



EN 653/PS 611

Energy Policy Analysis

L9 (22nd January 2019)

India Inequality Share of top 1%



Figure 10: Share of top 1% in national income

India Inequality Share of top 0.1%



Figure 11: Share of top 0.1% in national income

India Inequality Share of bottom 50%

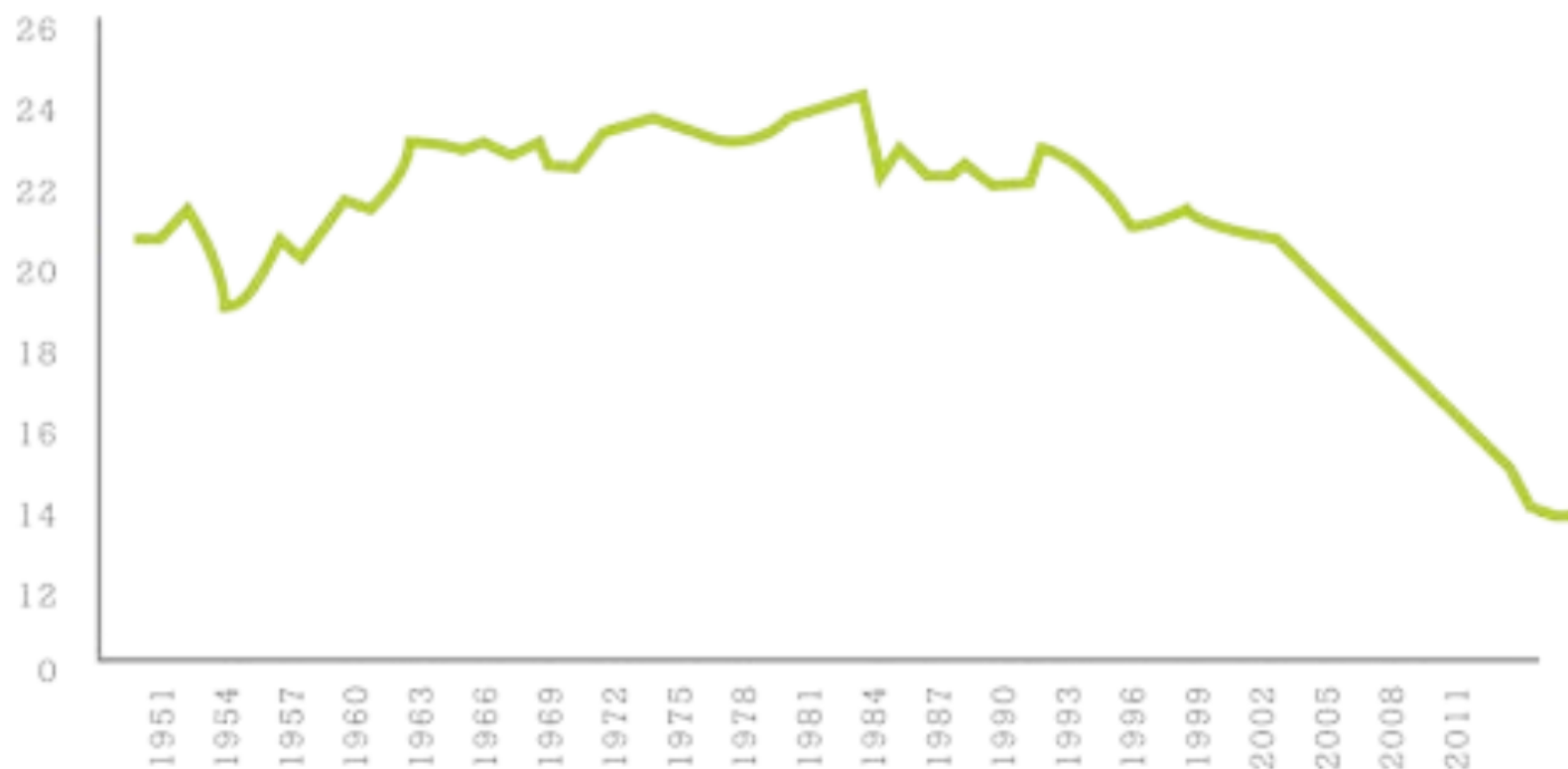


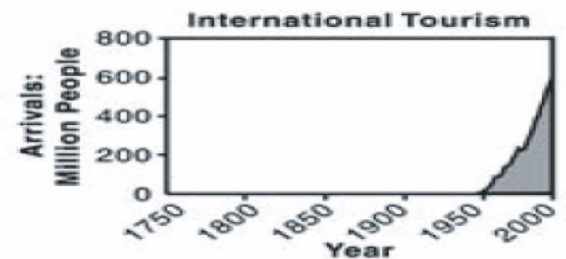
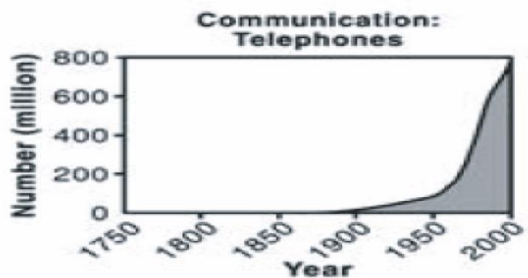
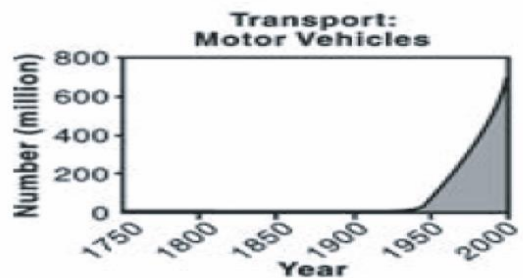
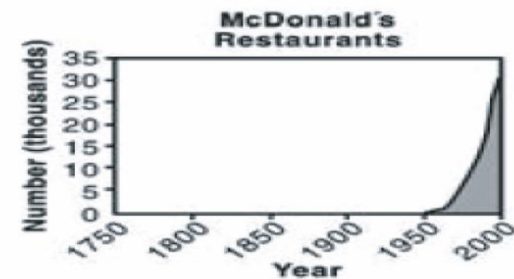
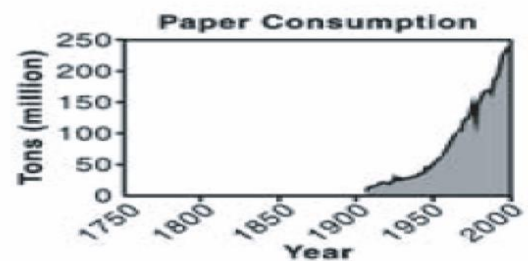
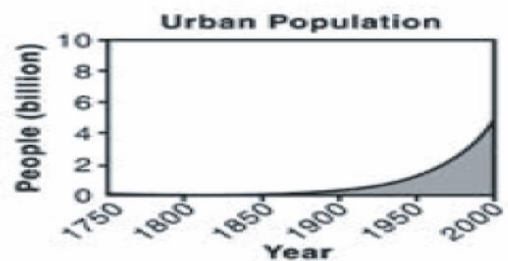
