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Applied Systems Analysis
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Recent applications of SA for achieving sustainable futures

Nebojsa Nakicenovic

Deputy Director General

International Institute for Applied Systems Analysis

Professor Emeritus of Energy Economics

Vienna University of Technology

*Systems Analysis 2015 Conference, IIASA
Laxenburg, Austria — 11-13 November 2015*



IIASA, International Institute for Applied Systems Analysis

science for global insight



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Recent applications of SA for achieving sustainable futures for **all** on a safe planet

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Applied Systems Analysis

Howard Raiffa

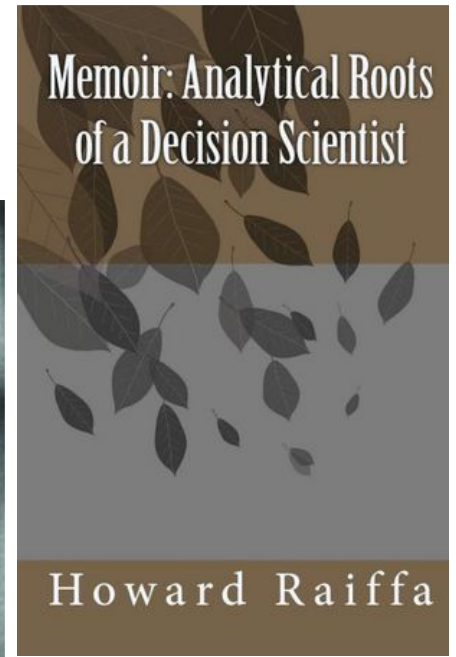
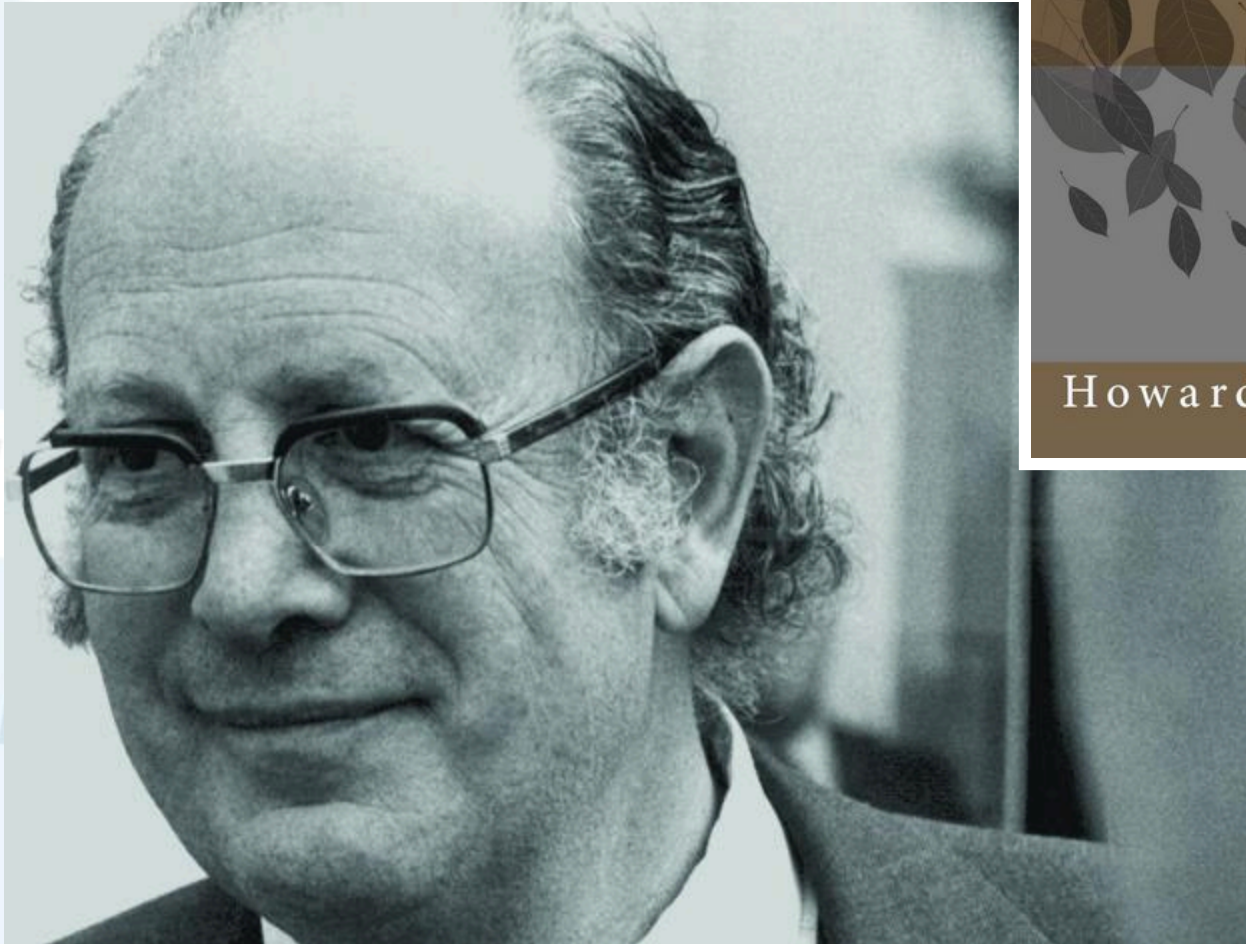
How did it all begin in 1968

➤ Research or Training?
Research of Common
Problems, Cybernetics,
Institute or Center?



→ Institute for Applied Systems Analysis
**because nobody will know what it means
and then we'll have a clean slate.**

<https://youtu.be/jwRzS-jvfkA>



Professor Howard Raiffa

Global CO₂ Emissions



Sustainable Development Goals (SDGs)

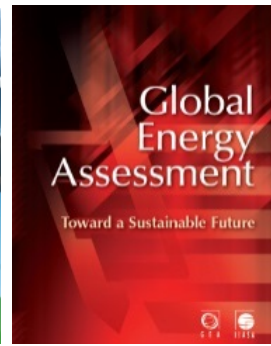
Goal #	Description	Goal #	Description
Goal 1	End poverty in all its forms everywhere	Goal 10	Reduce inequality within and among countries
Goal 2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Goal 11	Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 3	Ensure healthy lives and promote well-being for all at all ages	Goal 12	Ensure sustainable consumption and production patterns
Goal 4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Goal 13	Take urgent action to combat climate change and its impacts
Goal 5	Achieve gender equality and empower all women and girls	Goal 14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 6	Ensure availability and sustainable management of water and sanitation for all	Goal 15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 7	Ensure access to affordable, reliable, sustainable and modern energy for all	Goal 16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Goal 17	Strengthen the means of implementation and revitalize the global partnership for sustainable development
Goal 9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation		

Sustainable Development Goals (SDGs)

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2012 INTERNATIONAL YEAR OF
SUSTAINABLE ENERGY
FOR ALL



2030 Energy Goal

- Universal Access to Modern Energy
- Double Energy Efficiency Improvement
- Double Renewable Share in Final Energy

Aspirational & Ambitious but Achievable

SUSTAINABLE DEVELOPMENT GOALS

IIASA Research

"Science must be at the heart of this process so as to help achieve synergies and avoid conflicts among the 17 SDGs."



IIASA Partnerships



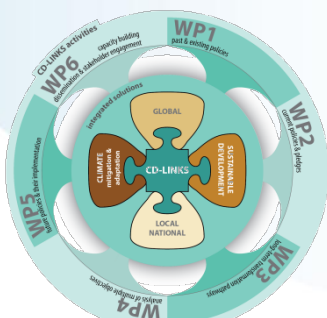
The World In 2050 Initiative

Stockholm Resilience Centre
Sustainability Science for Biosphere Stewardship



THE EARTH INSTITUTE
COLUMBIA UNIVERSITY

Nexus Solutions Partnership





Laudato Si'
On Care for Our Common Home

POPE FRANCIS

POPE FRANCIS
PRAISE
BE TO
YOU

Laudato Si'

On Care for Our Common Home

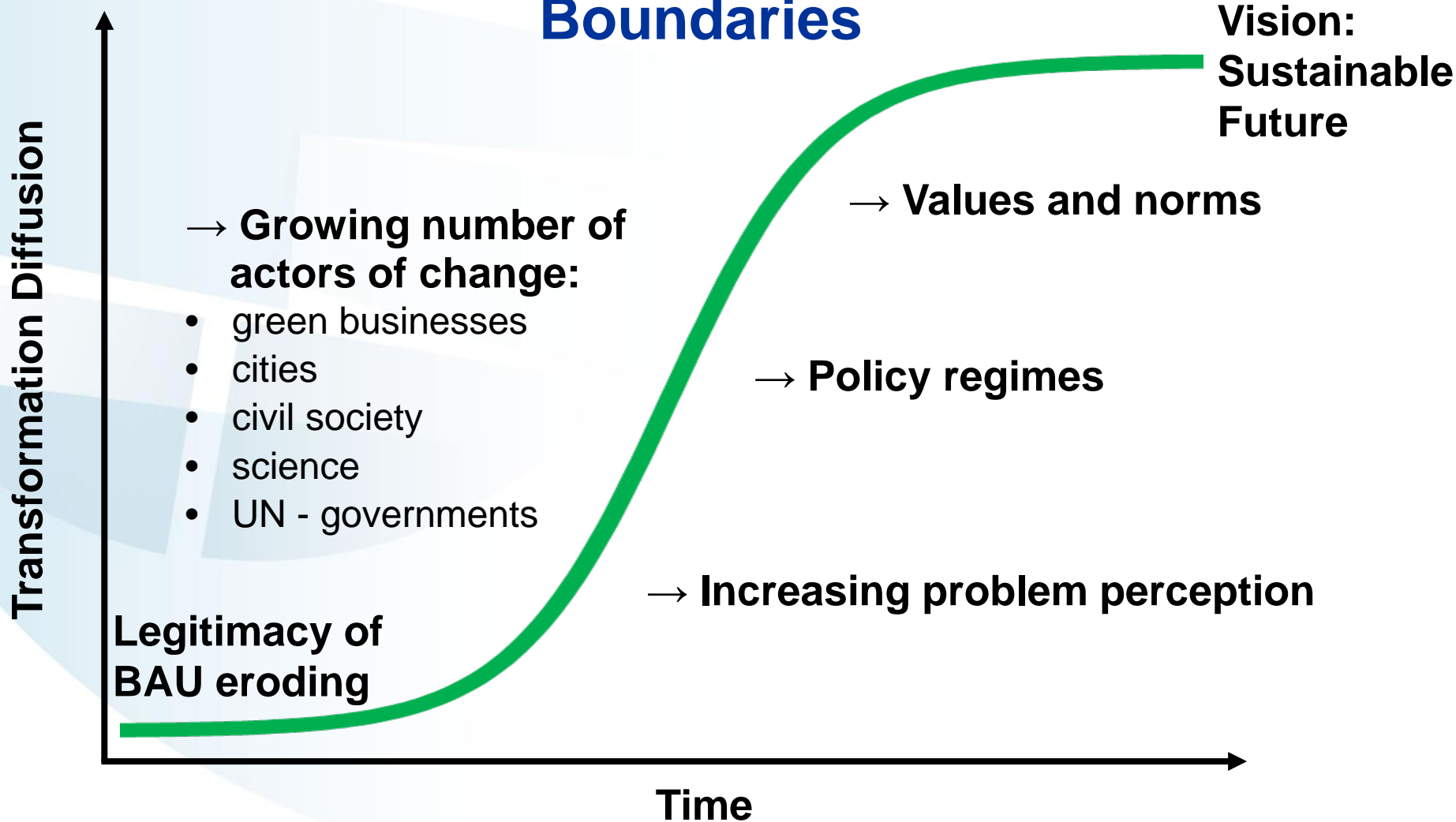


IGNATIUS

Sustainability Transformation

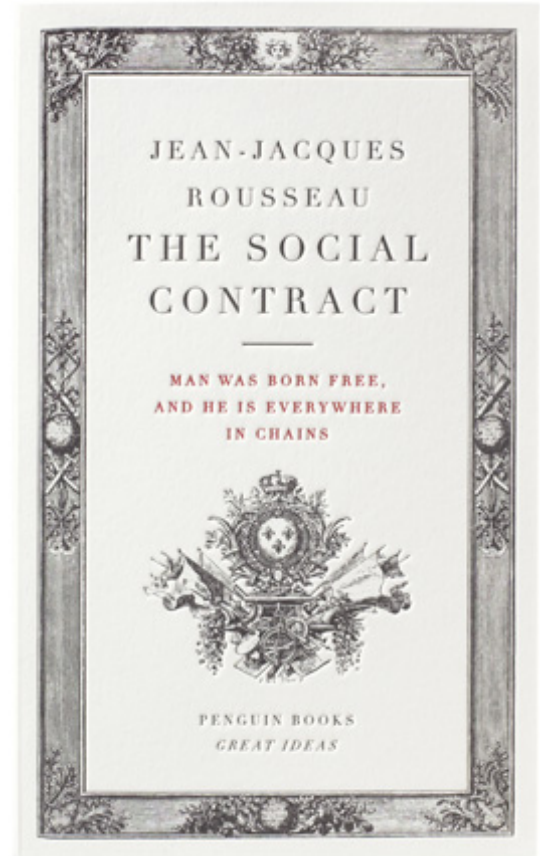
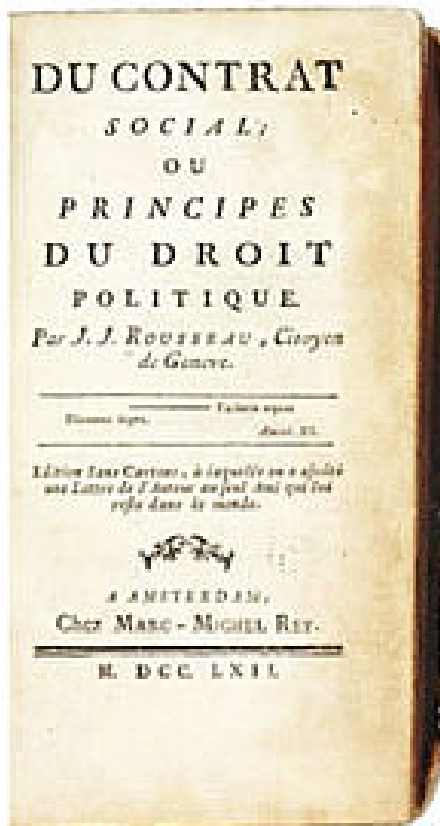


