

Energy for Better or Worse: Local-Global Links between Energy Use and Climate Change

Markku Lehtonen
Science and Technology Policy Research
(SPRU)
University of Sussex

Sylvia Karlsson
Finland Futures Research Centre
Turku School of Economics

Outline

Energy for better...

Energy for some...

...and not for others

Energy for worse (trends)

UK energy policy

Global energy governance

Some big global changes needed

Many, many small local changes needed

Energy for better...

Energy is...?

...the only universal currency

"All natural processes and all human actions involve transformation of energy..."

...Civilization's advances can be seen as a quest for higher energy use converted into increased food harvests and greater mobilisations of materials" (Smil, 2001)

Energy for better...

- human muscles and fire
- draft animals 10,000 years ago in some continents
- waterwheels and windmills 500-1000 AD
- from fire to stoves to furnaces (and gunpowder)

Energy for some...

Today most energy humans use come from combustion engines or electricity generators

Modern energy use total:

Total sales value: 2 trillion USD or 6 % of world GDP

Per capita 1,65 tonnes of oil equivalents

We use much much more energy,
and much much more efficiently

...and not for others

Facts:

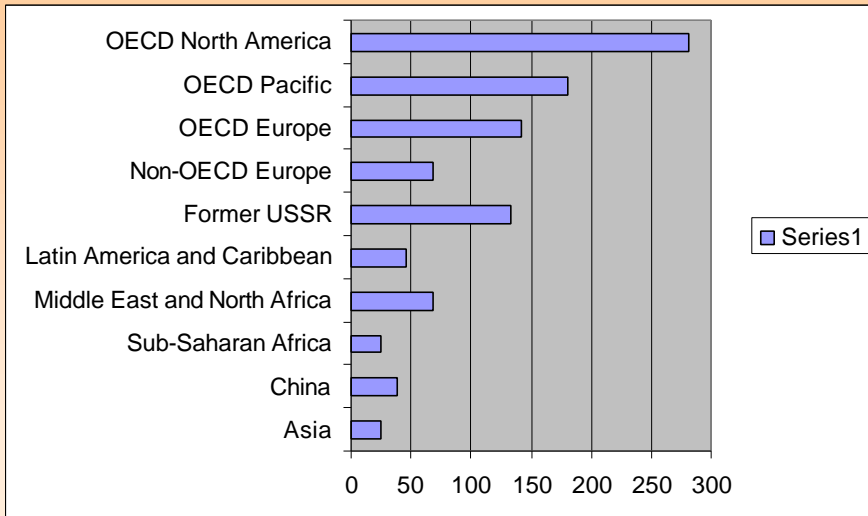
- 2,4 billion people lack access to modern cooking fuels (half of all households and 90% of rural households)
- 1,6 billion lack access to electricity (one quarter of world population)

Consequences:

- poverty
- poor health
- labour demands on women and children
- lack of education
- lack of telecommunication
- driving urbanisation

...and not for others

Per capita energy use (giga joules) by region, 2000



Source: World Energy Assessment Overview 2004 Update

Energy for worse for some...

Health impacts:

- Indoor air pollution: 1 million children
700,000 adults die each year
- Outdoor air pollution: 26,000 children
750,000 adults die each year

Environmental impacts:

- acid rain
- habitat destruction/biodiversity loss

Social/economic impacts:

- human displacement
- too much is (often) no good

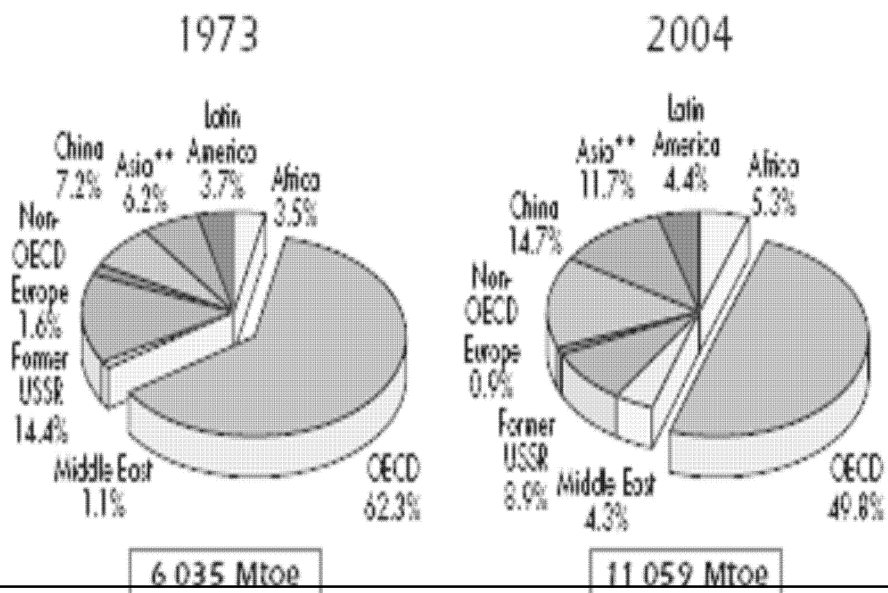
Energy for worse for all...