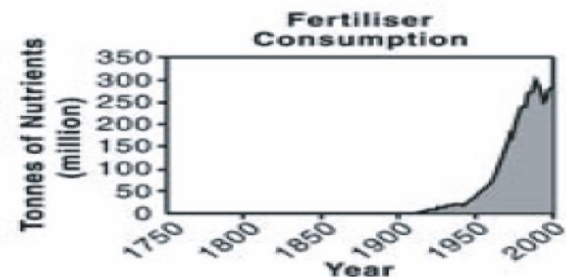
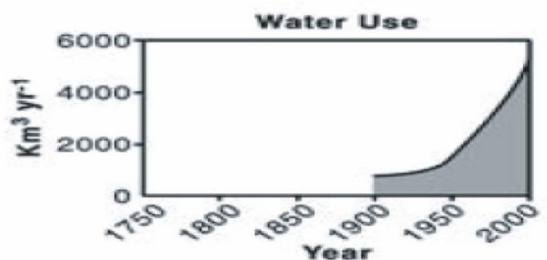
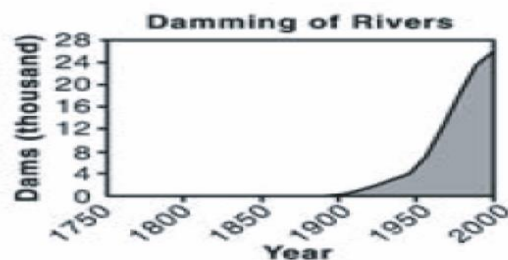
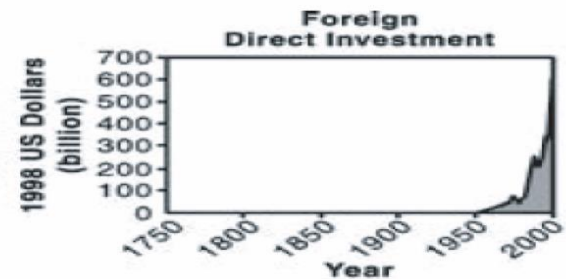
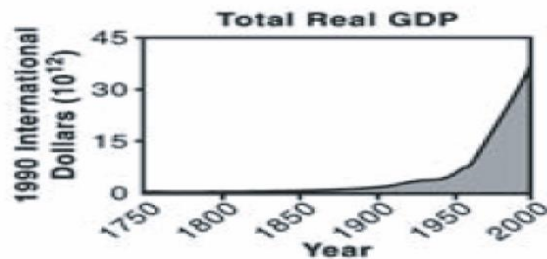
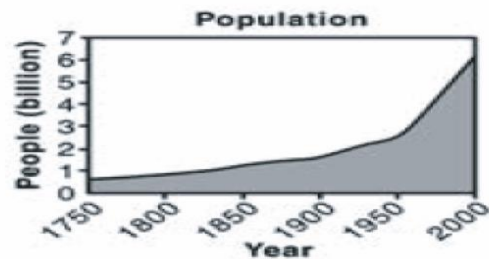
Figure 12: Share of bottom 50% in national income

India Inequality Share of middle 40%



Figure 13: Share of middle 40 % (50th – 90th percentile) in total income

Global Trends – Unbounded Growth?





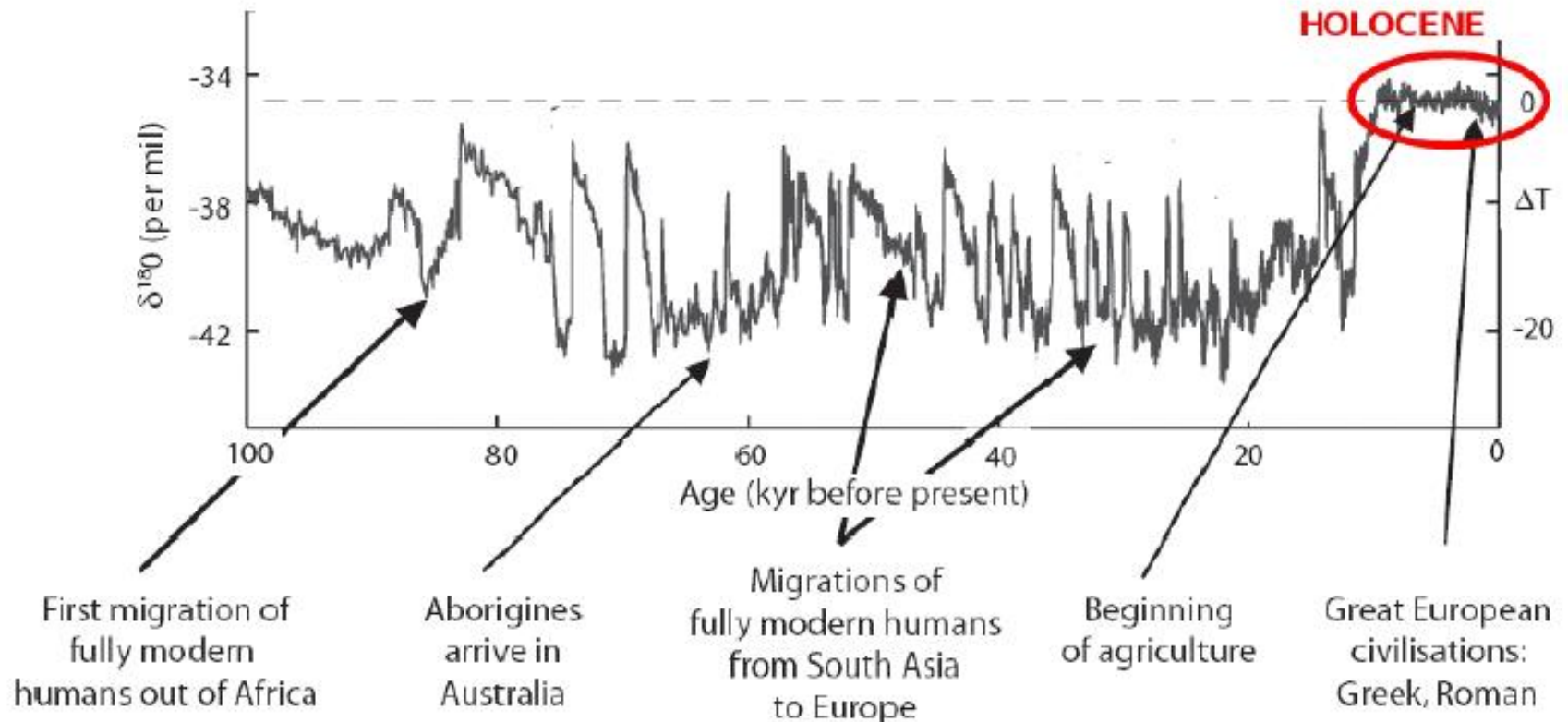
What is sustainable Development?

