



# WRONG ABOUT URBANIZATION?

---

HOW EMERGING  
FACTORS COULD  
SHIFT PEOPLE AWAY  
FROM CITIES

---

**November 2018**  
Oscar Serpell

**Kleinman Center for Energy Policy**  
UNIVERSITY OF PENNSYLVANIA | SCHOOL OF DESIGN

# WRONG ABOUT URBANIZATION?

## HOW EMERGING FACTORS COULD SHIFT PEOPLE AWAY FROM CITIES

Oscar Serpell November 2018 [kleinmanenergy.upenn.edu](http://kleinmanenergy.upenn.edu)

More than half of the world's population now lives in urban areas. By 2050, that figure will have risen to 6.5 billion people—two-thirds of all humanity.

UNITED NATIONS SDG #11

By 2050 the world urban population is expected to nearly double, making urbanization one of the 21st century's most transformative trends.

THE NEW URBAN AGENDA, HABITAT III

## INTRODUCTION

It is widely assumed by experts that over the next half century the world's urban populations will experience significantly higher rates of growth than rural populations will experience, thus leading to a shift in the rural–urban population ratio. Belief in this global transition, known as urbanization, is exemplified by the statements

above from two of the most important sustainability documents released this decade.

In North America, the population has jumped from 50% urban in 1950 to over 80% urban today, and recent census trends reveal an ongoing concentration of population and economic wealth into cities throughout the world (Bloom et al. 2018).

This trend toward population densification has far-reaching implications for environmental, economic, and social sustainability efforts around the globe.

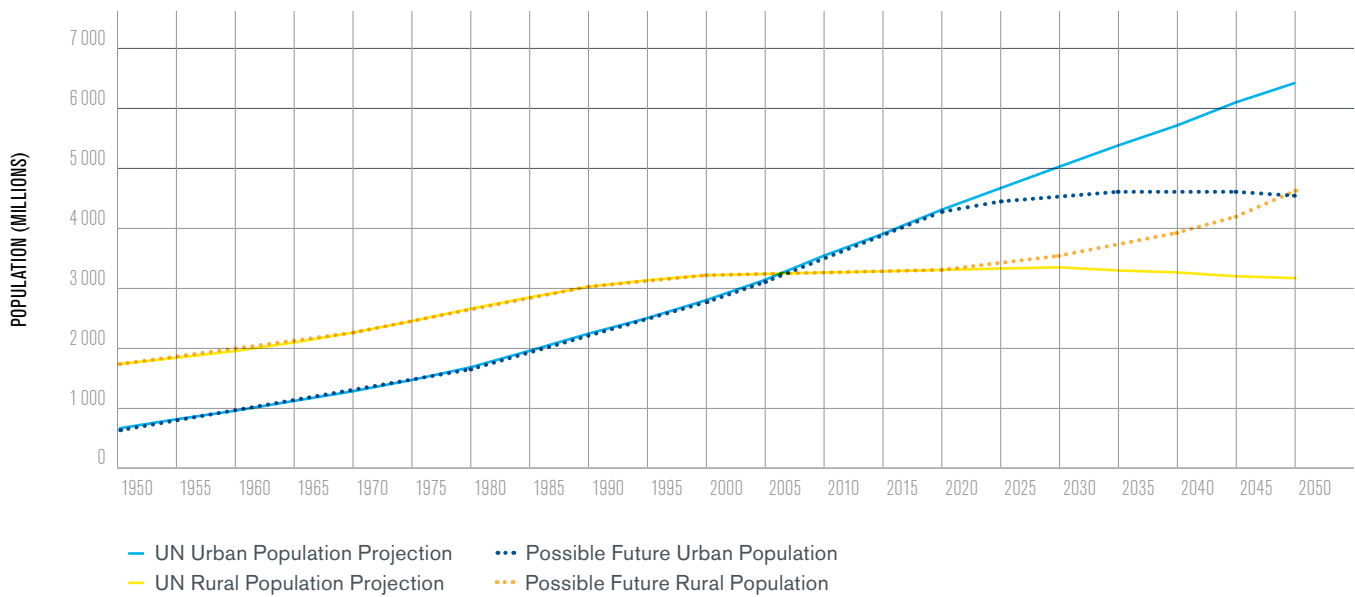
On a per capita basis, urban populations are typically less directly energy intensive and have a much smaller land use footprint than rural communities of a similar socio-economic strata (Arbabi & Mayfield, 2016).

