Session 1 – Global opportunities for eco-innovation

Identifying prospects and opportunities

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UNEP

International Resource Panel

Green Economy means:

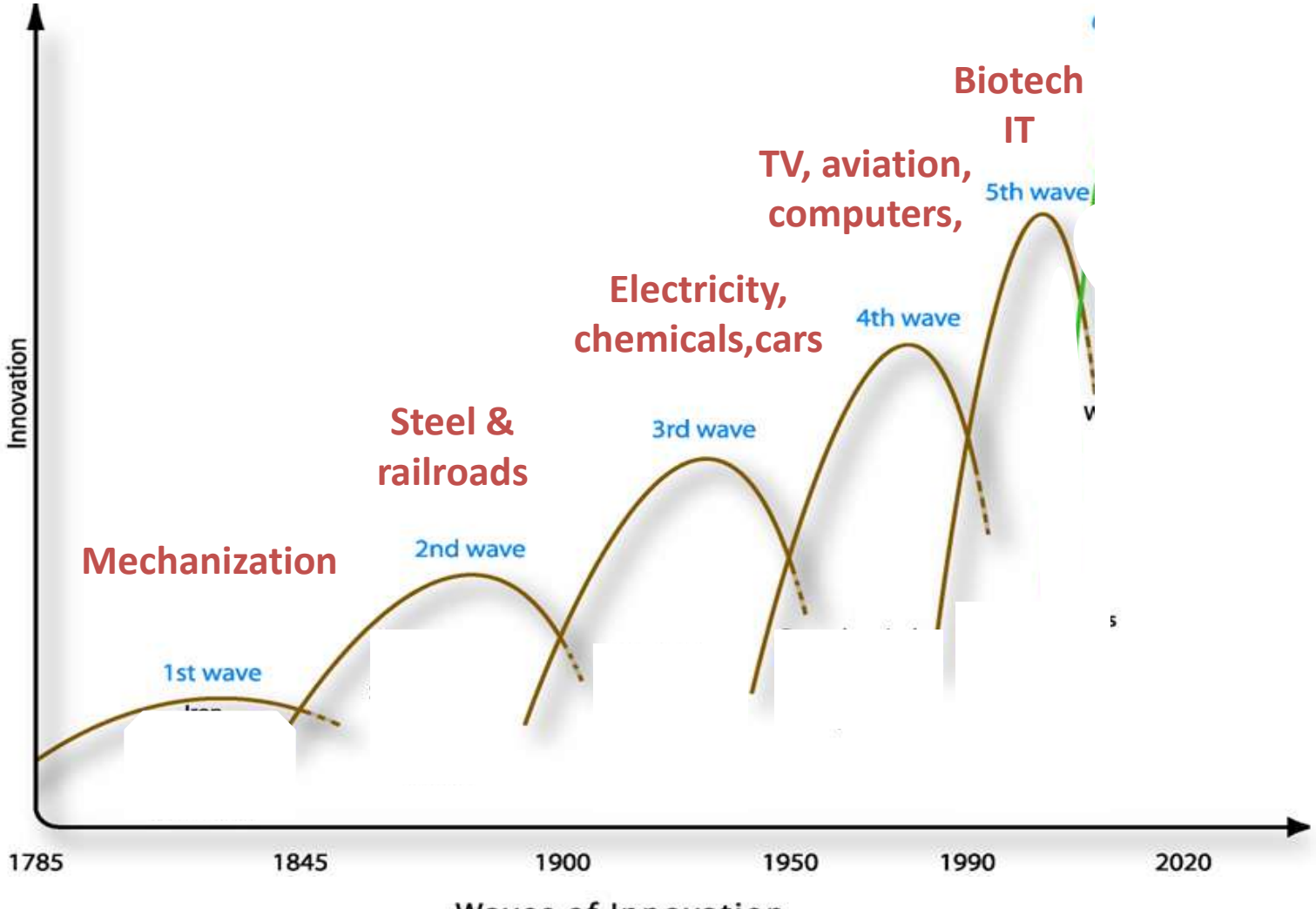
Green Technology

Green Business, and

Green Politics

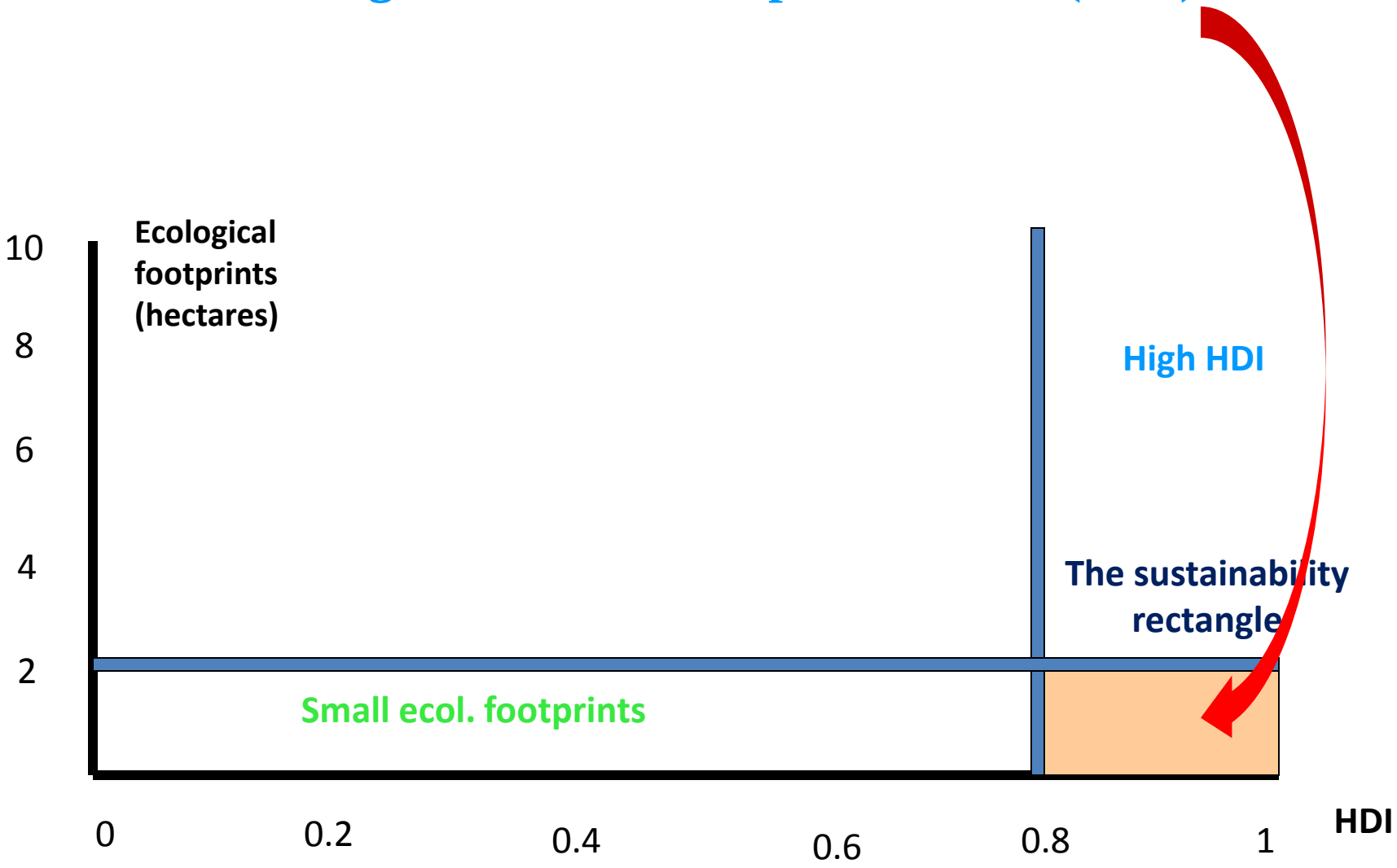
Five “brown” innovation cycles (“Kondratiev Cycles”) so far. All of them eating ever deeper into nature.

(after Charlie Hargroves, co-author, Factor Five)

