Sea Level Rise and Urban Infrastructure

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Sea level rise

- IPCC: 0.44 to 0.76 meters of global mean SLR by 2100
  - Under an intermediate emissions scenario
  - 0.63 to 1.60 meters under higher emissions
- Substantial land subsidence for many coastal cities
  - Jakarta will be 35% below sea level by 2050

This paper

- Exposure of urban infrastructure to SLR up to 5 meters
- SUDS: Sea level rise and Urban infrastructure Data Set
  - New global data covering 11,422 cities, 3.7 trillion people

Frontier spatial data

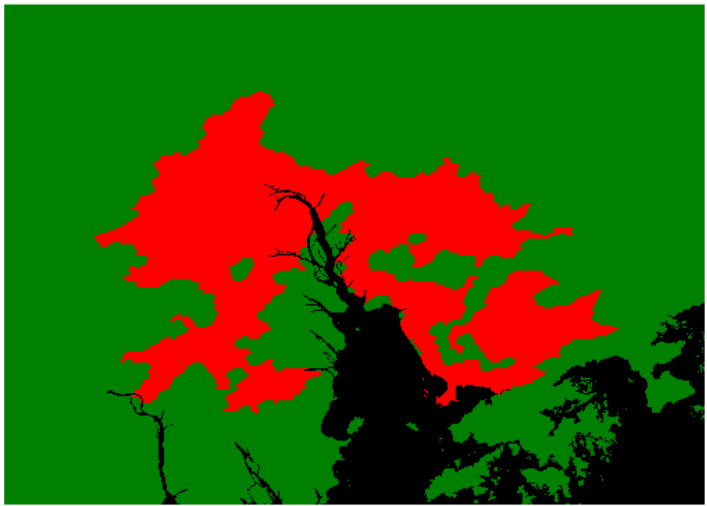
- Harmonized at 30-meter resolution

- City boundaries: GHS-UCDB
- Coastlines: GSHHG
- Elevation: FABDEM
- Infrastructure: OSM, GRIP
- Night lights: VIIRS

Inundation

- Elevation data from FABDEM
  - Copernicus satellite-derived elevation data
  - With forests and buildings removed
- Simple physical model of sea level rise
  - Elevation + hydrologic connectivity
  - (Below sea level + in the ocean's path)

1. Guangzhou



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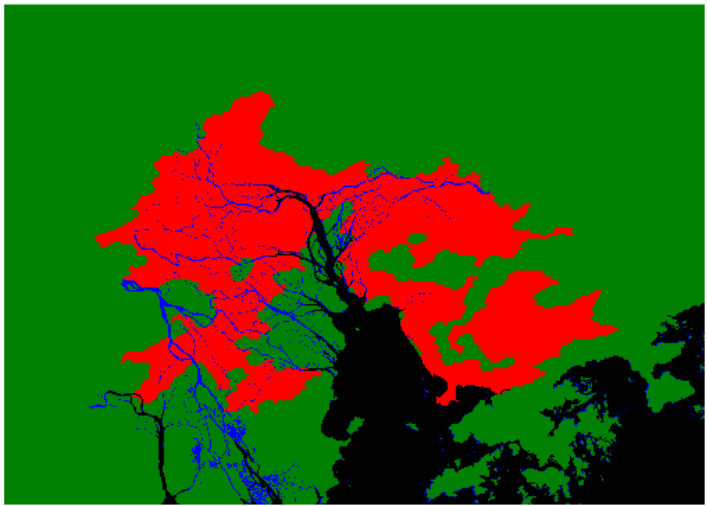

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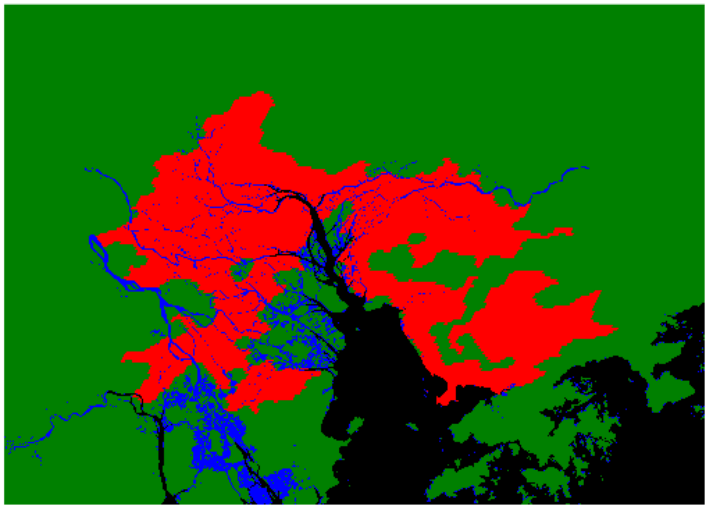

