Creating Sustainable Cities – What can we learn from each other?

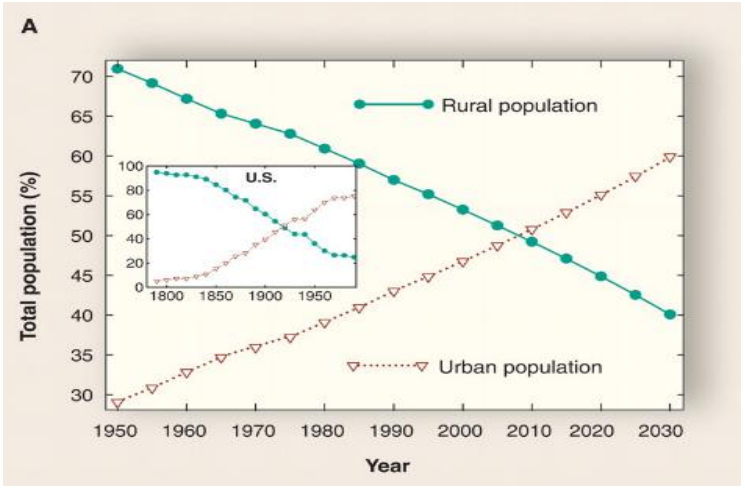
Urban land use change and human-environmental well-being

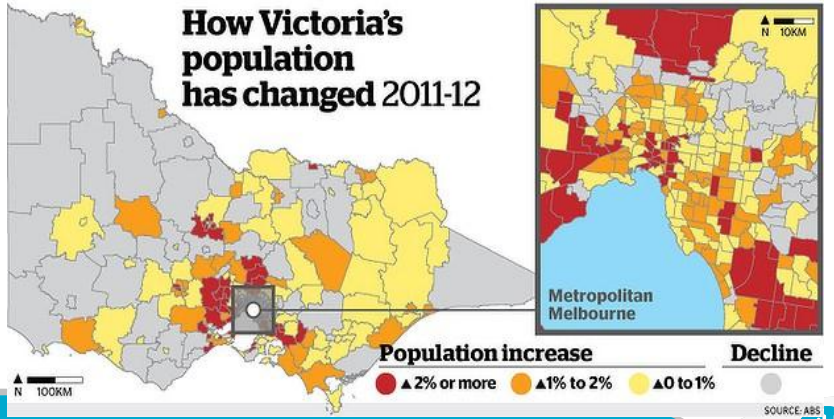
Brenda Lin | Research Scientist
09 August 2013

Urbanization

- Urban dwellers exceed 50% of world population
- Cities growing to unprecedented sizes
- Australia – 89% Urbanization rate
  - 1.2% annual rate of change (2010-2015 est.)
- Melbourne – fastest growing city
  - Just under 25% of Australian population
  - Population of 4.25 million in mid-2012

(The Age, April 2013)

