



Migration, Urbanization and Climate Change: Assessing current knowledge

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Outline

- Migration in the context of urbanization
- Compatibility of Climate and Population Data
 - Why the resolution of climate data is presently inadequate to answer the question “does climate change cause migration”?
 - Migration and Urbanization in context of climate change adaptation and mitigation
- Suggestions for improved data and methods

Migration to where?

- Most migration is in within country
 - Though county-level origin-destination matrices are increasing in quality
- Migration destinations
 - Rural-to-rural
 - Rural-to-urban
 - Urban-to-urban
 - Urban-to-rural
 - All forms exist, but good global and even national-estimates do not exist

Who migrates?

- Our current understanding is that, it's
 - Those who are able
 - Those who are better off
 - Young adults
 - Part of a household not necessarily all of a household
- Depends
 - Seasonal vs. permanent migration
- Implications for climate-induced migration?

Migration and urbanization

- Underlying trends:
 - Cities are probably the most common destination of migrants.
 - Global population is now more urban than rural
 - The overwhelming majority of future world population growth will take place in the cities and towns of Asia and Africa.
- But, how much of urban growth can be attributed to migration?
- And, how much of migration is caused by environmental change?
 - Surprisingly, these are both poorly studied question.

Oft-cited study: “40% of urbanization due to migration”

□ UN Study (Chen et al., 1998)

- Compares census subnational units for cities in a limited number of countries
- Study undertaken in spatial vacuum
- FINDING:
 - 60% of urbanization due to natural increase
 - 40% of urbanization due to migration and administrative reclassification
 - Administrative re-classifications of subnational units occur:
 - Political reorganization
 - Administrative or legal reasons
 - Population growth (due to any cause)

New Work underway to revisit this question

- Research by myself, Mark Montgomery and colleagues places urbanization and city growth in a spatial framework
 - Allows us to look more closely at fertility, mortality and migration as the determinants of city growth
 - Preparing subnational estimates of these is major but necessary undertaking
 - To assess possible environmental correlates of city growth
 - Currently only considered fixed environmental characteristics
 - Future work could examine time-varying ones

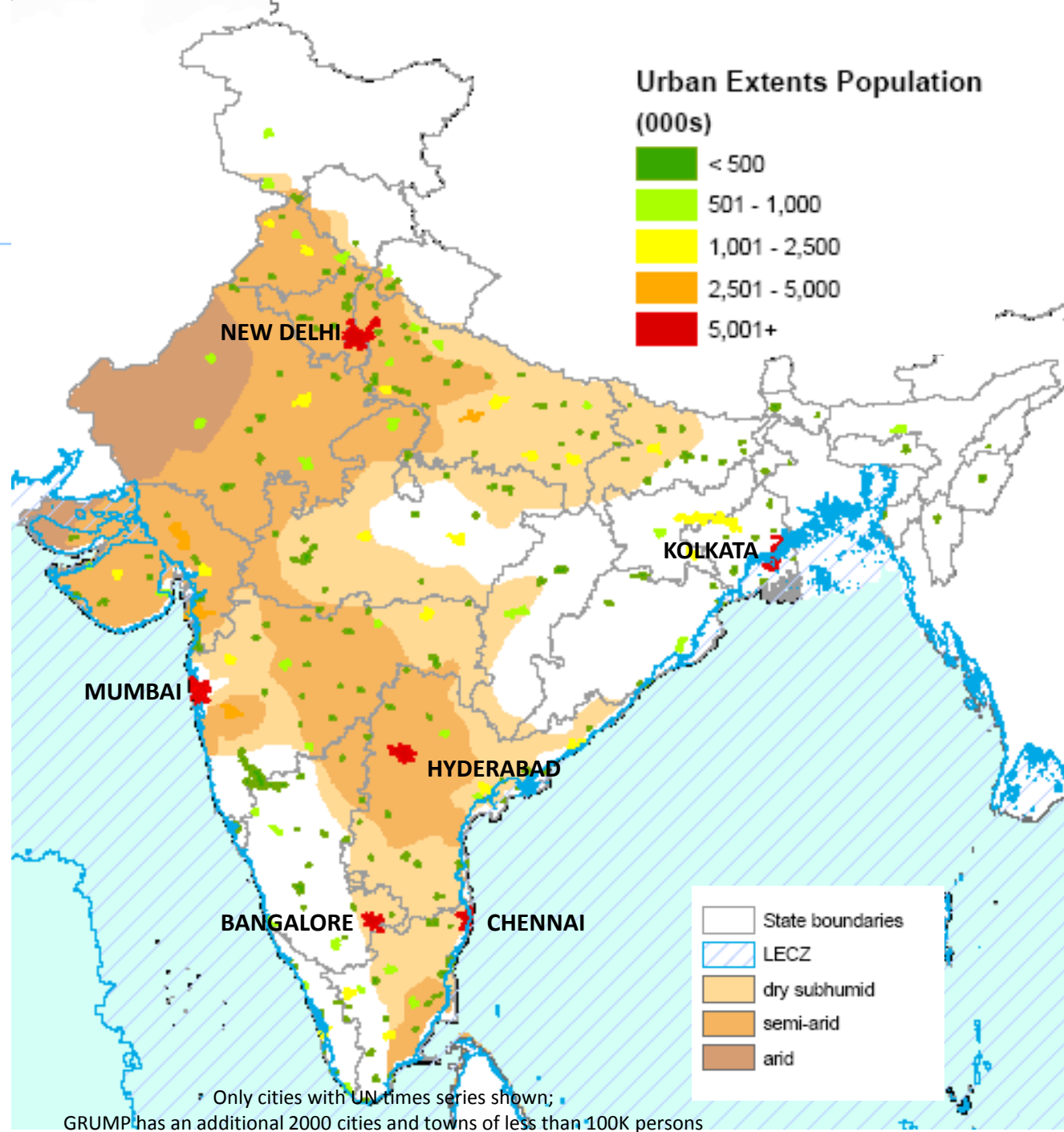
Outcome of research

- Place cities in the environmental contexts
- Produce spatially informed population forecasts
- Examine the causes of growth
- Consider the implications for climate change and related environmental change on population distribution and vulnerability.

