Presentation to the UN Commission for Sustainable Development

Globalizing patterns of natural resource use in relation to human development

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4 messages I wish to get across

1. Across the globe, we use ever more resources with the help of ever more energy from fossil fuels, thus exhausting the resource base and destabilizing global geo-biospherical cycles.
2. Global resource use (materials and energy) is driven by population, income, development and constrained by population density.
3. Access to resources, and use of resources, is extremely unequal internationally. Without well designed policies, this will result in severe conflicts.
4. At the same time, improving human quality of life is becoming less resource dependent – we can achieve more with less.

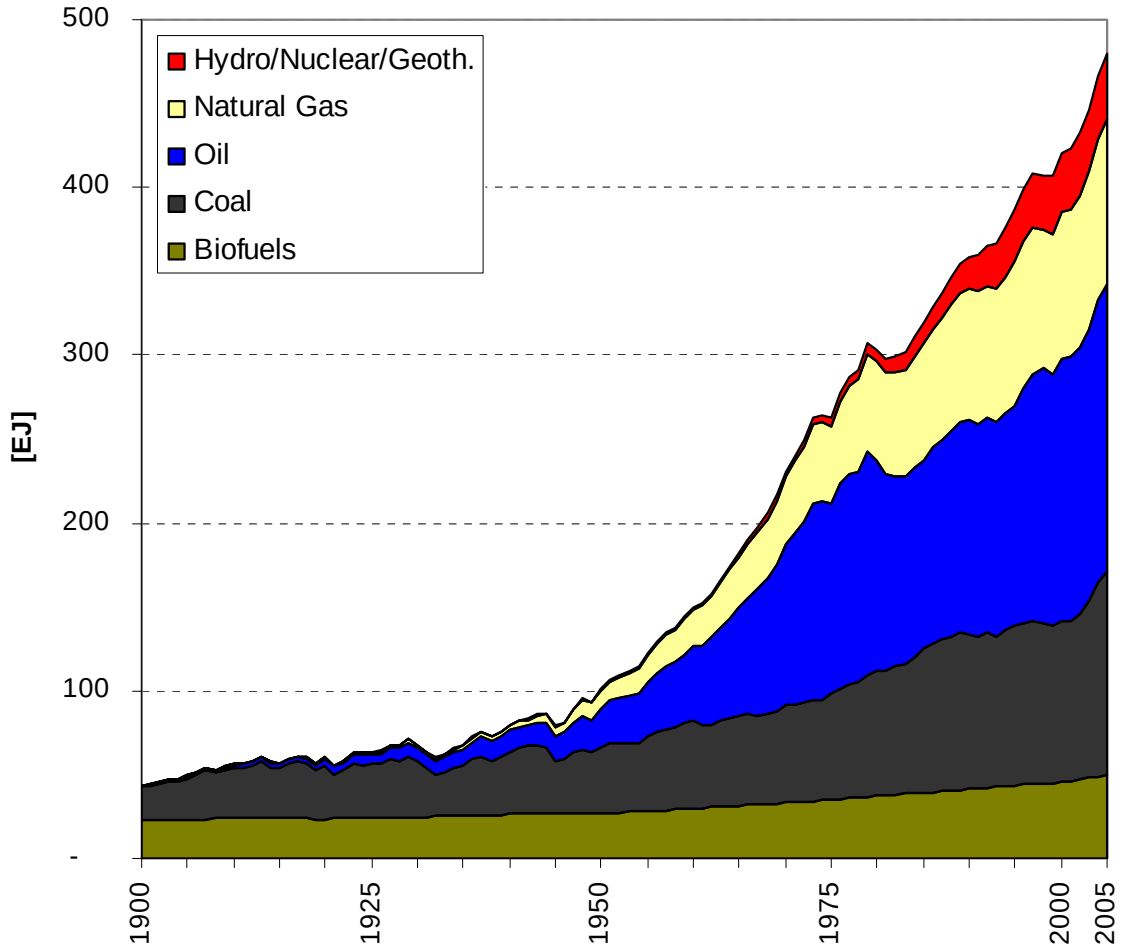
Message 1: Centennial resource use explosion

The sociometabolic scale of the world economy has been increasing by one order of magnitude during the last century:

- **Materials use**: From 7 billion tons to over 60 bio t (extraction of primary materials annually).
- **Energy use**: From 44 EJ primary energy to 480 EJ (TPES, commercial energy only).
- **Land use**: from 25 mio km2 cropland to 50 mio km2

