Mapping the Human Planet: Integrating Settlement, Infrastructure, and Population Data to Leave No One Behind

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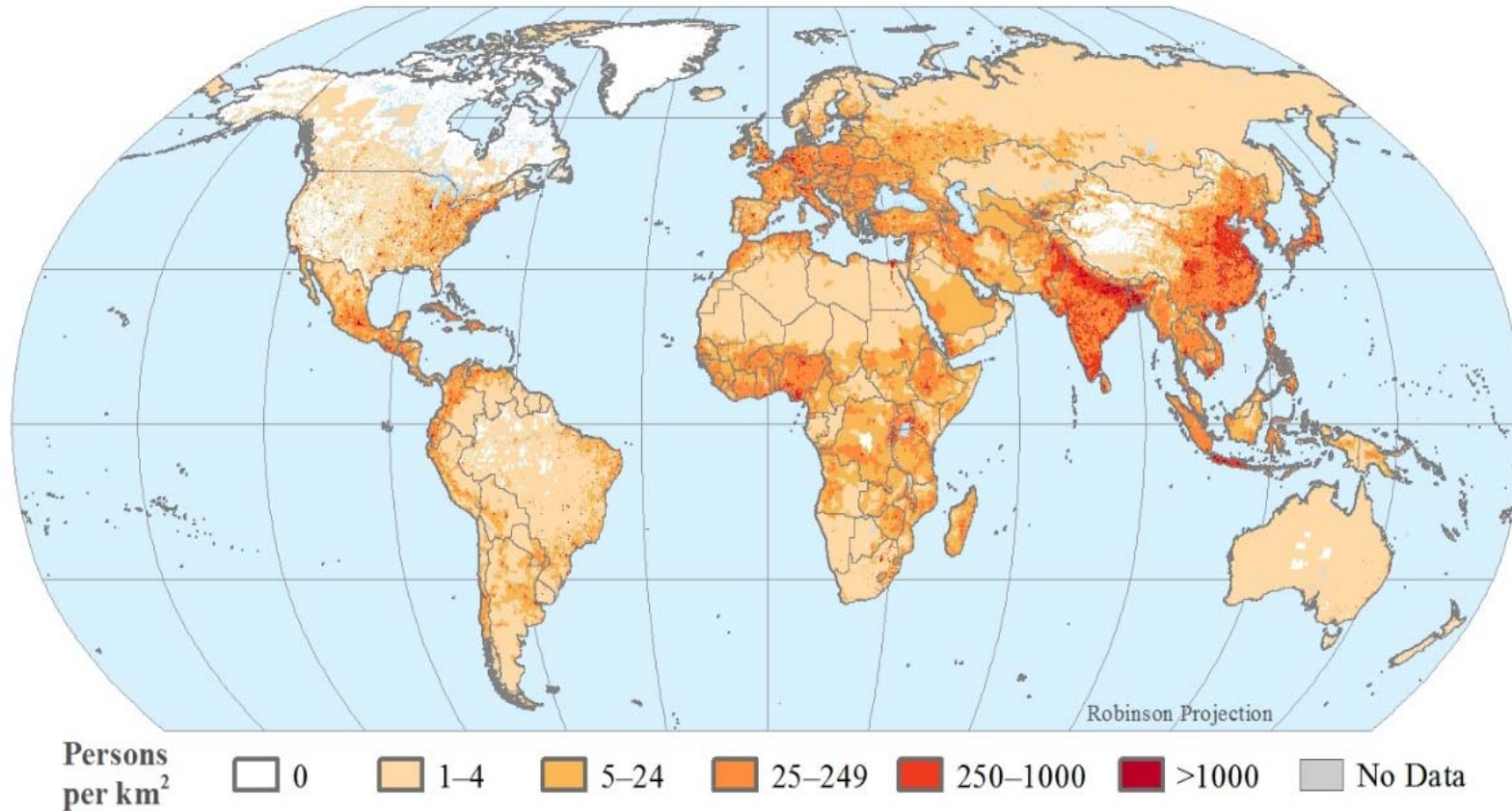*Associate Director, Geospatial Applications*

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Gridded Population of the World, Version 4

▸ Based only on subnational population & boundary data from national censuses

Robinson Projection

Persons per km²: ☐ 0 | ☐ 1–4 | ☐ 5–24 | ☐ 25–249 | ☐ 250–1000 | ☐ >1000 | ☐ No Data

http://sedac.ciesin.columbia.edu/data/collection/gpw-v4/sets/browse

GPWv4.10, Elderly Population, 2010

Basic Demographic Characteristics, v4.10, 2010: The Elderly (Ages 65 and Older)

