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Applied Systems Analysis  
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science for global insight

# Deprivations and Inequalities in Multiple Dimensions: Electricity Access for Improving Human Well-being

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IIASA, International Institute for Applied Systems Analysis

# Multiple Domains

Institutional



## Capital



Infrastructure



Financial

Human



Rules  
Laws

Governance  
Structures

Social



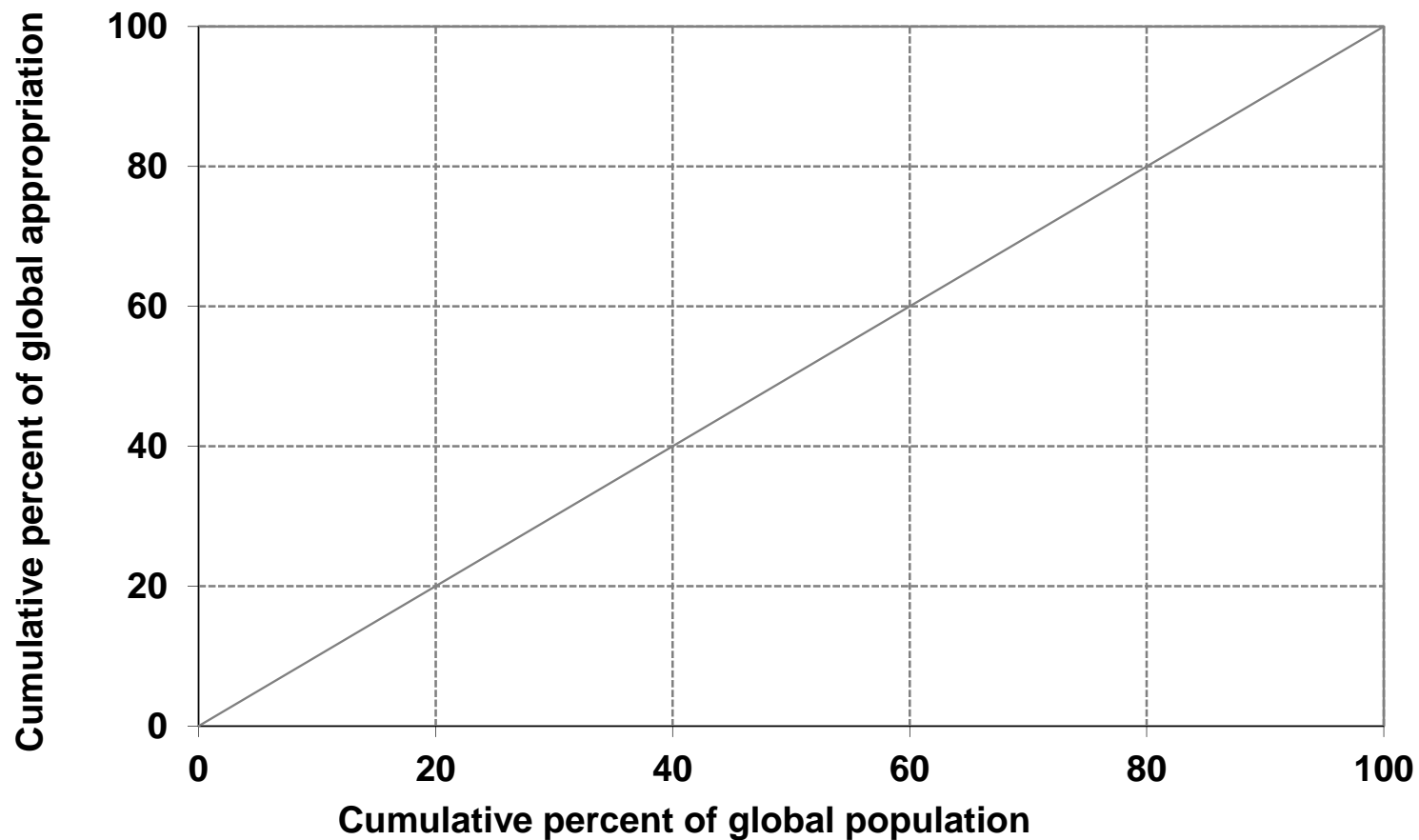
Natural



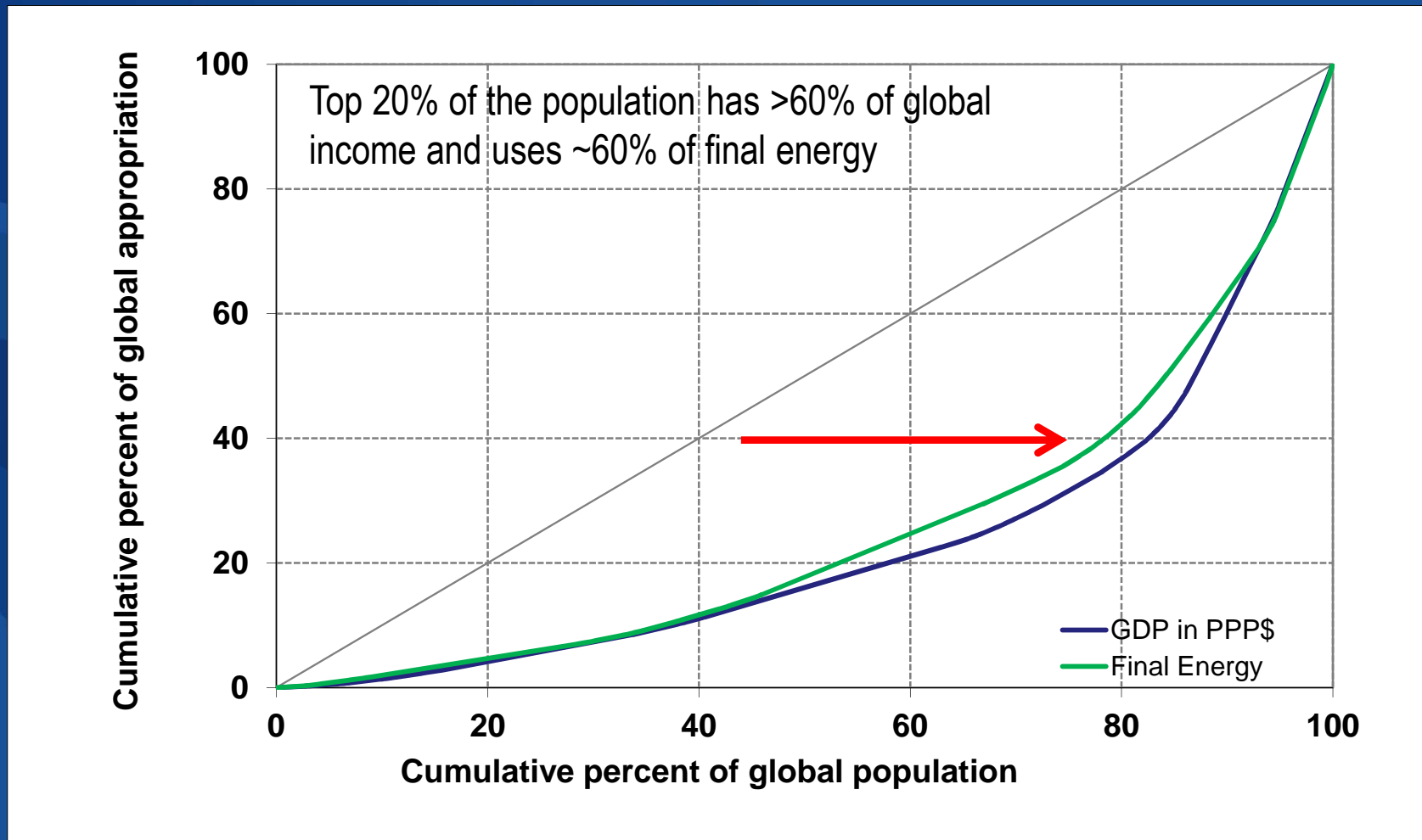
Capital



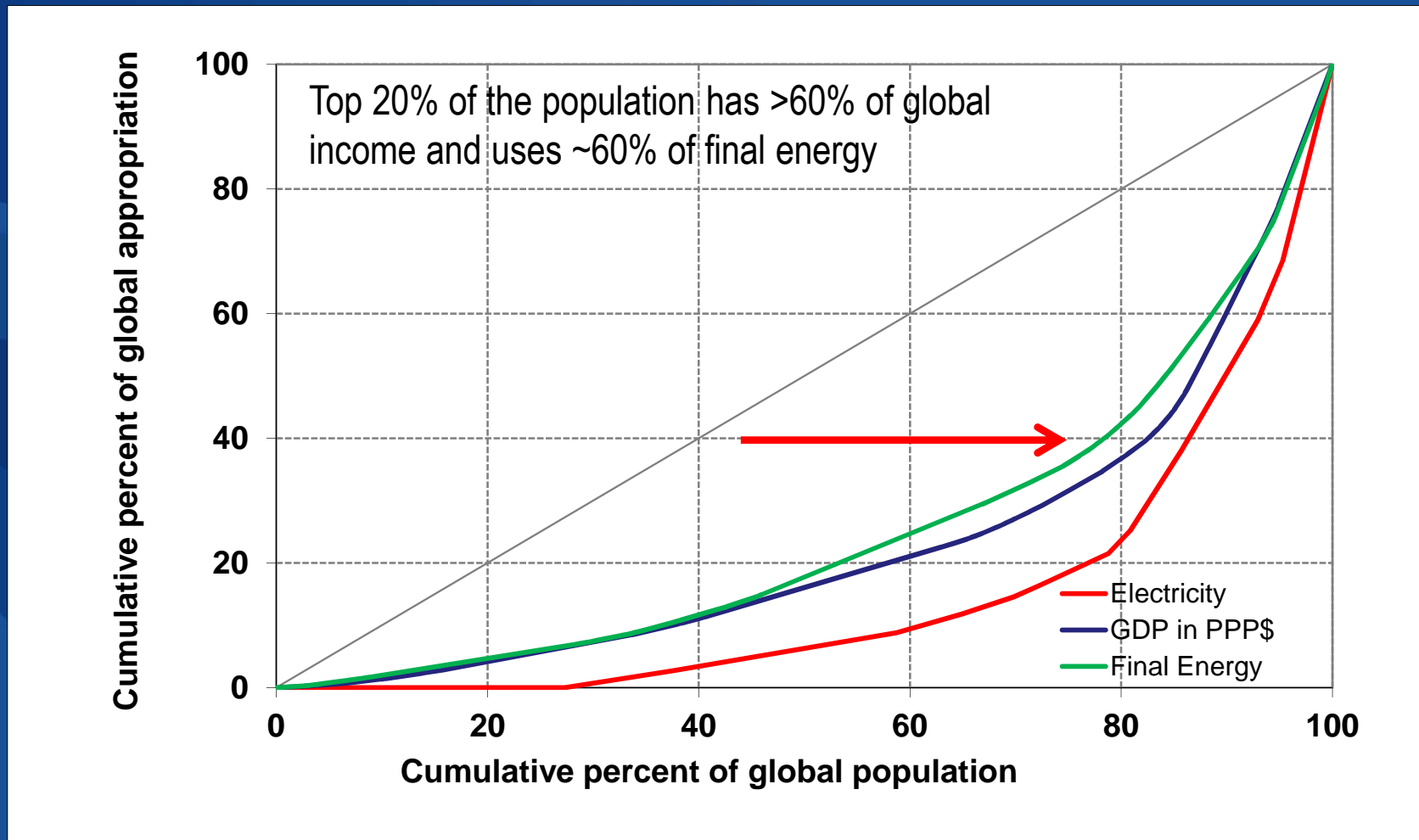
# Inequalities in Energy Use Mirror Inequalities in Income