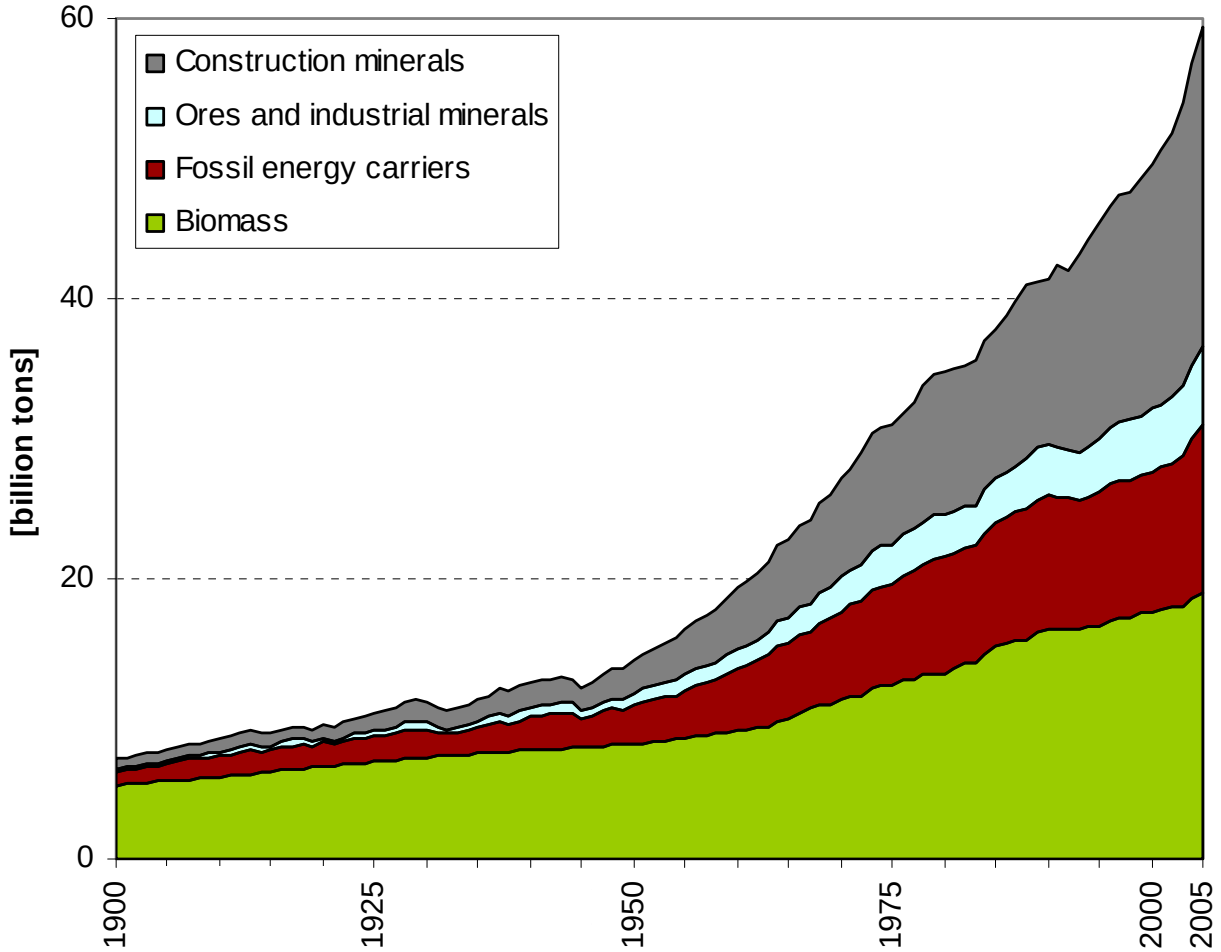
Definition: *sociometabolic scale is the size of the overall annual material or primary energy input of a socio-economic system, measured according to established standards of MEFA analysis. For land use, no standard measure of scale is defined.*

