (33 countries and 10 regions). LI: Lower Income as defined by the World Bank; LMI: Lower Middle-Income; UMI: Upper Middle-Income. Data from the World Bank’s World Development Indicators database. Black line: country trend line.

Over the course of the past 59 years, the relationship between the timing of regional urbanization and per-capita economic indicators was negative for both GDP and GNI.

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1 The relationship is highly statistically significant for GDP (countries: Spearman’s non-parametric correlation; rho = -0.361, 2-tailed p = 0.04; region: rho = -0.743, 2-tailed p < 0.001)
Appendix B
Definitions of “Urban”

There have been many attempts to define “city” and related terms over the years, many of them based on administrative considerations or population density (reviewed in Dijkstra and Poelman, 2014). Some have used multiple criteria, and a few have simply failed to define the term (United Nations HABITAT, 2019). Further complicating things, other terms are sometimes used, either interchangeably with “city” or with one another. To effectively compare data from different countries, a consistent definition is needed for the purpose of this project.

Existing definitions

Setting aside the artificiality of the urban-rural dichotomy (Champion and Hugo, 2004), definitions currently being used by members the Working Group, outside experts, and the literature are listed at the end of this Appendix (additional, country-level definitions are summarized in Appendix 5 of Dijkstra and Poelman, 2014). In general, they fall into two categories.

First, in order to work with a diversity of countries (each using its own definition), many organizations have chosen to avoid using a consistent, internally-derived definition. Instead, they rely on host-country definitions. While acknowledging that this is an operationally important approach, some (e.g., Dijkstra et al., 2018; United Nations HABITAT, 2019) point out that it renders inter-country comparisons difficult or invalid.

Instead, critics of country-based approaches typically employ a data-intensive, grid-based analysis which usually results in three categories based on population density. Names vary, but common ones are “urban center;” “intermediate density” or “towns and suburbs;” and “rural.” “Urban cluster” or “Metropolitan Area” is sometimes used when several high-density areas are located close to one another and create a matrix or gradient, but the term is also used in other ways to indicate materially different development types.

Freely-available remote sensing databases now allow the second kind of definition to be operationalized relatively easily. This is a comparatively new development (Weeks, 2004), which allows individuals and organizations with sufficient GIS skills to create “heat maps” of population density at the 1km² scale used, for example, by Dijkstra et al. (2018). These allow areas with comparable density to be readily compared across countries and regions in a way that would have been impossible until recently. However, the thresholds used vary (United Nations HABITAT, 2019).

and nearly significant even with the much smaller sample for which GNI data are available (countries: rho = -0.319, 2-tailed p = 0.071; regions: rho = -0.617, 2-tailed p = 0.057).
The definition used in this project is based on the Dijkstra et al. (2018) definition used by the European Commission and accepted by vary United Nations HABITAT (2019). The data needed for making that determination are fairly minimal: a 1 km$^2$ grid of population density, derived from remote sensing. While the resulting definition is simplistic, it should be easily derived over broad geographical swaths, and serves as a minimal baseline standard. Additional components can be added in countries where more detailed data are available, allowing for multifaceted descriptions (for example, including change over time, economic activity, governance metrics, or building form) that may be of greater use internally or for specialized studies than for initial international comparisons. Similarly, although additional terms such as “city core”, “exurban”, and “suburb” are often used in the literature, defining them based on the basis of this minimalist data is unlikely to be productive.

PREVIOUSLY USED DEFINITIONS, BY SOURCE

USG

HUD (Yennie Y. Tse)

“HUD uses several methods for designating a given area as either “urban” or “rural,” and the specific method chosen will depend on the assignment or program area. The most widely used techniques include those developed by the US Census and the Office of Management and Budget (OMB). In addition, some offices prefer to use Rural-Urban Commuting Area (RUCA) codes. Each method entails its own advantages and shortcomings …

HUD’s Geocode Service Center (GSC) … might be the best definition we can send over; however, it’s important to understand that Census does not actually define “rural.” Instead, “rural” entails anything other than urban, which Census defines in two ways:

- Urbanized Areas (UAs) of 50,000 or more people;
- Urban Clusters (UCs) of at least 2,500 and less than 50,000 people.”

US Census Bureau (https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html)

“The Census Bureau identifies two types of urban areas:

- Urbanized Areas (UAs) of 50,000 or more people;
- Urban Clusters (UCs) of at least 2,500 and less than 50,000 people [located outside urbanized areas].

“Rural” encompasses all population, housing, and territory not included within an urban area.”

More detail in Ratcliffe, 2015.
USAID (Kevin Nelson)

Our “definition of 'urban' is based on county context. We've spent a lot time grappling with this, and still not satisfied, but our focus has moved beyond this point.”

Peer reviewed

Hove et al., 2013

“Urbanisation is characterised as a: (i) demographic process, (ii) necessary element of economic and industrial development, (iii) driving force behind social change and (iv) universal phenomenon.”

Ernstson et al., 2010

call for cities to be framed as complex socio-ecological systems composed of networks that are both socio-ecological and socio-technical.

Meerow et al., 2016

“Urban resilience refers to the ability of an urban system-and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales-to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity.”

Zhou et al., 2015

“In this study, similar to Zhou et al (2014), we define urban land as those 1 km pixels with urban percentages larger than 20%, consistent with the developed areas in the US NLCD dataset (Fry et al 2011).”

Beynon et al., 2016.