Energy (mostly fossil fuels) is the key driver (two thirds of Green House Gases come from energy) behind human contributions to climate change

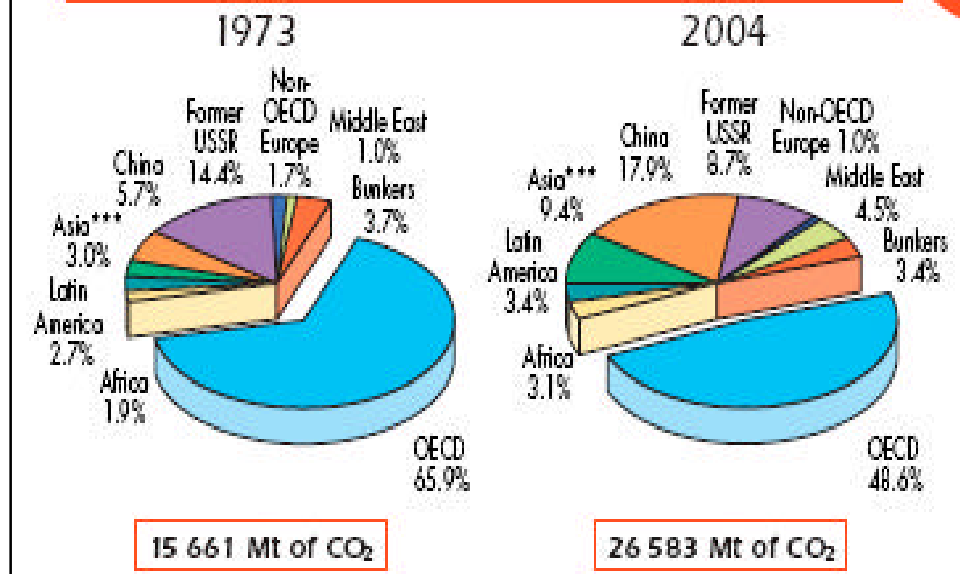
Global CO₂ emissions will increase 50% by 2030 if current policies continue

