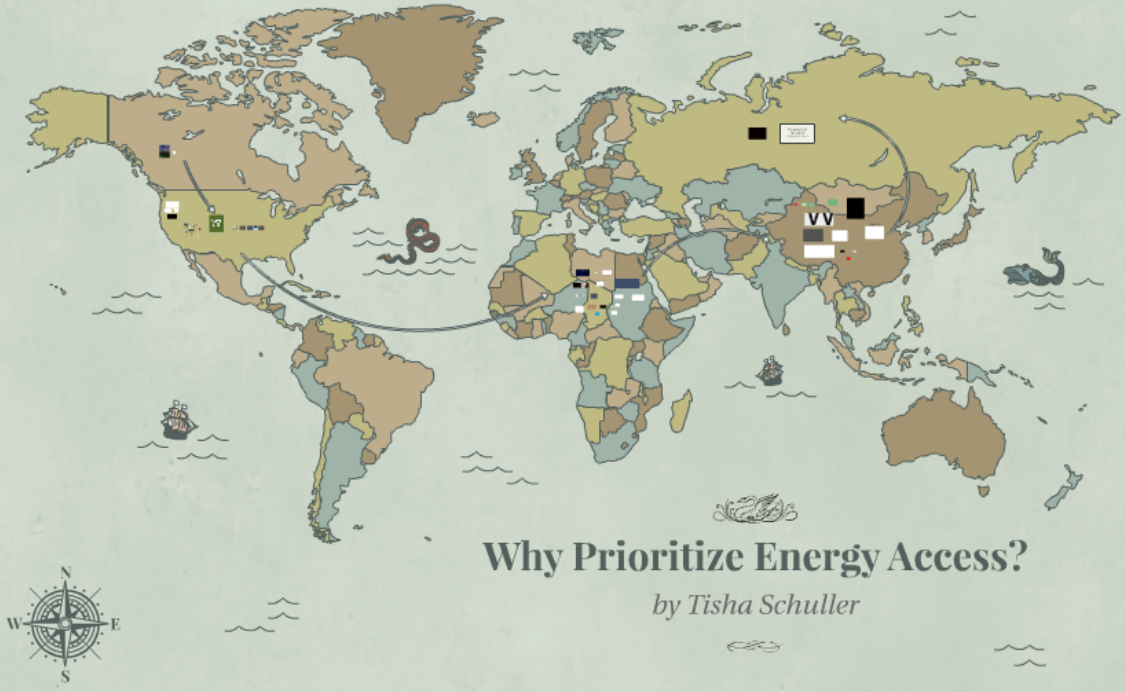
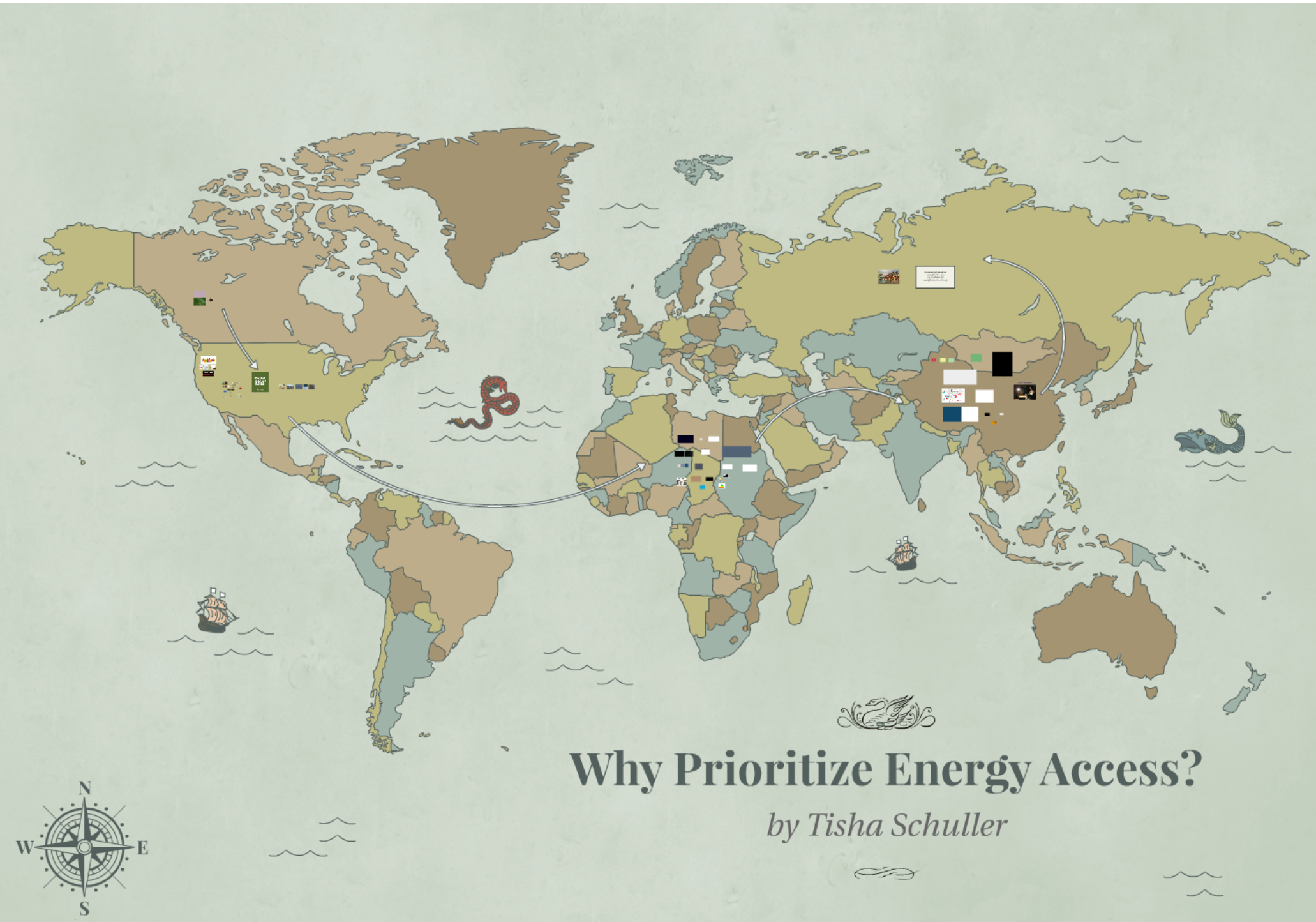


Why Prioritize Energy Access?

by Tisha Schuller



Why Prioritize Energy Access?

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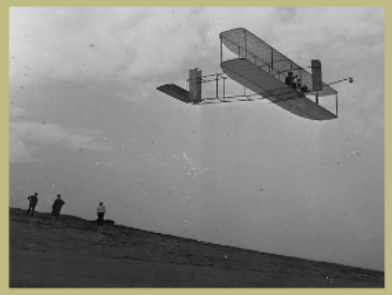
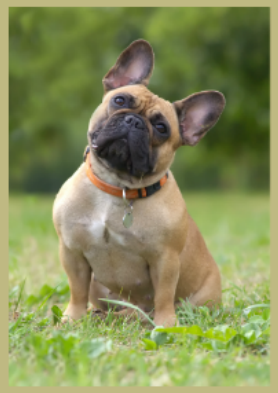
DO NOT
TOP OFF



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NGI Research Symposium 2017

Reducing Energy Poverty with Natural Gas: Changing Political, Business, and Technology Paradigms

SPEAKERS INCLUDE

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Partner, Global Gas Partners GMBH

PHILIP MSHELBILA
General Manager, Shell Nigeria

RACHEL PRITZKER
President & Founder, Pritzker Innovation Fund

MAARTEN WETSELAAR
Integrated Gas & New Energies Director, Royal Dutch Shell

JOYASHREE ROY
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SAMIR SARAN
Vice President, Observer Research Foundation

