



Demography, Migration and Energy Demand

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Presentation Outline

- Key drivers of energy use and current treatment of demographic changes in modeling energy demand
- Some projections of urbanization and its importance in certain regions
- Comparison of energy consumption patterns across rural and urban households in China and India
- Some projections of household demand for cooking energy in India accounting for rural and urban differences



Drivers of Energy Use and Emissions

Demography

Economic Growth

Technology

Policy

Lifestyles

Demographic change is one among many drivers

Economic growth models have focused on population size and technology as key drivers. What about other demographic factors?



Demography, Energy & Emissions

**Population
Growth/Decline**

Aging

Urbanization

Household Size

- Most models (used for projections) typically consider only changes in population size
- What are the implications of other demographic trends for future energy demand?

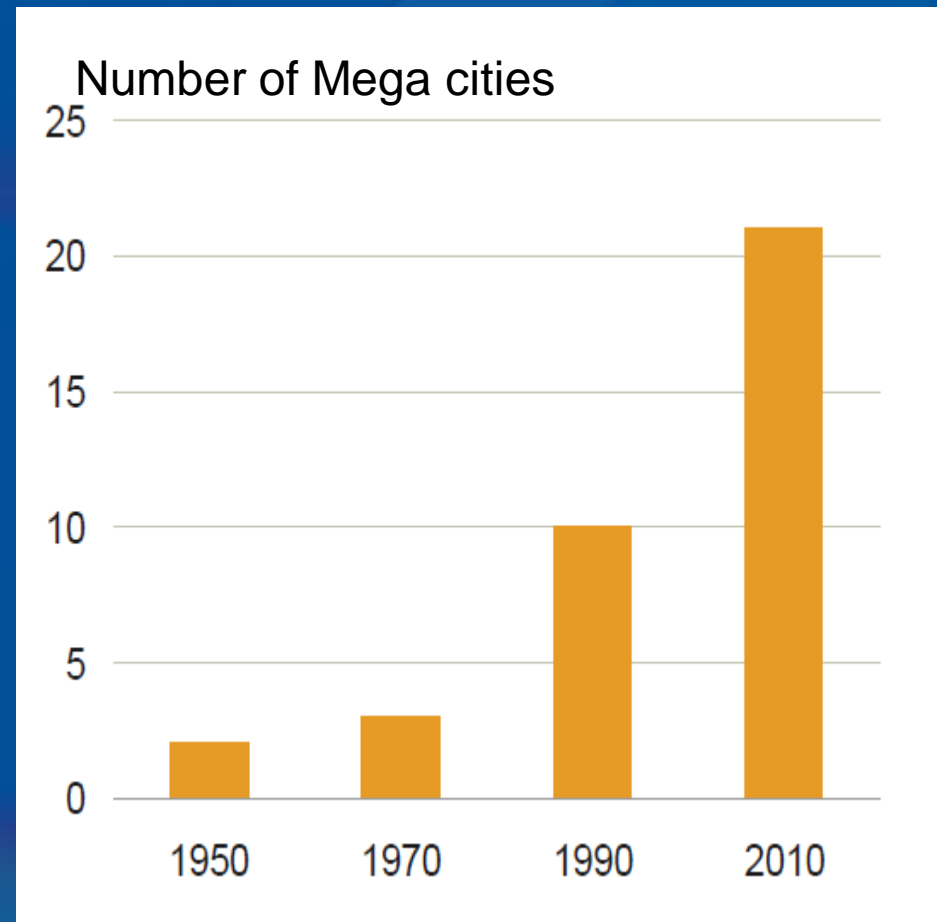
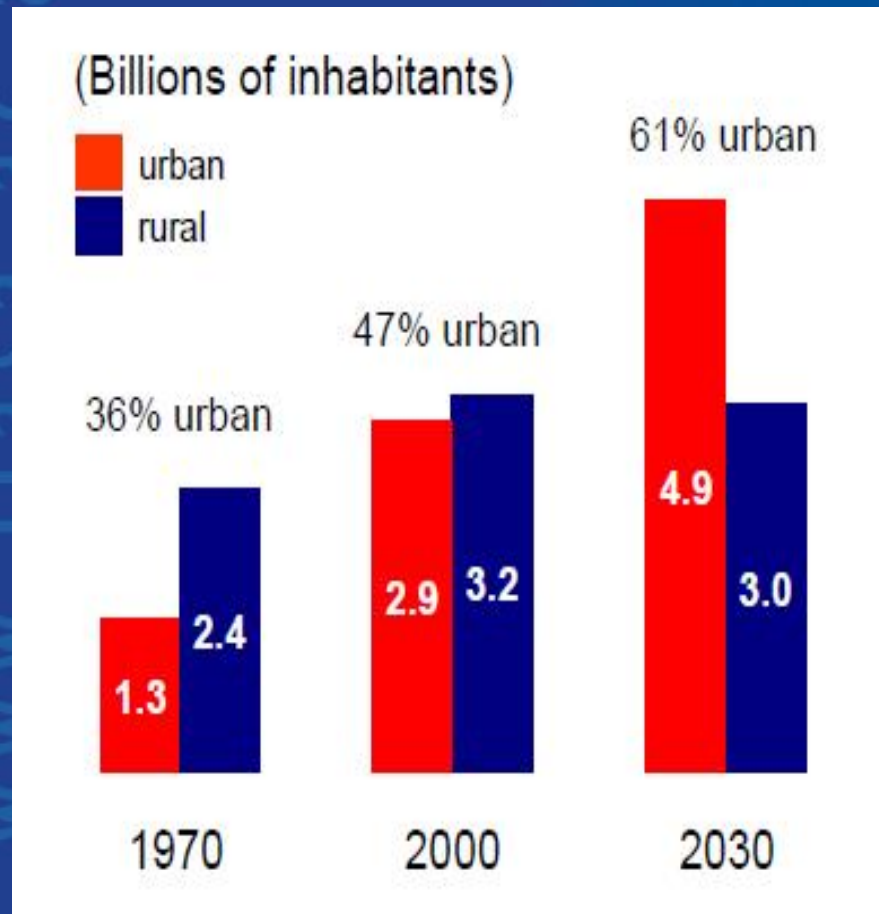


Global Urbanization and Energy

- Growing populations of South Asia, China and regions of Africa will urbanize at an increasing rate.
- Urban residents may use several times more energy, and energy from different sources from what they used in the countryside. Urbanization can bring with it an increasing dependence on fossil energy.