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Brundtland Report WCED 1987

Development without cheating our children

Long term global temperature record

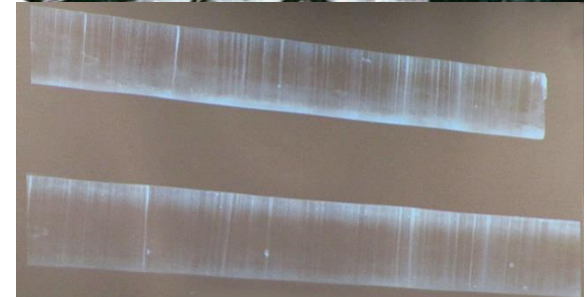
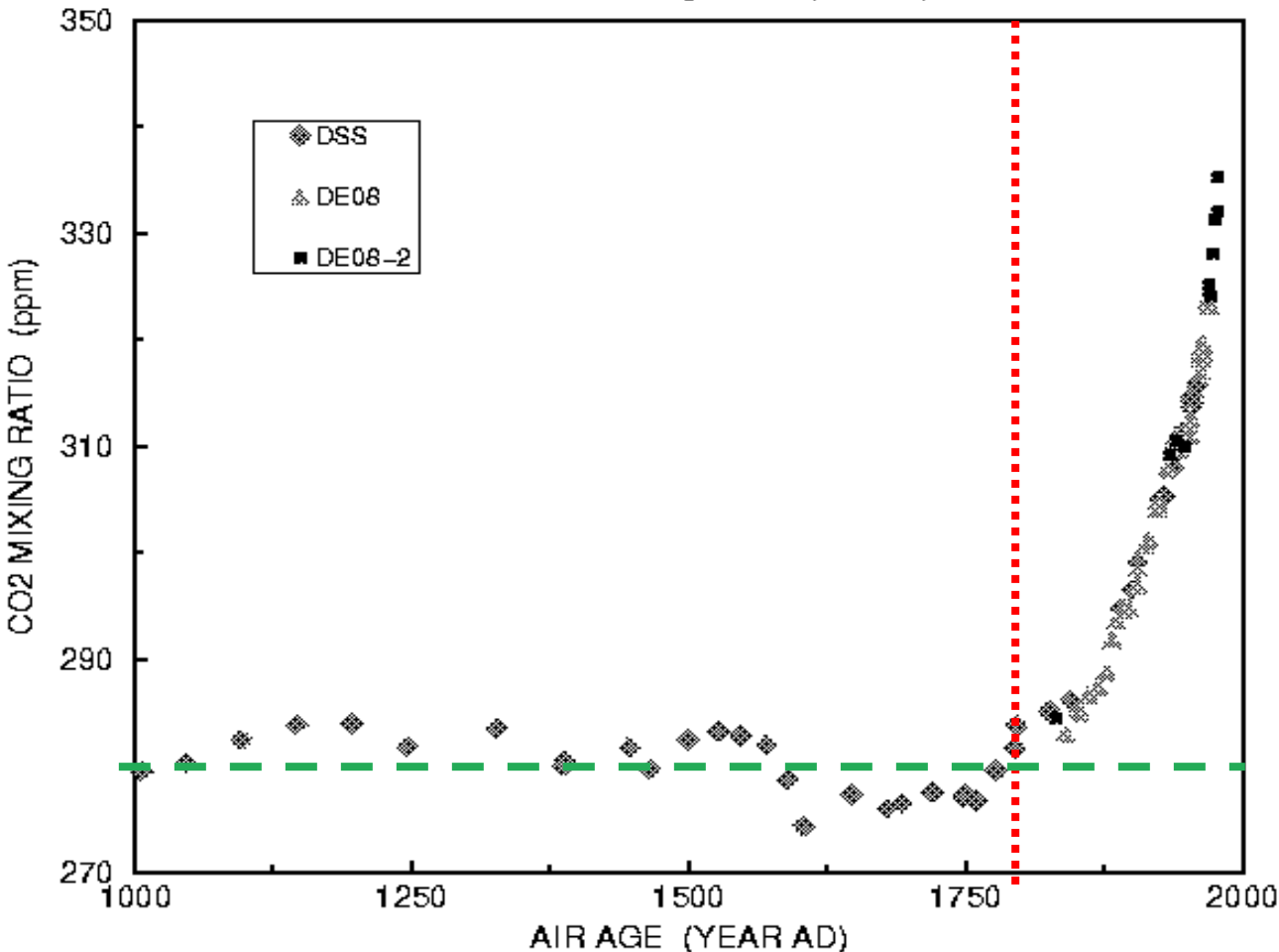


Rockstrom et al, Nature 2009

Carbon Dioxide Concentrations

LAW DOME, ANTARCTICA ICE CORES

Source: Etheridge et al. (CSIRO)



<http://cdiac.ornl.gov/trends/co2/graphics/lawdome.gif>

Climate Change



The Tragedy of the Commons

Science 13 Dec 1968:

Vol. 162, Issue 3859, pp. 1243-1248

Garrett Hardin





India's INDC

#1 Reduce Emissions Intensity of GDP by 33-35% of 2005 level in 2030

#2 Create 40% cumulative non fossil power by installed capacity by 2030 (using finance from Green Climate Fund)

#3 Create an additional carbon sink of 2.5 to 3 billion tonnes of CO₂ equivalent through additional tree cover and forest



Kaya Identity

Total CO₂ Emissions =

$(\text{CO}_2/\text{E})(\text{E}/\text{GDP})(\text{GDP}/\text{Pop})\text{Pop}$

CO₂/E – Carbon Intensity

E/GDP- Energy Intensity of Economy

India and World (Selected Indicators for 2015)



Population	1311.1 million	7334 million
GDP (PPP)	7364.8 Billion 2010 US\$ (5823 \$/person)	105035 Billion 2010 US\$ (14322\$/person)
Primary Energy	34.5 EJ	524 EJ
Energy/person	26.3GJ/person/year	71.4 GJ/person/year
Electricity/person	800 kWh/capita/year	3052 kWh/capita/year
CO₂ emissions	2066.0 Million tonnes	32294 Million tonnes
CO₂/Per population	1.58 tonnes /capita/year	4.4 tonnes /capita/year
CO₂/GDP	0.90 kg /2010US\$	0.43 kg /2010US\$

