CENTER FOR HOMELAND DEFENSE AND SECURITY
NAVAL POSTGRADUATE SCHOOL

Argonne NATIONAL LABORATORY

HSx MODULE: URBANIZATION

June 2017

CONTEXT

- Urbanization can be defined as the general shift of populations towards urban and more densely populated areas from rural areas.
  - More than half of the world's population currently lives in towns or cities, and about two-thirds are expected to do so by 2050.
  - Megacities (more than 10 million people) will increase to 41 by 2030 (as of 2015 there were 29).
- Increasing urban populations will affect a wide range of factors.
  - *Environmental concerns*: large cities near coastal areas vulnerable to flooding and sea-level rise due to global warming; air pollution; waste management; urban heat islands.
  - *Economic concerns*: limited employment opportunities can create increased friction, strain on social welfare institutions.
  - *Health concerns*: when cities cannot support the numbers, public health crisis
  - *Infrastructure concerns*: cities may not be able to find or spend necessary money to support the influx of people.
  - *Political concerns*: countries with limited employment opportunities can fuel violence/radicalization.

CHINA'S EXPANDING URBANIZATION

- China, looking to connect multiple cities in five urban areas, would be home to half a billion people by 2020.
  - Planning urban "clusters" to incorporate multiple cities and towns.
  - Almost 500 million rural Chinese people moved to cities in past 35 years.
  - New megacity Xiongan to be built near Beijing.
- Beijing needs to address issues to prevent:
  - Worsening air quality due to industrial contamination.
  - Greater risk of public health outbreak.
    - Presence of highly pathogenic poultry viruses.
    - Increase of cancer, environmentally-induced illness.
  - Threat of rising sea levels.
    - Cities on coastal lands.
  - Transportation issues
  - Water shortages

UNEVEN URBANIZATION GROWTH PATTERN

Cities Booming in Asia and Africa, While European, Japanese, and American Megacity Populations Barely Growing

- Asia and Africa will add 10 new megacities by 2030.
  - Delhi, India; Dhaka, Bangladesh; and Lagos, Nigeria projected to add 10 million each.
- Slower growth or population decreases in Japan, the Americas, and Europe
  - Tokyo and Osaka projected to be smaller in 2030;
  - London, Paris, New York projected to add only one million people.
- Increased rate of urbanization in developing countries could strain resources and sharpen societal inequalities.
  - Rather than being a method of reducing poverty, in some places increased urbanization could drive increased poverty.
  - Estimated 40 percent of urban expansion is taking place in slums, increasing rate of poverty, highlighting socioeconomic divisions, and increasing health risks.

ENVIRONMENTAL IMPLICATIONS

Coastal Population Growth Means Increasing Numbers Affected by Rising Sea Levels and Extreme Weather Events

- Three-quarters of all major cities are along coastlines.
  - Additionally, the urbanization of these coastal areas is growing more rapidly than farther inland.
- Due to thermal expansion and melting of the world's ice, the sea level is rising.
  - With the sea level rising, proper planning techniques will become crucial to protecting these urbanized and important regions.
- More than a billion people living in coastal cities are vulnerable to severe flooding and extreme weather.
    - Events feed into fresh water shortages, refugee crises, and political instability.

ENVIRONMENTAL IMPLICATIONS (CONTINUED)

Air Pollution and Waste Management Require New Ideas for Mitigation

- As regions continue to urbanize, pollution from industrialization and transportation tends to be rampant in these areas.
  - These regions tend to suffer from industrial and photochemical smog, which can cause lung problems.
  - Deteriorating air pollution results in higher illness rates, strained resources unable to treat new health issues.
- Sanitation and waste management problems require updated infrastructure and new ways of handling sanitation.
  - Poor sanitation leads to increased health concerns.

ENVIRONMENTAL IMPLICATIONS (CONTINUED)

Urban Heat Islands Increase Need for Efficient Infrastructure

- Temperatures in cities can be as much as 22°F higher than nearby rural regions.
  - Roof and pavement surface temperatures, which are often found in urbanized areas, can be 50-90°F hotter than air temperatures, while shaded areas of more rural settings tend to be around the same temperature as the air.
  - The increase in temperatures raises the energy consumption used to cool the city and can impact the vegetation and agriculture as well.
- Cities need to account for temperatures rising higher as more people move to the cities.
  - Will need to boost infrastructure.