THE HONORABLE GEORGE SHULTZ
Distinguished Fellow, Hoover Institution


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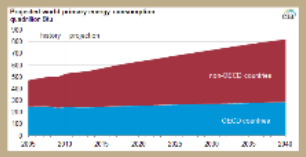
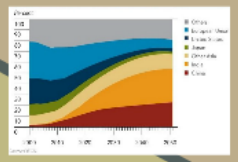
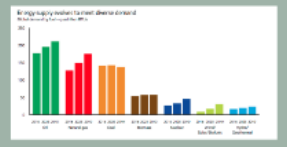
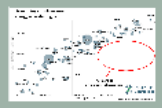
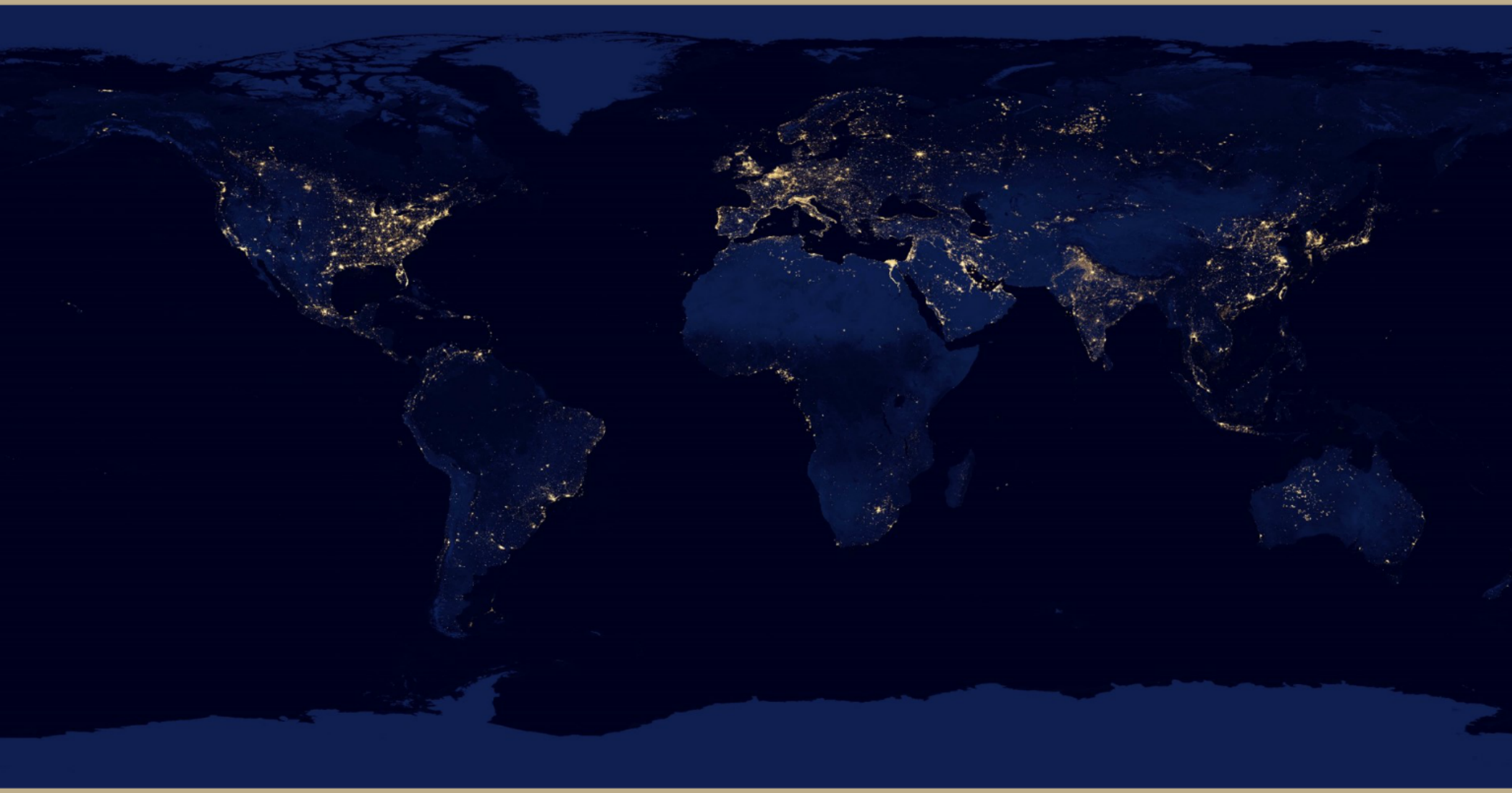