Gridded Population of the World, Version 4 (GPWv4)
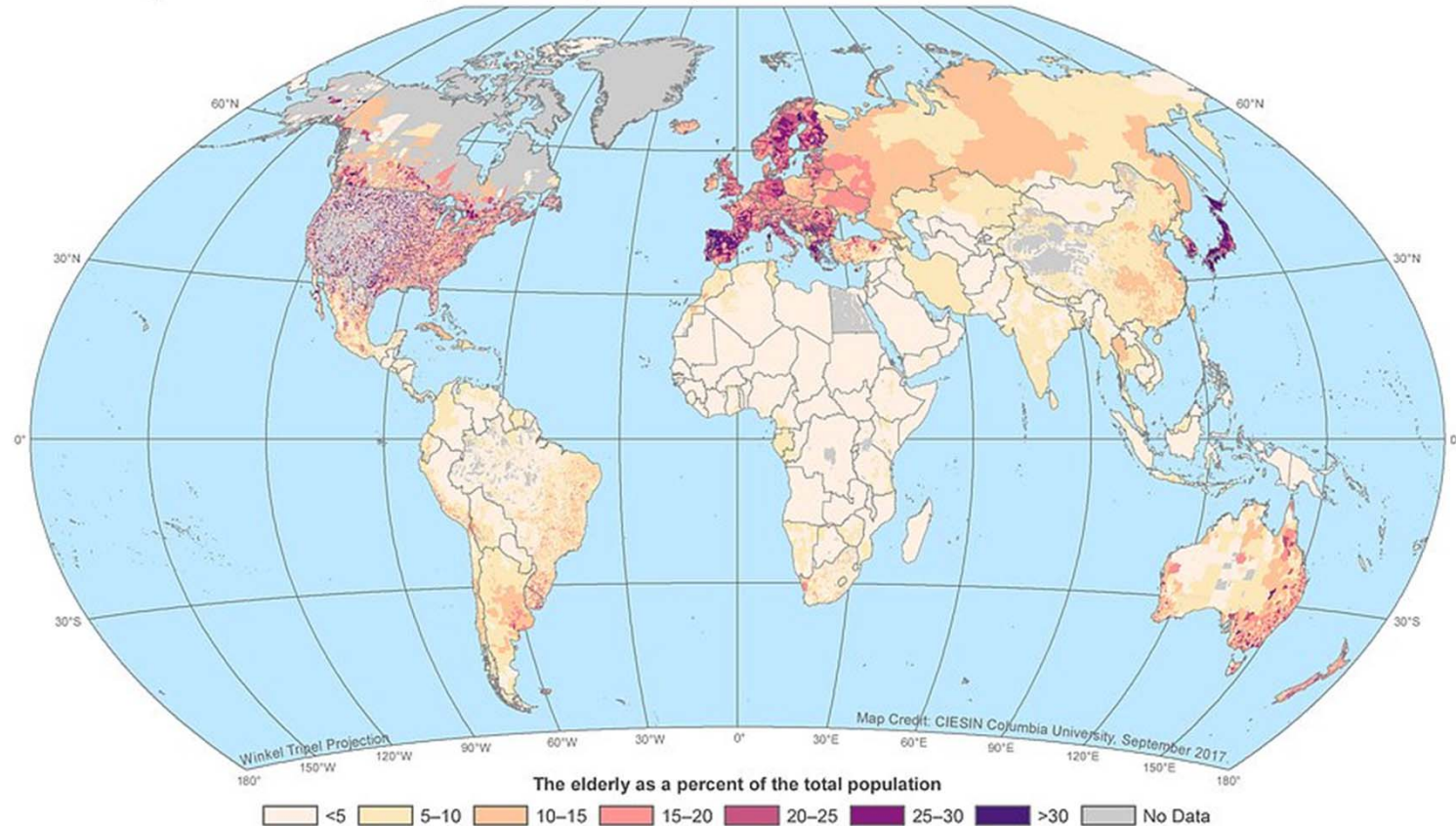
The elderly as a percent of the total population

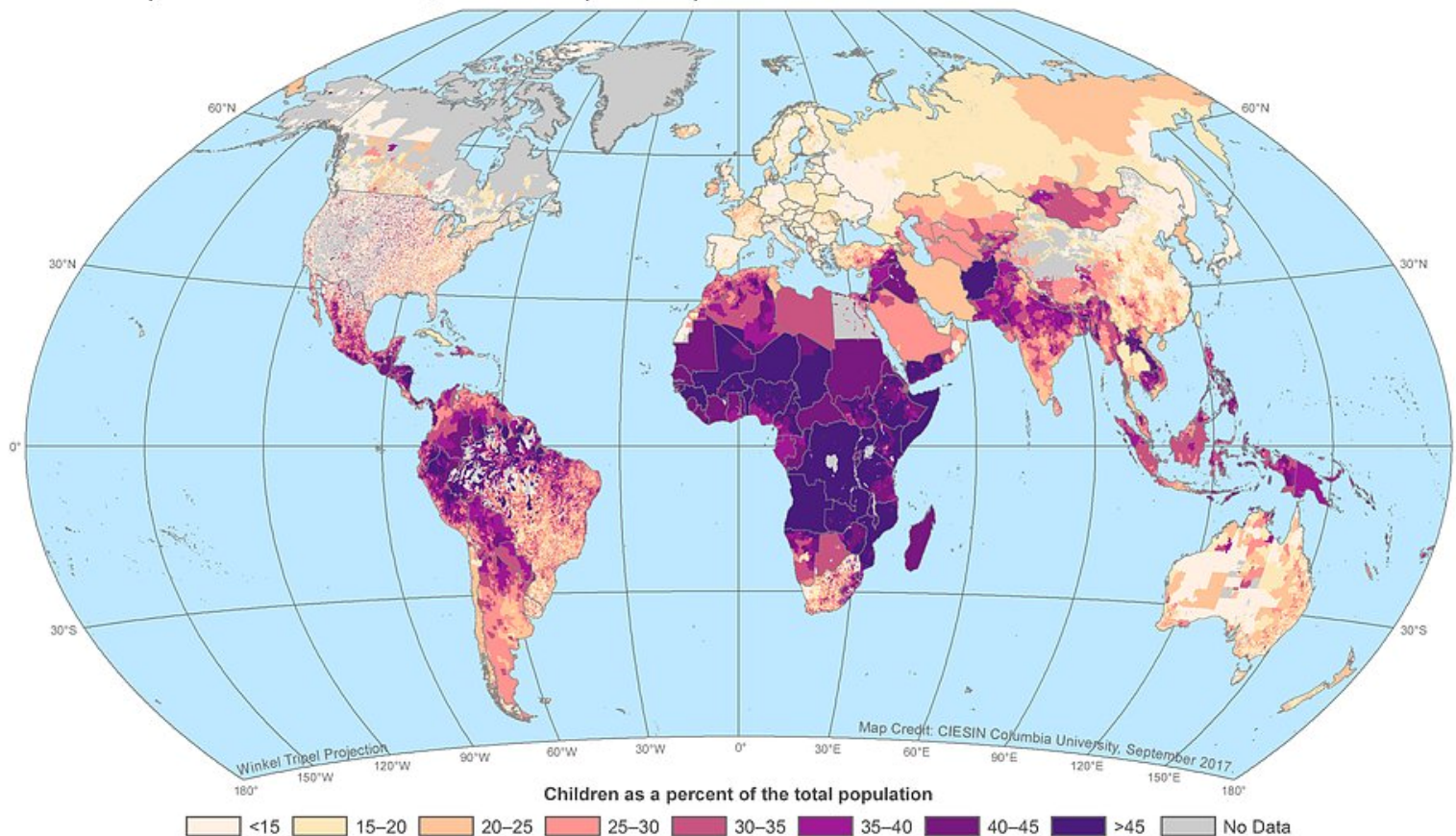<5   5–10   10–15   15–20   20–25   25–30   >30   No Data

