Last Time

- International Migration in the Developing World: Origin and Destination Impacts
- Mexico-US Migration
Today’s Objectives

• Urbanization
• Population, Environment, and Development
Urban Density

Are people in big cities stupid, Sir?

No of course not! Why on earth do you ask?

Because my book says that's where the population is most dense!
Urbanization

World Population: Average Annual Increase For Each Decade, 1750-2100 (projected)  

[Graph showing the increase in world population from 1750 to 2100, with separate bars for developing and developed regions.]
Figure I.1. Urban and rural populations of the world: 1950-2030

United Nations Department of Economic and Social Affairs/Population Division

World Urbanization Prospects: The 2003 Revision
Figure I.2. Contribution of urban and rural population growth to total population growth: 1950-2030

Period:
- 1950-1955
- 1955-1960
- 1960-1965
- 1965-1970
- 1970-1975
- 1975-1980
- 1980-1985
- 1985-1990
- 1990-1995
- 1995-2000
- 2000-2005
- 2005-2010
- 2010-2015
- 2015-2020
- 2020-2025
- 2025-2030

- More developed regions, urban population
- Less developed regions, urban population
- More developed regions, rural population
- Less developed regions, rural population

United Nations Department of Economic and Social Affairs/Population Division
World Urbanization Prospects: The 2003 Revision
### Table I.1. Total, Urban and Rural Populations by Development Group, Selected Periods: 1950-2030

<table>
<thead>
<tr>
<th>Development group</th>
<th>Population (billions)</th>
<th>Average annual rate of change (per cent)</th>
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*World Urbanization Prospects: The 2003 Revision*
Figure I.4. Percentage of population residing in urban areas by major areas of the world: 1950, 1975, 2003 and 2030

United Nations Department of Economic and Social Affairs/Population Division
World Urbanization Prospects: The 2003 Revision
Figure I.6. Number of urban agglomerations with 5 million inhabitants or more: 1975, 2003 and 2015

- **World**
- **More developed regions**
- **Less developed regions**

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<th>Year</th>
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<td>2015</td>
<td>61</td>
<td>16</td>
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</table>
Figure II.1. Estimated and projected urban populations of the world, more developed regions and less developed regions: 1950-2030

United Nations Department of Economic and Social Affairs/Population Division

World Urbanization Prospects: The 2003 Revision
Figure II.4. Average annual rate of change of the urban populations of the world, more developed regions and less developed regions: 1950-2030
NEW WORLD ORDER  In 1950 there was just one city with a population of more than ten million—New York. In 2015 there will be 21, and the number of urban areas with populations between five and ten million will shoot from 7 to 37. This growth will occur mainly in developing countries, those least equipped to provide transportation, housing,
Urban Explosion

Map showing urban growth from 2000 to 2015 across various cities and regions globally.
Urbanization - Definitions

• **Urbanization** - % of a nation’s populations in urban areas or change in % urban
  – static point in time measure or as sense of rate of ↑%

• **Urban Growth** - increase in city size
  (regardless of percent change in the city)
Primacy and Rank Size Rule

- One city per country that dominates in size and influence = Primate City
Primacy and Rank Size Rule

• Rank Size Rule – in large countries with diverse economies, city size is related to its rank among country’s cities
  • cities ranked 4th would have a population 1/4x as large as #1 rank
Urban Transition:
Urbanization % by Region

<table>
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</table>

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*World Urbanization Prospects: The 2003 Revision*
Urbanization Transition

• Logistic curve from < 20% to > 70%
  – A transition in location
  – Newly industrializing countries are mimicking the 19th century experiences of W. Europe
    • 1950-75 LDCs % urban increase 17% to 28%
    • vs. 1875-1900 Europe/USA % urban increase 17% to 26%
Urban Transition: Europe

• Before 1850, no country was predominately urban
• 1900, United Kingdom is the only urban country
  – Today, all industrialized countries & much of Latin America are urbanized
• Europe
  – 1.6% in cities > 100,000 in 1600
  – 2.2% “ “ in 1800
• Industrial Revolution → very rapid change: more rapid industrialization → more rapid urbanization
  – England 10% in cities > 100k in 1800
  – 40% 1900
USA Urbanization History

• Before 1790 < 5% urban; 1860 20% urban
  – Increase in Irish and other immigration
• 1900 40% urban (>2,500); 1920 51% urban
  – large scale immigration from Europe
  – new industrialization in NE and Mid West
  – Rural to Urban movement generally with mechanization of agriculture
USA Urbanization History

• Transportation technologies
  – Rail transportation, Trolleys, Automobiles

• Policy and Social change
High – Low Rural Growth Areas

1990 - 2000

- Red = 8% increase of more
- Yellow = 1 – 7 percent
- White = no change or decline
Basic U.S. Change 1990-2000

Figure 2. Numeric Change in Resident Population for the 50 States, the District of Columbia, and Puerto Rico: 1990 to 2000

Change in Number of People
- Greater than 1 million
- 500,001 to 1 million
- 100,001 to 500,000
- 0 to 100,000
- Less than 0

Change for U.S.: 32,112,013

Prepared by Geography Division
Where does this growth come from?