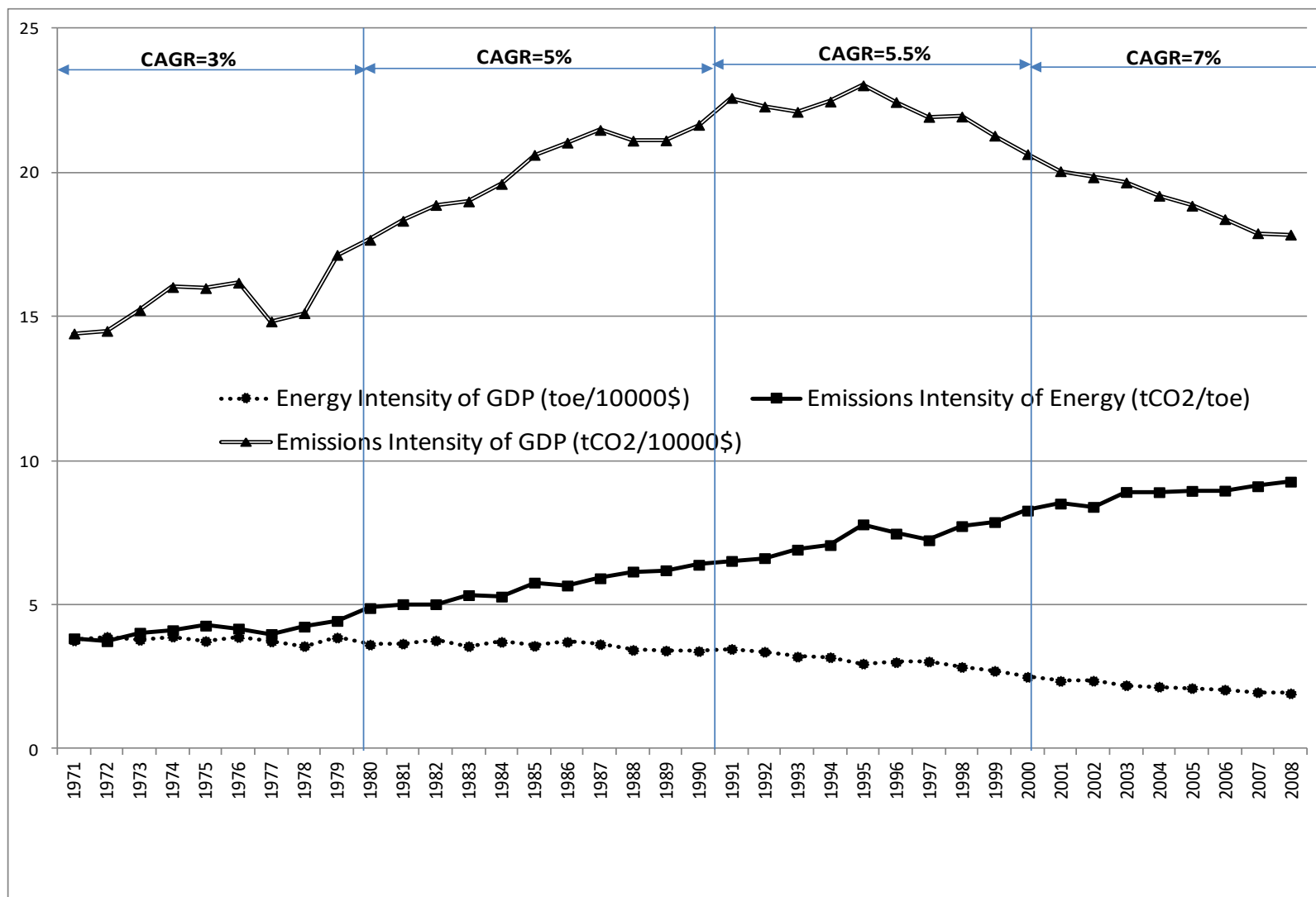
Source: IEA, Key World Energy Statistics 2017



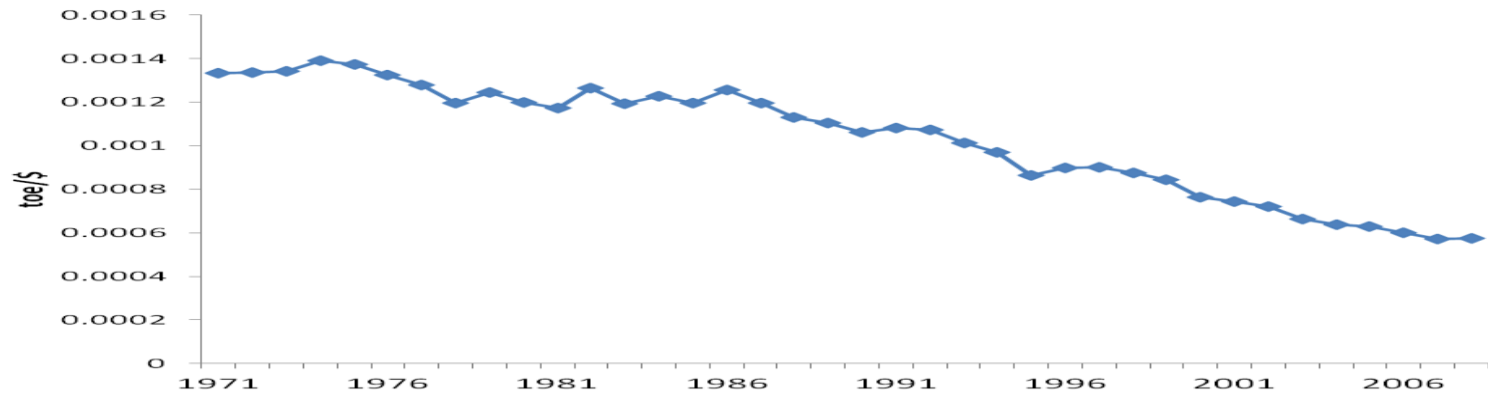
India and World Comparison

	Year	CO ₂ /E (kg/GJ)	E/GDP (MJ/\$)	GDP/Pop (\$/capita)	CO ₂ /Pop (T/capita)	Pop (Billion)	CO ₂ (G <u>T</u> onne)
World	2005	56.0	8.31	8930	4.16	6.5	27.0
	2015	56.0	7.64	10293	4.40	7.3	32.3
India	2005	64.2	14.97	982	0.94	1.1	1.1
	2015	89.2	10.09	1752	1.58	1.3	2.1

