# SCHEMA, a crosscutting project: Accounting for Socioeconomic Heterogeneity in IIASA Models
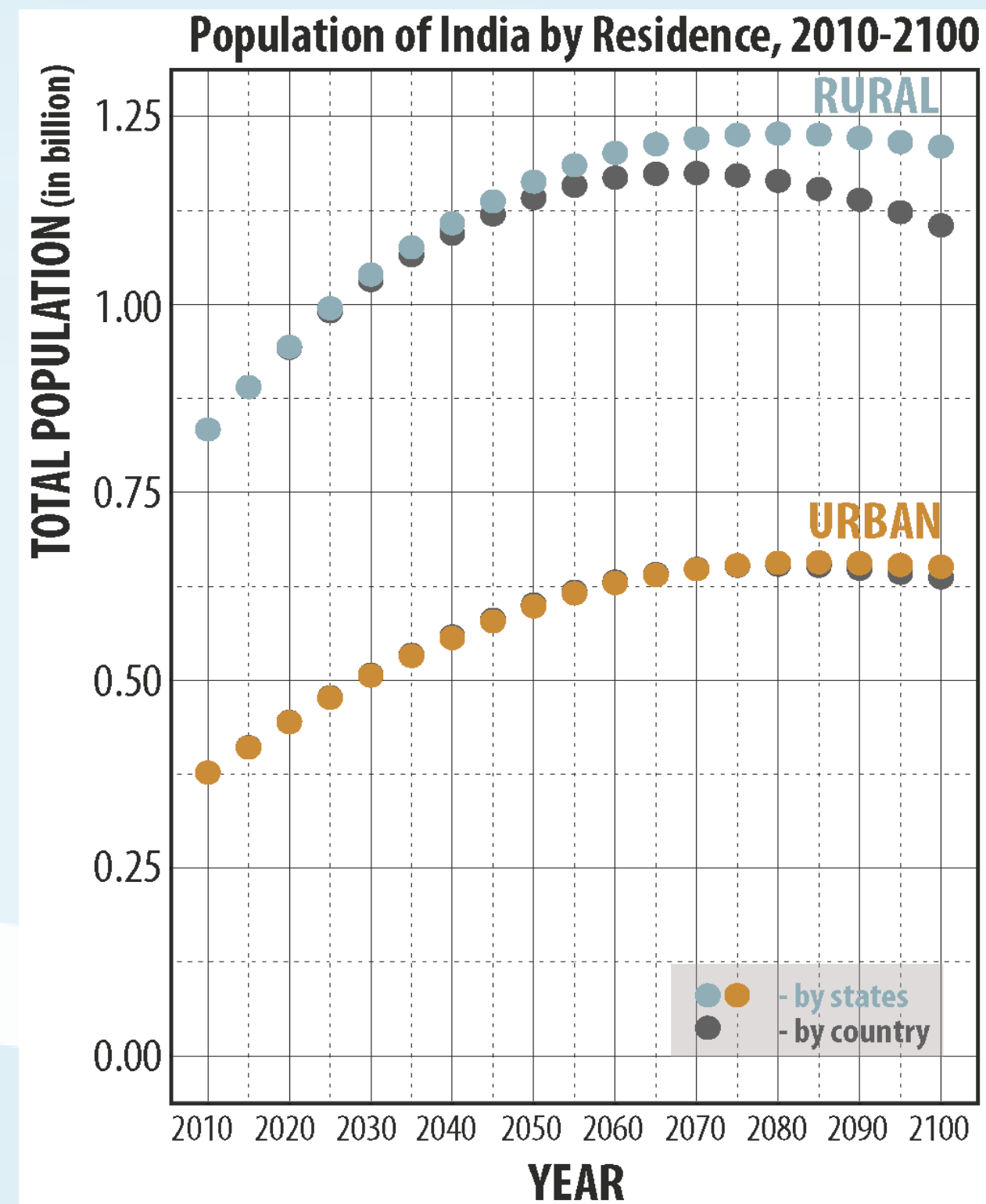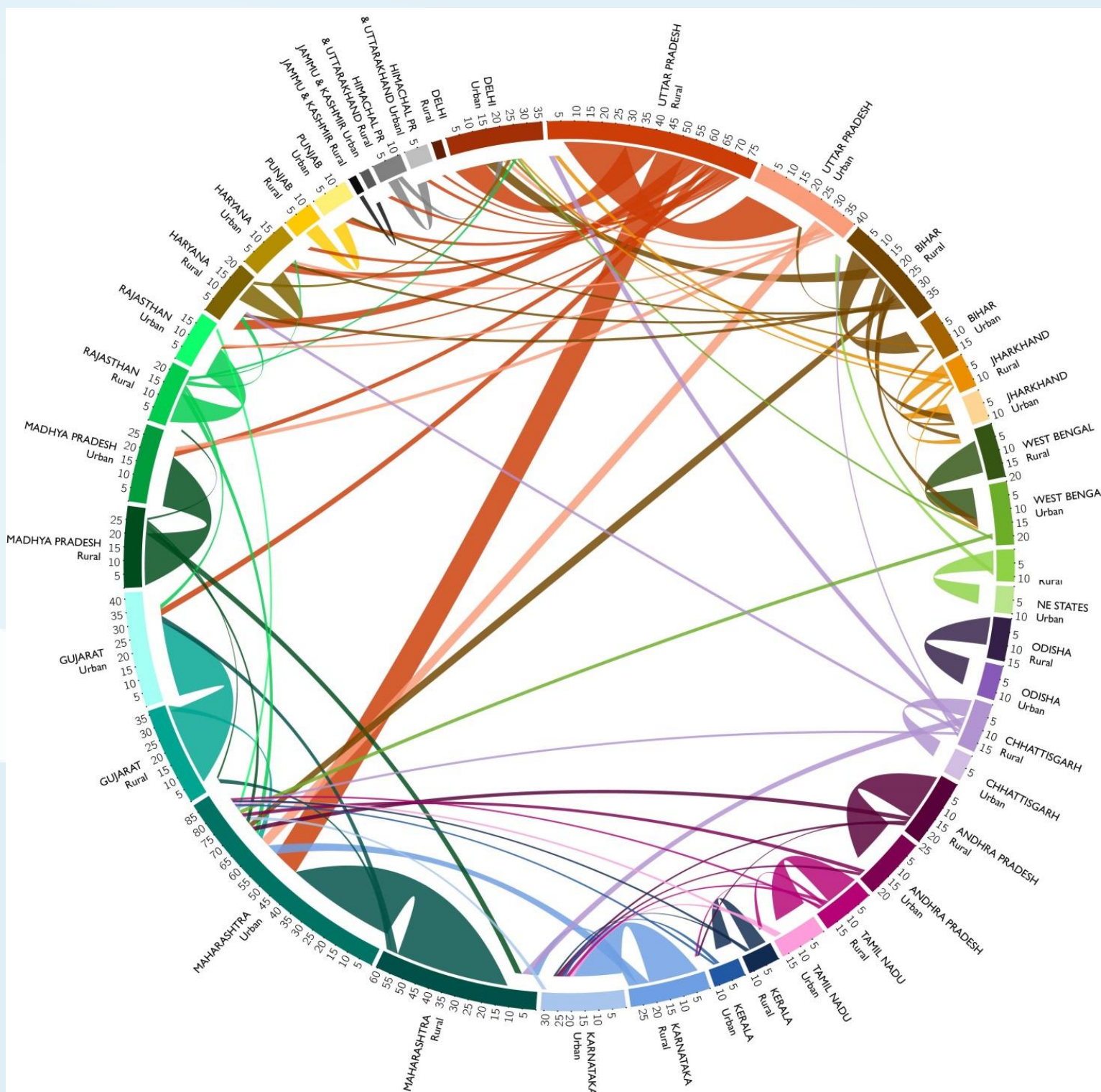
Samir KC, Gregor Kiesewetter, Shonali