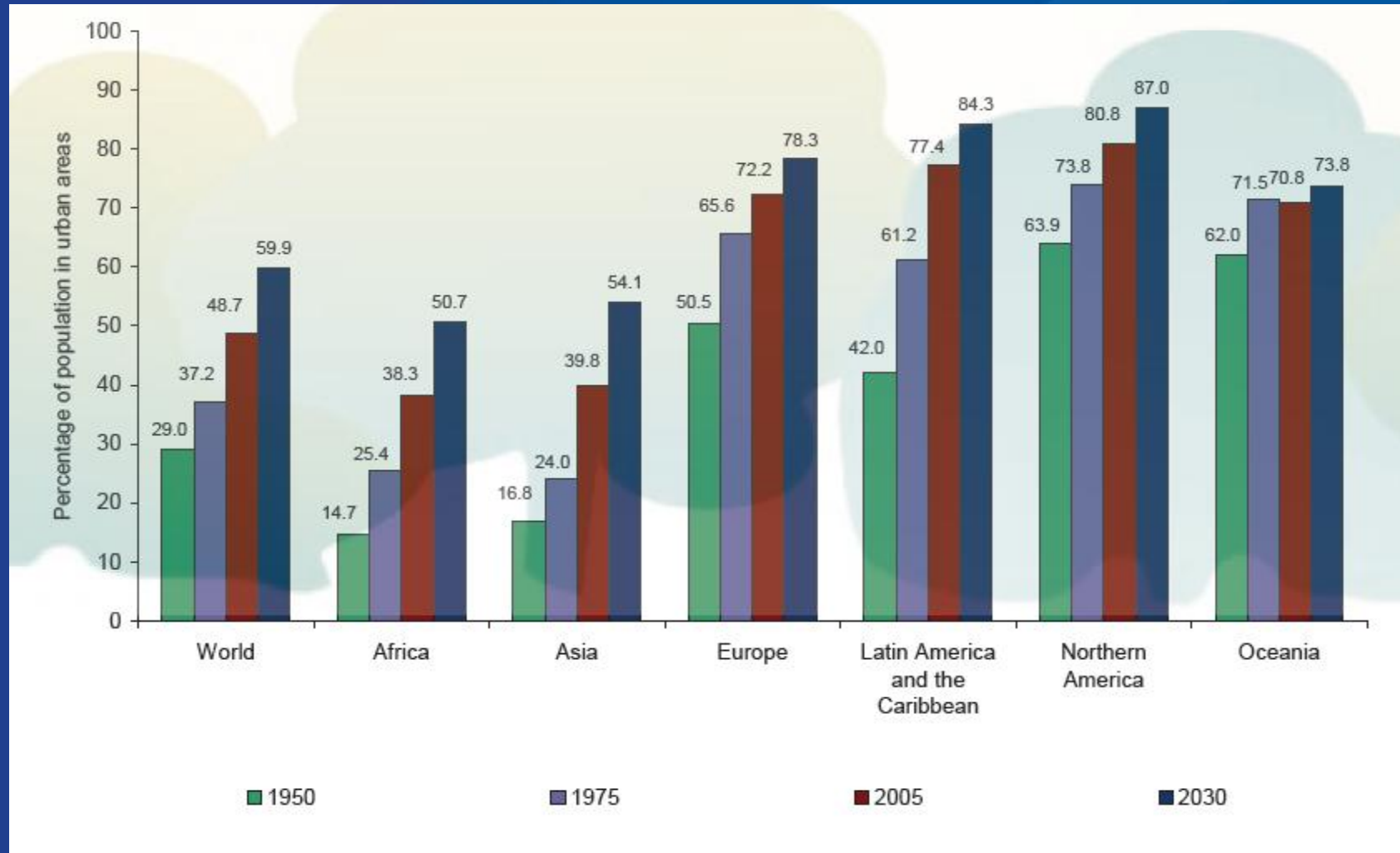


World Urbanization Trends





Urbanization Trends by Region

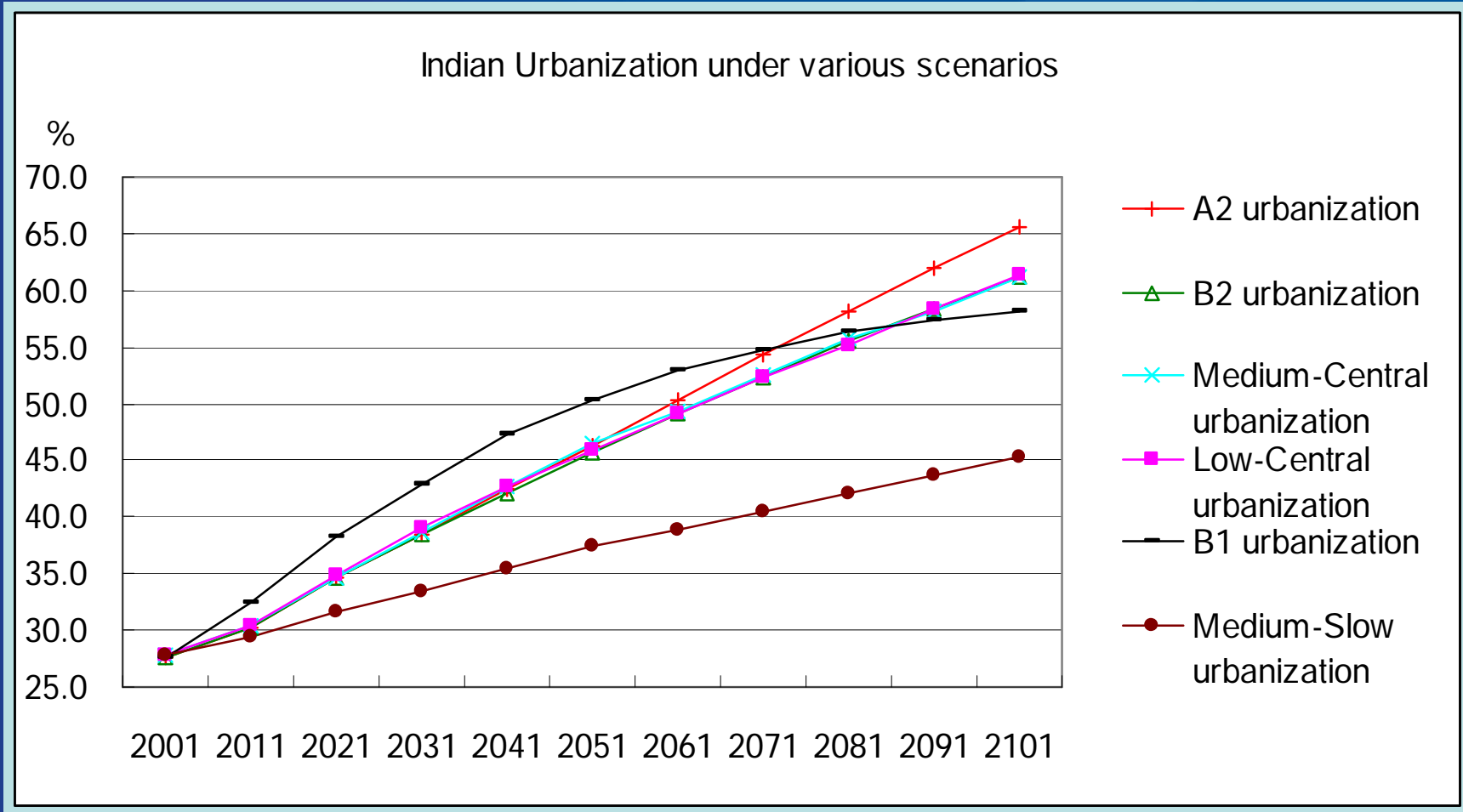


Source: UN 2007, World Urbanization Prospects



Future Urbanization Trends in India

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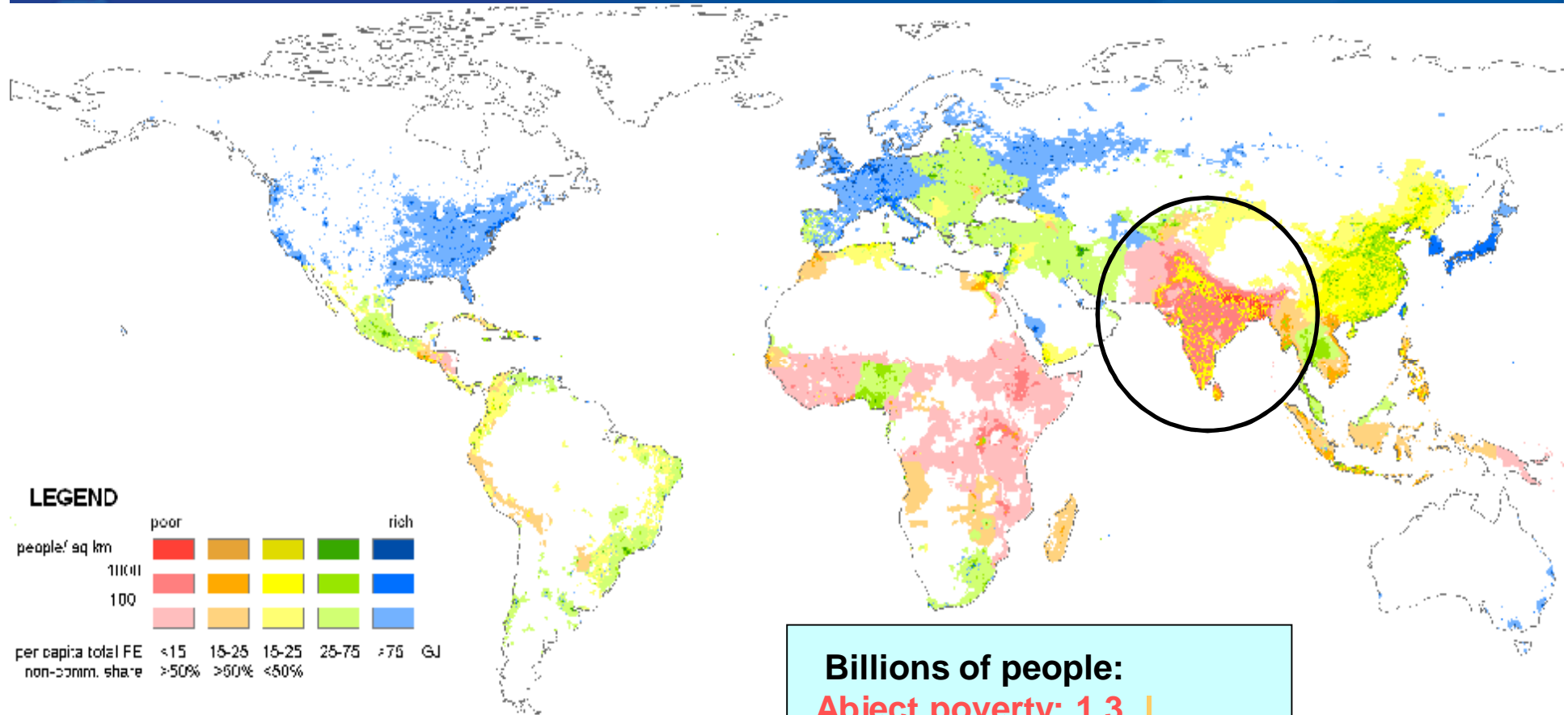