“three factors identified in the three-factor model form the intermediate multiple indices of rurality ... Population and Housing Dynamics (Factor 1): This factor is a combination of traditional population metrics, such as population density and work activity ratios i.e. Male and Females of Working Age as a % of the total population. This is coupled with the variable of dwelling stock. Migratory Dynamics (Factor 2): This factor is a combination of changes in population movement made up of In Migration %, Out Migration % and Balance Migration %. Social Dynamics (Factor 3): This factor is a combination of two variables both reflecting socio economic trends, Population Change 2000-10 and Non Commuting Population.”
NGOs

IFPRI (Marie Ruel)

"we do not use our own definition because we feel that it is best for us to be flexible and to follow the official classifications of “urban” that individual countries use, when we work at country level; or that large data collection exercises (including the Demographic and Health Surveys (DHS) and the Living Standards Measurement Surveys (LSMS)) use, when we analyze existing data and look at urban/rural differences or specifically at urban statistics across countries”

OECD (Organisation for Economic Co-operation and Development), 2013

“The definition of urban areas in OECD countries uses population density to identify urban cores and travel-to-work flows to identify the hinterlands whose labour market is highly integrated with the cores.”

(also see Dijkstra papers below, which are the basis of operational definitions)


“The definition of ‘urban’ varies from country to country, and, with periodic reclassification, can also vary within one country over time, making direct comparisons difficult. An urban area can be defined by one or more of the following: administrative criteria or political boundaries (e.g., area within the jurisdiction of a municipality or town committee), a threshold population size (where the minimum for an urban settlement is typically in the region of 2,000 people, although this varies globally between 200 and 50,000), population density, economic function (e.g., where a significant majority of the population is not primarily engaged in agriculture, or where there is surplus employment) or the presence of urban characteristics (e.g., paved streets, electric lighting, sewerage).”

United Nations, 2016

“Urban population is the de facto population living in areas classified as urban according to the criteria used by each area or country.”

Urban Institute (Chas Cadwell)

“Every country defines it differently, so we opted to use the definition that is used by the individual countries USAID works in....thinking that since we need, in the end, to work with the local officials and citizens, it is better to focus on the issues than on threading some arbitrary externally-defined needle about what is urban.”
Other

Bibby and Brindley, 2013

“settlements with a population of 10,000 or more should be treated as ‘urban’ in the absence of particular reasons for setting a different level. All smaller settlements were to be treated as rural … areas of built up land with a minimum area of 20 hectares and an associated population of 1,000”

Breese, 1966

“subsistence urbanization … implies urbanization in which the ordinary citizen has only the bare necessities.”

Demographia (https://meetingoftheminds.org/a-comparison-of-the-worlds-1000-largest-urban-areas-30879?omhide=true&utm_source=Meeting+of+the+Minds+Newsletter+List&utm_campaign=a512e6bc02-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_cdb70a5ce7-a512e6bc02-58012553&mc_cid=a512e6bc02&mc_eid=946eb98940)

“There are three basic definitions of the city.

The City Proper, which is the political jurisdiction of the historical core municipality, such as the Ville de Paris or the City of New York. Most often, these areas are only a small part of a larger urban or metropolitan area, the two generic definitions of a city. There are no neutral demographic standards for establishing such jurisdictions, they are defined neither by physical nor economic standards.

The Metropolitan Area (called “functional urban area” in Europe) is organized around a core urban area (the physical city), and include the rural areas and smaller urban areas from which people commute to the core urban area.

The Urban Area, is the physical city, defined by the full extent of contiguous urban development. It is surrounded by rural land (all non-urban land is rural) or bodies of water. Built up urban areas are defined by their city lights visible from a high-flying airplane at night. They are not jurisdictions, such as municipalities, provinces or states, but are defined by where development meets rural areas. Few countries designate urban areas, but the advent of satellite photography and web applications like “Google Earth” make it possible to identify their geographic expanse. In combination with the rapidly improving international census data available on the internet, it is also possible to estimate populations within the urban peripheries.”
Dijkstra and Poelman, 2014.

“... distinguishes three types of [local administrative units]: densely, intermediate and thinly populated areas.”

1 Densely populated area: (alternative name: cities)
   • At least 50% living in high-density clusters (alternative name: urban centre).

2 Intermediate density area (alternative name: towns and suburbs)
   • Less than 50% of the population living in rural grid cells; and
   • Less than 50% living in a high-density cluster.

3 Thinly populated area (alternative name: rural area)
   • More than 50% of the population living in rural grid cells.”

“High-density cluster: Contiguous grid cells of 1 km$^2$ with a density of at least 1,500 inhabitants per km$^2$ and a minimum population of 50,000.”

Dijkstra et al., 2018

“national definitions of urban and rural areas as reported to the UN are not suitable for international comparisons”

“The degree of urbanisation identifies three types of cells using on a 1 km$^2$ grid

1. An urban centre consists of contiguous grid cells with a density of at least 1,500 inhabitants per km$^2$ and has at least a total population of 50,000; gaps in this centre are filled and the edges are smoothed with an iterative application of the majority rule (if five out of the eight surrounding cells are part of an urban centre, this cell is added to the centre).

2. An urban cluster consists of contiguous grid cells with a density of at least 300 inhabitants per km$^2$ and at least a total population of 5,000; and

3. Rural grid cells: grid cells outside urban clusters.”

These are the basis of the definition employed by the European Union (https://ghsl.jrc.ec.europa.eu/ucdb2018Overview.php).