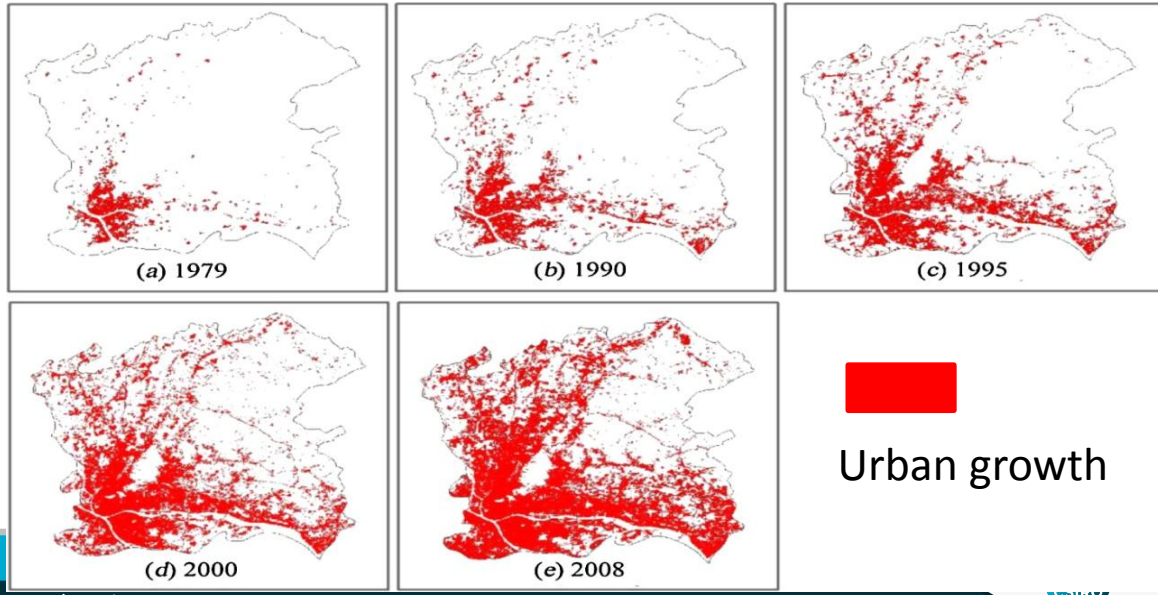




Growth of Asian Megacities

- Urbanization in Japan (91.3%) and Korea (83.2%) already well established with smaller annual rates of growth
- Many countries like China becoming increasingly urbanized
  - 50% urban, annual rate of change 2.85%
  - Beijing: 20% per decade since 1960
  - Guangzhou – large-scale edge expansion

(Sun et al, 2013)



Biodiversity loss due to urbanization

- Impacts on ecoregions, rare species, and protected areas are localized but cumulatively significant
- 8% of terrestrial vertebrate species on the IUCN Red List are imperilled largely because of urban development
- The median distance from a protected area to a city in Eastern Asia is predicted to fall from 43 km to 23 km by 2030

(McDonald et al 2008)

Powerful Owl

Red-crowned Toadlet

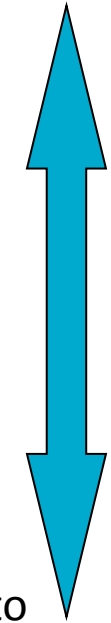
Biodiversity loss due to urbanization

- Homogenization
  - Recent study of four Chinese cities found convergent urban form in shape, size, and growth rates despite varying economic and political drivers
- Shift in communities to “urban adapted” species → Loss of native species

(Grimm et al 2008; Olden 2006)

Major motivations for urban biodiversity

Benefits to Nature



Benefits to Humans

- Preserve local biodiversity (protect rare species)
- Create corridors for natural populations
- Understand and facilitate responses to environmental change
- Connect people with nature and provide environmental education
- Provide ecosystem services
- Fulfil ethical responsibilities
- Improve human well-being

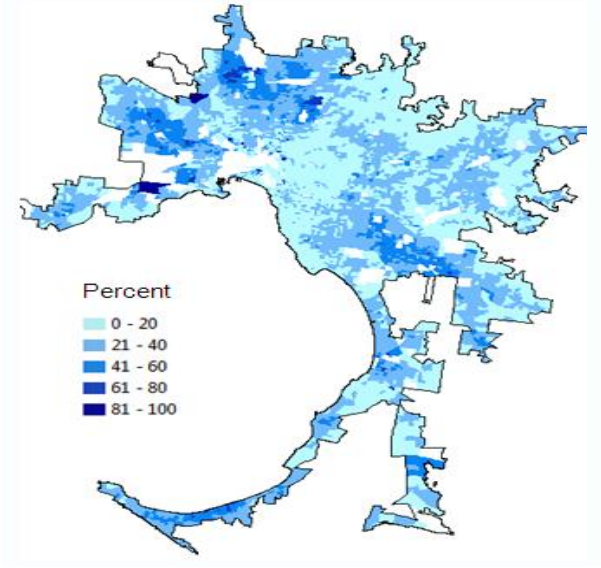
(Dearborn and Kark, 2009)