Source: Jiang et al. (in prep)



Mapping Energy Poverty

Taxonomy based on final energy availability and share of non-commercial energy



Billions of people:

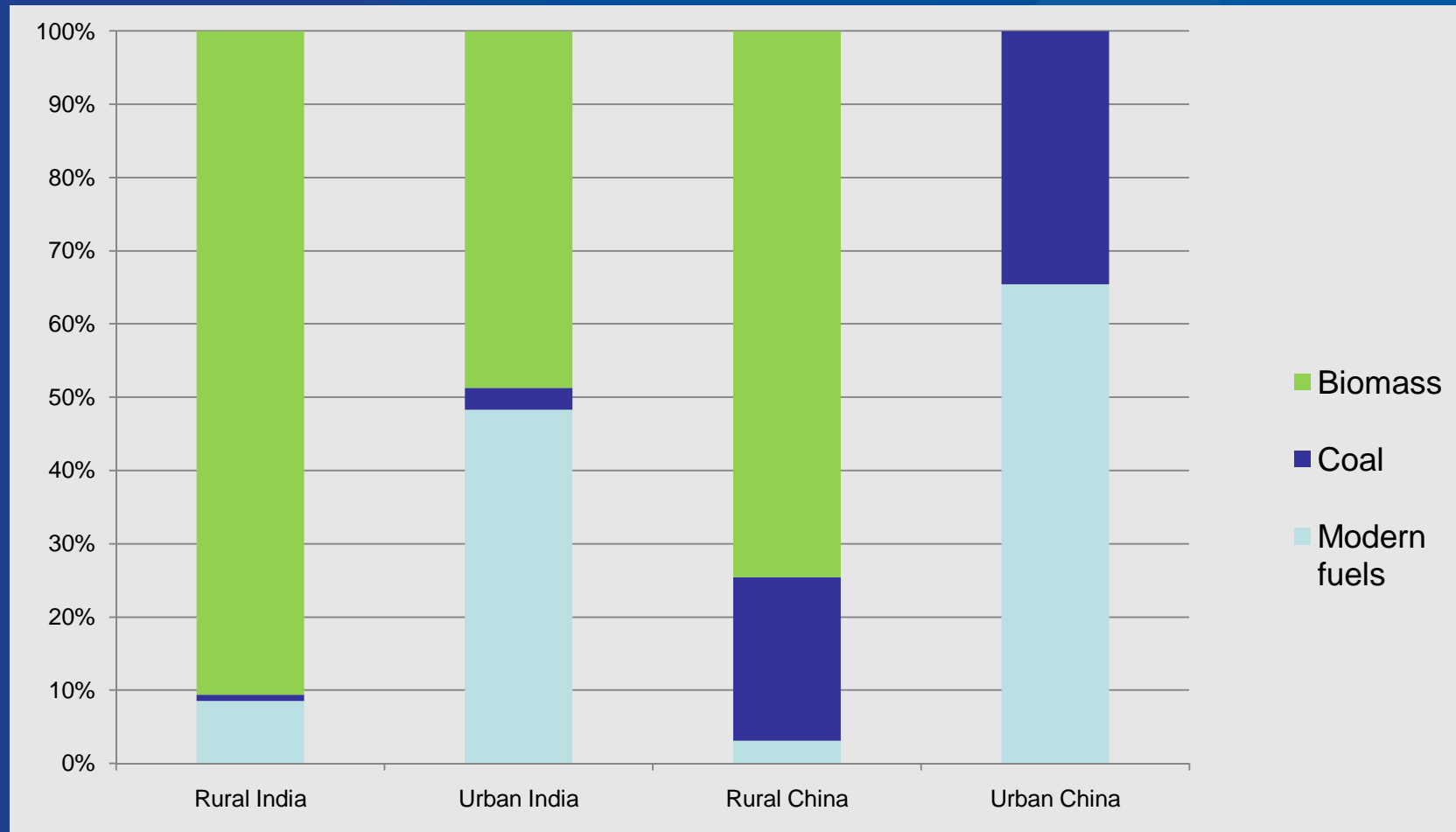
Abject poverty: 1.3		3.3
Poor: 0.6		
Less poor: 1.4		2.8
Middle class: 1.4		
Rich: 1.2		