Example

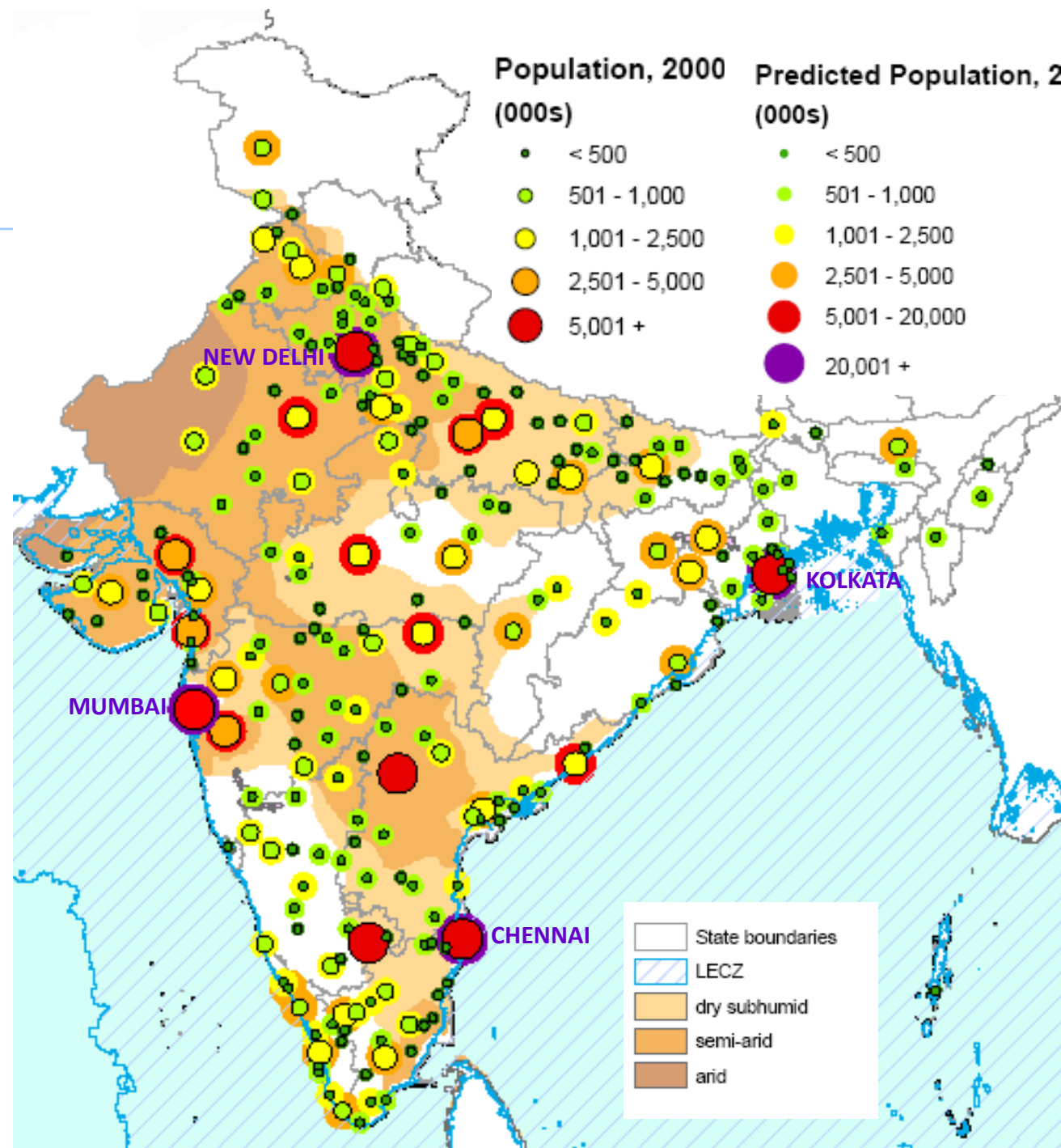
India, 2000

- Cities rendered true to their spatial extents
 - India's largest cities are in drylands
 - Many are also coastal
 - Kolkata and Mumbai are coastal only
- In the following slides, cities rendered as graduated symbols because we have extents for only one point in time



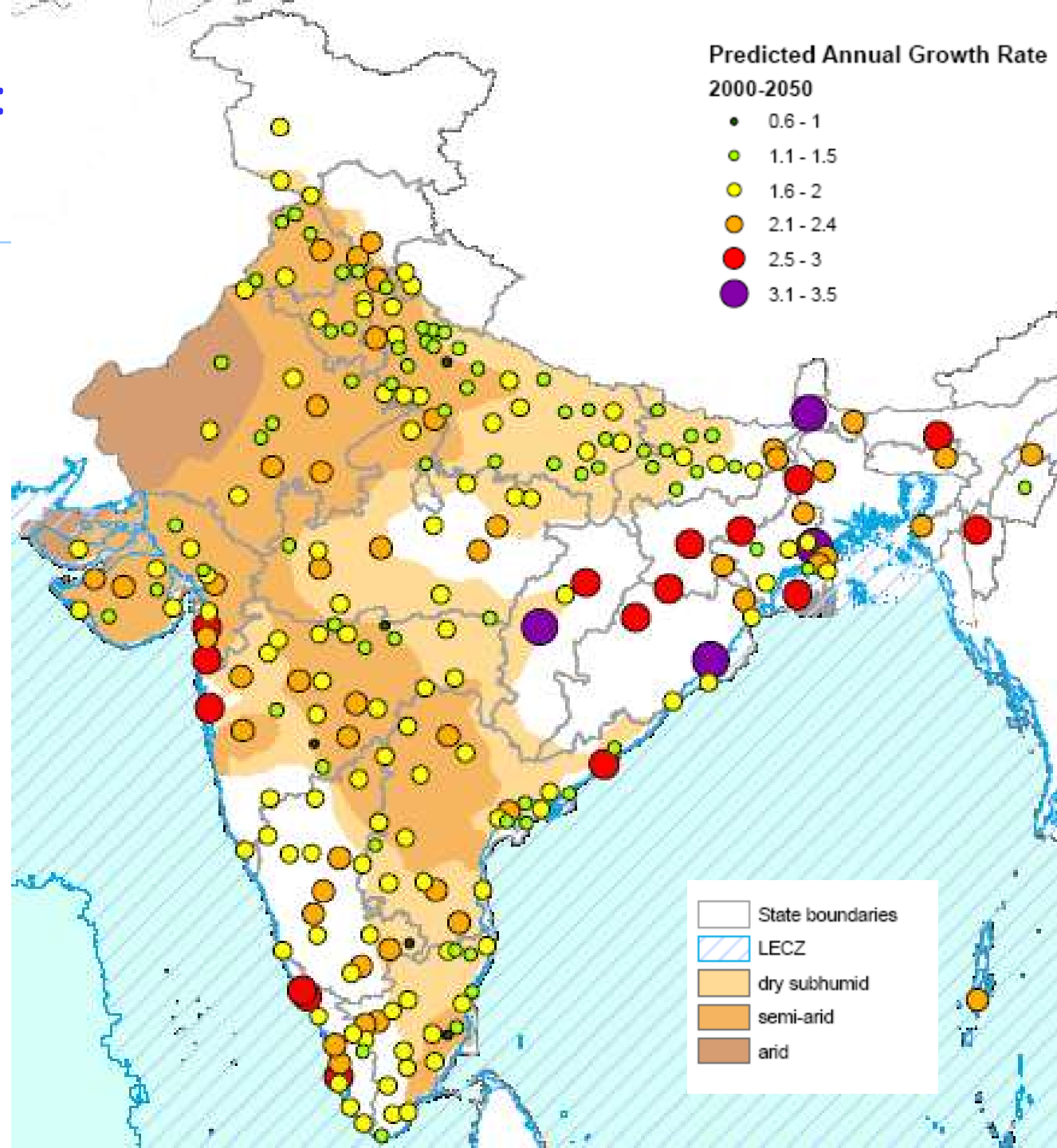
City size: India, 2000-2050

- In 2000, India has 6 cities of 5M+
- By 2050, India will have 4 20M+ cities
 - 3 of these are coastal
- And, another 11 cities of over 5M persons
 - All of which are either in arid or coastal zones!



City growth rates: India, 2000-2050

- Though India's largest cities are in arid zones, the fastest growing ones are not
 - Highest growth cities (purple & red) tend to be coastal
- Both population size and rate of growth have implications for adaptation!



Preliminary estimates

- Do not account for migration
- (or subnational fertility and mortality)
 - City-specific fertility and mortality is unknown.
- How to estimate migration?
 - Use available census and surveys

Where do demographic data come from?

- Three main sources
 - National Censuses
 - International (and national-level) survey efforts
 - Vital registration systems

- How do these differ?
 - In the information they collect
 - Coverage and universe
 - (Implicit) spatial scale

Where do demographic data come from?

