Core Case Study: The Ecocity Concept in Curitiba, Brazil

- **Ecocity, green city**: Curitiba, Brazil
- Bus system: cars banned in certain areas
- Housing and industrial parks
- Recycling of materials
- Helping the poor
- New challenges
Solutions: Bus Rapid Transit System in Curitiba, Brazil
22-1 What Are the Major Population Trends in Urban Areas?

- **Concept 22-1** Urbanization continues to increase steadily and the numbers and sizes of urban areas are growing rapidly, especially in developing countries.
Half of the World’s People Live in Urban Areas (1)

- Urbanization

- Urban growth
  - Natural increase
  - Immigration from rural areas
    - Pushed from rural areas to urban areas
    - Pulled to urban areas from rural areas
Half of the World’s People Live in Urban Areas (2)

- Four major trends
  - Proportion of global population living in urban areas is increasing
  - Number and size of urban areas is mushrooming
    - Megacities, hypercities
  - Urban growth slower in developed countries
  - Poverty is becoming increasingly urbanized; mostly in developing countries
Global Outlook: Satellite Image of Major Urban Areas Throughout the World

Los Angeles 13.3 million
New York 16.8 million
Mexico City 18.3 million
Sao Paulo 18.3 million
Buenos Aires 12.1 million
Cairo 10.5 million
Mumbai (Bombay) 22.6 million
Delhi 13.0 million
Karachi 10.4 million
Lagos 12.2 million
Calcutta 13.3 million
Jakarta 11.4 million
Shanghai 12.8 million
Beijing 10.8 million
Tokyo 26.5 million
Osaka 11.0 million
Manila 10.1 million

Key
- 2004 (estimated)
- 2015 (projected)
Typical Daily Traffic Jam of People, Carts, and Other Vehicles in Delhi, India

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Case Study: Urbanization in the United States (1)

- Four phases between 1800 and 2008
  - Migration from rural areas to large central cities
  - Migration from large central cities to suburbs and smaller cities
  - Migration from North and East to South and West
  - Migration from cities and suburbs to developed rural areas
Case Study: Urbanization in the United States (2)

- Environmental problems decreasing

- Older cities
  - Deteriorating services
  - Aging infrastructures
Major Urban Areas in the United States Revealed by Satellite Images at Night
Urban Sprawl Gobbles Up the Countryside (1)

- Urban sprawl

- Contributing factors to urban sprawl in the U.S.
  - Ample land
  - Federal government loans
  - Low-cost gasoline; highways
  - Tax laws encouraged home ownership
  - State and local zoning laws
  - Multiple political jurisdictions: poor urban planning
Urban Sprawl Gobbles Up the Countryside (2)

- Effects of urban sprawl

- Megalopolis
  - Bowash
Urban Sprawl in and around the U.S. City of Las Vegas, Nevada, from 1973 to 2000
Natural Capital Degradation: Urban Sprawl

**Urban Sprawl**

**Land and Biodiversity**
- Loss of cropland
- Loss of forests and grasslands
- Loss of wetlands
- Loss and fragmentation of wildlife habitats

**Water**
- Increased use of surface water and groundwater
- Increased runoff and flooding
- Increased surface water and groundwater pollution
- Decreased natural sewage treatment

**Energy, Air, and Climate**
- Increased energy use and waste
- Increased air pollution
- Increased greenhouse gas emissions
- Enhanced global warming

**Economic Effects**
- Decline of downtown business districts
- Increased unemployment in central city
- Loss of tax base in central city

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NATURAL CAPITAL DEGRADATION

Urban Sprawl

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- Loss of tax base in central city
- Decreased natural sewage treatment
U.S. Megalopolis of Bowash

Bowash (Boston to Washington)
Animation: SF Bay region growth
22-2 What Are the Major Urban Resource and Environmental Problems?

- **Concept 22-2** Most cities are unsustainable because of high levels of resource use, waste, pollution, and poverty.
Urbanization Has Advantages

- Centers of:
  - Economic development
  - Innovation
  - Education
  - Technological advances
  - Jobs

- Environmental advantages
Urbanization Has Disadvantages (1)

- Huge ecological footprints
- Lack vegetation
- Water problems
Urbanization Has Disadvantages (2)

- Concentrate pollution and health problems
- Excessive noise
- Different climate and experience light pollution
Inputs

- Energy
- Food
- Water
- Raw materials
- Manufactured goods
- Money
- Information

Outputs

- Solid wastes
- Waste heat
- Air pollutants
- Water pollutants
- Greenhouse gases
- Manufactured goods
- Noise
- Wealth
- Ideas
Noise Levels of Some Common Sounds

Permanent damage begins after 8-hour exposure

Noise Levels (in dbA)

0 | Normal breathing
10 | Whisper
20 | Quiet rural area
30 | Quiet room
40 | Rainfall
50 | Normal conversation
60 | Vacuum cleaner
70 | Average factory
80 | Lawn mower
90 | Rock music
100 | Thunderclap (nearby)
110 | Earphones at loud level
120 | Air raid siren
130 | Boom cars
140 | Military rifle
150 | Military rifle
Permanent damage begins after 8-hour exposure.