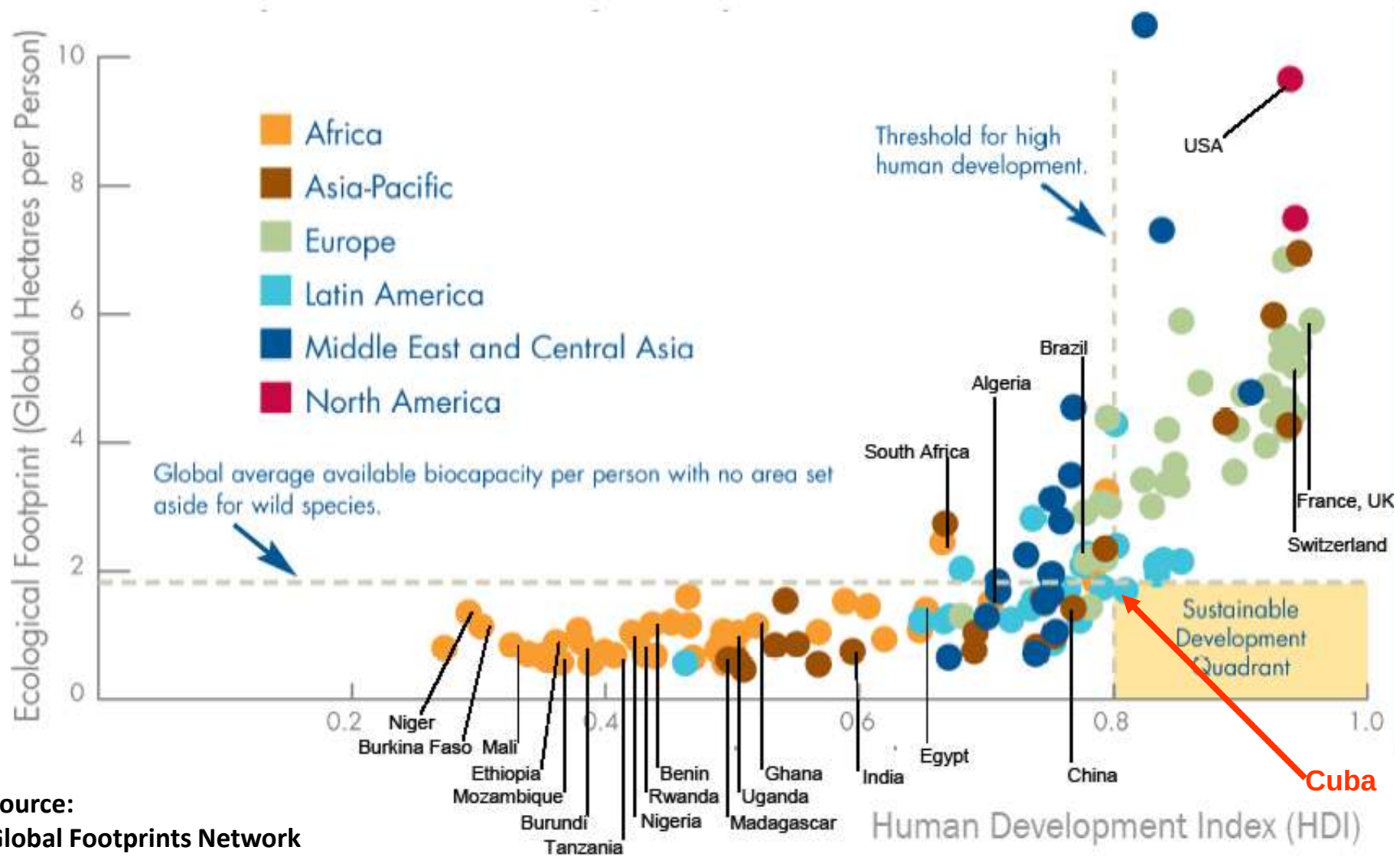


This can‘t go on. If we want further innovation, and growth, we better find methods of doing it in a green way. That‘s the idea of sustainable development.

Sustainable development means small ecological footprints and a high Human Development Index (HDI)



Alas, only one country currently populates the sustainability rectangle