- National Censuses
 - Age-sex structure (all)
 - Education (most)
 - Race-ethnicity (many)
 - Housing (some)
 - Income/poverty (some)

- Coverage/universe
 - Most countries
 - Population-wide (usually)
 - Decadal intervals

- Reporting unit
 - Administrative units
 - Sometimes quite small

Where do demographic data come from?

- International Surveys (Demographic and Health Survey [DHS] and Multiple Indicator Cluster Survey [MICS] programs)
 - Age-sex structure
 - Education
 - Births*
 - Infant and child death*
 - Housing
 - Poverty proxies

* Allows for the calculation of fertility and mortality rates

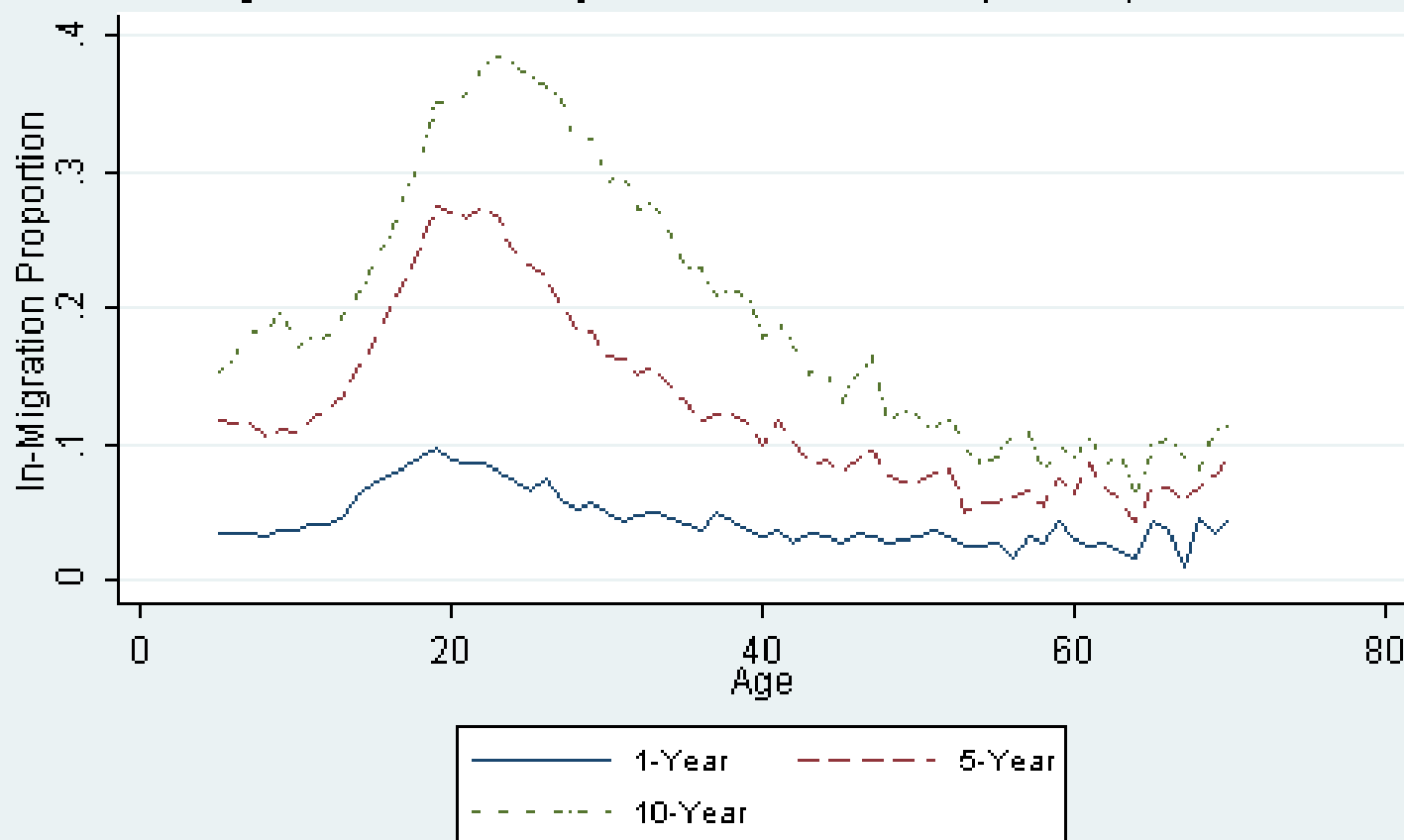
- Coverage/universe
 - Developing-world countries
 - Women of child-bearing age
 - Periodic (irregular intervals between survey rounds)
- Reporting unit
 - Coarse subnational region

Where is migration data?

- “Where did you live 1 year (or 5 or 10 years) ago?”
 - A frequent census and survey question [but not MICS]
 - Answers vary:
 - From ‘elsewhere’
 - To specific locations:
 - Place or province names
 - Within this province, from another province, abroad
 - Urban or Rural classifications
 - A mix of all of the above
- Alternative question: where was your previous residence?
 - Sometimes this question followed by, “when did you live there?”
- Vital registration systems do not capture migration

How to measure migration?

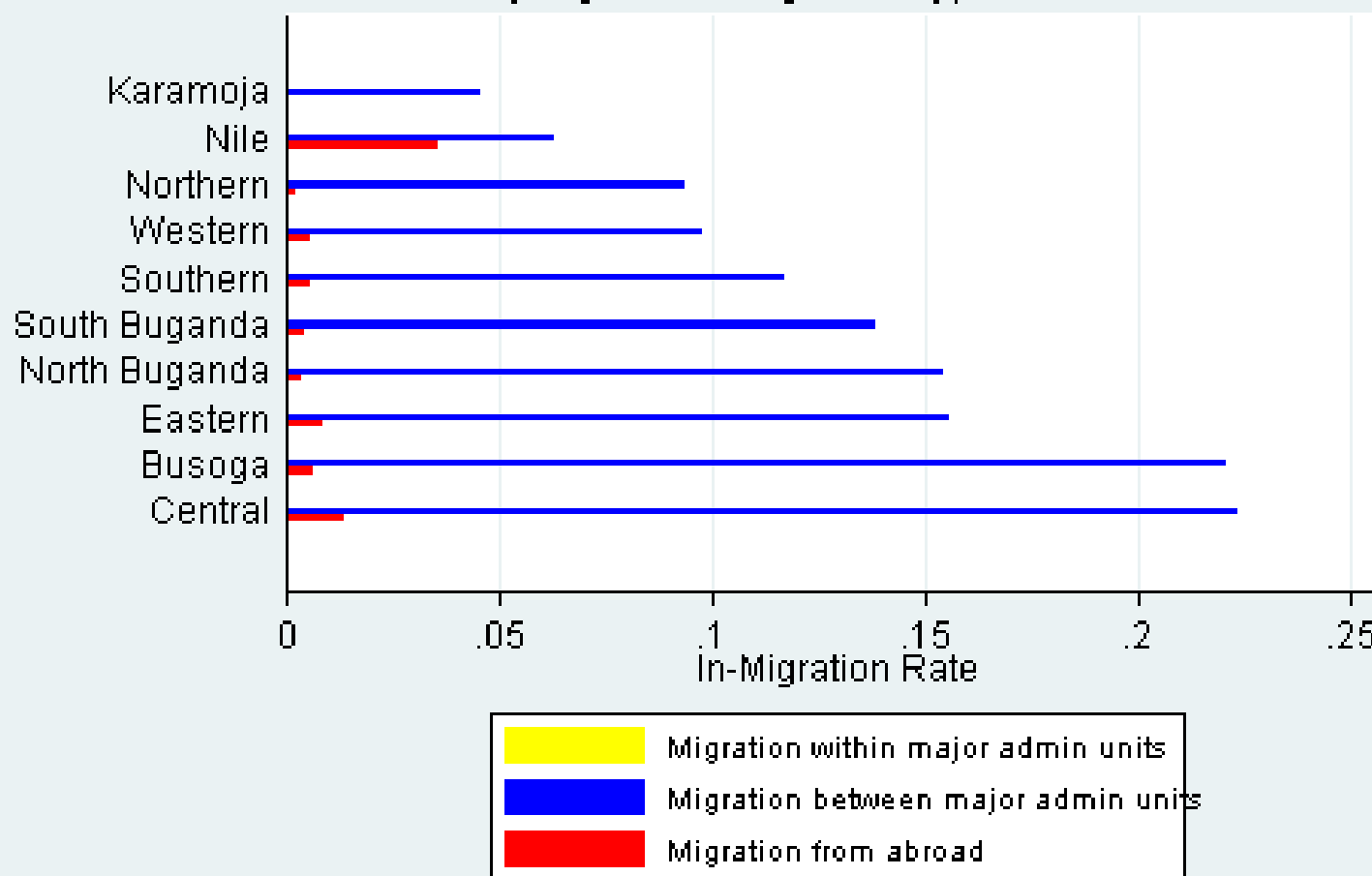
Uganda Urban in-Migration Proportions by Age
Migration between major administrative units(districts), Year 2002