Potential loss of ecosystem services

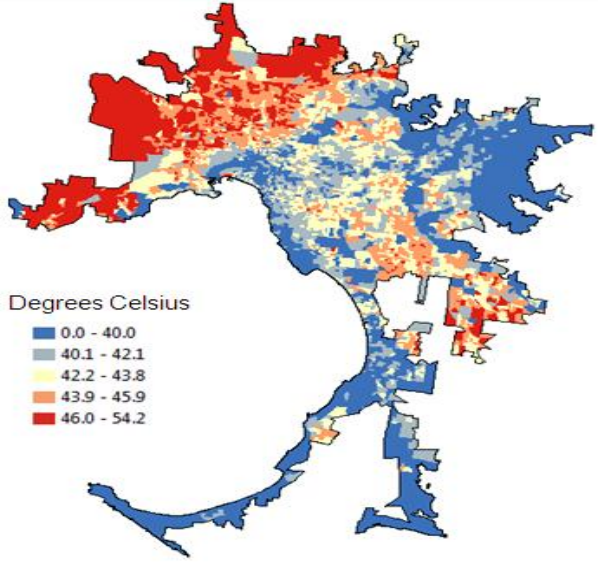
- Microclimate Regulation
  - Urban Heat Island
- Noise Reduction
  - Soft ground or vegetation
- Rainwater Drainage
  - Reduce peak flood discharge
  - Increase infiltration
- Cultural Values
  - Leisure and rest
  - Physical and mental benefits

Potential loss of ecosystem services

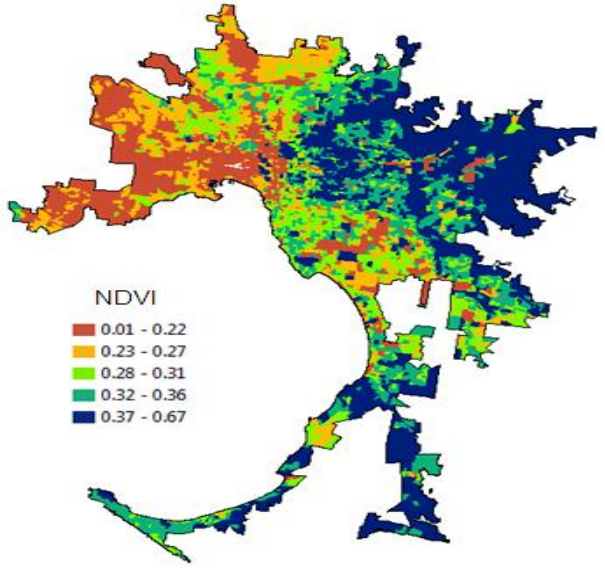
Low Income Households



Land Surface Temperature



Vegetation Cover



(Barnett et al., on-going research)

Potential loss of ecosystem services

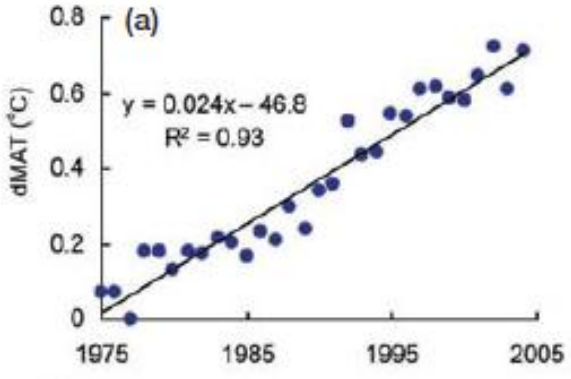
Increasing Urban Heat Island Issues in Shanghai

Correlated to:

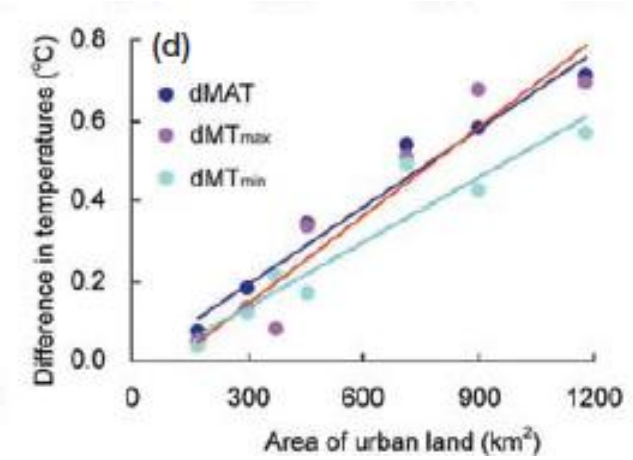
- Increased air and water pollution
- Loss of natural vegetation cover
- Increased cholesterol related diseases