In an urbanized world, more land is available for agriculture, energy infrastructure, and protected natural land, theoretically lessening humanity's demand on the planet's limited resources.

Population density within urban areas also reduces the per capita energy demand of transportation and resource distribution. Infrastructure, such as electricity grids and pipeline networks, are more easily maintained within cities, reducing the reliance on wood and oil for cooking and heating, thereby substantially reducing emissions per unit of energy (Sadorsky, 2014). Consolidated cities and urban districts are also conducive to strong local governance. This allows cities to implement experimental and innovative local efforts to address the world's most pressing energy and environmental challenges, while maintaining accountability and inclusivity via direct partnership with local citizen action groups (Habitat III, policy unit 4, 2016).

The New Urban Agenda, the UN's Sustainable Development Goals, and many other cooperative



**FIGURE 1: THE WORLD'S URBAN AND RURAL POPULATIONS, 1950–2050**

UN projections of urban and rural populations (solid lines), and possible future populations should emerging drivers reverse the rate of urbanization (dotted lines).  
Image edited from the UN's 2014 World Urbanization Projections.

development efforts tout these properties of urban settlements as untapped opportunities for achieving a more sustainable future. To summarize the shared vision of these sustainability efforts; if we invest heavily in urban systems to accommodate larger populations in livable and flourishing cities, we will be able to encourage and adapt to a higher urban-to-rural population ratio, and thus reap the environmental and social benefits of centralized living.

The UN firmly believes that between now and midcentury, populations will continue to shift from rural areas to more heavily urbanized areas; and all existing population data from the last few decades shows substantial relative growth in urban areas. However, what if projections of urban growth out to mid-century are wrong? What if the current trend of urbanization doesn't continue for the foreseeable future? What would this mean for the future state of resource management, and what implications would this have on long-term sustainability initiatives today?

## THE UN WORLD URBANIZATION PROSPECTS

It is important to understand the source and methodology behind the often noted statistic that by 2050, two-thirds of the global population will live in urban areas. This projection of future urban growth comes from the 2014 revision of the UN's Department of Economic and Social Affairs "World Urbanization Prospects" document. Although many documents using this statistic suggest possible reasons for increased urbanization—such as the pursuit of education, economic opportunities, resource security, and general improvements in the quality of life—it is important to note that the UN uses no such theoretical justification for its estimates of global urbanization. Instead, the UN exclusively bases these estimates on observed historical trends in country specific census reports.

The data from these national census reports vary considerably in vintage, reliability, and even in their definition of "urban" and "urbanization." In some cases, nations have revised their definition of urban over the years, and around the world, a considerable share of the increase in urbanization comes from smaller settlements

being reclassified as urban settlements after meeting county specific political, population, or infrastructure requirements (McGranahan & Satterthwaite, 2014).

Of the 233 countries represented in the UN's 2050 projections, 65 countries use administrative designations to define urban areas, 49 use population size or density, and another 10 define an urban area based on the types of public infrastructure that exist. The remaining 109 countries use some combination of these criteria to define areas as “urban,” including 32 countries that incorporate economic criteria (UN Methodology, 2014). The UN projections make no attempt to “impose consistency in definitions across countries,” meaning that the 66% urban population predicted by the report is only reflective of country specific definitions of “urban.”

## DEFINING URBANIZATION

---

As stated earlier, urbanization is defined as the increase in the proportion of a population that lives in urban areas (McGranahan & Satterthwaite, 2014). Urban populations can grow, but this is not necessarily indicative of urbanization unless the overall population is growing at a comparably slower rate. The “rate of urbanization” describes the year-over-year change in this urban–rural ratio of the population.

For the purpose of discussion in this report, a third derivative is proposed: the “drive for urbanization.” If the rate of urbanization is positive, that necessarily means that a complex and uncertain combination of socio–economic, political, technological, and environmental factors have led to a positive “drive for urbanization.” If the balance of these factors were to shift so that the drive for urbanization turned negative, the rate of urbanization would similarly turn negative. By understanding past drivers of urbanization, and exploring possible future drivers of urbanization, it is

possible to appreciate the uncertainty of future rates of urbanization. Understanding this uncertainty is essential to interpreting the UN's statistical projections, which were based only on historical population patterns.