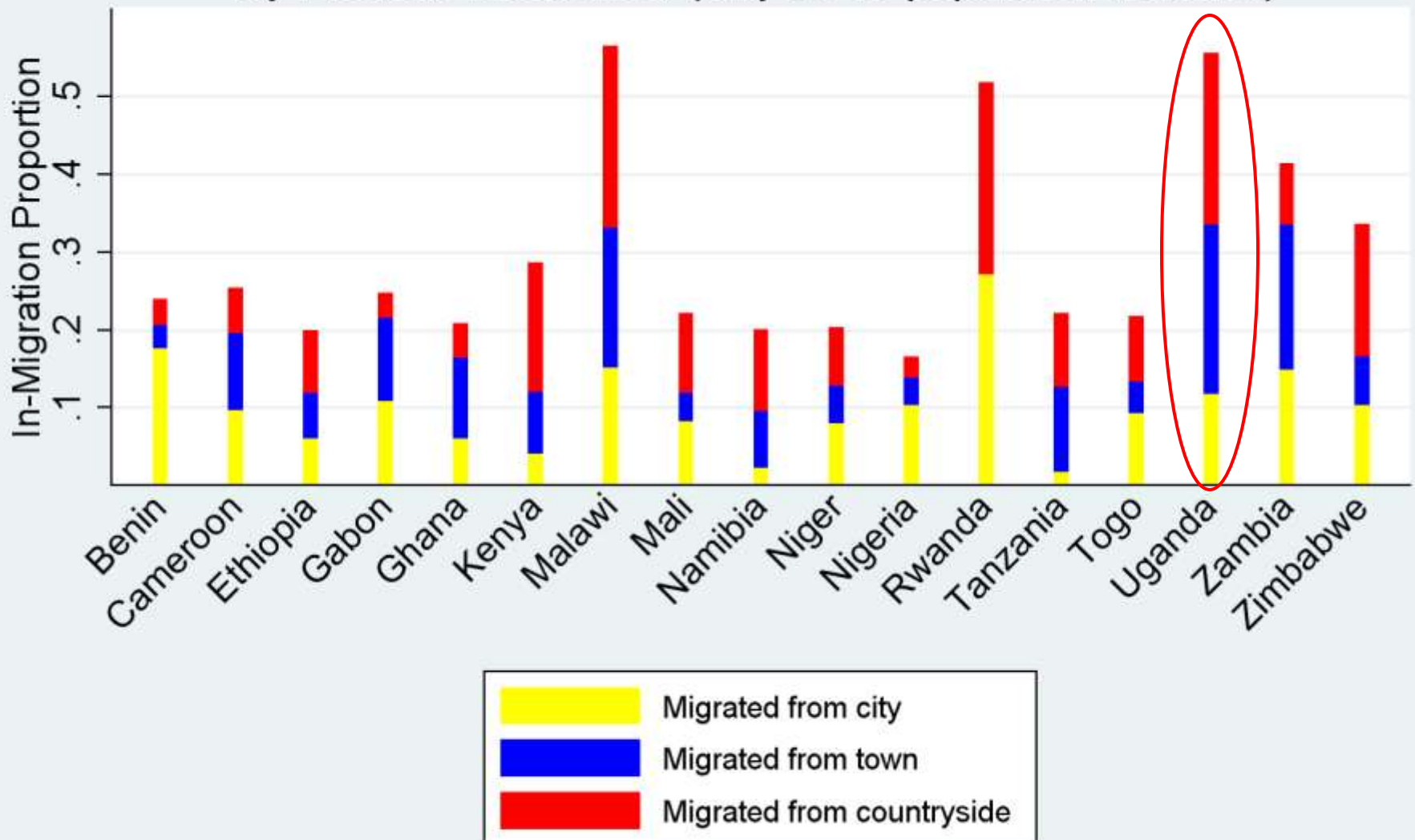
*Graph truncated at 70 years of age due to the small number of observations

Migration from where?