Gridded Population of the World, Version 4 (GPWv4) Basic Demographic Characteristics, Revision 10 consists of estimates of human population by age and sex, consistent with national censuses and population registers, for the year 2010. The global distribution of the elderly, ages 65 and older, is represented here as a percent of the total population in the year 2010. It is calculated by summing the counts in the v4.10 5-year age group rasters from ages 65 to 85+, then dividing the sum by the total population in the year 2010 and multiplying the quotient by 100.

3

GPWv4.10, Child Population, 2010

Basic Demographic Characteristics, v4.10, 2010: Children (Ages 0–14)

Gridded Population of the World, Version 4 (GPWv4)

Children as a percent of the total population

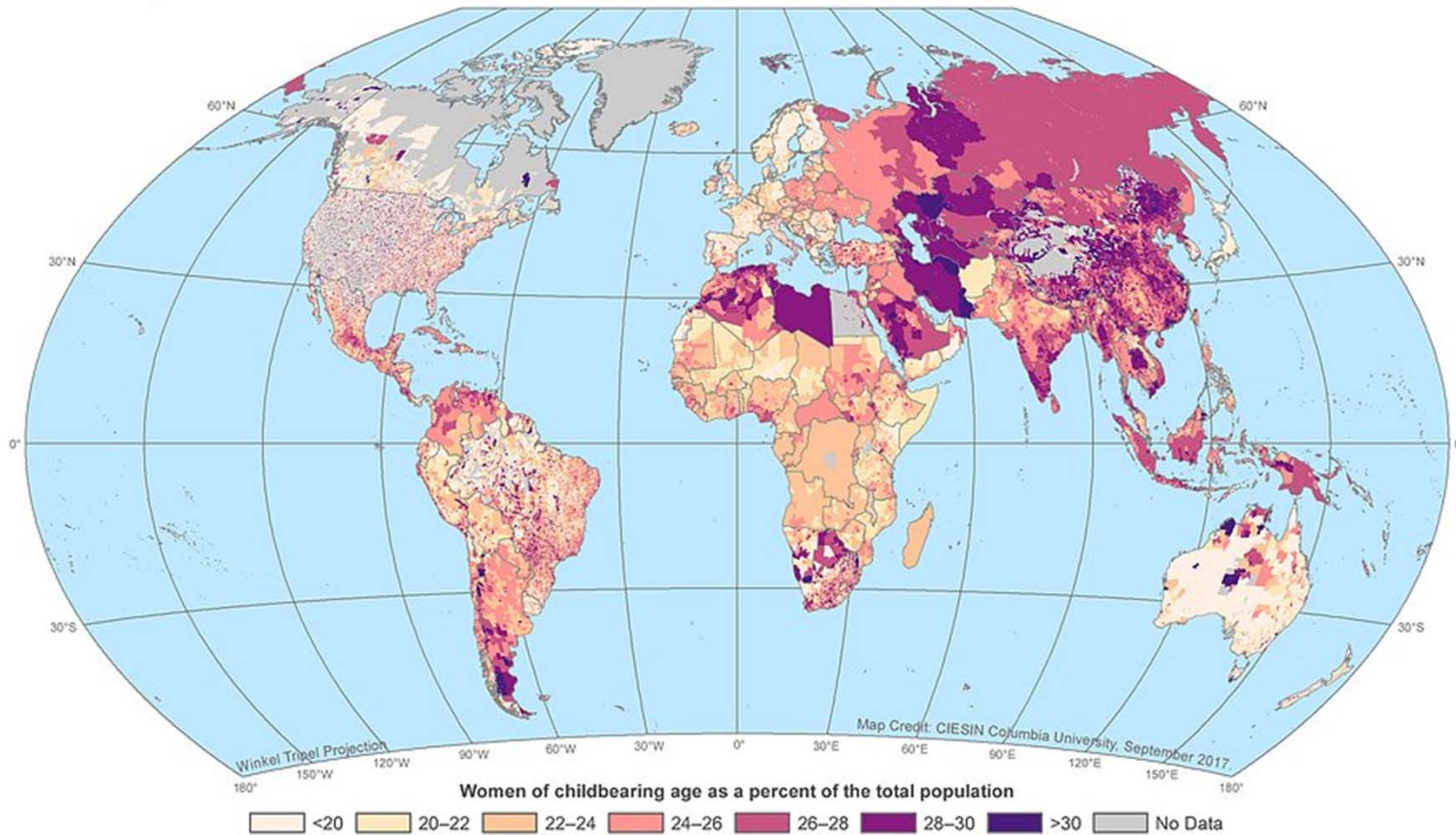| <15 | 15–20 | 20–25 | 25–30 | 30–35 | 35–40 | 40–45 | >45 | No Data |