Source:
Global Footprints Network

Why do we need sustainability?

Global warming risks;
Massive biodiversity losses;
Massive overfishing;
Some minerals become very scarce;

… and global demand is rising.

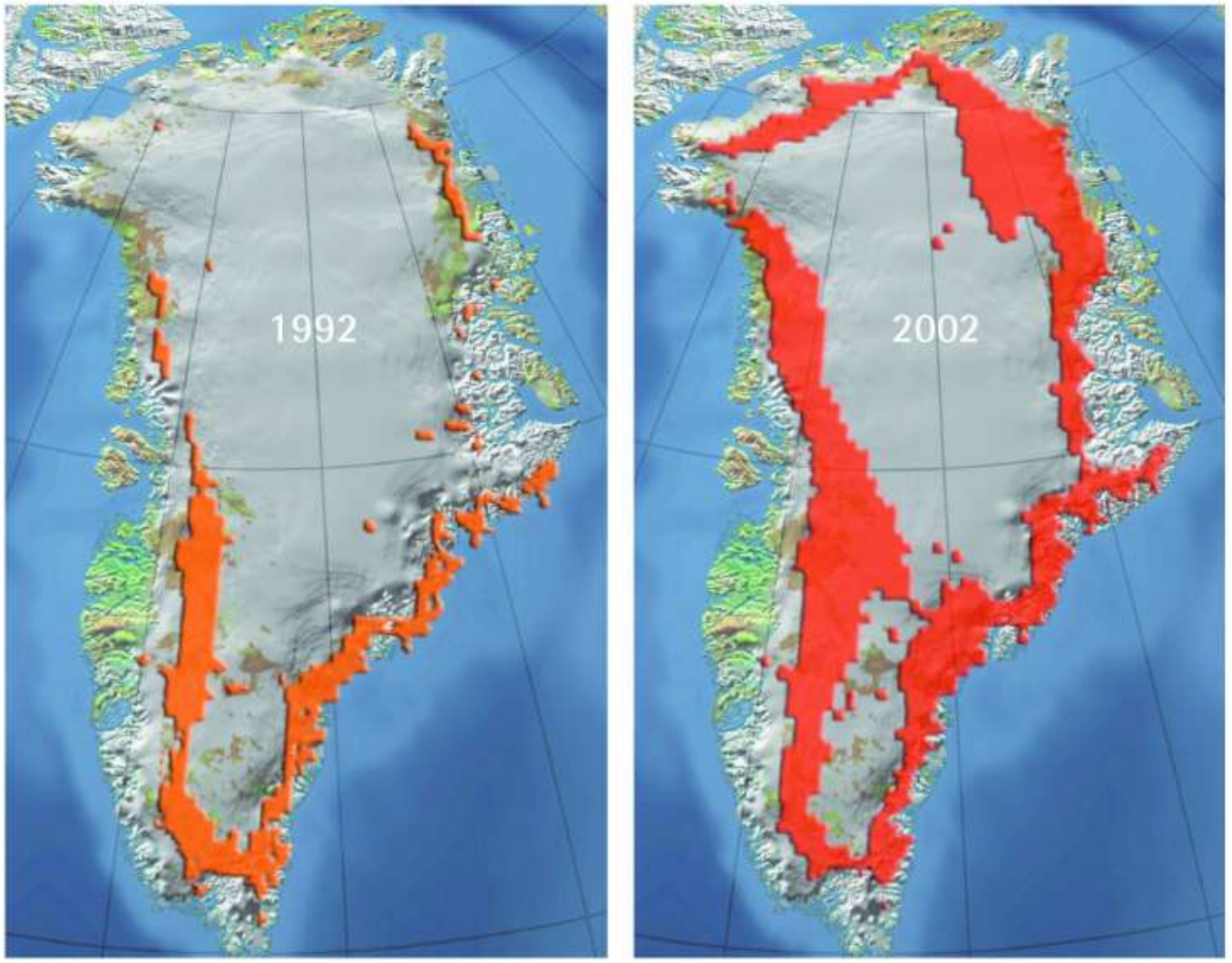
Let us just look at climate.
In 2010 alone huge desasters.