## DRIVERS OF PAST URBANIZATION

---

Looking back at the last century, there is an indisputable trend toward urbanization. In 1950, there were only 83 cities worldwide with a population of more than 1 million, and 30% of the world's population was urban. Today, the world is estimated to be 54% urban and there are over 500 cities with more than 1 million people (UN, 2014 & Florida, 2018). Looking specifically at China, the most populous country in the world, the percent urban has increased from just 13% in the 1950's to 50% in 2010 (Chinese Population Census). In recent decades, the global trend of urbanization has become so pronounced that urban population growth accounts for almost all global population growth (UN, 2014).

With hindsight, it is easy to recognize that this movement into cities has likely been driven by a number of observable political, social, technological, and economic changes that have also occurred over the last century. Since the industrial revolution, cities have become the engines of economic growth, the expansion of global trade has further accentuated the economic densification around air, sea, and traffic ports, and efficiency improvements in agriculture have reduced rural job prospects. Today, fewer than 600 cities are responsible for more than 60% of global GDP (Dobbs et al. 2011). In addition to economic concentration, easy and reliable access to healthcare and education have likely been factors driving people to move from remote rural areas into urban centers, especially in developing nations where access to these services is limited.



A rural farmer browses the web from a laptop. Global internet access is reducing the geographical constraints on education, employment opportunities, and access to goods.

## FUTURE DRIVERS OF URBANIZATION

While the benefits of urban dwelling outlined above may begin to explain past patterns of population densification, there are emerging technological, economic, political, social, and environmental factors that could rapidly reverse the drive for urbanization either by reducing the hardships of rural life or by accentuating some of the stresses of urban living. It is possible, though uncertain, that some combination of these factors could sufficiently counter the existing positive drivers of urbanization. If this were to occur, future land use could look very different from what the UN and many other organizations are currently predicting.

Several of these factors, especially those associated with technological change, have progressed further in developed nations than they have in developing nations where some of the highest rates of urbanization are occurring. There is, however, every indication that less developed countries will continue to progress economically and technologically, and indeed in some

instances, the rate of urbanization in less developed regions may be even more powerfully influenced by these factors, as populations circumvent some of the historical drivers of urbanization (Diop, 2017 & Harvey, 2015). Much of the uncertainty around technological drivers of urbanization has to do with how quickly these technologies can reach less developed countries where the rate of urbanization is highest.

### **JOBS & EDUCATION**

Since the industrial revolution, cities have become centers of business and industry. The concentration of economic assets into cities has meant that for decades, cities have provided better job prospects for both the working and middle class, especially as agriculture has concurrently become far less labor intensive (Lahiri, 1991). Over the last century, global exports have contributed significantly to the concentration of industry, retail, and associated job opportunities around major ports of entry (Federico & Tena-Junguito, 2016).

However, over the last two decades, the rise of the service and knowledge economy within cities and the ubiquitous use of internet-based communication has begun to decouple economic opportunity and geographic location. In the 2017 Gallup “State of the American workplace” poll, 43% of American workers reported spending at least some portion of the week working remotely; a four percent increase since 2012 (Chokshi, 2017).

There are emerging technological, economic, political, social, and environmental factors that could rapidly reverse the drive for urbanization.

As the capabilities of the internet expand to connect us in more engaging and reliable ways, the need for a centralized workforce will continue to decline for many sectors of the economy. Cloud-based data storage and telecommunication will increase opportunities to take part in the service and knowledge economy from outside of cities. This transition toward a more distributed workforce also has a number of financial benefits. For example, lower costs of living in rural communities means that salaries can be comparatively lower for non-urban employees and rental costs for urban office space can be considerably reduced (Forbes Finance Council, 2017).

Furthermore, improved telecommunication is making business travel more and more challenging to justify both financially and environmentally. Frequent air travel is one of the most emissions intensive activities an individual can take part in, and online conferencing software is making virtual business communication more effective than ever. In fact, because air travel is so difficult to decarbonize, it looks as though reduced air travel will be absolutely essential to achieving a net-zero

carbon economy (Miles, 2017). As businesses reduce the need to transport employees and partners to and from centralized airports, this could further reduce the urban concentration of economic assets.