“Doing More with Less” within Planetary Boundaries

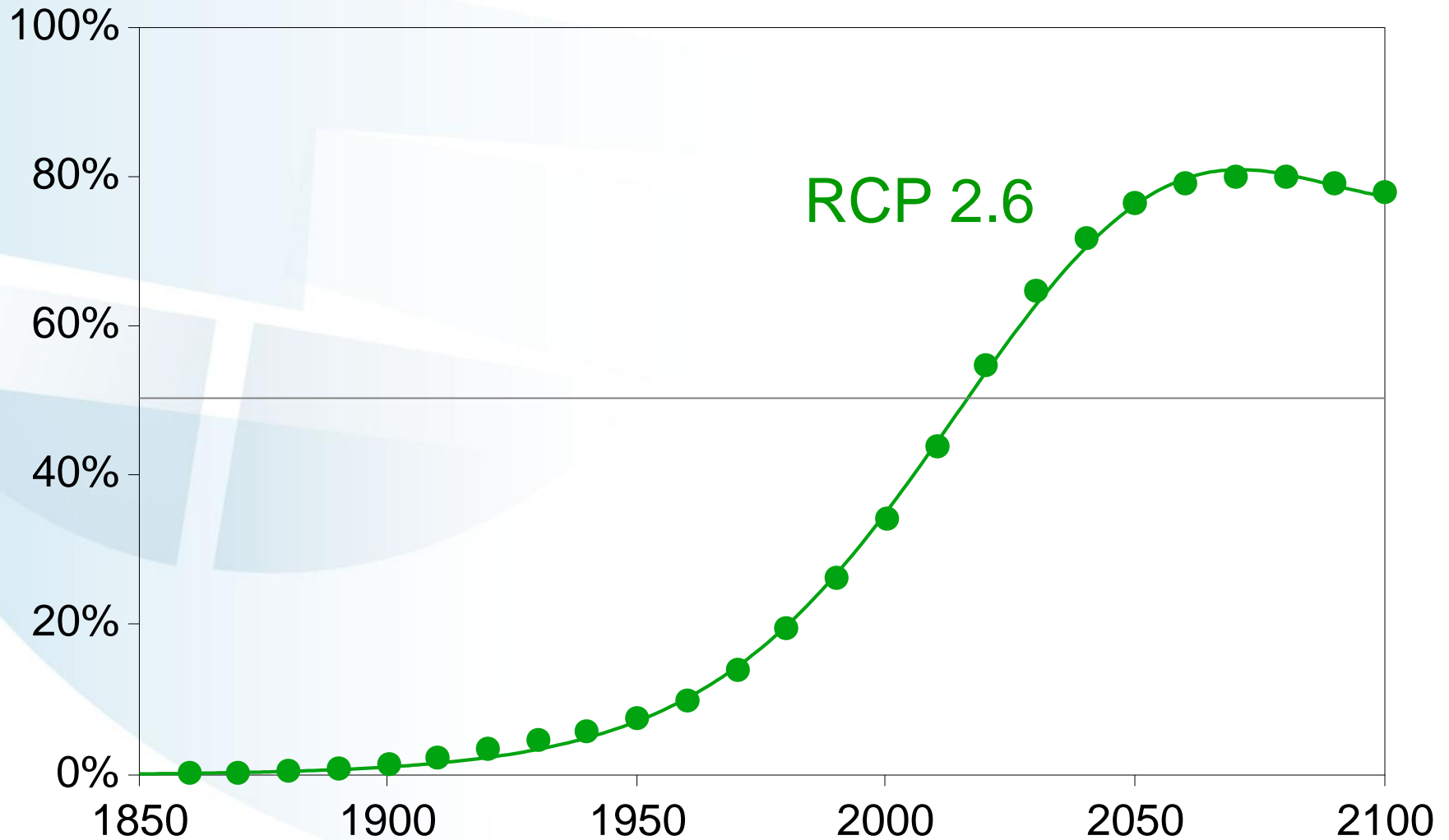


Social Contract

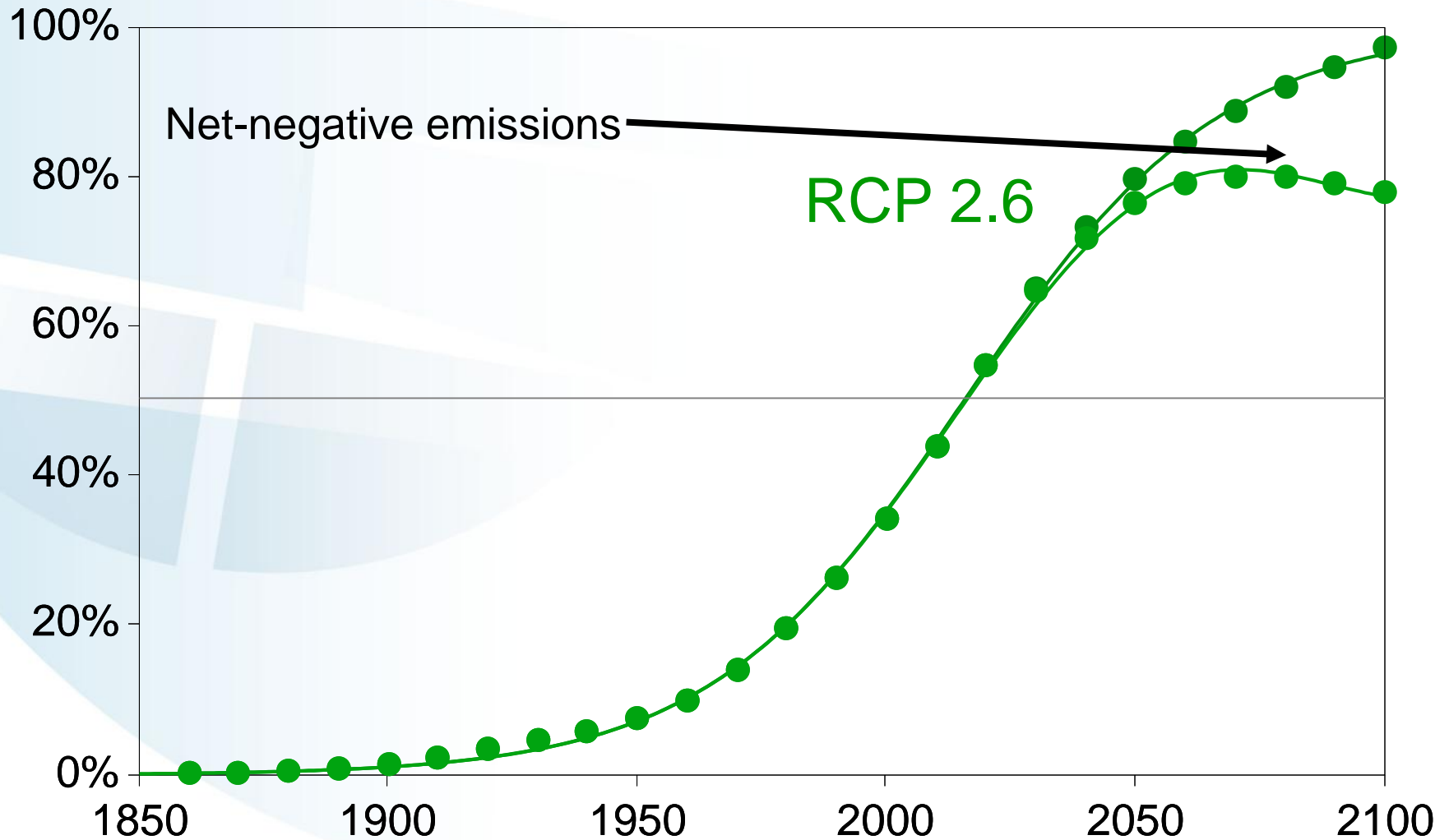
Vision of Sustainable Future



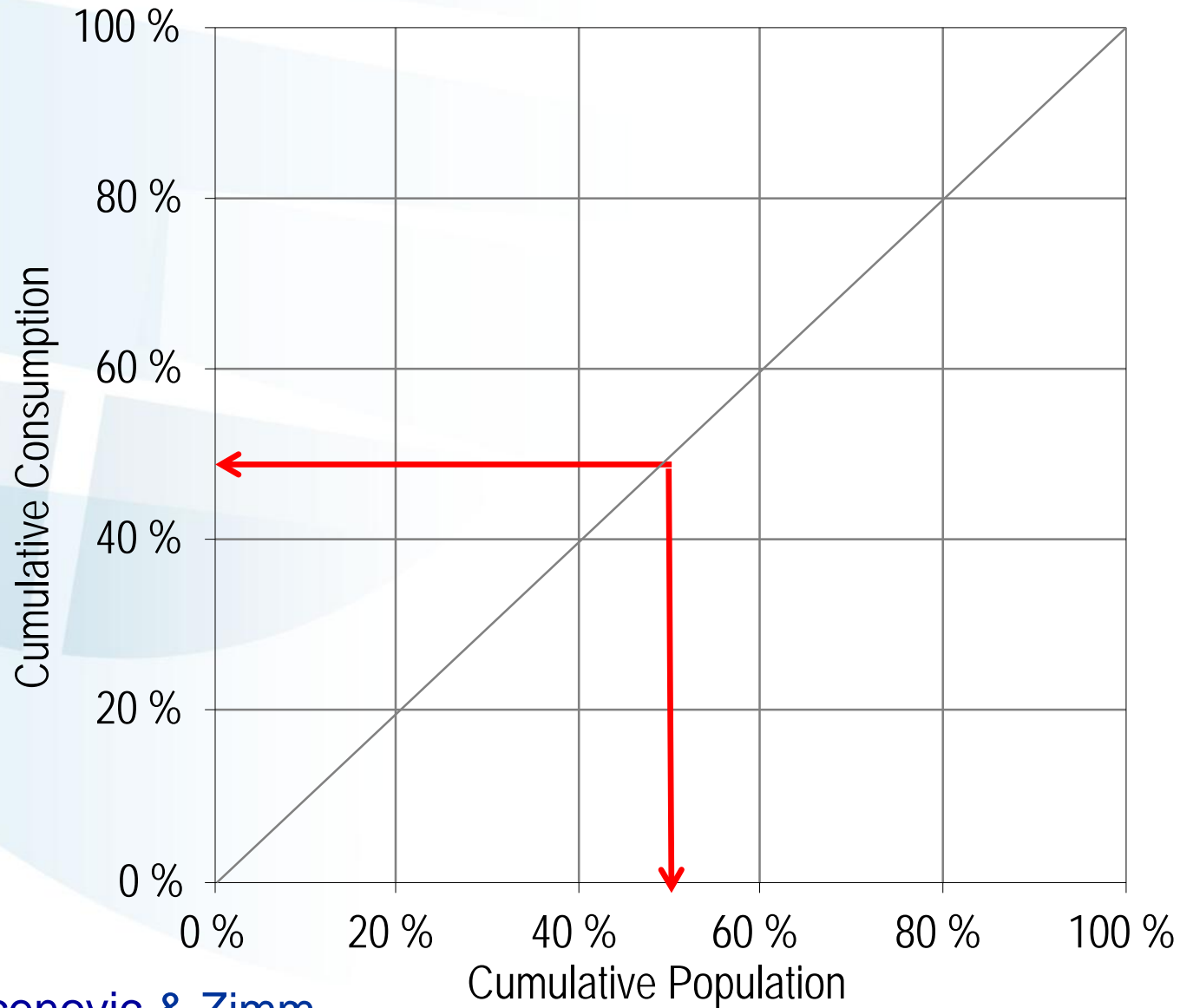
Cumulative Carbon Emissions



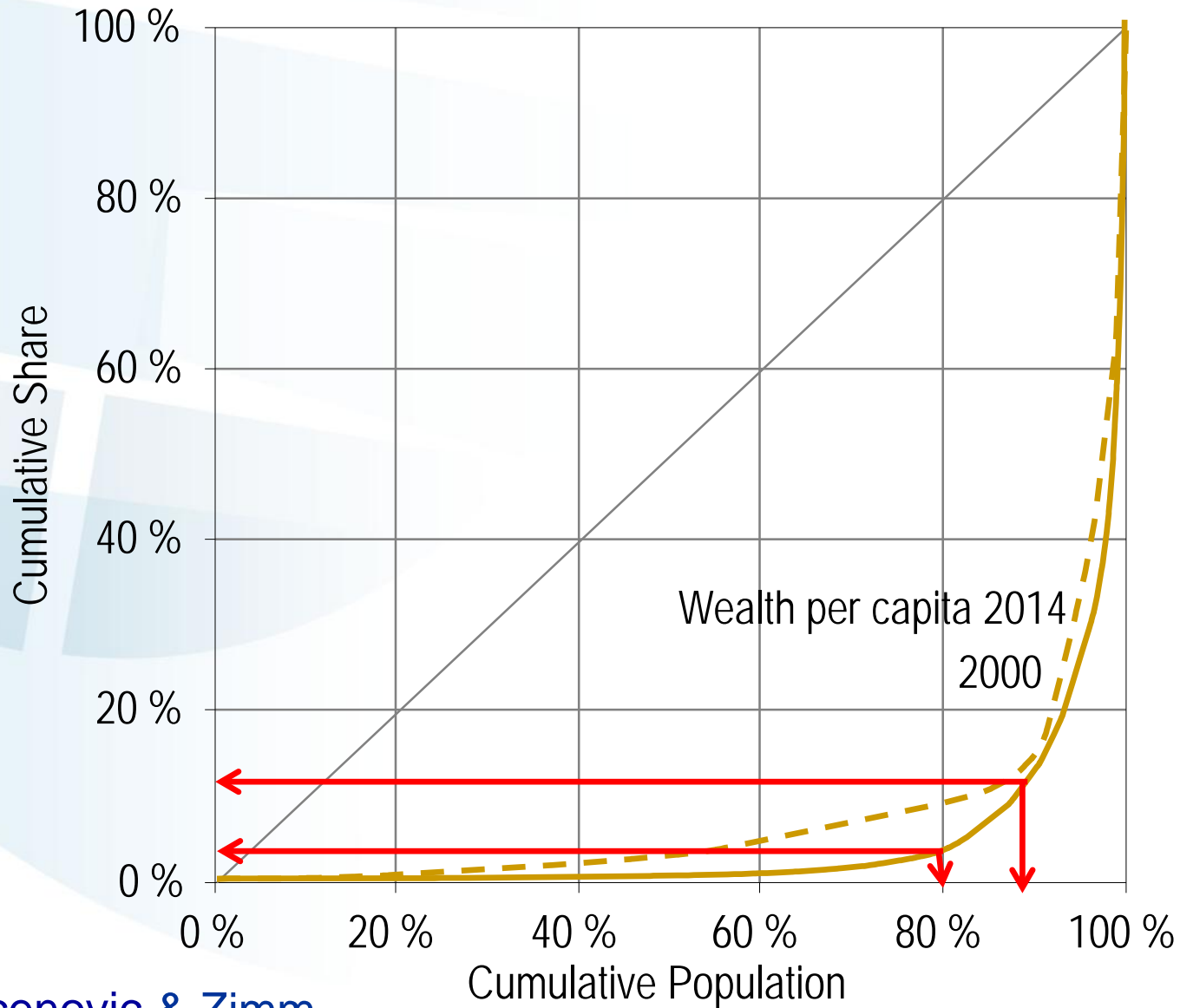
Cumulative Carbon Emissions



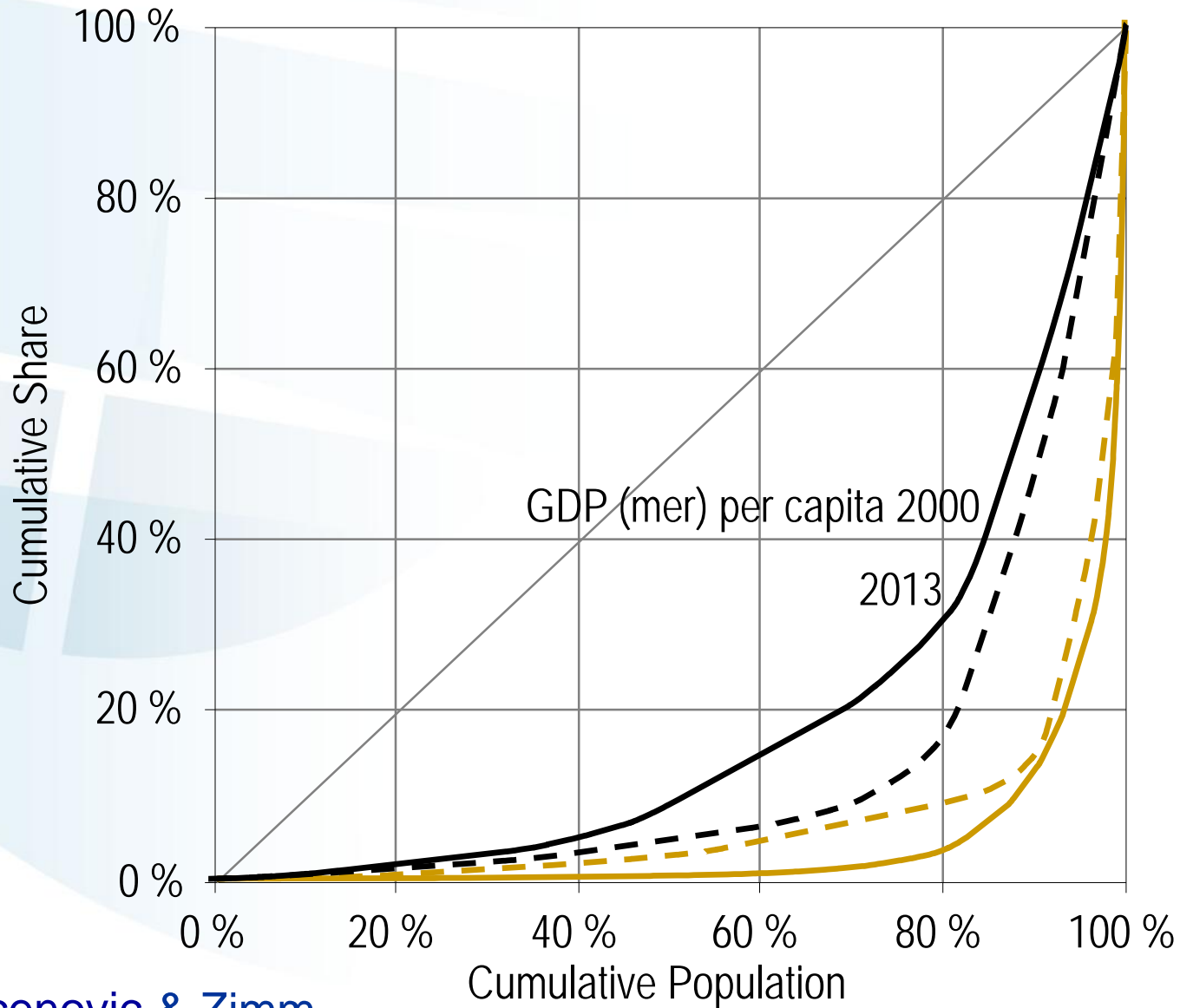
Global Lorenz Distributions