Pakistan: the disastrous flood

An iceberg of 260 sqkm broke off Greenland

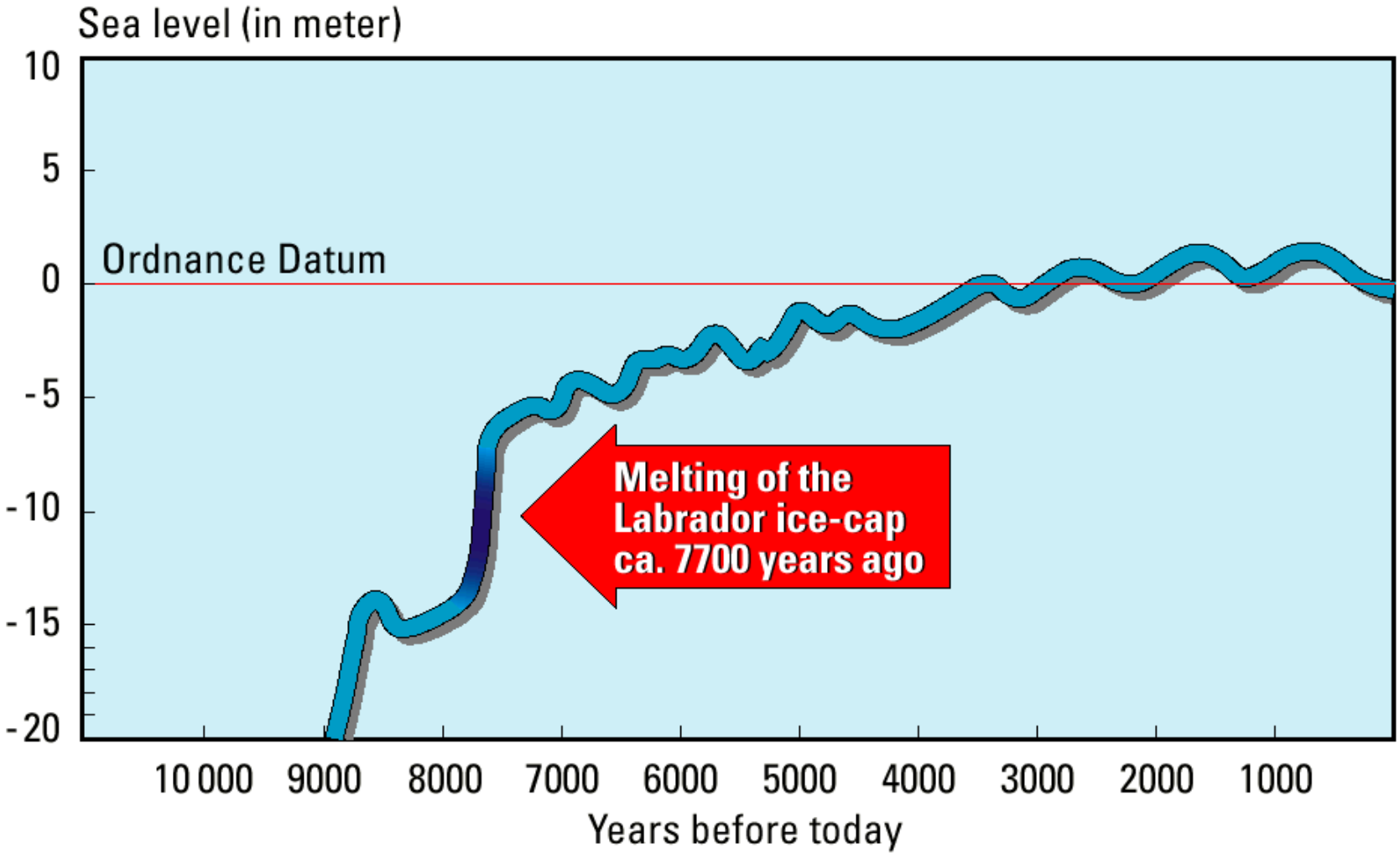
Russia: wildfires for weeks

We seem to be destabilizing Greenland. (Freshwater coverage during Summers 1992 and 2002)



Sea level rise can take catastrophic speed!