Gridded Population of the World, Version 4 (GPWv4) Basic Demographic Characteristics, Revision 10 consists of estimates of human population by age and sex, consistent with national censuses and population registers, for the year 2010. The global distribution of children, ages 0–14, is represented here as a percent of the total population in the year 2010. It is calculated by summing the counts in the v4.10 5-year age group rasters from ages 0 to 14, then dividing the sum by the total population in the year 2010 and multiplying the quotient by 100.

4

GPWv4.10, Women of Childbearing Age, 2010

Basic Demographic Characteristics, v4.10, 2010: Women of Childbearing Age (Ages 15–49)

Gridded Population of the World, Version 4 (GPWv4)

Women of childbearing age as a percent of the total population

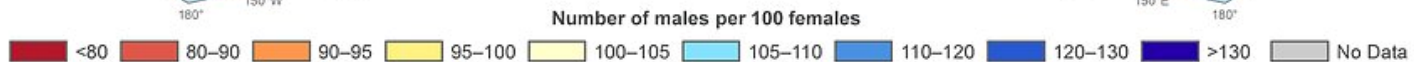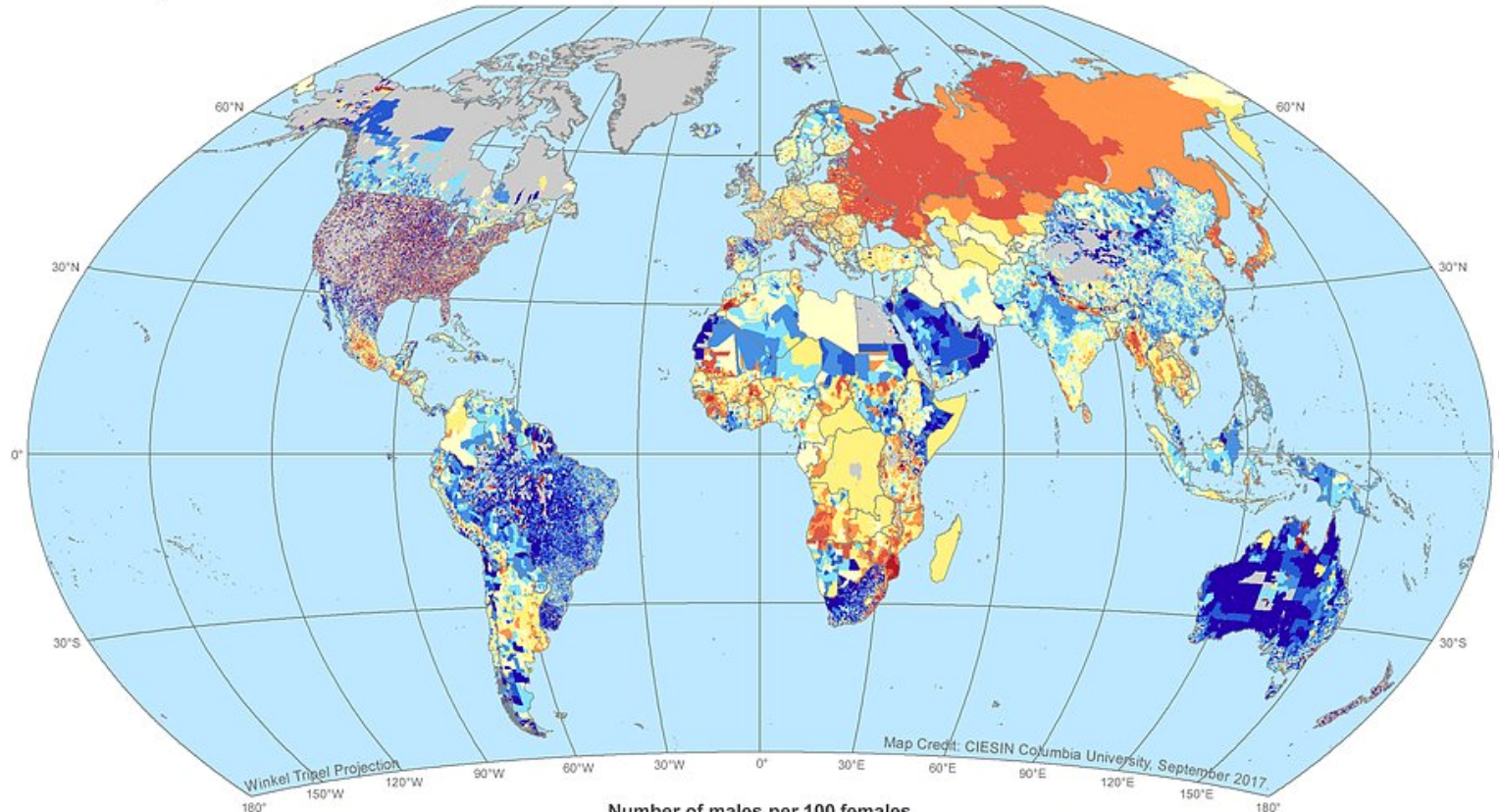<20 | 20–22 | 22–24 | 24–26 | 26–28 | 28–30 | >30 | No Data