Source: Gruebler et al, 2008



Pattern of Household Fuel Use Across Rural & Urban Areas

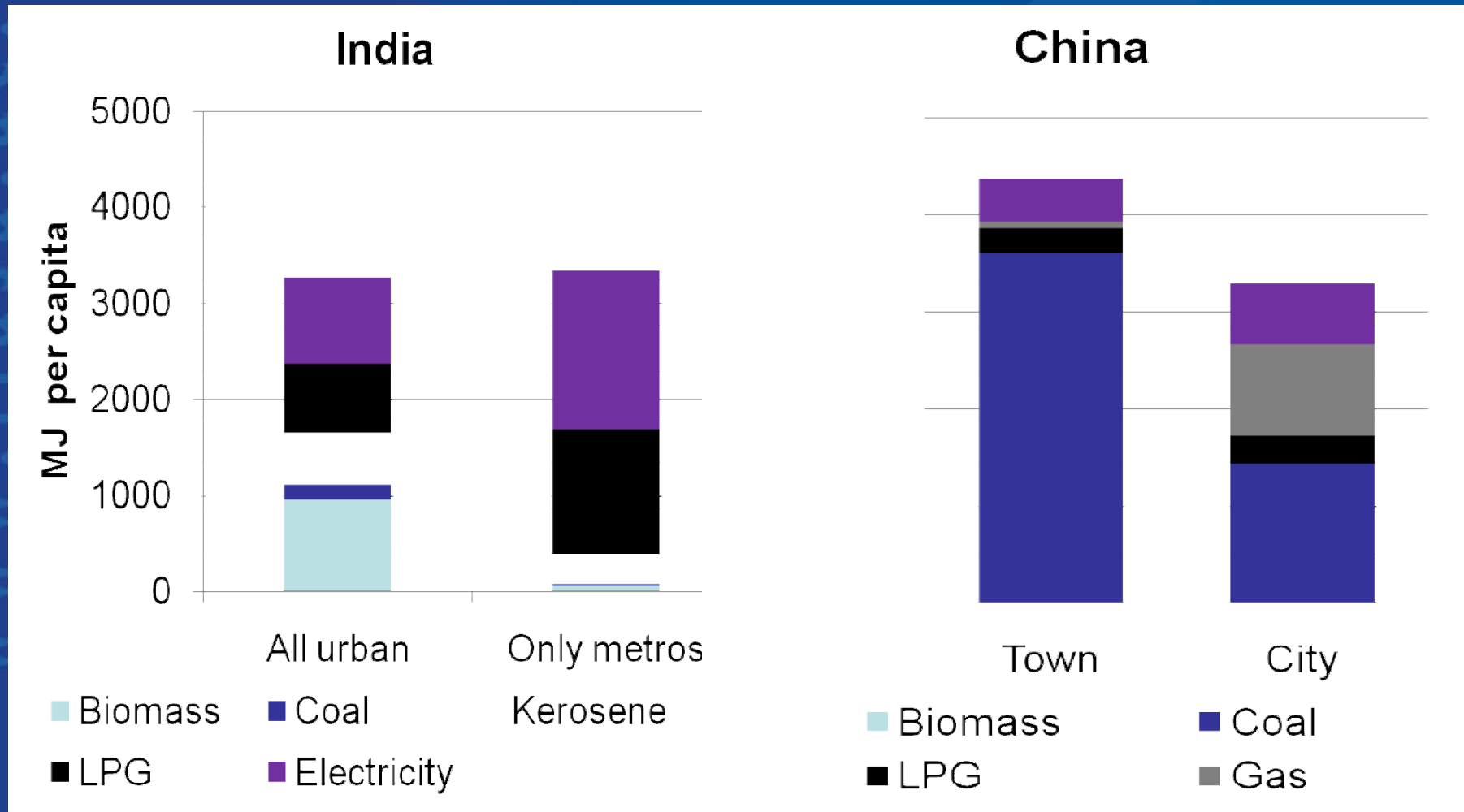
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Source: Pachauri & Jiang 2008



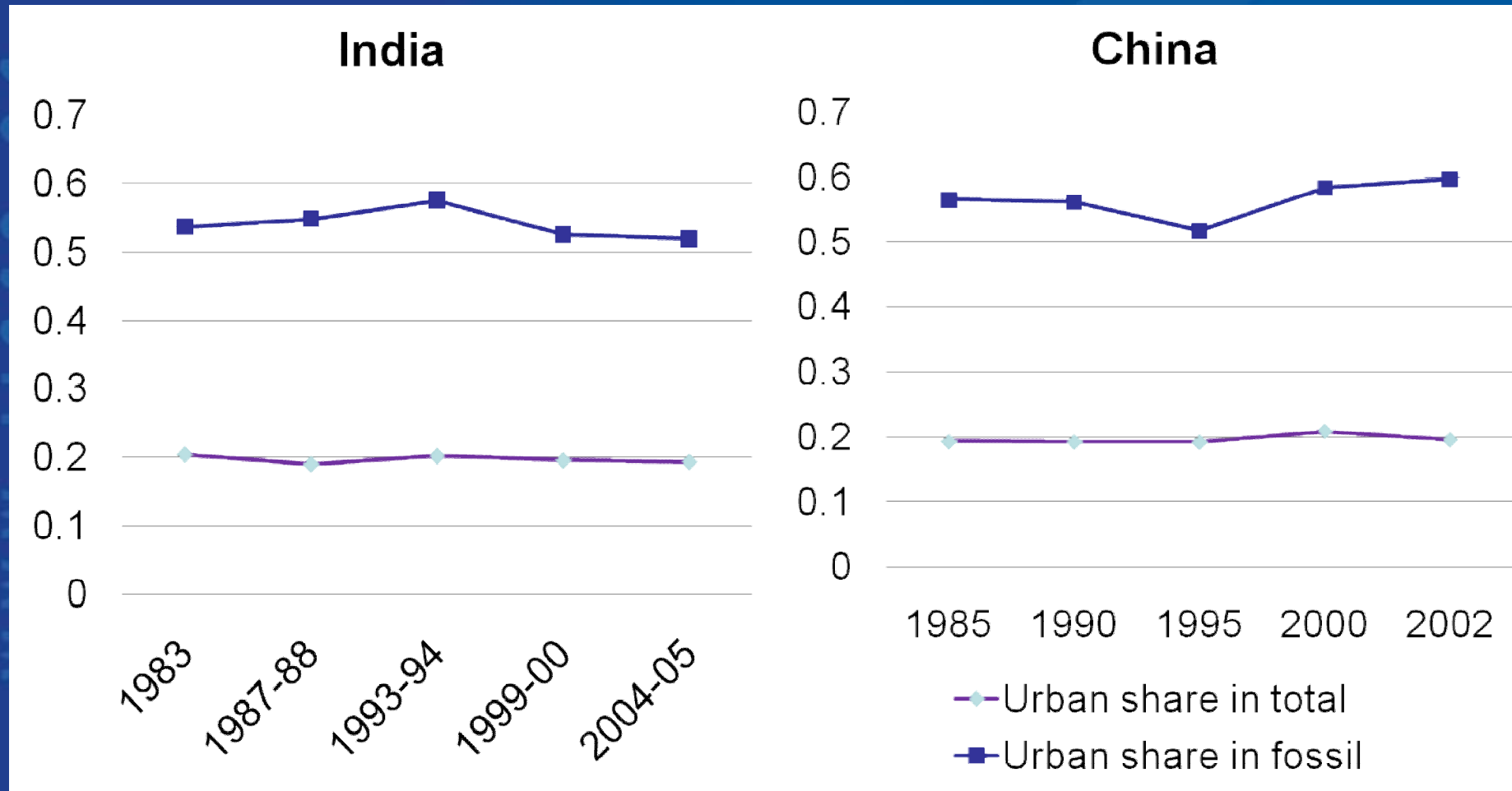
Variations in Household Energy Use Patterns Across Urban Type