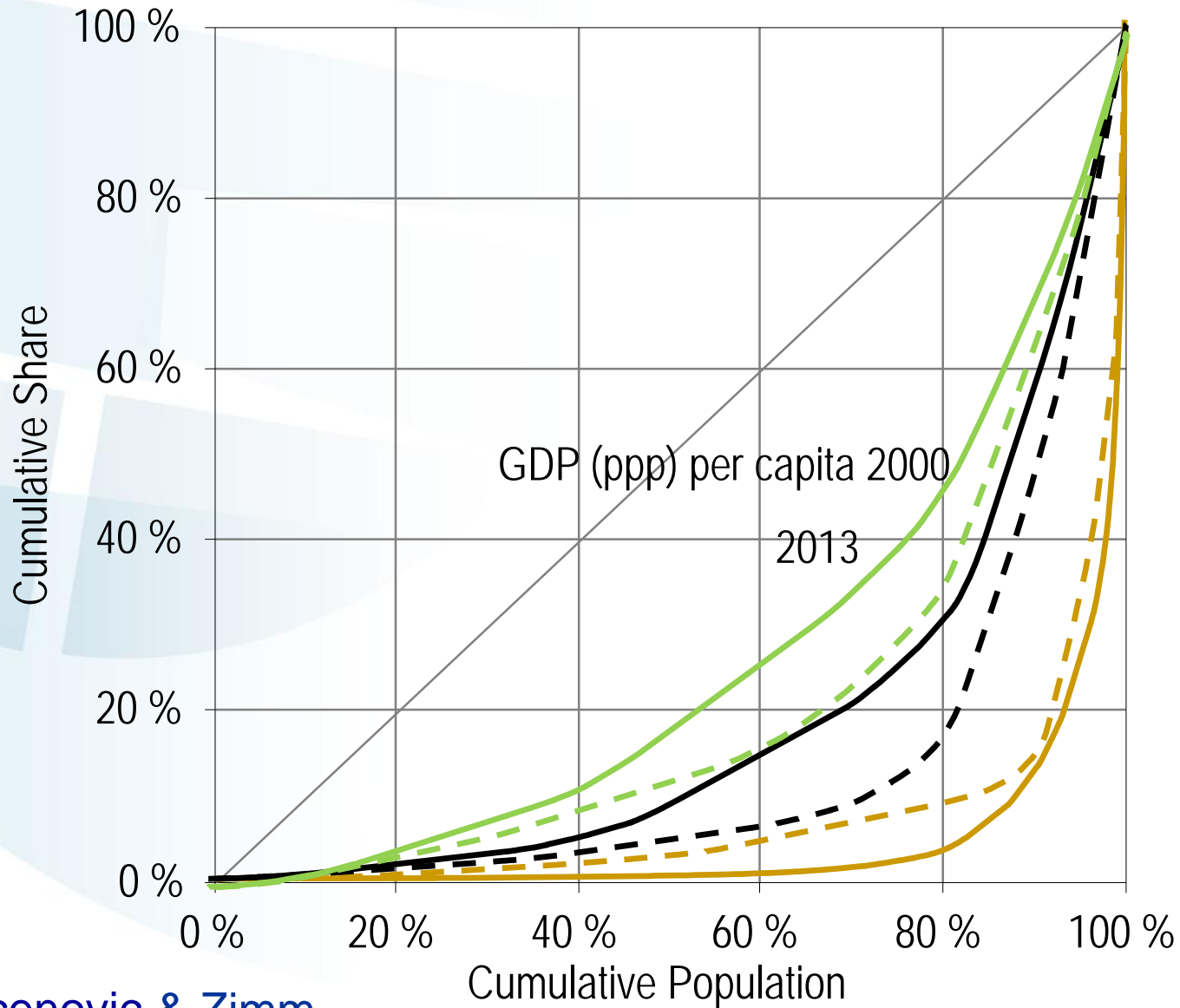
Global Lorenz Distributions



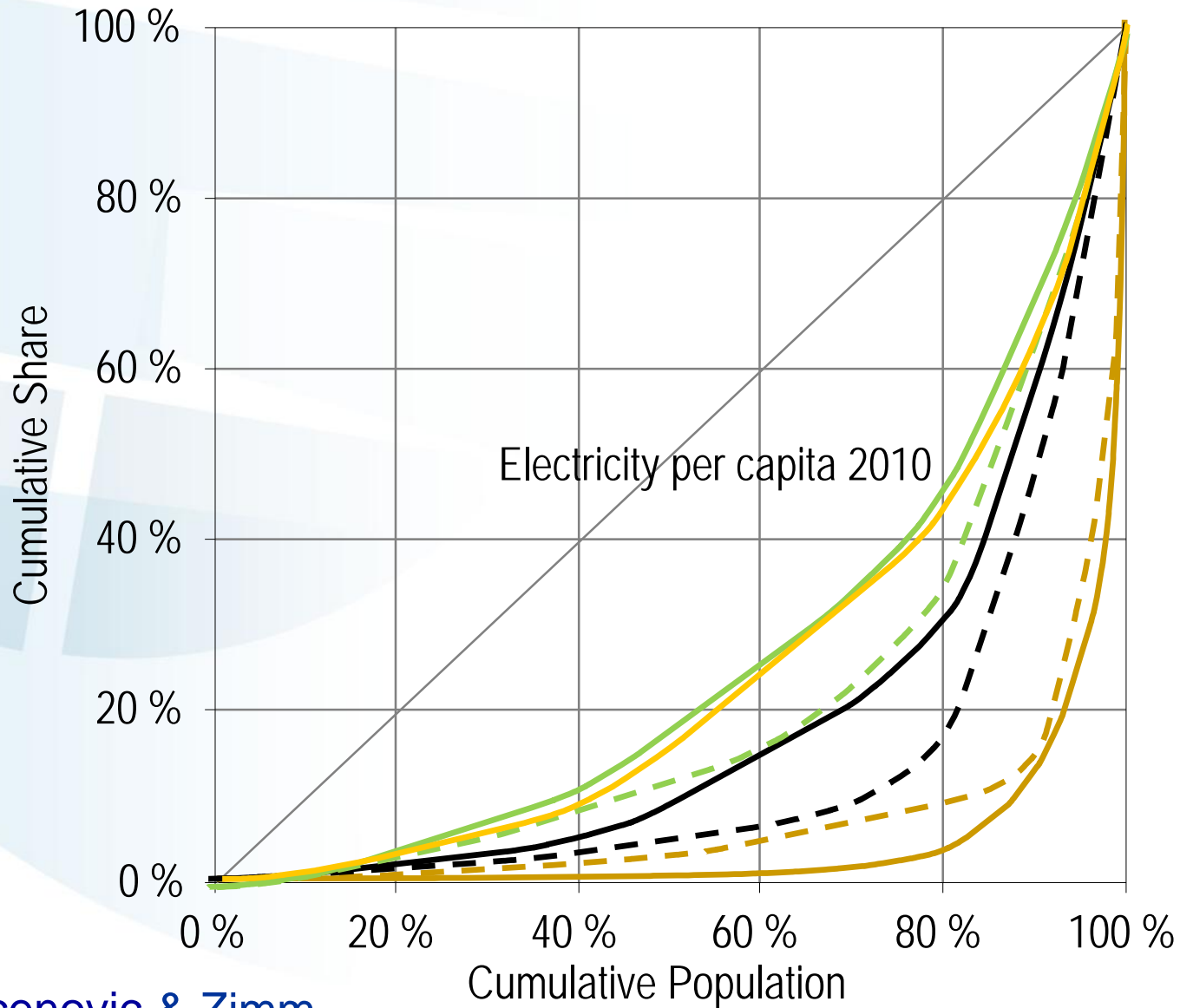
Global Lorenz Distributions



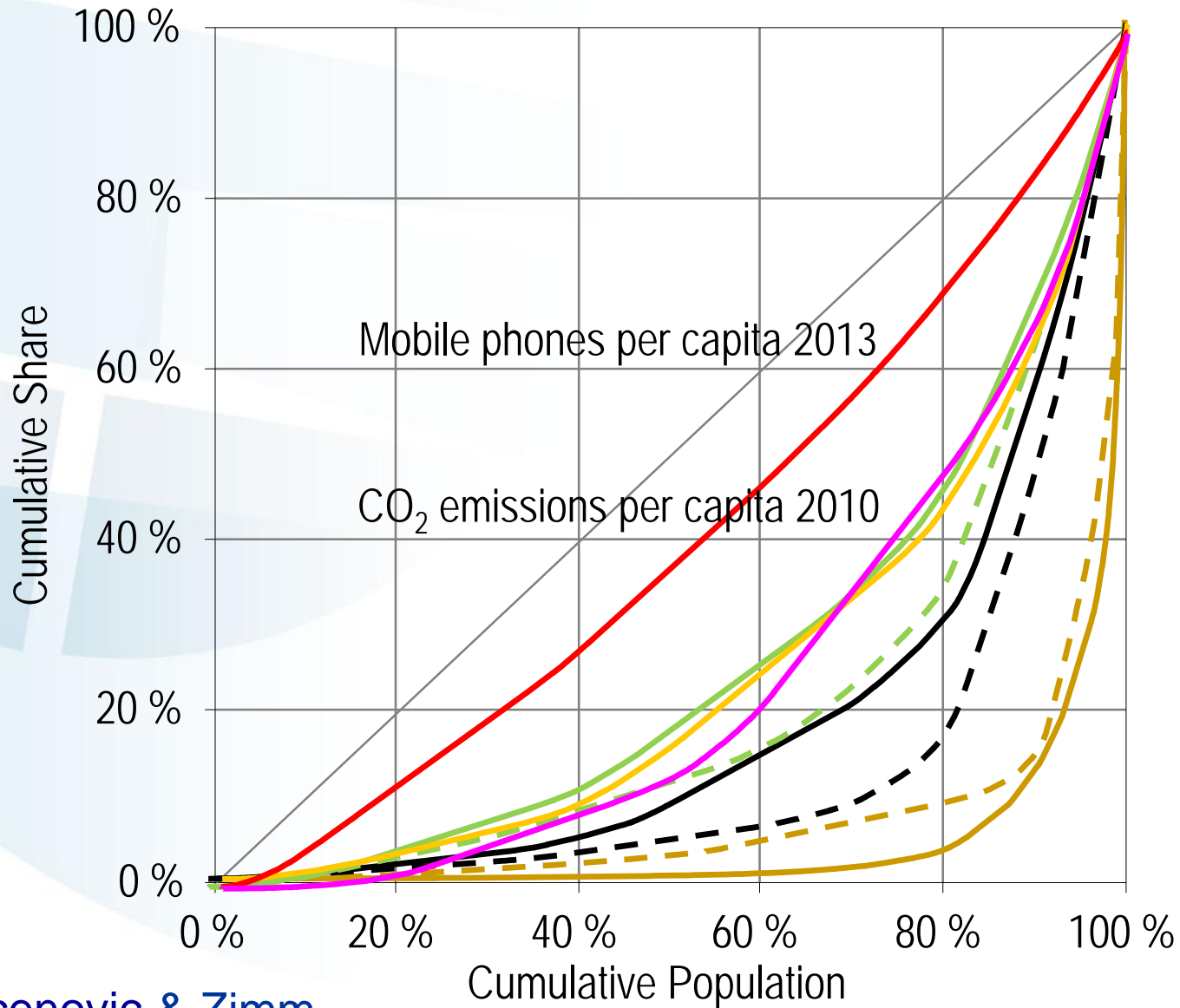
Global Lorenz Distributions



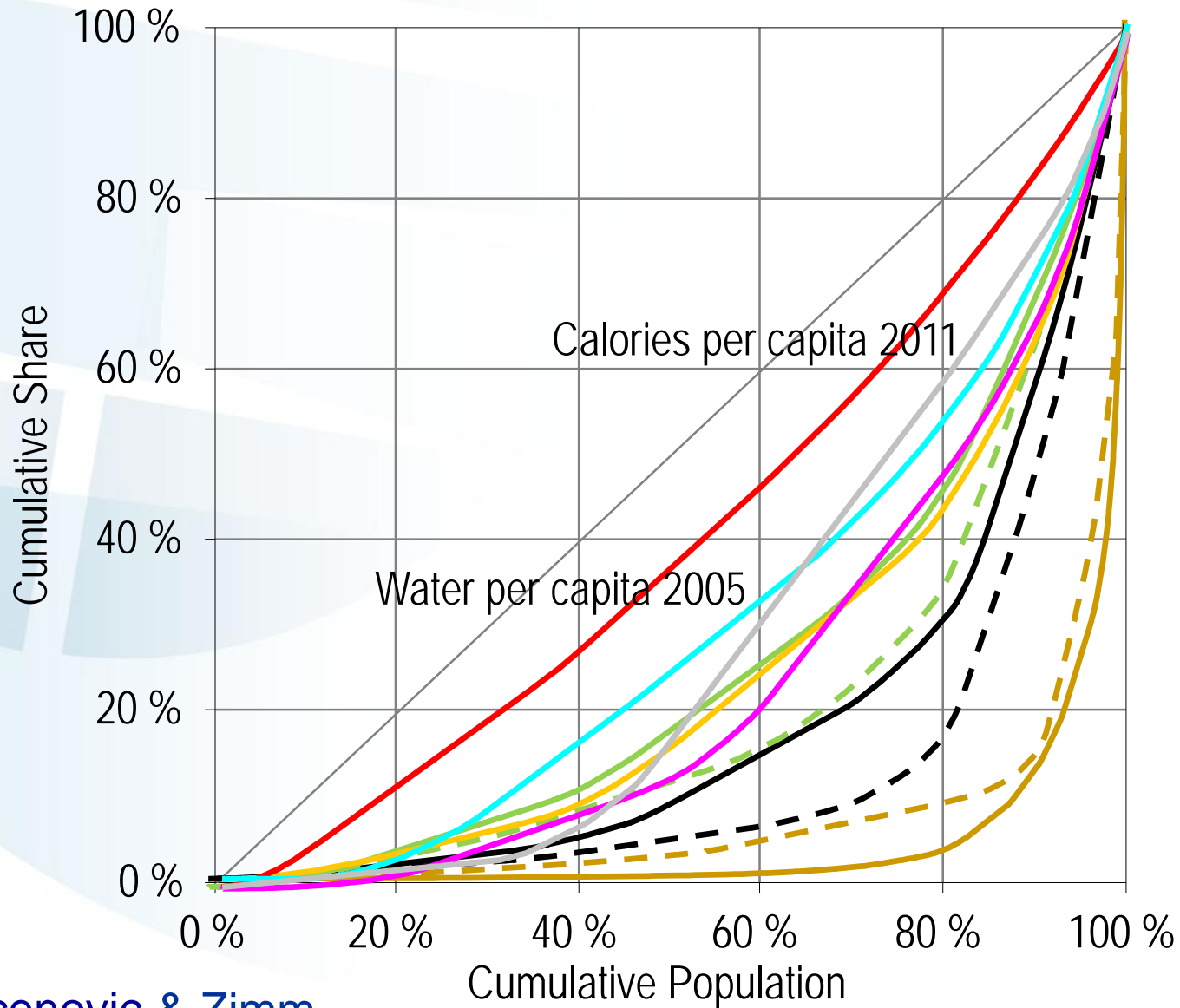
Global Lorenz Distributions



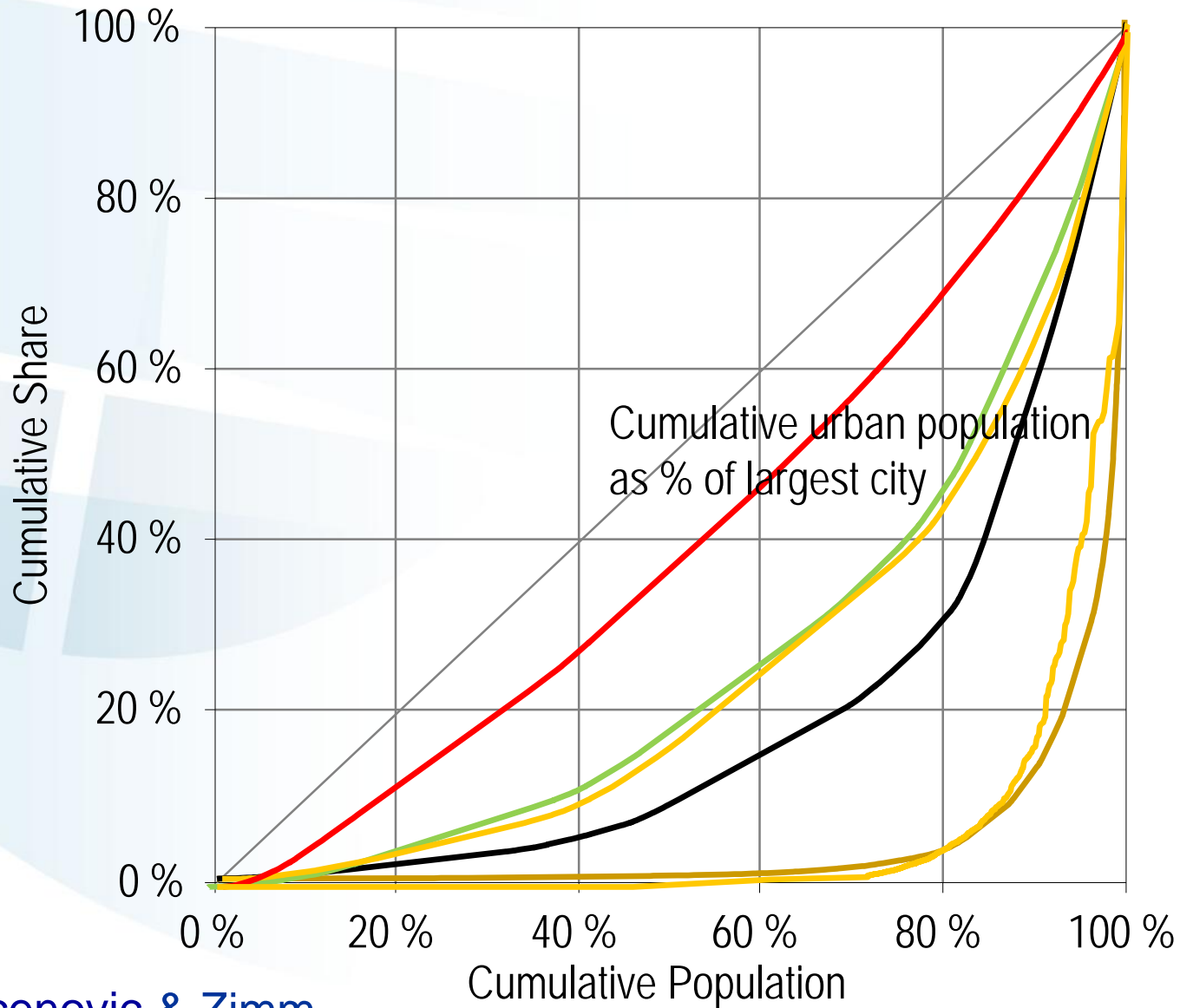
Global Lorenz Distributions



Global Lorenz Distributions

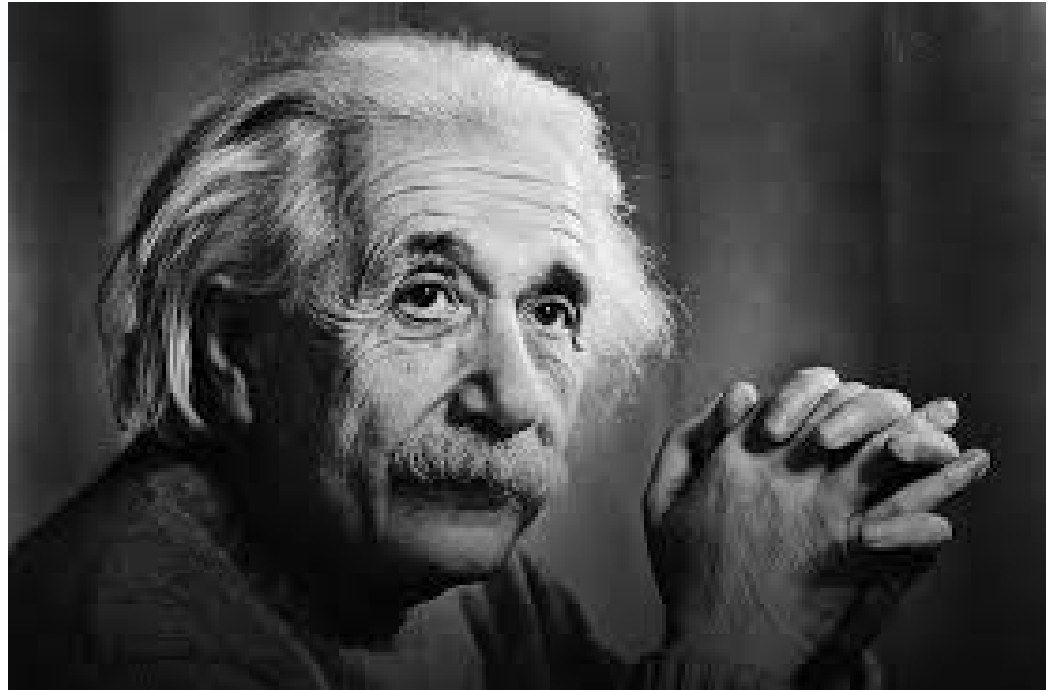