Global Middle Class is Growing

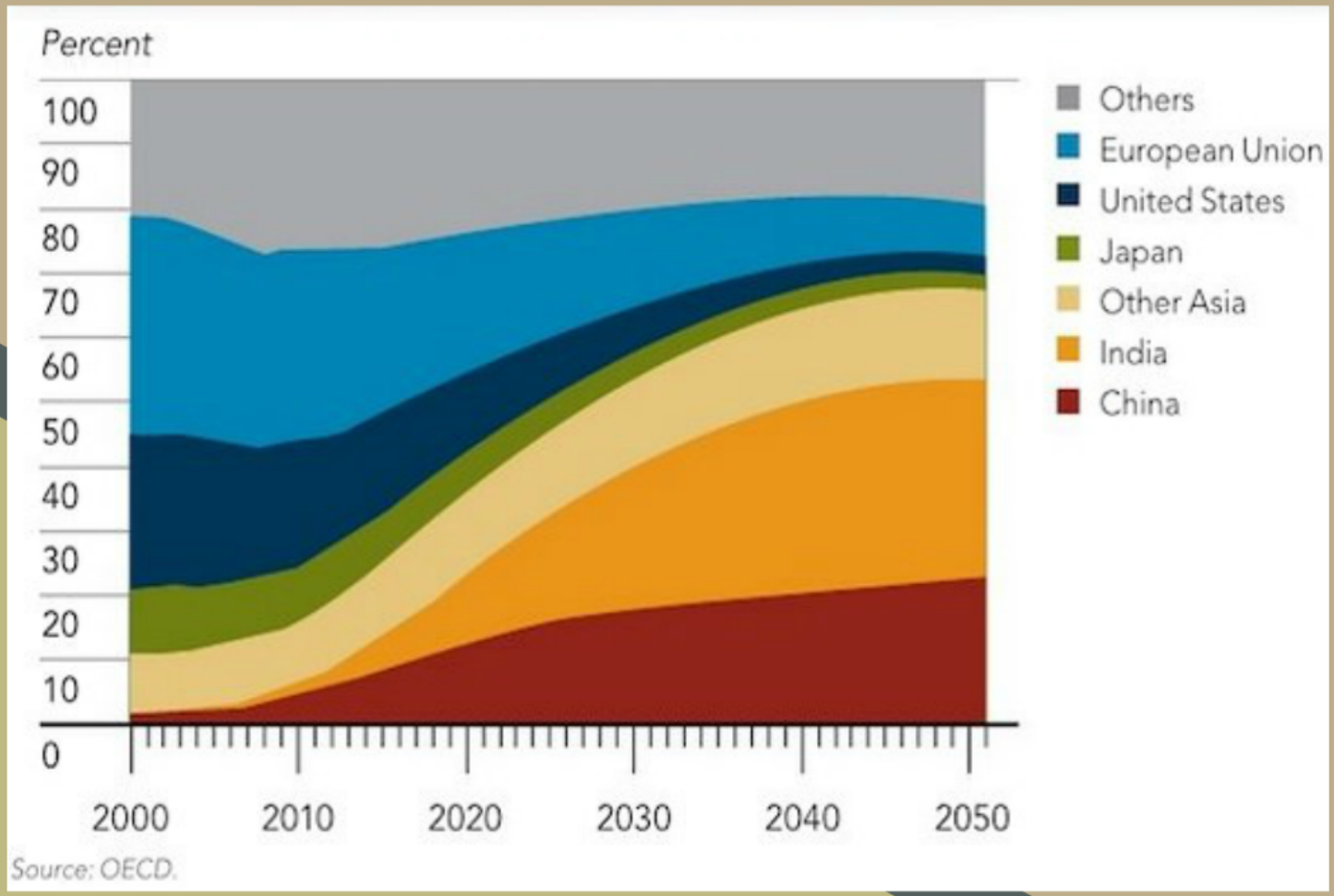


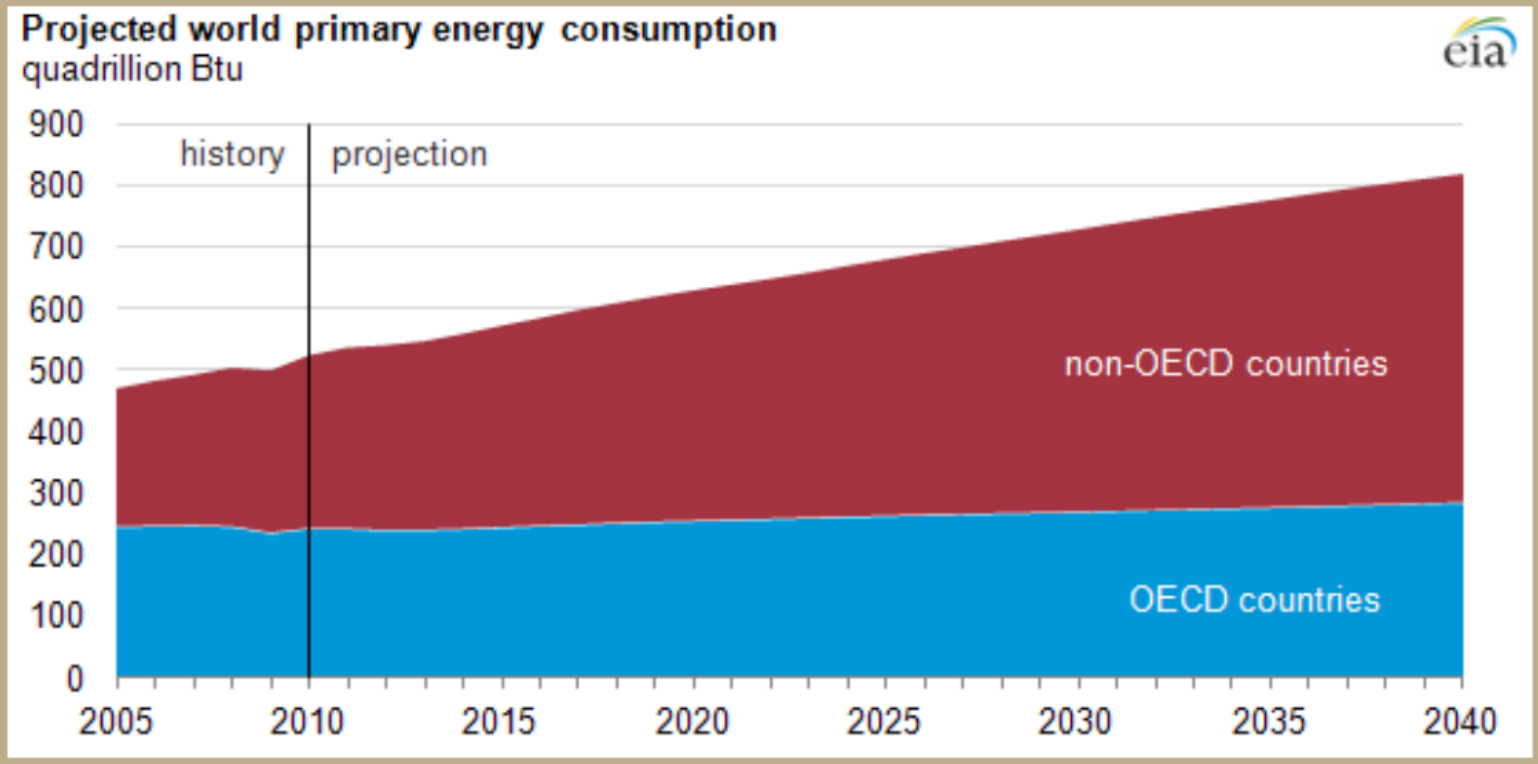






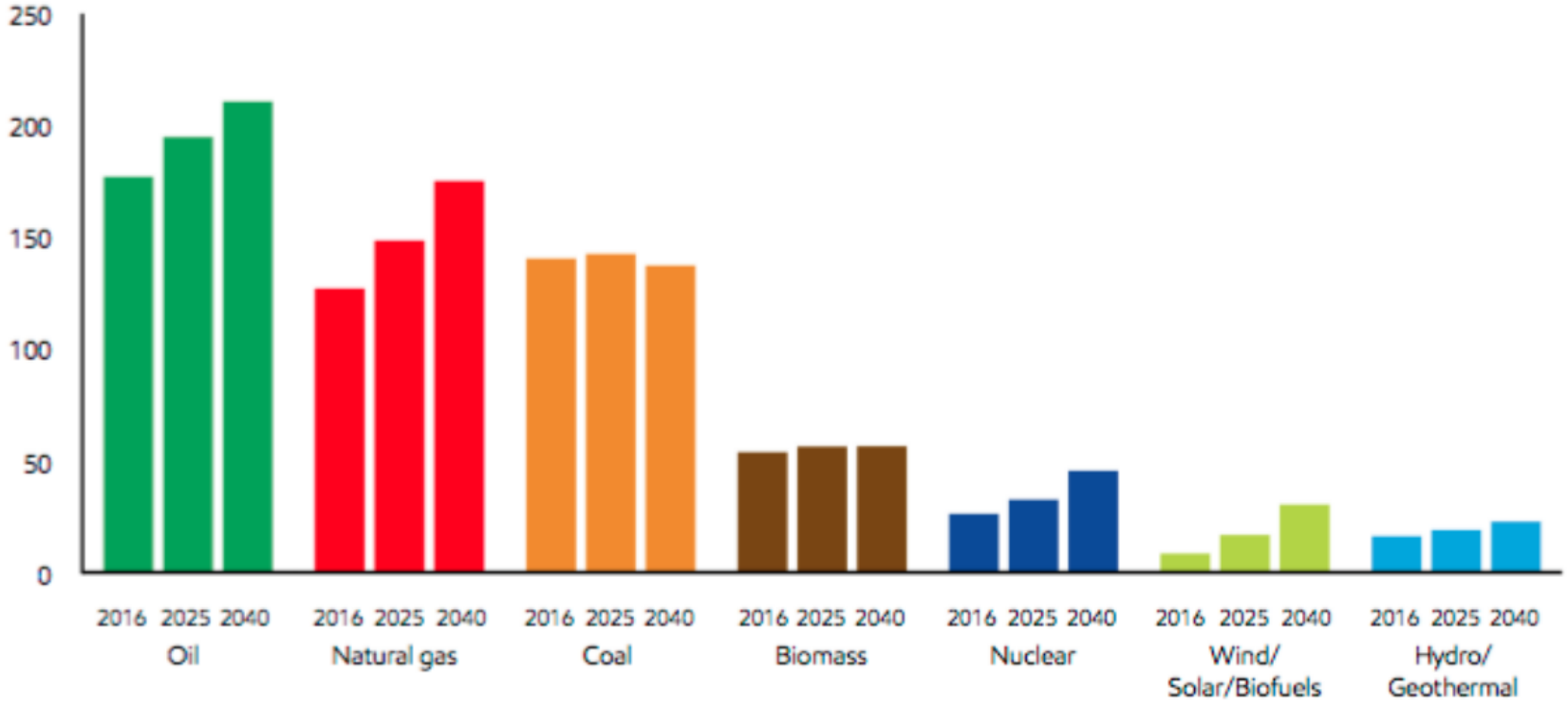
Global Middle Class is Growing




Projected world primary energy consumption
quadrillion Btu
eia
900
800
700
600
500
400
300
200
100
0
history
projection
non-OECD countries
OECD countries
2005
2010
2015
2020
2025
2030
2035
2040

