Mapping peri-urbanization in the Red River Delta

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Background

• Coupled Natural-Human Systems and Emerging Infectious Diseases
  – Anthropogenic environmental change and avian influenza in Vietnam
Background

- Framework: Environmental risk transition (Smith 1990)
What is peri-urbanization?

• Various definitions, depending on perspective

  – Urban: desakota (McGee 1991)

  – Rural: deagrarianization (Rigg 2006)

Why do we care about peri-urbanization?

- Rapid modification of landscapes
- Intense pressure on resources
- Lack of adequate public services
- Degradation/conversion of agricultural lands
- Neglected governance and management
How can we identify peri-urban areas?

*Cedric Price’s analogy of urban evolution*
How can we identify peri-urban areas?

- Constructed Surface Area Density for S.E. Asia, 2010 (NOAA/NGDC)
- Global Land Survey, 2000, Landsat ETM+ (USGS)
Study area
Method 1: Demographic analysis

  – Social, economic, & environmental data aggregated by commune

• Development of transition models
  – Urban: Changing nature of the built environment
  – Agricultural: Loss and diversification

• Cluster analysis and GIS
## Urban transition

<table>
<thead>
<tr>
<th></th>
<th>Water source</th>
<th>other</th>
<th>filtered</th>
<th>rain</th>
<th>tap</th>
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<tbody>
<tr>
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<td>simple (latrine)</td>
<td>Sulabh (squat)</td>
<td>flush</td>
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<tr>
<td>Building materials</td>
<td>temporary</td>
<td>wooden</td>
<td>semi-permanent</td>
<td>permanent</td>
<td></td>
</tr>
</tbody>
</table>

![Graph showing diversity of infrastructure](image_url)
Agricultural transition

- **Main income from agriculture (% HH):**
  - Rural: High
  - Transitional: Decline
  - Urban: Low

- **Irrigated area (%):**
  - Rural: Low
  - Transitional: Increase
  - Urban: High

- **Agricultural population density (persons/km²):**
  - Rural: High
  - Transitional: Decline
  - Urban: Low

- **Poultry density (heads/km²):**
  - Rural: Low
  - Transitional: Increase
  - Urban: High
Census-derived classification of communes

Transitional communes (2006)
Land area ~ 8%
Population ~13%

Growth (2001-2006)
Area: 8.4% per year
Population: 10.68% per year
Method 2: Remote sensing

- **Data**
  - Landsat TM/ETM+ imagery: 1990s to present
  - GPS/photo field surveys: summer 2011
  - Local knowledge
  - Google Earth historical imagery

<table>
<thead>
<tr>
<th>Stable land cover classes</th>
<th>Change from agriculture to built-up land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>1993 – 2000</td>
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<tr>
<td>Forest</td>
<td>2000 – 2007</td>
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<tr>
<td>Water</td>
<td>2007 – 2011</td>
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<tr>
<td>Built-up</td>
<td></td>
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</tbody>
</table>

- Supervised classification: support vector machine (SVM) algorithm
Census-derived classification

Remote sensing classification
Cảm ơn quý vị!

"We're waiting for the city to come to us..."