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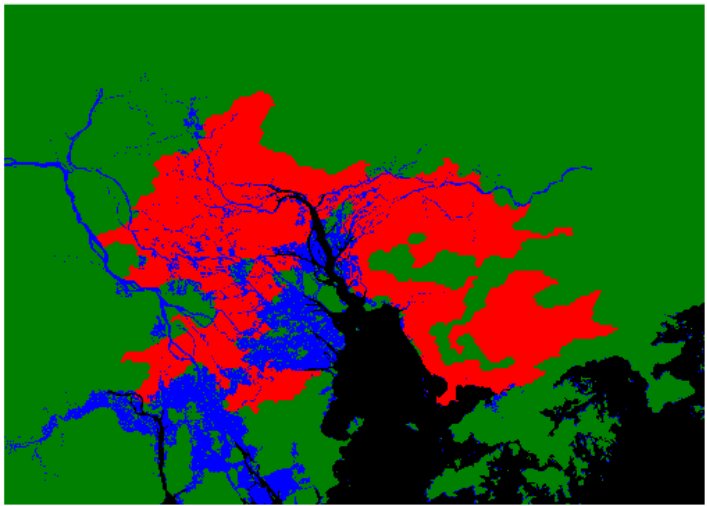

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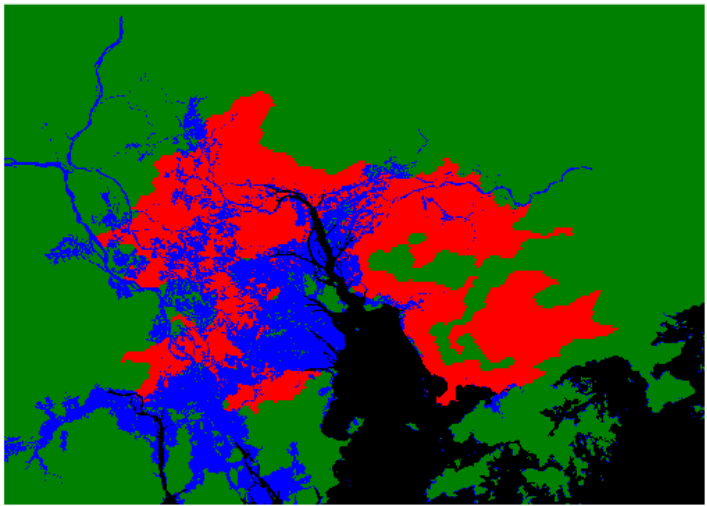

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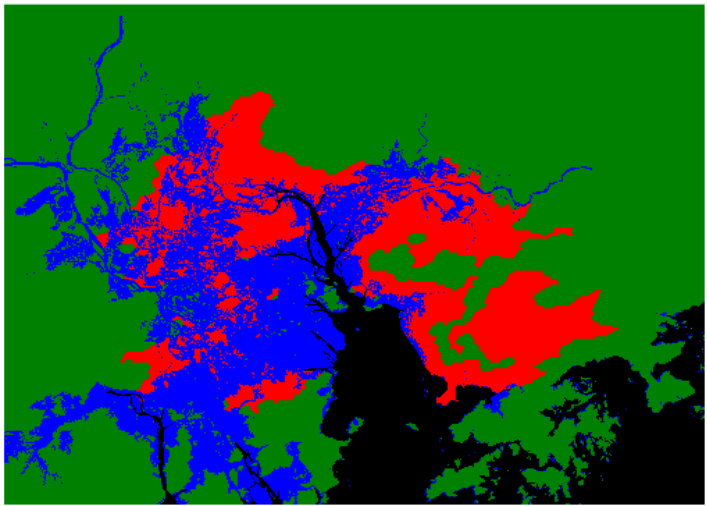

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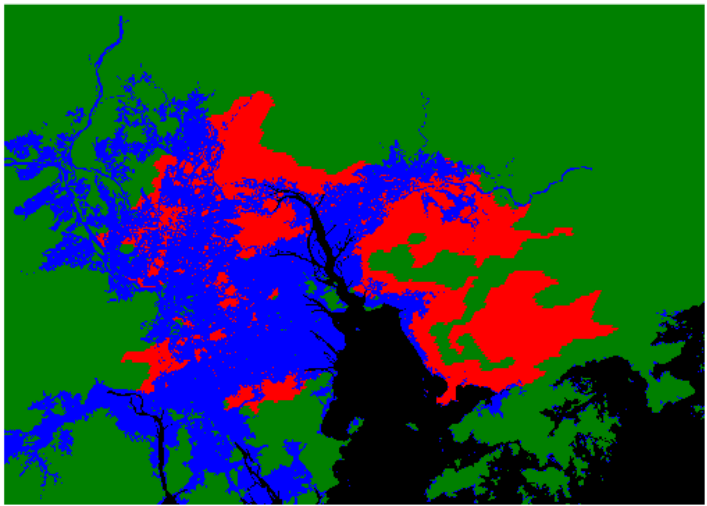