Uganda 5-Year Urban In-Migration Rate
by region and Migration Type, Year 2002

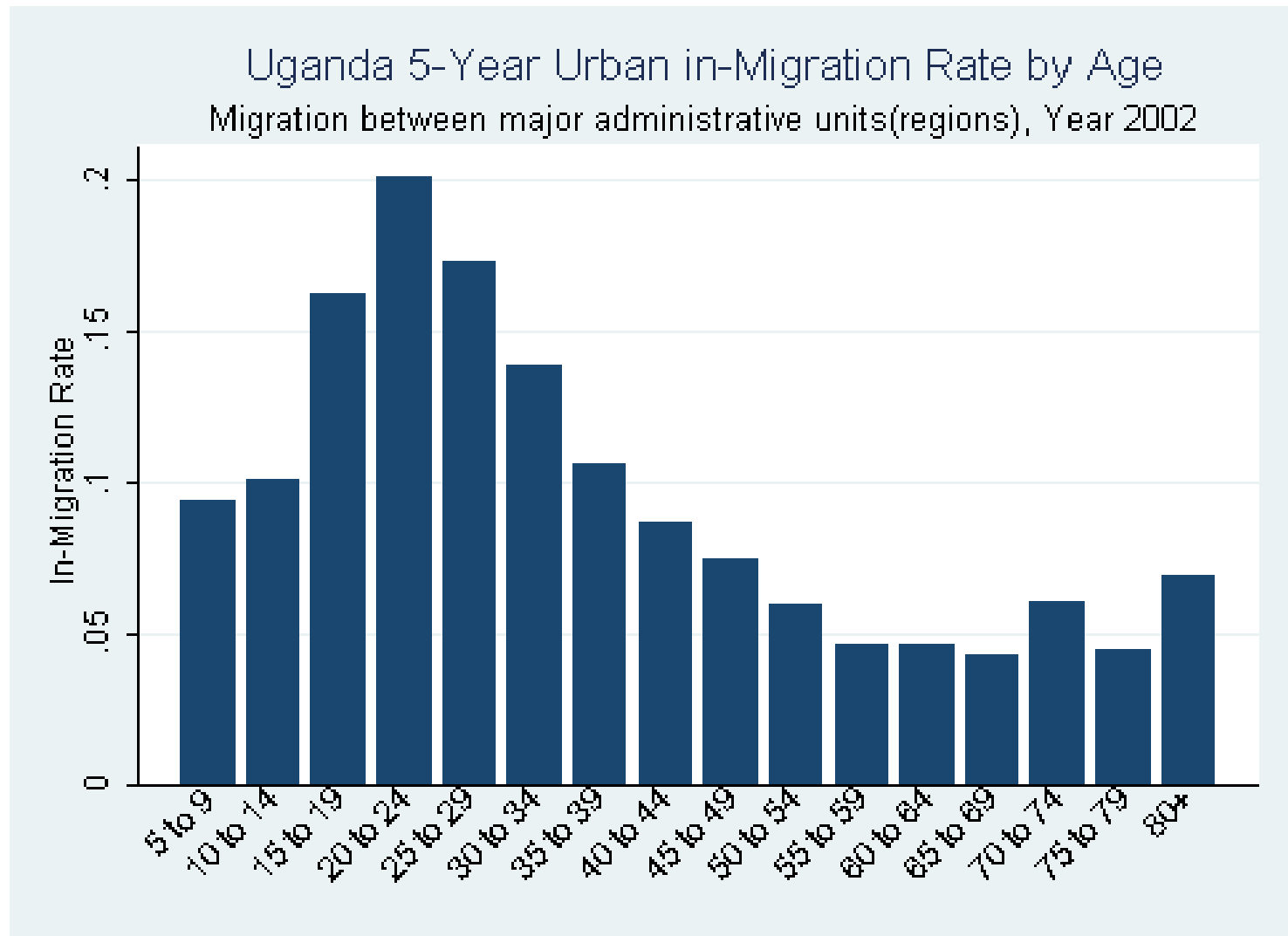


5-Year Urban Total In-Migration Proportions for African Countries by Previous Residence, (only 15-49 population included)



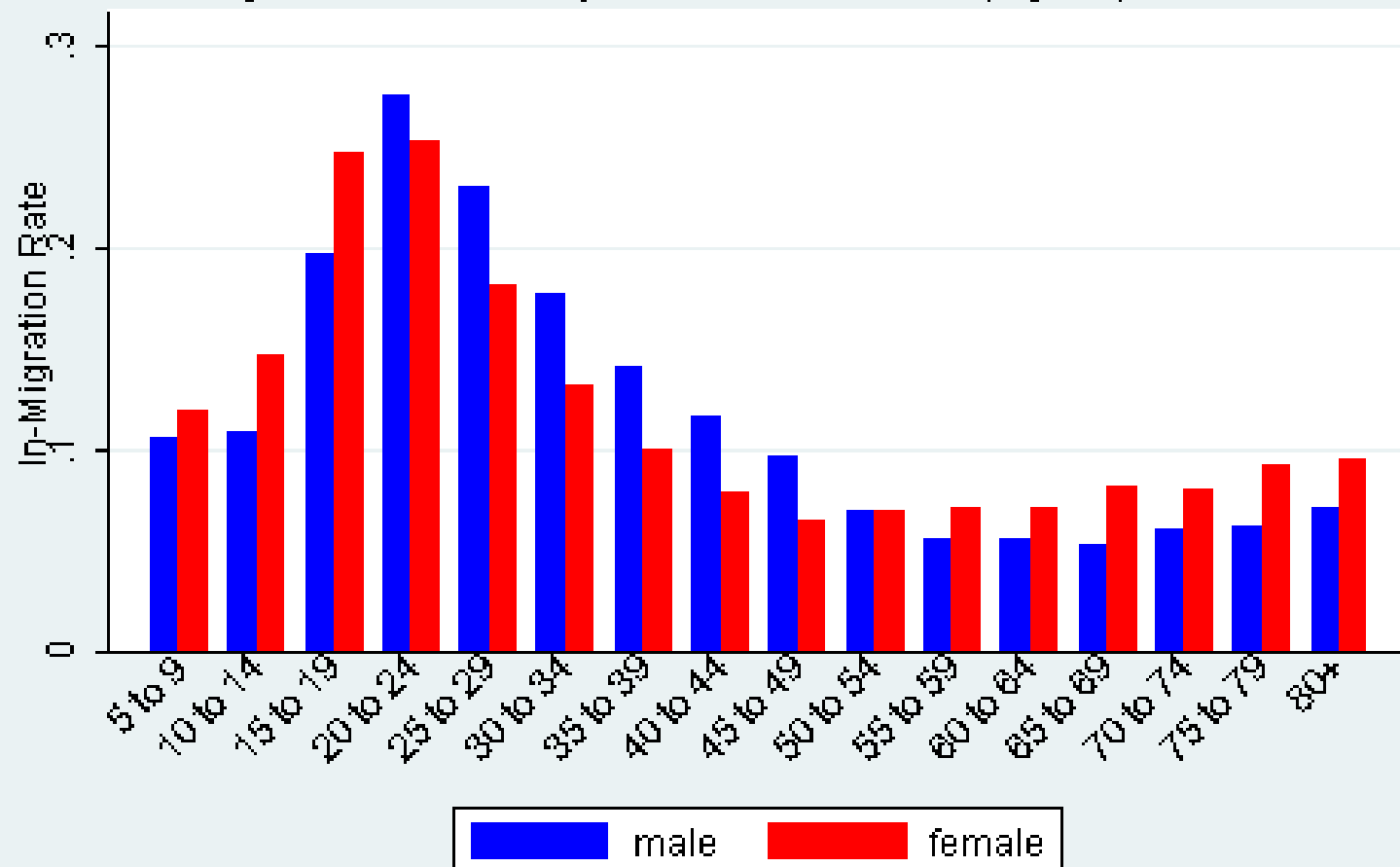
*Migration rates are calculated based on DHS 1998-2001 surveys

Age distribution of migrants



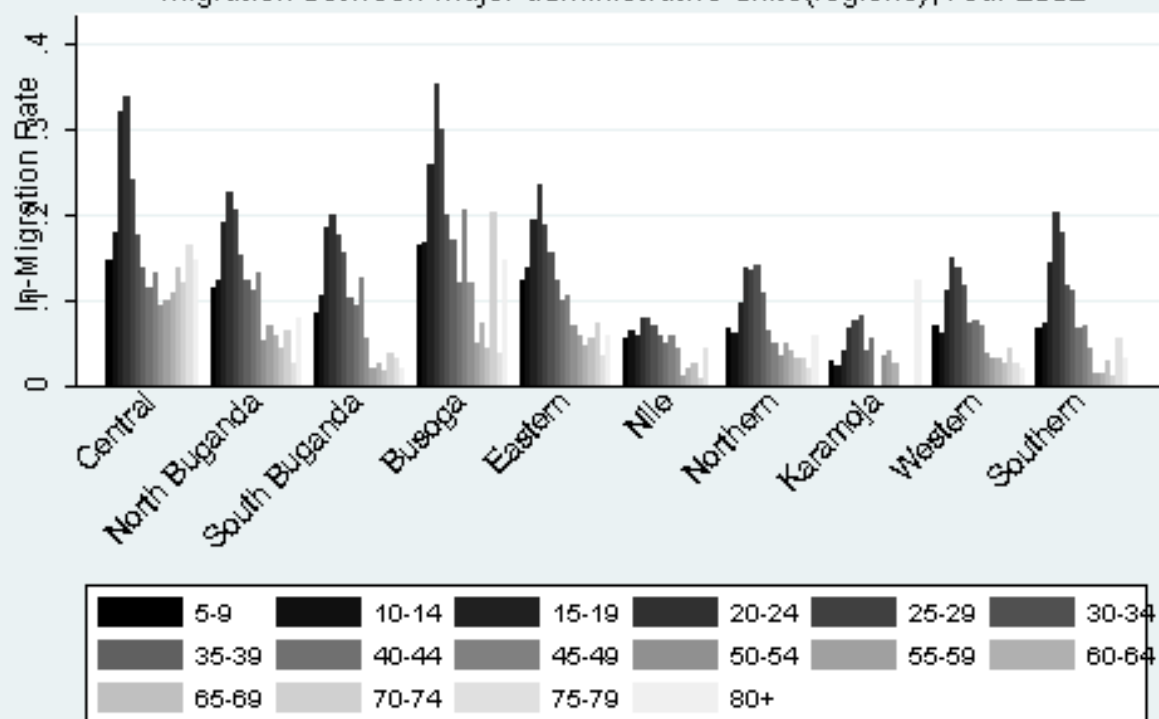
More female than male migration among teens and young adults