Source: Pachauri & Jiang 2008



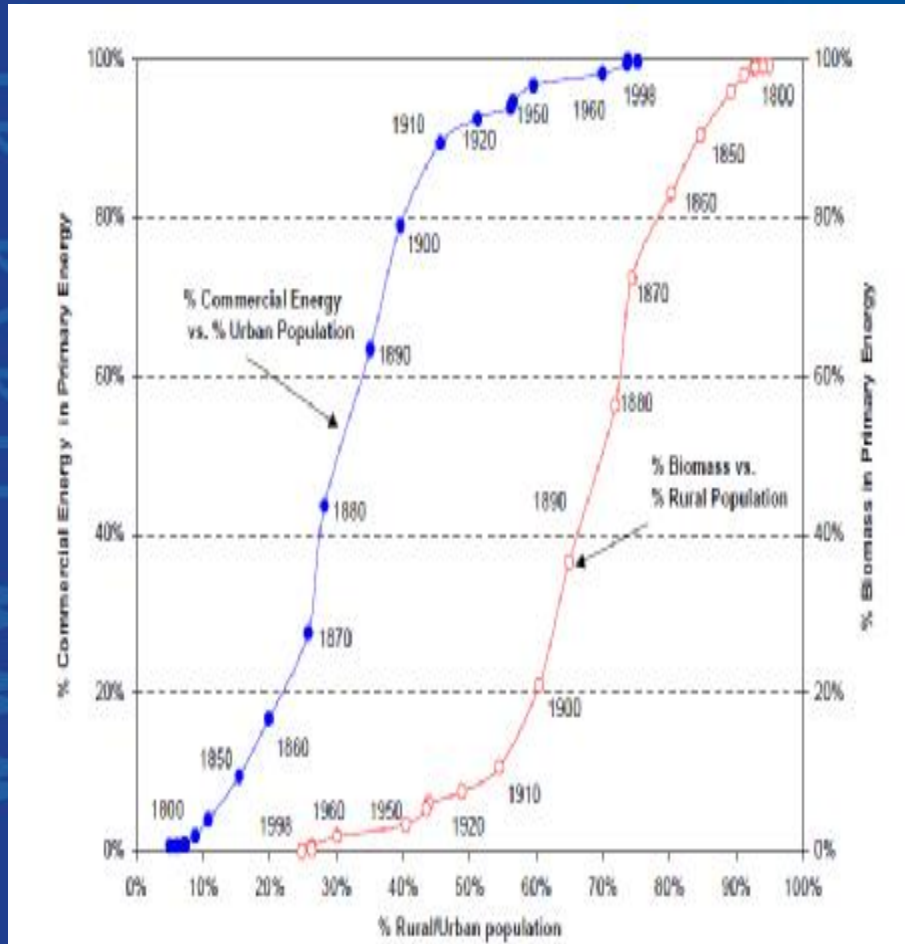
Share of Urban Energy in Total Residential Energy Use