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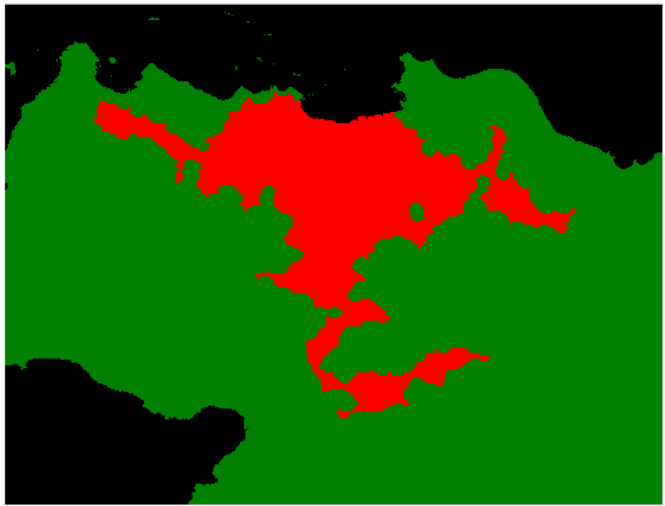

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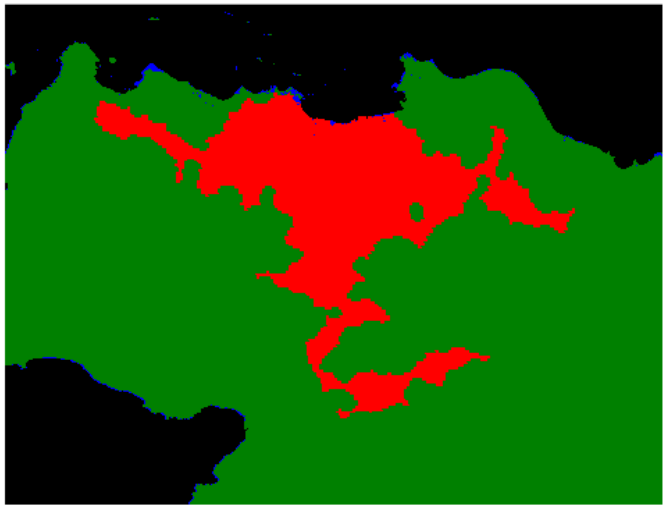

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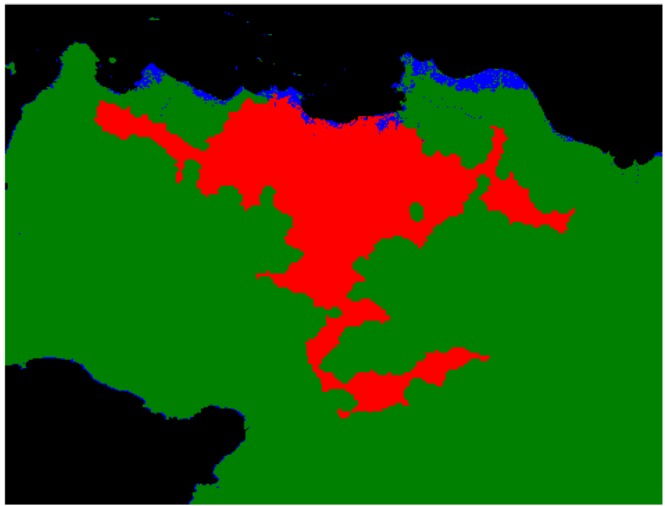

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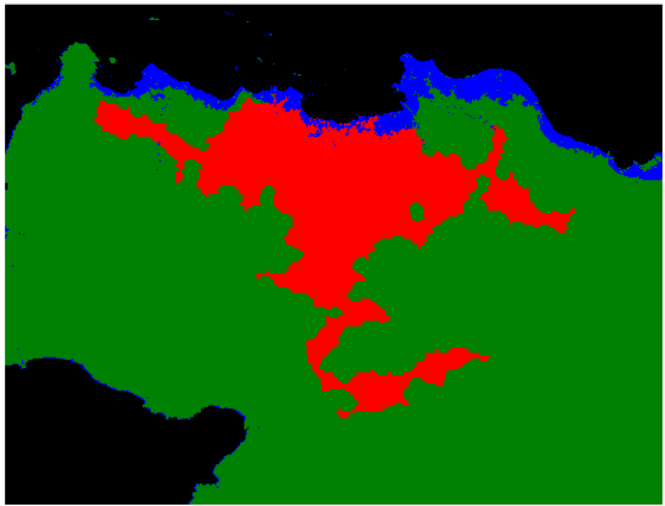