sociometabolic scale: Global commercial energy supply 1900-2005



Source: Krausmann et al. 2009

Metabolic scale: Global materials use 1900 to 2005

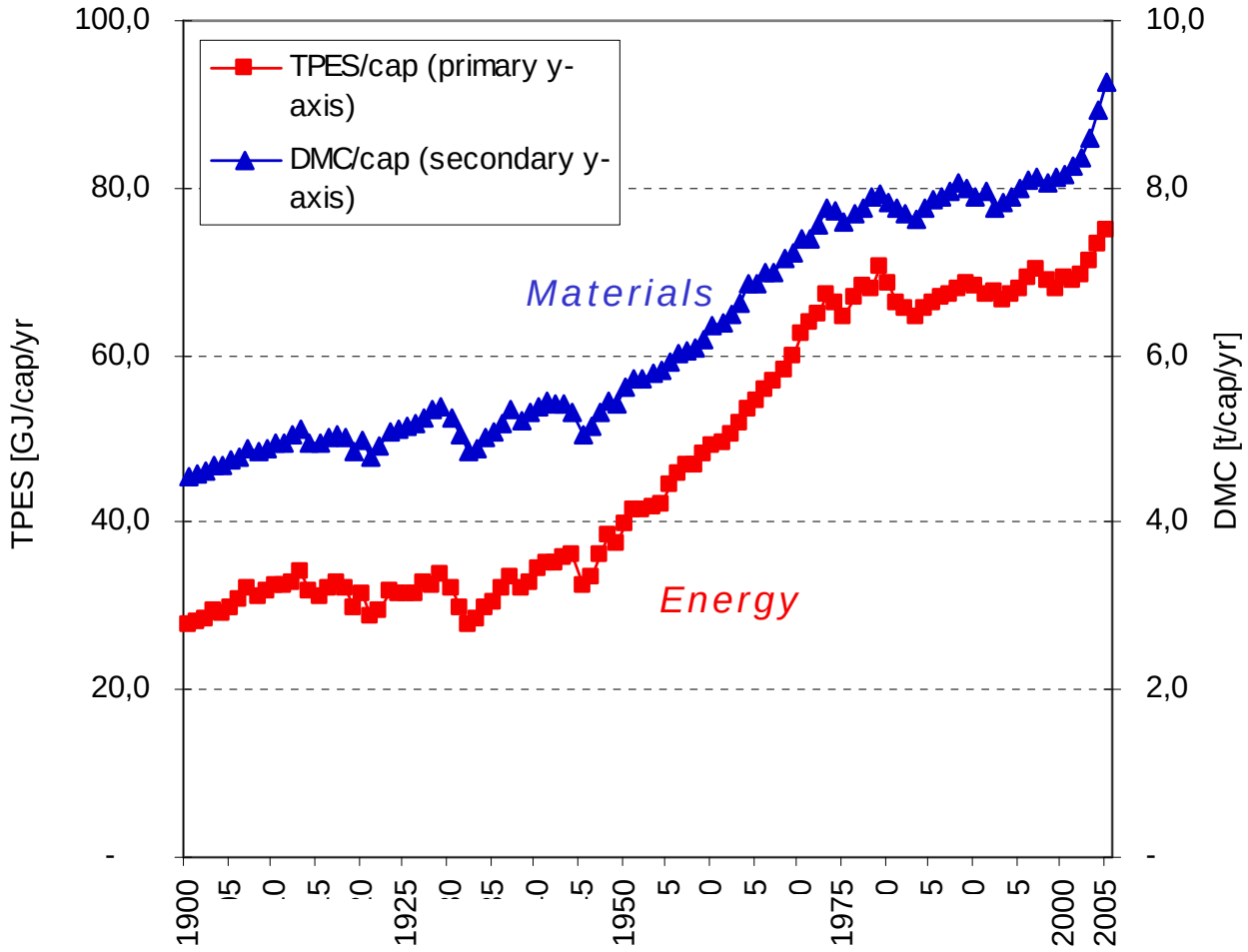


Source: Krausmann et al. 2009

Message 2: Drivers of resource use: population, income, development and, as a constraint, population density

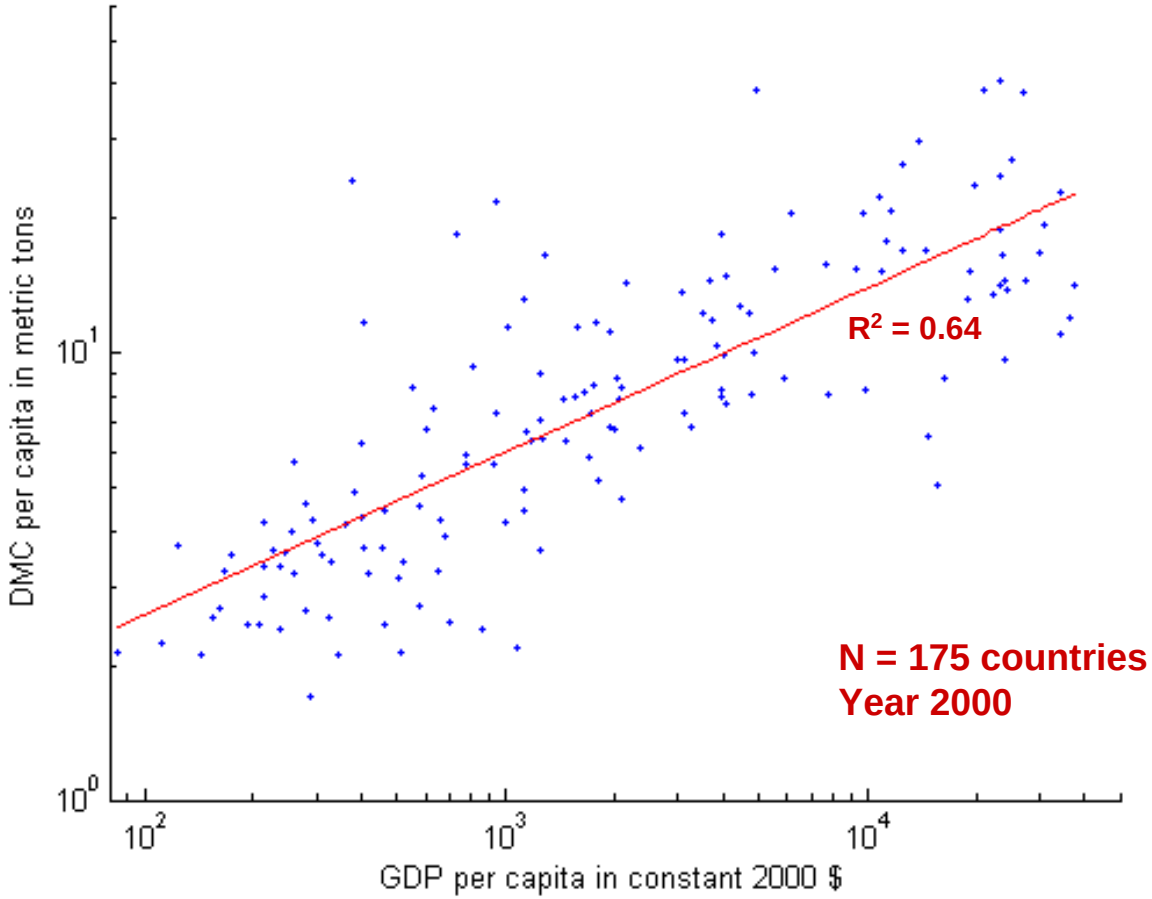
- Population numbers
- Rising income (GDP)
- “Development” in the sense of transition from an agrarian to the industrial regime.
- Human settlement patterns: higher population density allows lower resource use