Global Lorenz Distributions



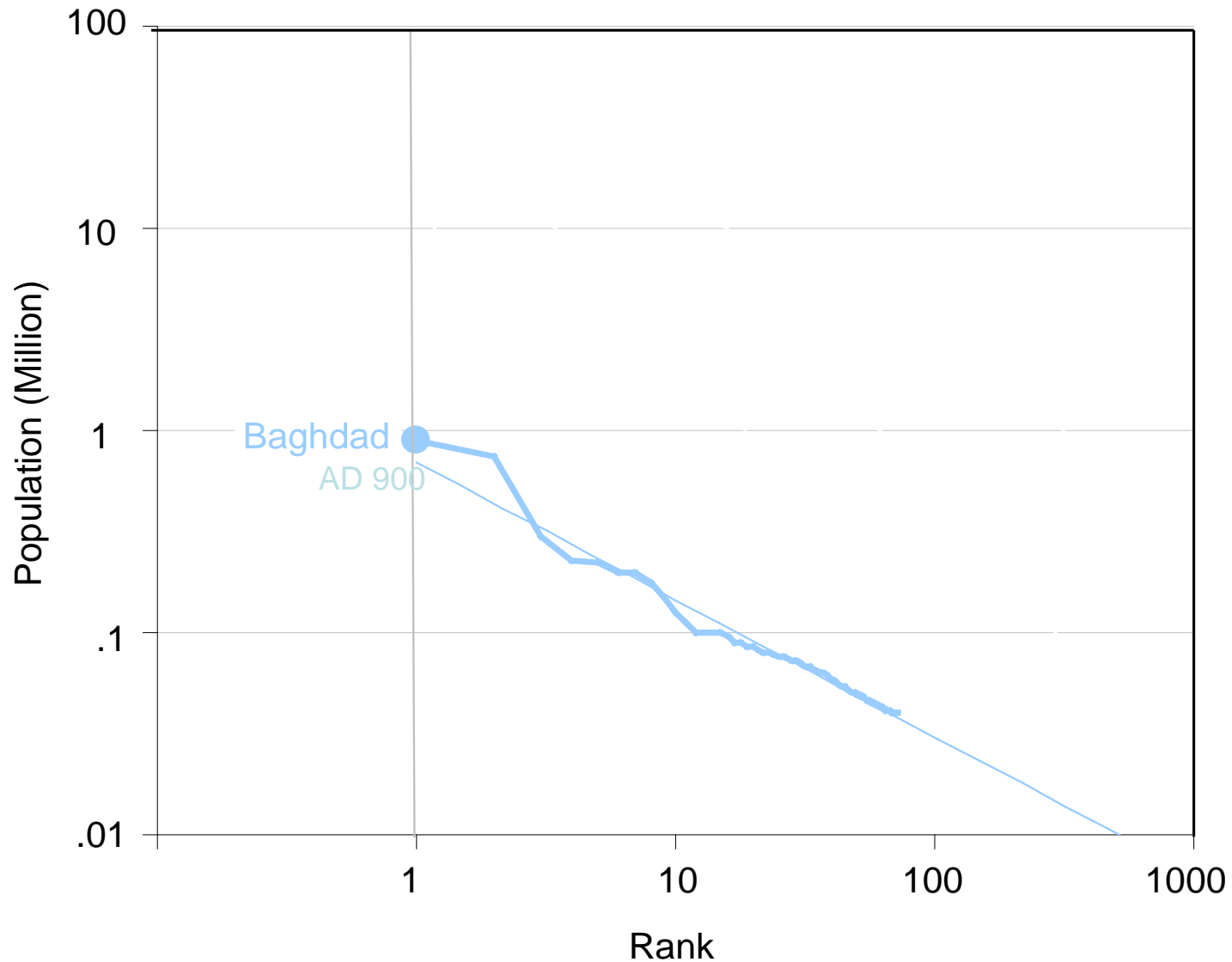
Albert Einstein

Everything should be made as simple as possible, but not simpler.

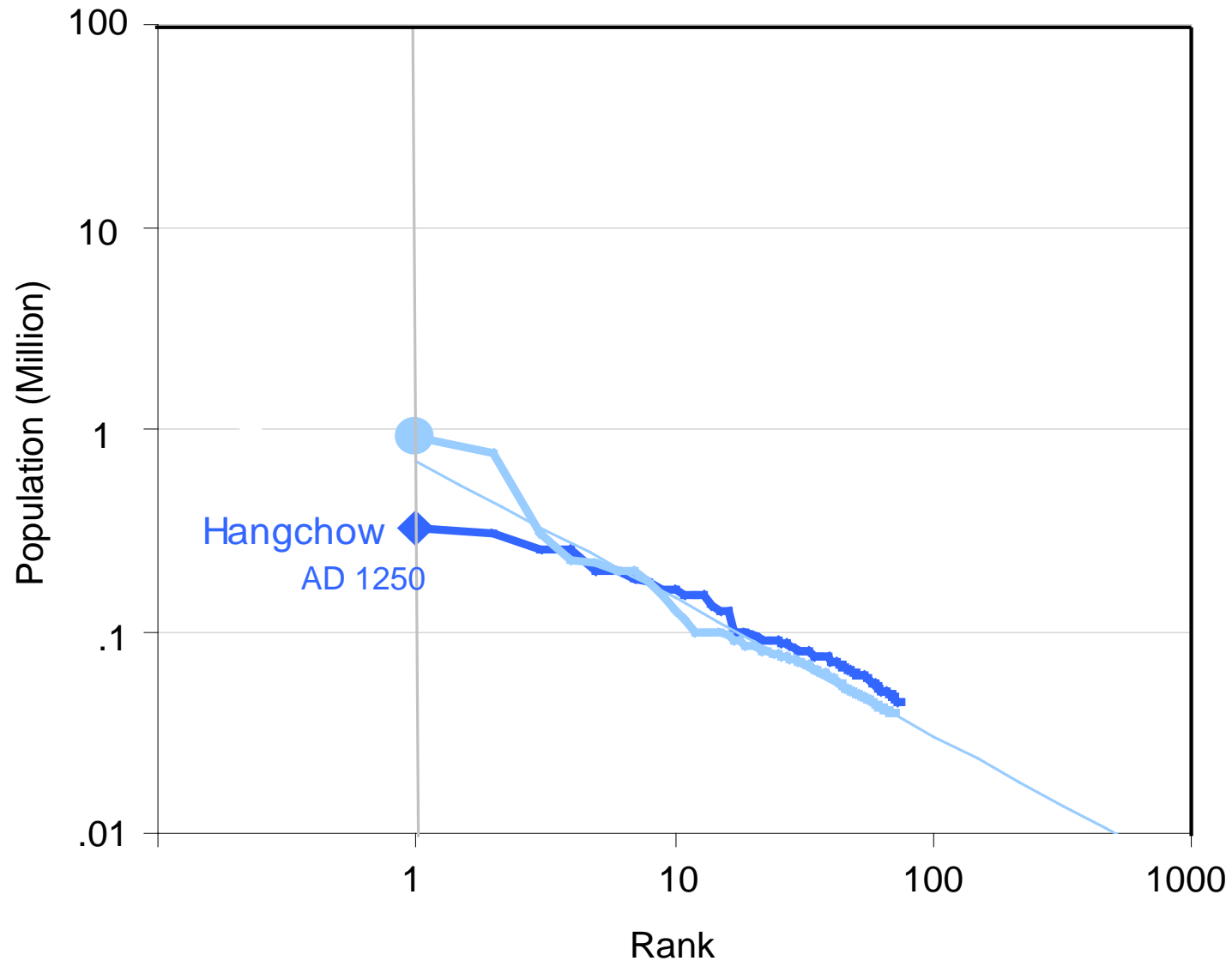


If you can't explain it simply, you don't understand it well enough.

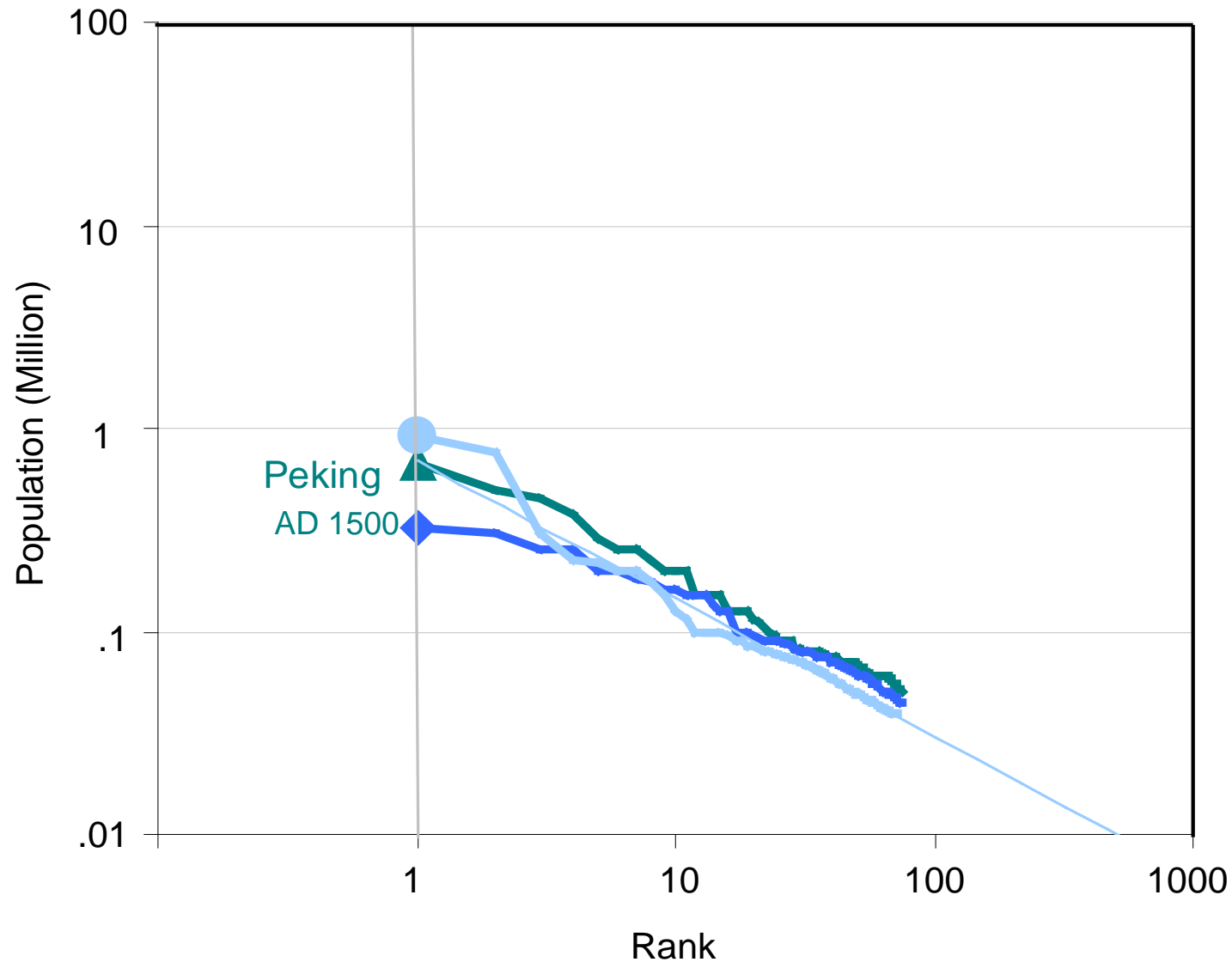
City Hierarchies (Rank Size)



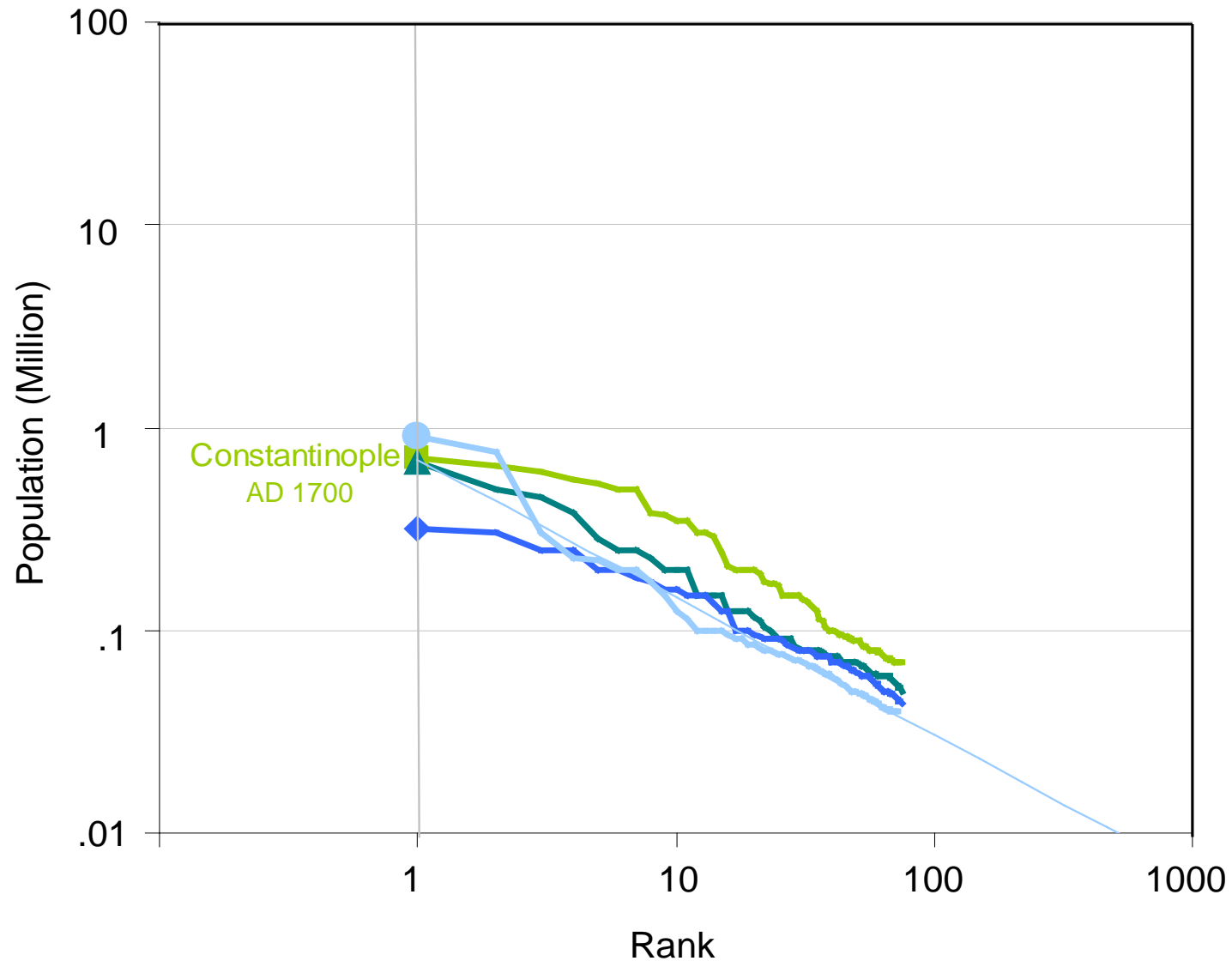
City Hierarchies (Rank Size)