ECONOMIC IMPLICATIONS

Urbanization's Role in Reducing Poverty but also Potential for Social Friction

- Countries with higher levels of urbanization tend to have significantly lower rates of poverty than countries with lower levels.
  - Over 80 percent of global GDP is produced in cities.
  - "Megaregions" are responsible for 66 percent of global economic activity and 85 percent of technological and scientific innovation.
- There might not always be enough jobs for everyone moving to the urban areas.
  - Especially true for urbanization in countries with "youth bulge".
  - Limited employment opportunities places strain on government ability to support/social services.
    - Scarce resources can lead to black market/illegal activity.
  - Can create wider divide between "haves" and "have nots".
    - Social friction can lead to political violence.

HEALTH IMPLICATIONS

Increased Urbanization Creates Some Health Benefits, But Mostly Challenges for the Future

- Traditionally urban dwellers had benefits over rural counterparts.
  - Lower infant mortality rate
  - Better access to healthcare
  - More sanitary living conditions
- Rapid and unplanned urbanization creates worsening living conditions.
  - Almost 700 million city dwellers do not have adequate sanitation.
    - Increases risk of illness, worm infections, cholera, diarrhea
      - Illness can spread quickly because of interconnected world and transmit outside slums and beyond.
  - Increased threat of food and water scarcity.
    - If supply cannot meet demand, can expect an increase in illness.

INFRASTRUCTURE IMPLICATIONS

Urbanization Requires Increased Infrastructure Development to Prevent Standard of Living Decline

- Urbanized areas cover about two percent of the Earth's surface, but are responsible for 75 percent of the world's resource consumption.
- Urbanization can increase more efficient public infrastructure and services by concentrating population in easier to reach areas if proper planning and resources exist OR it can increase social stresses if it does not have the ability to deal with demands on infrastructure.
  - Massive infrastructure investment and spending will be necessary to combat wasting of resources and energy.
  - Can lead to political movements or violence if government does not have the capacity to deal with strains on infrastructure
- Need for increased energy, transportation, clean water and air, healthcare, food production infrastructure as numbers increase
- Increase in number of households despite reduced household size
  - Will need to ensure enough adequate housing to prevent slums
  - High density population often creates housing price bubble and a lack of affordable housing.

POLITICAL IMPLICATIONS

Increased Urbanization Can Highlight Inequalities, Raise Potential for Violence

- Rapid, unplanned urbanization leads to increased social and political violence.
  - Heightened inequalities
  - Competition over resources
- Governments are unable to support ever increasing urban populations.
  - Increased strain on critical infrastructure, health care, education, and food supply.
- New urban dwellers move to cities expecting better life, when that doesn't happen it drives discontent.
- Power of governments is increasingly centralized in the cities.
  - *Benefit*: higher incentive to solve country's problems.
  - *Downside*: rural populations excluded from power, increasing potential for social/political movements.

CURRENT INITIATIVES

- Address congested traffic patterns
  - Adding public transportation.
  - Investing in infrastructure development.
- Energy conservation
  - Technology aids in more efficient use of energy.
  - Investing in additional sources of energy (e.g., solar).
- Air quality standards
  - Environmental Protection Agency and others are setting standards domestically and globally.
  - Bike share programs reduce emissions from vehicles.

RESOURCES

The following resources provide further information on the topic:

- "Global Trends: Paradox of Progress," National Intelligence Council, January 2017. Web. March 2017. https://www.dni.gov/files/images/globalTrends/documents/GT-Full-Report.pdf
- "The megacity state: The world's biggest cities shaping our future," Allianz Risk Pulse, November 2015. Web. March 2017. https://www.allianz.com/v_1448643898000/media/press/document/Allianz_Risk_Pulse_Megacities_20151130-EN.pdf
- Wilson, Steve. "The risks of rapid urbanization in developing countries," Zurich Insurance Company. January 15, 2015. Web. March 2017. https://www.zurich.com/en/knowledge/articles/2015/01/the-risks-of-rapid-urbanization-in-developing-countries

Additional research materials and information sources regarding this topic can be found in the associated *Literary & Scholastic Resource List*.