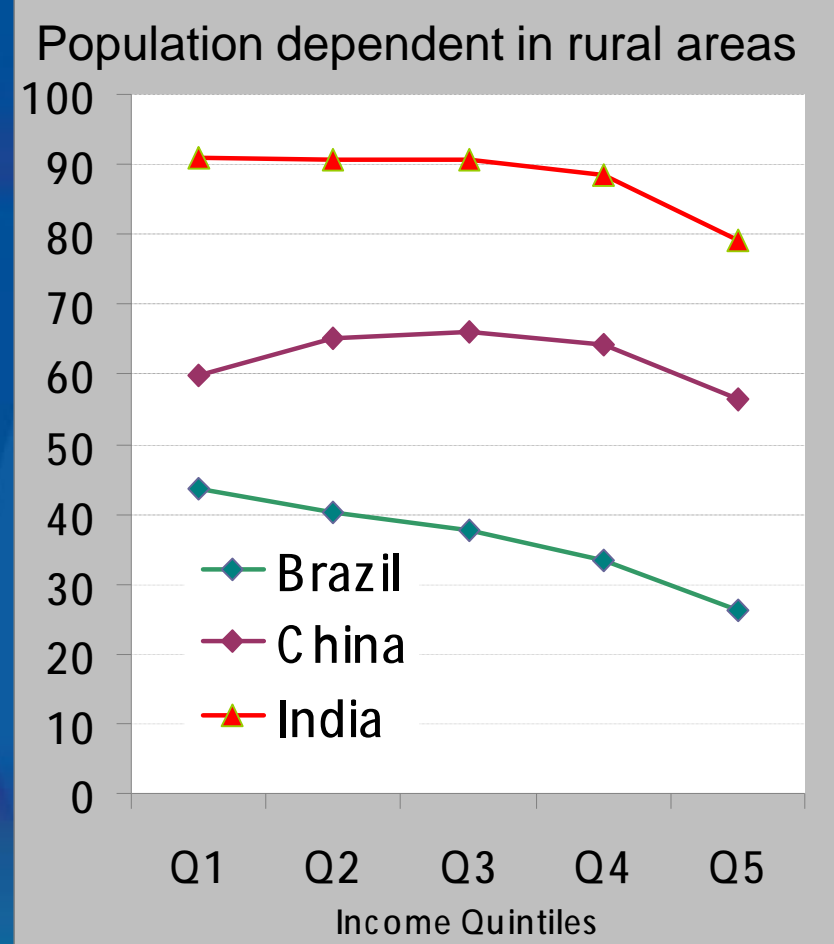
Source: Pachauri & Jiang 2008



Population Dependence on Traditional Biomass



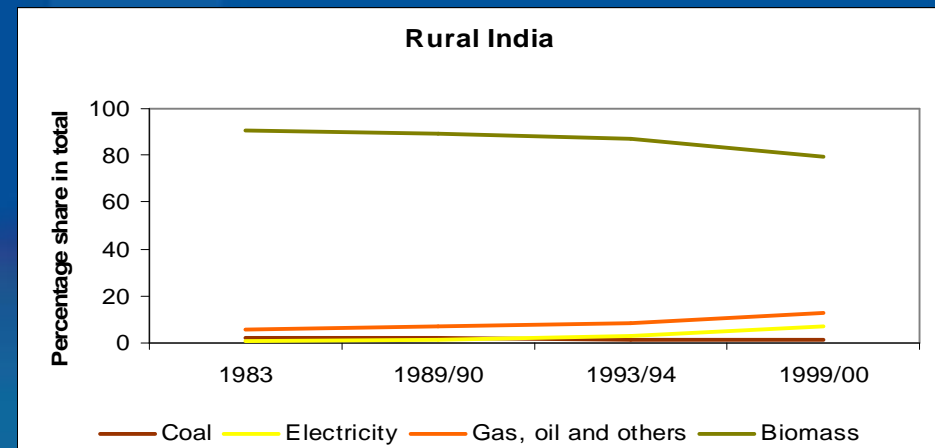
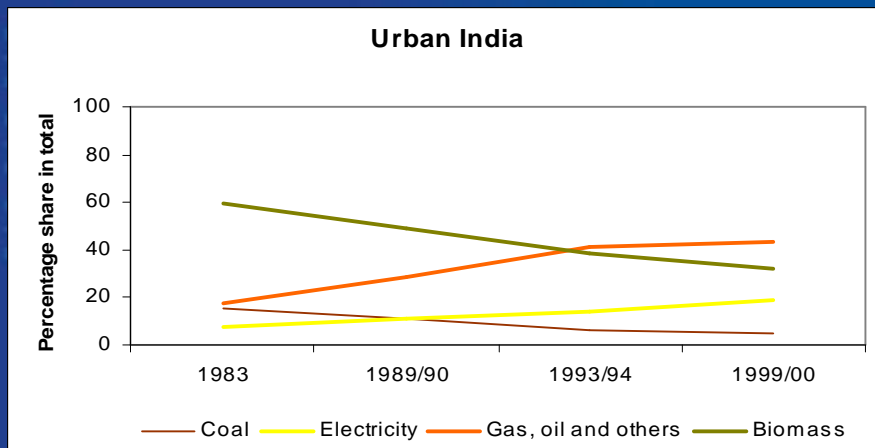
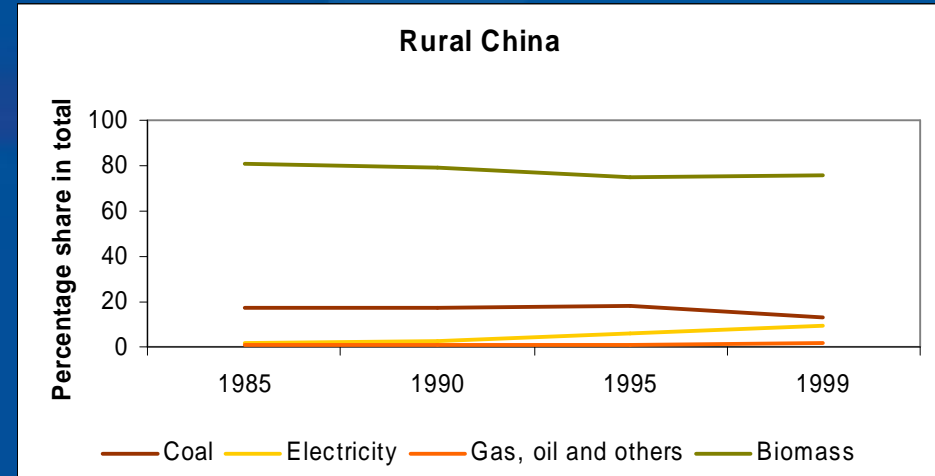
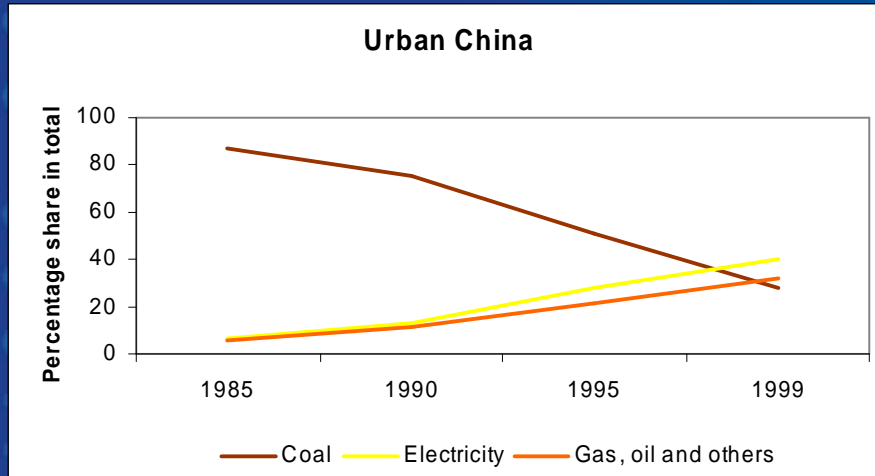
Source: Victor 2002