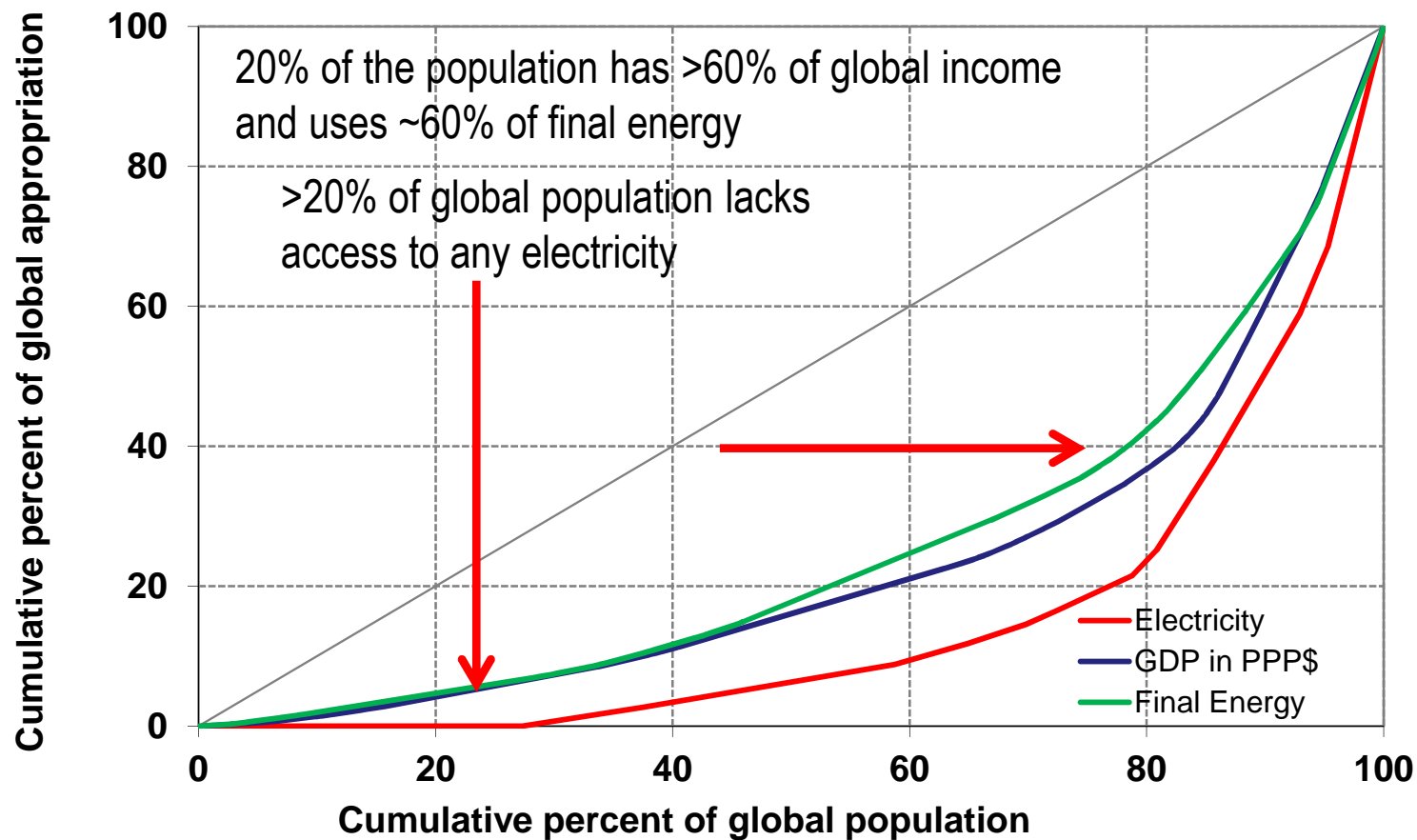
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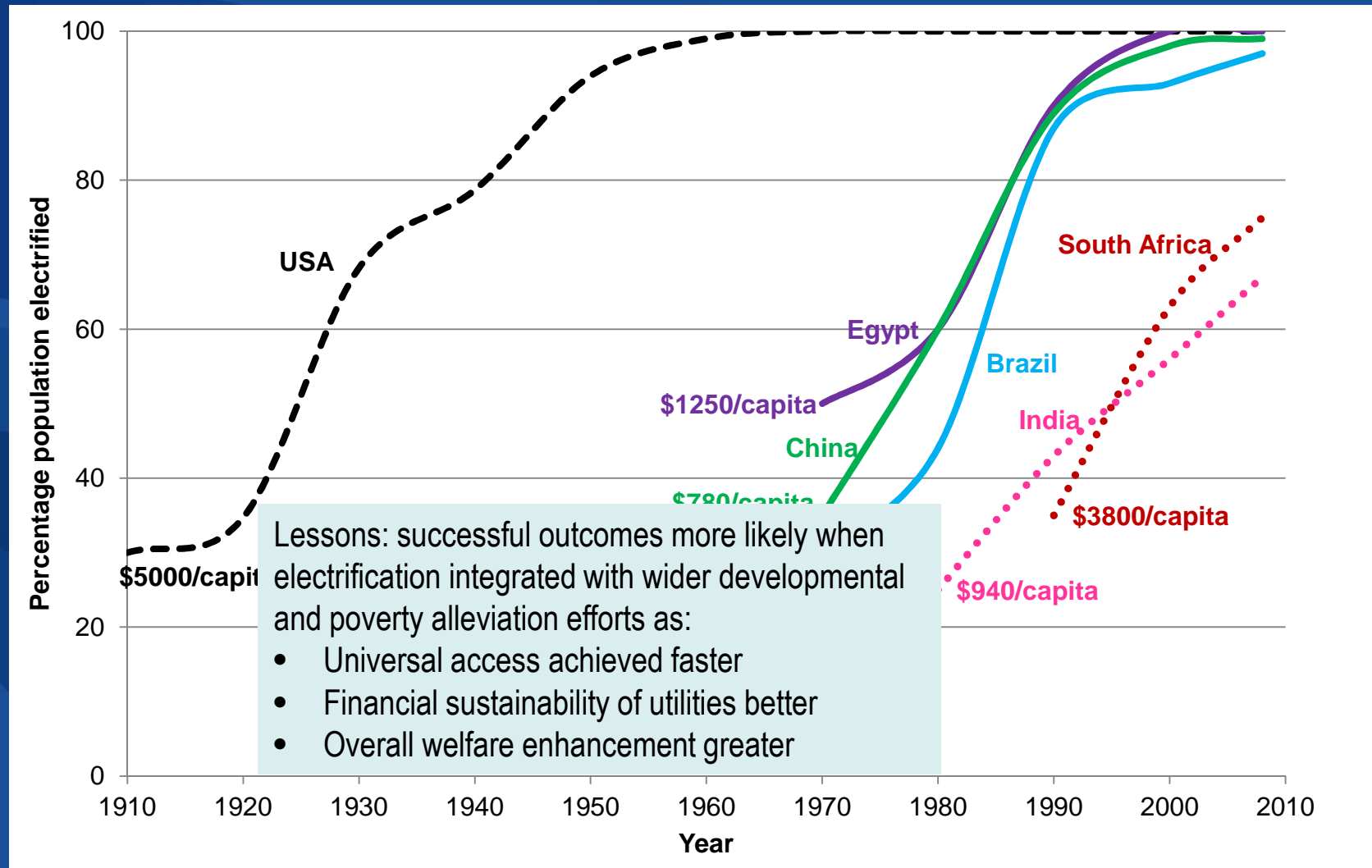