IDFC (Tandel et al., 2016)

“India has two official modes for classifying urban and rural areas. The ... administrative definition, is based on whether a settlement has an urban or rural local body. The default classification of a settlement is rural and it becomes urban only if the state government converts it through requisite legal processes including notification... All residual settlements, which are governed by panchayats, are administratively rural.”
“The second ... definition ... is employed by the Census of India ... includes all administratively urban settlements, which the Census refers to as Statutory Towns, together with all ‘Census Towns’ (CTs) and ‘Urban Outgrowths’ (OGs). CTs are administratively rural settlements that the census deems urban using criteria of having at least 5,000 inhabitants, at least 400 people per sq km, and at least 75% of the male main working population engaged in non-agricultural pursuits. OGs are viable units contiguous to towns and possess urban features in terms of infrastructure and amenities. Thus, the administrative definition of urban is a subset of the census definition. CTs and OGs are areas that the Census of India considers urban, but are governed as rural.”

“the current definition used for identifying urban and rural areas and channeling funds for development schemes may not be qualified for the role ... it may be better for policymakers to rely on criteria that can be measured objectively.”

Anthony Gad Bigio, George Washington University

“Forget administrative boundaries. To me the most reliable approaches are the satellite observation of urban footprints, where contiguity of built-up areas and density of built-up vs. open space per observation unit allow the definition of what's urban and what's not. Numerical thresholds get established for that purpose. Lamont-Doherty has some excellent work in that area. Also European Space Agency. But you probably don't want to get lost in the weeds.

“The problem is that such an approach is not backed up by the statistical data that all countries compile and then gets aggregated regionally/globally by UNDESA. So we end up working with that, as universally accepted, but with plenty of disclaimers every time.”

Online

https://www.nationalgeographic.org/encyclopedia/urban-area/

“An urban area is the region surrounding a city. Most inhabitants of urban areas have nonagricultural jobs. Urban areas are very developed, meaning there is a density of human structures such as houses, commercial buildings, roads, bridges, and railways.”


“belonging to, or relating to, a city or town.”
Appendix C
Lagos, Nigeria: the Future of Urbanization in Africa

“We have to come to [Lagos] to see how things will evolve over the next ten to 20 years”

Google CEO Sundar Pichai, speaking in Lagos in 2018

Globally, urban populations rose more than tenfold from 1900 (about 220 million) to 2000 (2.84 billion; UNFPA 2007). Although urbanization in Africa has been slow, compared to much of the world, it is not a new phenomenon. Great Zimbabwe is one of the better-known sub-Saharan examples of pre-colonial city life in the continent. Yet most of these centers were small, and by most populations standards used today, would not be defined as “urban.” Although some of these centers had stone walls, permanent populations that included administrative and commercial functions, and built fortifications for defense, they typically only had a few thousand residents. However, Africa is now urbanizing more rapidly than any other part of the world. Shortly after 2030, more than half the population of the continent will live in cities, a shift that has recently occurred in Nigeria (United Nations, 2019).

Lagos is described in detail by Mabogunje (1968). Begun as a fishing and agricultural center, probably in the 17th century. Its population in 1800 was still only a few thousand (Figure C1), but grew mid-century as the city became increasingly important to the slave trade. The population was greatly enhanced by arrival of freed and escaped slaves under and the growth of business under British colonialism. Swamp draining in the 1920s led to improved public health. Employment opportunities drew many more internal immigrants (some of them examples of circular mobility – temporary movement to the city to maximize economic opportunities; Awumbila, 2017). By the 1960, the population (already over one million) was considered “over-urbanized” (Mabogunje, 1968). In 1991, during a period of military rule, Abuja replaced Lagos as the capital (Campbell and Page, 2018).

Figure C1. Past and projected population for Lagos, Nigeria. Data up to 1963 are from Mabogunje (1968) and from 1965 to 2035 from United Nations, Department of Economic and Social Affairs, Population Division (2018). Long-term projections are from Hoornweg and Pope (2017).
Today, the relatively small State of Lagos, which includes the city, is the most populous in Nigeria and an economic powerhouse. It’s GDP, the 7th largest in Africa, is bigger than that of several African countries, including some seen as particularly promising (Nigeria as a whole is the largest). The city of Lagos is Nigeria’s largest commercial center, responsible for some 60 percent of Nigeria’s entire industrial and commercial business according to the State governor (Rosen, 2018). Presumably, much of the impressive level of internet penetration in the country – at nearly 120 million users (almost 60% of the population in 2019, according to Internet World Stats [https://www.internetworldstats.com/stats1.htm]) – is due to urban users, many of them in Lagos which has become the local digital innovation hub. “Lagos has provided a template for the whole of Nigeria” (Pilling, 2018). It exceeds the national rates in literacy, access to water, mobile phone numbers, and car ownership (Pilling, 2018).