Uganda 5-Year Urban in-Migration Rate by Age and Gender
Migration between major administrative units (regions), Year 2002



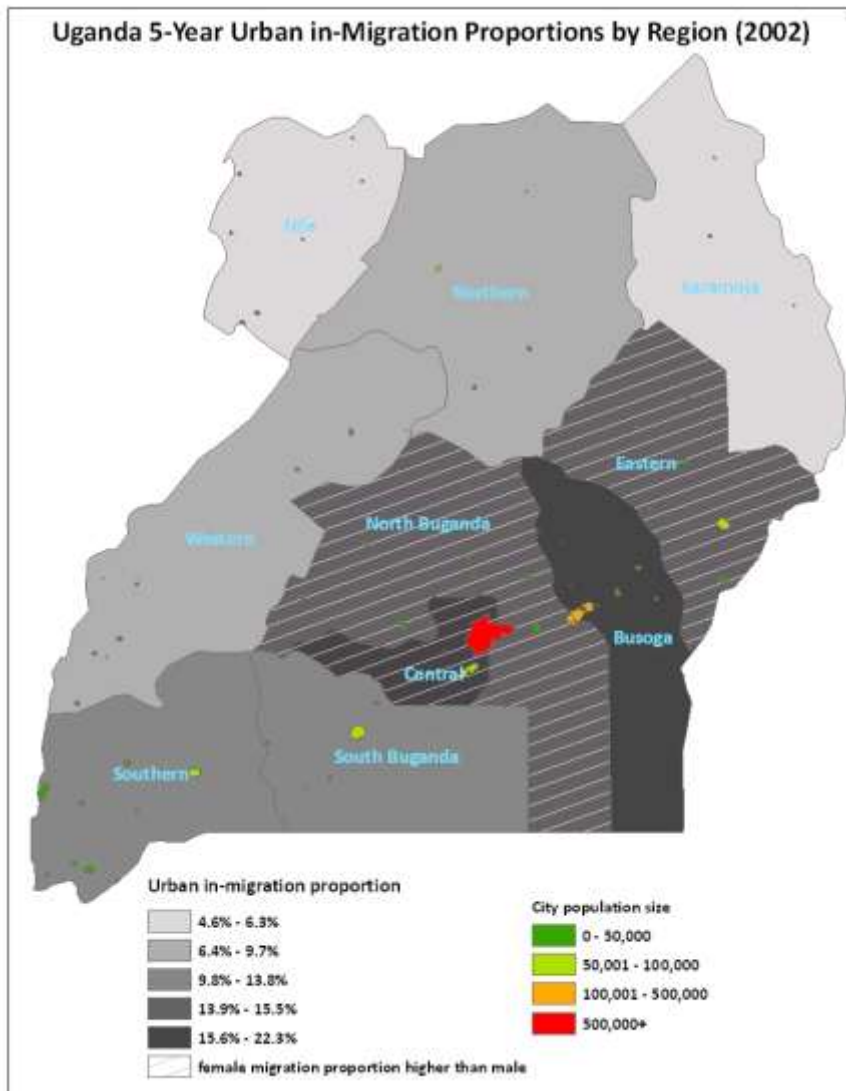
Regional pattern

Uganda 5-Year Urban in-Migration Rate by Region and Age
Migration between major administrative units(regions), Year 2002



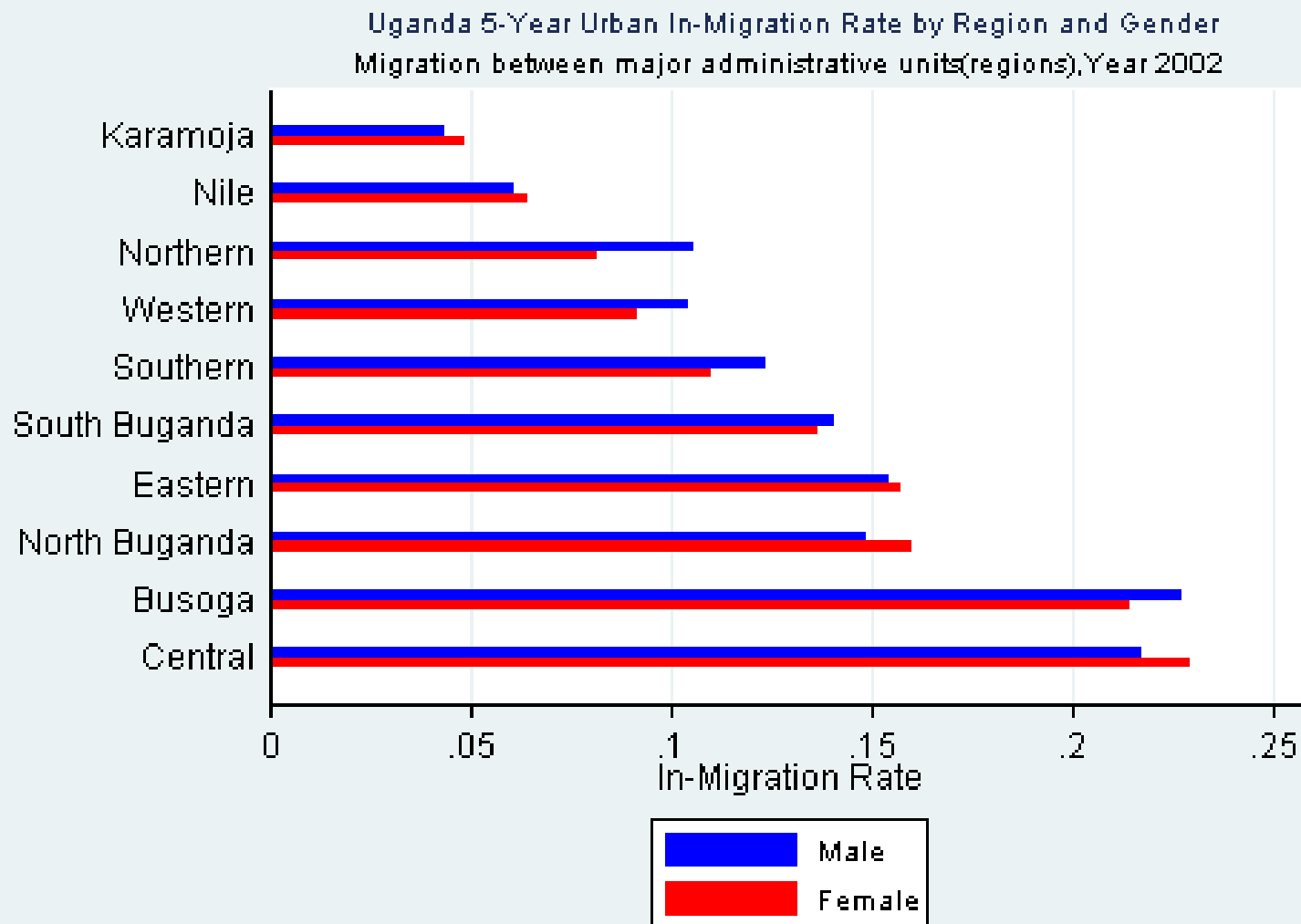
Age pattern pretty uniform across region but levels differ quite a bit