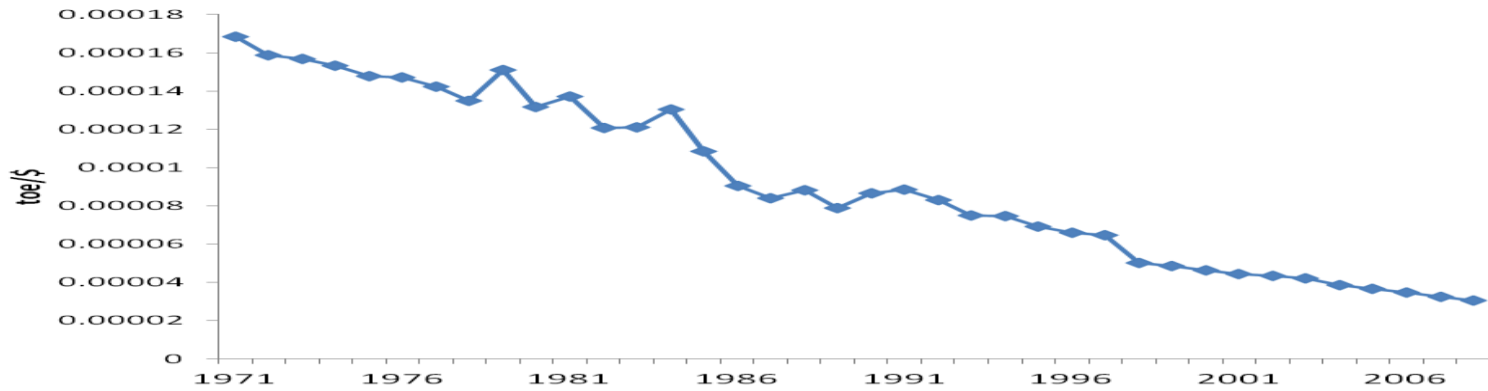
Time Series Trends In Intensity



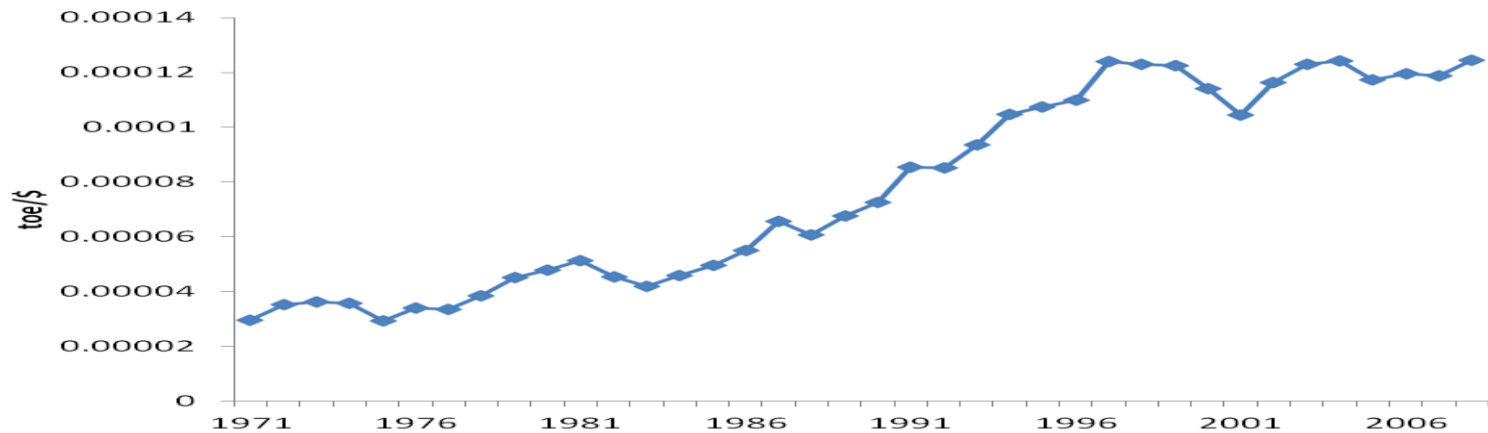
Energy Intensity of GDP - Industry



Energy Intensity of GDP - Services



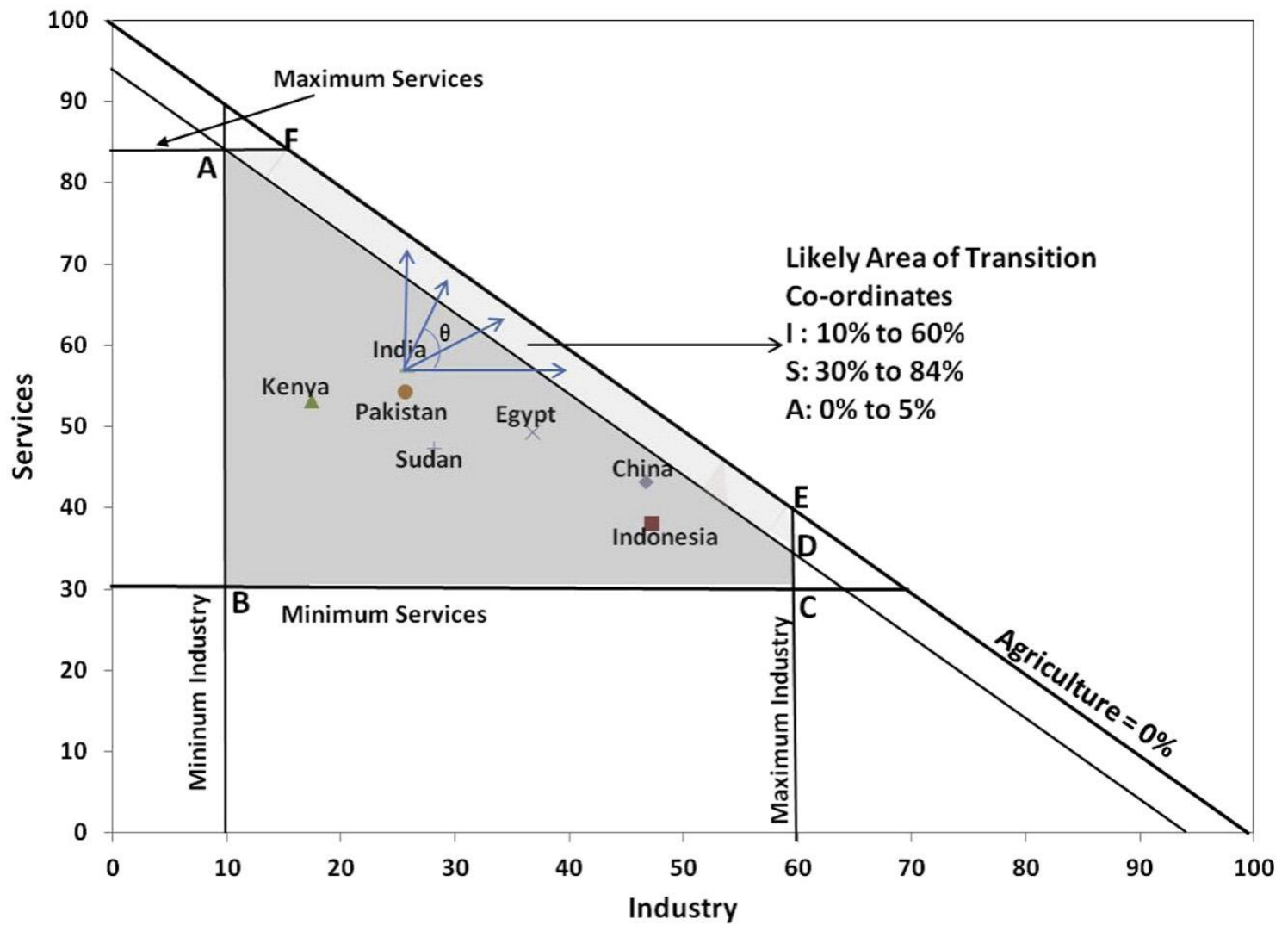
Energy Intensity of GDP - Agriculture



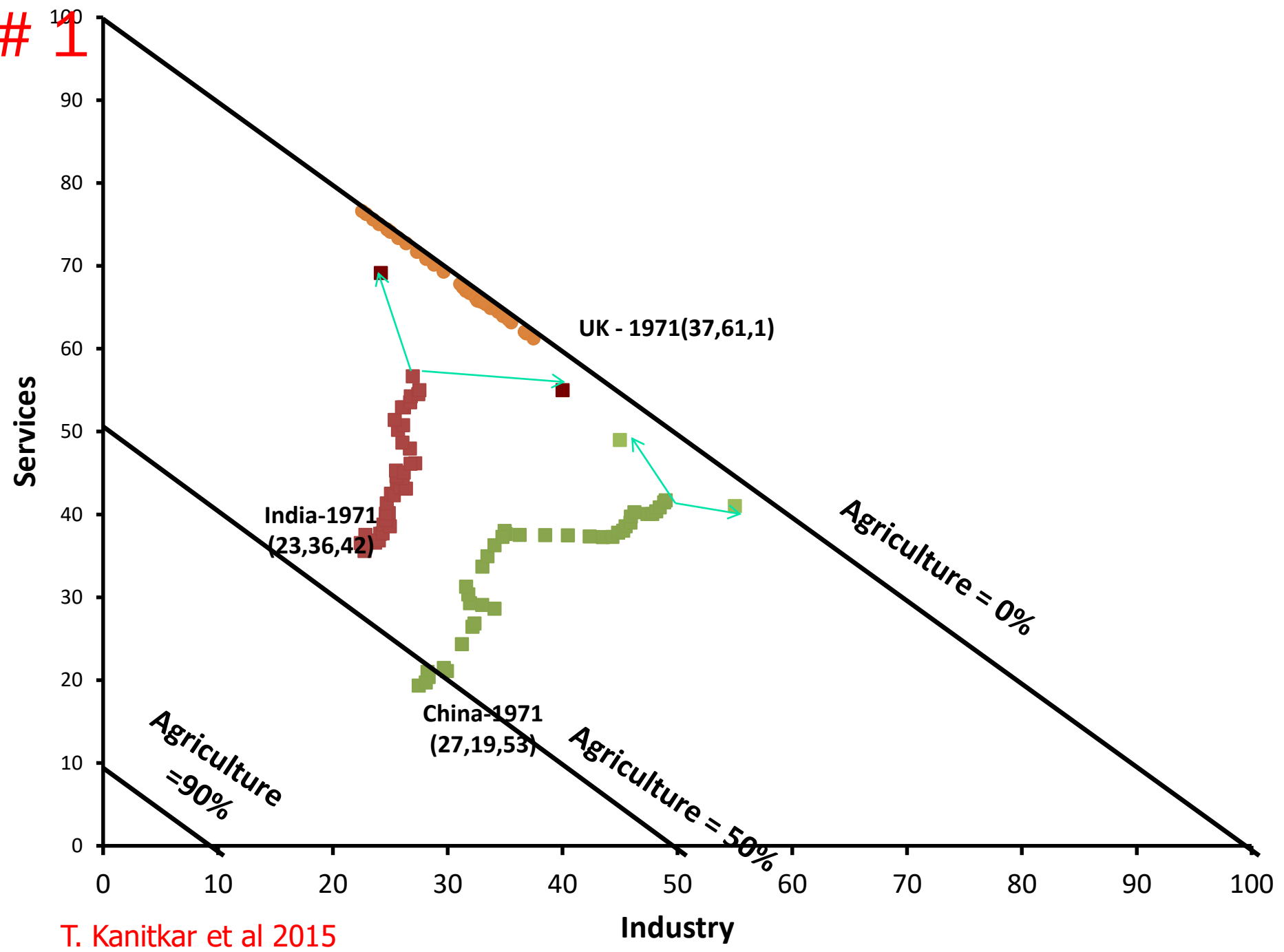


Decomposition Analysis