- 19th C urban places had mortality > rural
- 19th C urban fertility ~ 1/3 lower than rural
- Growth of cities in 19th C due to rural to urban migration
Global Megalopoli Trends

• 1900 London is largest 6.5 million
  – All others in Europe or USA + Tokyo
• 1970 New York largest 16.3 million
  – Shanghai, Mexico City, Buenos Aires, Sao Paulo (4/10 in LDCs)
• 2000 Mexico City largest ~26 million
  – only 2 from more developed world (NYC + Tokyo)
• Trend in more large cities and larger cities
  – 43 cities > 100,000 people in 1900
  – 40 cities > 1 million in Latin America alone in 1990
  – ~400 cities > 1 million (vast majority in LDCs) 2005
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- Urban growth rates are 2x larger than rural
- MDCs + Latin America – Rural growth rates very small (or negative)
- Africa: very high urban growth 4.5%/year
  - 15 year doubling (highest in the world)
- Africa: rural growth rate also world’s highest due to very rapid RNI

- Africa: 23% → 37.7% (307m) ~60% increase
- Asia: 20% → 38% (1.4b) ~ 2x increase
- Latin America: 57% → 76% (400m) ~ 1.3x increase
- MDCs: 68-75% → ~7% increase
- LDCs: 25-40% → 1.6x increase
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<th>Rank</th>
<th>Country or area</th>
<th>Percentage urban in 2000</th>
<th>Rank</th>
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Countries or areas that in 2000 had at least 100,000 inhabitants but less than a million.
Developing World Urbanization:
% urban in cities >1million

- Latin America
  - 1975 = 35.7%
  - 1990 = 38.6%
  - 2010 = 46.2%

- Asia
  - 1975 = 38.1%
  - 1990 = 40%
  - 2010 = 40.5%
  - cities > 10m increased from 31 to 187m (1975-2010)

- Africa
  - 1975 → 17.7% of urban population in cities > 1m
  - 1990 → 26.8% of urban population in cities > 1m
  - 2010 → 33.6% of urban population in cities > 1m
New Urban Forms

- Increasing size of large cities as % of urban population increases
  - coalescing (connurbation) of multiple cities into huge urban agglomerations (Megalopoli)
    - Boston-NYC-Philly- Washington D.C. – first megalopolis
    - Cleveland-Detroit-Chicago-Milwaukee- Canada
    - SE England & metro London
    - NW Europe Amsterdam → Rhine
    - S. China coast & Shanghai
    - Brazil: Rio-Sao Paulo Triangle
Urban Futures 2002 - 2015

- Africa has highest rates of urban growth ~ same as last 20 years, 4%/year
- Latin America and MDCs rural growth is negative (i.e. loses population)
Urban Futures 2002 - 2015

- Rural growth rates are smaller than last 20 years
- Urban growth rates are smaller 1993-2015 than 1973-93
Percent of Total Population Living Rural

- Rural Now
- Rural 2020
- Rural 2030
- Rural 2050
- Rural 2090
The Year is 2050

- Russians: 55
- West Europeans: 67
- Latin Americans: 84
- Africans: 124
- North Americans: 52
- Eastern Europeans: 28
- Aus./N.Z.: 6
- Asians: 584

THE GLOBAL VILLAGE OF 1,000
Causes of Urbanization

• Rural Push
  – insufficient land, few alternative economic opportunities, few avenues for social advance, labor-saving agriculture

• Urban Pull
  – greater variety in employment, greater possibility of advancement
Causes of Urbanization

• Social Pulls & Pushes
  – (Pulls) Individual factors, Increased education and health care
  – (Pushes) Rural violence, Physical disasters
Future of Urbanization

• All the world’s net expected population growth in the next thirty years will be from urban areas.
• Smaller urban settlements (< 500,000) of the less developed regions will be absorbing most of this growth.
• Mega-cities, like Tokyo, Mexico City, and New York will continue to dominate the urban landscape in some countries, but the majority of the urban dwellers will be residing in the smaller cities.
Urbanization 2003 to 2030

• The world’s urban population is expected to rise from 3 billion (2003) to five billion by 2030.
  – The rural population is anticipated to decline from 3.3 billion in 2003 to 3.2 billion in 2030.