Energy supply evolves to meet diverse demand

Global demand by fuel – quadrillion BTUs




World Population in 2018
The country's size in this map represents the size of the population.
Each square [▪] represents 500,000 people.
All 15,266 squares show where the world's 7.633 billion people live.
by Max Roser for OurWorldinData.org – the free online publication that presents the data and research on how the world is changing.
Population data from the United Nations Population Division.
Version 3 (October 2018)
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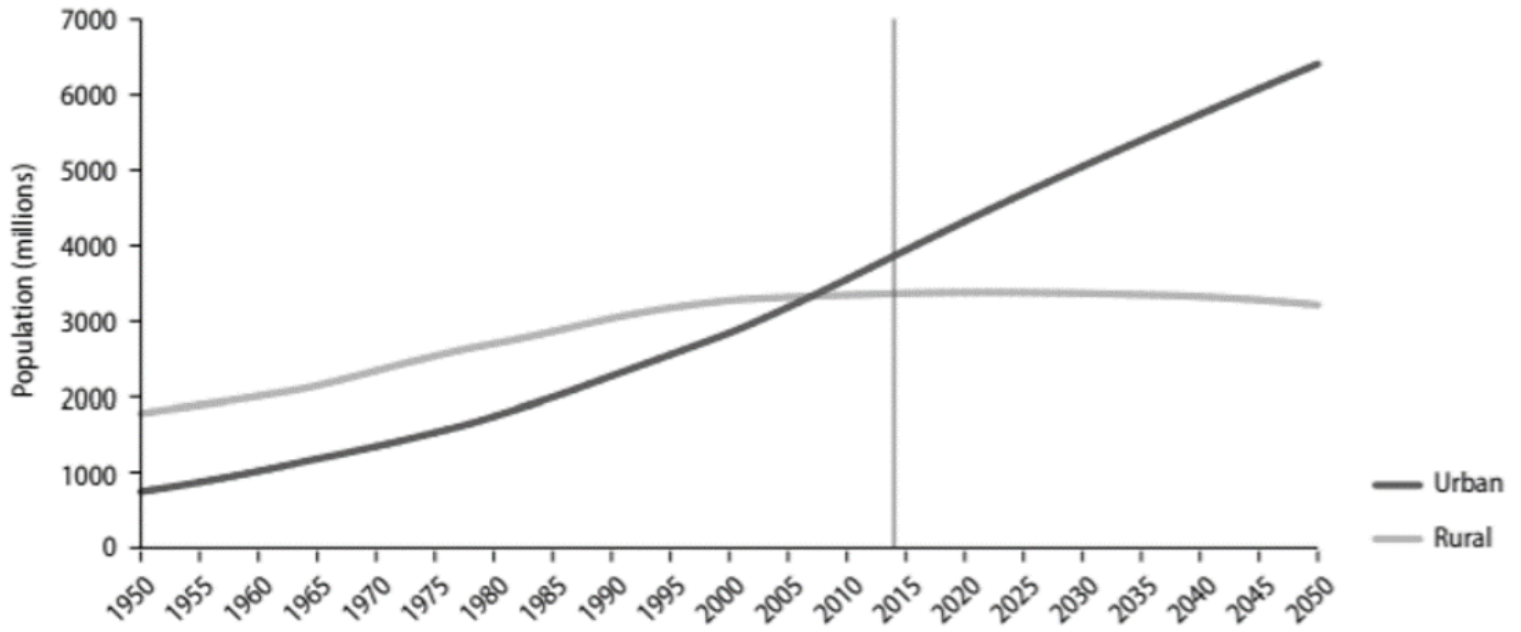
Our World in Data
Canada 37m
United States 326.8 million
Mexico 130.8m
North America, Central America and the Caribbean in total 587 million
Colombia 49.6m
Brazil 210.9m
Peru 32.6 million
Argentina 44.7m
South America total 428 million
United Kingdom 66.6 million
Russia 144 million
Germany 82.3m
Poland 38.1m
Ukraine 44m
France 65.2m
Spain 46.4m
Turkey 81.8m
Europe in total 711 million
Uzbekistan 32.4m
Iran 82m
Iraq 39.3m
Saudi Arabia 33.6m
Yemen 28.6m
Algeria 42m
Morocco 36.2m
Egypt 99.4m
Nigeria 195.9m
Sudan 41.8m
Ethiopia 107.5m
Uganda 44.3m
Kenya 51m
Tanzania 59.1m
D.R. Congo 84 million
Angola 30.8 million
Madagascar 26.3 million
Mozambique 30.3m
South Africa 57.4m
Africa in total 1.288 billion
Nepal 28.6m
Pakistan 200.8m
China 1.415 billion
18.5% of the world population
India 1.354 billion
17.7% of the world population
Bangladesh 166.4m
Myanmar 53.8m
Thailand 69.2m
Vietnam 96.5m
Philippines 106.5m
Malaysia 32m
Indonesia 266.8m
South Korea 51.2m
Japan 127.2m
Hong Kong 7.4m
Oceania in total 41 million
Asia in total 4.568 billion

Figure 2.

Urban and rural population of the world, 1950–2050

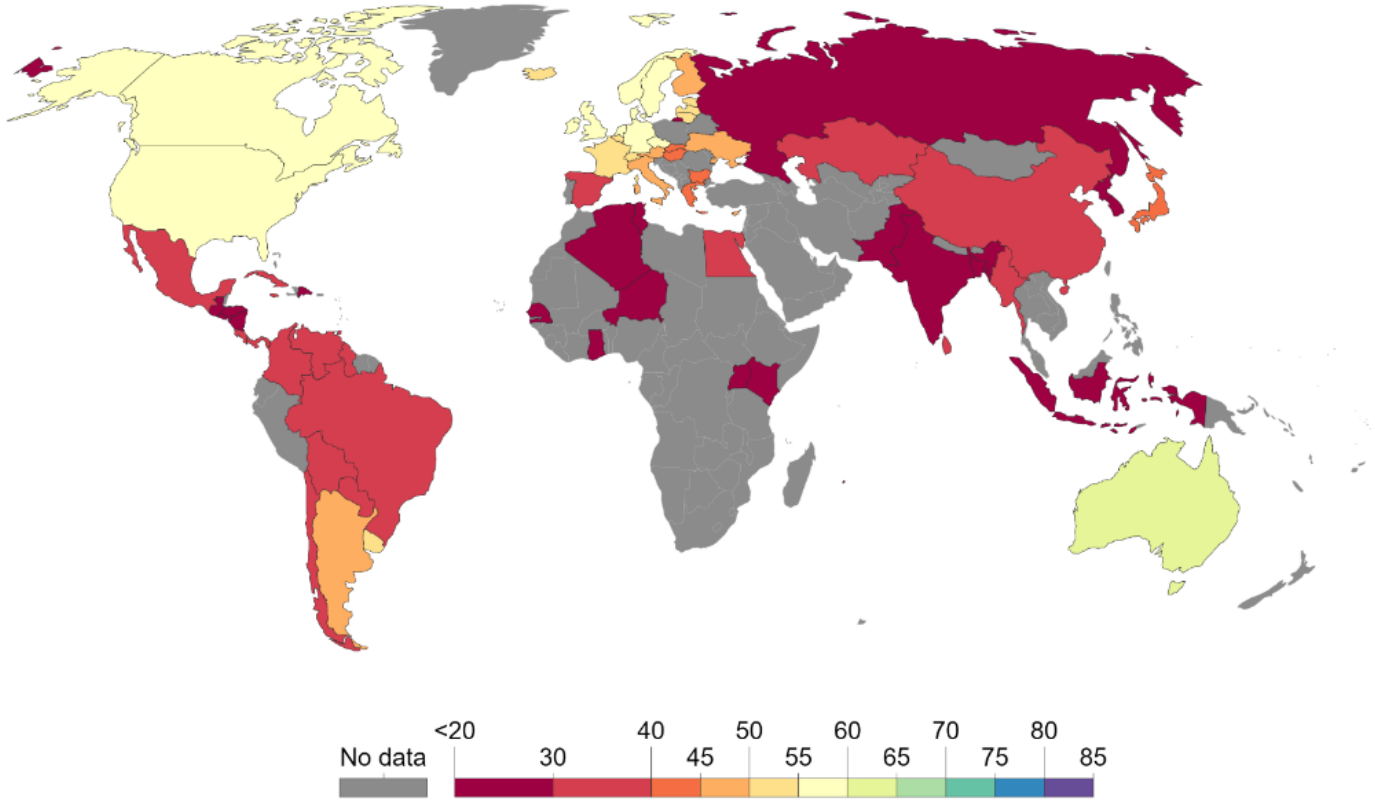
A majority of the world's population lives in urban areas