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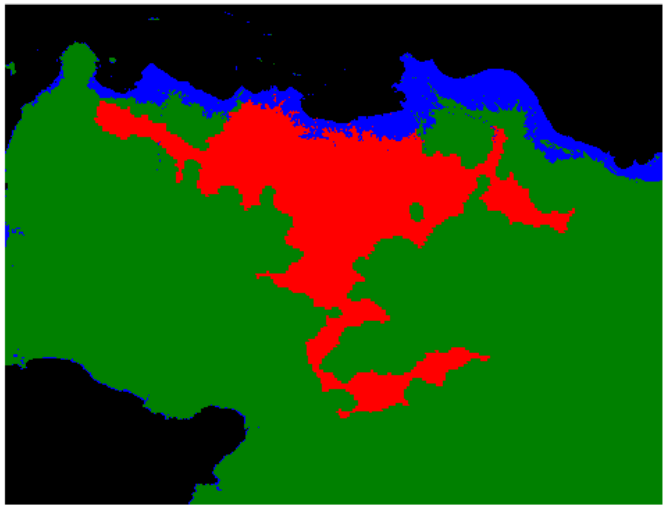

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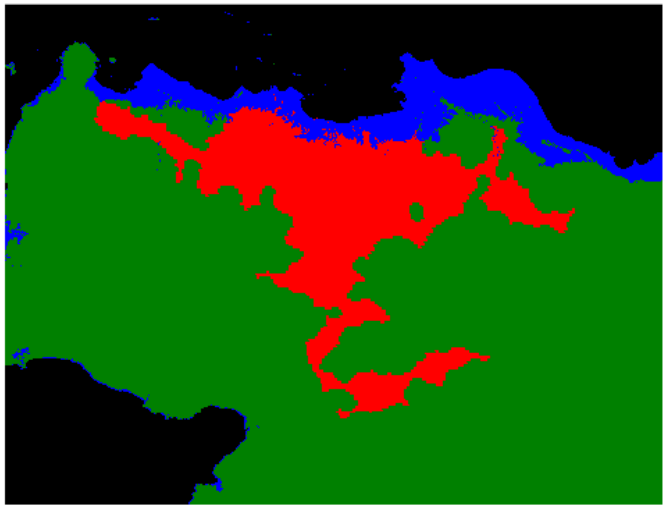

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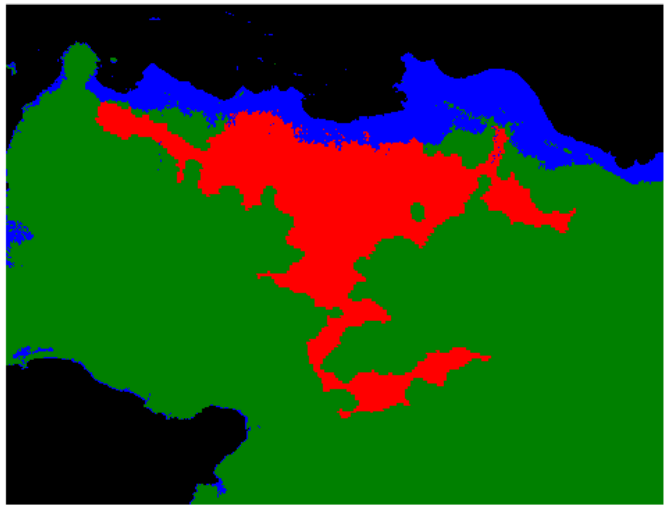

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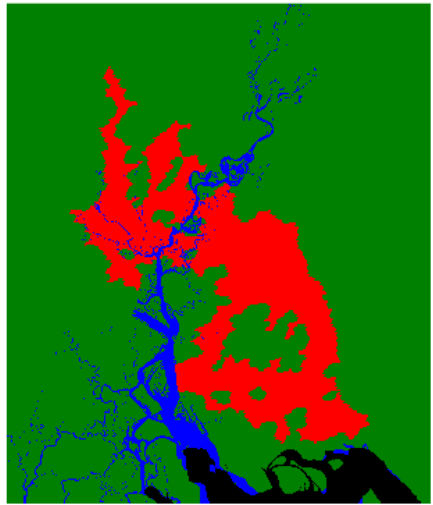

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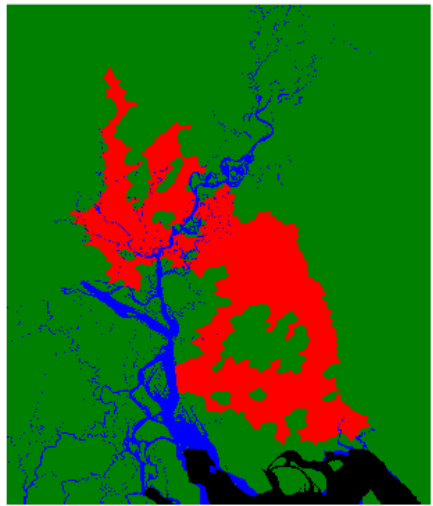