(after Michael Tooley. Global sea-levels: floodwaters mark sudden rise. Nature 342 (6245), p 20 - 21 1989)



Different sea levels, different coast lines!
(I prefer not to show the Finnish situation!)

Italy during the last Ice Age (20 000 years ago)

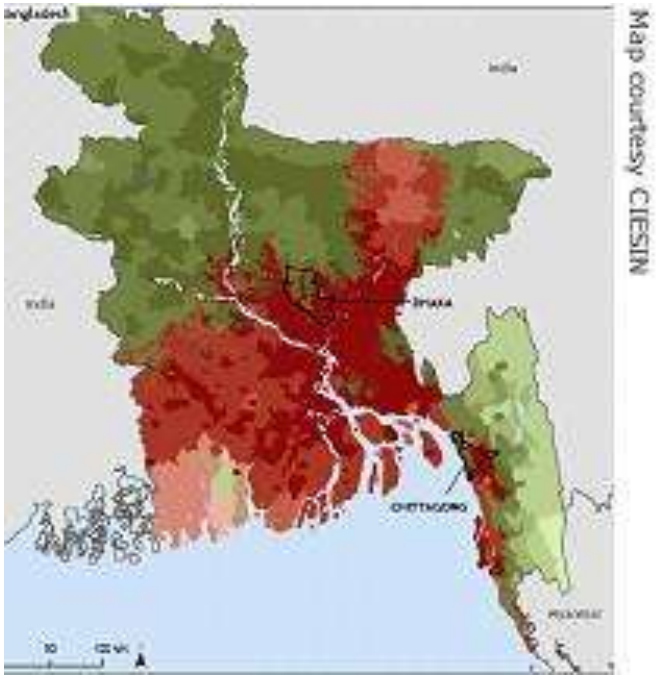
today's coast line

.... and during the last Hot Age (2 million years ago)

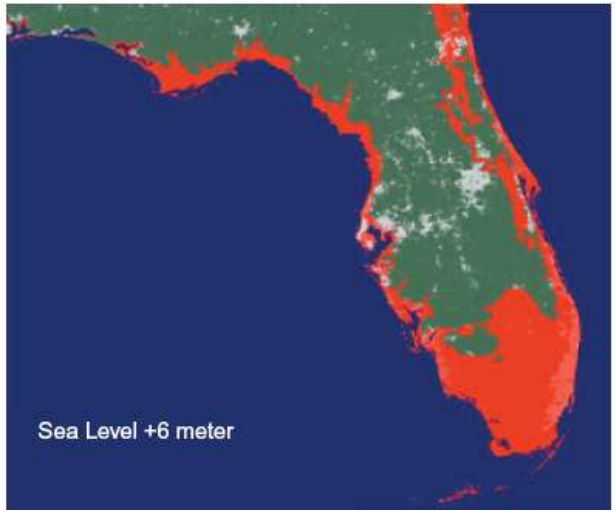
Source: Atlante Geografico Moderno. Mondadori 1996

Areas in red are under water if the Greenland ice breaks off

Bangladesh



Florida



Asia‘s vibrant growth centres are mostly at the coast!

