

Environmental Justice in the Anthropocene Symposium

Fort Collins, 24-25 April 2017

## Energy Justice and Energy Access in the Global South

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# Energy justice?

- Derives from environmental justice
- Tensions between (LaBelle, 2017)
  - Universal energy justice
    - Procedural justice (via e.g. energy regulators) and distributional justice (implies energy affordable) + sustainable (reduce present and inter-generational externalities)
  - Particular energy justice
    - Recognition justice of cultural and environmental factors influencing choices around energy technologies and policy preferences for the distribution of energy services

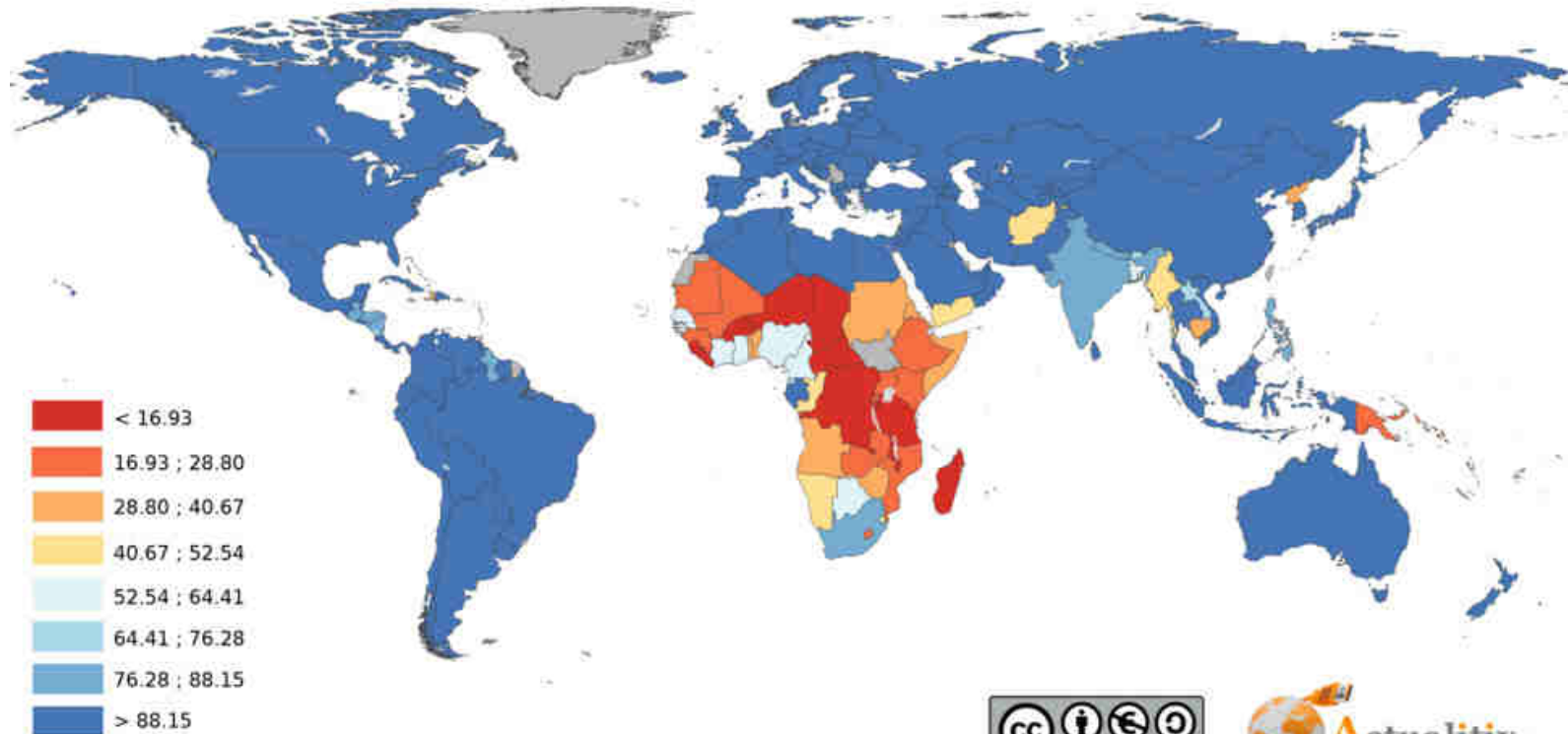
**Energy Consumption by Country**

Legend:

- More than 400 million Btu/person\*year
- 250 to 400 million Btu/person\*year
- 150 to 249 million Btu/person\*year
- 75 to 149 million Btu/person\*year
- 25 to 74 million Btu/person\*year
- 10 to 24 million Btu/person\*year
- 5 to 9 million Btu/person\*year
- Less than 5 million Btu/person\*year

# Unequal electrification rate

Access to electricity (% of population)



Source : The World Bank - 2012  
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# Lorenz curves for residential electricity in 5 countries