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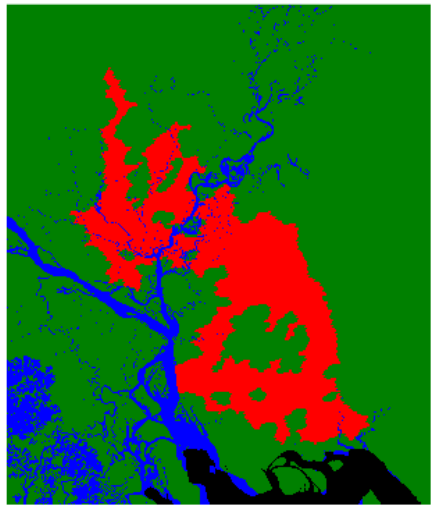

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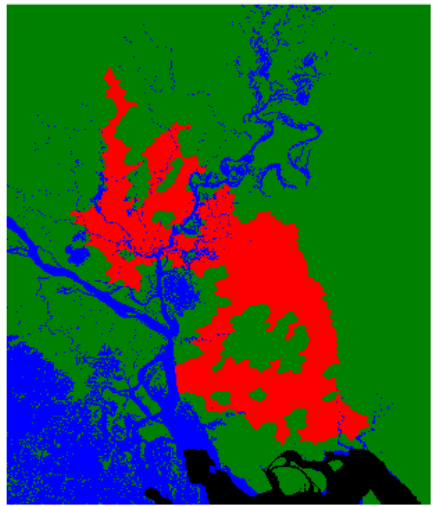

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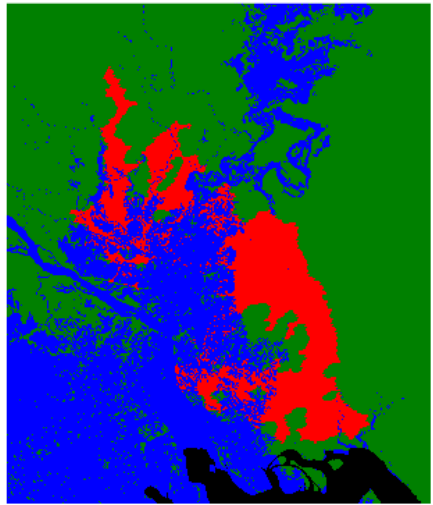

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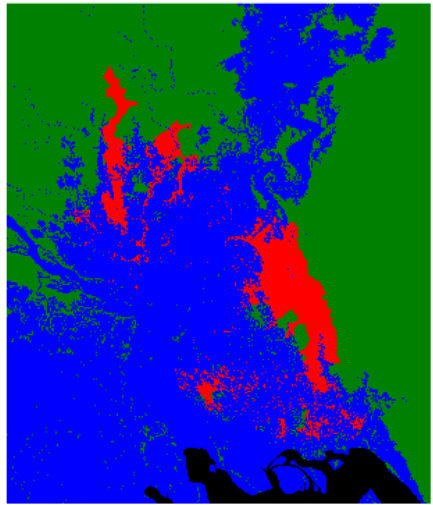

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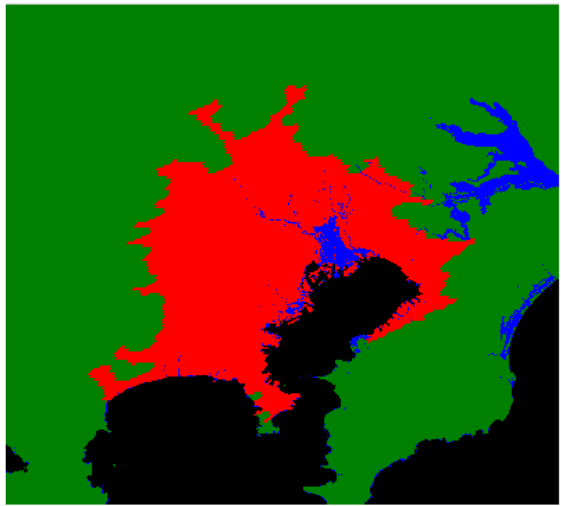