Noise Levels (in dbA):

- Normal breathing (0 dB)
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- Rainfall (20 dB)
- Vacuum cleaner (30 dB)
- Lawn mower (40 dB)
- Rock music (50 dB)
- Earphones at loud level (60 dB)
- Boom cars (70 dB)
- Whisper (80 dB)
- Quiet room (90 dB)
- Normal conversation (100 dB)
- Average factory (110 dB)
- Chainsaw (120 dB)
- Thunderclap (nearby) (130 dB)
- Air raid siren (140 dB)
- Military rifle (150 dB)
Life Is a Desperate Struggle for the Urban Poor in Developing Countries

- Slums
- Squatter settlements
- Shantytowns
- Terrible living conditions

What can governments do to help?
Global Outlook: Extreme Poverty Forces Hundreds of Millions to Live in Slums
Case Study: Mexico City

- Urban area in crisis
  - Severe air pollution
  - Water pollution
  - 50% Unemployment
  - Deafening noise
  - Overcrowding
  - Traffic congestion
  - Inadequate public transportation
  - 1/3 live in slums *(barrios)* or squatter settlements

- What progress is being made?
Concept 22-3  A combination of plentiful land, inexpensive fuel, and expanding networks of highways in some countries has resulted in dispersed cities whose residents depend on motor vehicles for most transportation.
Cities Can Grow Outward or Upward

- Compact cities
  - Hong Kong, China
  - Tokyo, Japan
  - Mass transit

- Dispersed cities
  - U.S. and Canada
  - Car-centered cities
Motor Vehicles Have Advantages and Disadvantages (1)

- Advantages
  - Mobility and convenience
  - Jobs in
    - Production and repair of vehicles
    - Supplying fuel
    - Building roads
  - Status symbol
Motor Vehicles Have Advantages and Disadvantages (2)

- Disadvantages
  - Largest source of outdoor air pollution
  - Accidents: death and injury
  - Helped create urban sprawl
  - Traffic congestion
Reducing Automobile Use Is Not Easy, but It Can Be Done (1)

- Full-cost pricing: high gasoline taxes
- Difficult to pass in the United States
  - Strong public opposition
  - Mass transit: not an option in most cities
  - Dispersed nature of the U.S.
- What about a tax shift?
Reducing Automobile Use Is Not Easy, but It Can Be Done (2)

- Raise parking fees
- Tolls on roads, tunnels, and bridges into major cities
- Car-sharing
- Charge a fee to drive into a major city
- It is working in some cities
Some Cities Are Promoting Alternatives to Car Ownership

- Bicycles
- Heavy-rail systems
- Light-rail systems
- Buses
- Rapid-rail system between urban areas
Trade-Offs: Bicycles, Advantages and Disadvantages

Advantages
- Affordable
- Produce no pollution
- Quiet
- Require little parking space
- Easy to maneuver in traffic
- Take few resources to make

Disadvantages
- Little protection in an accident
- Do not protect riders from bad weather
- Impractical for long trips
- Can be tiring (except for electric bicycles)
- Lack of secure bike parking
## TRADE-OFFS

### Bicycles

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Trade-Offs: Mass Transit Rail, Advantages and Disadvantages

**Advantages**
- Uses less energy and produces less air pollution than cars
- Requires less land than roads and parking areas for cars
- Causes fewer injuries and deaths than cars
- Reduces car congestion in cities

**Disadvantages**
- Expensive to build and maintain
- Cost-effective only along a densely populated corridor
- Commits riders to transportation schedules
- Can cause noise and vibration for nearby residents
## TRADE-OFFS

### Mass Transit Rail

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Trade-Offs: Buses, Advantages and Disadvantages

**Advantages**
- Can be rerouted as needed
- Cost less to develop and maintain than heavy-rail system
- Can greatly reduce car use and air pollution