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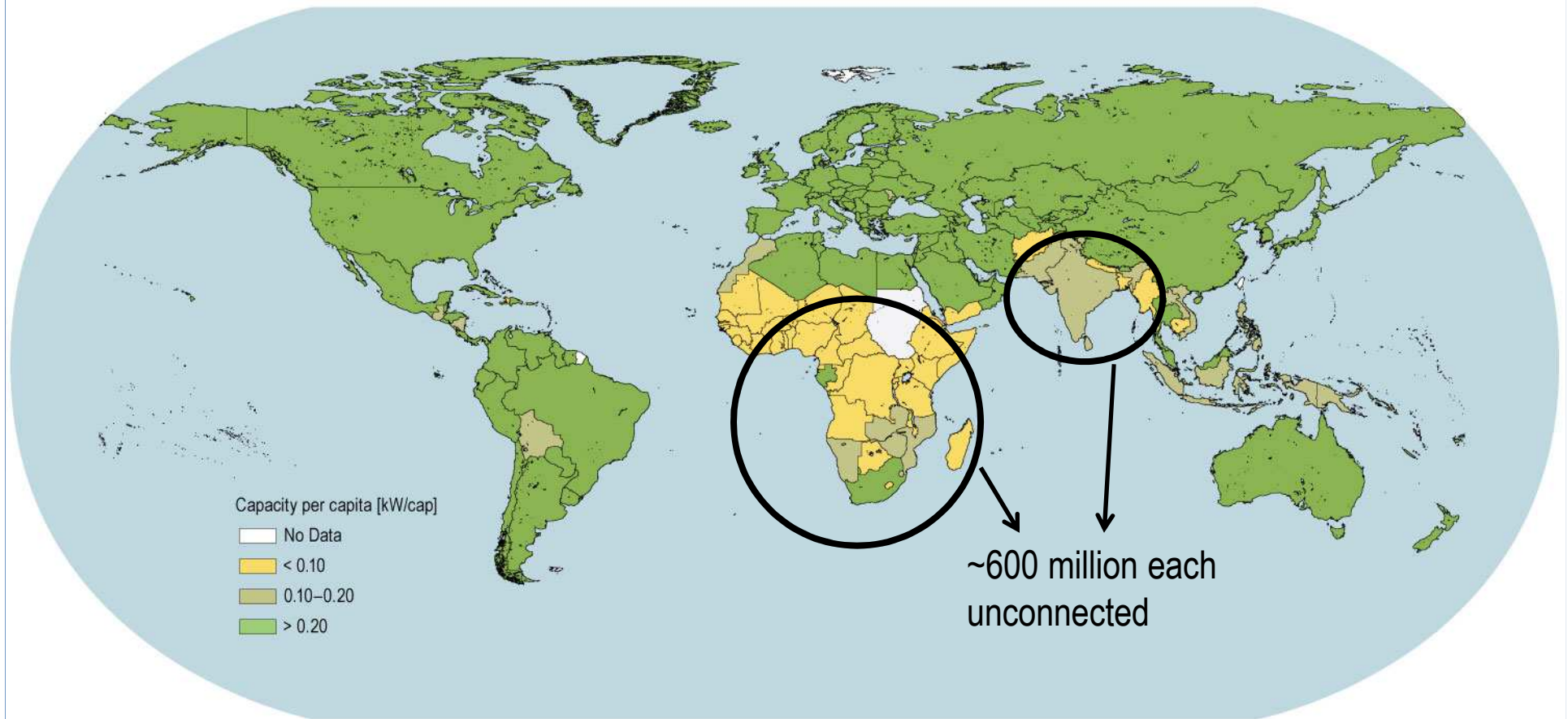
# Inequalities in Energy Use Mirror Inequalities in Income