Most of the future increase expected in the developing world

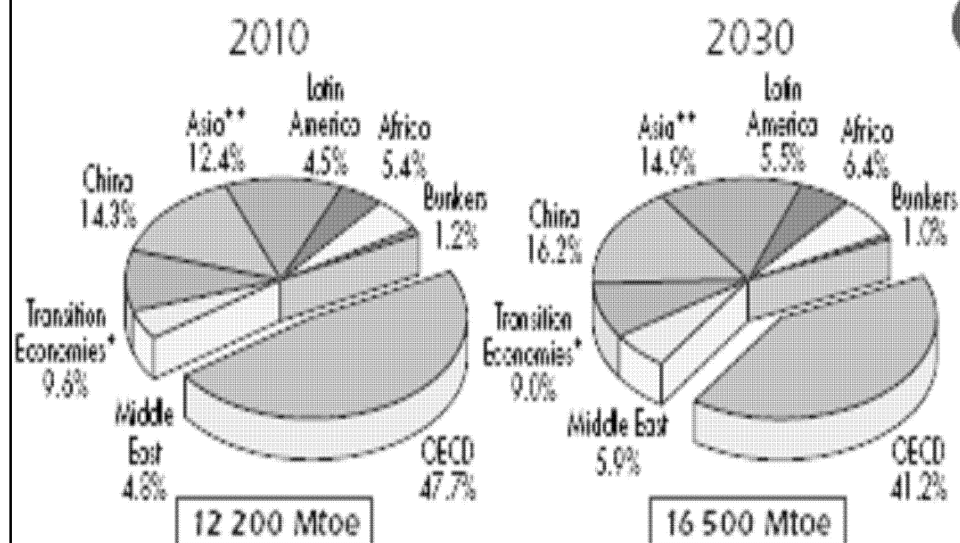
1973 and 2004 Regional Shares of TPES*



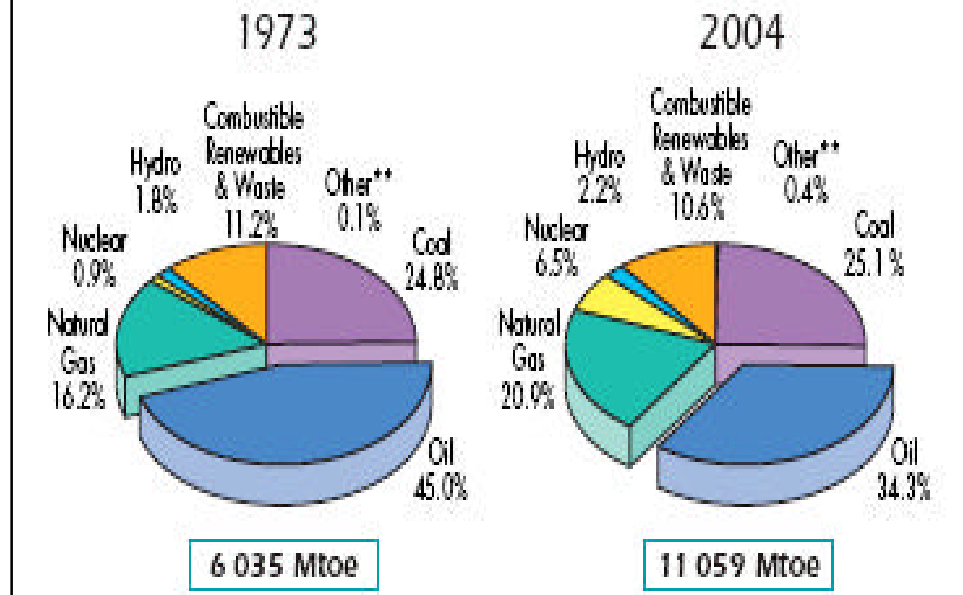
1973 and 2004 Regional Shares of CO₂ Emissions **



Regional Shares of TPES in 2010 and 2030 for the Reference Scenario



1973 and 2004 Fuel Shares of TPES*



Renewables to the rescue?

- Biomass much used in the developing world, whereas OECD countries account for the majority of the 'new' renewables (esp. wind, solar)
- Renewables are the third largest contributor to global *electricity production*: 18% of production in 2003
 - coal 40%
 - natural gas 19%
 - nuclear 16%
 - oil 7%
- wind accounts for 90% of the total renewable electricity production

Share of renewables in 2003 (source: IEA)

	Share of renewables	Hydro	Geothermal, solar, wind, etc.:	Combustible renewables and waste:
Africa	50%	2.6	0.3	97.1
Latin America	29%	35.9	1.4	62.6
Asia	33%	4.0	3.5	92.5
China	17%	10	0	90
Non-OECD Europe	9.4%	40.8	0.7	58.5
Former USSR	3%	69.7	1.1	29.2
Middle East	0.7%	42.7	24.1	33.2
OECD	5.6%	35.1	11.7	53.3
World	12.2%	16.2	3.8	80.0

	Total renewables	Renewables excluding combustible renewables and waste
United Kingdom	1.3	0.2
Brazil	39.5	13.6
Germany	3.2	1.1
Denmark	12.1	2.4
Norway	45.0	38.9

IEA reference scenario (current and planned policies)

- Non-hydro renewables in electricity generation will triple, from 2% in 2003 to 6% in 2030
- *Wind power* will see the biggest increase in market share
- *Biomass* used for electricity generation will triple
- *Geothermal power* will grow at the same rate as biomass
- *Solar, tidal and wave energy* will make more substantial contributions towards the end of the projection period
- The largest increases in renewables in OECD Europe, driven by strong government policies

Energy policy: key issues

- Centralisation and national grids (1900-
- Cheap oil & industrialisation
- Oil crises (1973 & 1979)
- Liberalisation (late 1980s)
- Climate change
- Security of supply; terrorism
- 'peak oil'