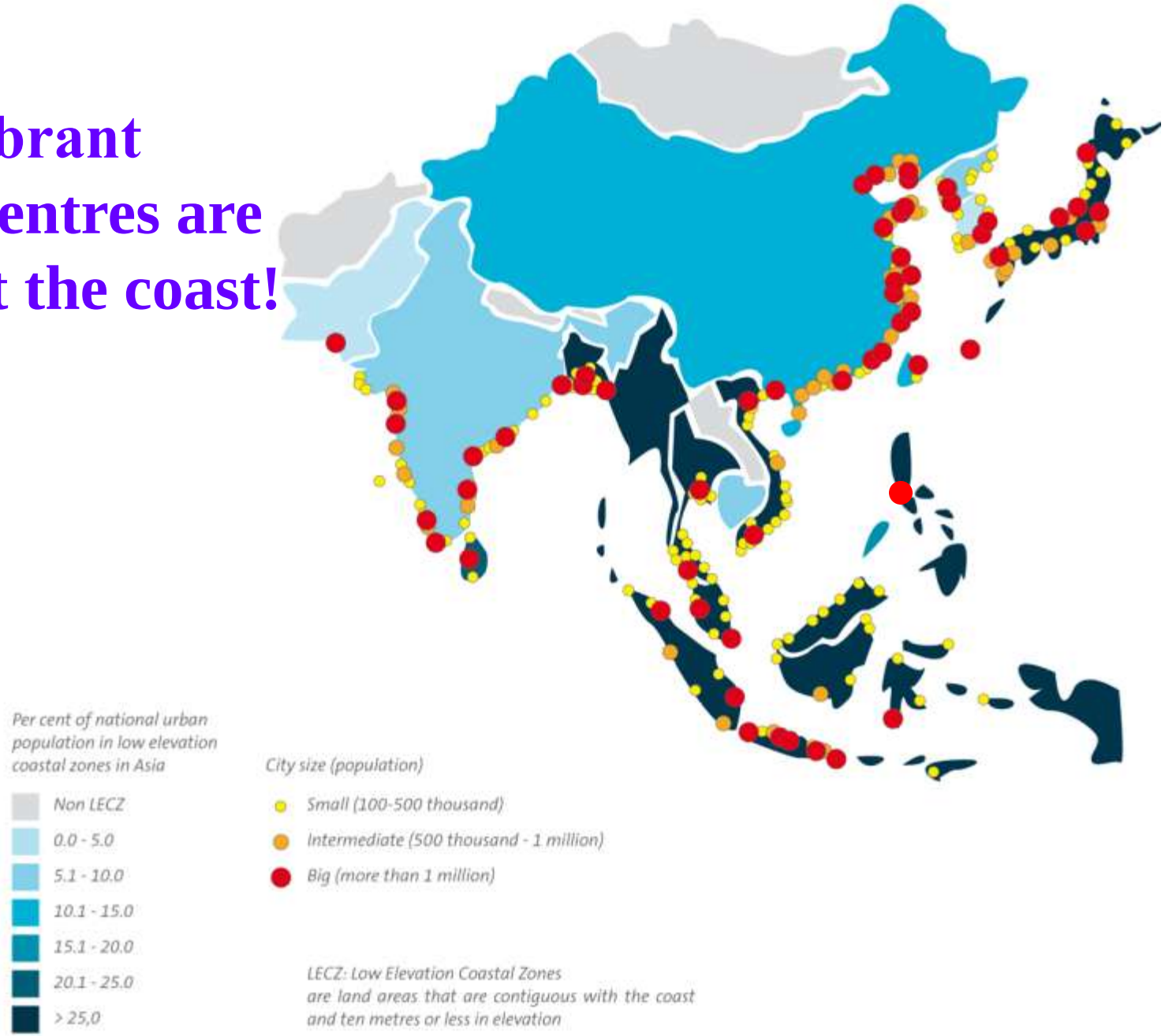
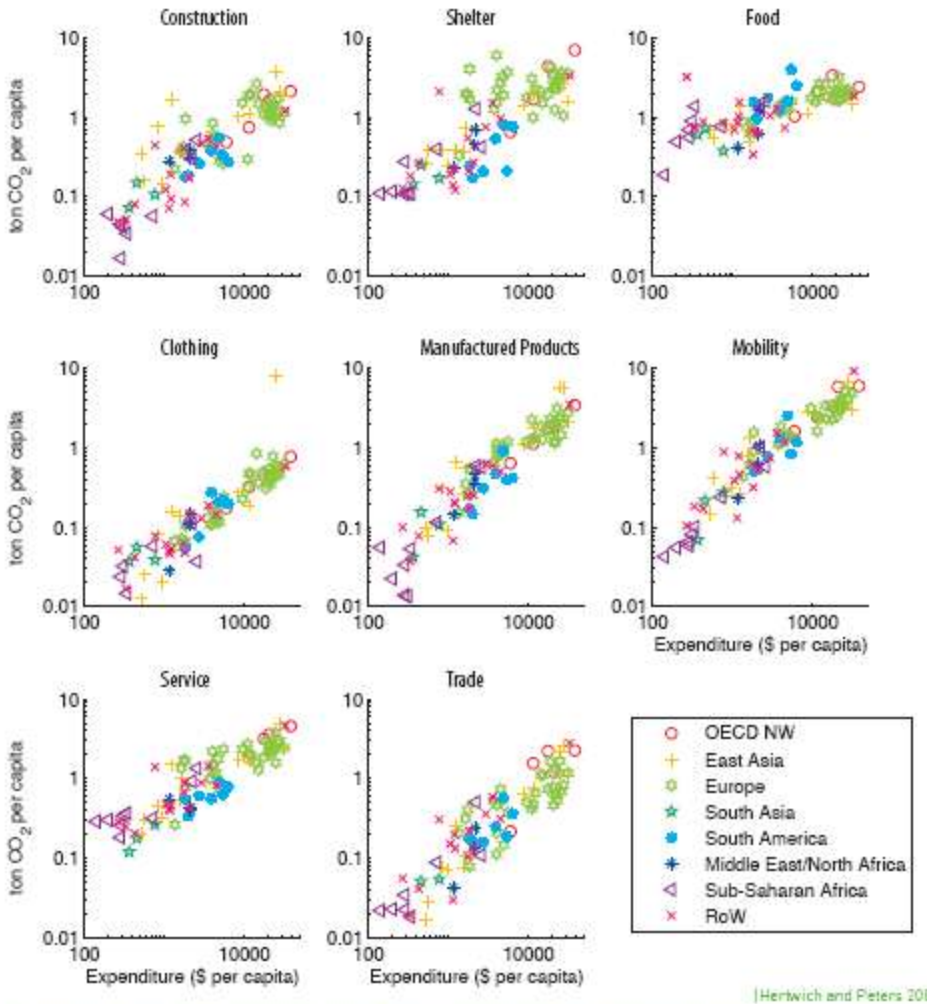


Figure 4.6: Carbon footprint (tonnes of CO_2 equivalents per capita in 2001) of different consumption categories in 87 countries/regions as a function of expenditure ($ per capita)