# Historical Household Electrification



# Current Status of Inequalities in Access to Electric Infrastructure

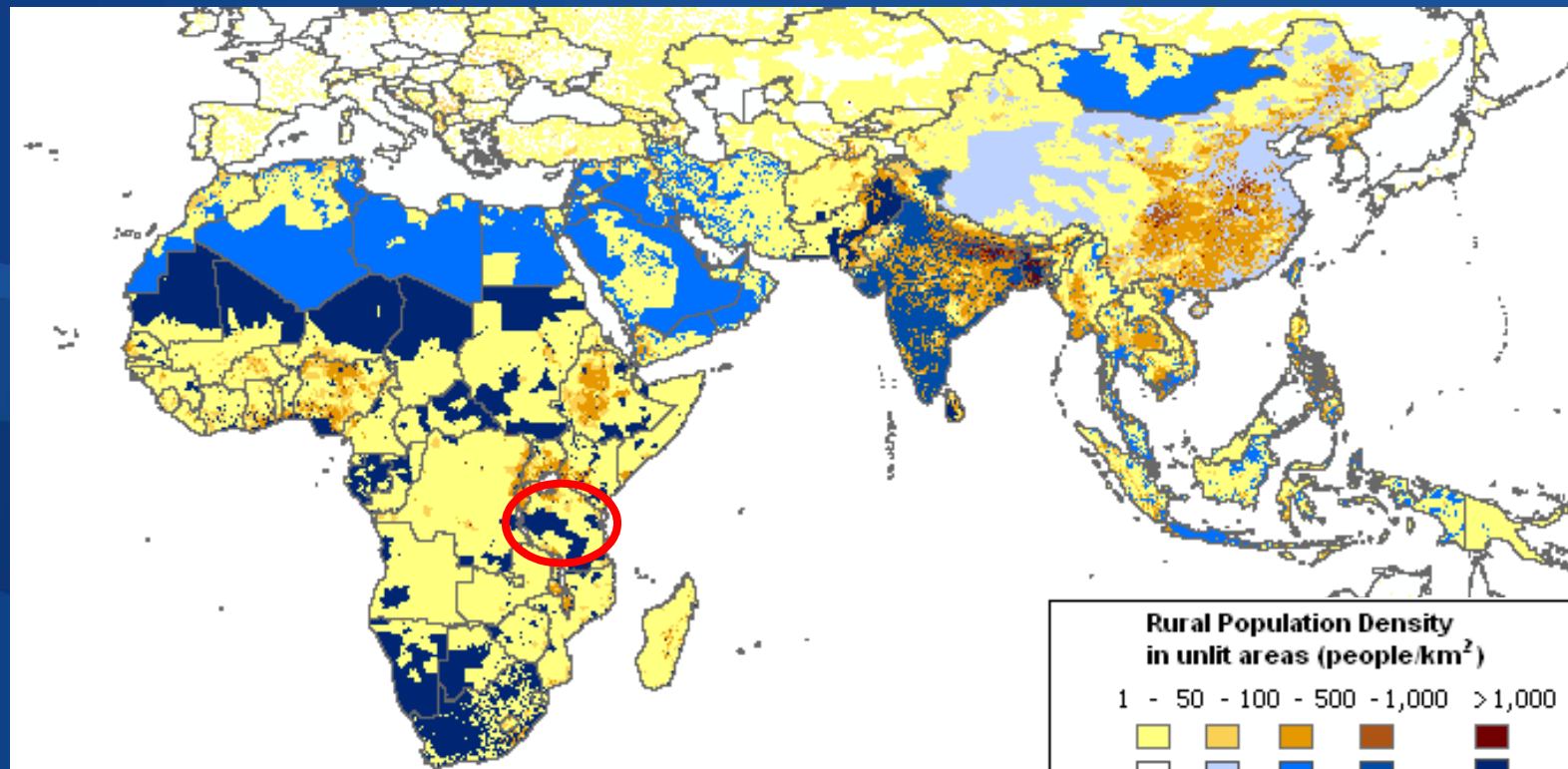




# Insights for Maximizing Well-being through Electrification Efforts

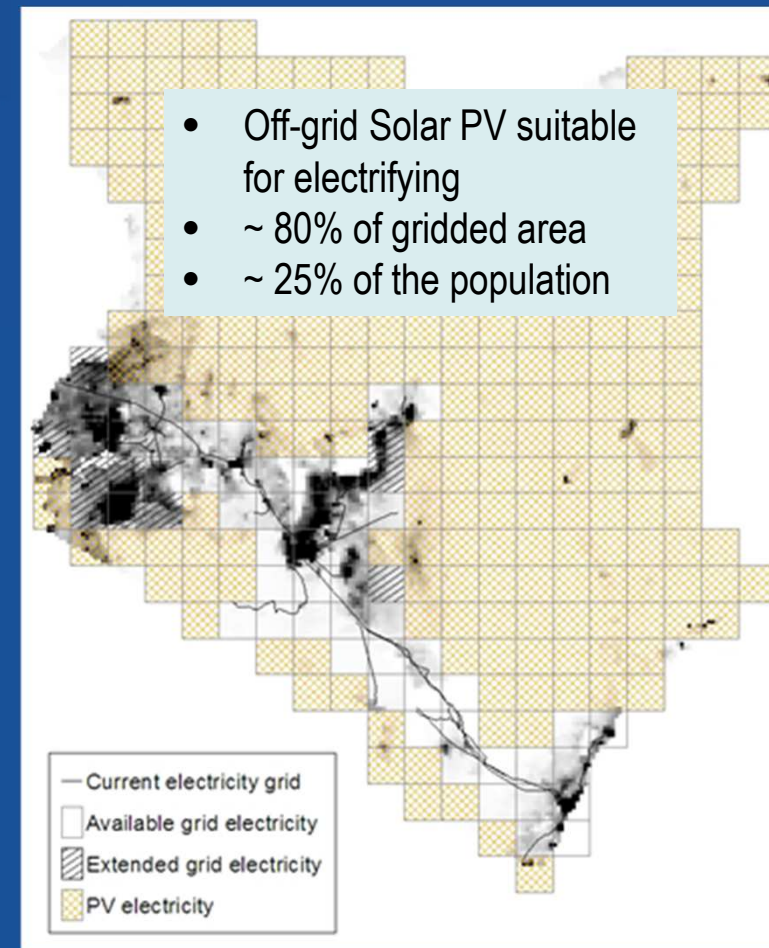