(Zhao et al., 2013)

Change in Mean Annual Temperature (1975-2005)



Change in Mean Annual Temperature in relation to Urban Land Area

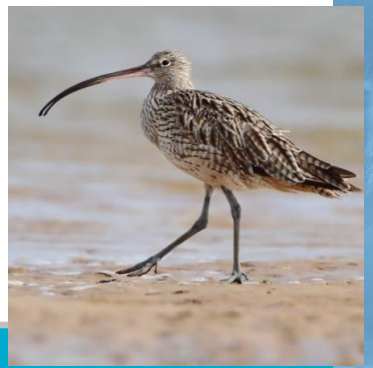


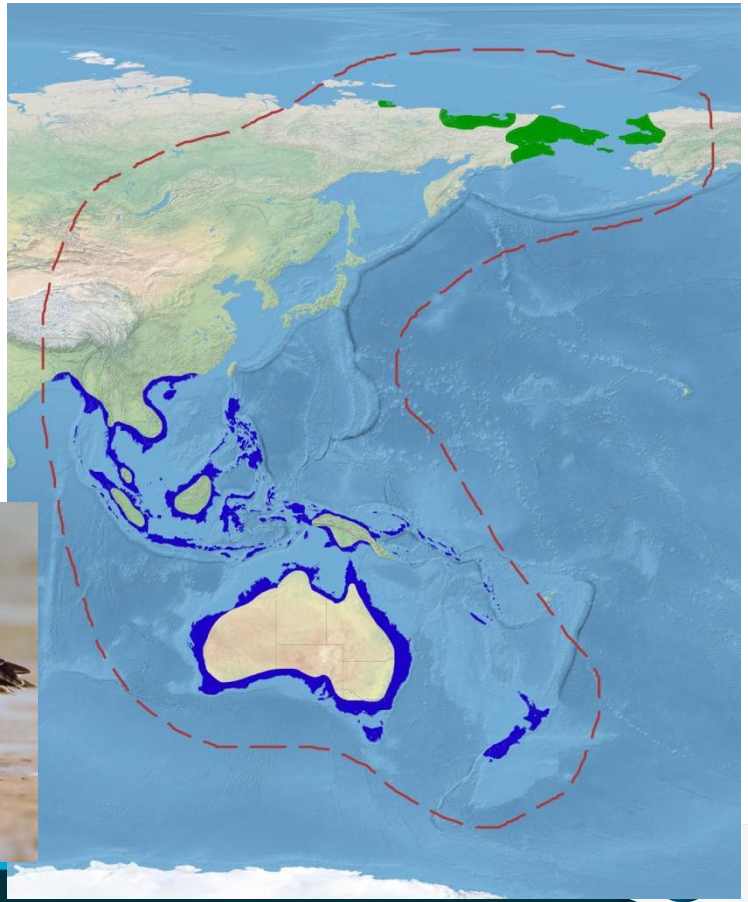
Working together to increase urban environmental research

- Full range of urbanization in which to study the effects of land use change on biodiversity and ecosystem service loss
- Increasing knowledge exchange for maintaining (Australian cities) or restoring (Asian megacities) lost vegetation and ecosystem services
- Shared resources for working at local to regional scales

Working together to increase urban environmental research

- Asian-Australian corridors for conservation
  - Urban sprawl in northern latitudes appears related to declines in abundances in some migratory birds in southern latitudes
  - Protection of the East Asian–Australasian Flyway





(Fuller group, Univ. of Queensland)

Thank you

Climate Adaptation Flagship
Brenda Lin
Research Scientist

t +61 3 9239 4476
e Brenda.Lin@csiro.au
w www.csiro.au