(Hertwich and Peters 2009)

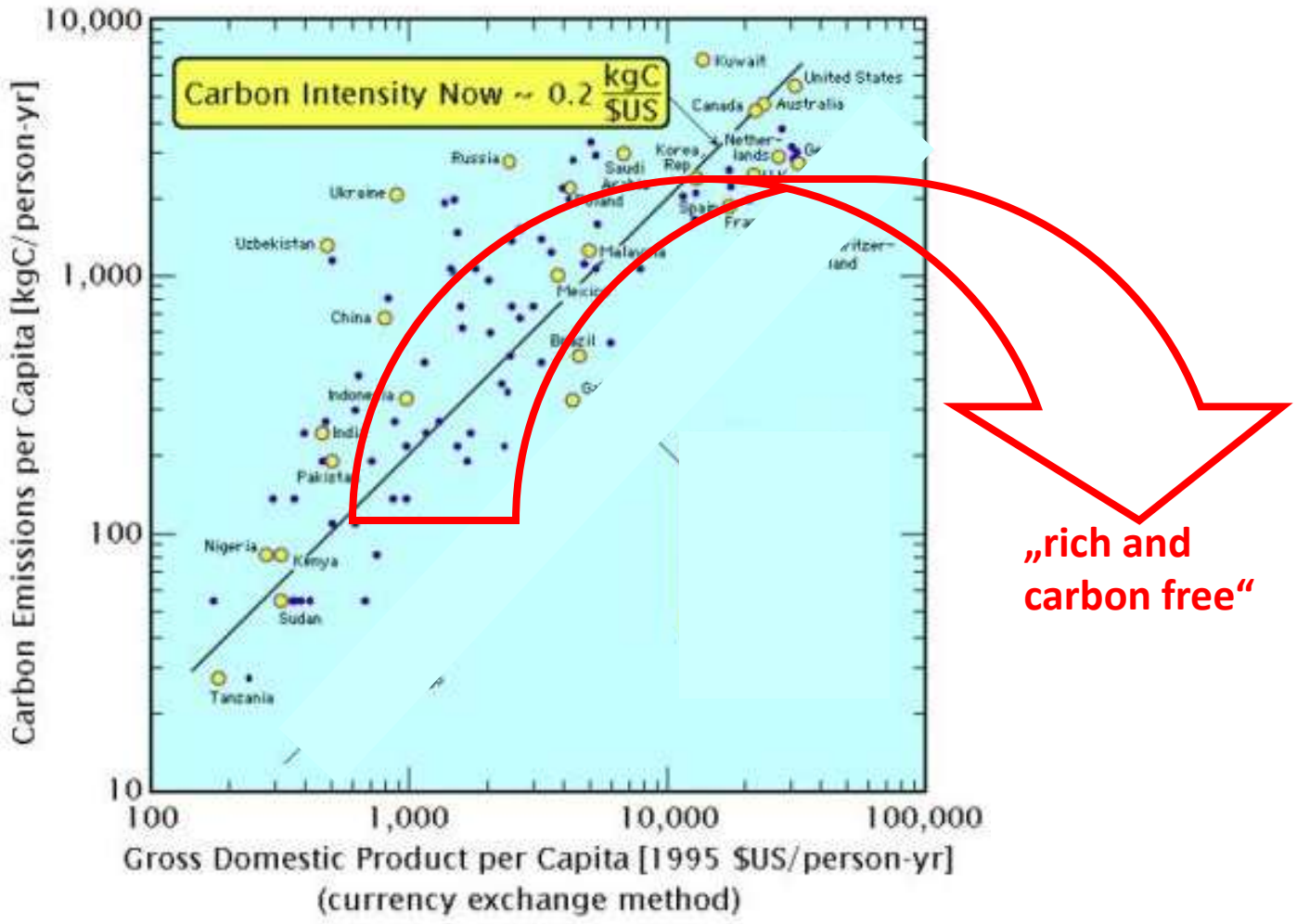
Note: OECD NW stands for the "New World" countries in the OECD, i.e. Australia, Canada, Mexico, New Zealand and the US. "RoW" represents various aggregate regions.

So far, carbon footprints grow in all sectors.