![Figure C2. Relationship between city population and education level in Nigeria. Data are averages of regional data taken from the 1952 census of Nigeria (Mabogunje, 1968). The line shows the linear trend of improved education with larger city size.](image)

The decades-long educational advantage of large cities in Nigeria (Figure C2) and the economic opportunities continue to act as attractors. But, as with many African cities, the development has been organic and mostly unplanned – what Pieterse and Parnell (2014) termed “informal mode of urbanization.” Lagos generally offers poor quality of life, with most of its residents living in unregistered structures, suffering from poor transportation and drainage, poor access to the electrical supply and medical care, and unplanned, uncontrolled growth. “Subsistence urbanization” (Breese, 1966) is common and corruption is rife. According to the World Bank (2015), two thirds of residents live in slums. Low income from taxation means local government cannot fund basic services (Pilling, 2018; Rosen, 2018). In addition, the location of Lagos on the southern coast makes it particularly susceptible to climate-driven sea-level changes, something the government is doing little to address (Campbell and Page, 2018). In a 2019 ranking by the Economist Intelligence Unit (https://www.cnn.com/travel/article/worlds-most-livable-cities-2019-trnd/index.html), Lagos was recently identified as the second least livable major city in the world – behind only Damascus, Syria. How it could possibly meet the needs of the 88 million residents projected for the end of this century (Figure C1), when Lagos is anticipated to be the densest city on the planet (Hoornweg and Pope, 2017), is unclear.
Appendix D

China and the United States: Alternative Models for Urbanization

Early cities appear in what is now China well over 3,000 years ago. In 1954, a Chinese census reported by Shabad (1959) lists the urban population to be over 77 million, slightly over 13% of the total population, with Shanghai leading with 6,204,417, Peking next at 2,768,149, and Tientsin third with 2,693,831. A total of 103 cities had a population > 100,000 and an additional 48 at 50,000-100,000 (Shabad, 1959). Twentieth century Chinese socialism emphasized industrialization, initially without substantial urban growth (Lin, 1998). The 1954 value was an increase over the 10 percent reported in 1949, but by 1978 was still below 20 percent (Ren, 2013). Afterwards, development was rapid and provided a much higher standard of living for residents than in surrounding rural areas (Wang and Zuo, 1999). Initially, the overall process of urbanization in China was not materially different from that in other rapidly developing countries in that much of the process was driven more by the response of the population to perceived opportunities than by design. The Communist Party established a Household Registration System intended to reduce internal migration (Xiao et al., 2018) and tried to discourage it further by reducing state-subsidized education and healthcare benefits for migrants and their children. Despite government disincentives, a large internal migration of rural residents was attracted to improved urban conditions (Wang and Zuo, 1999), and by 2010, half the Chinese population was urban (Ren, 2013).

General fiscal and political decentralization began in the 1990s. At the same time, government policy shifted to an urban focus (Ren, 2013). The Household Registration System was partially abolished in 2014, when a National New-type Urbanization Plan was issued (Chen et al., 2018). By 2017, nearly 60% of China’s population was urban and urbanization quality has generally improved, particularly in eastern, coastal areas (Xiao et al., 2018) that had strong connections with the world outside China (Doulet, 2008) and higher economic productivity (Zhang et al., 2019). The massive investment in infrastructure also created major environmental issues such as lowered air quality and related illnesses, as well as created urban poverty and “subsistence urbanization” (Breese, 1966; Ren, 2013).

Urban planning is a global discipline attempting to address some of the challenges involved in urban growth. However, government oversight in China is stronger than in comparable countries such as India (Biau, 2007). Whereas urbanization in most countries is primarily a market-driven process, China’s recent urban expansion, which has been extremely rapid and centrally instigated, “is mainly led and monopolized by the local government” (Xiao et al., 2018). The result has been creation of “ghost cities,” over-expanded urban developments that are mostly complete but where habitation has greatly lagged (He et al., 2016; Lu et al., 2018). By some popular media reports, about a fifth of all houses in China currently stand empty (e.g., https://www.scmp.com/business/china-business/article/2172413/fifth-chinas-urban-housing-supply-lies-empty-equivalent-50). In fact, a combination of a graying population, weak housing...
demand, oversupply, rising real-estate prices, and population mobility has resulted in a poorly reported pattern of urban *shrinking* in a substantial number of (mostly central) Chinese cities (Zhang et al., 2019). Nonetheless, most are growing rapidly, and central and regional government initiatives regularly lead to the construction of new cities planned for populations of over 1 million people (Doulet, 2008).

The American model of urbanization is markedly different in several important ways. Although the two countries are similar in having planning as part of the process, urban planning in the US is both more variable among locations, which have much greater independence in all steps of the process, and less intrusive. The Chinese model gives less attention to individual freedoms and environmental sustainability, but may be aimed at outcomes likely to occur further in the future. The American model is primarily reliant on private investment and corporate initiatives, whereas Chinese urban development is primarily organized, funded, and executed more centrally.

In the context of foreign aid, this contrast can be important in two primary ways. First, most developing country cities develop more organically and with less planning than either model. All else being equal, the more flexible American model is likely to be more attractive than the rigid Chinese one, and the local involvement in the planning and execution more clearly benefit native inhabitants. However, with China offering more development assistance in many sectors, their model is competing in an uneven arena, with potential security implications. Second, understanding modern Chinese urban planning may offer insights into the unconscious thought processes of Chinese officials involved in foreign aid.
Appendix E

Examples of Urban Interest and Potential Burden Sharing Partners


2. Starting in 1981, the Urban Institute at the MacArthur Foundation ([https://www.urban.org/](https://www.urban.org/)) has been looking at urban issues – primarily social issues within the US, though insights might have relevance internationally.

3. Africities ([https://www.africities.org/](https://www.africities.org/)) is a tri-annual meeting of the United Cities and Local Governments of Africa (UCLG Africa), starting in the 1980s.