Resource use per person = sociometabolic rates: Transitions between stable levels across 20th century



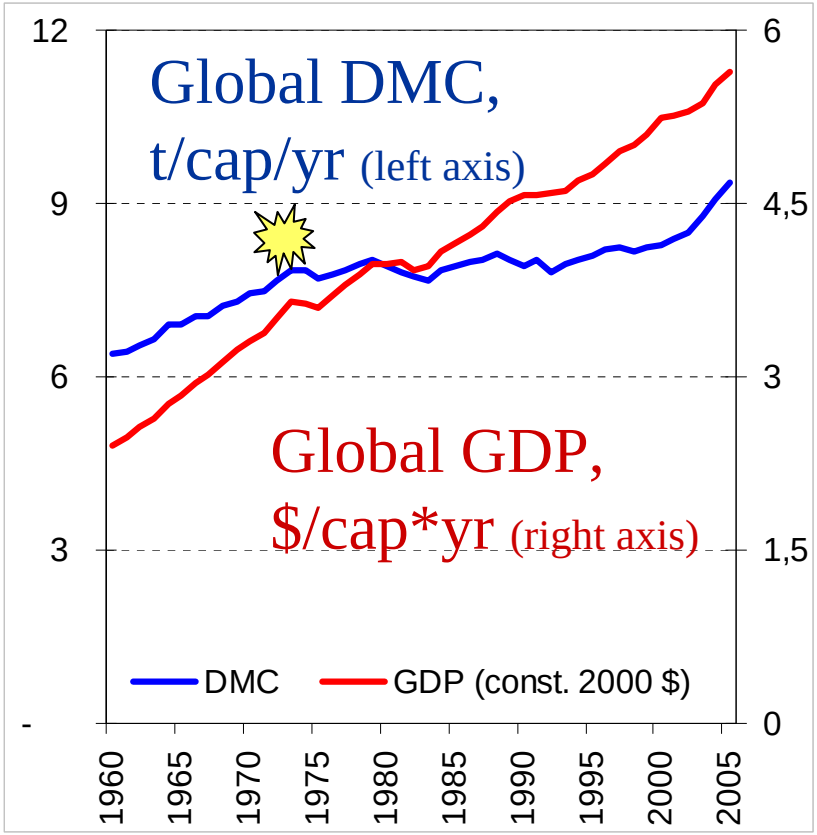
Source: Krausmann et al. 2009

sociometabolic rate (materials) and income: loglinear relation, no sign of a “Kuznets curve”



Source: UNEP Decoupling Report 2010

Global metabolic rates grow slower than income („decoupling“)