**Disadvantages**
- Can lose money because they need low fares to attract riders
- Can get caught in traffic and add to pollution
- Commits riders to transportation schedules
- Noisy
# TRADE-OFFS

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Fig. 22-13, p. 601
Trade-Offs: Rapid Rail, Advantages and Disadvantages

Rapid Rail

**Advantages**
- Can reduce travel by car or plane
- Ideal for trips of 200–1,000 kilometers (120–620 miles)
- Much more energy efficient per rider than a car or plane

**Disadvantages**
- Expensive to run and maintain
- Must operate along heavily used routes to be profitable
- Causes noise and vibration for nearby residents
TRADE-OFFS

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Potential Routes for High-Speed Bullet Trains in the U.S. and Parts of Canada
Case Study: Destroying a Great Mass Transit System in the United States

- National City Lines
- Purchased and dismantled streetcar systems
- Sales of cars and buses increased
- Guilty of conspiracy
Concept 22-4  Urban land-use planning can help to reduce uncontrolled sprawl and slow the resulting degradation of air, water, land, biodiversity, and other natural resources.
Conventional Land-Use Planning

- **Land-use planning**
  - Encourages future population growth
  - Economic development
  - Revenues: property taxes
  - Environmental and social consequences

- **Zoning**
  - Mixed-use zoning
Smart Growth Works (1)

- **Smart growth**
  - Reduces dependence on cars
  - Controls and directs sprawl
  - Cuts wasteful resource
Smart Growth Works (2)

- U.S. cities
  - Portland, OR
  - San Francisco, CA

- Curitiba, Brazil

- China: stand on urban sprawl

- Europe: compact cities
Solutions: Smart Growth Tools

**Limits and Regulations**
- Limit building permits
- Urban growth boundaries
- Greenbelts around cities
- Public review of new development

**Protection**
- Preserve existing open space
- Buy new open space
- Buy development rights that prohibit certain types of development on land parcels

**Zoning**
- Encourage mixed use of housing and small businesses
- Concentrate development along mass transportation routes
- Promote high-density cluster housing developments

**Taxes**
- Tax land, not buildings
- Tax land on value of actual use (such as forest and agriculture) instead of on highest value as developed land

**Tax Breaks**
- For owners agreeing not to allow certain types of development (conservation easements)
- For cleaning up and developing abandoned urban sites (brownfields)

**Planning**
- Ecological land-use planning
- Environmental impact analysis
- Integrated regional planning
- State and national planning

**Revitalization and New Growth**
- Revitalize existing towns and cities
- Build well-planned new towns and villages within cities
### Smart Growth Tools

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### SOLUTIONS

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Preserving and Using Open Space

- **Urban growth boundary**
  - U.S. states: Washington, Oregon, and Tennessee

- **Municipal parks**
  - U.S. cities: New York City and San Francisco

- **Greenbelts**
  - Canadian cities: Vancouver and Toronto
  - Western European cities
Central Park, New York City, USA
22-5 How Can Cities Become More Sustainable and Livable?

- **Concept 22-5** An ecocity allows people to: choose walking, biking, or mass transit for most transportation needs; recycle or reuse most of their wastes; grow much of their food; and protect biodiversity by preserving surrounding land.
New Urbanism Is Growing

- Conventional housing development
- Cluster development
- New urbanism, old villageism
  - Walkability
  - Mixed-use and diversity
  - Quality urban design
  - Environmental sustainability
  - Smart transportation
Conventional and Cluster Housing Developments
Typical housing development
Typical housing development
The Ecocity Concept: Cities for People Not Cars

- **Ecocities or green cities**
  - Build and redesign for people
  - Use renewable energy resources
  - Recycle and purify water
  - Use energy and matter resources efficiently
  - Prevent pollution and reduce waste
  - Recycle, reuse and compost municipal waste
  - Protect and support biodiversity
  - Urban gardens; farmers markets
  - Zoning and other tools for sustainability
Science Focus: Urban Indoor Farming

- Rooftop greenhouses
  - Sun Works: designs energy-efficient greenhouses

- Hydroponic gardens

- Skyscraper farms

- Ecological advantages and disadvantages
Case Study: China’s Vision for an Ecocity

- 2008: Dongtan, China, ecocity
- Carbon neutral city: use renewable resources for energy
- Reduce the need for cars, or use electric- or hydrogen-powered cars
- Public transportation
The Ecovillage Movement Is Growing

- Ecovillage movement
  - Eco-hoods

- 1993: ecovillage in Los Angeles, CA, U.S.
  - What is making it work?

- Other ecovillages
  - Success stories