Life expectancy, 1920

Shown is period life expectancy at birth. This corresponds to an estimate of the average number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life

Our World in Data

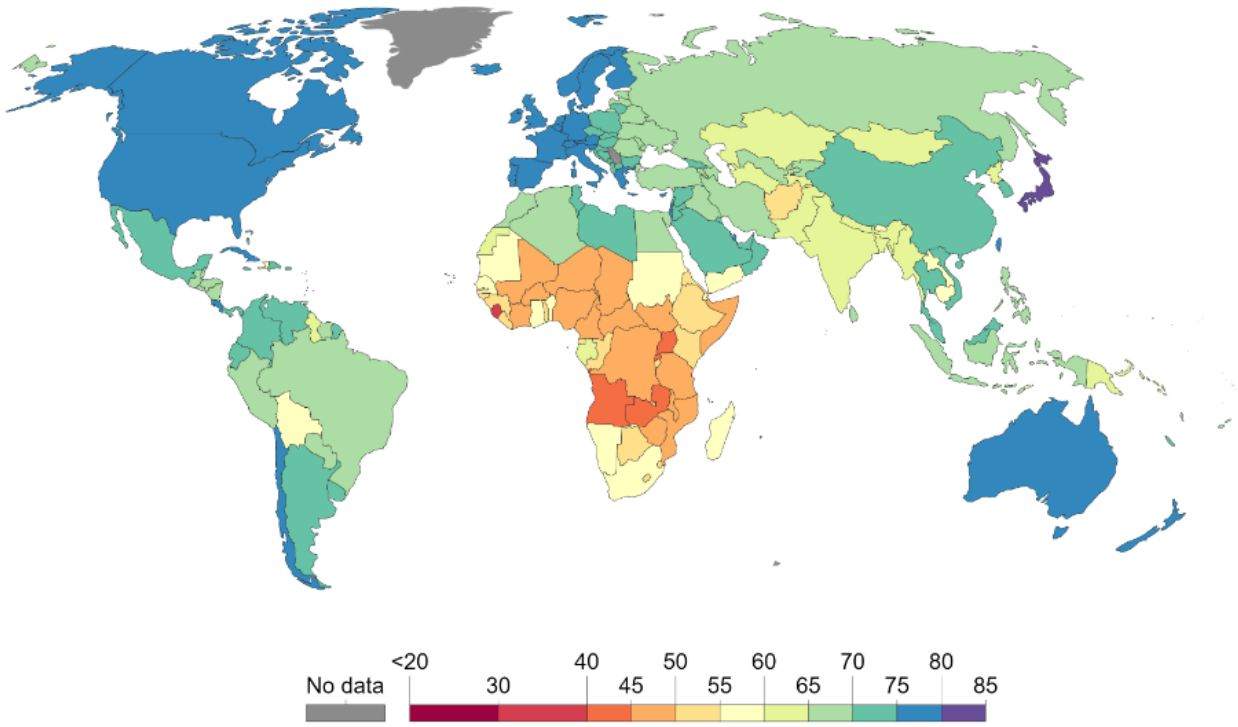


Source: Clio-Infra estimates until 1949; UN Population Division from 1950 to 2015

Life expectancy, 1997

Shown is period life expectancy at birth. This corresponds to an estimate of the average number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life

Our World in Data

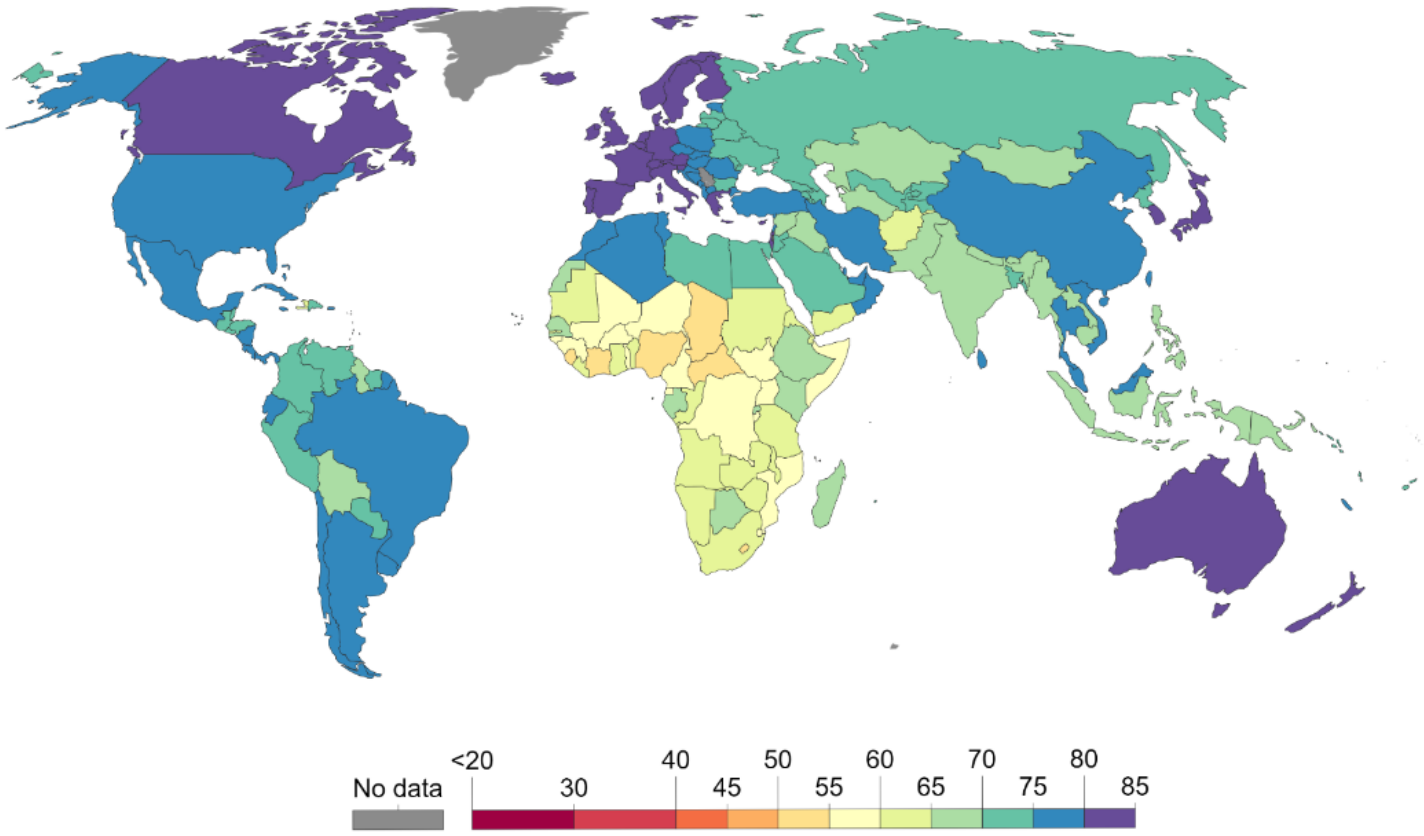


Source: Clio-Infra estimates until 1949; UN Population Division from 1950 to 2015

Life expectancy, 2015

Shown is period life expectancy at birth. This corresponds to an estimate of the average number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life