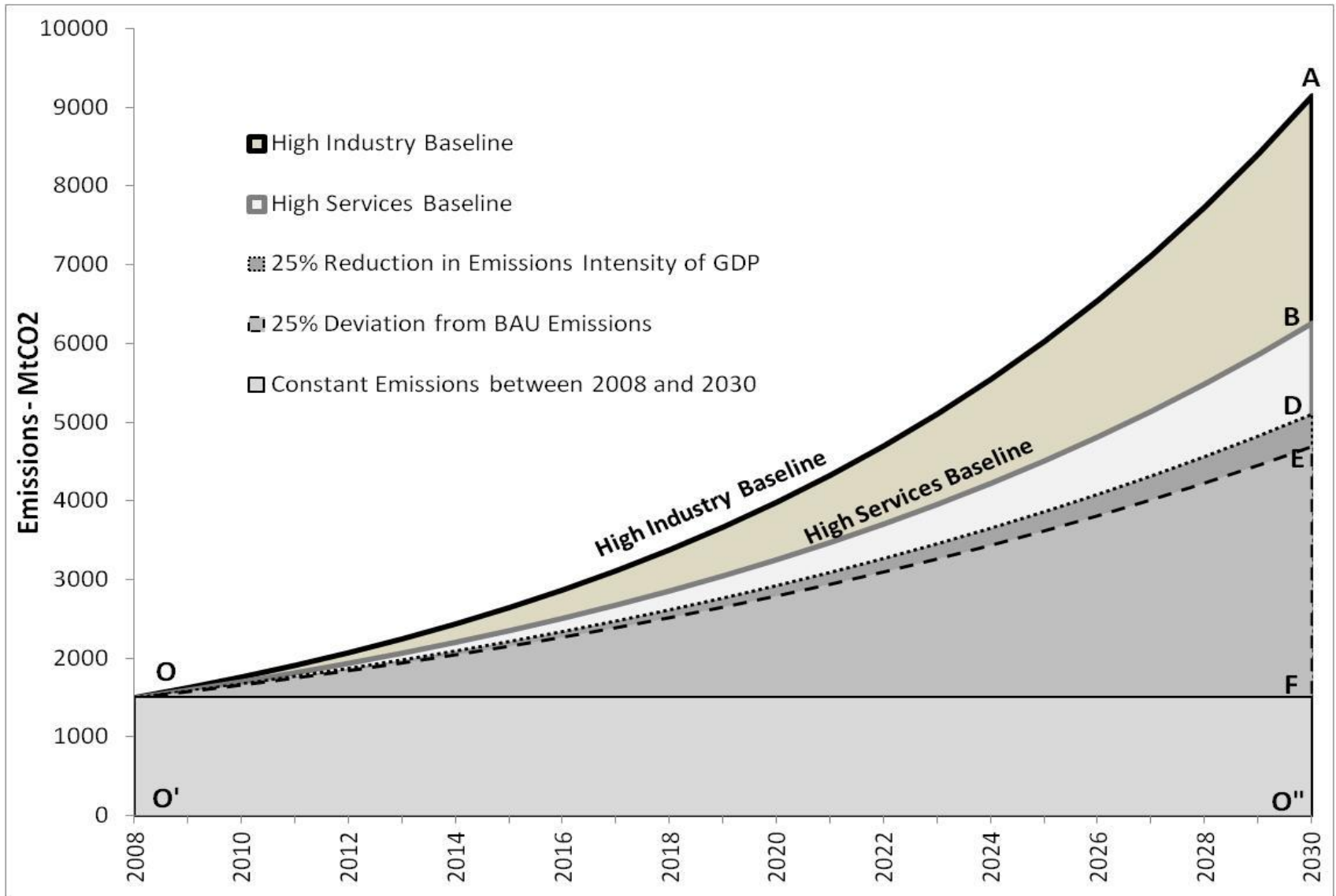
	1971-78	1978-87	1987-95	1995-2008
	Change per year (%)	Change per year (%)	Change per year (%)	Change per year (%)
Total Emissions Intensity	-0.10%	3.88%	0.62%	-1.97%
Change in Structure	0.83%	0.75%	0.70%	0.07%
Change in energy intensity of GDP	-1.54%	-0.13%	-2.70%	-2.99%
Change in Emissions Intensity of Energy	0.74%	3.10%	3.35%	1.57%