The rise of virtual communication removes another major driver of urbanization: access to education. Dedicated online teaching organizations, online libraries, and open-access media websites mean that if you have open access to the world wide web, you can develop a basic understanding of virtually any subject without the need for formal, in-person education at urban schools. In many countries there are now degree programs that occur entirely online, and the availability of free information is constantly expanding. It is unlikely that these online services will ever completely replace in-person education at schools and universities—especially for children. However, for hundreds of millions of people the internet provides the opportunity to gain access to information, and in doing so, improves quality of life without moving to an urbanized region.

In developing countries—where only 7% of the population had access to the internet as recently as 2005—rapidly expanding telecommunication networks are connecting hundreds of millions of people a year to distributed information, education, and employment opportunities (International Telecommunications Union). As satellite, cell tower, and device technologies improve, connecting rural populations with reliable telecommunication services will become more affordable.

## DISTRIBUTED ELECTRICITY

Distributed energy generation and storage, technologies that are finally finding their legs after years of innovation, promise to remove an enormous barrier to the expansion of rural and suburban communities: access to electricity. For the first time in human history, we can realistically envision a future in which it is possible to generate and store a sufficient quantity of energy to reliably power a home using only a rooftop solar installation and a home battery.

Although still prohibitively expensive, costs for both rooftop solar and battery storage have been plummeting in recent years. If the price and efficiency of these technologies continues to rapidly improve, they could

become indispensable tools in the effort to provide hundreds of millions of rural residents with reliable and affordable electricity. These distributed technologies will begin to offer millions of people an alternative path to electrification other than urbanization. The question is how quickly, and how profoundly, it will impact the drive for urbanization over the next 50 years.

## AUTONOMOUS TRANSPORTATION

Autonomous vehicles capable of navigating roadways using cameras and sensors combined with sophisticated artificial intelligence software will soon allow people and goods to travel long distances more easily, more safely, more affordably, and more quickly than ever before.

Until recently, most of the world only had access to goods that were locally produced or available through local markets. In developing regions, this made—and continues to make—rural populations extremely vulnerable to food, fuel, and water shortages. Autonomous transportation could significantly improve the movement of essential goods across long distances and through sparsely populated regions, improving rural access to goods and reducing rural vulnerabilities. The advent of autonomous road vehicles will likely reduce the isolation caused by living in low-density areas and will reduce the proximity advantages of living in high-density urban areas.

## EXTREME WEATHER

In addition to the economic and technological drivers discussed above, there are also environmental factors that could decelerate, or even reverse, urbanization in the coming decades. For example, cities have unique vulnerabilities to extreme weather related to climate change. Heatwaves, accentuated by heat absorbent urban surfaces, have already killed thousands and brought major cities like Karachi, Pakistan to a temporary standstill (The New York Times, May 2018). Other cities such as Cape Town, South Africa are currently existing on the edge of a critical water shortage because of a lack of rainfall (Cotterill, May 2018).

In areas of the world where precipitation is expected to increase, the impermeability of urban surfaces can lead to flooding, standing water, run-off, and contamination of drinking water. In each of these scenarios, the high population density and extreme concentration of resource consumption contributes to the climate vulnerability of these communities. The results of system failure from natural disasters or chronic mismanagement could be devastating for millions of people.

Of course rural populations are faced with their own, no less significant, vulnerabilities to climate change. Both rural and urban populations are going to be significantly challenged by climate change in the coming years, and it remains uncertain whether in the long run, rural or urban systems will be more able to rapidly adapt to these challenges. On the one hand, urban systems have better emergency services than rural communities. On the other hand, the severity of urban system failure could be far greater.

## DISEASE

Ever since populations began living in large urban settlements thousands of years ago, humanity has been battling against one particularly persistent phantom of urbanization: infectious disease (Illing, 2018). Water, food, and vector borne infectious diseases naturally thrive in areas of high population density, and throughout history there are many instances of urban populations falling victim to deadly outbreaks (Cochrane, 2014). Advances in modern medicine have reduced these risks in countries with easy access to vaccinations and antibiotics; however, in many lower income countries, urbanization is occurring in the absence of available or affordable preventative health care (World Health Organization).