Literary and Scholastic Resources – Urbanization

Date of information: March 2017

Overview: While not exhaustive, the following resources provide a roadmap to understanding the concept of urbanization. These resources provide a base knowledge and a start for some of some of the key concepts and sectors of urbanization. With research constantly being completed, more data will become available.

Module Resource Lists to Cross-Reference: Major Economies Confront Shrinking Workforce, Challenges in Infrastructure Funding, Asymmetric Population Growth, Aging and Failing Infrastructure

Organizations:

- United Nations, Department of Economic and Social Affairs – Population Division: According to the website, the Population Division plays an active role in the intergovernmental dialogue on population and development, producing updated demographic estimates and projects for all countries. More information can be found at http://www.un.org/en/development/desa/population/

- United Nations Human Settlements Program: According to the website, the program is working towards a better urban future. Its mission is to promote socially and environmentally sustainable human settlements and the achievement of adequate shelter for all. More information can be found at https://unhabitat.org/

- Environmental Protection Agency: The United States Environmental Protection Agency's mission is to protect human health and the environment. More information can be found at https://www.epa.gov/

- The World Bank: According to the World Bank's website, the organization has set two main goals for the world to achieve by 2030. The first goal is to end extreme poverty by decreasing the percentage of people living on less than $1.90 a day to no more than 3%. The second goal is to promote shared prosperity by fostering the income growth of the bottom 40% for every country. More information can be found at http://www.worldbank.org/

Recent Publications and Journal Articles:

- Story of cities #future: what will our growing megacities look like?: This article discusses different characteristics that cities of the future could adopt in order to adapt to changing environment, increasing waste, and evolving technology. It highlights that the most likely outcome is that cities could continue as they are without major changes or become deserted.
    - *Citation:* Anderson, Darran. "Story of cities #future: what will our growing megacities look like?," The Guardian. May 26, 2016. Web. March 2017. https://www.theguardian.com/cities/2016/may/26/story-cities-future-growing-megacities-waste-floating-smart

- The risks of rapid urbanization in developing countries: This article highlights four primary challenges when dealing with rapid urbanization: infrastructure, health, climate change, and social instability. It notes that infrastructure is key to quality of life, and governments may not be able to keep up with growing urbanization. It highlights that, whereas in the 20th century urban dwellers were healthier and had better living conditions than rural residents had, this may no longer be the case, particularly in developing countries. Rising sea levels likely will affect cities, which may or may not have the necessary infrastructure to handle that and more frequent extreme weather events. Finally, it notes that rapid urbanization can

prevent people from getting out of poverty and can increase the likelihood of violence and social unrest due to inequalities.

- *Citation*: Wilson, Steve. "The risks of rapid urbanization in developing countries," Zurich Insurance Company, January 15, 2015. Web. March 2017. https://www.zurich.com/en/knowledge/articles/2015/01/the-risks-of-rapid-urbanization-in-developing-countries

- The megacity state: The world's biggest cities shaping our future: This report lays out the future of megacities (cities with populations more than 10 million people) and discusses the opportunities and risks associated with expanding metropolitan areas, including China's efforts to connect multiple cities into even larger gigacities (over 50 million residents). It also notes the difference in rate of growth within African and Asian cities versus cities in the developed world.
  - *Citation:* "The megacity state: The world's biggest cities shaping our future," Allianz Risk Pulse. November 2015. Web. March 2017. https://www.allianz.com/v_1448643898000/media/press/document/Allianz_Risk_Pulse_Megacities_20151130-EN.pdf

- Global Trends: Paradox of Progress: This report from the National Intelligence Council lays out the drivers of global trends over the next twenty years. It breaks down the information by subject matter and by region. It highlights the fact that an increasing percentage of the world's population live in cities and addresses all of the demographic, social, political, economic, and environmental issues that increasing urbanization will cause.
  - *Citation*: "Global Trends: Paradox of Progress," National Intelligence Council. January 2017. Web. March 2017. https://www.dni.gov/files/images/globalTrends/documents/GT-Full-Report.pdf

- Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding – A Global Assessment: The authors in this article discuss the global patterns of urbanization and development near coastal regions. The group then uses a series of modelling tools to forecast the outcome and effects that future coastal flooding may have on these regions.
  - *Citation*: Neumann, B., Nicholls, R.J., Vafeidis, A.T., & Zimmermann, J. "Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding – A Global Assessment." PLoS One (2015 March 11). Web. March 2017. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4367969/

- Rising Seas: Tim Folger initially describes tales from Hurricane Sandy, but then switches his focus to global sea rise, the way certain countries are mitigating for sea rise, and what can potentially be done in the United States to combat the same issue.
  - *Citation*: Folger, Tim. "Rising Seas." National Geographic (2013 September). Web. March 2017. http://www.nationalgeographic.com/magazine/2013/09/rising-seas-coastal-impact-climate-change/

- Difference Between Industrial Smog & Photochemical Smog: Samantha K. Harvey, a Senior Science Writer at NASA's Jet Propulsion Laboratory explains the differences and effects of industrial versus photochemical smog.
  - *Citation:* Harvey, Samantha K. "Difference Between Industrial Smog & Photochemical Smog." Seattle Post-Intelligencer. Web. March 2017. http://education.seattlepi.com/difference-between-industrial-smog-photochemical-smog-4955.html

- Urbanization and Air Pollution: Then and Now: David D. Parrish, of the Cooperative Institute for Research in Environmental Sciences at the University of Colorado-Boulder, discusses the impact that urbanization had on air pollution of cities. After analyzing decades of air pollution and air quality index changes, he confirms that the air quality mitigation can be done, however it needs to improve greatly.

  - *Citation*: Parrish, David. "Urbanization and Air Pollution: Then and Now." EoS (2015). Web. March 2017. https://eos.org/features/urbanization-air-pollution-now

- Energy Saving Potentials and Air Quality Benefits of Urban Heat Island Mitigation: Hashem Akbari discusses the air quality and temperature surrounding urban heat islands and then dives into the potential benefits and saving potentials of urban heat island mitigation.
  - *Citation*: Akbari, Hashem. "Energy Saving Potentials and Air Quality Benefits of Urban Heat Island Mitigation." United States: N. p., 2005. Web. March 2017. https://www.osti.gov/scitech/biblio/860475

- Developing Countries Need to Harness Urbanization to Achieve the MDGs: IMF-World Bank Report: In a press release, the World Bank discusses the need to control urbanization and the benefits of controlling urbanization towards countries ultimately meeting their Millennium Development Goals.
  - *Citation*: "Developing Countries Need to Harness Urbanization to Achieve the MDGs: IMF-World Bank Report." The World Bank, April 17, 2013. Web. March 2017. http://www.worldbank.org/en/news/press-release/2013/04/17/developing-countries-need-to-harness-urbanization-to-achieve-mdgs-imf-world-bank-report

- Impacts of Urbanization on Urban Structures and Energy Demand: What Can We Learn for Urban Energy Planning and Urbanization Management?: Authors Reinhard Madlener and Yasin Sunak discuss urbanization and the impact it has on urban structures and energy demand. In the article, they dive into the specifics of locations in developed and non-developed countries, urban growth rates, and energy consumption.
  - *Citation*: Madlener, R. & Sunak, Y. "Impacts of Urbanization on Urban Structures and Energy Demand: What Can We Learn for Urban Energy Planning and Urbanization Management?" Sustainable Cities and Society, Volume 1, Issue 1, pages 45-53 (2011 February). Web. March 2017. http://www.sciencedirect.com/science/article/pii/S2210670710000077

- Urbanization: A Major Driver of Infrastructure Spending: David Aldred, of CitiBank, discusses the impact of infrastructure spending and its relation to urbanization.
  - *Citation*: Aldred, David. "Urbanization: A Major Driver of Infrastructure Spending." Citi for Cities. Web. March 2017. http://www.citigroup.com/citi/citiforcities/pdfs/Urbanization_A_Major_Driver_of_Infrastructure_Spending.pdf