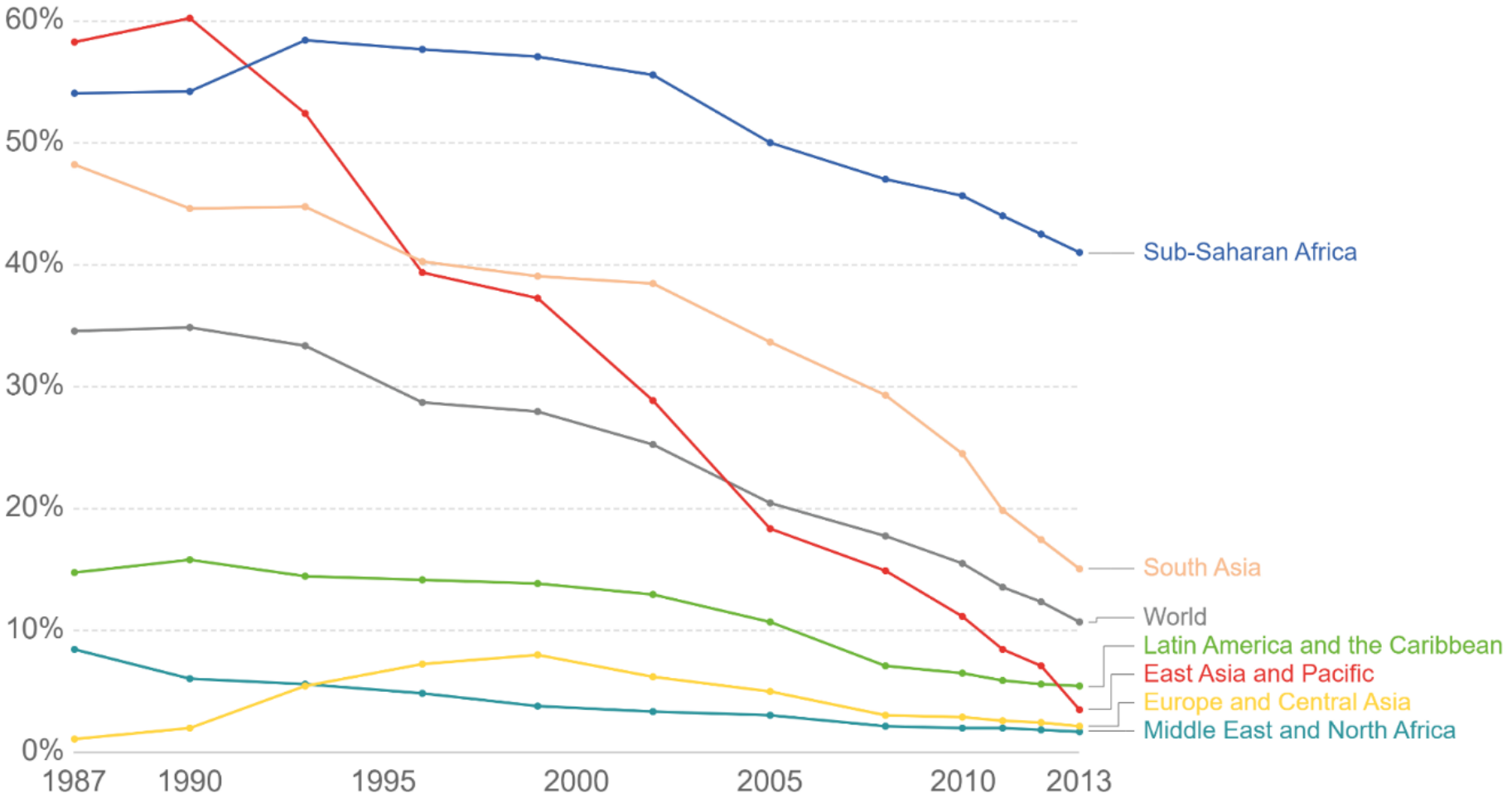
Our World in Data



Source: Clio-Infra estimates until 1949; UN Population Division from 1950 to 2015

Share of the population living in extreme poverty, by world region

Extreme poverty is defined as living with per capita household consumption below 1.90 international dollars per day (in 2011 PPP prices). International dollars are adjusted for inflation and for price differences across countries.



Source: Share of the population living in extreme poverty by world region - PovcalNet World Bank
Note: Consumption per capita is the preferred welfare indicator for the World Bank's analysis of global poverty. However, for about 25% of the countries, estimates correspond to income, rather than consumption.

HAS NO ACCESS TO ELECTRICITY

HEALTHCARE

EDUCATION

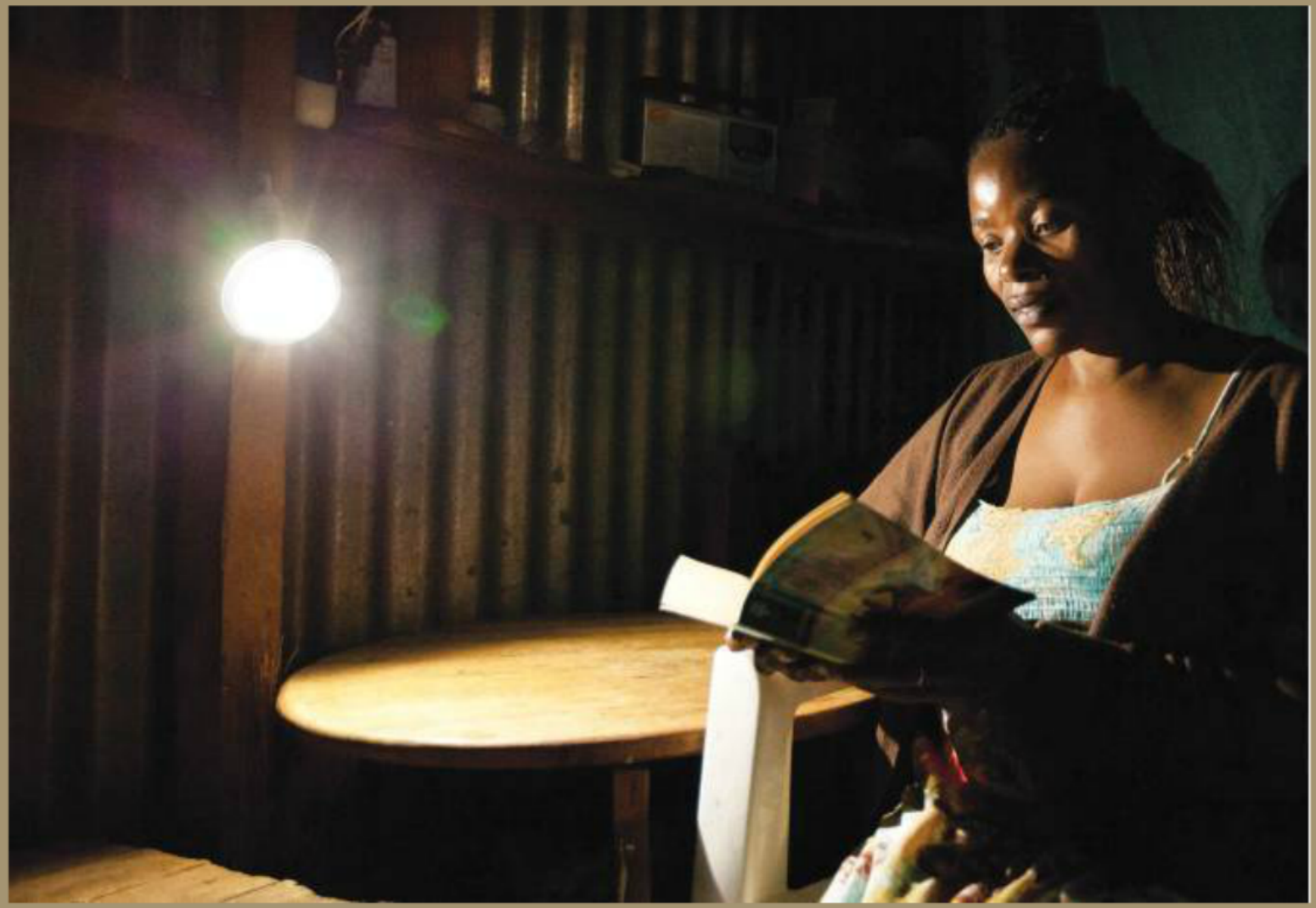
OF THE PEOPLE WITHOUT ACCESS TO MODERN ENERGY LIVE IN SUB-SAHARAN AFRICA OR DEVELOPING ASIA

1987 1990

Source: Share of the po
Note: Consumption per
countries, estimates co
OurWorldInData.org/ex