Pachauri, Narasimha D Rao, Hugo Valin
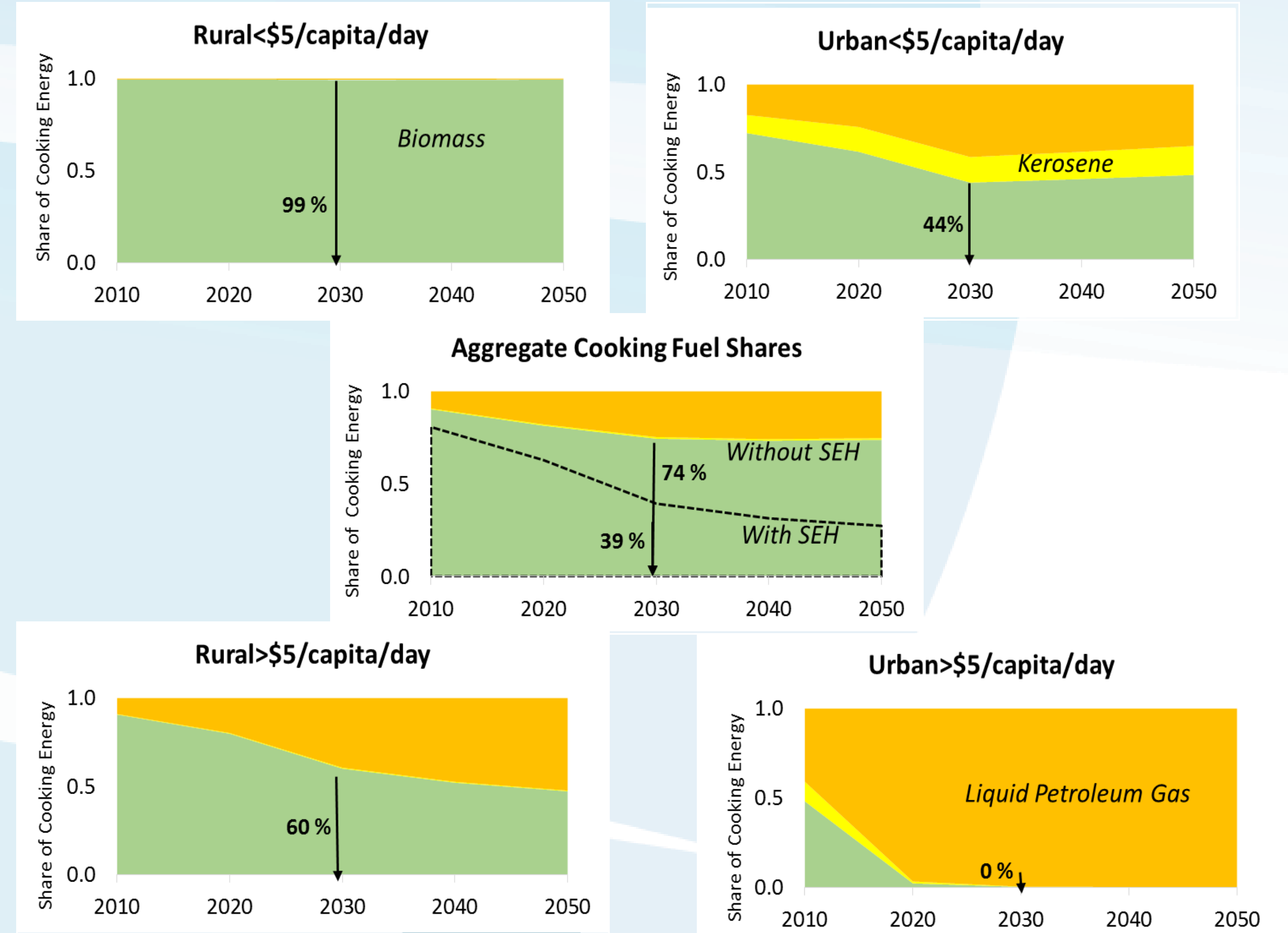
## Population