1



Emission Reduction Effort



T. Kanitkar et al 2015

Global Energy Transitions

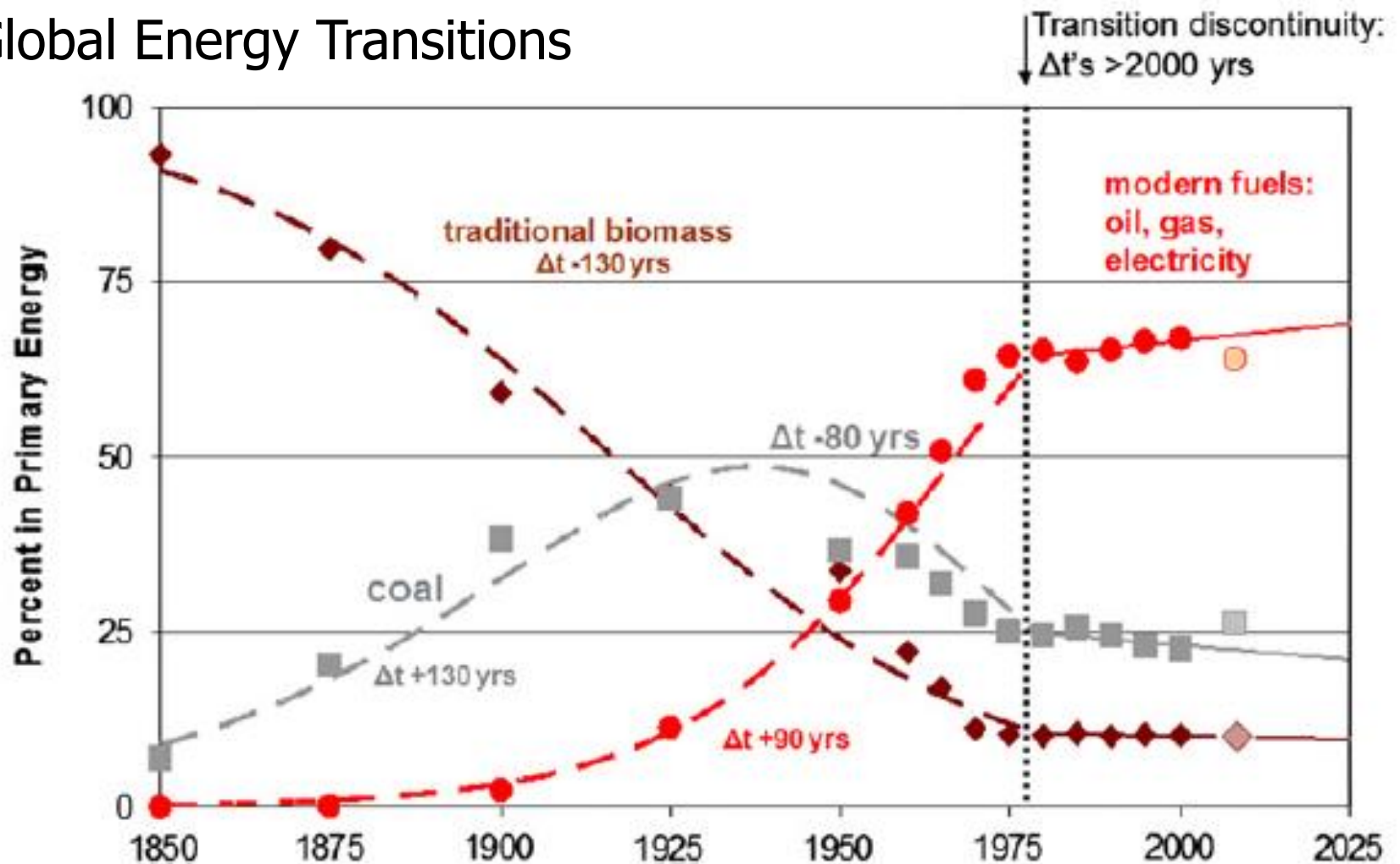
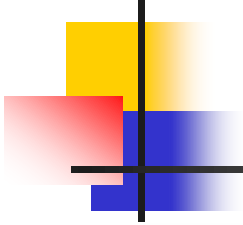


Fig. 1. Two “grand” transitions in world primary energy use 1850–2008 (in percent of primary energy). Symbols denote historical data and lines are model estimates using a multiple logistic substitution model to approximate the historical data. Source: adapted from Wilson and Grubler, 2011.