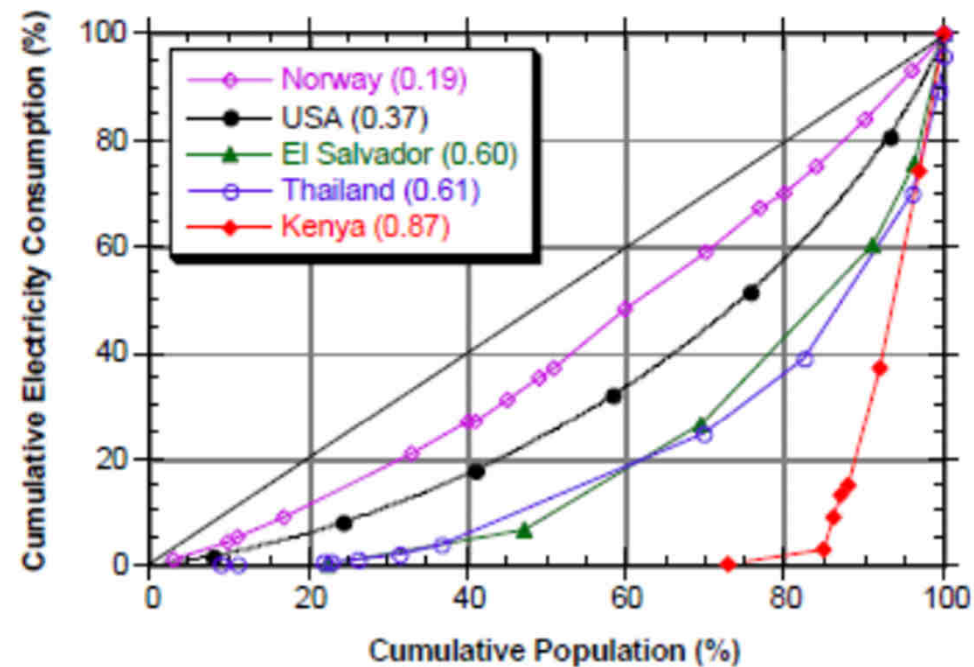


Fig. 2. Lorenz curves for residential electricity in five countries. The Gini coefficients for residential electricity consumption are presented in the legend of the graph in (parentheses).



# Energy transition/energy access 1

- Classic conception of energy transition linked to development (assimilated to growth)
  - Increase of energy intensity with shift in energy sources/ technologies
    - Wood/Charcoal/Coal-steam/Oil...
  - Sources of energy less and less embedded in local communities – more and more capital intensive
  - Energy access assimilated to connection to the grid/network with a central source of generation
  - Sustain unlimited exponential growth
    - Example China energy plans 10 years ago were predicting several time increase of energy generation with coal plants