5. C40 ([https://www.c40.org/about](https://www.c40.org/about)), which currently holds almost 100 megacities, more than 650 million people, and about a quarter of the global economy, was established in 2005 and focuses on climate resiliency.

6. World Smart Sustainable Cities Organization (WeGO; [http://wego.org/?ckattemp=1](http://wego.org/?ckattemp=1)) has been active since 2010.

7. The Rockefeller Foundation has had its “100 Resilient Cities” since 2013 ([http://www.100resilientcities.org/](http://www.100resilientcities.org/)). However, 100RC will wind down starting August 1, 2019.

8. The Strong Cities Network ([https://strongcitiesnetwork.org/en/](https://strongcitiesnetwork.org/en/)) was established in 2015 and mostly includes mayors in Western Europe. It is “managed and facilitated by the Institute for Strategic Dialogue” ([https://www.isdglobal.org/](https://www.isdglobal.org/)).


10. The National Institute of Standards and Technology has an international initiative to “distil … a consensus framework of common architectural features to enable smart city solutions that meet the needs of modern communities” ([https://pages.nist.gov/smartcitiesarchitecture/](https://pages.nist.gov/smartcitiesarchitecture/));


12. The Center for Strategic and International Studies released an April 2019 report entitled “The higher road: Forging a US strategy for the Global Infrastructure Challenge.” That same day, the Brookings Institute, through its Global Cities Initiative (jointly with JPMorgan), held a talk entitled “the global cities agenda and lessons from Milan: A conversation with Mayor Giuseppe Sala;”

13. The International Food Policy Research Institute hosted an event entitled “Urban Food Systems for Better Diets, Nutrition, and Health” on Friday, May 17, 2019

14. The National Science Foundation has awarded funding for a series of urban conferences to be held during the summer of 2019.

15. World Resource Institute Ross Center for Sustainable Cities ([https://wrirosscities.org/our-work](https://wrirosscities.org/our-work)) works to “create more prosperous, livable cities.”
Appendix F

Analyses of Challenges and Opportunities of Urbanization

The information presented in the text is supported by a series of statistical and graphic analyses conducted specifically for this document. In order to keep the text less technical, supporting analyses are presented in this Appendix and only their conclusions are presented in the text.

Democracy, Human Rights, and Governance (DRG)

Figure F1. Urbanization level in 2018 and two measures of DRG. Triangles represent 171 nations for which data exist in both databases. A: participatory democracy index. B: public sector corruption. The trend line shows the statistically significant and positive relationship. However, once GDP is accounted for, the correlation with the participatory democracy index disappears completely and that with public sector corruption becomes much weaker.

Economic growth and Environmental Sustainability

The data in Figure 4 of the text comprise 33 countries included in the World Bank’s World Development Indicators database. Included are all countries (N = 21) for which data on both indicators are found for the entire period 1960-2018. Because there were few data for the low (0 - 20 percent) and the high (85 - 100 percent) end of the urbanization range, we also added all countries (N = 12) for which data spanned > 5 years and helped fill in those ranges. Small island nations where the entire population lives in one urban center were excluded. Red: African countries (Benin, Burundi, DR Congo, Ethiopia, Gabon, Madagascar, Rwanda, South Africa); light blue: Asia (India, Republic of Korea, Malaysia, Philippines, Thailand); cyan: Central American and the Caribbean (Costa Rica, Dominican Republic, Guatemala, Honduras, Panama, Puerto Rico); green: South America (Argentina, Chile, Ecuador, Peru, Uruguay); magenta: North

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3 Participatory democracy index: r = 0.033, p > 0.6. Public sector corruption: r = 0.130, p = 0.096.
Counterintuitively, a nation’s urbanization level is positively related to its sustainability and more urbanized countries show better overall sustainability\(^4\). However, both parameters are related to national economics\(^5\). A more sophisticated analysis shows that urbanization does not consistently affect biodiversity either positively or negatively\(^6\). Although poorer countries tend to also be less urban and more food-insecure (Ware and Kramer, 2019), the relationship between urbanization and CO\(_2\) emissions persists after per-capita GDP is factored out\(^7\). Nations with high urbanization levels show higher CO\(_2\) emissions. Within the dataset described in the text, urbanization and CO\(_2\) emissions are highly and positively correlated (rho = 0.869, p < 0.001).

All too often, urbanization results in loss of green space (Nowak and Greenfield, 2018; Girma et al., 2019). However, cities that are designed with urban biodiversity in mind contain “green infrastructure” which offers habitat for wildlife at the same time that it offers green space conducive to human well-being (Stone, 2012; Lewis et al., 2019). Creating green spaces as part of a developing world urban improvement project for reasons of human physical and psychic health would also, if thoughtfully implemented, have positive biodiversity impacts.

**Urbanization and education**

Given the crucial importance of education to individual outcomes in developed countries, the question arises whether this is also the case globally. This is indeed the case for 184 countries (Figure F2). More urbanized countries show a significantly higher level of education, and this relationship holds once GDP is statistically controlled for\(^8\). In other words, urbanization appears to allow higher educational attainment. This finding is consistent with those of Montgomery et al. (2003, pp. 161-163), who documented better educational outcomes for urban children and adults and better outcomes in large cities than in smaller ones across 16 countries.