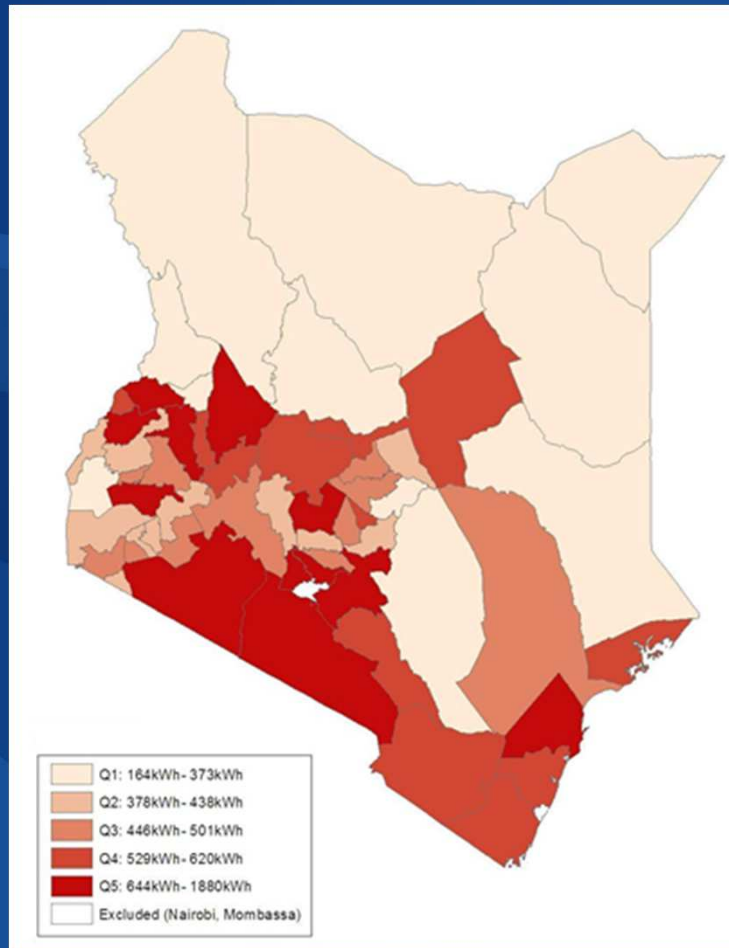
1. Regions differ – so solutions will differ

# Population Density in Rural Unlit Areas



- South Asia rural density in unlit areas typically >100 people per square km
- Sub-Saharan Africa rural density in unlit areas typically <50 people per square km