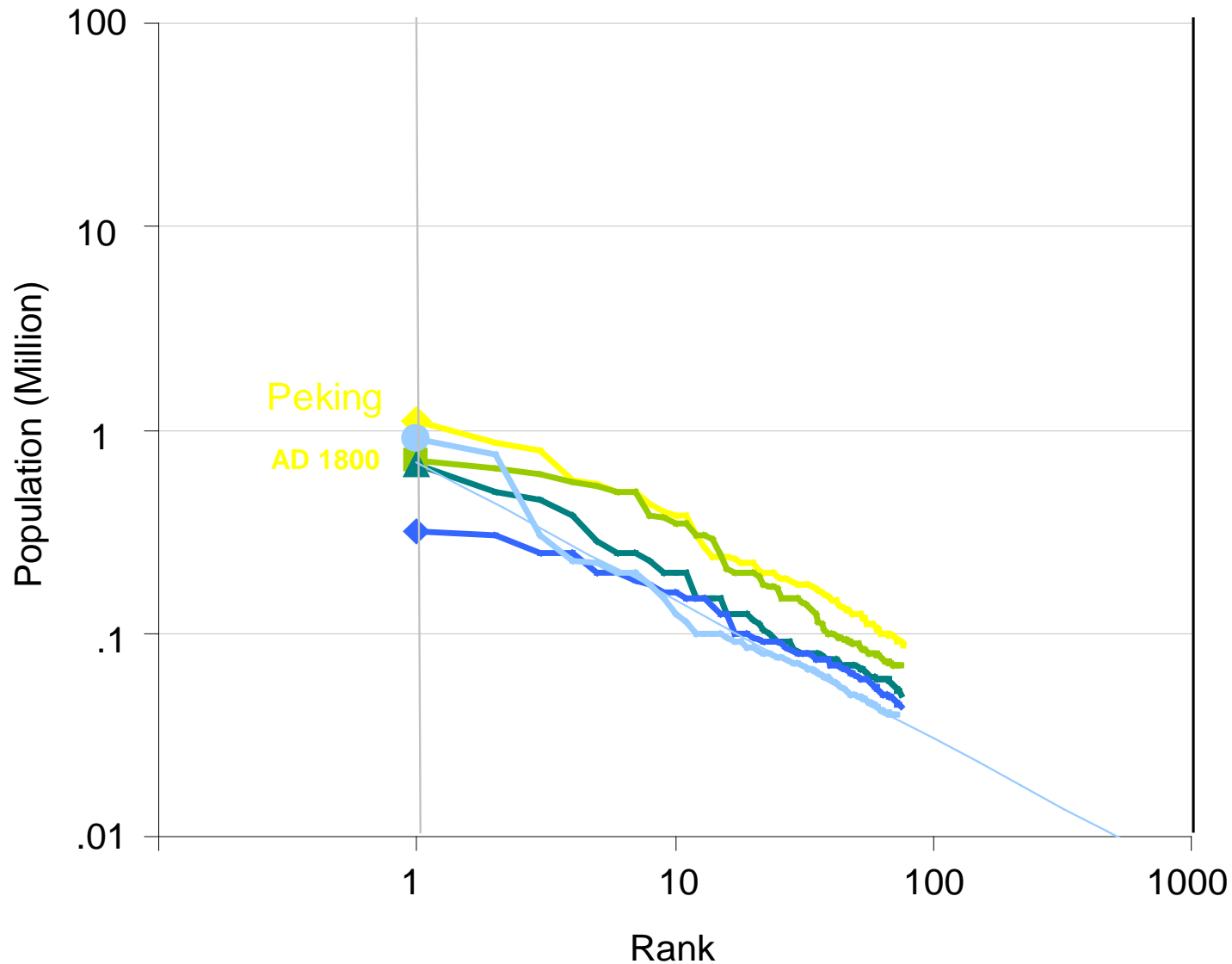
City Hierarchies (Rank Size)



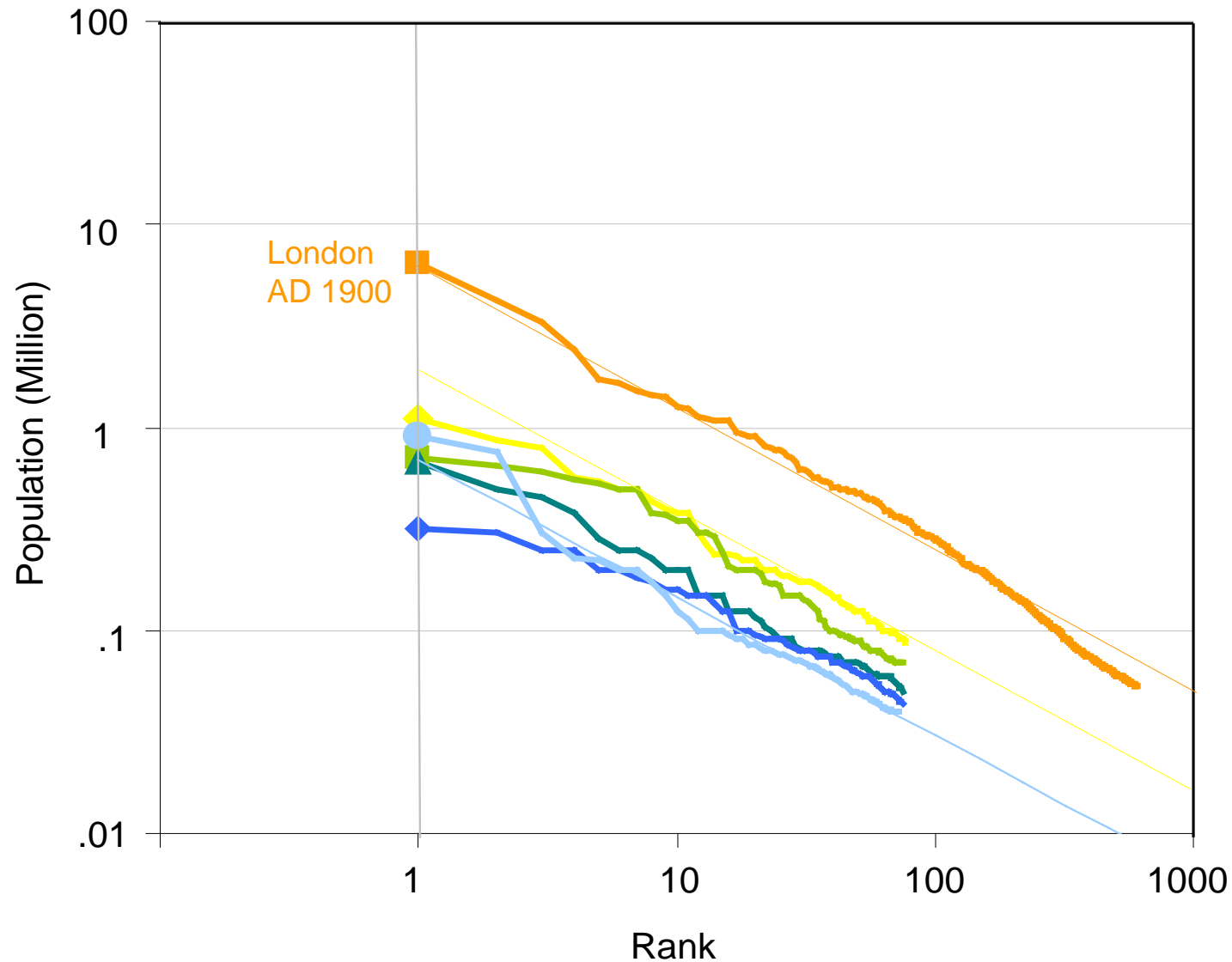
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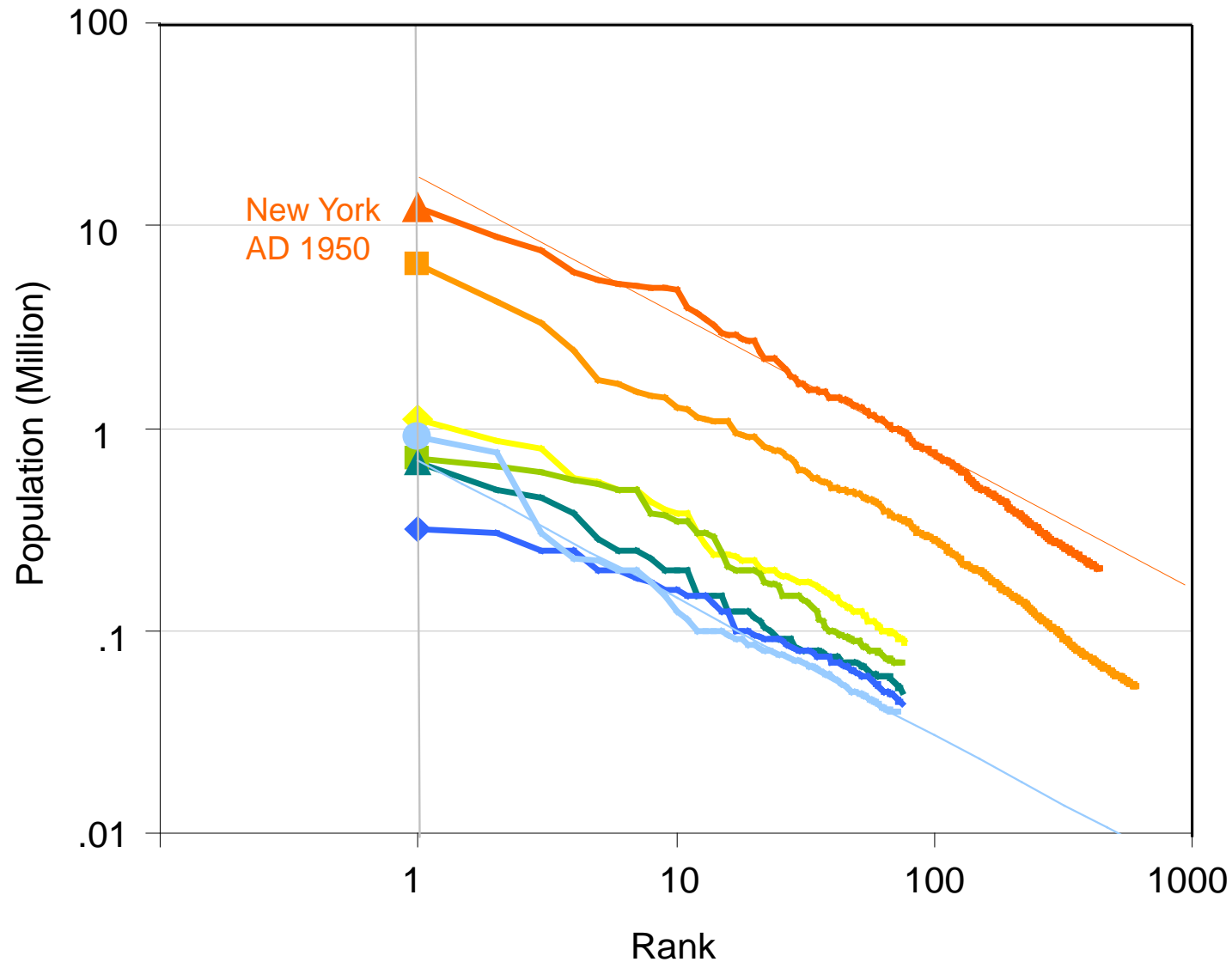
City Hierarchies (Rank Size)



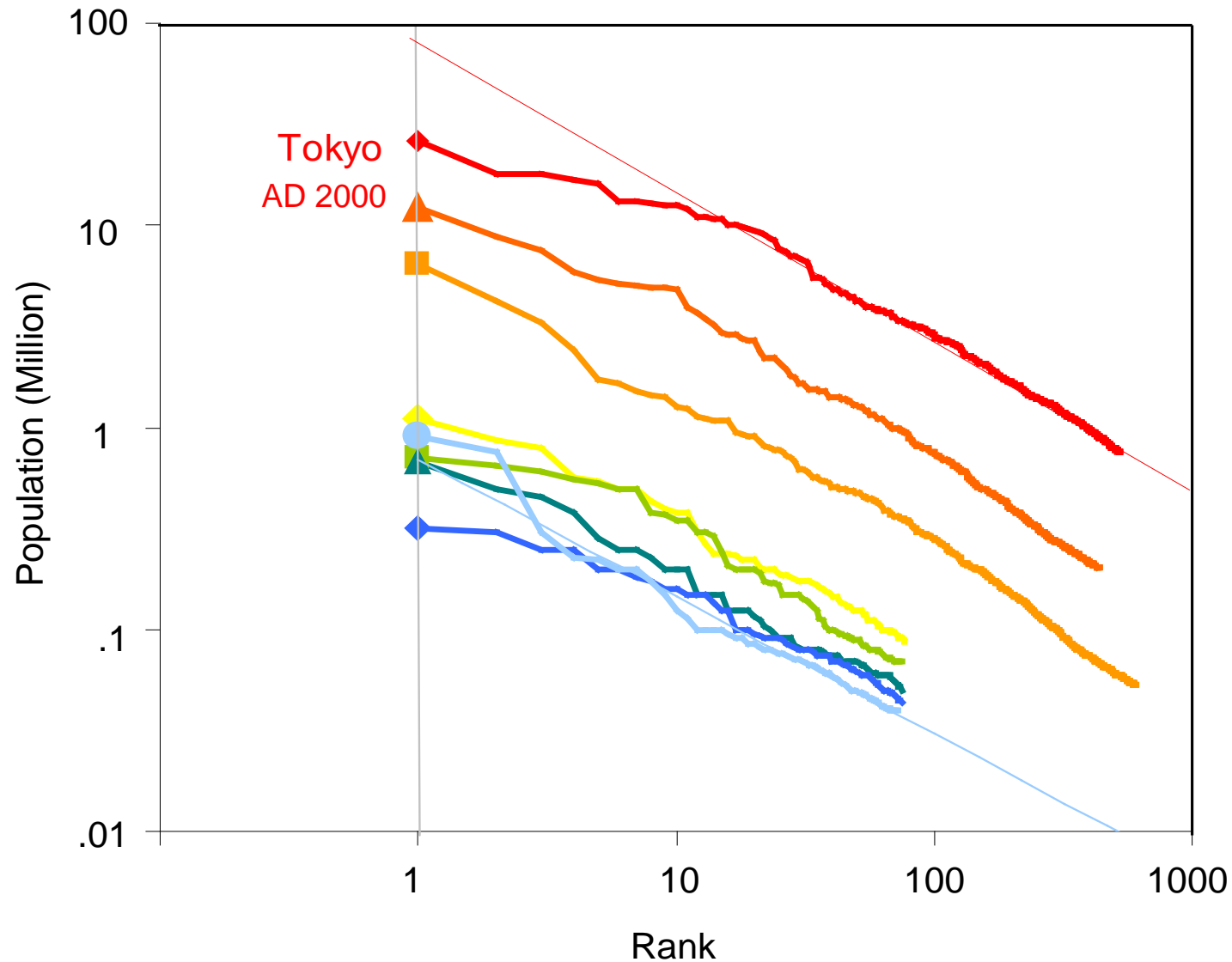
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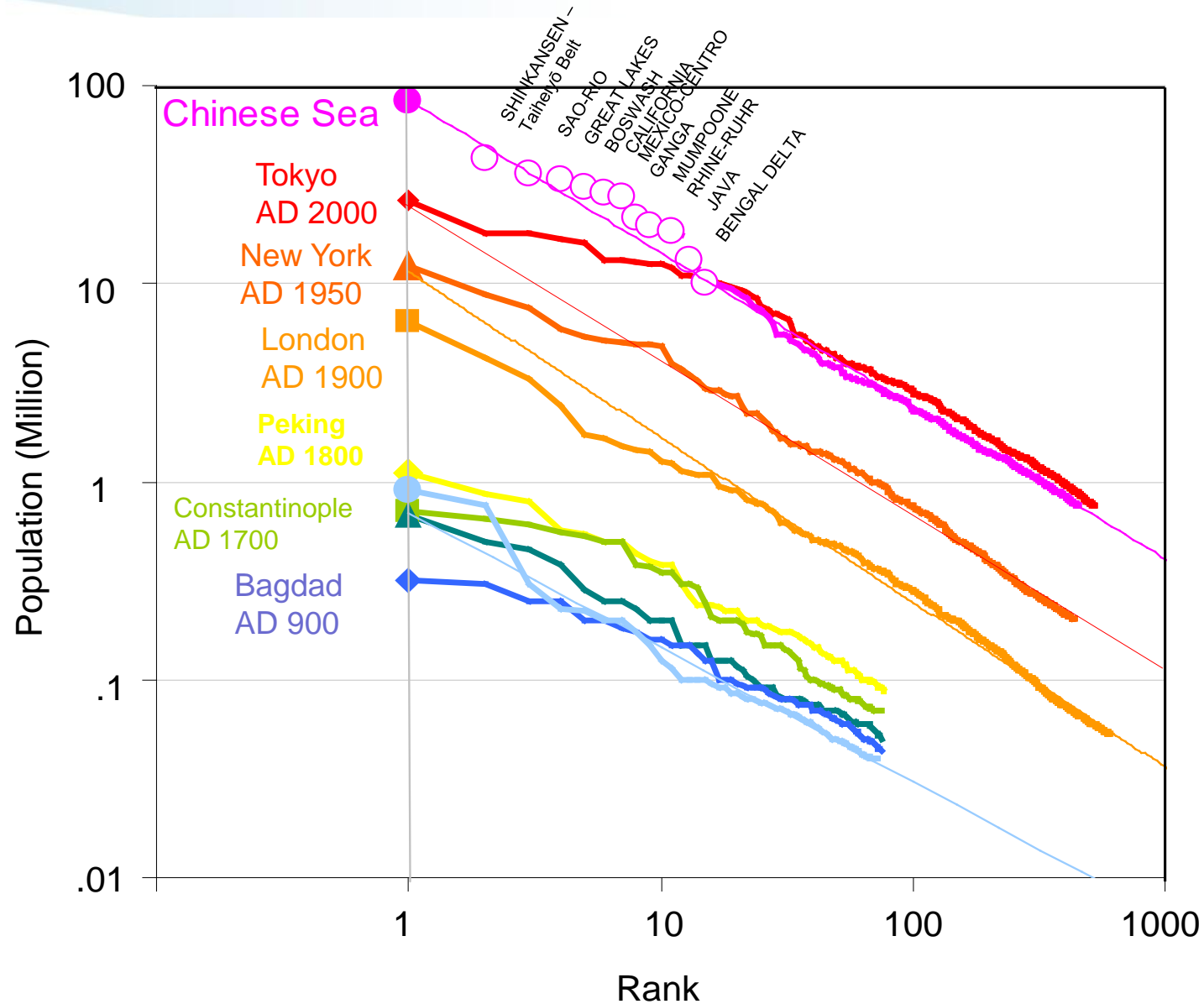
City Hierarchies (Rank Size)