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\(^4\) Urbanization level: 2018 levels reported by the World Bank. Sustainability index: ESI calculated by NASA’s Socioeconomic Data and Applications Center for 22 countries identified by Ware and Kramer (2019) as having especially low and particularly high levels of food insecurity (non-parametric correlation. Spearman’s rho = 0.43, p = 0.046).

\(^5\) A partial correlation controlling for GDP shows no significant relationship between urbanization and sustainability at the national level (P > 0.3).

\(^6\) Principal Component Analysis (Appendix I) of economic status, including urbanization, and biodiversity, including sustainability. There was no correlation between the two factors (p > 0.8).

\(^7\) Partial correlation between urbanization and CO\(_2\) emissions, accounting for per-capita GDP: partial correlation r = 0.607, p = 0.04.

\(^8\) Urban and economic data from World Bank, database: World Development Indicators. Education Index taken from UNDP (http://hdr.undp.org/en/data#). Spearman’s non-parametric correlation: Rho = 0.625, two-tailed p < 0.001. Partial correlation correcting for GDP: df = 175, r = 0.441, p < 0.001.
Urbanization and human health

In the most recent data available, the cross-nation relationship between urbanization level and life expectancy (Figure F3) is positive and highly statistically significant\(^9\).

If more affluent countries offer better health care, however, then differences in life expectancy may not actually represent an effect of urbanization. However, accounting for national economic output, urbanization nonetheless appears to allow better health outcomes, as measured by longevity\(^{10}\).

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\(^9\) Spearman’s non-parametric correlation (n = 196 countries, rho = 0.630, 2-tailed \(p < 0.001\)). The same is true when the analysis is conducted at the level of regions (n = 46 regions, Spearman’s rho = 0.859, 2-tailed \(p < 0.001\)).

\(^{10}\) We conducted a partial correlation analysis that accounts for the effect of country per-capita GDP, with no change in the conclusions (n = 183 countries, \(r = 0.581\), 2-tailed \(p < 0.001\)). The same is true for regions (n = 43 regions, \(r = 0.860\), 2-tailed \(p < 0.001\)).
Urbanization and humanitarian assistance

In 2017, USAID was engaged with over 50 countries, providing food assistance to tens of millions of people. Although there is clearly room for improvement (USAID, 2019), the agency appears further ahead of the State department as a whole in both formulating and assessing a strategy. According to its latest summary (Table F1), about 14 percent of 173 projects in 43 countries and funded for $2.88 billion went to a variety of projects identified as urban in recent years. Urban funding was unrelated to the receiving country’s urbanization level or economic output, however\(^1\), presumably representing the presence of other indications of need or use of unrelated considerations.

Table F1. Summary of recent USAID urban funding provided by the Office of Land and Urban in the Bureau of Economic Growth, Education, and Environment.

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Awards</th>
<th>Percent of Total (Award Count)</th>
<th>Percent of Total (Award Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan &amp; Pakistan</td>
<td>15</td>
<td>9%</td>
<td>20%</td>
</tr>
<tr>
<td>Africa</td>
<td>40</td>
<td>23%</td>
<td>18%</td>
</tr>
<tr>
<td>Asia</td>
<td>29</td>
<td>17%</td>
<td>12%</td>
</tr>
<tr>
<td>Europe &amp; Eurasia</td>
<td>19</td>
<td>11%</td>
<td>6%</td>
</tr>
<tr>
<td>LAC</td>
<td>39</td>
<td>23%</td>
<td>13%</td>
</tr>
<tr>
<td>Middle East</td>
<td>18</td>
<td>10%</td>
<td>8%</td>
</tr>
<tr>
<td>Worldwide</td>
<td>13</td>
<td>8%</td>
<td>23%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>173</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td><strong>14%</strong></td>
<td><strong>14%</strong></td>
</tr>
</tbody>
</table>

Urbanization, Peace, and security

Older literature cited in Oosterveld et al. (2018) found that nations with higher urbanization rates had lower overall homicide rates in the mid-1990s. However, this relationship does not hold using data from 2017\(^2\) or for the larger 2010 dataset\(^3\). The average urbanization rate in the

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\(^1\) Rho = 0.057, p = 0.719 for 42 countries. When GDP was accounted for, r = 0.045 and p = 0.783 for 38 countries for which data exist.

\(^2\) For 2017, the relationship between urbanization rates (World Bank data) and homicide rates (from United Nations Office on Drugs and Crime) of 73 nations was negative but far from statistical significance (r = -0.076, p ≈ 0.7). Non-parametric analysis produced similar results (rho = -0.168, p ≈ 1.1).

\(^3\) A sample of 169 nations was available for 2010. However, the correlation between national urbanization rates (World Bank data) and homicide rates (from United Nations Office on Drugs and Crime) remained far from
six countries with homicide rates of 40 per 100,000 citizens or higher was 59 percent, compared to an average homicide rate of 5.9 and urbanization of 58 percent for the remaining countries, also supporting the view that there is no relationship between the two factors and that economic prosperity is a much more robust immediate predictor of violence. Reported correlations, then, likely result from the positive impact that urbanization has on per capita incomes.

