

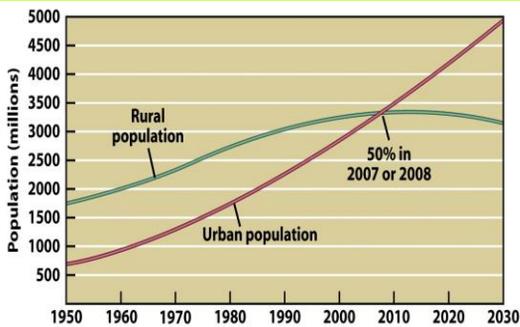


Most people used to live like this



Increasingly people live like this.

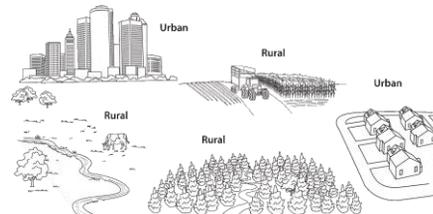
For the first time in history, there are now more urban residents than rural residents.



Urban Vs Rural Areas

- **Urban:** Land mostly covered with buildings and roads (includes suburbs)

- **Rural:** Any other type of land use or land cover (includes forests, cropland, etc.)



The Rise of Cities

- Ever since the Industrial Revolution, when farms began producing surplus food, people have been moving to cities to find work or to be near amenities.
- Add in population growth and the world's urban population has more than quadrupled since 1950.

- An increase in population in urban areas compared to rural areas is referred to as urbanization.



Environmental Costs of Urbanization



1. Changing Land Cover and Use

- **Land cover:** Vegetation and structures that cover land. Such as: trees, grass, water, buildings, pavement
- **Land use:** Human activities that occur on land. Such as: farming, logging, residential development

1. Changing Land Cover and Use

- Land cover influences land use, and humans change both when they build urban areas.

This can result in:

- habitat loss and a decrease in biodiversity
- less land left as wetlands, forests, and farms

1. Changing Land Cover and Use

- creation of Brownfields
 - areas of vacant factories, warehouses, or sites that may be contaminated from past uses
 - no longer support much plant life



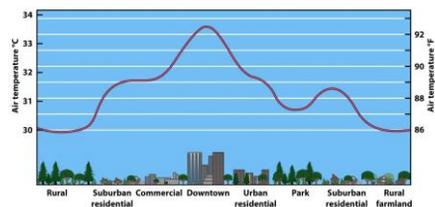
2. Increased Pollution



- Long commutes result in airborne pollutants and greenhouse gas emissions
- Increased noise and light pollution

3. Heat Islands

- Cities are warmer than their surrounding areas – a phenomenon referred to as a heat island.



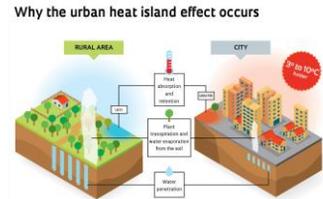
3. Heat Islands

Heat islands result from the change in land cover.

- dark structures and pavement absorb heat
- tall buildings and narrow streets trap heat and reduce air flow
- less vegetation lowers the natural cooling effects of shading and evaporation from soil and plants

3. Heat Islands

Add in the waste heat from cars, factories, and humans and the urban area is 3-10 °C warmer than rural areas, even at night!



3. Heat Islands

The demand for cooling drives up the energy consumed in cities – which in turn:

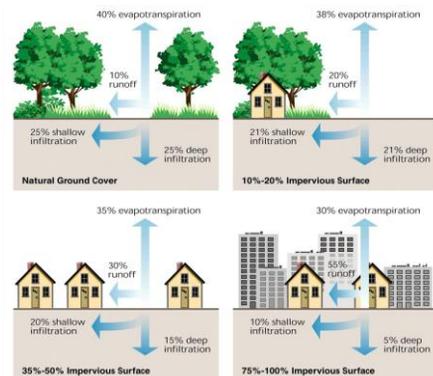
- increases air pollution and greenhouse gas emissions
- compromises human health.

4. Altered Water Runoff

- Paved surfaces increase runoff (the amount of water that moves along the surface of the ground rather than into the ground).
- Which then increases the chance of flooding
- And results in more erosion (the transfer to sediment from one location to another)

4. Altered Water Runoff

- Erosion increases the sediment being washed into streams and lowers the quality of the aquatic ecosystem.
- Paved surfaces decrease the amount of water soaking into the soil, meaning less water to recharge the underground water table.



What's more...

- Most large cities are in developing countries.

The world's 10 largest cities^a Table 3.1

1975	2005	2015
Tokyo, Japan, 20.6	Tokyo, Japan, 35.2	Tokyo, Japan, 35.5
New York, U.S. 15.9	Mexico City, Mexico, 19.4	Mumbai (Bombay), India, 21.0
Mexico City, Mexico, 10.7	New York, U.S. 18.7	Mexico City, Mexico, 21.6
Osaka-Kobe, Japan, 9.8	São Paulo, Brazil, 18.3	São Paulo, Brazil, 20.5
São Paulo, Brazil, 9.6	Mumbai (Bombay), India, 18.2	New York, U.S. 19.9
Los Angeles, U.S., 8.9	Delhi, India, 15.0	Delhi, India, 18.6
Buenos Aires, Argentina, 8.7	Shanghai, China, 14.5	Shanghai, China, 17.2
Paris, France, 8.6	Kolkata (Calcutta), India, 14.3	Kolkata (Calcutta), India, 17.0
Kolkata (Calcutta), India, 7.9	Jakarta, Indonesia, 13.2	Dhaka, Bangladesh, 16.8
Moscow, Russian Federation, 7.6	Buenos Aires, Argentina, 12.6	Jakarta, Indonesia, 16.8

^aPopulation in millions.

- Highly developed countries
- Developing countries

What's more...

- When urbanization proceeds too rapidly, basic support services are threatened!

- substandard living conditions
- poverty & high unemployment
- inadequate or non-existent water, sewage & waste disposal