Source: Pachauri & Jiang 2008, CEPAL 2007



Household Energy Transitions in Urban & Rural India & China



Source: Pachauri & Jiang 2008

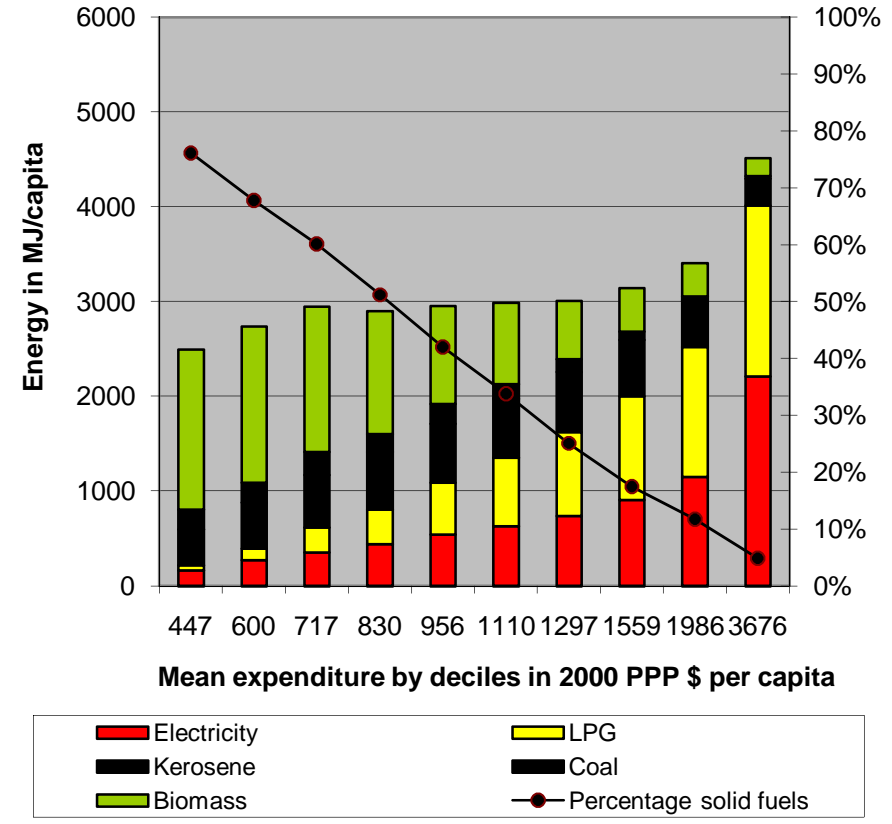
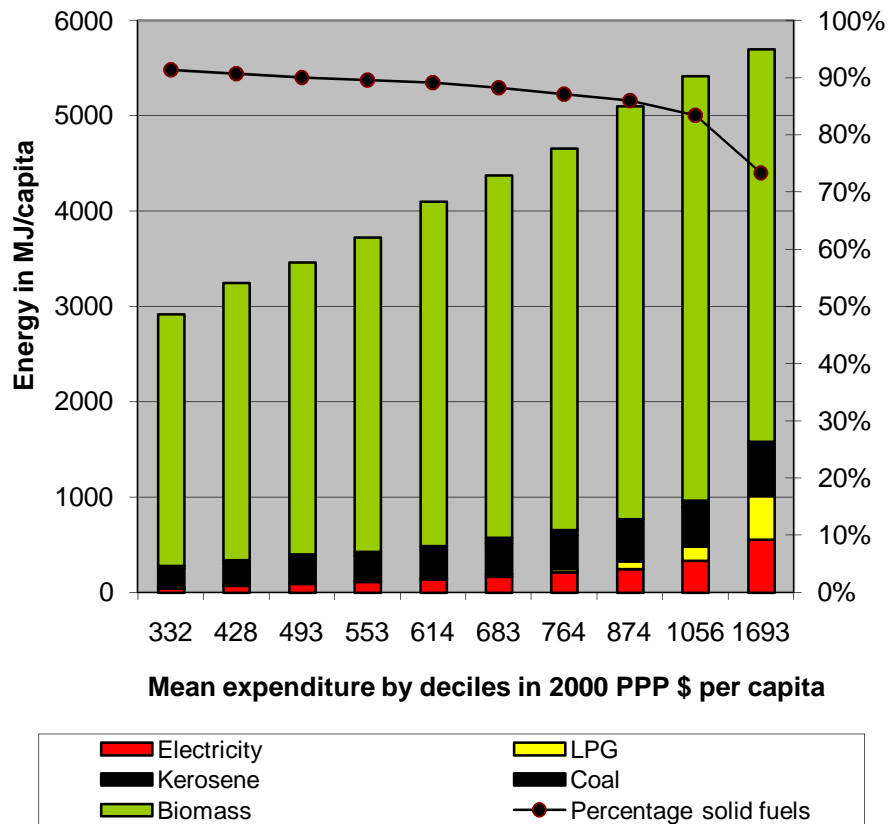


Household Energy Use Patterns in India in 2004/05

Rural Households

Little transition in rural areas

Urban Households





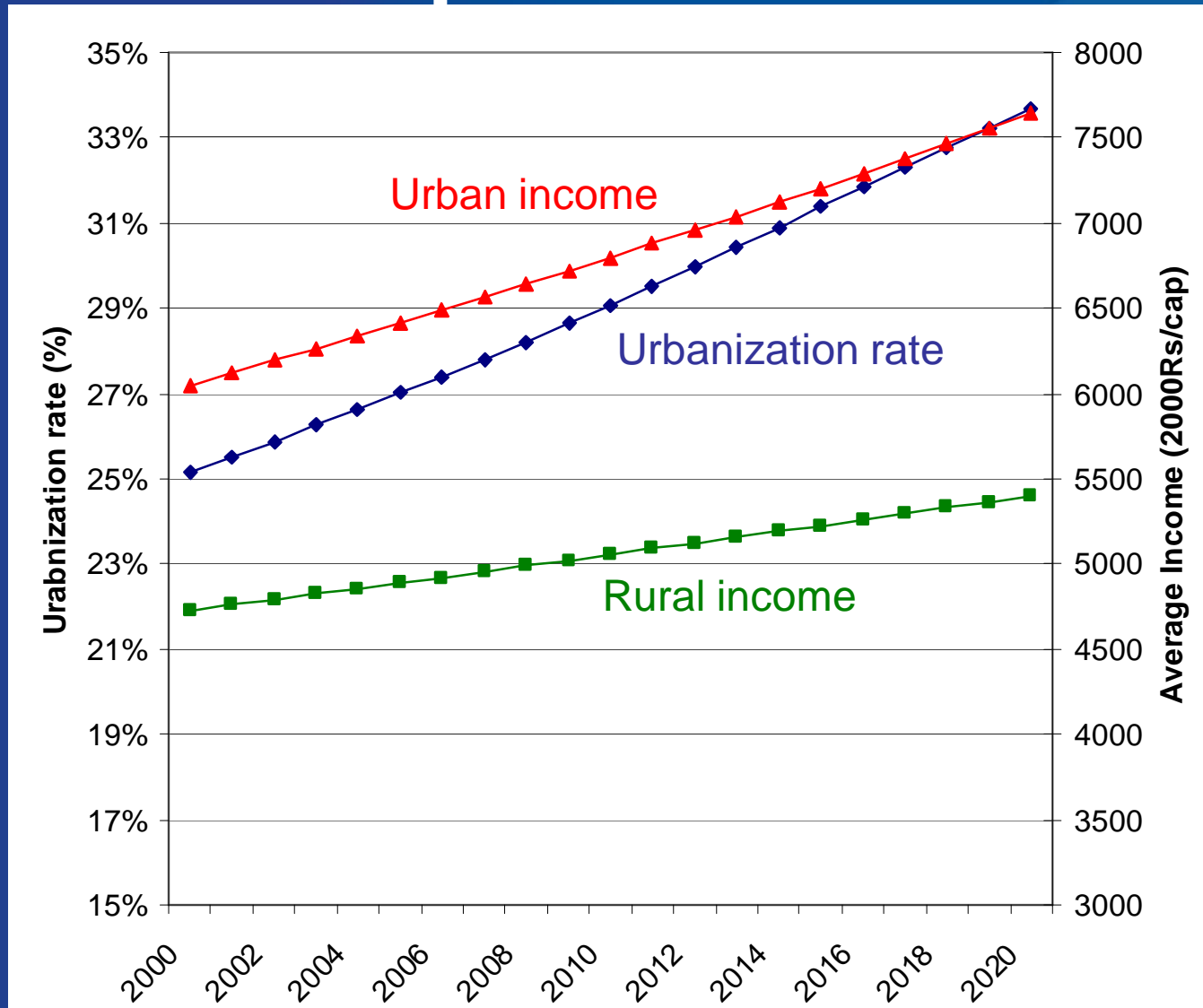
GEA Residential Access Scenarios Methodology