Global energy governance

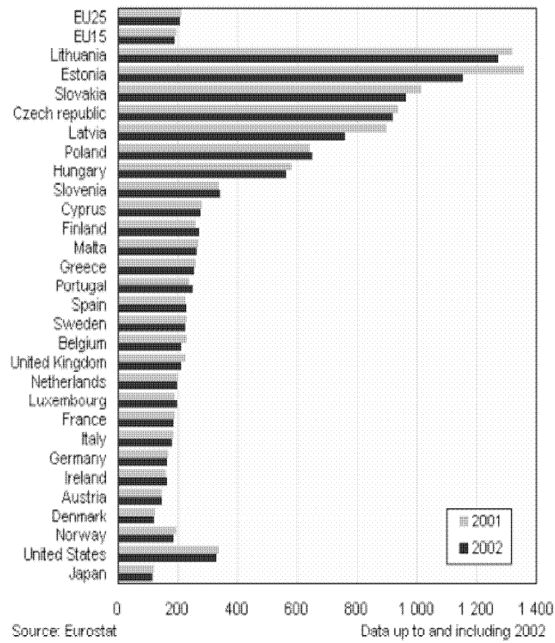
- Framed as national security issue
- Only nuclear energy has a 'home' in the UN
- Energy aid low or high but often in 'wrong' direction
- More visible in global discussions since 2001

Global energy governance

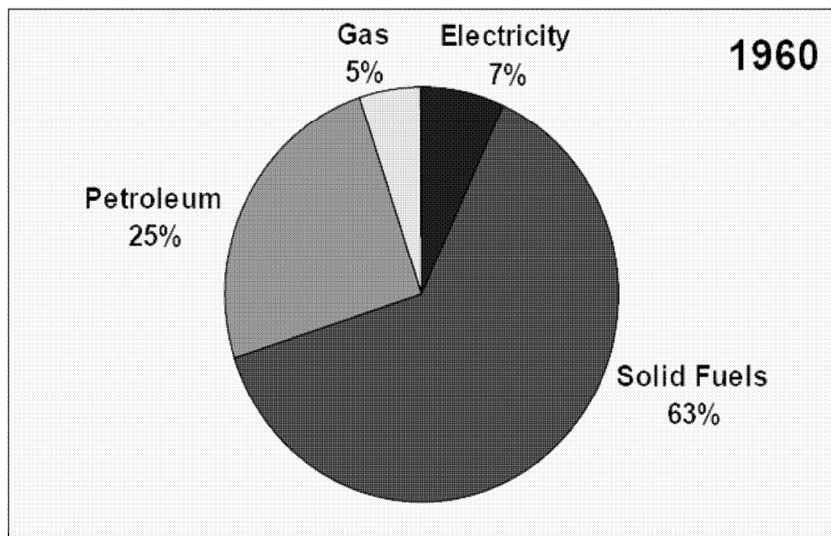
Recent global energy discussions (WSSD, CSD 9+14):

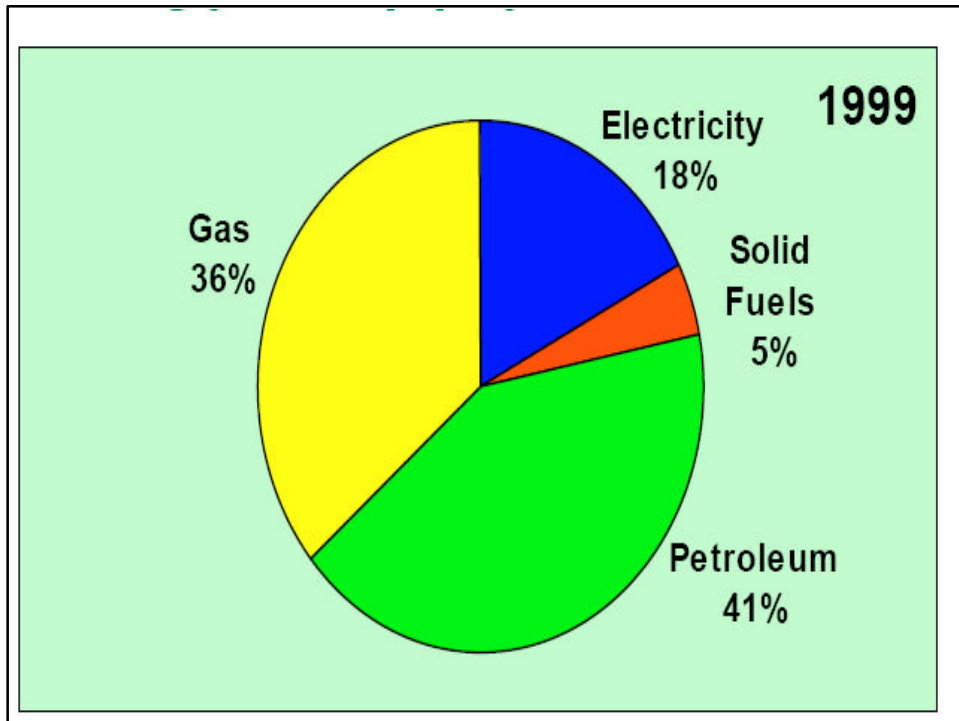
- Energy prerequisite for Millennium Development Goals (MDGs) on e.g. poverty, health
- Energy efficiency; the obvious win-win solution
- Renewable energy sources (decentralised); high on agenda linked to energy security and oil prices
- Cleaner fossil fuels (+nuclear); oil will dominate coming decades, call for carbon sequestration etc.
- Lack of implementation, call for investments, aid, technology transfer, capacity-building, South-South cooperation, public-private partnerships