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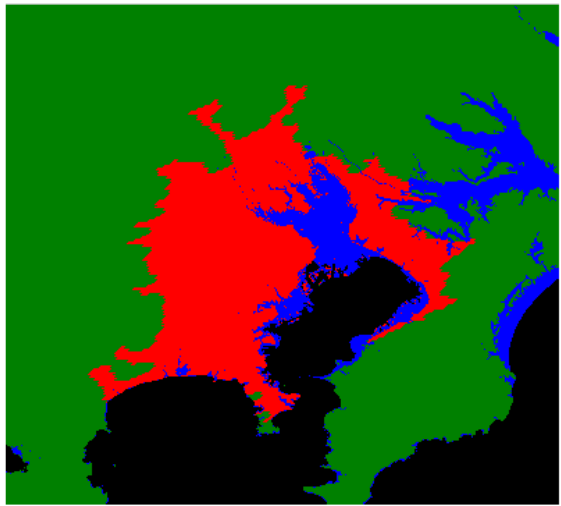
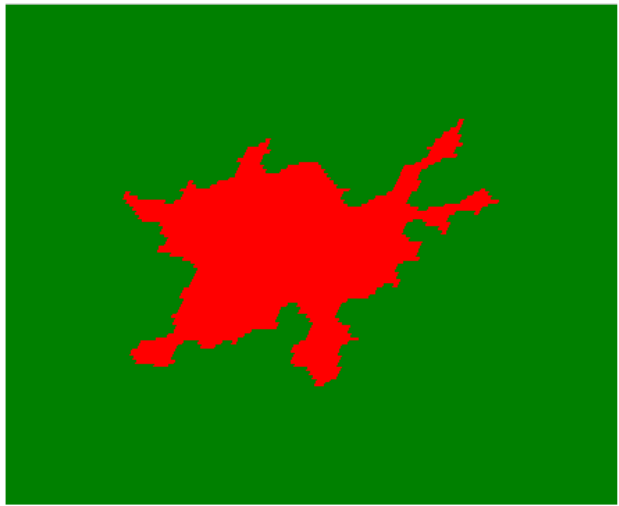


5. New Delhi



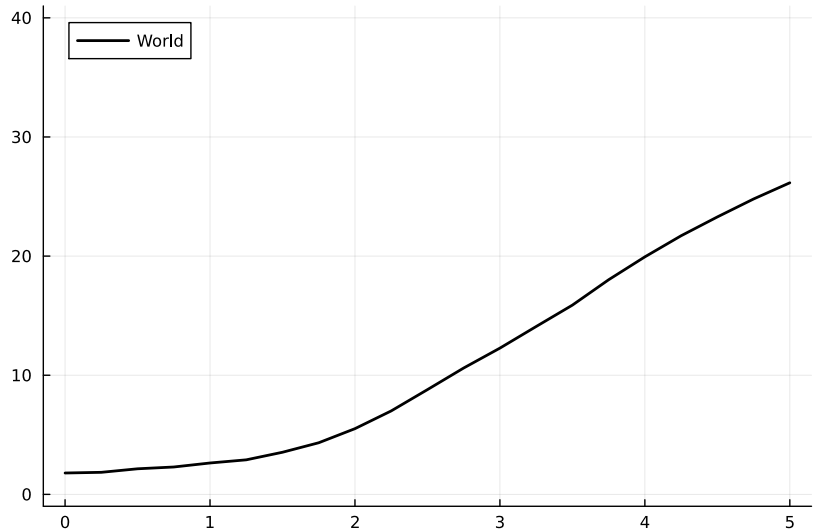
Infrastructure

1. Education: schools, kindergartens, colleges, universities (OSM)
2. Health: hospitals, clinics, doctors, dentists, pharmacies (OSM)
3. Transport: highways, primary roads, secondary roads, tertiary roads (GRIP)

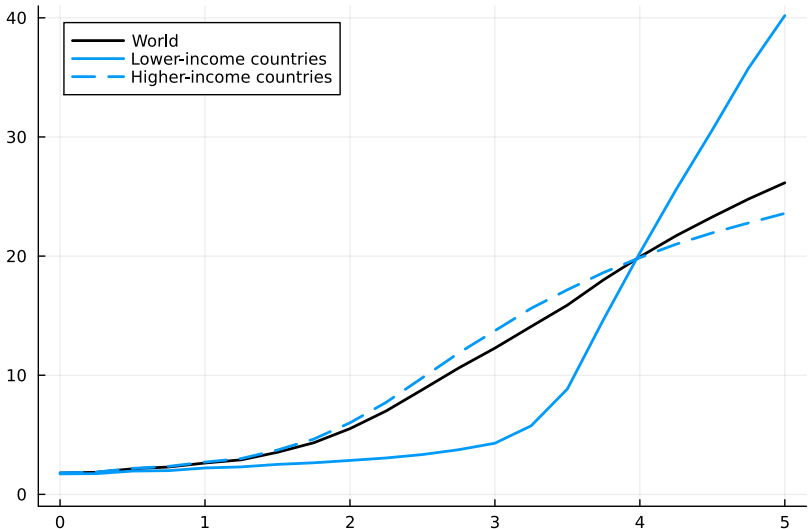
Exposure

- Overlaying inundation, city boundaries, and infrastructure
  - Weighting by population
- Ignoring current and future defense
  - Interpretation: land and infrastructure “at risk”