Disregarding internal migration and urbanization leads to underestimation of total population due to fertility and education differences

**Concept: Internal Migration**

Source: Census 2001; Visualization: N. Sander; M. Sperisger & S. KC



Population of India by Residence, 2010-2100

RURAL
URBAN

by states
by country

## Energy access

Disregarding income heterogeneity and urban/rural differences leads to overestimation of biomass (solid fuels) in cooking energy

Rural<$5/capita/day — Biomass — 99 %

Urban<$5/capita/day — Kerosene — 44%

Aggregate Cooking Fuel Shares — Without SEH 74 % — With SEH 39 %

Rural>$5/capita/day — 60 %

Urban>$5/capita/day — Liquid Petroleum Gas — 0 %

## Income distribution

Technological change, education inequality and capital flows tend to increase income inequality



Urban

Income per cap, per day
>$10
$5-$10
$2.5-$5
$1.25-$2.5
<$1.25

Rural
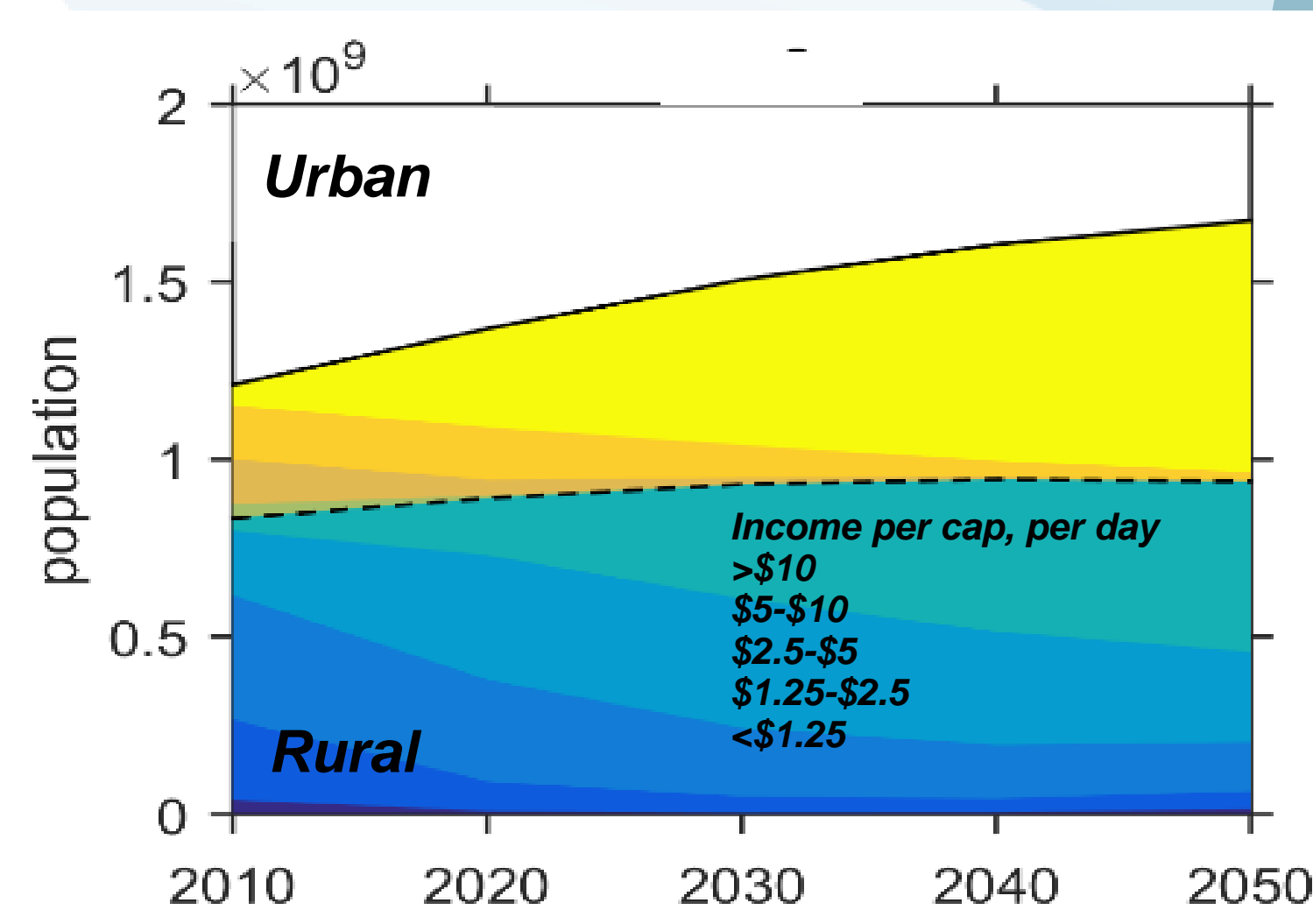
### Socio-economic heterogeneity critical for capturing preferences and impacts on well-being