# Example of time-scale of energy transitions

The United States has shifted to different fuel use patterns

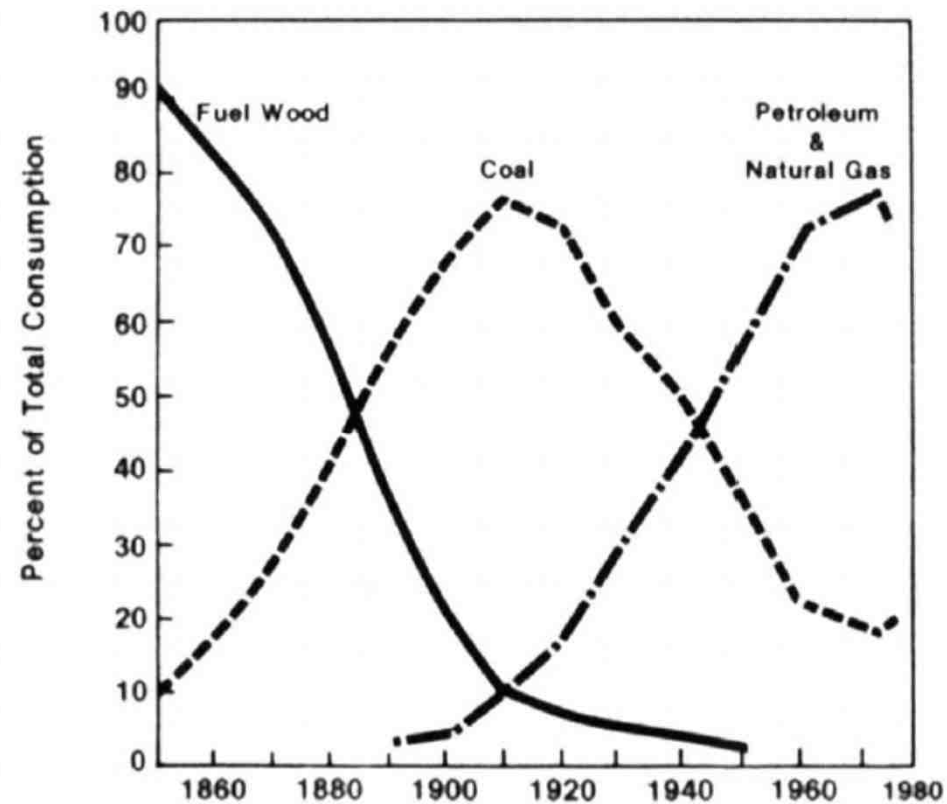
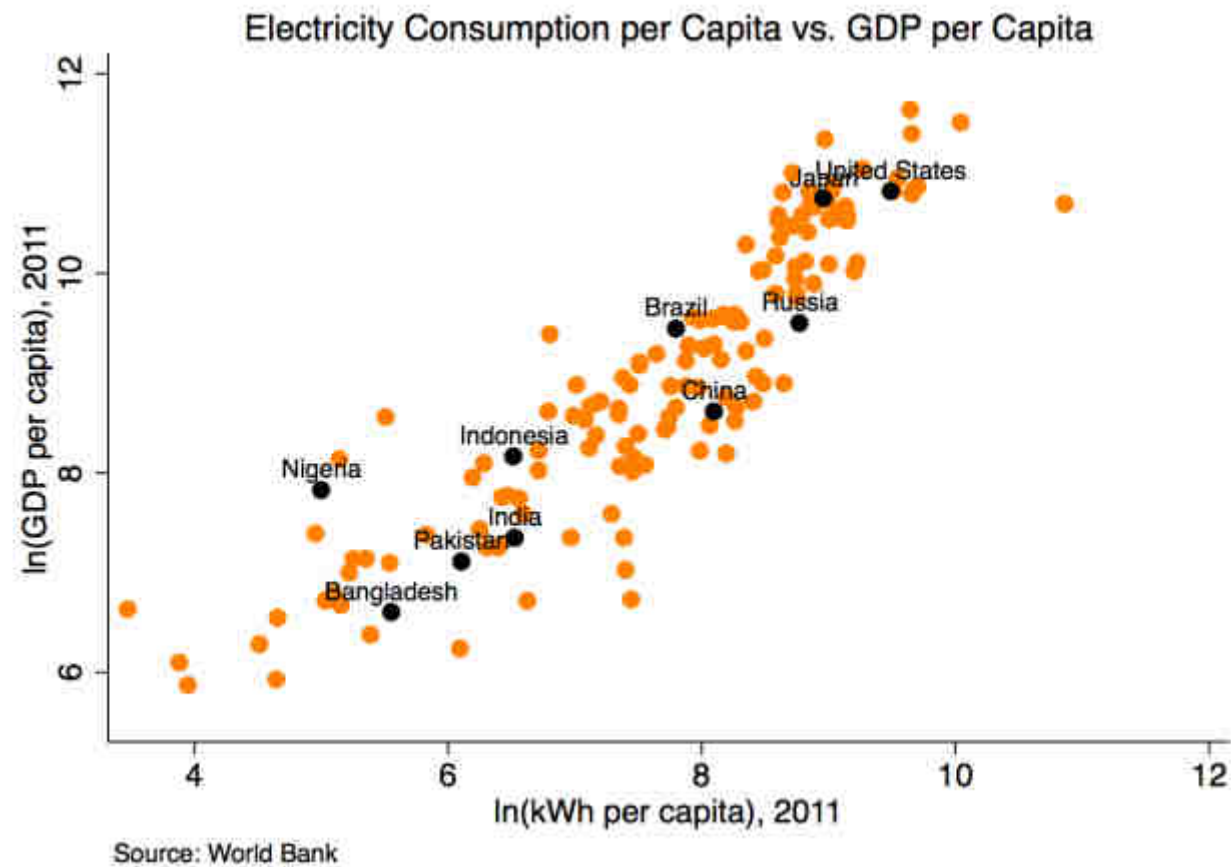
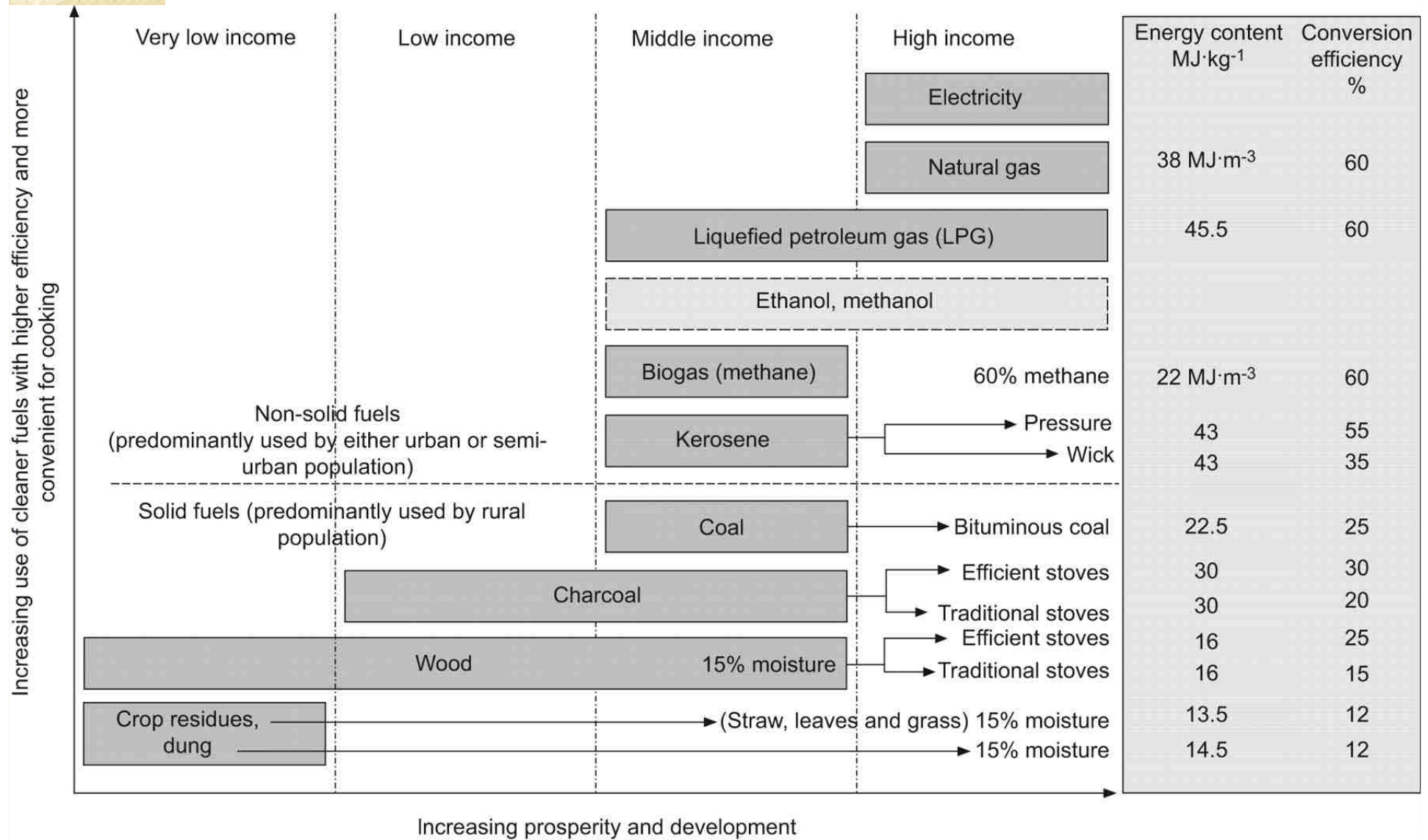