• By 2007, for the first time in history, the world will have more urban dwellers than rural ones.

• The world’s urban population is projected to grow at an average annual rate of 1.8%.
  – 38 year doubling time.
Urbanization Impacts

**Economic:** Will wages increase or decrease?

**Socio-economic:** Education

**Political-economic:** Public infrastructure, sewage, waste, roads, housing, schools, water

**Demographic:** Fertility, Disease transmission

**Environmental:** Pollution, food demand, rural deforestation or afforestation?
5 minute break

and then...

• Population-Resources-Environment Theories
• Historical and Current Population-Food Patterns
• Sustainability: Green Revolution & renewable vs. non-renewable
Human Billions

– 1900 ~ 1 billion 100k years
– 1930 ~ 2 billion 30 years
– 1960 ~ 3 billion 30 years
– 1974 ~ 4 billion 14 years
– 1987 ~ 5 billion 13 years
– 1999 ~ 6 billion 12 years
Current and Projected Human Population Growth

<table>
<thead>
<tr>
<th>Region</th>
<th>2004</th>
<th>2050</th>
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<td>Oceania</td>
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World Population Projections

Carrying Capacity

• The upper limit beyond which resources that support a given population are exceeded

• Classic View - Population growth limited by resources necessary for survival

• Current View - some populations grow to OR over shoot limit and fail beyond recovery

• To what degree are humans dependent on natural resources?
Food Requirements

• Food needs are a function of population size, age structure and income
• Food demand is projected to grow 2.7%/year partly as a consequence of ↑ income

• Regionally – potential problems with food supply
  – Asia demand increasing at > 2.3%/year
  – N. Africa + Mideast (↑ population + wealth) → 3.8%/year demand growth
  – S. Saharan Africa → 3.6%/year demand growth
Resource Impacts
(Renewables)

• 200 million hectares of forests lost in LDCs (> the size of Mexico) from 1980-1995

• 1.5 billion hectares of the world’s cropland abandoned over last 40 years due to erosion.

• 1970 – 2003
  – 15% decline in terrestrial wildlife populations
  – 35% decline in marine wildlife populations
  – 54% decline in freshwater wildlife populations

• Projected declines from 1995 - 2010
  – fish catches decline 10% per capita
  – irrigation lands decline 12% per capita
  – forests decline 30% per capita
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<td>5.0</td>
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<td>3.2</td>
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1/ From 1993 including Estonia, Latvia and Lithuania. 

Source: FAOSTAT.
Table 2. Annual changes in per caput food production (crop and livestock)

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<td>1.5</td>
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<td>1.9</td>
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</tbody>
</table>

Source: FAOSTAT.
Thomas Malthus 1766-1834

In 1798 he argued:

- Food is necessary
- Passion between the sexes is necessary and constant
- Population if unchecked grows geometrically
- Food production can only grow arithmetically
Thomas Malthus 1766-1834

Two forms of population regulation

• “Positive Checks” mortality
• “Preventative Checks” reduced human fertility
Population pressure in agricultural societies does not create Malthusian crunch but rather gives rise to increased agricultural output via intensification.

- **Intensification** – concept of increased output per unit area of agricultural land per unit time
  - inputs (fertilizer, insecticide, irrigation ..)
  - changing crops
  - adding labor inputs
  - cropping more frequently
Population pressure in agricultural societies does not create Malthusian crunch but rather gives rise to increased agricultural output via intensification.

**Intensification** – concept of increased output per unit area of agricultural land per unit time:
- inputs (fertilizer, insecticide, irrigation ..)
- changing crops
- adding labor inputs
- cropping more frequently
Food vs. Population: From Theory to Reality

- Population growth has been matched by food output growth
- Using 1961-65 as baseline:
  - LDCs had increased food production 160% by early 1980s
- Problems over last 20-30 years
  - ¾ of world’s population in LDCs – but they produce only ~ ½ the world’s food
Food vs. Population: From Theory to Reality

• But...problems over last 20-30 years:
  – ¾ of world’s population in LDCs – but they produce only ~ ½ the world’s food
Hunger: Problem of Production or Distribution?