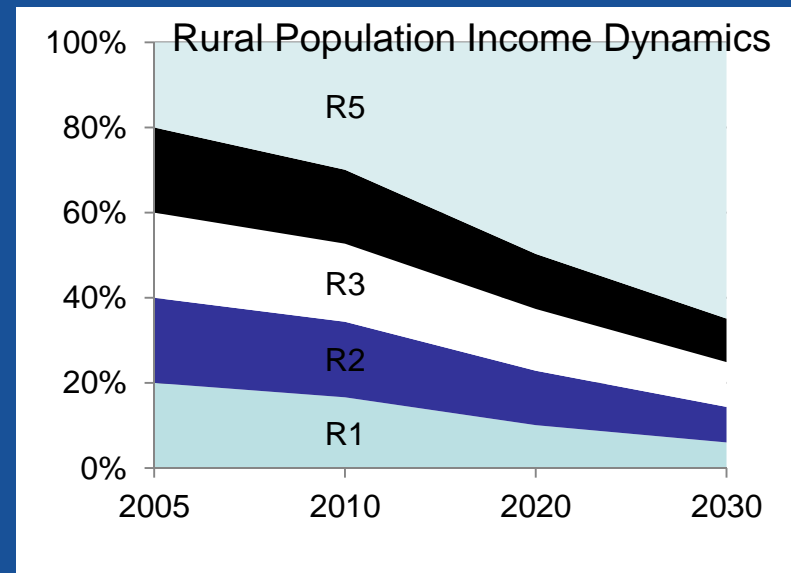
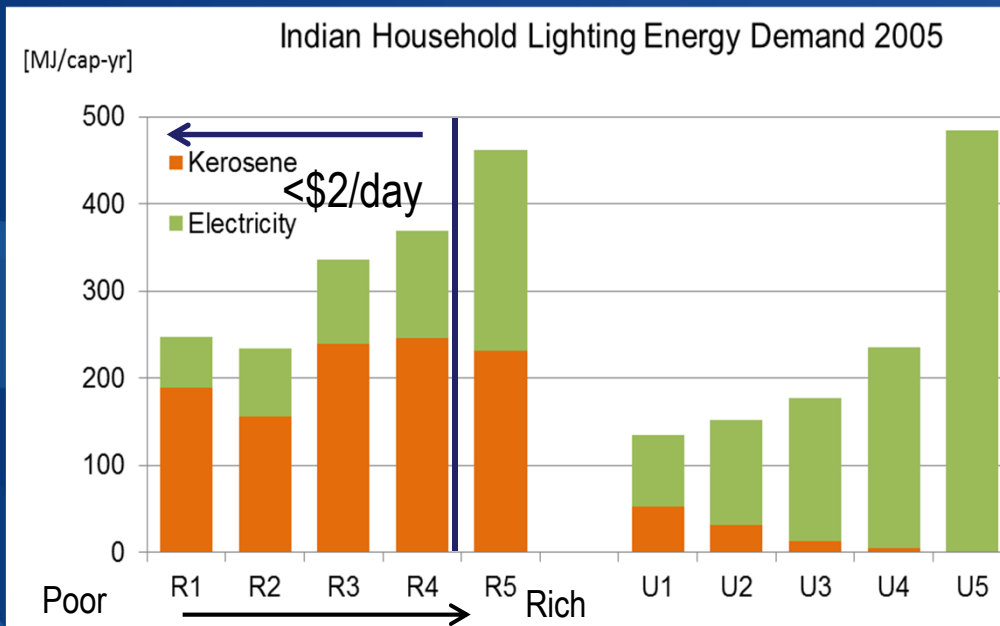
# Decentralized Electrification Options Suited to Some Regions in Kenya



# Insights for Maximizing Well-being through Electrification Efforts

## 2. Population heterogeneities and time dynamics matter

# Demands and Incomes are Heterogeneous and Dynamic



# Insights for Maximizing Well-being through Electrification Efforts

3. Benefits are multiple and their estimation is vital

# Multiple Benefits

## Benefits of Saved Kerosene Subsidies in India

72 million rural households (~43%) rely primarily on kerosene for lighting, many more use it for backup

Current kerosene subsidies for rural lighting cost the government >\$1 billion per year

Universal electrification by 2030, could save \$0.6-0.7 billion per year in avoided kerosene subsidies for lighting alone

Source: Narula et al. 2012

## Benefits for Indian Non-Farm Enterprises (NFE)

NFE employ 25% of Indian workforce  
50% of which are employed in rural areas  
And 25% of which are women

With access:  
Probability of owning a NFE higher by 5%  
Earnings likely to be higher by 25%

Regular and reliable supply crucial:  
Every hour of supply likely to raise earnings by 0.5%

Source: Rao (in review)

# IIASA's Contribution to Eliminating Extreme Deprivations & Inequalities

- Deeper understanding of multiple dimensions, their interlinkages and drivers
- Leveraging synergies in investments by identifying and estimating multiple benefits and gains from better coordination across policy domains.