### Research approach

- Identify and develop projections for key drivers of heterogeneity
- Link primary drivers of heterogeneity to final well-being indicators in IIASA's large-scale integrated assessment models for population, energy, air pollution, food and nutrition
- Create a common input database for use by all models
- Develop proof-of-concept with India, a large and very diverse country

### Dimensions of heterogeneity

- Urban vs rural
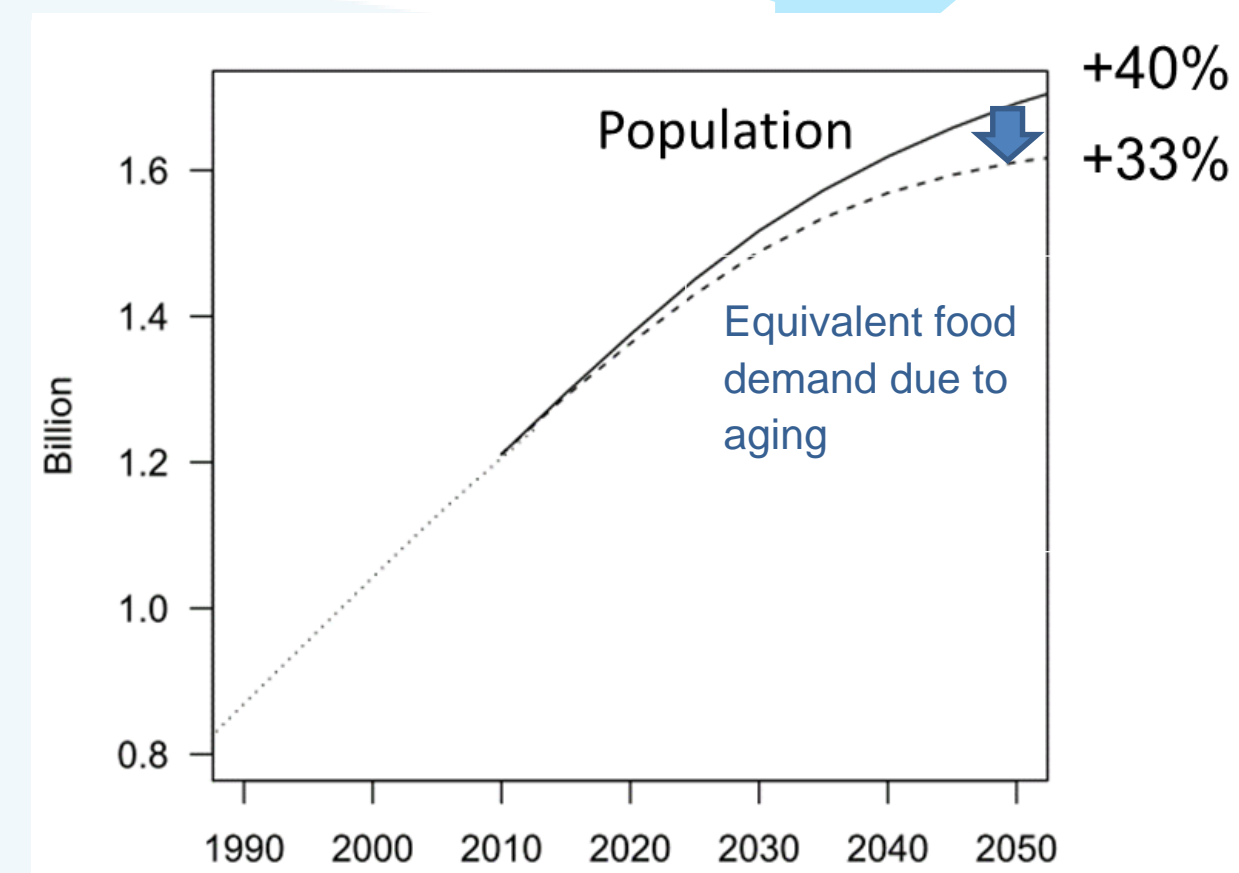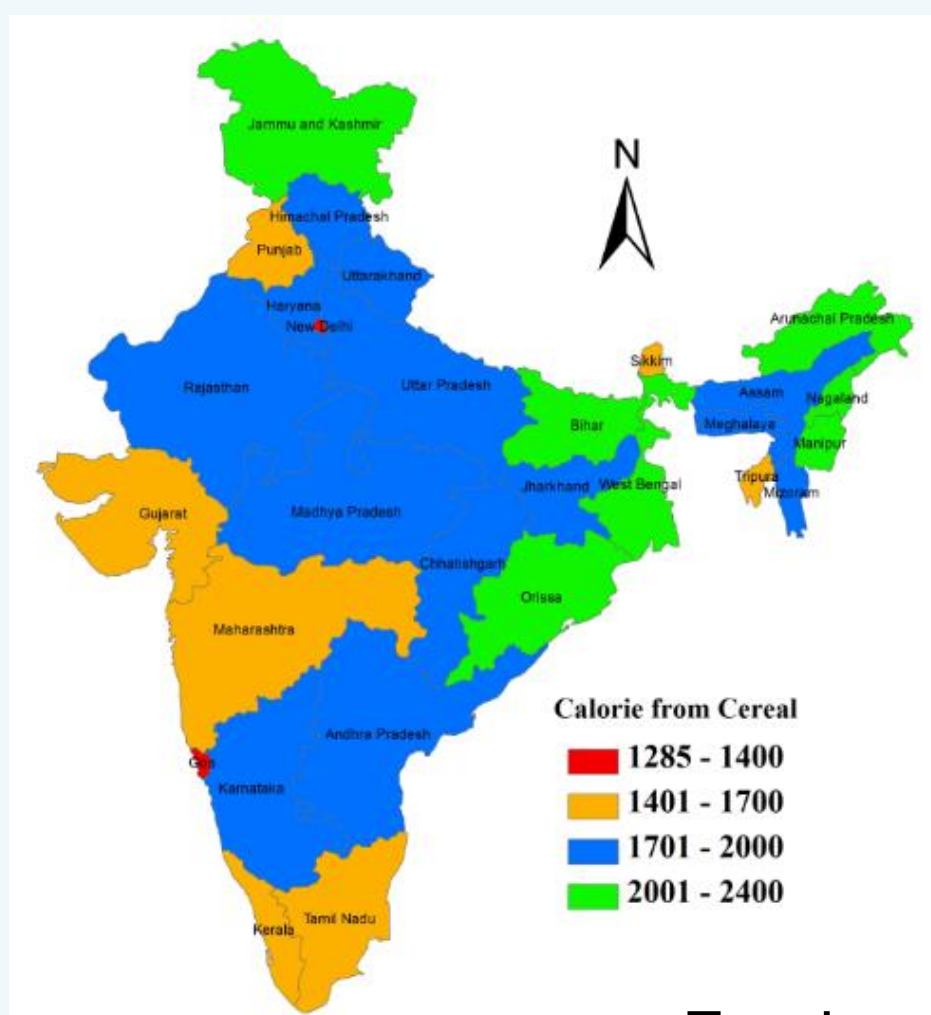- Income inequality
- Age, sex, education
- State of residence