Figure 1. A graph illustrating energy transitions from President Carter's National Energy Plan.  
Source: U.S. EOP, 1977, p. 6.

# Energy as fuel of growth



# Energy access assimilated to “energy ladder”?





# Energy transition/energy access II

- More recent conception of energy transition
  - Recognise “limits of growth”
    - Decoupling – untangling
    - [Development </> growth] </> increase energy intensity
  - Representations of energy
    - Energy not a number of kWh (W. Patterson, 2009)
    - But energy services (which can be provided by small sources of energy)
  - “Good” energy = low-carbon energy <> “Bad” energy
    - Electricity major contributor to carbon emissions
    - Renewable energy technologies & energy efficiency

Table 2-1: Energy Technologies for Power Generation – Moderate Fuel Price Scenario <sup>(a)</sup>

Energy source	Power generation technology		Production Cost of Electricity (COE)			Net efficiency 2007	Lifecycle GHG emissions			Fuel price sensitivity
			State-of-the-art 2007	Projection for 2020	Projection for 2030		Direct (stack) emissions	Indirect emissions	Lifecycle emissions	
			€ <sub>2005</sub> /MWh	€ <sub>2005</sub> /MWh	€ <sub>2005</sub> /MWh		kg CO <sub>2</sub> /MWh	kg CO <sub>2</sub> (eq)/MWh	kg CO <sub>2</sub> (eq)/MWh	
Natural gas	Open Cycle Gas Turbine (GT)	-	65 ÷ 75 <sup>(b)</sup>	90 ÷ 95 <sup>(b)</sup>	90 ÷ 100 <sup>(b)</sup>	38%	530	110	640	Very high
	Combined Cycle Gas Turbine (CCGT)	-	50 ÷ 60	65 ÷ 75	70 ÷ 80	58%	350	70	420	Very high
		CCS	n/a	85 ÷ 95	80 ÷ 90	49% <sup>(c)</sup>	60	85	145	Very high