– Presence of food in a community no guarantee that people have access to it
– Most famines are a failure of access more than an absolute shortage of food
– For subsistence: availability of enough land to produce food for the family
– For non-farmers: opportunity to get food via exchange
Food Access Problems

• Population growth
  – increase in population may push people to environmentally marginal land
Food Access Problems

• **Environmental problems**
  – regional drought
  – environmental degradation/marginal areas
Food Access Problems

• Political economy aspects
  – poor land distribution (rich have most)
  – high fees/taxes/bribes
  – best lands in cash export crops not food
Consequences of Hunger

- Regional scale (e.g. SS Africa)
  - food shortage “classic” view of famine
  - social conflict
  - regional population movements
  - changing demographics: ↑ mortality & ↓ fertility
  - disease synergy in refugee camps
Consequences of Hunger

• Household scale
  – not all suffering shared equally
  – women and children
  – family fragmentation
While DES does not indicate food consumption, it does identify: those countries in which people are more likely to have enough to eat (represented by shades of green); those in which the daily DES is marginal (beige); those in which hunger and malnutrition are likely to be widespread (orange). Those countries that face the most severe food supply shortages, with average daily DES below 2,000 kilocalories per person per day, are coloured in red.
Global-Scale Food Production

• Currently, there is enough food for a basic vegetarian diet to support ~ 6 billion
  – If the available food was distributed according to need, it would be sufficient to feed everyone in the world
  – Animal foods are inefficient: <10% of vegetable food
• If 15% calories from animal sources: enough to feed ~ 3.9b
• If~25% calories from animals: enough for ~ 2.6b
Food Poverty & Deprivation 2002

- 780 million suffer from chronic hunger
- 156 million children under five in developing countries suffer from protein energy malnutrition
- 16% infants worldwide born underweight
- 35% of kids < 5 years old were underweight for age
Figure 1. Proportion of Undernourished in Developing Regions. Actual and FAO Baseline Projections

Source: FAO 2000, 2001b
Strategies to Prevent Food Shortages

• Alter conditions of food availability
  – Social disruption/war/revolution
    • Subsistence farmers displaced from Ag lands
Strategies to Prevent Food Shortages

– Agricultural land distribution
  • The best land is often controlled by few in LDCs
  • Remaining population without sufficient land
  • Provide sufficient non-agricultural employment
  • Shortage of jobs → shortage of ability to buy food
Strategies to Prevent Food Shortages (Increase Ag. Output)

• Institutional problems
  – “Cheap” urban food policies
  – Export-oriented government policies
Strategies to Prevent Food Shortages (Increase Ag. Output)

- Policy on tenure/title also a problem
- Little direct government investment in appropriate infrastructure for small farmers
- Internationalization of grain and agriculture generally
- Shortage of labor in some rural areas
Have we overshot our limits?

While the Developed nations have only about a third of the world's population, they consume about 60% of world's energy.

www.internationalcartoons.com
How has food production surpassed population growth?

**Green Revolution**

- Started with Rockefeller’s $ in the 1950s to develop higher yielding varieties of wheat for Mexican conditions

- The research has significantly increased yields of rice & wheat in Latin America, India, Pakistan, Philippines, Thailand, Indonesia
Green Revolution

• The development of new varieties of basic staple grain crops that out produced traditional ones

• High Yield Varieties produce significantly larger yields/plant (of grain) in “Ideal” special conditions
  – these plants are very responsive to increased fertilizer
  – need very careful control of pests
  – responsive to (needs) irrigation
Green Revolution Problems

- High cost since seed is hybrid and must be purchased (cannot save)
- High yield but also high risk – lacks diversity of strains to protect against pest damage
- Produces less non-grain biomass
- Requires irrigation
Green Revolution Problems

• Agro chemicals contamination
  – water pollution
  – human health risks
  – pesticides – damage environment (produce resistant bugs)
Bio Tech – the 2\textsuperscript{nd} Green Revolution?

• Genetic engineering leads to breeding changes:
  – Breed for post/disease resistance
  – Breed for tolerance for marginal conditions
  – Breed for increased protein: quantity and quality
  – Expanded suite of N\textsubscript{2} fixing crops
Renewable vs. Non-renewable resources

• **Renewable resources** can be used repeatedly
  – Water
  – Forests
  – Crops

• **Non-renewable resources** are used once only
  – Coal
  – Oil
Renewable vs. Non-renewable resources

• Role of technology
• Mineral use has risen over time
• Neo-malthusian problem
Nonrenewable Resources

• Energy the key since much substitution of the resources is by energy
  – fax vs. letters vs. WWW/email

• Vast increase in fossil fuel use unevenly distributed
  – Developing world has 85% of world’s population and uses 25% of world’s oil; about the same as the US with <5% of world’s population.