## Local Pollution

Disregarding heterogeneity in cooking fuel choices leads to overestimation of particulate ($PM_{2.5}$) emissions
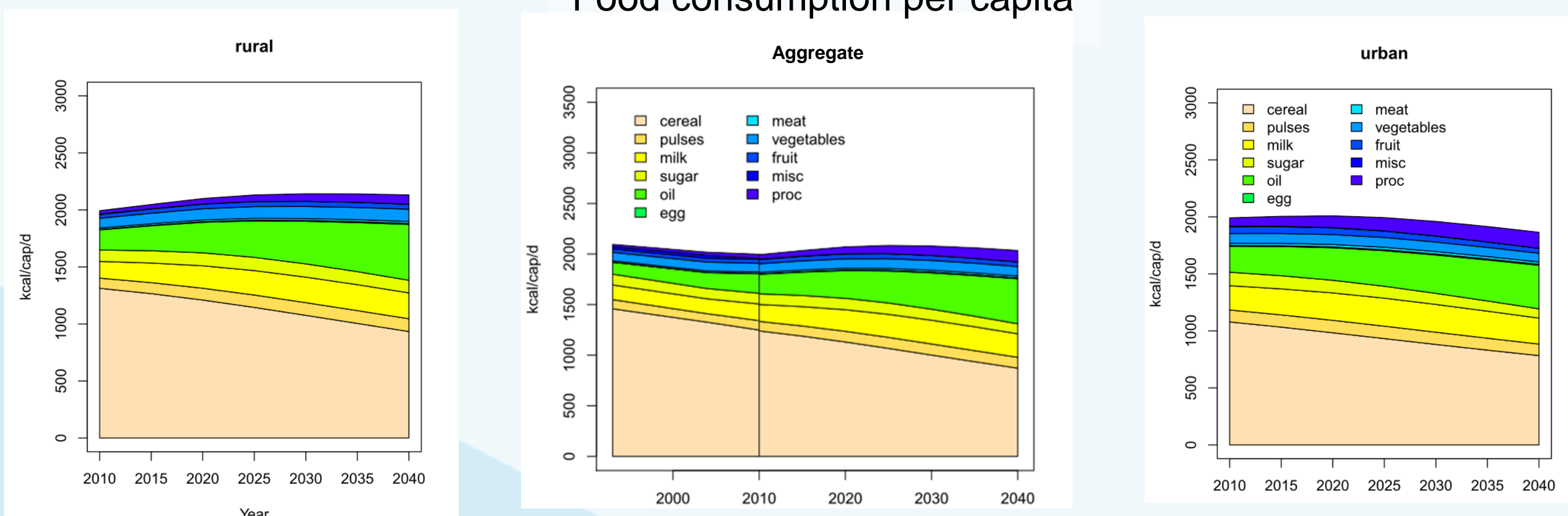
With SEH