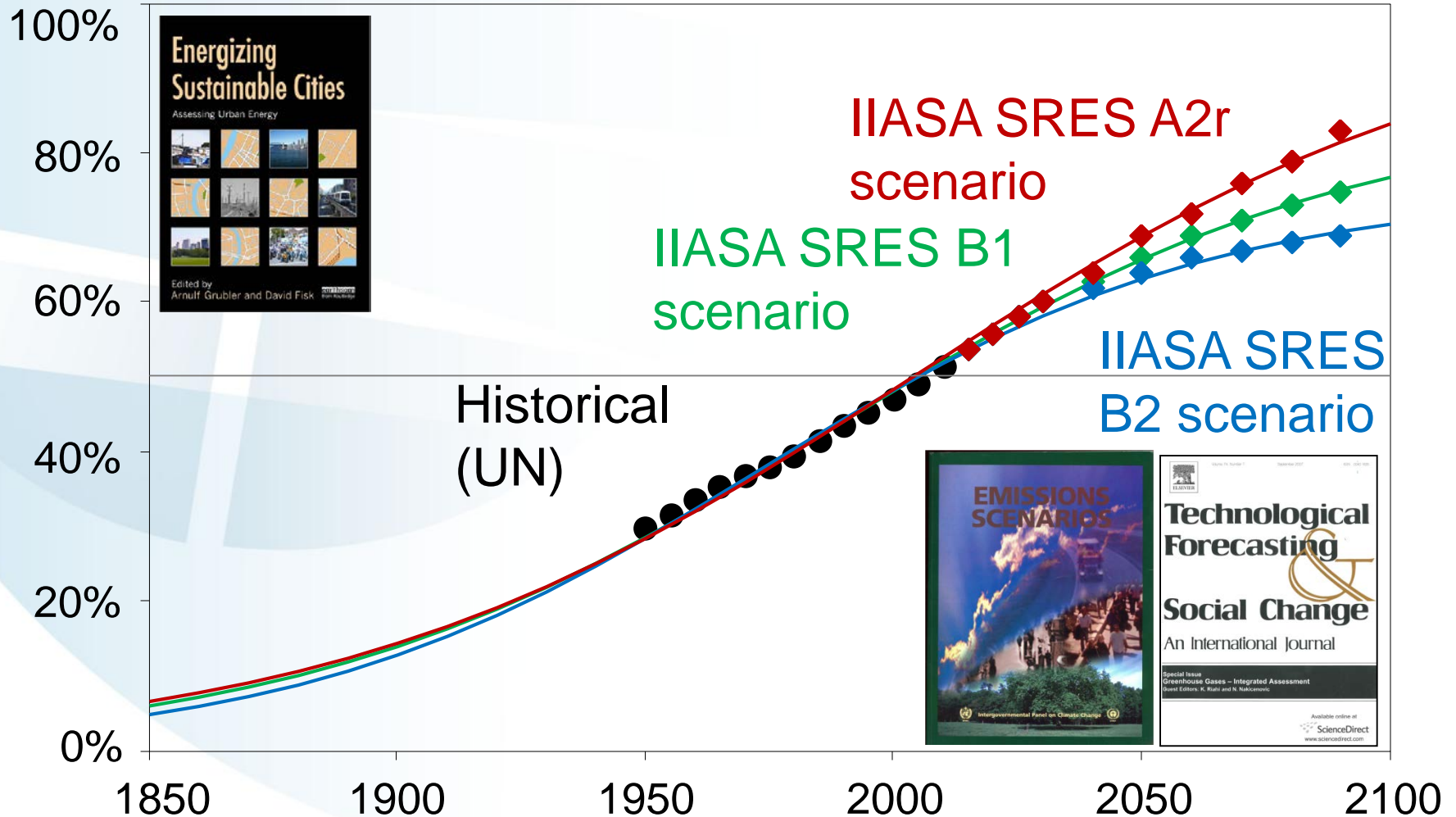
City Hierarchies (Rank Size)



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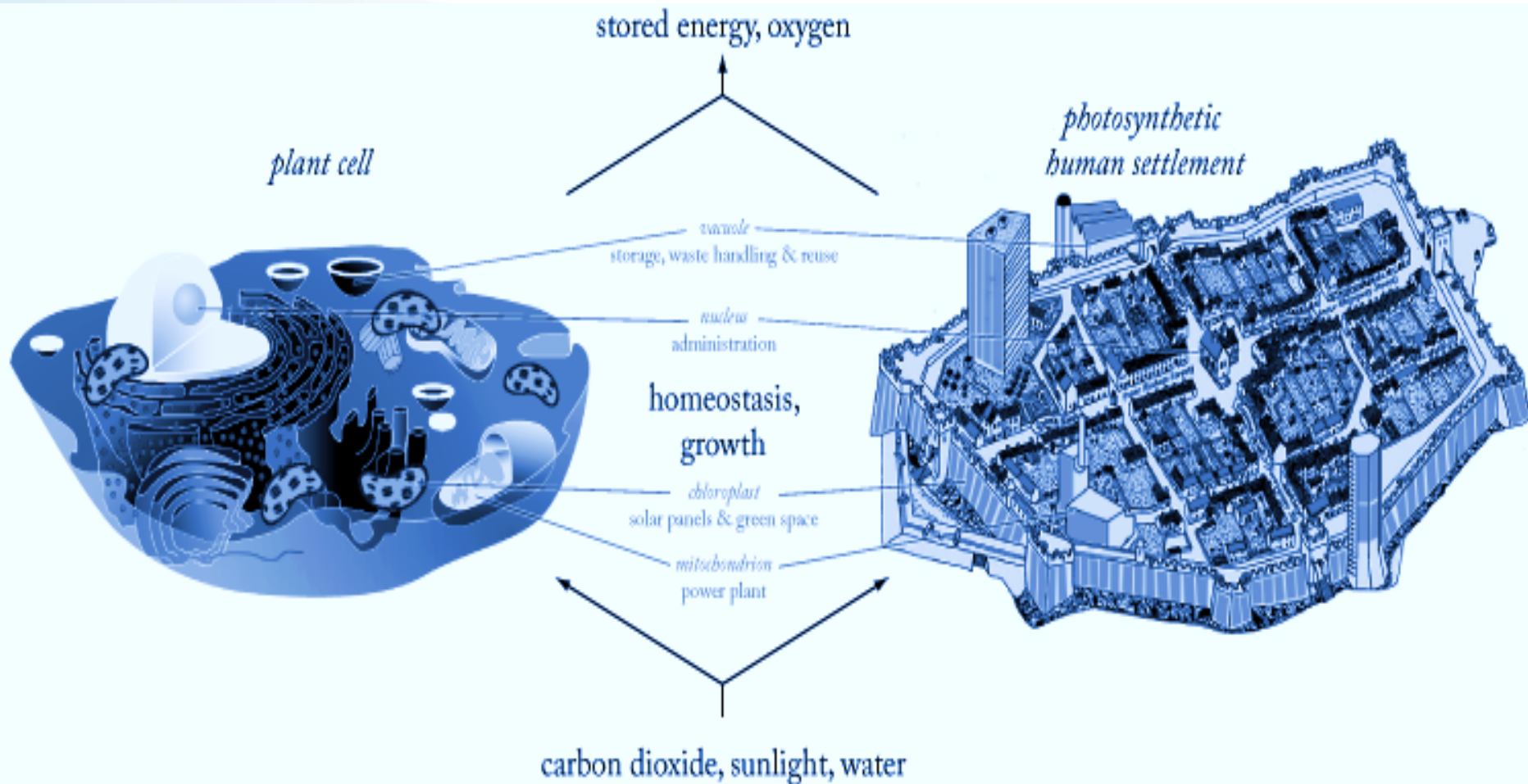


Urbanization World



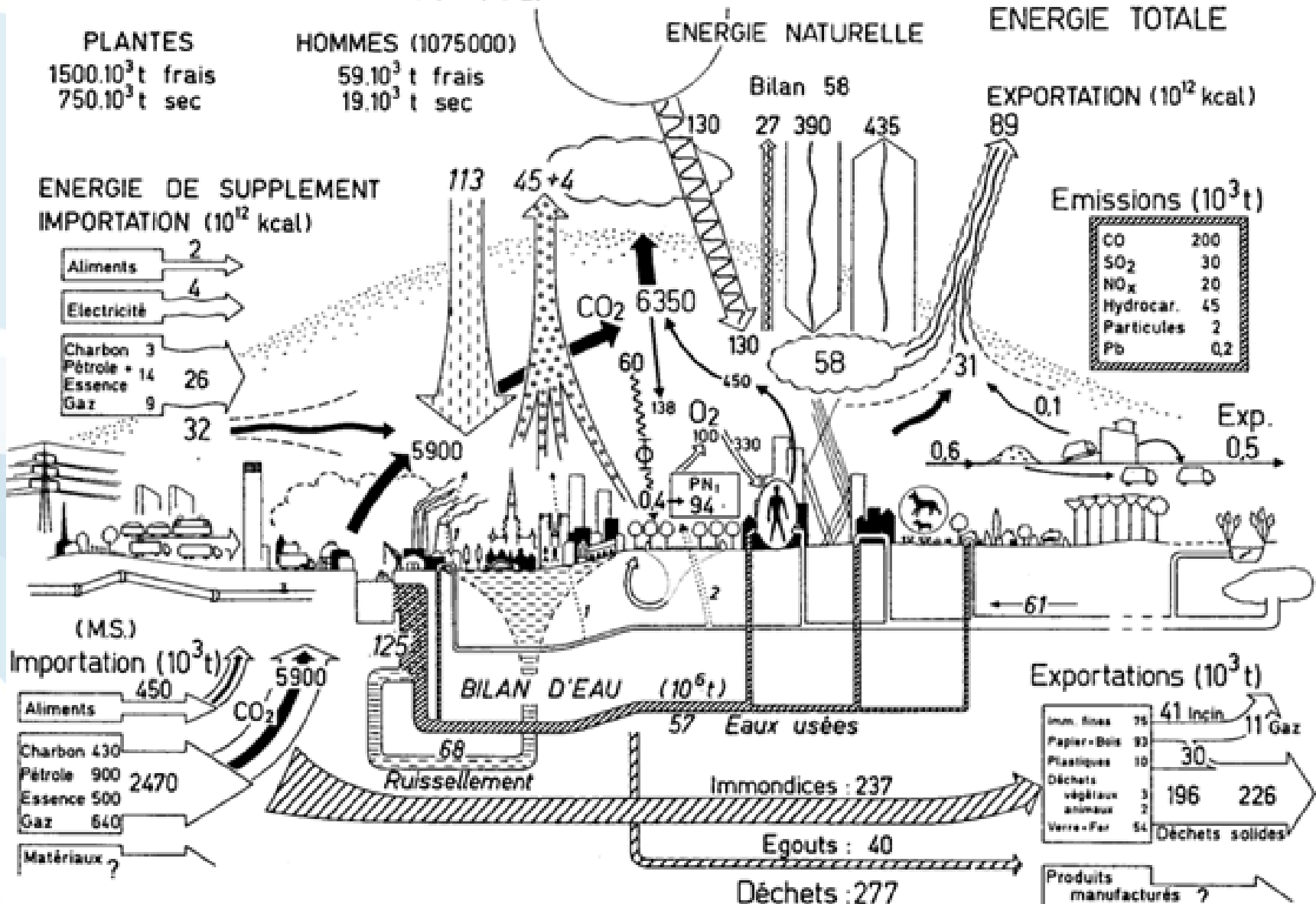


Urban Metabolism or Ecology



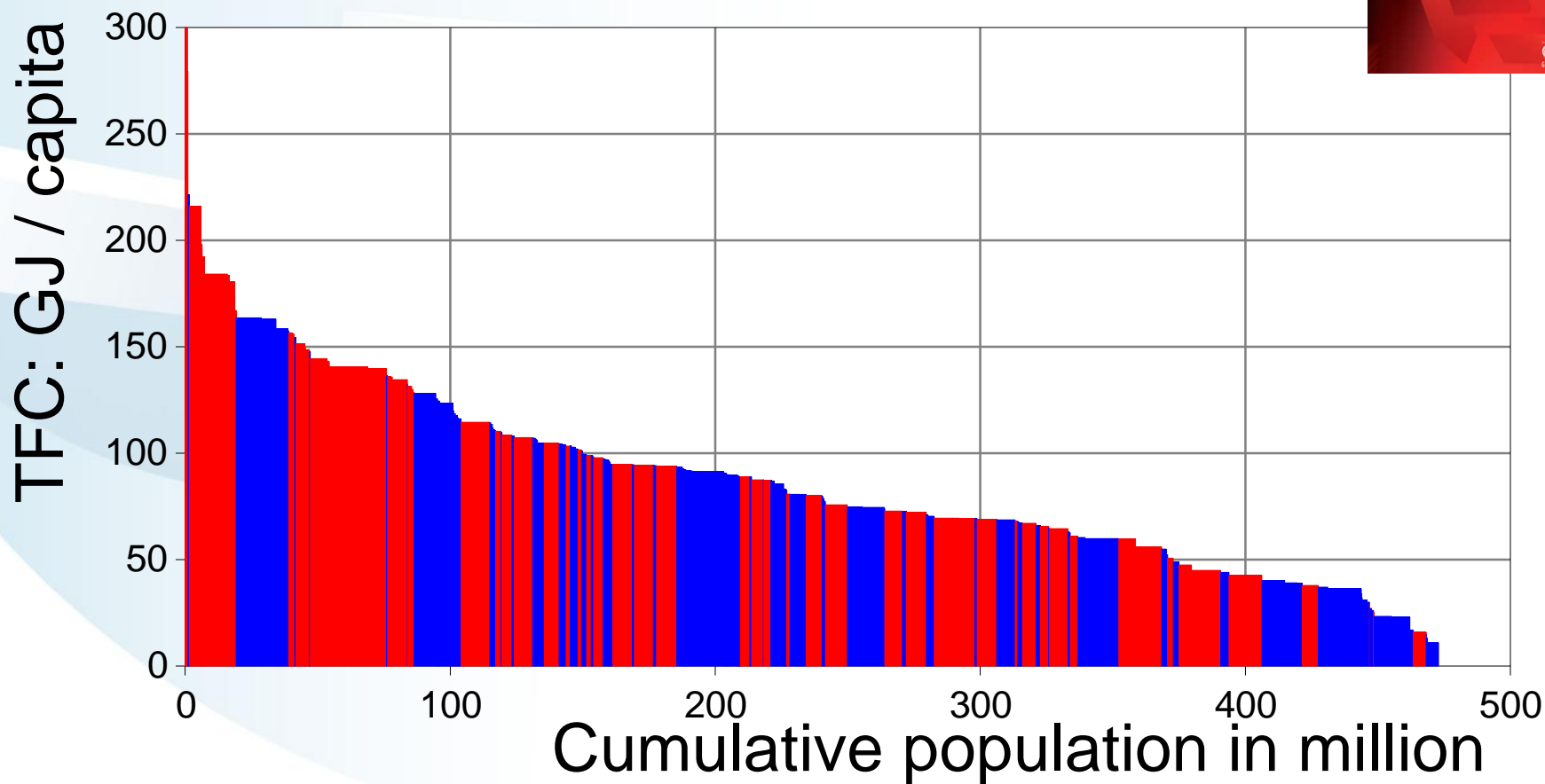
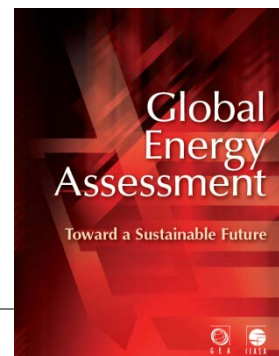
Brussels Urban Metabolism

ECOSYSTEME BRUXELLES (16.178 ha)