Energy consumption in relation to GDP (tons of oil equivalents per €1M)



UK Energy Supply 1960

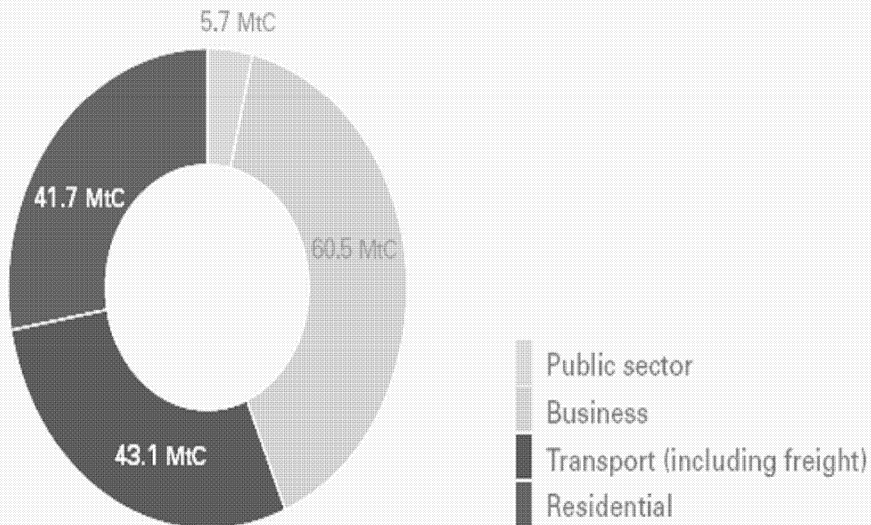




UK Electricity (Energy Review 2006)

- o Gas 37%
- o Coal 34%
- o Nuclear 20%
- o Renewables 5%

CHART 4. CARBON DIOXIDE EMISSIONS BY END USER IN THE UK, 2004
(MILLION TONNES OF CARBON)



UK Energy Policy

- Industrial policy & energy policy based on coal + centralised management: 1900-1988
- Thatcher, liberalisation, miners & unions down, 'dash for gas'
 - Dash for gas not for environmental, but political and ideological reasons
- Blair's climate policy – or Cameron's?
- Gas dependency
- Nuclear?

2003 White Paper on Energy

- o Climate: put the UK on a path to cut CO2 emissions by 60% by around 2050, with real progress (20%) by 2020
- o Security of supply: maintain the reliability of energy supplies
- o Competitiveness: promote competitive energy markets in the UK and elsewhere
- o Fuel poverty: ensure that every home is adequately and affordably heated

2006 Energy Review

- 'the situation has changed', because of
 - oil price increase
 - 'energy gap'
 - urgency of climate change
- two challenges: climate and security of supply