• Other resource inequities
  – MDCs use ~ 10 more fuel/capita
  – 7x more steel/capita
  – 3x more cereal/capita
  – 18x more wood/capita
Figure 3. World Energy Consumption by Region, 1970-2025

Source: U.S. D.o.E.
This map depicts the world's relative geography

http://research.amnh.org/biodiversity/crisis/resconpercap.html
This map depicts the distribution of the world's population.

http://research.amnh.org/biodiversity/crisis/resconpercap.html
This map depicts the distribution of the world's wealth.

http://research.amnh.org/biodiversity/crisis/resconpercap.html
This map depicts global CO2 emissions

http://research.amnh.org/biodiversity/crisis/resconpercap.html
Figure 36. World Oil Consumption by Region, 1970, 2001, and 2025

Coal Country

Natural gas and other fuels have become increasingly important in power generation, but coal is still the primary source of electricity.

*Includes nuclear and hydoelectric sources.

Source: Energy Information Administration
Renewable Resources & Pollution

• Model of pollution/degradation - 3 parts
  – Demographics Effect (population size)
    • population → ↑ problems
  – Technology Effect (Barry Commoner)
    • types of technology/industry is the main problem not population
  – Affluence effect (Paul Erlich)
    • increasing use per capita → major problem not population
  – Synergies
Land Use Change and Degradation

- Developing world population growth responsible for most (80%) deforestation
- Expansion of agriculture
  - use of more marginal soils in drylands and elsewhere
    → potential loss of productive potential
- Increased (intensification) of agriculture on existing plots → ↑ erosion
- >2 billion use wood as fuel: deforestation/erosion
Population Impacts

- Soil degradation/erosion etc → ↓ food production
- $\frac{3}{4}$ of population in developing world live in ecologically vulnerable areas
  - low agricultural potential, increased risk to environmental change
- ↑ population → ↑ crowding → ↓ sanitation → ↑ disease (developing world cities)
Population, Resources, & Violence

- people use renewables more rapidly than appropriate
- population growth can result in overuse
- social wealth distribution can produce resource scarcity for a group
- synergies
The Example of Bangladesh

• 120m population, 0.08ha/capita, 785 people/ha, $200/capita – size of Wisconsin
  – physical geography: among the best agricultural soils anywhere
  – high population → complete use of available cropland
  – resource/population crunch → significant migration from Bangladesh to neighboring Assam in India
  – conflict with India – political/ethic/religious
The Example of Central America
2 Worlds: 2 Kinds of Impacts

- Problems and Potential Solutions: Population and Sustainable Development in the Developing vs. Developed Worlds
The population-resource-environment nexus

- Half the world -- nearly three billion people -- live on less than two dollars a day.

- The GDP (Gross Domestic Product) of the poorest 48 nations (i.e. a quarter of the world's countries) is less than the wealth of the world's three richest people combined.

- The world's 497 billionaires in 2001 registered a combined wealth of $1.54 trillion, greater than the combined incomes of the poorest half of humanity.

- Nearly a billion people entered the 21st century unable to read a book or sign their names.

- Less than one per cent of what the world spent every year on weapons was needed to put every child into school by the year 2000 and yet it didn't happen.

- 20% of the population in the developed nations, consume 86% of the world's goods.
An analysis of long-term trends shows the consumption gap between the richest and poorest countries was about:

• 3 to 1 in 1820
• 11 to 1 in 1913
• 35 to 1 in 1950
• 44 to 1 in 1973
• 72 to 1 in 1992
• 100+ to 1 in 2007
• “Today, across the world, 1.3 billion have no access to clean water; 3 billion have no access to sanitation; 2 billion have no access to electricity.”

• A mere 12 percent of the world's population uses 85 percent of its water; these 12 percent do not live in the Third World.
Consider the global priorities in spending in 1998

<table>
<thead>
<tr>
<th>Global Priority</th>
<th>$U.S. Billions</th>
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<tbody>
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<td>Basic education for everyone in the world</td>
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<tr>
<td>Cosmetics in the United States</td>
<td>8</td>
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<tr>
<td>Water and sanitation for everyone in the world</td>
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<tr>
<td>Ice cream in Europe</td>
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<tr>
<td>Reproductive health for all women in the world</td>
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<tr>
<td>Perfumes in Europe and the United States</td>
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<tr>
<td>Basic health and nutrition for everyone in the world</td>
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<td>Pet foods in Europe and the United States</td>
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<td>Business entertainment in Japan</td>
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<td>Narcotics drugs in the world</td>
<td>400</td>
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<td>Military spending in the world</td>
<td>780</td>
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Review

- Urbanization
- Population, Environment, and Development