Oil	Internal Combustion Diesel Engine	-	100 ÷ 125 <sup>(b)</sup>	140 ÷ 165 <sup>(b)</sup>	140 ÷ 160 <sup>(b)</sup>	45%	595	95	690	Very high
	Combined Cycle Oil-fired Turbine (CC)	-	95 ÷ 105 <sup>(b)</sup>	125 ÷ 135 <sup>(b)</sup>	125 ÷ 135 <sup>(b)</sup>	53%	505	80	585	Very high
Coal	Pulverised Coal Combustion (PCC)	-	40 ÷ 50	65 ÷ 80	65 ÷ 80	47%	725	95	820	Medium
		CCS	n/a	80 ÷ 105	75 ÷ 100	35% <sup>(c)</sup>	145	125	270	Medium
	Circulating Fluidised Bed Combustion (CFBC)	-	45 ÷ 55	75 ÷ 85	75 ÷ 85	40%	850	110	960	Medium
	Integrated Gasification Combined Cycle (IGCC)	-	45 ÷ 55	70 ÷ 80	70 ÷ 80	45%	755	100	855	Medium
		CCS	n/a	75 ÷ 90	65 ÷ 85	35% <sup>(c)</sup>	145	125	270	Medium
Nuclear	Nuclear fission	-	50 ÷ 85	45 ÷ 80	45 ÷ 80	35%	0	15	15	Low
Biomass	Solid biomass	-	80 ÷ 195	85 ÷ 200	85 ÷ 205	24% ÷ 29%	6	15 ÷ 36	21 ÷ 42	Medium
	Biogas	-	55 ÷ 215	50 ÷ 200	50 ÷ 190	31% ÷ 34%	5	1 ÷ 240	6 ÷ 245	Medium
Wind	On-shore farm	-	75 ÷ 110	55 ÷ 90	50 ÷ 85	-	0	11	11	nil
	Off-shore farm	-	85 ÷ 140	65 ÷ 115	50 ÷ 95	-	0	14	14	
Hydro	Large	-	35 ÷ 145	30 ÷ 140	30 ÷ 130	-	0	6	6	nil
	Small	-	60 ÷ 185	55 ÷ 160	50 ÷ 145	-	0	6	6	
Solar	Photovoltaic	-	520 ÷ 880	270 ÷ 460	170 ÷ 300	-	0	45	45	nil
	Concentrating Solar Power (CSP)	-	170 ÷ 250 <sup>(d)</sup>	110 ÷ 160 <sup>(d)</sup>	100 ÷ 140 <sup>(d)</sup>	-	120 <sup>(d)</sup>	15	135 <sup>(d)</sup>	Low

<sup>(a)</sup> Assuming fuel prices as in 'European Energy and Transport: Trends to 2030 - Update 2007' (barrel of oil 54.5\$<sub>2005</sub> in 2007, 61\$<sub>2005</sub> in 2020 and 63\$<sub>2005</sub> in 2030)

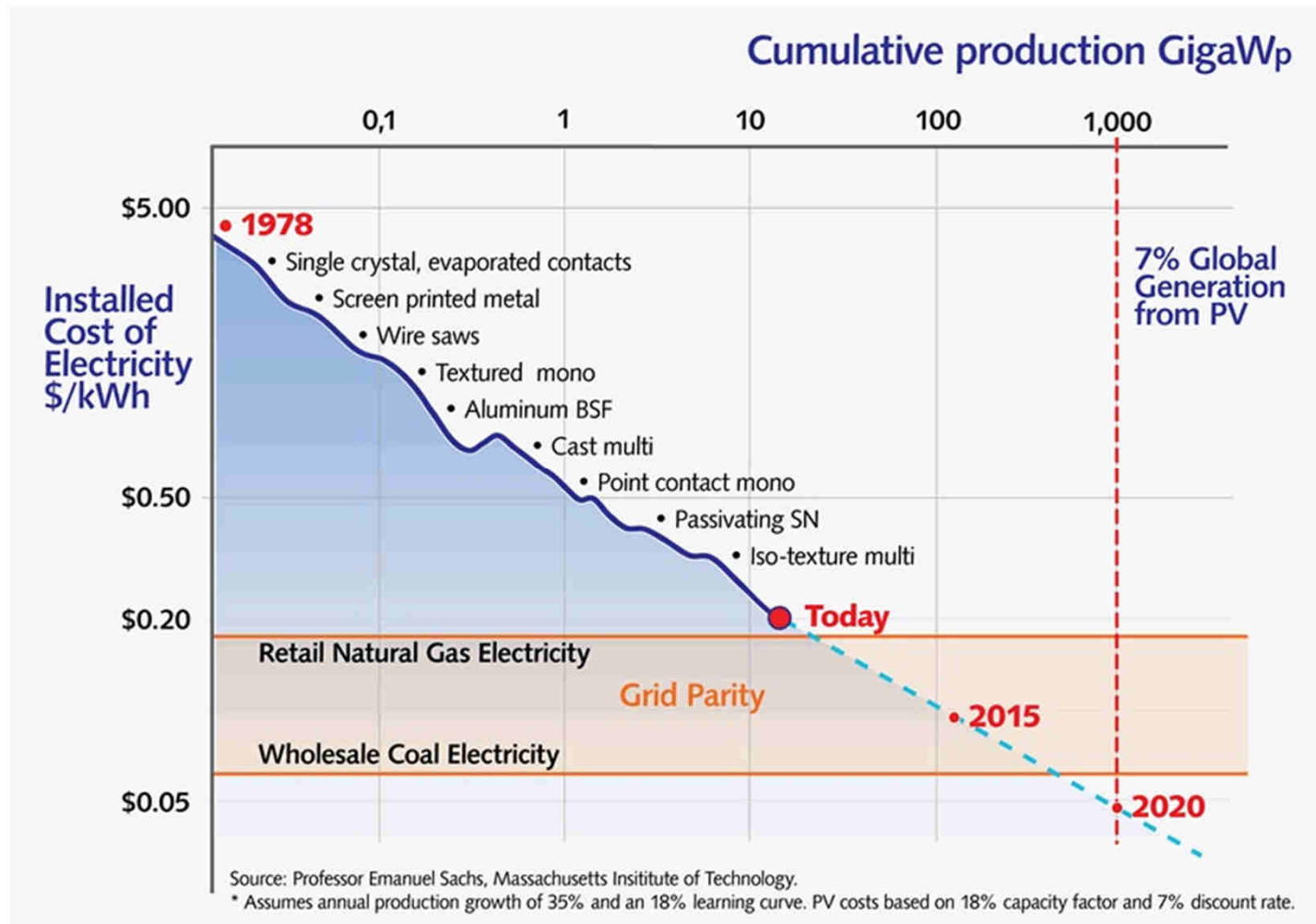
<sup>(b)</sup> Calculated assuming base load operation