7
AFFORDABLE AND
CLEAN ENERGY

300 KwH (basic access)

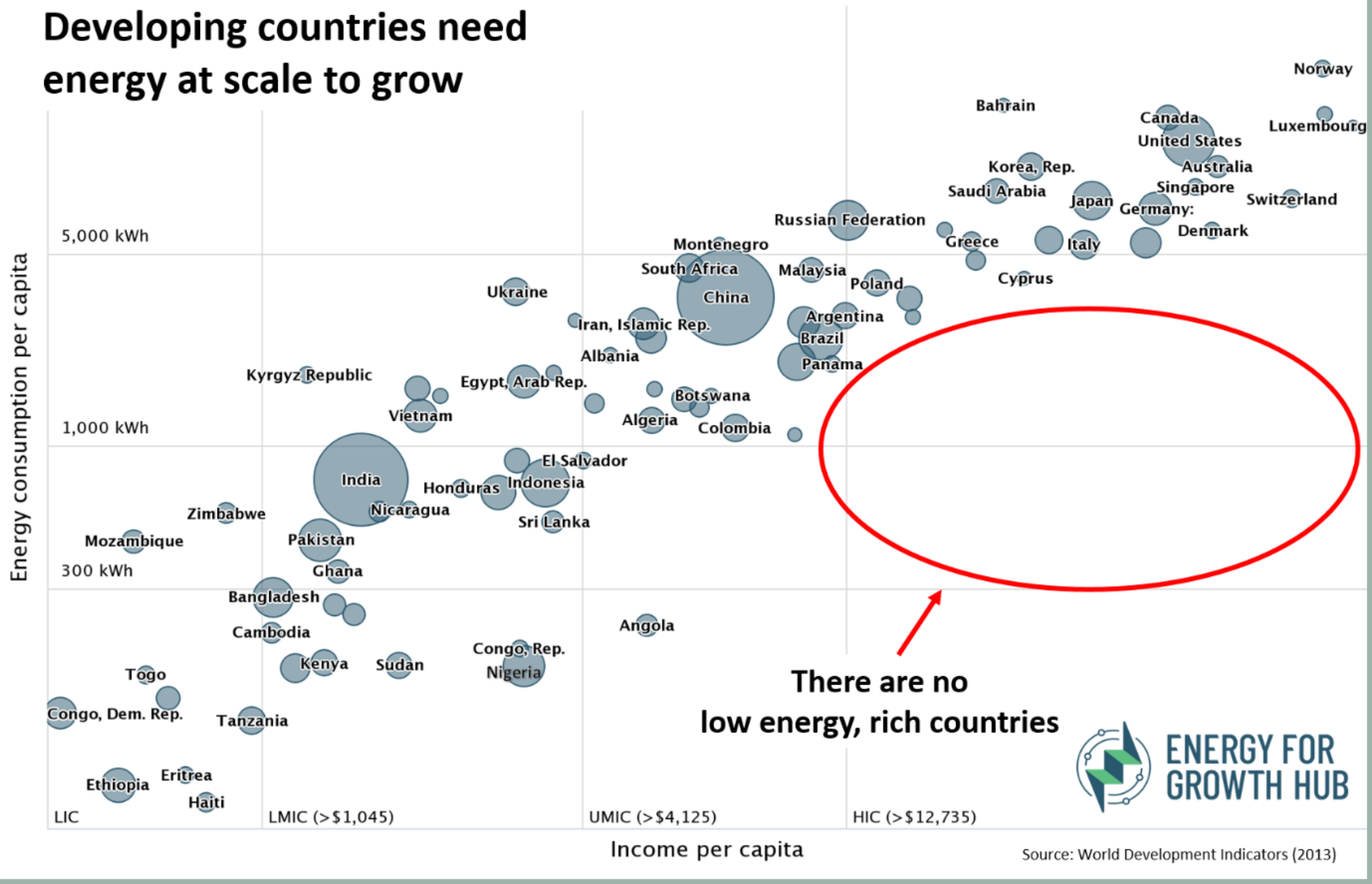


SUSTAINABLE DEVELOPMENT GOAL 7

Ensure access to affordable, reliable, sustainable and modern energy for all

1500 kwH (modern access)

Developing countries need energy at scale to grow



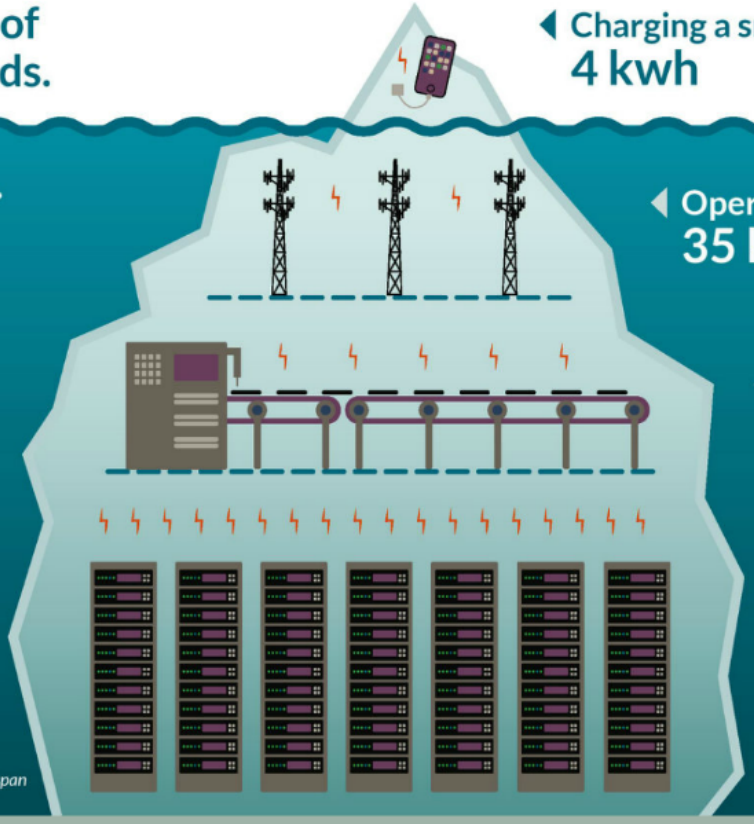
ENERGY FOR GROWTH HUB

PROSPERITY DEMANDS A LOT OF ENERGY

THE INVISIBLE ENERGY OF A SMARTPHONE

Charging is less than 1% of your phone's energy needs.

The other 99% is hidden.



Charging a smartphone
4 kwh

Operating a cell tower
35 kwh

Manufacturing a smartphone
93 kwh

Operating data centers
443 kwh

Estimates are 2013 data per iPhone per year, assuming a three-year lifespan
Sources: Fischer, Madrigal, Smil, Lella

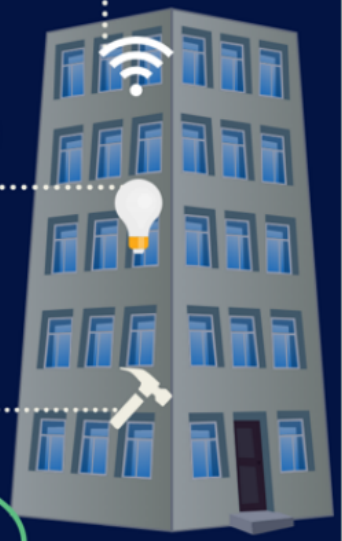
ENERGY FOR GROWTH HUB

ENERGY FOR AN OFFICE BUILDING

Connectivity

employee transport
data centres
cell towers

3,000 MWh/yr



Operations

HVAC
lighting
appliances

15,000 MWh/yr

Embedded in materials

concrete
steel
glass
construction

18,000 MWh

Values are based on a typical office building of 300,000 sq.ft & 1000 employees.
There are 50+ such buildings in the US.