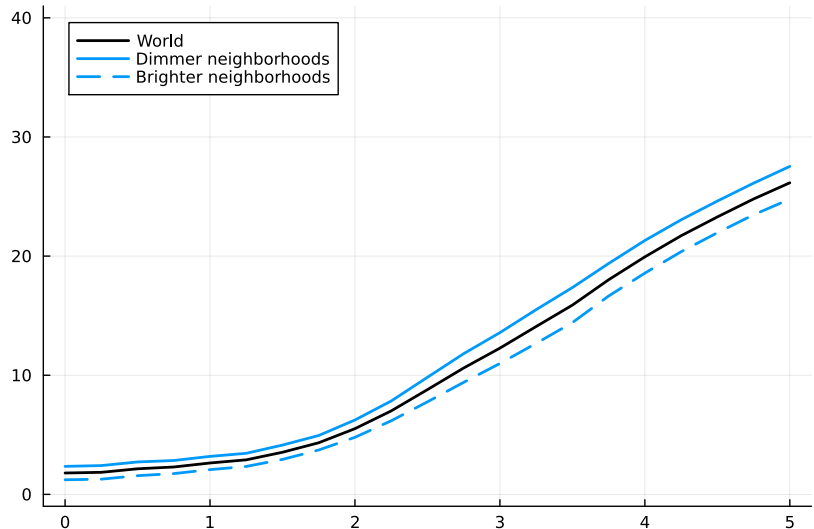
Land inundated (% by meters SLR)



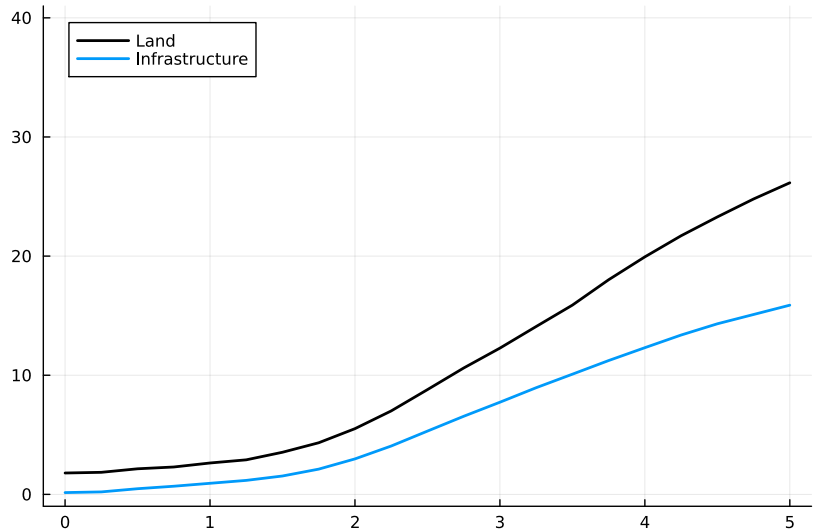
Lower-income cities less exposed until 4 meters



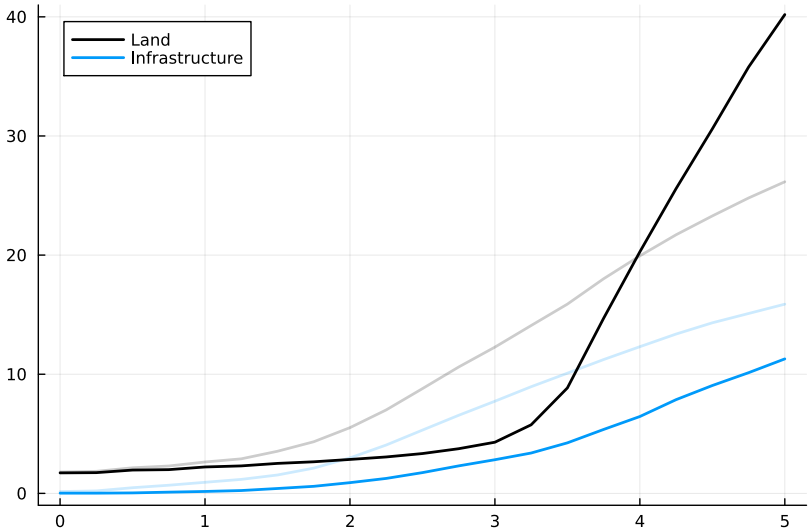
Dimmer neighborhoods somewhat more exposed



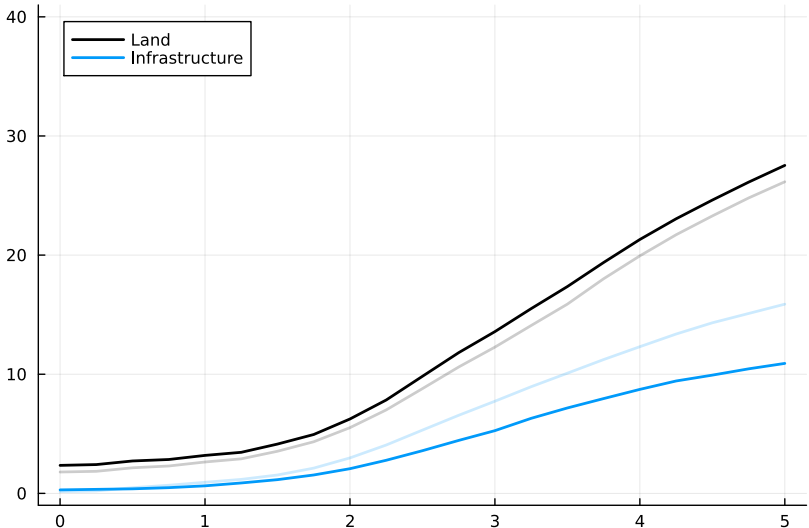
Education and health infrastructure are placed well