Subnational estimates of urban migration



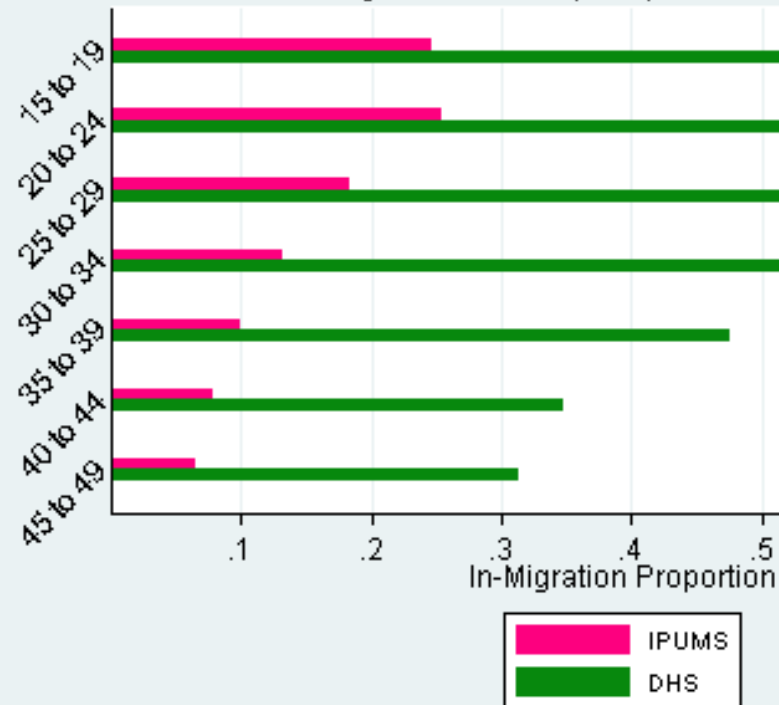
- Higher rates found in regions with big cities
 - Rates are greater for females than males in these regions!
 - Pattern consistently found in all study countries
 - 10-countries in Africa, census micro-data from IPUMS collection

Graphical view of map

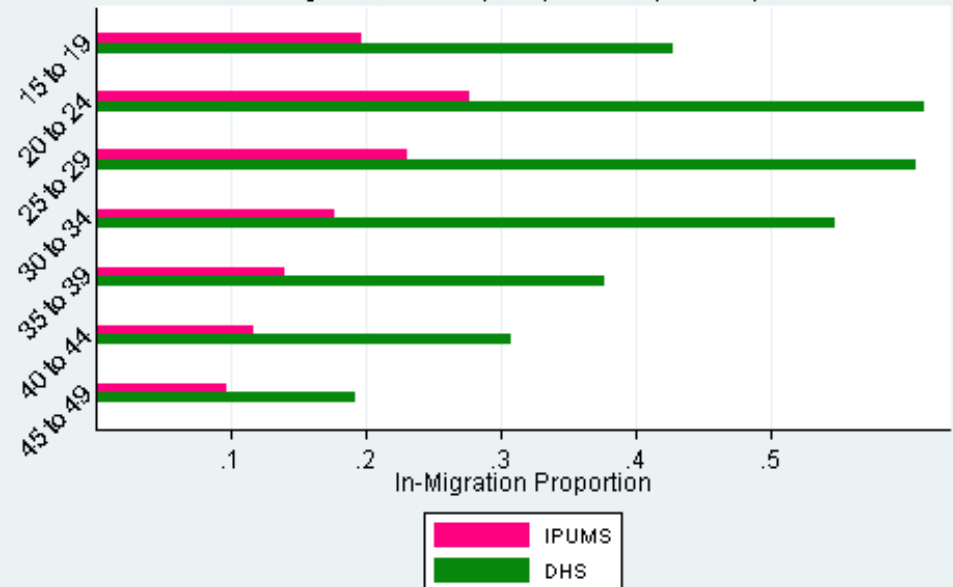


Different Sources of demographic data seem to produce much different estimates

Female 5-Year Total Urban In-Migration Estimates
Uganda, IPUMS(2002) vs DHS(2000-01)



Male 5-Year Total Urban In-Migration Estimates
Uganda, IPUMS(2002) vs DHS(2000-01)



Results are preliminary and are not for circulation

Placing migration an environmental context

□ Demographic data

- Tell us less about migration than other things demographic
- Apart from population counts, they are typically rendered in coarse spatial terms

□ Climate data

- Though climate change data are spatial, the resolution is presently inadequate to answer the question “does climate change cause migration”?
- Event data are often not as spatial as one would like
 - E.g., the extent of flooding

Spatial information is the glue

- Climate change will happen in particular localities
 - Will not be borne evenly across most countries
 - Adaptation will be local
- Spatial information is necessary!
 - To understand both directions of the population-climate change linkages
 - causes and consequences
 - Putting people in their place
 - Understanding who is where
- Effective policy depends on good data and methods