**Urbanization and gender**

Assessing gender equality using multinational comparisons is difficult. Using data on urban percentage and per-capita GDP in 2018 (from the World Development Indicators database of the World Bank) and a gender index (data from World Economic Forum 2018 global gender gap report) shows no significant trend among 148 countries (Rho = -0.13, p = 0.115; When corrected for GDP, N = 111 countries, r = -0.002, p = 0.981). Few data exist that would allow numerical intra-country analyses, but what is there suggests that urban settings allow women greater opportunity, freedom, and equality.
Appendix G

Implications of Urbanization for Climate Vulnerability

Cities are particularly vulnerable to some effects of climate change. According to one recent analysis, by 2050, over three quarters of the cities in the world will experience “a striking change in climate conditions (Bastin et al., 2019). Over one fifth “will experience climate conditions that are not currently experienced by any existing major cities,” and both the likelihood and the magnitude of the shift will be especially large in areas relatively close to the equator – in Africa, Asia, and South America (Bastin et al., 2019).

Intense heat waves are occurring more frequently and are more extreme (IPCC, 2019). Because of heat island effects caused by large areas of dark, unshaded surface, cities tend to be warmer than surrounding rural areas (Rosenzweig et al., 2018). Thus, heat waves can be particularly devastating in urban centers, which host large numbers of particularly vulnerable people in small areas (Singh et al. 2019). Moreover, particularly susceptible urban dwellers may not only live in inadequate dwellings but also be geographically further away from family which can support them in an emergency and therefore more greatly reliant on whatever social safety net exists locally (Singh et al. 2019). Proper design, including added “green infrastructure” that provides shade among other benefits can help reduce such impacts.

Both droughts and floods are also on the increase. Many urban areas with populations in the millions are already or will be soon facing water stress (Hofste et al., 2019). Recent news about Chennai, India and Cape Town South Africa running out of water, as well as about Mexico City, Mexico subsiding because of overdraw of underground water resources served to highlight this challenge. Extremely high stress, the highest category affects 33 cities housing over 250 million people today and 45 cities / almost 470 million people by 2030 (Hofste et al., 2019). Proper design and allocation adjustments can help reduce the stress. A combination of unwise expansion into floodplains and extreme rainfall is increasing the frequency and impact of urban flooding, especially in poor countries and disproportionally impacting urban poor (Douglas et al., 2008). Flooding and drought in rural areas also impact urban centers, both through influencing food supplies for urbanites and by motivating climate refugees to migrate to cities.

Finally, coastal areas, which are home to hundreds of millions of people, are increasingly susceptible to sea-level rise and storm damage (Rosenzweig et al., 2018). Since many cities began as major ports and many others are located near the sea, this puts many cities at risk, even before future increases in sea levels are taken into account. Recent events in Mozambique help underscore how devastating such impacts can be to a developing economy and its people. Fairly simple approaches can offer short-term help, but long-term solutions require adaptive approaches that are both costly and slow to implement (Rosenzweig et al., 2018). To the extent that these can be built into ongoing development, which is often underway or desperately needed in developing countries, such approaches can be especially cost-effective, however.
Appendix H

Zika as an example of urban disease

Zika is a mosquito-spread viral disease which hit the news during a recent outbreak in 2015-2016. It was originally isolated in Uganda in 1947 and the first documented human case was reported in 1952. Until the early 2000s zika was limited to equatorial areas, primarily in Africa (where it continued expanding) but also southeast Asia – it apparently spread to Malaysia in 1945 and then Micronesia around 1960 (Faye et al., 2014). French Polynesia reported a major outbreak in 2013, affecting > 10% of the population who sometimes also suffered from a devastating neurological aftermath, Guillain–Barré syndrome (Roth et al., 2014). Transmission to South America, near-simultaneously documented in 2015 from two Brazilian cities, apparently occurred via further spread in the Pacific (Figure 2 of Gatherer and Kohl, 2016). The spread to Brazil is what captured media attention, both because of the scope – an estimated 1.5 million cases – and the birth of thousands of microcephalic babies.

It quickly spread to North America, with 62 cases reported in the US in 2015 (all in travelers returning from affected areas) and over 5,100 cases in 2016 (almost 5,000 of them in travelers). In the mainland US, local transmission was primarily reported in Florida, but also Texas (CDC, https://www.cdc.gov/zika/reporting/2016-case-counts.html). Over 36,000 cases were reported from US territories including Puerto Rico, American Samoa, and the US Virgin Islands. Response to Zika, specifically, has been well funded by the USG (over $1 billion allocated to CDC and others), WHO, and others. According to a GAO report, “one-time funding and a short time frame,” as well as the need “to establish relationships with key host country officials,” hampered USAID response.
Why is this particularly relevant to urbanization?

Zika is typical of many diseases (e.g., dengue and chikungunya) that are found in both urban and rural settings:

1. It quickly spreads internationally via the growing international transportation network, creating a significant public health impact and a national security concern. (Incidentally, at least some diseases that affect farm operations show similar dependence on transport pathways – for example, African swine fever; Suguiria and Haga, 2018)
2. It first arrives in a country in urban settings (via ports, airports; e.g., Lourenço et al., 2017)
3. It spreads quickly because human population density is high
4. It reaches much higher incidence rates than in rural areas (almost double in the case of Pereira, Colombia: Rodriguez-Morales et al., 2017).
5. Disease irruption in developing countries can be followed by major social and economic disruption which can ultimately lead to social and political unrest. In the short term, emergency relief aid is often called for. Spread to the US, as in the case of Zika, can additionally pose national security concerns and long-term and widespread health consequences.
Appendix I

Principal Component Analysis (PCA) of Urbanization and Biodiversity

What is PCA?