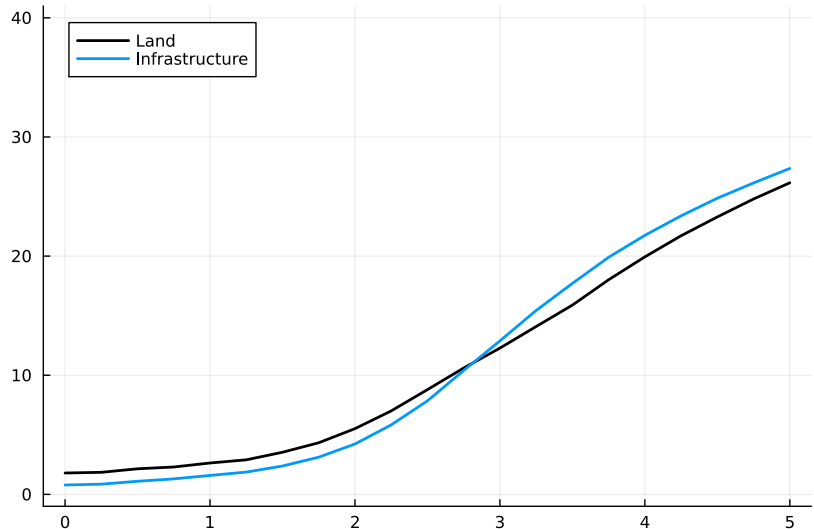
Especially for lower-income cities



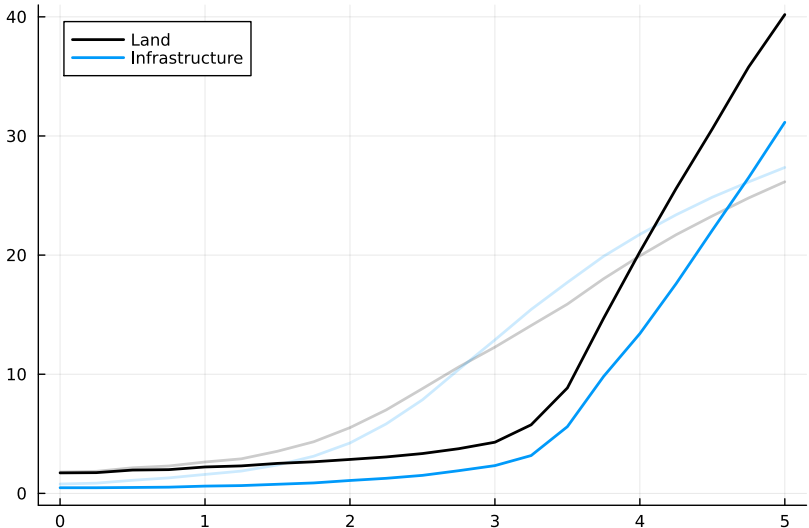
And for dimmer neighborhoods



Roads have proportional exposure



Somewhat better for lower-income cities



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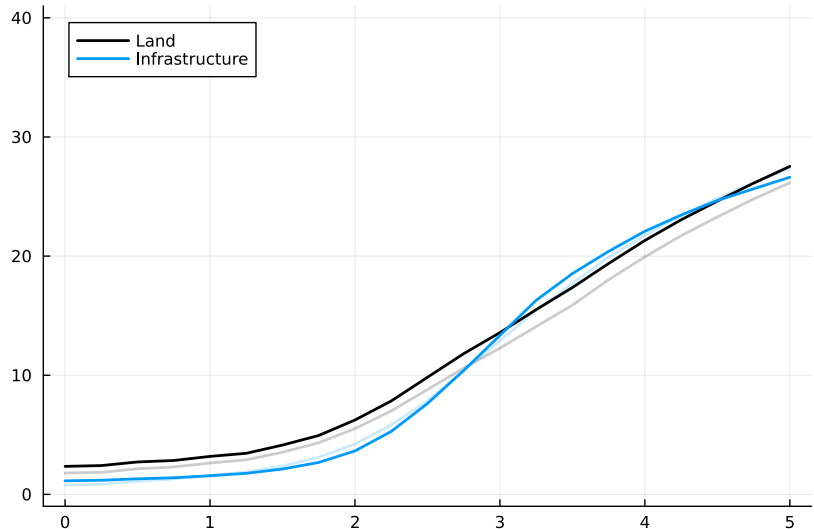

Summary

- New data set on sea level rise and urban infrastructure
  - Data and code available soon for download
- Lower-income cities are less exposed until 4 meters SLR
  - And infrastructure is relatively well-placed