Numerous environmental factors, often in combination, predispose to the spread of infectious diseases and even provoke new epidemics.
These factors include environmental deterioration and ecological degradation.
• Rampant urbanization.
• Water pollution.
• Adverse climatic conditions (e.g. global warming, El Nino and La Nina weather phenomena).
Nipah Virus Encephalitis

- Nipah's emergence may have arisen from the interaction of man and nature, according to Daszak and researcher Jonathan Patz, Director of the Program on Health Effects Of Global Environmental Change at Johns Hopkins University in Baltimore.
- A scenario where an El Niño caused severe dry conditions. Fires that people had set to clear land burned out of control.
- The smoke and haze stunted fruit development in the shrinking forests and forced the bats to migrate to places outside their usual habitat—like the forest outskirts, near neighboring pig farms.
- On many farms, animal pens mingle with orchards. The researchers believe that fruit bats may have contaminated fruit that then fell into the pigpens.
- "It's a really unnatural set of circumstances that has brought pigs in close contact with fruit bats," says Daszak.
- "It's an extremely complex situation. These environmental landscape changes like logging and burning are global in scale, and have the potential to bring together people, wildlife and reservoirs of diseases in ways we couldn't anticipate."
• Human encroachment into virgin jungles where unknown pathogens lurk.

• Deforestation facilitating contact between humans and animals.
Proposed family tree of human and simian immunodeficiency viruses

- **Host**: Mandrill, Green Monkey, Human, Sooty Mandrill, Chimpanzee
- **Strain of virus**: Mandrill virus, Green monkey virus, HIV-2, Mangabey virus, Chimpanzee virus, HIV-1

(Host unknown)
• Soil erosion.
• Falling water tables, desertification.
• Ecosystem imbalances.
Natural disasters such as the recent Indian Ocean tsunami.
Environmental factors also interact with other microbial, host, demographic, socio-economic and political factors.
To exacerbate “old” communicable diseases (such as dengue, malaria, cholera, tuberculosis).
To trigger newly emerging infections (such as avian influenza, SARS, HIV, Ebola).
The importance of learning and understanding the contribution of environmental factors to the spread of communicable diseases. These factors are specific to the pathogen, disease and community.
Amoy Garden Outbreak

Total number of cases: 329

Total number of deaths: 42

Case-fatality rate: 12.8%
Layout of Housing Blocks in Amoy Gardens
Floor Drains at Amoy Gardens

Legend
- Waste Pipe
- Soil Pipe
- Soil & Waste Stack
- Vent Pipe
- Water Trap
- Entry of Odour / Vectors
- Loss of Water Seal

Presence of Water Seal Prevents Entry of Odour / Vectors
保持水封可以防止臭气或带菌昆虫进入

Loss of Water Seal Allows Entry of Odour / Vectors
水封流失令臭气或带菌昆虫进入
Globalization of disease & health

- April 9, 2003: First case in Africa
- April 14, 2003: SARS genome sequenced
- May 22-25, 2003: Signs of peaking in TW, HK, SG, VN, CA.

Source: BBC News
Probable cases of **SARS** by reported source of infection*

(Singapore, Feb 25 – Apr 30, 2003)

*Case 1 = 1; Case 2 = 6; Case 3 = 35; Case 4 = 130; and Case 5 = 127. Excludes 28 cases with either no or poorly defined direct contacts or who were cases translocated to Singapore with no further secondary transmission. MMWR 2003;52:405
SARS Factors - Structural

1. Mega cities (population centres including slums, malls)
2. Mega hospitals: hospital pathogens & cultures
3. Technology business centres, Air travel commuters
Economic Burden in Asian Tourism

GDP of the broader travel and tourism economy, measuring visitor spending and investment in tourism


Data provided by the World Travel & Tourism Council
Hospital as centres for disease spread.

Contagiousness in mega cities: hospitals, hotels, factories & entertainment venues, shopping malls and festivals.

Air & mass transportation modes.

Socio-behavioural & Structural Interactions
SARS Lessons

- Mega cities & capitals at risk.
- Contagiousness: summative or exponential risks.
- Infectivity in crowded environments.
- Closed environments: elevators, underground, hospitals, airplanes, theatres.
- Crowded conditions: condos, malls, mass transportation.
Legionnaires' disease (legionellosis)

- *Legionella pneumophila*
- Relation to water collection systems
- Air conditioning systems / towers
Emergence of Viruses Affecting Humans

Cumulative Number of New Viruses

Year

88 89 90 91 92 93 94 95 96

CDC
Important role of effective environmental management practices.
Discussion Questions

- Consider the following factors in the spread of infectious disease: international trade in exotic animals, loss of natural animal habitats to development, and the ease of global travel. What measures can be taken in each of these areas to reduce the transmission of new viruses?

- Compare the threat posed by new diseases to that posed by the potential for biochemical terrorist activity. Which is ultimately more dangerous to our country? Which is more readily managed? Explain.
THANK YOU

Happy New Year