Gridded Population of the World, Version 4 (GPWv4) Basic Demographic Characteristics, Revision 10 consists of estimates of human population by age and sex, consistent with national censuses and population registers, for the year 2010. The global distribution of women of childbearing age, ages 15–49, is represented here as a percent of the total population in the year 2010. It is calculated by summing the counts in the v4.10 female 5-year age group rasters from ages 15 to 49, then dividing the sum by the total population in the year 2010 and multiplying the quotient by 100.

GPWv4.10 – Sex Ratio Grid, 2010

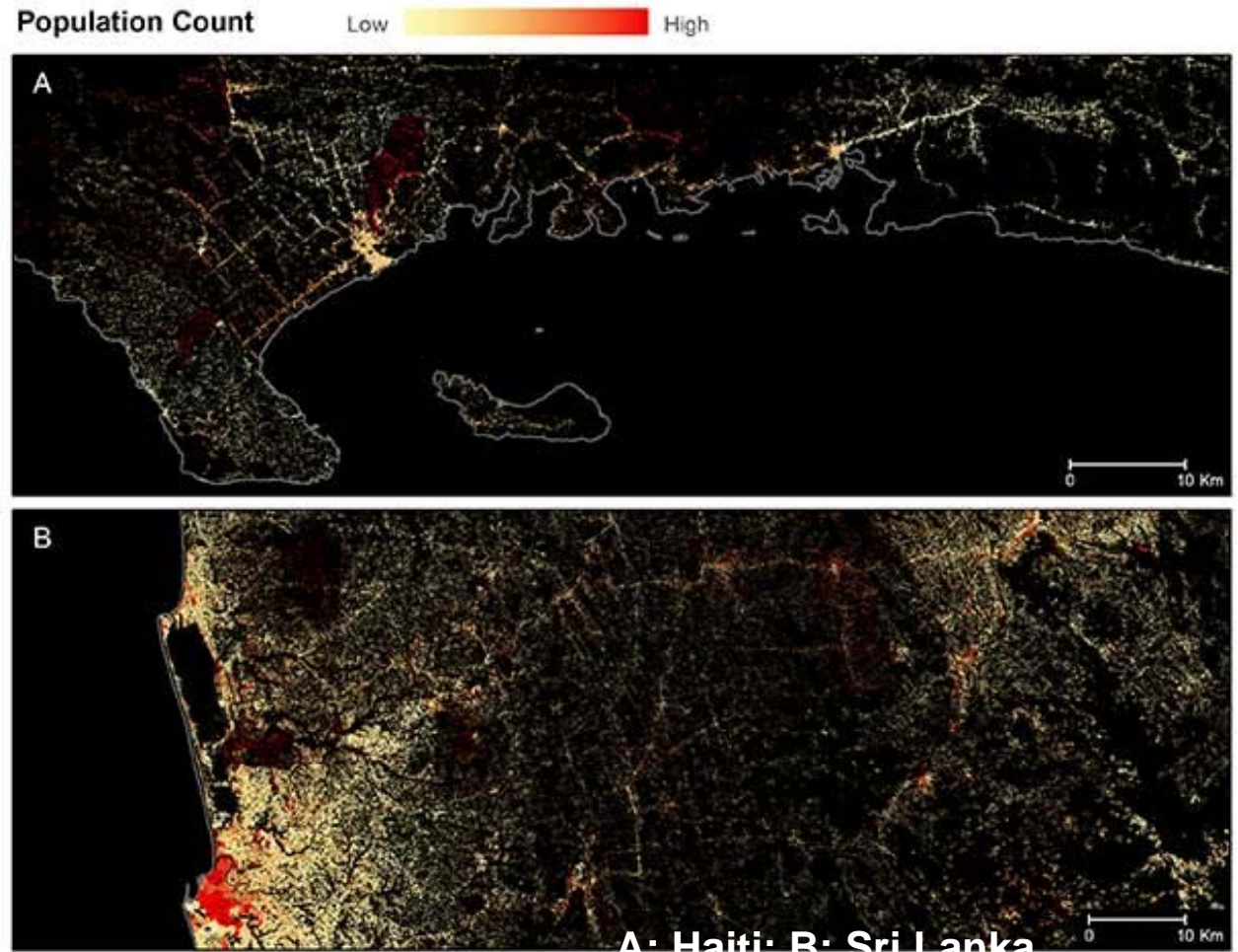## Basic Demographic Characteristics, v4.10, 2010: Sex Ratio

Gridded Population of the World, Version 4 (GPWv4)

Map Credit: CIESIN Columbia University, September 2017

Winkel Tripel Projection

Number of males per 100 females

| <80 | 80–90 | 90–95 | 95–100 | 100–105 | 105–110 | 110–120 | 120–130 | >130 | No Data |

Gridded Population of the World, Version 4 (GPWv4) Basic Demographic Characteristics, Revision 10 consists of estimates of human population by age and sex, consistent with national censuses and population registers, for the year 2010. The sex ratio represents the number of males for every 100 females in the population. It is calculated by dividing the total male count raster by the total female count raster and multiplying the quotient by 100.