Without SEH
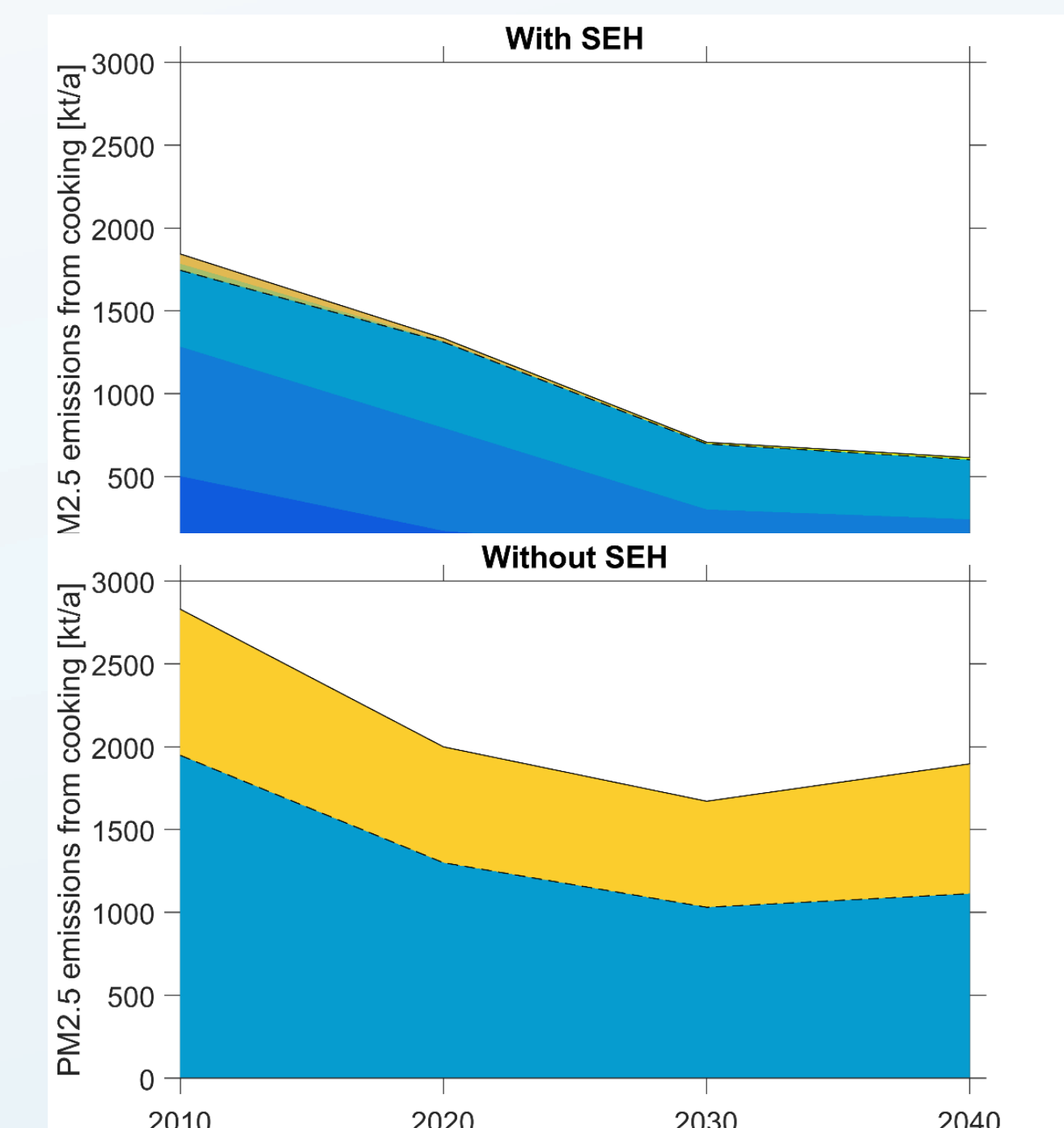
## Food and nutrition

Disregarding regional, income, demographic, and urban/rural differences underestimates the diversity in dietary patterns in India.

Calorie from Cereal
1285 - 1400
1401 - 1700
1701 - 2000
2001 - 2400

Population +40% +33%

Equivalent food demand due to aging

### Food consumption per capita

rural

Aggregate

urban

cereal
pulses
milk
sugar
oil
egg

meat
vegetables
fruit
misc
proc

## Air quality and health

Disregarding spatial distribution of particulate $PM_{2.5}$ emissions results in overestimating exposure and related premature mortality

$PM_{2.5}$ exposure with and without heterogeneity

SSP2 urban
SSP2 rural
Average household urban
Average household rural

With SEH

Without SEH

Income per cap, per day
>$10
$5-$10
$2.5-$5
$1.25-$2.5
<$1.25

Urban

Rural