Grubler, Energy Policy, 2012



Lessons from energy history for climate policy

Roger Fouquet

September 2015

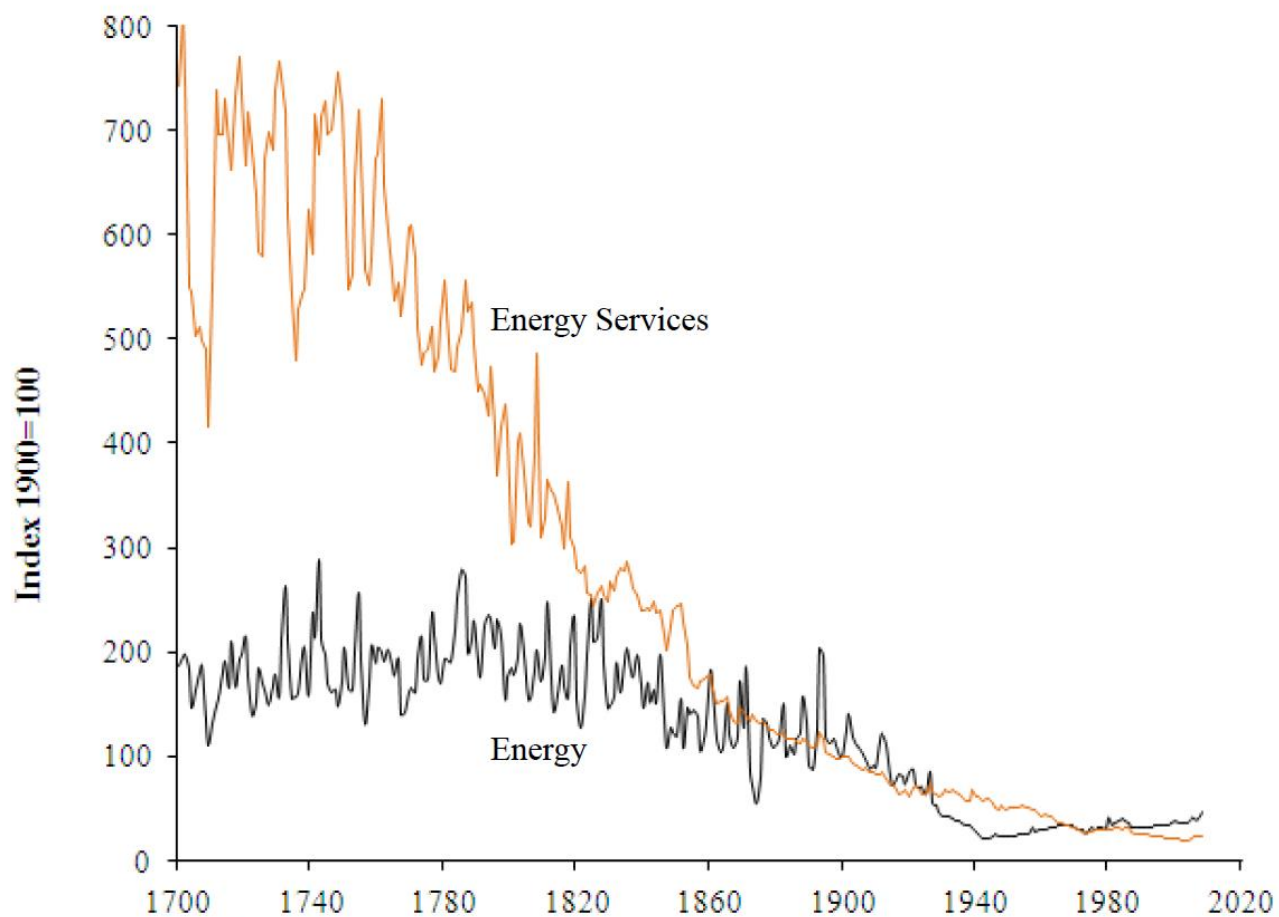
Centre for Climate Change Economics and Policy

Working Paper No. 235

**Grantham Research Institute on Climate Change and
the Environment**

Working Paper No. 209

<http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/09/Working-Paper-209-Fouquet.pdf>



Source: Fouquet (2011)

Figure 1. Average Price of Energy and of Energy Services⁴ in the United Kingdom (1700-2008)

Source: Fouquet (2015)

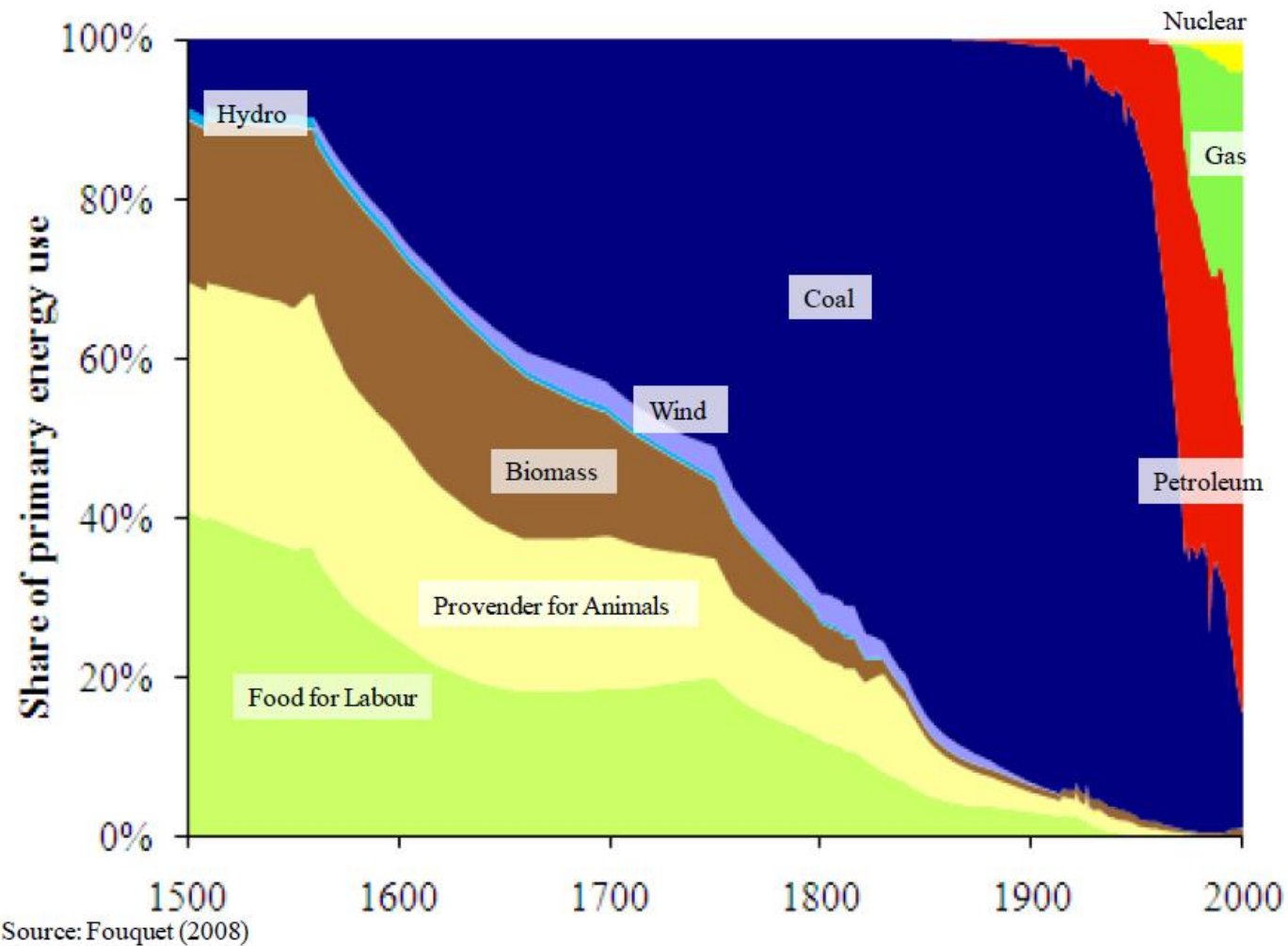


Figure 9. Share of Primary Energy Consumption in the United Kingdom (1500-2000)

Source: Fouquet (2015)



References

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