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Mapping Populations in Rural Areas

- High Resolution Settlement Layer (HRSL): **Focus on rural population to optimize Internet access**

- Collaboration with **Internet.org/Facebook** to produce open access 30-m resolution population density estimates: based on high res remote sensing imagery (IKONOS)

- Data for 22 countries plus Puerto Rico released; others to be released soon.

Population Count   Low ▭ High

A: Haiti; B: Sri Lanka

http://ciesin.columbia.edu/data/hrsl/

internet.org by **facebook**

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Linking Human Settlements with Population Data

- **Global Human Settlement Layer (GHSL)**
- Collaboration with **the European Commission's Joint Research Center** to produce open access 250m and 1km resolution population count estimates based on Landsat
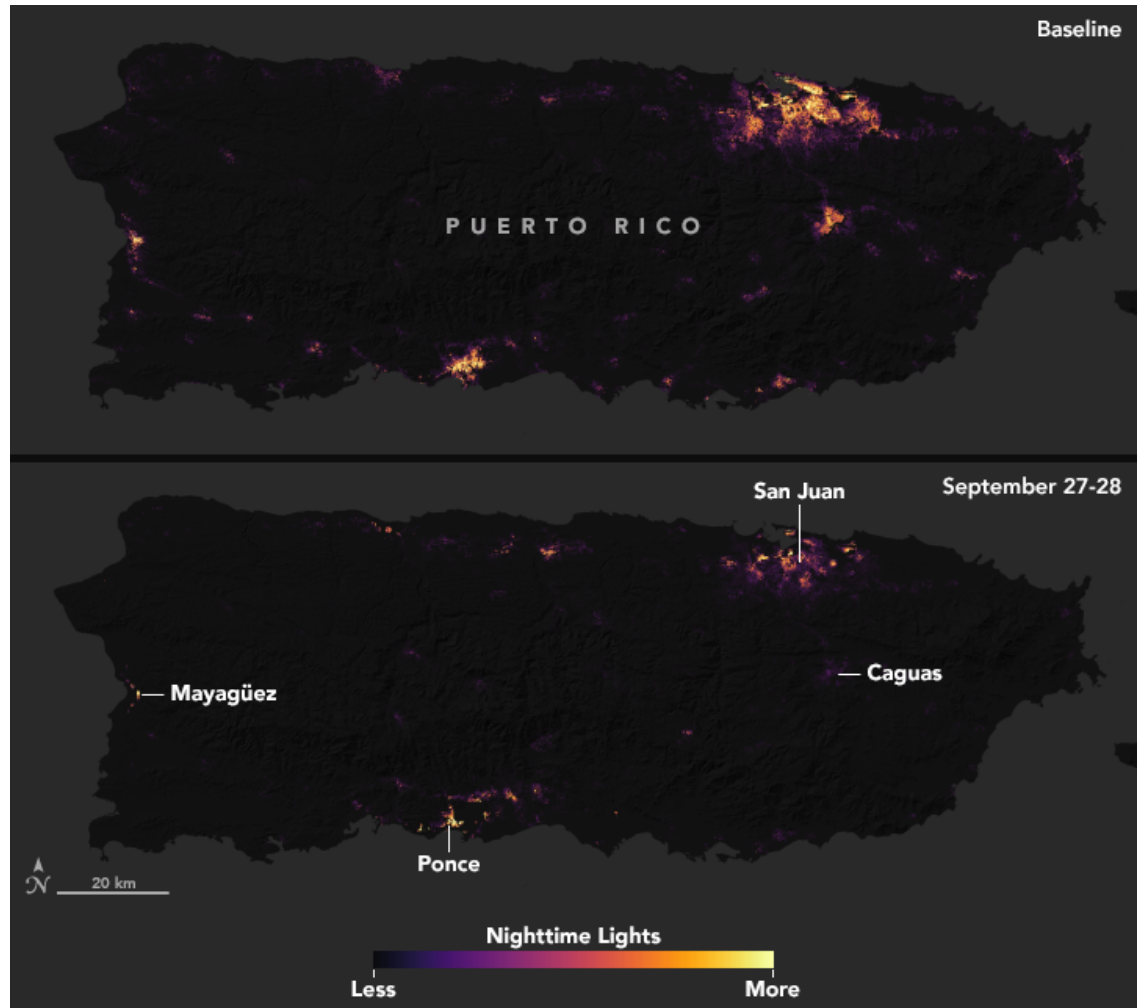- Global data set
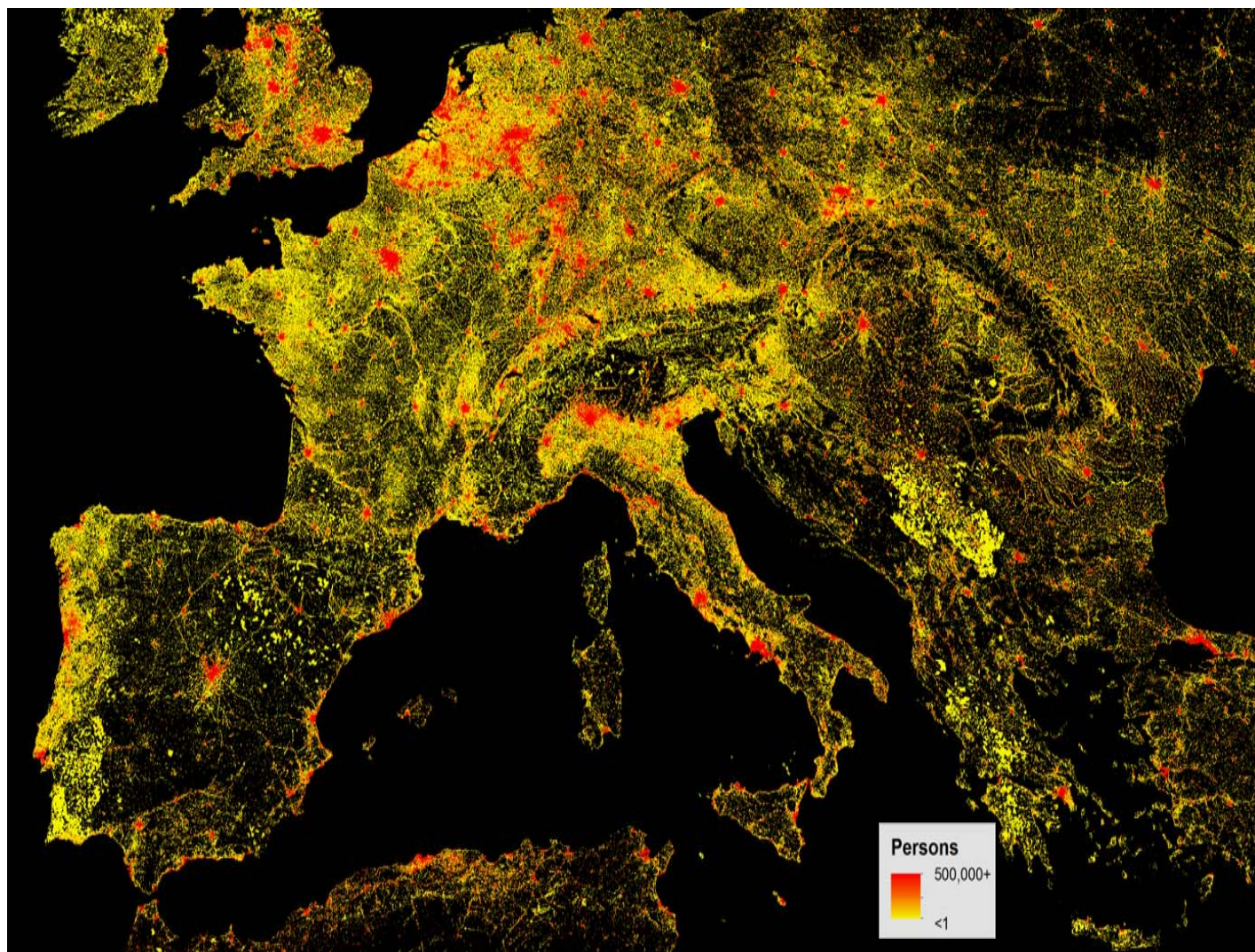
Persons
500,000+
<1