- Simple energy model of the residential/commercial sector of India
 - Linear programming, cost optimization (based on MESSAGE)
- 10 consumer groups
 - Urban/rural
 - Five income categories
- Main factor affecting fuel choice
 - Price of energy fuels & appliances
 - Financial (budget) constraints
 - Consumer's rate of time preference (planning horizon & implicit discount rate)
 - “Inconvenience costs” of low quality fuels (biomass and coal)
 - Policy instruments: fuel subsidy and/or micro-financing



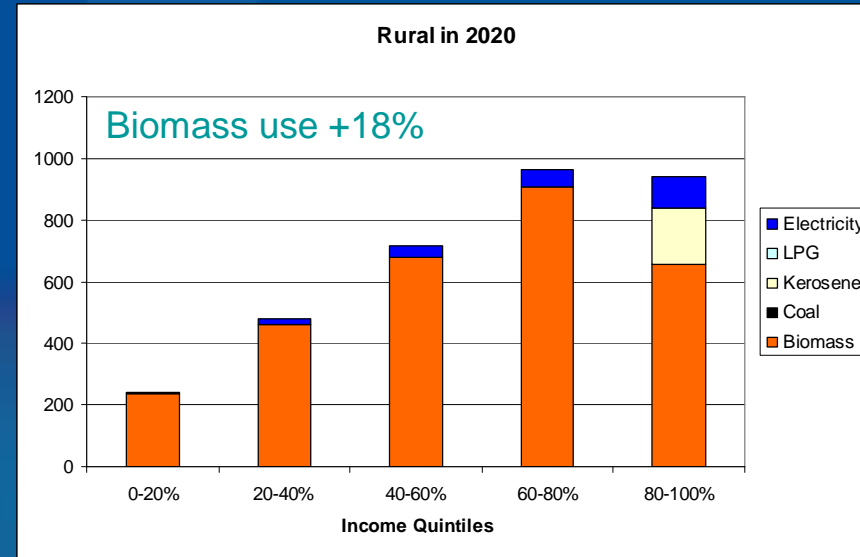
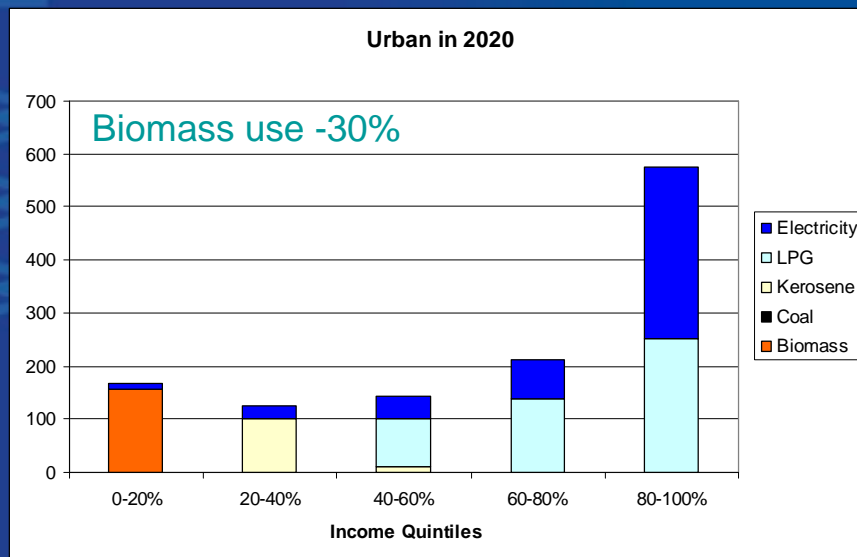
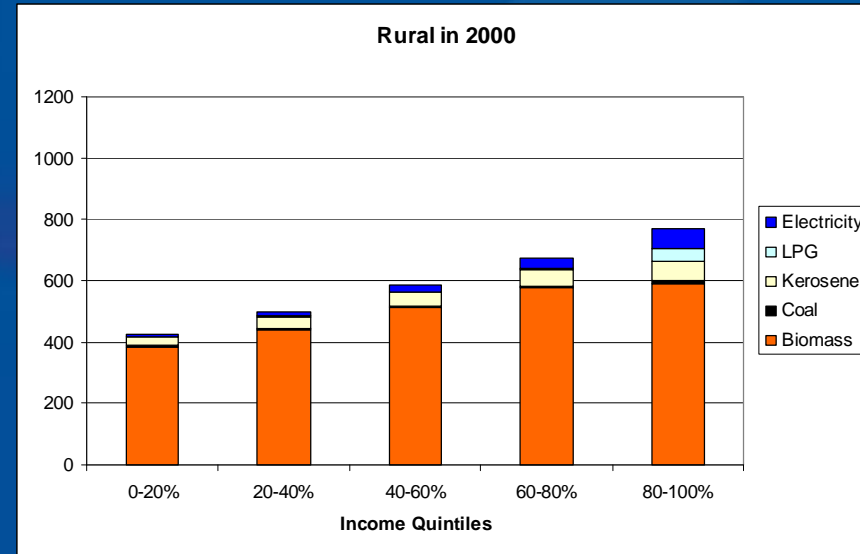
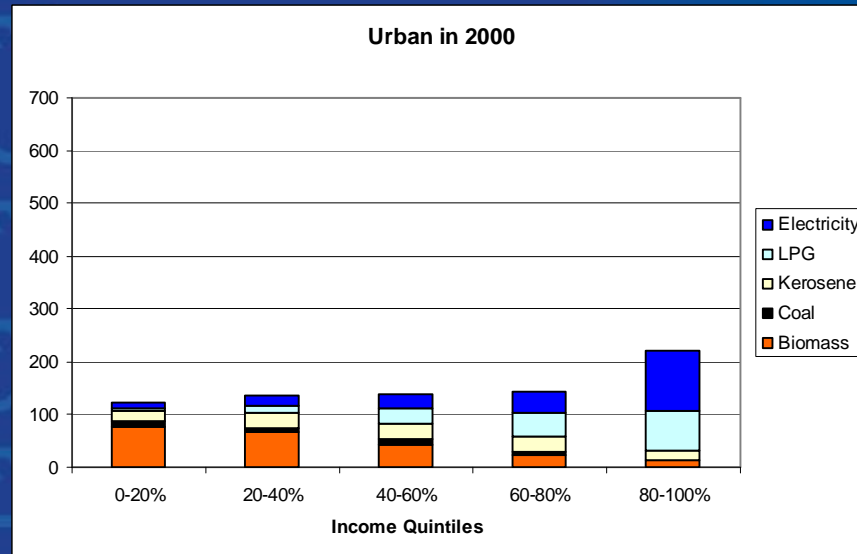
Urbanization & Income Growth Assumptions for India

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Results: Urban & Rural Household Fuel Use





Some Policy Implications

- Patterns of migration, urbanization and changes in city densities all have important implications both for the future energy mix and energy demand.
- In developing and least developed countries, urban slums will continue to grow, making it urgent that these areas also see investments for provision of energy services



Some Final Questions

- Might the availability of better energy infrastructure influence the direction of migration in the future?
- Can the absence of adequate access to clean energy sources in cities, delay the demographic transition (increase mortality and morbidity rates)?