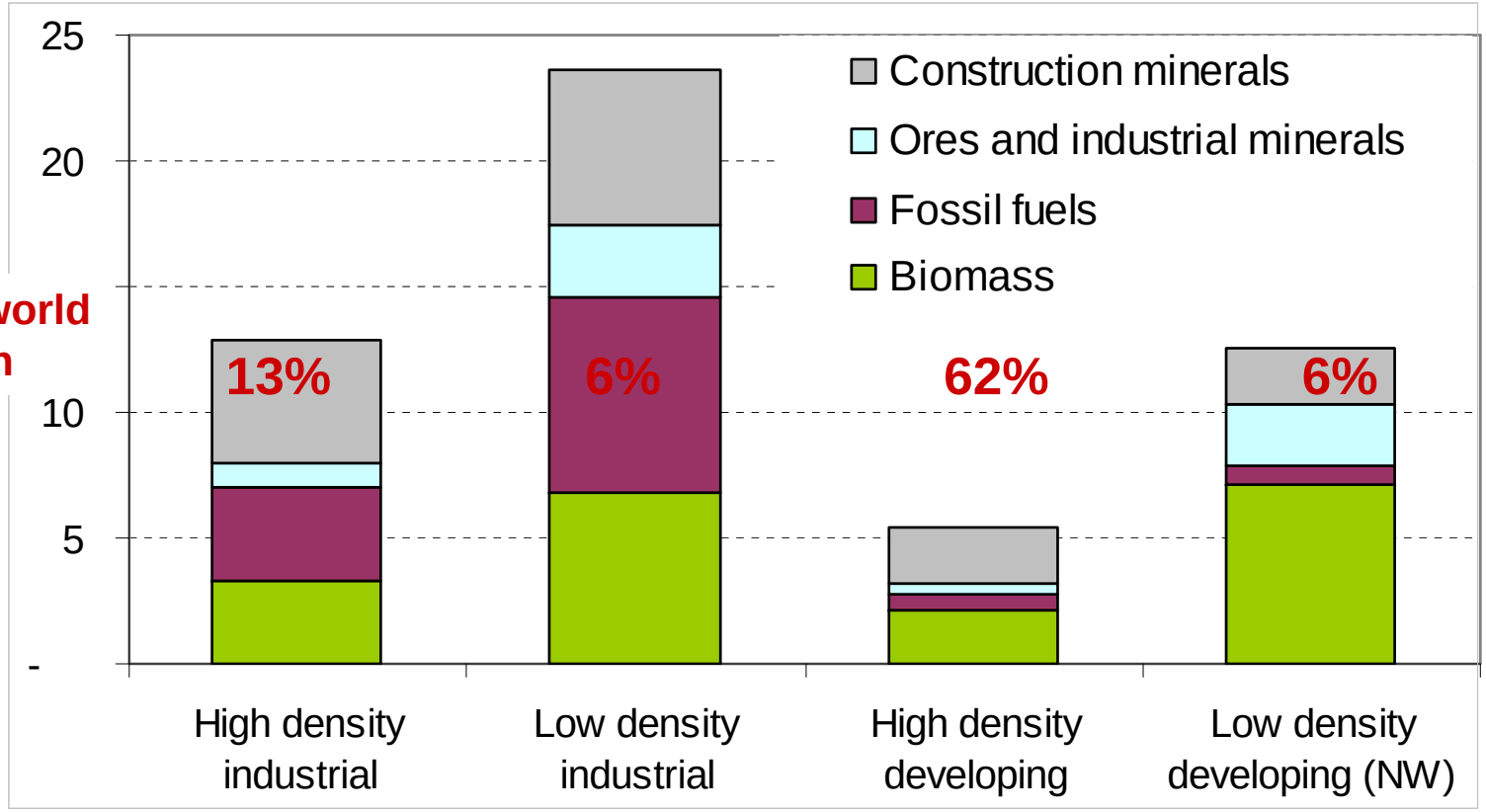
Source: after Krausmann et al. 2009

Message 3:
Access to resources, and use of resources, is extremely unequal internationally. Without well designed policies, this will result in severe conflicts.

Interwoven problems:

- Unequal distribution of natural resources on earth
- Corporate control over resources and the depletion of countries‘ natural capital for little benefit („resource curse“)
- Unequal consumption rates of natural resources
- Externalization of environmental cost of resource extraction
- Global scarcities accellerating (intergenerational problem)

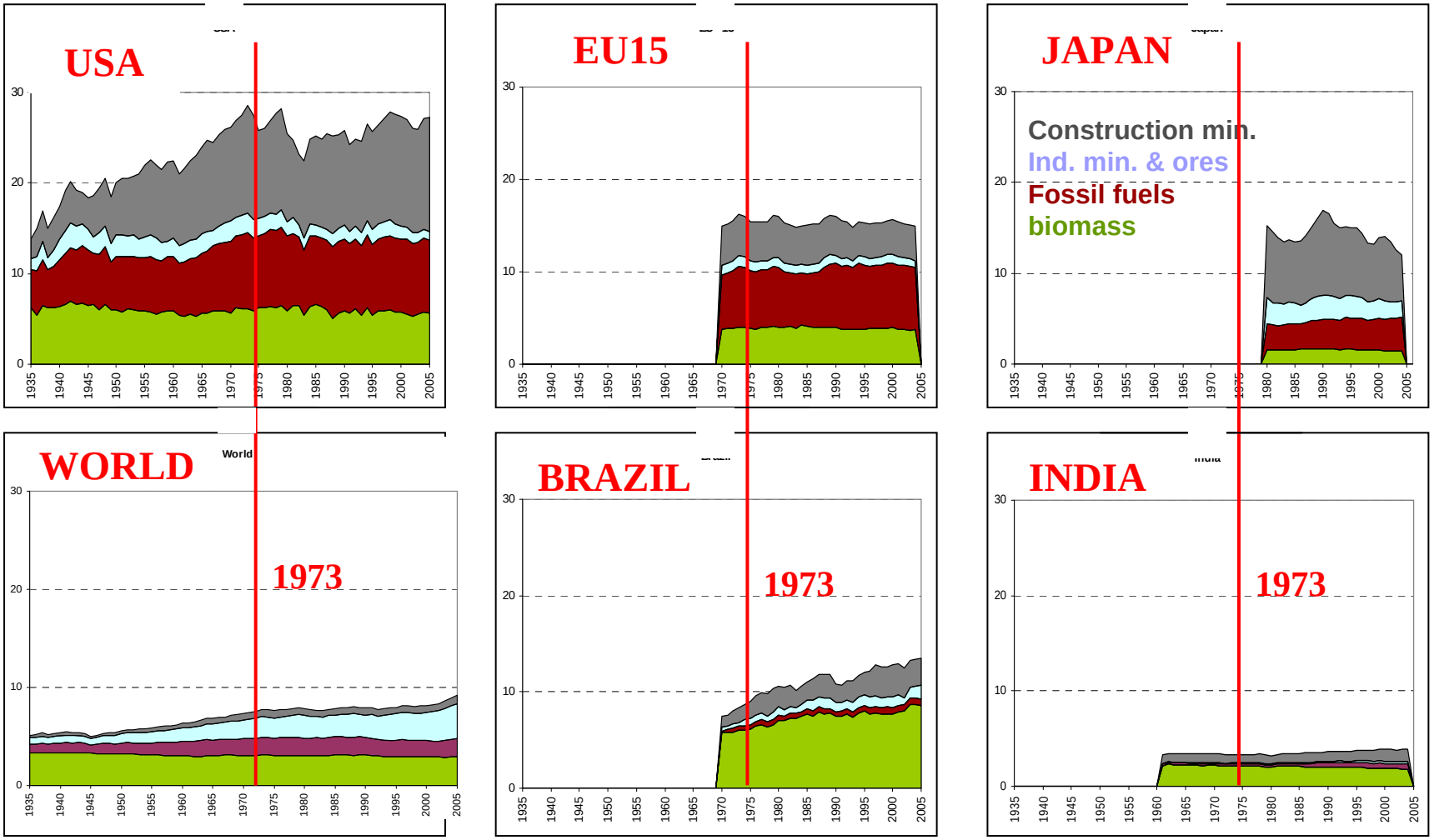
sociometabolic rates
by development status and population density