<sup>(c)</sup> Reported efficiencies for carbon capture plants refer to first-of-a-kind demonstration installations that start operating in 2015

<sup>(d)</sup> Assuming the use of natural gas for backup heat production

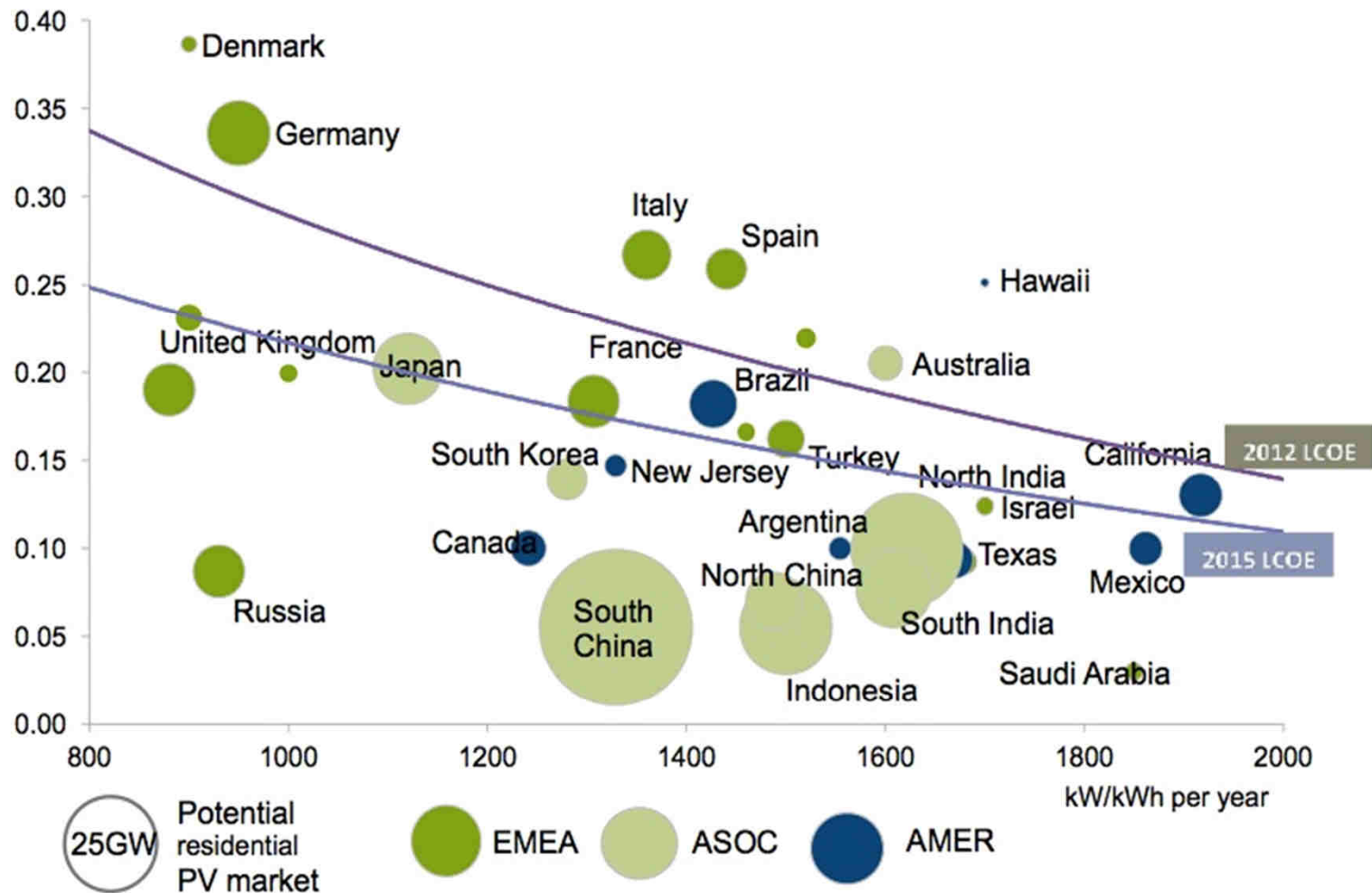
Source: JRC, 2007

# Economic reality of RET like solar PV



# Economic rational - photovoltaic/grid

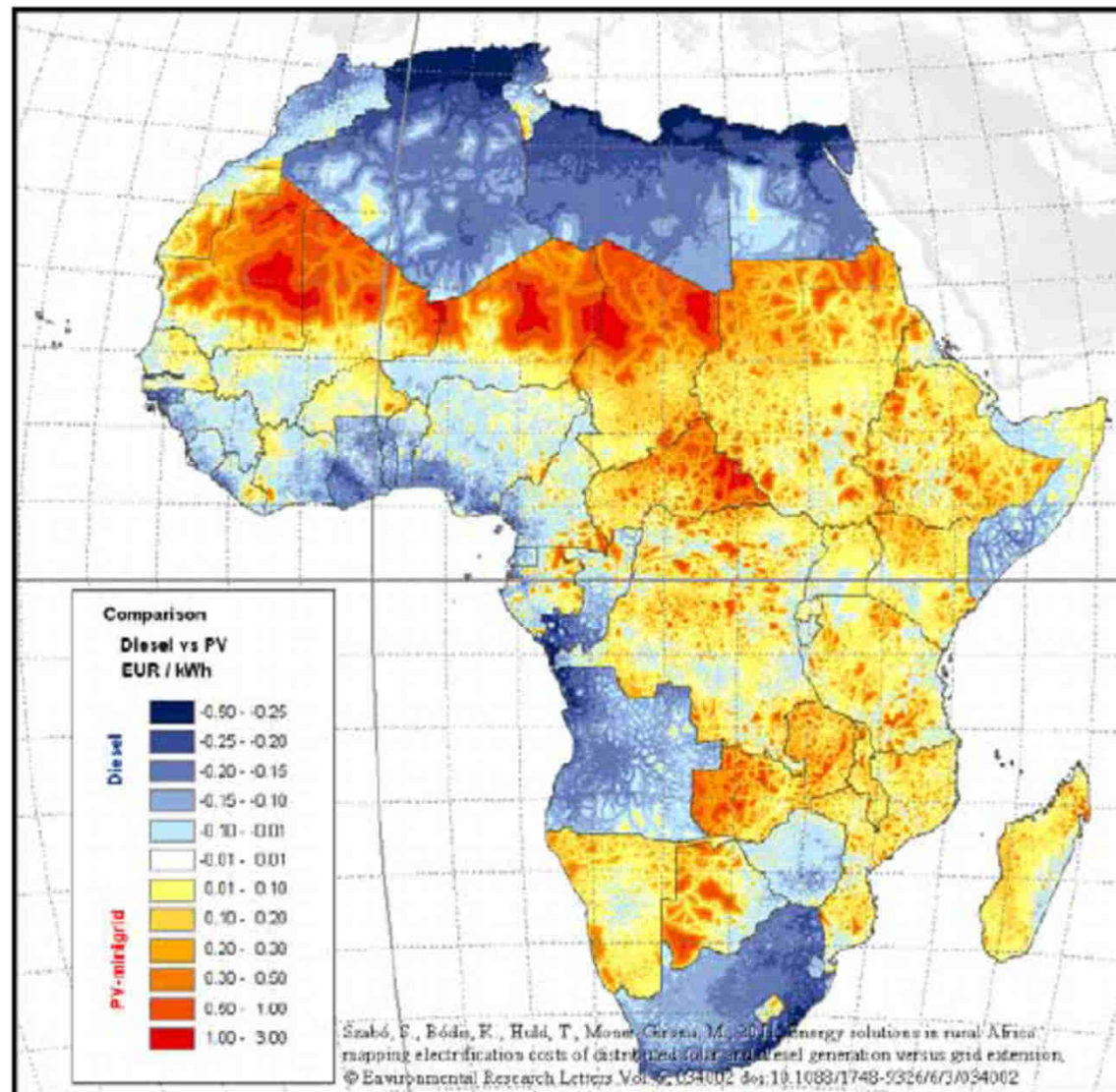
FIGURE 39: ESTIMATED RESIDENTIAL PV PRICE PARITY IN 2012 AND 2015, \$ PER KWH



LCOE based on 6% weighted average cost of capital, 0.7%/year module degradation, 1% capex as O&M annually. \$2.65/W capex assumed for 2012.