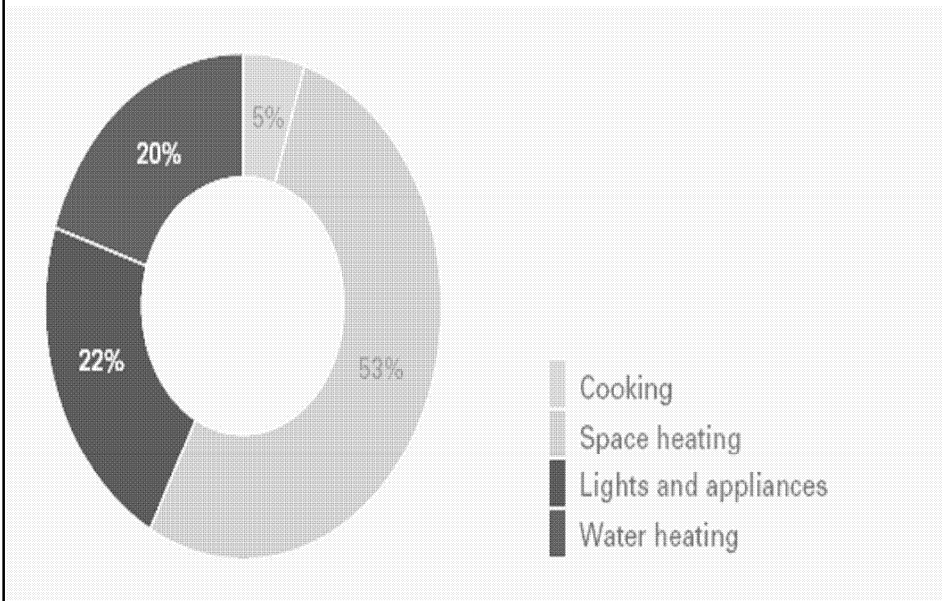
Energy Review

- o 'energy gap' = gas gap
- o Revival of nuclear
- o Security of supply
- o Distributed electricity, renewables & microgeneration (wind, solar, PV, CHP)
 - o From 'passive' to 'active' networks
 - o Potential for microgeneration up to 30-40% of UK's energy demand by 2050
- o Energy = more than just electricity

Outstanding issues (I)

- **Transport:**
 - 30 per cent of the total UK energy use
 - CO2 emissions growing (19% in 1990, 27% in 2010, 29% in 2020)
 - The only sector whose CO2 emissions in 2020 expected to be greater than 1990
- **Housing:**
 - responsible for more than 25% of CO2 emissions; old housing stock

CHART 5. RESIDENTIAL CARBON DIOXIDE EMISSIONS, 2003



Source: Defra, *The 2006 Climate Change Programme*

Outstanding issues (II)

- Liberalisation vs. need for strong governance/steering
- Can decentralisation and bottom-up solutions be initiated from the top?
- Time: urgency vs. institutional inertia:
- UK role in the world (equity; climate, nuclear, technology)
- Demand-side management and behavioural change
 - “rebound effect”

Why don't we act as responsible citizens?

- Institutional structures, infrastructure (public transport)
- Social expectations, cultural norms, habits and routines
- Economic incentives: alternatives more expensive
- “I will, if you will”

Two perspectives to individual behaviour

- **Consumer perspective**
- Individual's relation to the market
 - Steering through price mechanism
 - ‘free rider’ problem
- **Citizen's perspective**
 - Individuals' relation to government, politics and the civic realm (community)
 - Formation and practice of a rights and responsibilities that people have in community
- o Two dimensions of ‘low politics’:
 - o engagement in community level action against climate change
 - o government ‘watchdogs’

UK CSD: Key areas of work on individual behaviour

- Housing
- Food
- Everyday transport
- Holiday travel

Some big global changes needed

- Changing the economics
- Changing the politics and institutions
- Changing the knowledge

Many, many small changes needed

Our challenge

“Modern civilization has engineered a veritable explosion of energy use and has extended human control over inanimate energies to previously unthinkable levels. These gains made it fabulously liberating and admirably constructive—but also uncomfortably constraining and horribly destructive” (Smil 2001)

A world map with a dark blue background, where landmasses are highlighted in a lighter, glowing blue. The map shows a high concentration of energy consumption in North America and Europe, with significantly less consumption in Africa, South America, and parts of Asia. The text "Our challenge" is in the top right, and a quote is at the bottom.

Our challenge

“Nothing short of a fundamental shift in the material structures of political culture of the world-system itself would be required to attain an equitably distributed allotment of energy consumption rights” Podobnik 2002