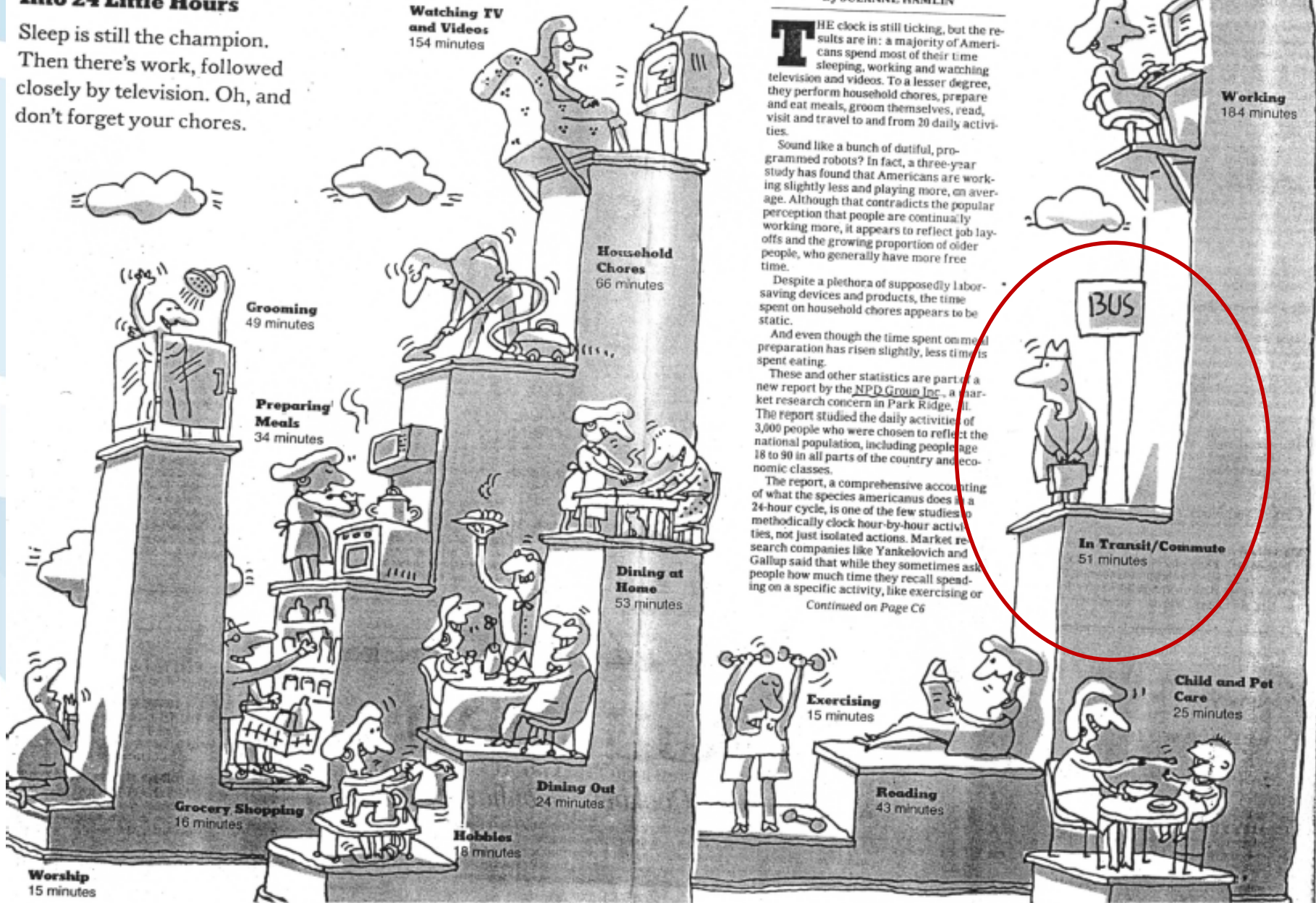
Final Energy per Capita

Red – above country average



Into 24 Little Hours

Sleep is still the champion. Then there's work, followed closely by television. Oh, and don't forget your chores.



By SUZANNE HAMLIN

THE clock is still ticking, but the results are in: a majority of Americans spend most of their time sleeping, working and watching television and videos. To a lesser degree, they perform household chores, prepare and eat meals, groom themselves, read, visit and travel to and from 20 daily activities.

Sound like a bunch of dutiful, programmed robots? In fact, a three-year study has found that Americans are working slightly less and playing more, on average. Although that contradicts the popular perception that people are continually working more, it appears to reflect job layoffs and the growing proportion of older people, who generally have more free time.

Despite a plethora of supposedly labor-saving devices and products, the time spent on household chores appears to be static.

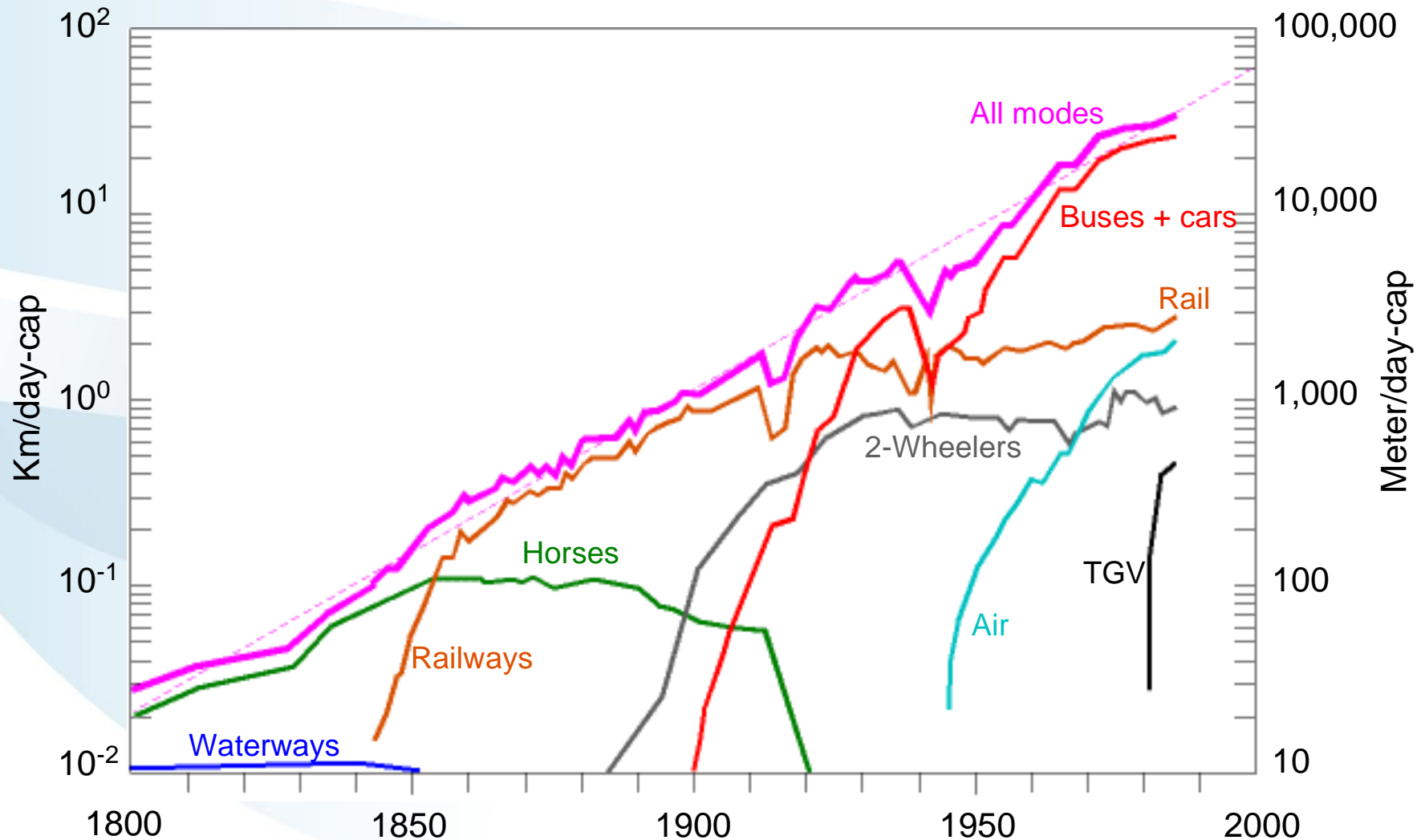
And even though the time spent on meal preparation has risen slightly, less time is spent eating.

These and other statistics are part of a new report by the **NPD Group Inc.**, a market research concern in Park Ridge, Ill. The report studied the daily activities of 3,000 people who were chosen to reflect the national population, including people age 18 to 90 in all parts of the country and economic classes.

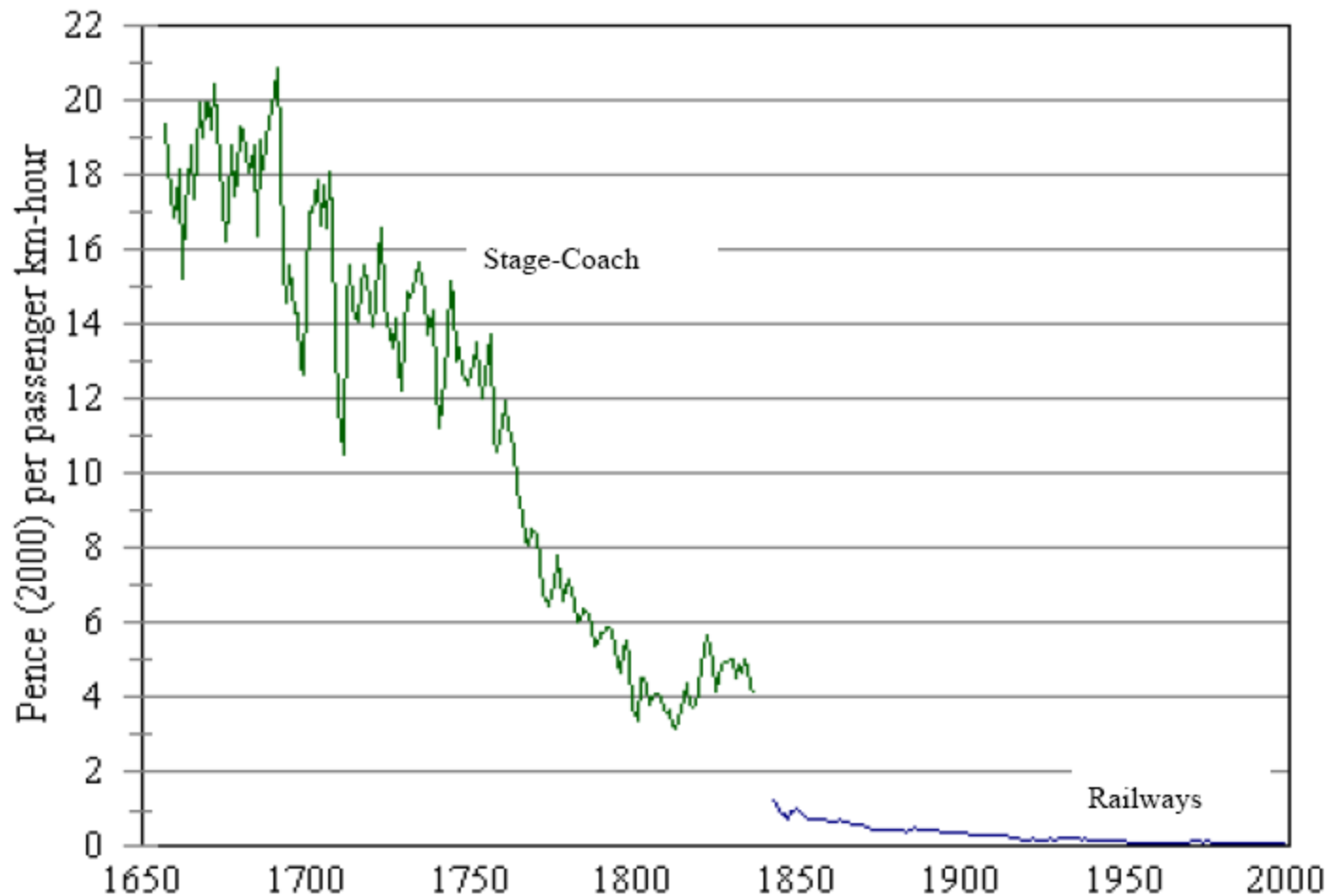
The report, a comprehensive accounting of what the species *americanus* does in a 24-hour cycle, is one of the few studies to methodically clock hour-by-hour activities, not just isolated actions. Market research companies like Yankelevich and Gallup said that while they sometimes ask people how much time they recall spending on a specific activity, like exercising or

Continued on Page C6

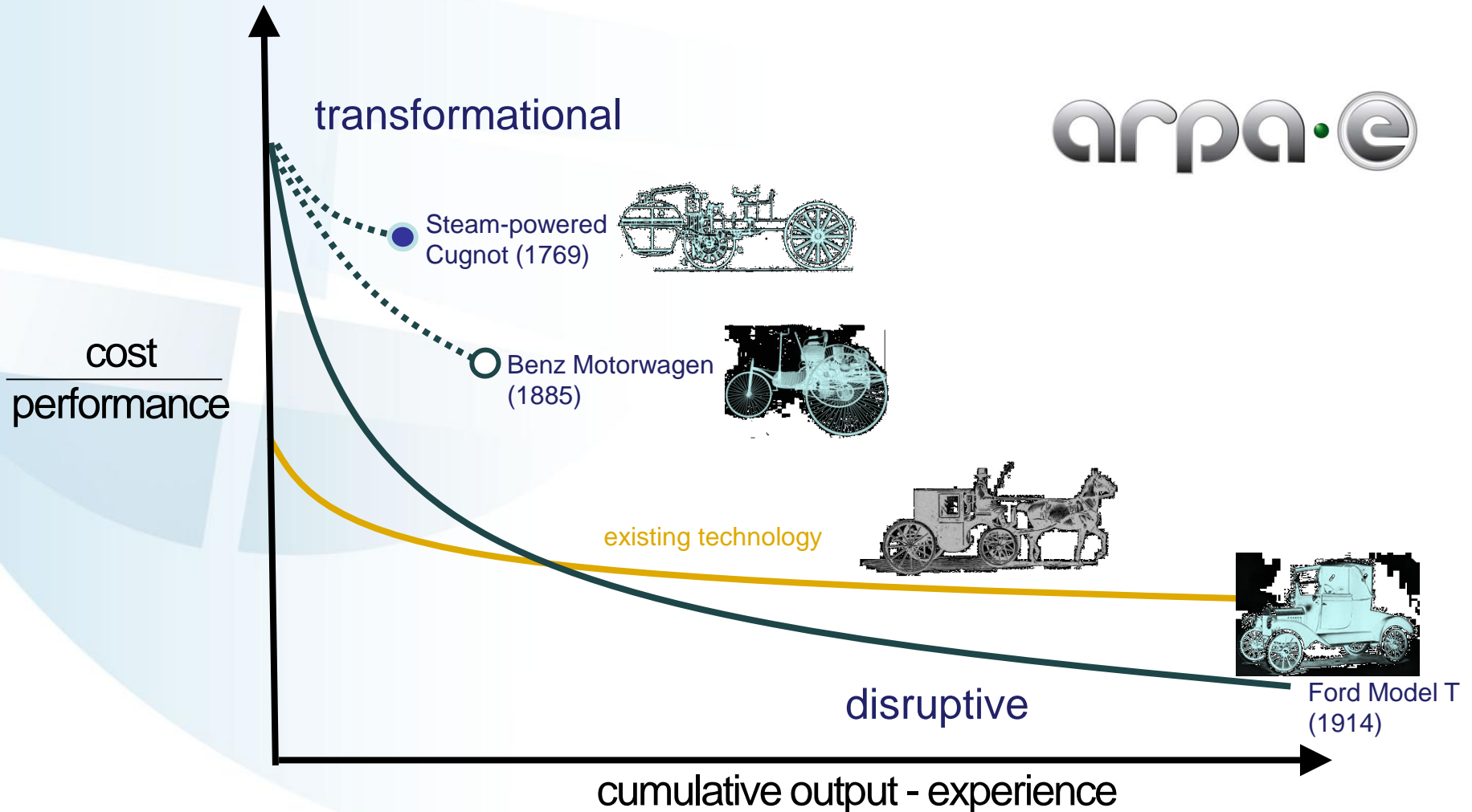
France - Growth in Motorized Mobility (pass-km per day per capita)



Price of Passenger Transport (per pass-km-hour)