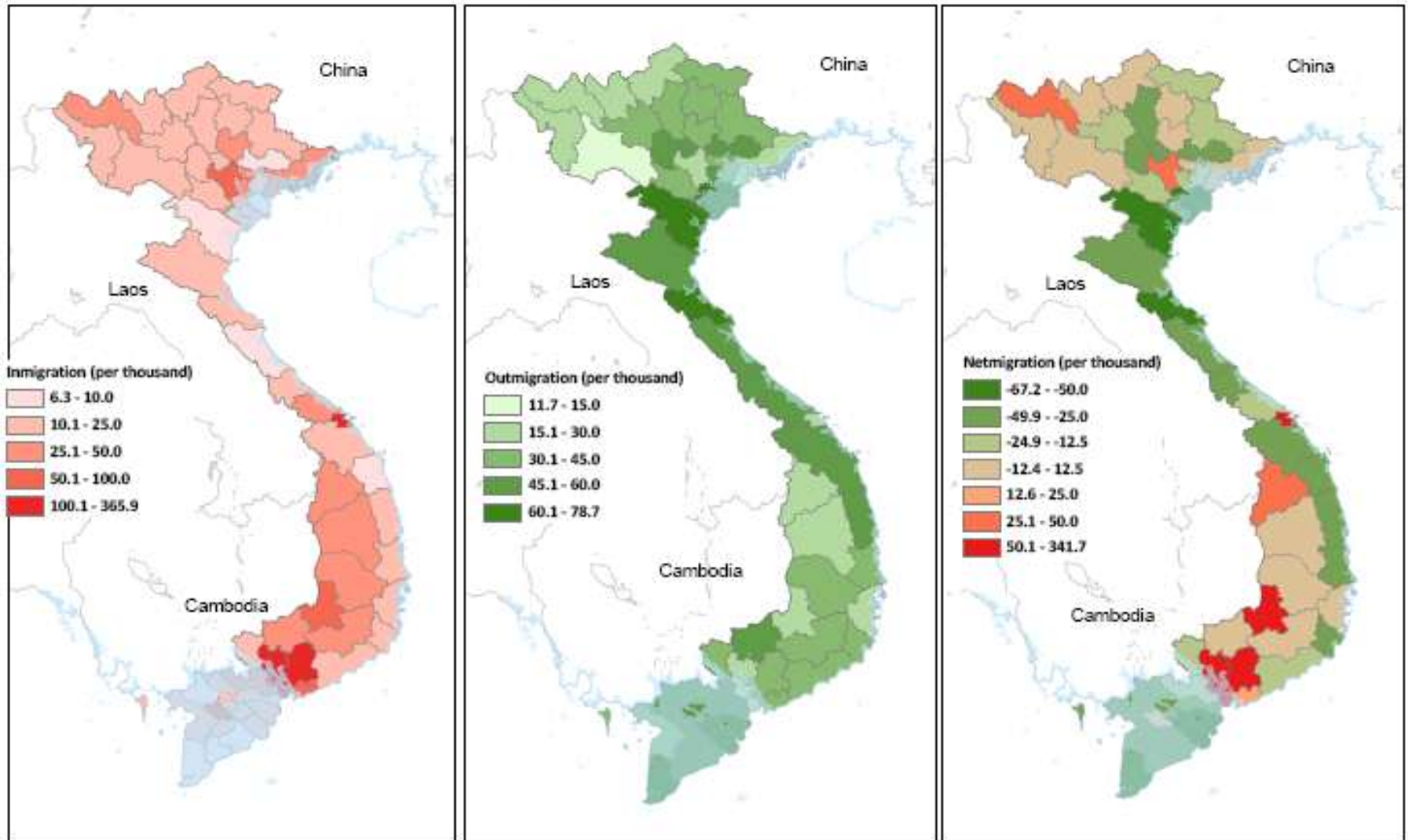
Climate and emissions data

- ❑ Come from observations (stations) and models
 - Data are (typically) spatial
 - ❑ Though surfaces tend to be coarse
 - “Downscaled” data are less robust
 - ❑ Points and grids
 - Models (of emissions) include population inputs
 - ❑ But primarily just future and current population counts
 - ❑ Turns out that households matter
 - Size
 - Location
 - Income
 - Coarse-scale compatible with national-level reporting of censuses and surveys but ...

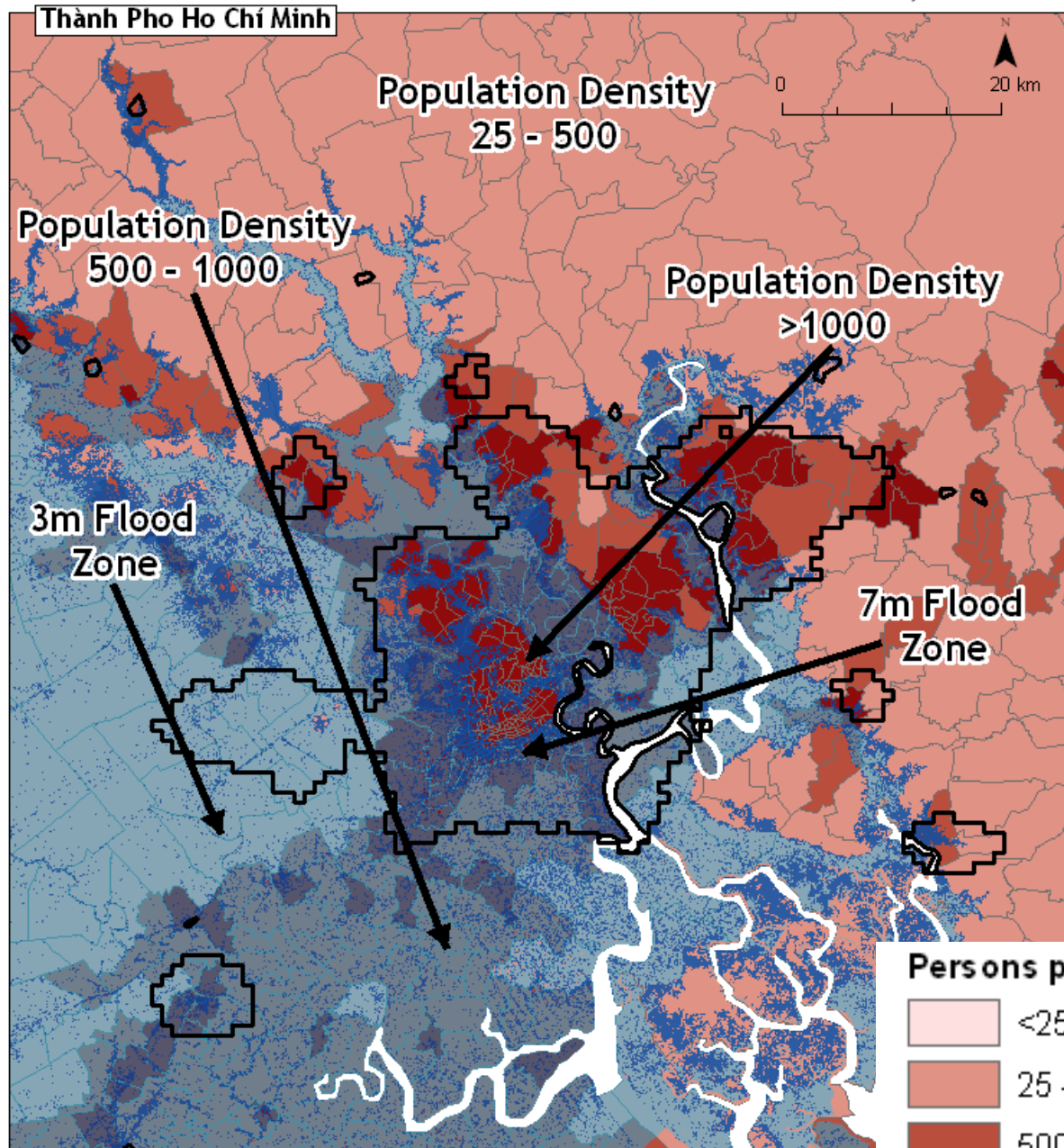
Sea-level rise scenarios

- Low Elevation Coastal Zone
 - Elevation up to 10 meters contiguous to coast
 - Used a proxy for coastal hazard
- Works well for estimation of exposures of population distribution or even moderate resolution census data
 - But definitely not time-varying

Internal Migration in Vietnam & seaward hazards



Vietnam Low Elevation Coastal Zones: 3m, 7m



Exposure is not uniform

- Study underway to produce estimates at 3, 5, and 7 meters to provide an intra-urban estimates
 - This would be especially valuable to local planners
 - Identify locations in greatest need of 'relocation'

Confronting the shortcomings in demographic data ...

- Demographic data on migration is sparse
 - Rarely covers temporary or seasonal migration
 - Rarely covers frequent or local moves
 - Spatial resolution is coarse
- Demographic data on cities is
 - Not readily accessible for all cities of the world
 - Not spatial except for population counts
 - And usually it is not possible to show much sub-city disaggregation
 - Tools of demographic data collection stress 'urban' not 'cities'
 - But new data and tools are opening up ...

Migration data, in particular

- Internal migration is just starting to be evaluated
- Censuses and survey programs offer a view in but must be critically vetted
- Linking with environmental data hasn't really begun
 - Conceptually possible but will force a close look at existing data and whether they are adequate for the questions we want answers to.

Concluding Remark

- Reliable estimates of migration for use with spatial information depend on:
 - Fine-scale inputs: Small area census units – like districts or enumeration areas – are essential or georeferenced surveys
 - Data on population characteristics (not just population counts) are necessary to effectively adapt to climate change
 - Methods to deal with irregularities in time-spacing and spatial units of demographic data with environmental change events
 - People in-country to produce data and estimates

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Thank you!