Source: UNEP Decoupling Report 2010

Metab.rates: DMC t/cap in yr 2000

material metabolic rates 1935 – 2005 not synchronized: very different depending on development status



Sources: USA: Gierlinger 2009, EU-15: Eurostat Database, Japan: Japan Ministry of the Enivronment 2007, Brazil: Mayer 2009, India: Lanz 2009, World: Krausmann et. al. 2009

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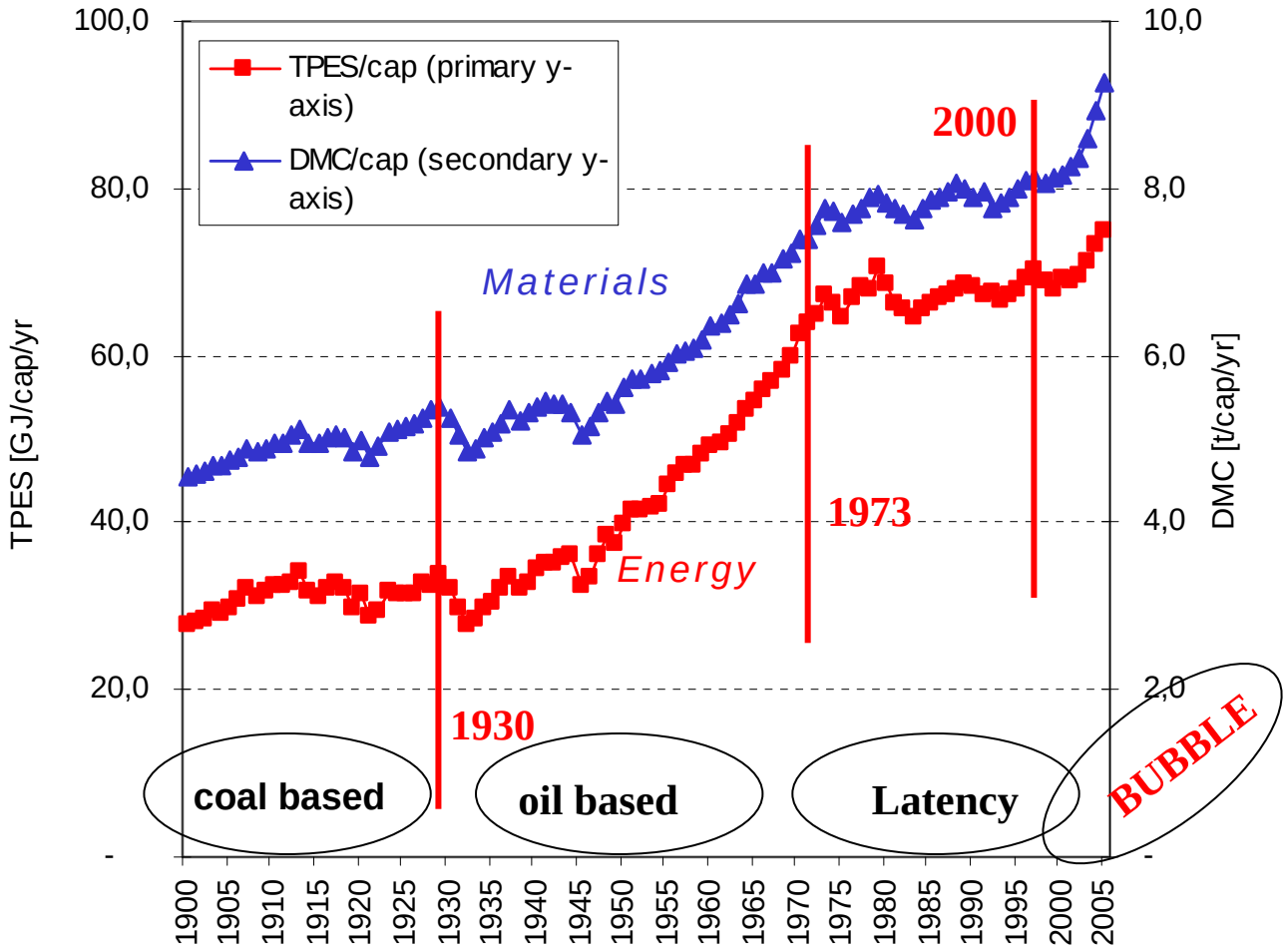
Phases of resource use dynamics



Source: after Krausmann et al. 2009

Three forced future scenarios of resource use

1. **Freeze and catching up:** industrial countries maintain their metabolic rates of the year 2000, developing countries catch up to same rates
   incompatible with IPCC climate protection targets