Most statistical analyses assume that the parameters being compared are independent of one another, but this is not true. For example, an individual’s height and weight are related to one another, but both are also related to age. An analysis that does not account for this risks reaching incorrect conclusions. Principal Component Analysis (PCA) is a statistical method for reducing intercorrelations within large datasets in which multiple parameters are not independent of one another.

The current analysis

As indicated in 3.a.i, a nation’s urbanization level appears positively correlated with its sustainability index, using the dataset described below. However, there are many reasons to expect both parameters to be correlated with a nation’s economy. Other parameters that might be of interest are also likely to be intercorrelated. To statistically account for this, we used a PCA.

The dataset

We focused on 22 countries identified by Ware and Kramer (2019) as having especially high or low food insecurity risks. The dataset also included information on CO₂ emissions for those countries. We added information on percent urbanization and per-capita GDP in 2018 from the World Bank’s World Development Indicators dataset (http://datatopics.worldbank.org/world-development-indicators/), the National Biodiversity Index (NBI) calculated by the Convention on Biological Diversity (https://www.cbd.int/gbo1/annex.shtml), and the Environmental Sustainability Index (ESI) calculated by NASA (https://sedac.ciesin.columbia.edu/downloads/data/esi/esi-environmental-sustainability-index-2005/2005-esi-esi-only-countries.xls).

Results

The PCA identified two principal components with strong support (as indicated by an eigenvalue > 1). Component 1, which explained 68.6 percent of the variance in the original dataset, had strong loadings for the five economic variables (Table 11). Component 2 explained an additional 14.6 percent of variance and was primarily related to measures of biodiversity.
Table 11. Component matrix output from the PCA. Values close to 1 (regardless of sign) indicate a strong relationship, whereas those close to 0 indicate little relationship.

<table>
<thead>
<tr>
<th></th>
<th>Component 1</th>
<th>Component 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food insecurity</td>
<td>.973</td>
<td>-.059</td>
</tr>
<tr>
<td>CO₂ emission</td>
<td>.929</td>
<td>-.071</td>
</tr>
<tr>
<td>CO₂ score</td>
<td>-.954</td>
<td>.081</td>
</tr>
<tr>
<td>Percent urban</td>
<td>.935</td>
<td>.011</td>
</tr>
<tr>
<td>GDP (2018)</td>
<td>.914</td>
<td>.145</td>
</tr>
<tr>
<td>Biodiversity (NBI)</td>
<td>-.218</td>
<td>.888</td>
</tr>
<tr>
<td>Sustainability (ESI)</td>
<td>.568</td>
<td>.444</td>
</tr>
</tbody>
</table>

Extracted factor scores for the two components show no relationship (rho = 0.059, p ≈ 0.8).

**Conclusion**

Although it typically reduces native biodiversity, urbanization does not consistently affect overall biodiversity either positively or negatively. The overall impact is context-specific.
Appendix J
Assessment of Candidate Countries for “Deep Dives”

Country Selection Methodology

To limit the scope of the project but make it as representative as possible, we chose to include two countries from each State Department region where foreign assistance is provided (Africa, East Asia and Pacific, Near East, South and Central Asia, and Western Hemisphere, but not Europe). We identified candidates based on the criteria listed in the next section.

Criteria

Countries for the initial list were chosen based on five criteria:

1. Defined urbanization challenges and changes;
2. Variation in profiles to enable cross-case comparison;
3. Regional variation;
4. Significant level of U.S. foreign assistance in multiple sectors; and
5. Ability to engage with U.S. country team/mission.

Briefly, countries may face unique challenges at various points of urban development. By using countries at different positions along the development path we hope to learn important lessons we can generalize to other countries at similar junctures. For example, Indonesia is more urban than Bangladesh and both are ahead of Ethiopia and Mozambique. Nonetheless, local cultures and developmental trajectories, as well as hard-to-predict exogenous shocks such as war, famine, disease, and natural disaster can significantly alter those paths. Choosing a geographically diverse group and two countries within each region acts as a hedge. Additionally, countries that are population outliers (i.e., India and China at the high end, small island nations at the low), as were upper middle to upper income countries, were excluded from consideration.

Selection Process

For each of an initial set of 56 candidates thus identified we produced a country information sheet (see below). Data were derived from the United Nations World Urbanization Prospects (2018) dataset, which contains estimates and projections of the urban and rural populations for all countries of the world, and of their major urban agglomerations. To avoid conscious or
unconscious bias\textsuperscript{14} we removed the name of the countries prior to handing these sheets to ten scorers who were asked to rank the countries within each region based on their likely contributions to the study\textsuperscript{15}. Based on their scores and additional discussions with F/P, we reduced the list to ten finalist countries (5 regions, two in each). These were then presented to and approved by the USG advisory committee multiple times to illicit input and feedback. The advisory committee is made up of stakeholders from HUD, OPIC, State, and USAID. Finally, we sought input from the Bureaus, which generally consulted with the identified countries before providing input. The list below is the final result of that process.

**Selected Countries** (see below, in alphabetical order)

Africa: Ethiopia, Mozambique
EAP: Philippines, Vietnam
NEA: Jordan, Morocco
SCA: Bangladesh, Nepal
WHA: Colombia, Peru\textsuperscript{16}


\textsuperscript{16} The southern triangle countries (Guatemala, Honduras, and El Salvador) ranked highly in the data visualization but were omitted from consideration out of uncertainty regarding future aid.