Sanitation also plays a significant role in preventing the spread of disease within urban areas. Unfortunately, in many of the largest cities in the developing world, these systems are absent or in disrepair, worsening the vulnerability of urban systems to disease. In the coming years, disease prevention is also likely to be challenged by the spread of disease vectors. As some areas of the planet get hotter and wetter, insect disease vectors will spread north and south to heavily urbanized regions of



the world, possibly spreading diseases that are new to those regions (World Health Organization).

Unlike disease outbreaks in past centuries, today's cities face an additional epidemiological risk because of widespread international travel (Pavia, 2007). If an outbreak occurs in one city, it is harder than ever to prevent that outbreak from jumping to other cities around the world. We caught a glimpse of exactly how this could occur during the 2014 Ebola outbreak in West Africa, which killed 11,000 people and successfully spread internationally for a brief window of time before being successfully contained (CDC). Future high-profile outbreaks could certainly act as an urban deterrent and have a negative impact on the global drive for urbanization.

## PSYCHOLOGICAL STRESS

Emotion is a powerful determinant of decision-making, and when considering possible future negative drivers of urbanization, the psychological effects of fear, anxiety, and stress should not be discounted (Lerner et al. 2015). For example, when it comes to the spread of disease, fear could be as powerful a negative driver of urbanization as the direct impacts of an outbreak.

In addition to environmental threats, the perceived safety of cities is driven by public dialogue around violent crime, geopolitical tensions, and civilian targeted attacks. Unlike random environmental disasters, terrorist attacks and acts of war are often intentionally targeted at population centers such as cities. A lost sense of security resulting from rising political tensions could impact the rate of urbanization in extremely unpredictable, and country-specific ways. Crime, or more accurately the perception of crime, within cities could also play a role in shifting future drivers of urbanization in highly uncertain directions.

## INVESTMENT

In the near future, insufficient or poorly directed investment could easily contribute to a reduced drive for urbanization. In addition to the need for new infrastructure, existing infrastructure such as bridges, roads, rail tracks, pipelines, houses, and distribution

networks in older cities will require extensive repairs (or in some cases, replacement) in the coming years. The longer these urban systems are left undealt with, the more costly they will eventually be to replace, and the more vulnerable the systems will become to failure.

These examples serve to illustrate the need for a theoretical analysis of the drivers of future urbanization that can be viewed in parallel with the UN's census-based projections.

Efforts to develop infrastructure strategies are occurring in cities around the world, but these efforts will be extremely costly and politically challenging (Sorowiecki, 2016). Ironically, cities in regions that have the least capacity for planned, sustainable investment are often the ones that are currently experiencing the highest rate of urbanization. Thus far, deferred investment has seemingly had little impact on the rate of urbanization; however, if these trends continue, the decreased livability of forgotten urban infrastructure could eventually tip the scale in favor of deurbanization.

## PREPARING FOR UNCERTAINTY

No single factor discussed above will reverse the current trend of urbanization. However, these examples serve to illustrate the need for a theoretical analysis of the drivers of future urbanization that can be viewed in parallel with the UN's census-based projections. Drivers of urbanization over the next several decades may look



extremely different than drivers of the last century. The UN projections do not qualitatively consider the dynamic factors that influence the choice to urbanize, nor the evolving definition of what it means to be “urban.” For many of the reasons outlined in this report, the UN’s urbanization projections rely on an oversimplified method of predicting future urbanization trends and should thus be interpreted as one possible future for urban development, rather than the sole outcome upon which we base our urban sustainability strategies.

## As cities and countries plan for a sustainable future, they ought to be cognizant of uncertainties surrounding urban development and patterns of population growth.

Effective sustainability plans are designed around population density realities. Urban sustainability strategies require the expansion of existing centralized infrastructure, whereas rural sustainability is achieved by finding new and efficient strategies for providing services over long distances, often through the use of distributed services and technologies. For this reason, future investment in sustainable technology should be informed by a complete understanding of possible future patterns of urbanization or deurbanization. As an example, when it comes to increasing the efficiency of transporting people and goods in an urbanizing world, tackling congestion via road or public transit infrastructure expansion might be a more effective sustainability strategy than incentivizing vehicle efficiency. For rural communities, vehicle efficiency and long-range electric vehicles would have a much

higher impact on overall emissions reductions than infrastructure expansion.