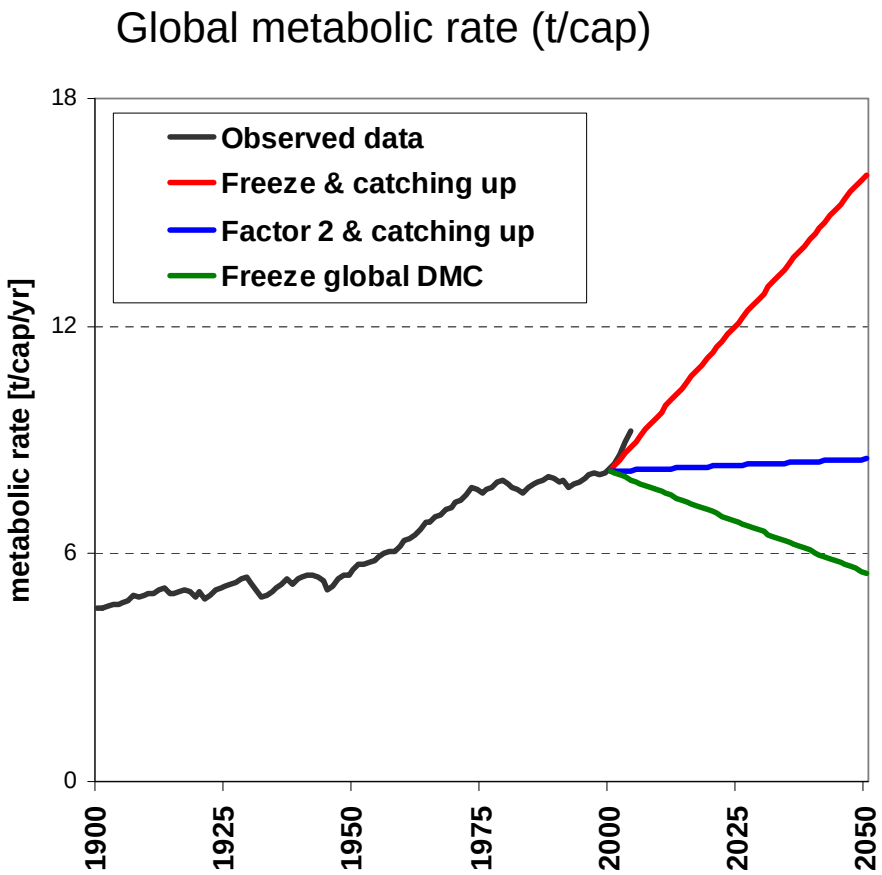
2. **Moderate contraction & convergence**: industrial countries reduce their metabolic rates by factor 2, developing countries catch up
   compatible with moderate IPCC climate protection targets

3. **Tough contraction & convergence:** global resource consumption of the year 2000 remains constant by 2050, industrial and developing countries settle for identical metabolic rates
   compatible with strict IPCC climate protection targets

Built into all scenarios: population (by mean UN projection), development transitions, population density as a constraint, stable composition by material groups

Source: UNEP Decoupling Report 2010

Projections of resource use up to 2050 – three forced future scenarios



Source: UNEP Decoupling Report 2010

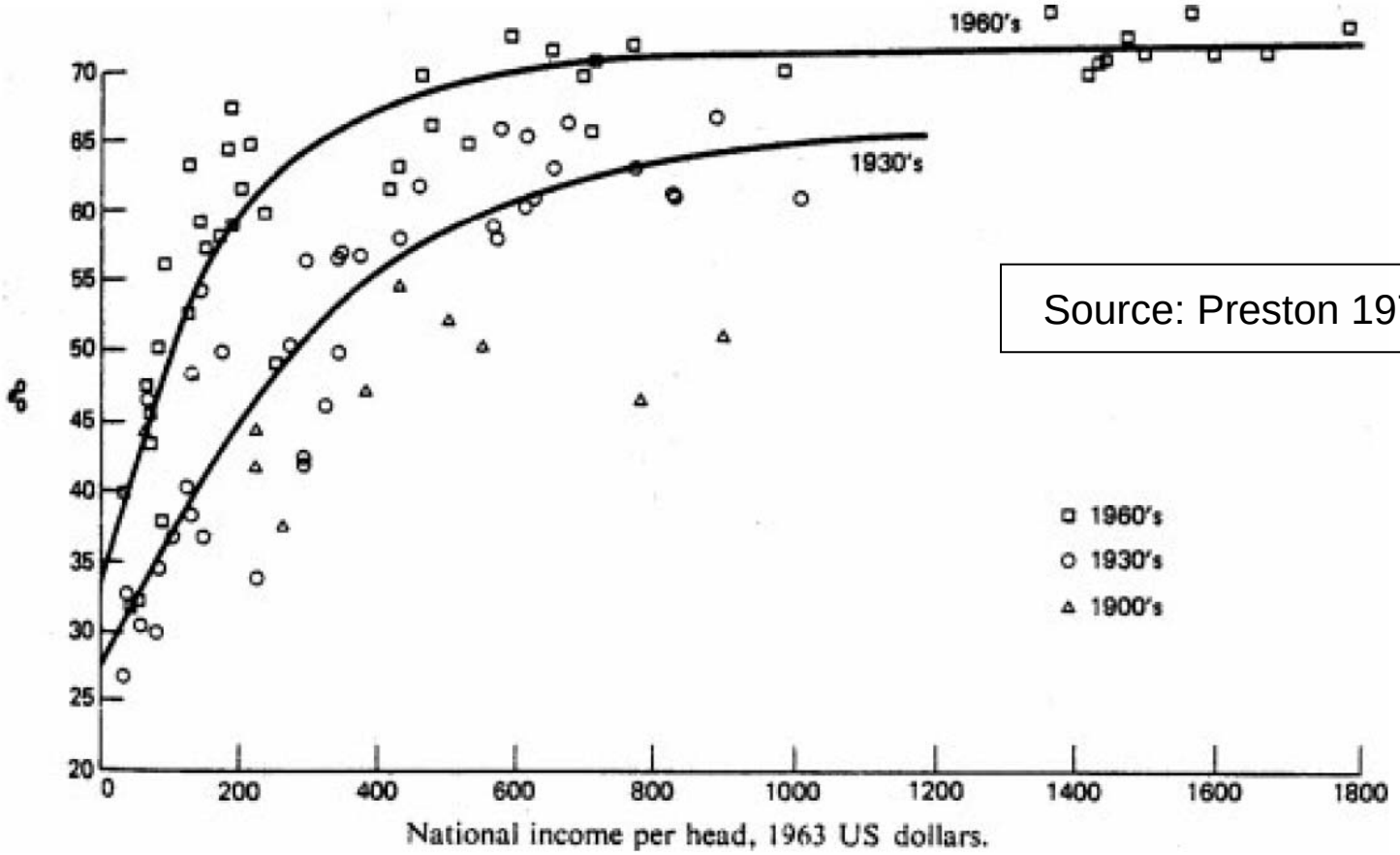
Message 4:

a new transition, to a sustainable industrial metabolism, should be directed at human wellbeing!

And

YES, WE CAN!

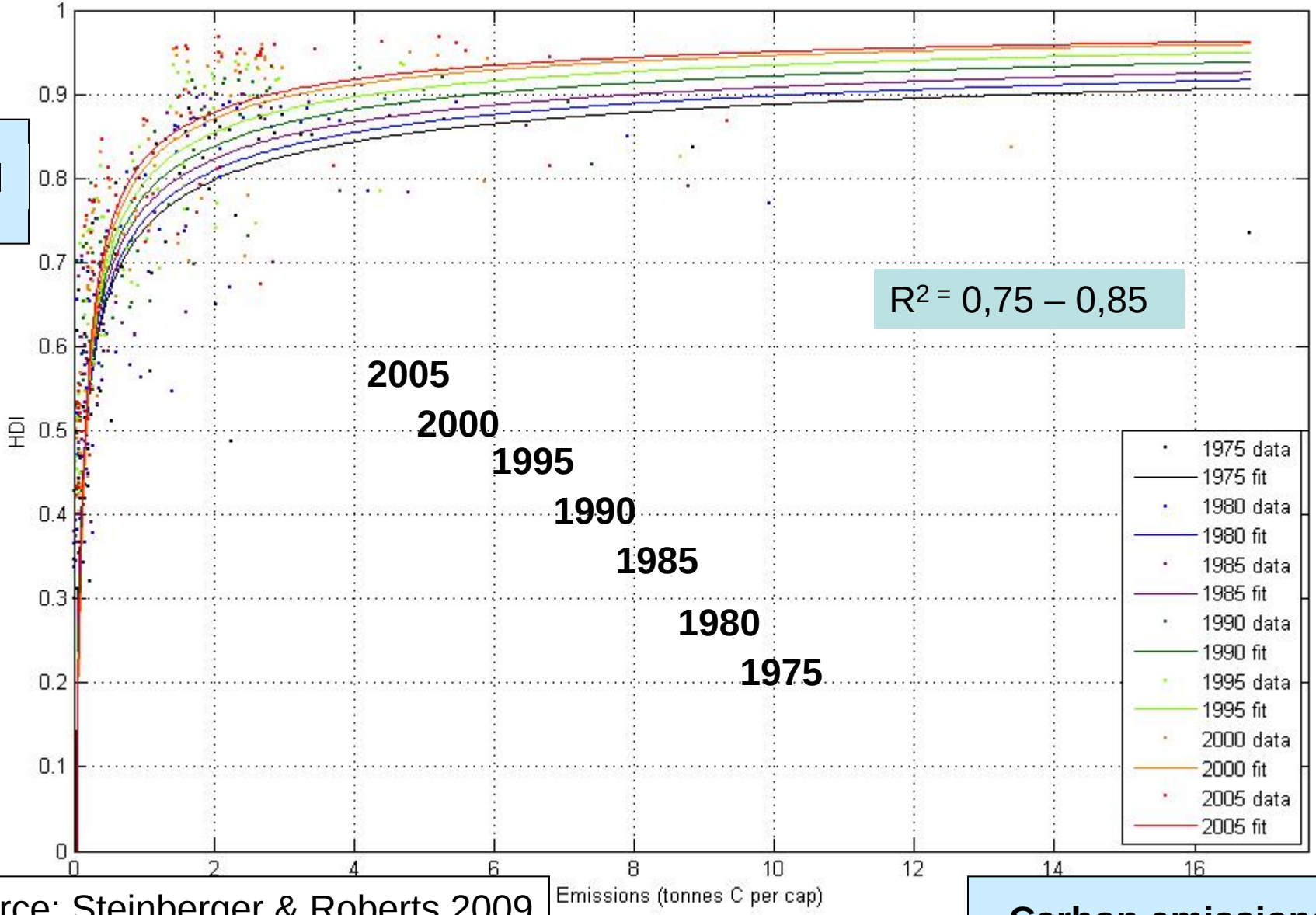
Life expectancy at birth in relation to national income: In 1960, for same life expectancy only half the income is required than in 1930!



Source: Preston 1975 (2008)

Figure 1 Scatter-diagram of relations between life expectancy at birth (e_o^o) and national income per head for nations in the 1900s, 1930s and 1960s.

Human development vs. Carbon emissions



HDI

Source: Steinberger & Roberts 2009

Carbon emissions