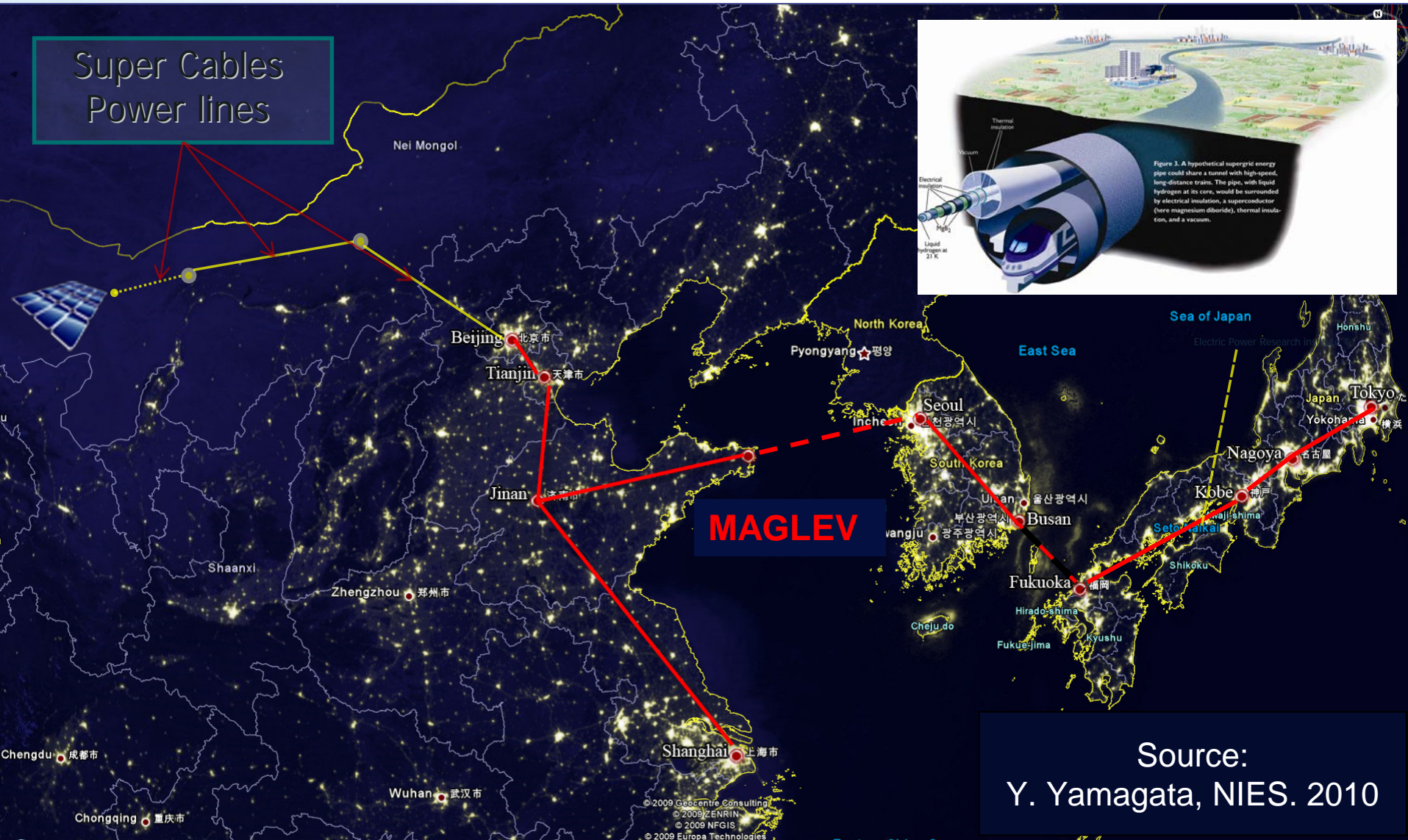


Incremental & Disruptive Technologies



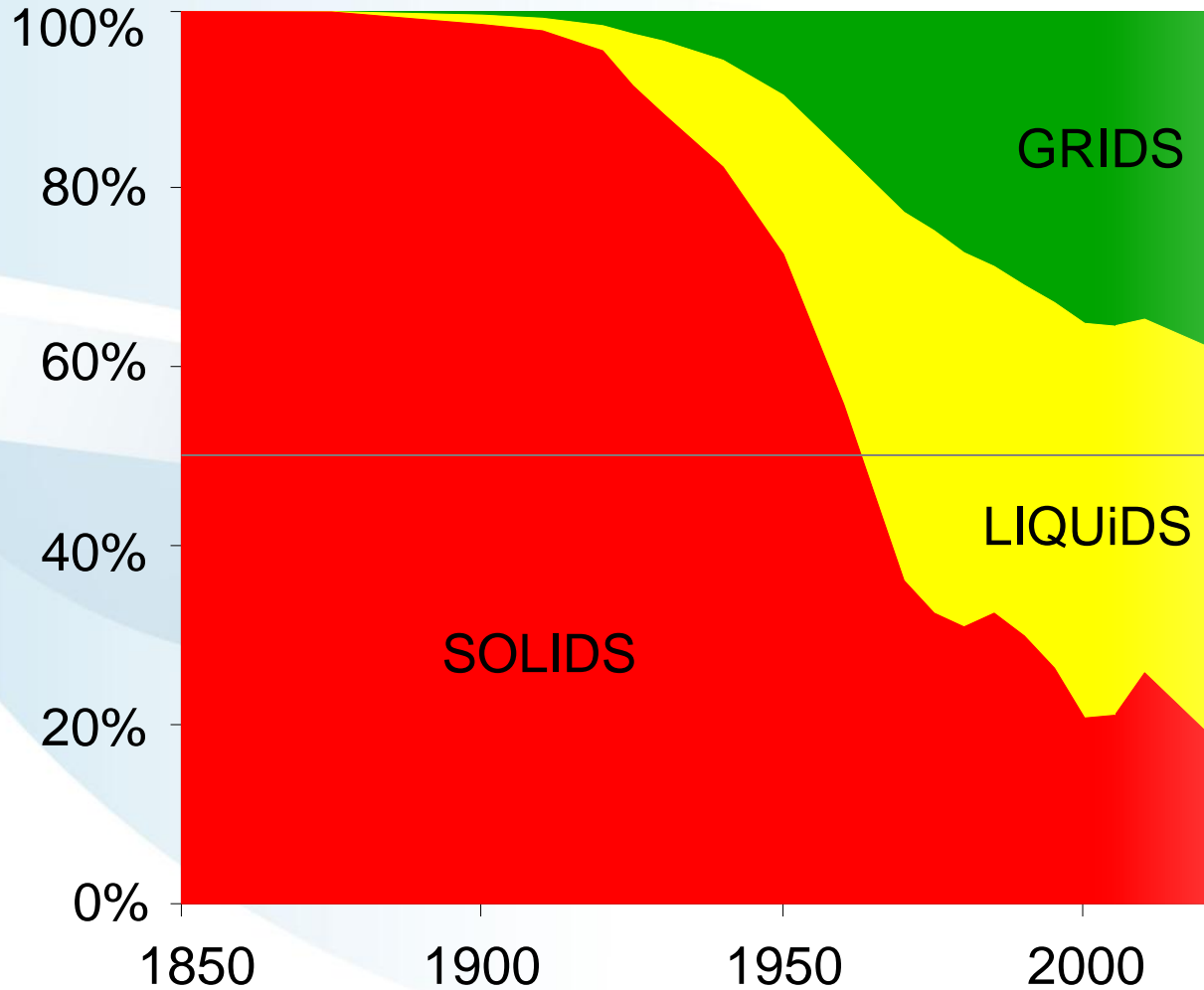
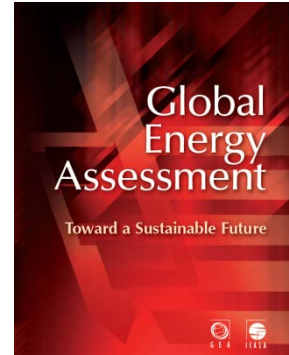
Potential Synergies between New Energy and Transport Infrastructures

Super Cables
Power lines

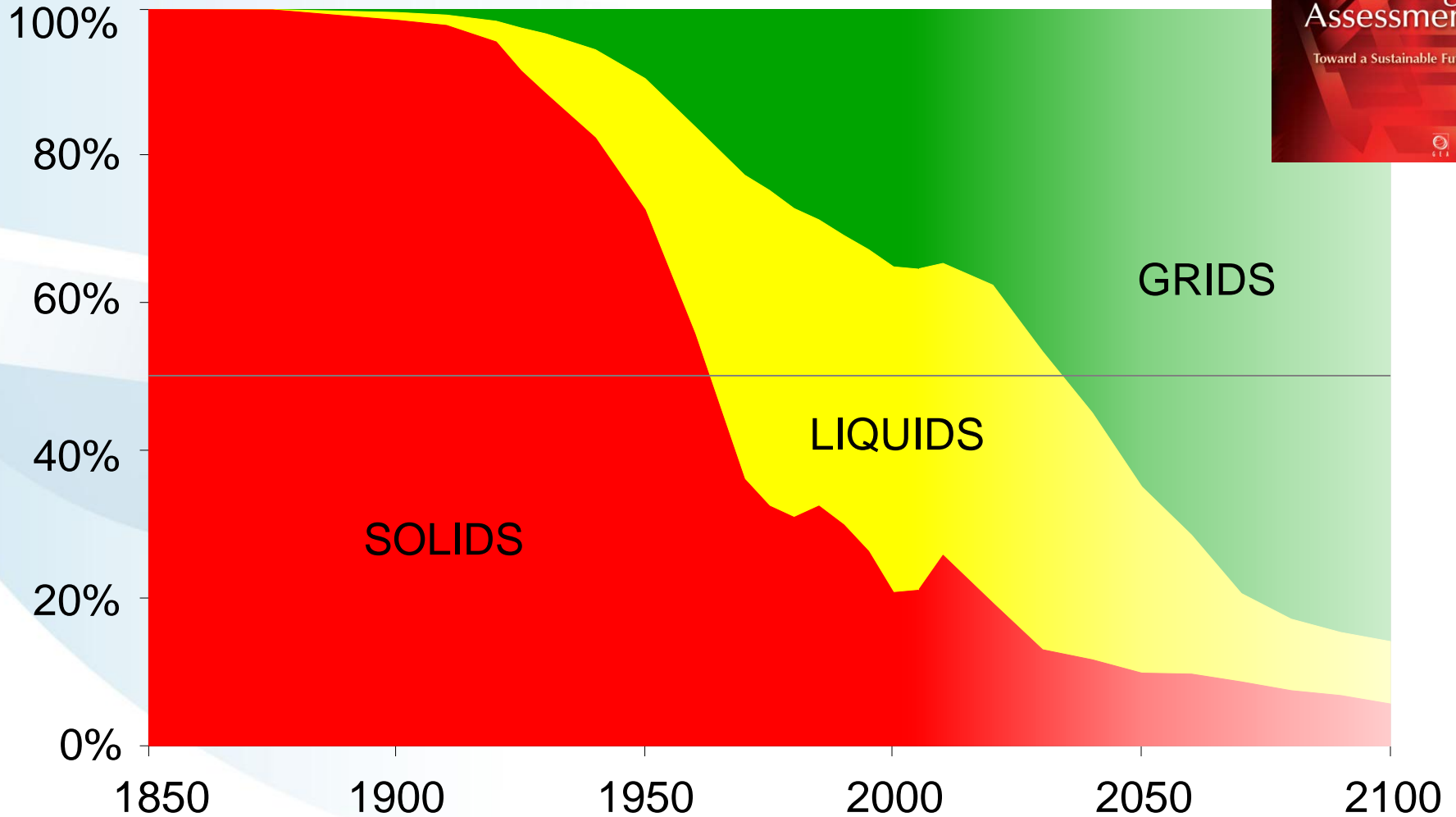
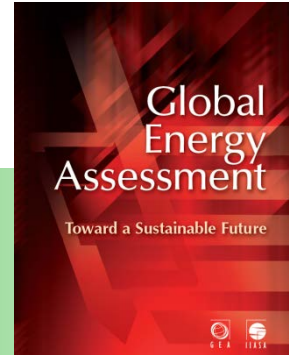


Source:
Y. Yamagata, NIES. 2010

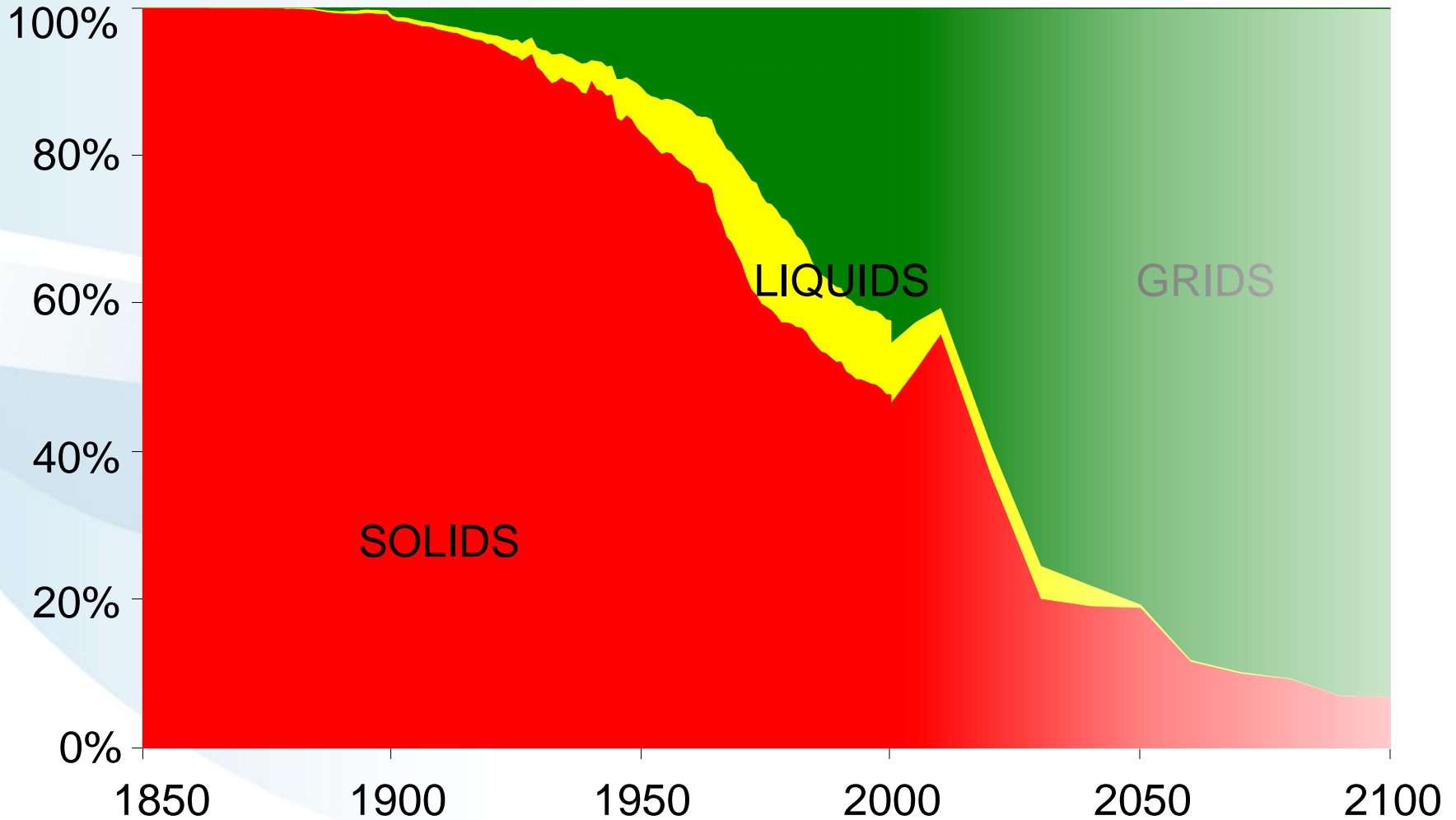
Transformation of Energy Systems



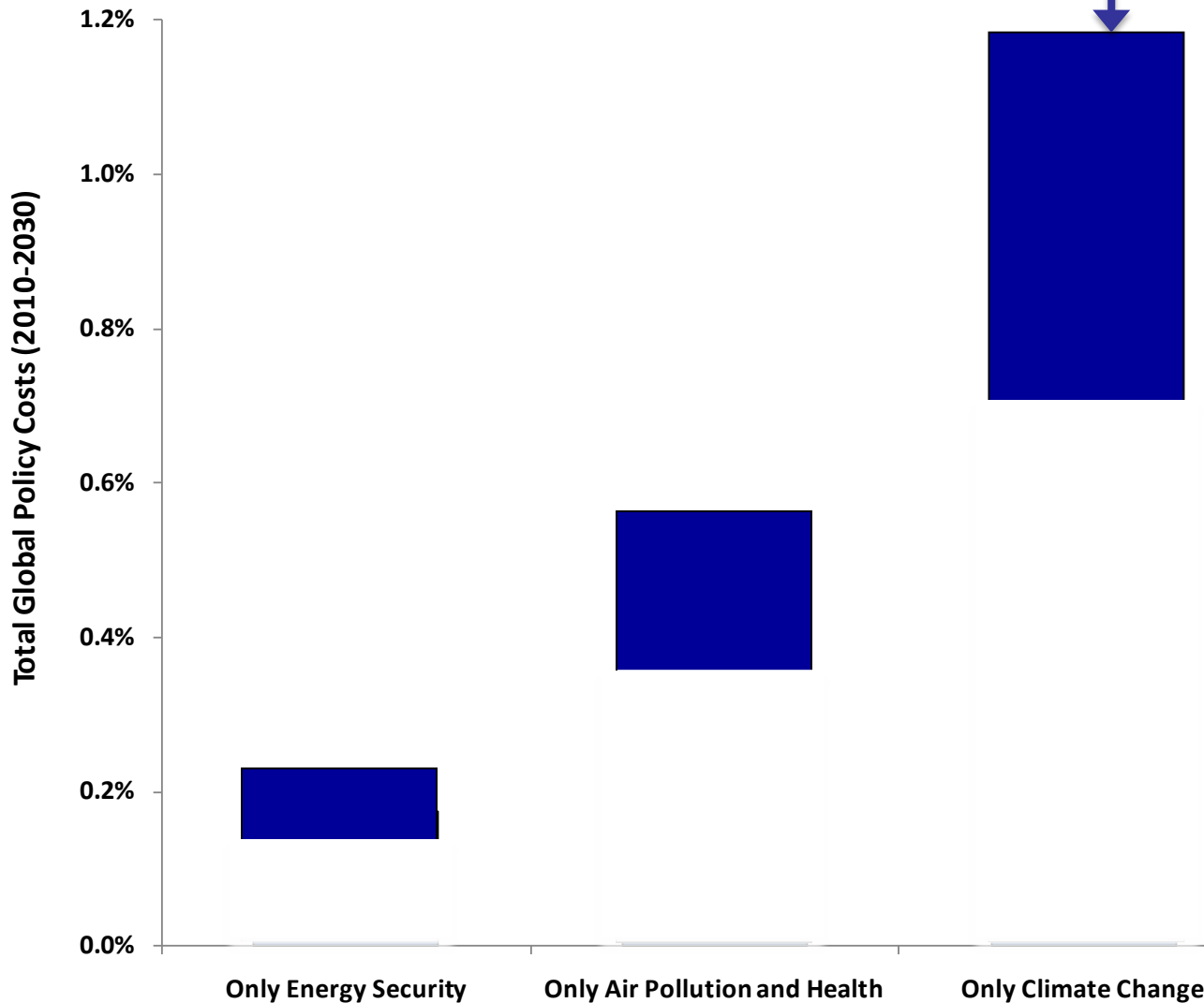
Transformation of Energy Systems



Transformation of Energy Systems Water Requirements



Multiple Benefits of Integrated Policies





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THANK YOU



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science