Similarly, distributed generation and energy storage become increasingly valuable in low-density settlements as the relative cost of maintaining a distribution network increases. In cities that already have a grid-connected distribution network, it is much easier to integrate new large-scale generation. Distributed energy resources in rural areas can also allow for the distribution of other critical services that require access to electricity such as telecommunication and cold storage of perishable food and medications (Serpell, 2017).

Two of the most significant sustainability documents to be produced this decade—the New Urban Agenda and the Sustainable Development Goals—rely heavily on the assumption that urbanization will progress as predicted by the UN’s 2014 World Urbanization Prospects document. Consequently, they both call for urgent investment in the expansion of urban systems. In a possible future scenario of deurbanization, these investments run the risk of becoming stranded assets.

Because the efficacy of different strategies is directly dependent on the type of development that is occurring in a region, cities ought to prioritize sustainability strategies that will provide benefits to the community regardless of future drivers of urbanization or deurbanization. These agnostic sustainability strategies will prove to be more robust in the event of unexpected future urbanization trends. Rather than continuously expanding infrastructure to accommodate possible future growth, cities should work to maximize the efficient use of existing infrastructure through local policies, adaptive design, and focused retrofitting.

Wherever possible, cities should embrace increased densification and multi-use investments rather than make irreversible investments in the expansion and specialization of spaces. For example, rather than expanding urban roads to accommodate higher volumes of traffic and reduce congestion, cities should instead consider policy incentives and regulations that will limit traffic within in the city center. This requires a lower upfront investment than road expansion and is future proof to possible future deurbanization.

Finally, as discussed early, urban populations usually have a lower energy demand versus rural populations of a similar socio-economic background. Therefore, in acknowledging the uncertainty that exists about future urbanization, the importance of emissions mitigation efforts become all the more pressing. A deurbanizing populous could significantly increase our projected energy demand out to midcentury, and further restrict our global carbon budget necessary to have a good chance of staying below 2 degrees Celsius of global warming.

## CONCLUSION

---

For decades, countries around the world have experienced rapid urbanization. Although some more developed countries are beginning to show signs of urban saturation, for much of the world the urbanization trend continues. Looking purely at historical data from national censuses and demographic surveys, it is logical to assume that this global development trend will continue for many years to come.

However, the world is constantly changing and the technological, political, social, economic, and environmental forces that drove historical rates of urbanization will not necessarily continue to drive urbanization in the future. Instead, a new set of emerging drivers could cause future patterns of urbanization to deviate dramatically from historical trends.

As cities and countries plan for a sustainable future, they ought to be cognizant of uncertainties surrounding urban development and patterns of population growth. Urban planners should prioritize investments that will improve long-term livability and sustainability of cities regardless of whether the UN's projections prove to be correct. Additionally, global efforts to limit global warming to 2 degrees Celsius must be informed by the possibility of a more decentralized and energy intensive economy. Considering the possible future drivers of urbanization, in addition to looking at historical trends, allows us to develop a more complete understanding of the geography of future development, leading us to more robust and sustainable decision-making.





## ABOUT THE AUTHOR

---

Oscar Serpell is a research fellow at the Kleinman Center for Energy Policy.

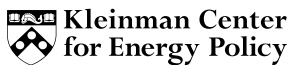
## ACKNOWLEDGMENTS

The author wishes to acknowledge the helpful comments of Dr. James R. Hines. Any remaining errors are the responsibility of the author alone.



# STAY UP TO DATE WITH ALL OF OUR RESEARCH:

[kleinmanenergy.upenn.edu](http://kleinmanenergy.upenn.edu)



---

University of Pennsylvania | School of Design  
Fisher Fine Arts Building, Suite 401  
220 S. 34th St.  
Philadelphia, PA 19104

**P** 215.573.3286

**F** 215.573.1650

[kleinmanenergy@upenn.edu](mailto:kleinmanenergy@upenn.edu)