Source: Bloomberg New Energy Finance

# Solar mini-grid PV vs diesel in Africa



Source: Szabo et al. Env. Research Letter, 6 (2011)

# Different paths for energy access

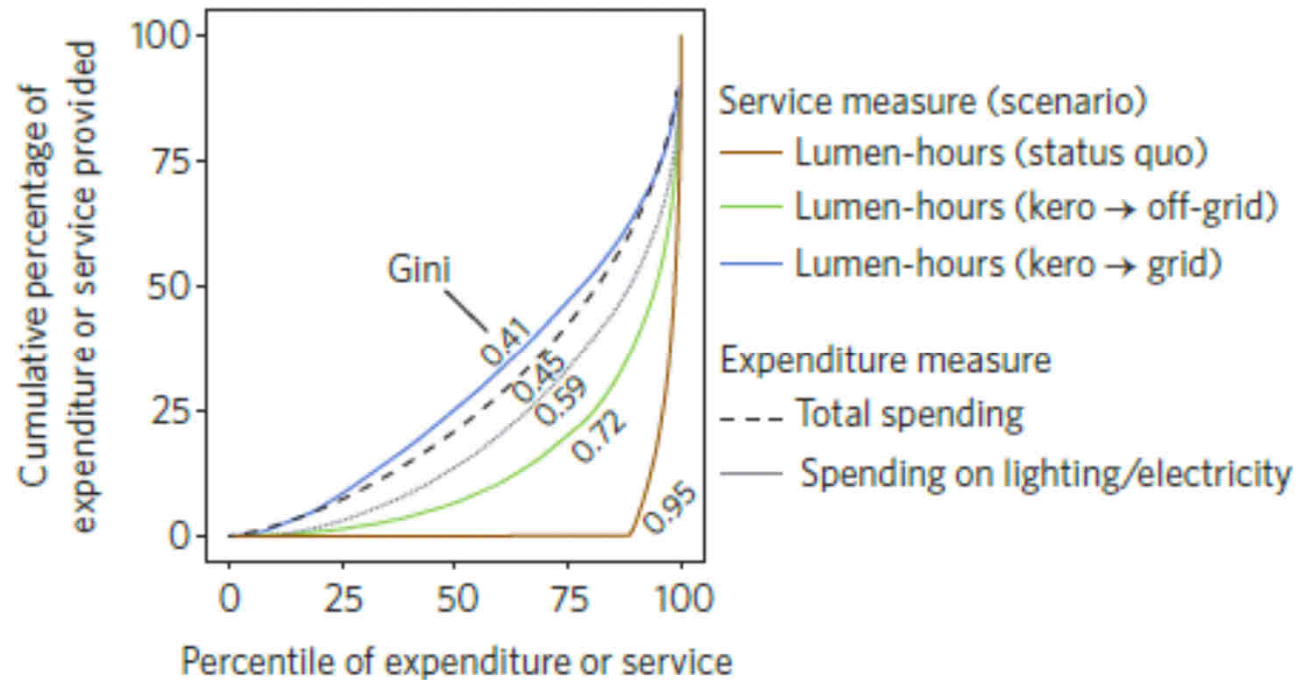
	Small decentralised energy	Large centralised energy
<b>Traditional energy</b>	<u>Wood/Charcoal for cookstoves</u> "Free" Time spent to collect wood Deforestation Indoor air pollution	
<b>Conventional energy</b>	<u>Diesel generation – genset</u> Noisy / polluting / high running cost  <u>Kerosene Lanterns</u> Burnt / Fire	<u>Coal – gas plant</u> Externalities Green house gases – air quality – mining impact
<b>Renewable energy</b>	<u>Solar Home systems – micro-hydro...</u> High investment cost / low running cost Small power delivered <b>BUT at large scale some externalities</b> Jobs creation	<u>Solar or wind farm</u> Intermittency High Cost – "luxury" for developing countries <b>NOW Lower cost than conventional energies</b> Reduction oil import



# Energy access with RETs & energy justice

- **Distributional Justice**
  - No more trade-off between cost and externalities
    - Small solar systems & mini-grid more affordable than diesel
  - Less environmental impact intra & intergenerational
    - More efficient due to small size and no grid losses
  - Spatial equity (even remote places can be electrified)
- **Procedural Justice**
  - Community involvement easier
  - Less prone to corruption

# Solar off-grid reduce un-equalities?



Simulation for energy access households in Kenya

Source: Alstone, Gersheson, Kammen (2015)



## Conclusion: impact of mainstream renewables?

- Large RETS like wind farms or solar farms
  - Profit-driven – maximisation outputs
  - Externalities (noise,...)
    - Non-inclusive - Relocation of inhabitants
- Small systems disseminated large scale
  - Social entrepreneurs – consumer satisfaction
  - Low quality products
    - Recycling and long-term sustainability
    - Limited choice – consumers not citizens
- RET mainstream vs conventional fossils fuels
  - Energy access increase in terms of rate of electrification
  - Own use/interpretation of energy linked to local social dynamics

# THANK YOU!

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"This document is an output from a project co-funded by UK aid from the UK Department for International Development (DFID), the Engineering & Physical Science Research Council (EPSRC) and the Department for Energy & Climate Change (DECC), for the benefit of developing countries. The views expressed are not necessarily those of DFID, EPSRC or DECC, or any institution partner of the project."