http://ghsl.jrc.ec.europa.eu/

European Commission

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Identifying Vulnerable Populations through Night-time Lights Data

- Night-time lights from VIIRS
- Puerto Rico, before and after Hurricane Maria


Courtesy M. Roman, NASA GSFC

Diversity of Products with Different Characteristics

Project	Prop. Allocation	Dasymetric	Statistical / machine learning	Multiple Time Points	Imagery / spectral data	Radar	Nominal Spatial Resolution
GPW	✓			✓			1km
Landscan		✓	✓?	✓	✓		1km
WorldPop			✓	✓ *			100m
GHSL		✓	✓	✓	✓		30m, 250m, 1km
GUF		✓	✓			✓	~12m for scientific research ~84m public
Esri		✓					250m
HRSL			✓		✓		30m
GMIS/HBASE			✓		✓		30 m

* Exists for some countries, planned for WorldPop Global

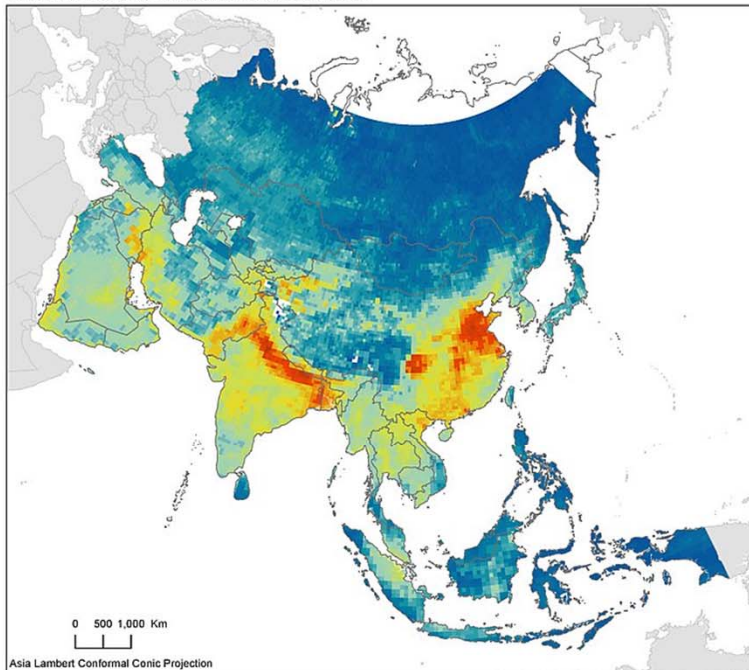# Population Exposure to Air Pollution: NO$_2$ and PM$_{2.5}$

Global 3-Year Running Mean Ground-Level Nitrogen Dioxide (NO$_2$) Grids from GOME, SCIAMACHY and GOME-2, 2010–2012
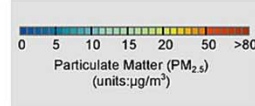Satellite-Derived Environmental Indicators
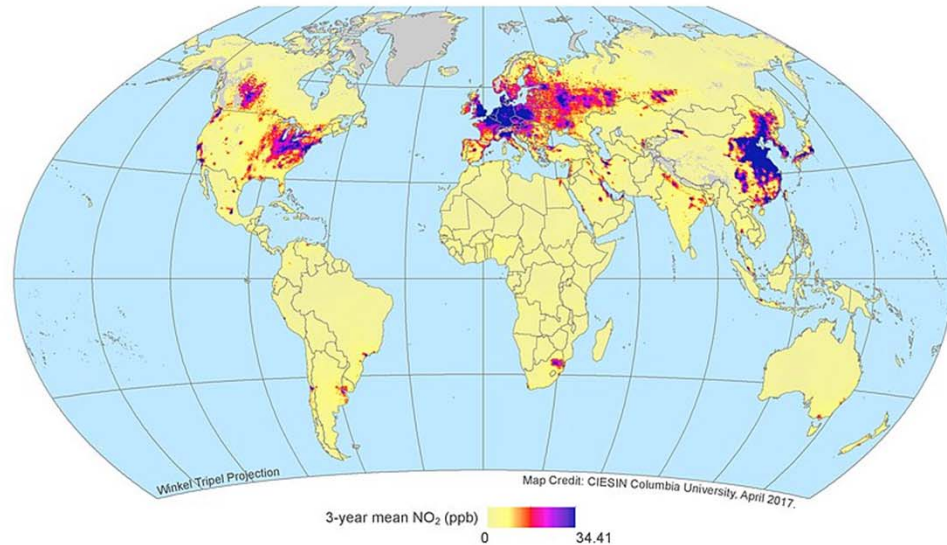
3-year mean NO$_2$ (ppb)   0   34.41

Global 3-Year Running Mean Ground-Level Nitrogen Dioxide (NO$_2$) Grids from GOME, SCIAMACHY and GOME-2 are part of the Satellite-Derived ...mental Indicators collection. This data set represents a series of three-year running mean grids (1996–2012) of ground level Nitrogen Dioxide that are ... from Global Ozone Monitoring Experiment (GOME), SCanning Imaging Absorption SpectroMeter for Atmospheric CHartographY (SCIAMACHY) and ... Ozone Monitoring Experiment-2 (GOME-2) satellite retrievals. This map displays 3-year mean satellite-derived NO$_2$ concentrations measured in parts per ...ppb) at a spatial resolution of 6 arc-minutes (0.1 degree or approximately 10 km at the equator) for the years 2010 to 2012.

Global Annual Average PM$_{2.5}$ Grids from MODIS and MISR Aerosol Optical Depth (AOD), 2010: Asia
Satellite-Derived Environmental Indicators

0   500 1,000 Km

Asia Lambert Conformal Conic Projection

Map Credit: CIESIN Columbia University, April 2013.

Global Annual PM$_{2.5}$ Grids from MODIS and MISR Aerosol Optical Depth (AOD) data sets provide annual "snap shots" of particulate matter 2.5 micrometers or smaller in diameter from 2001–2010. Exposure to fine particles is associated with premature death as well as increased morbidity from respiratory and cardiovascular disease, especially in the elderly, young children, and those already suffering from these illnesses. The grids were derived from Moderate Resolution Imaging Spectroradiometer (MODIS) and Multi-angle Imaging SpectroRadiometer (MISR) Aerosol Optical Depth (AOD) data. The raster grid cell size is approximately 50 sq. km at the equator, and the extent is from 70°N to 60°S latitude.

0   5   10   15   20   50   >80
Particulate Matter (PM$_{2.5}$)
(units:μg/m^3)

http://sedac.ciesin.columbia.edu/data/collection/sdei

POPGRID: A "Data Collaborative" for Settlement, Infrastructure, and Population Data

- Public-private data partnership involving intergovernmental organizations, national & academic research institutions, large and small companies, NGOs, foundations, universities, data stewards, etc.

- Goal: Accelerate the development and use of high quality, highly usable georeferenced data on population, human settlements, and infrastructure.