Data sources:
EIA, Forbes, CODOT, ACEA, CTBUH Journal, Tectonica Online, Portland Cement Association, Concrete Construction, Civil Engineering Projects Online, The Constructor, The Masterbuilder

The Role of Natural Gas in the Energy Transition

Providing Energy for Growth

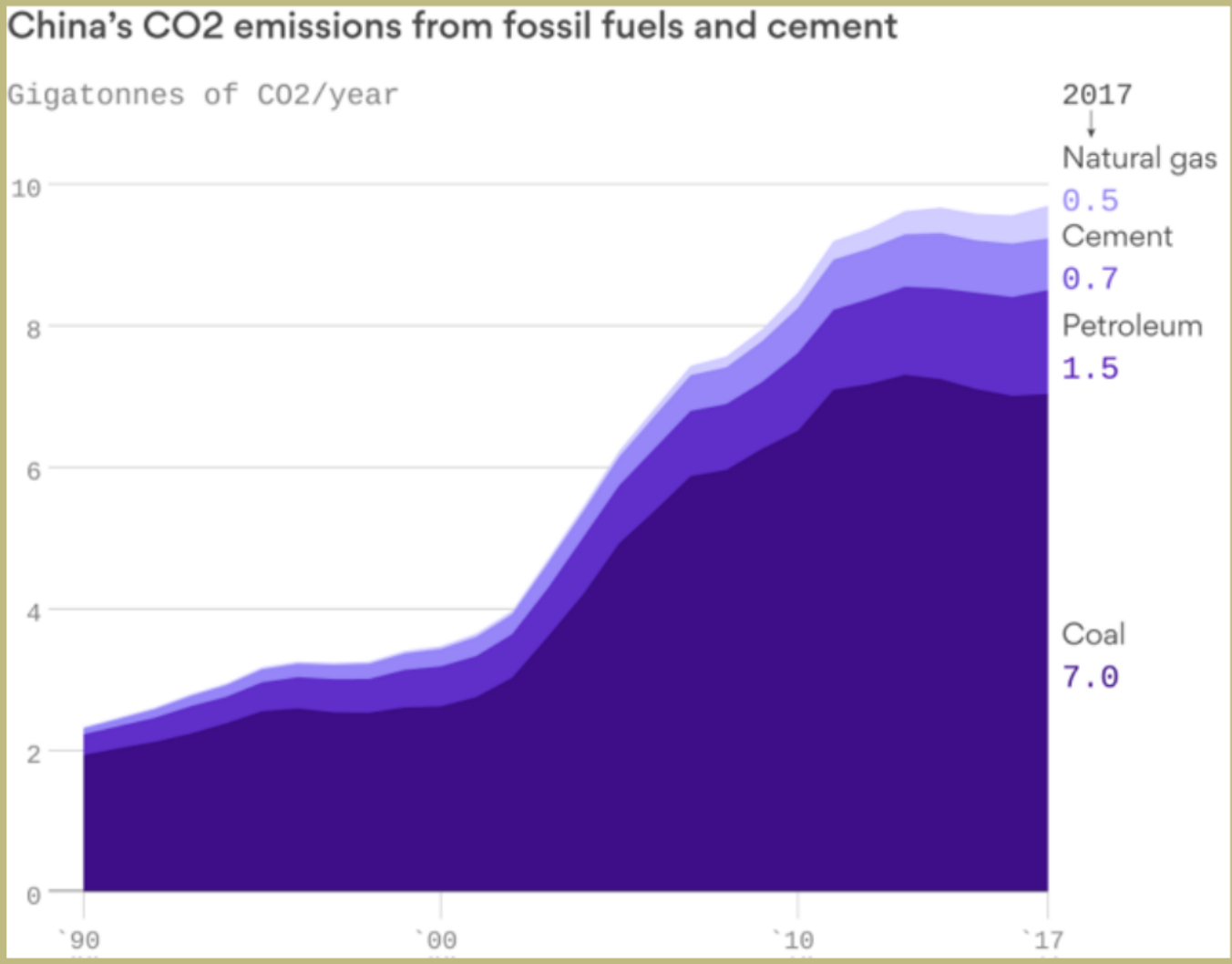
Tisha Schuller, Strategic Advisor

Stanford | Natural Gas Initiative
School of Earth Sciences and Precourt Institute for Energy

Reliable Modern Energy Services

Contribute to Poverty Reduction and Shared Prosperity*

*Source: Energy, Economic Growth, and Poverty Reduction, World Bank Group 2016


China's CO2 emissions from fossil fuels and cement
Gigatonnes of CO2/year
2017
Natural gas
0.5
Cement
0.7
Petroleum
1.5
Coal
7.0
10
8
6
4
2
0
`90
`00
`10
`17


NATURAL GAS USES
RESIDENTIAL
COMMERCIAL
INDUSTRIAL
ELECTRICITY
TRANSPORT

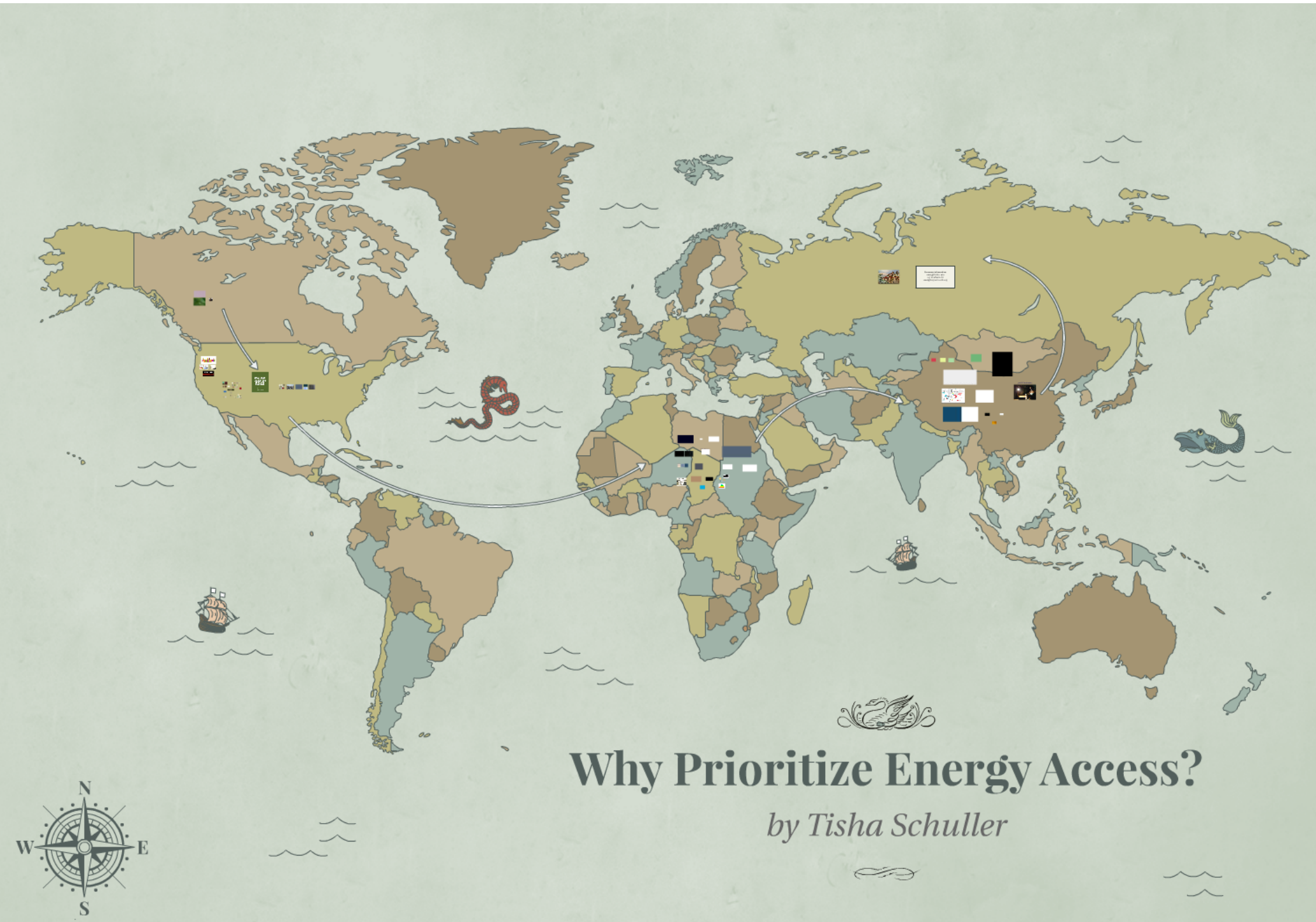

DO NOT
TOP OFF

For more information

energythinks.com

ngi.stanford.edu

energyforgrowthhub.org



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