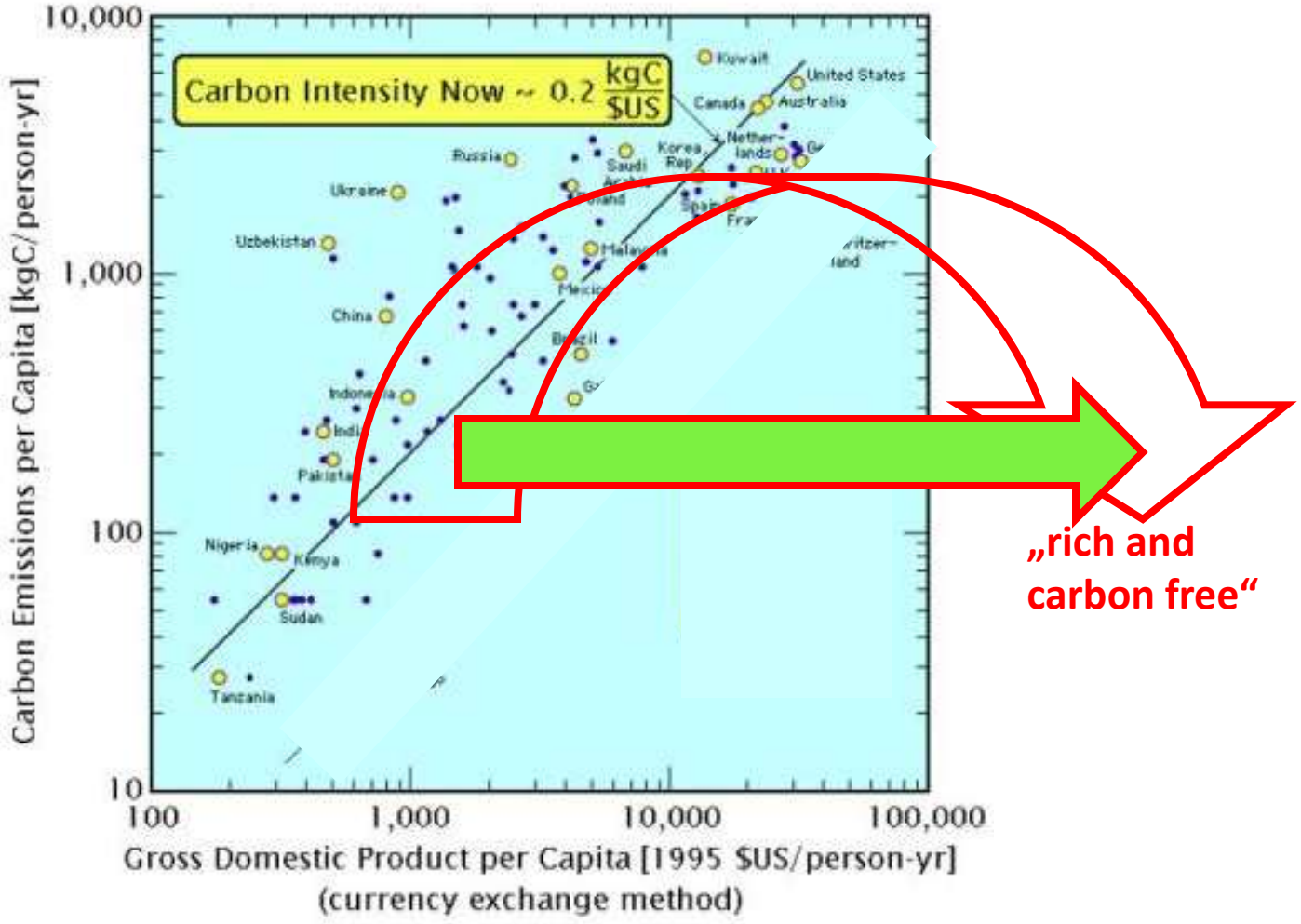
This have to change, meaning to create a

„Kuznets Curve of decarbonization“

So far, GDP goes with CO_2 intensity. We have to break this correlation, i.e. creating a Kuznets Curve of decarbonization.



So far, GDP goes with CO_2 intensity. We have to break this correlation, i.e. creating a Kuznets Curve of decarbonization. And then help poorer countries tunneling through.



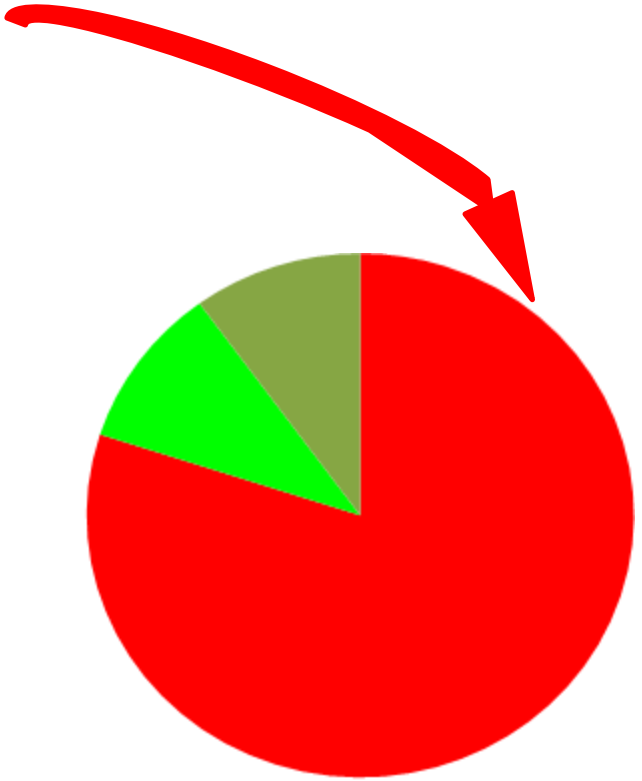
Three methods of creating light at the end of the tunnel:

- **Less CO_2 in energy**
- **Less energy in wealth**
- **Less wealth**

Conventional thinking suggests:

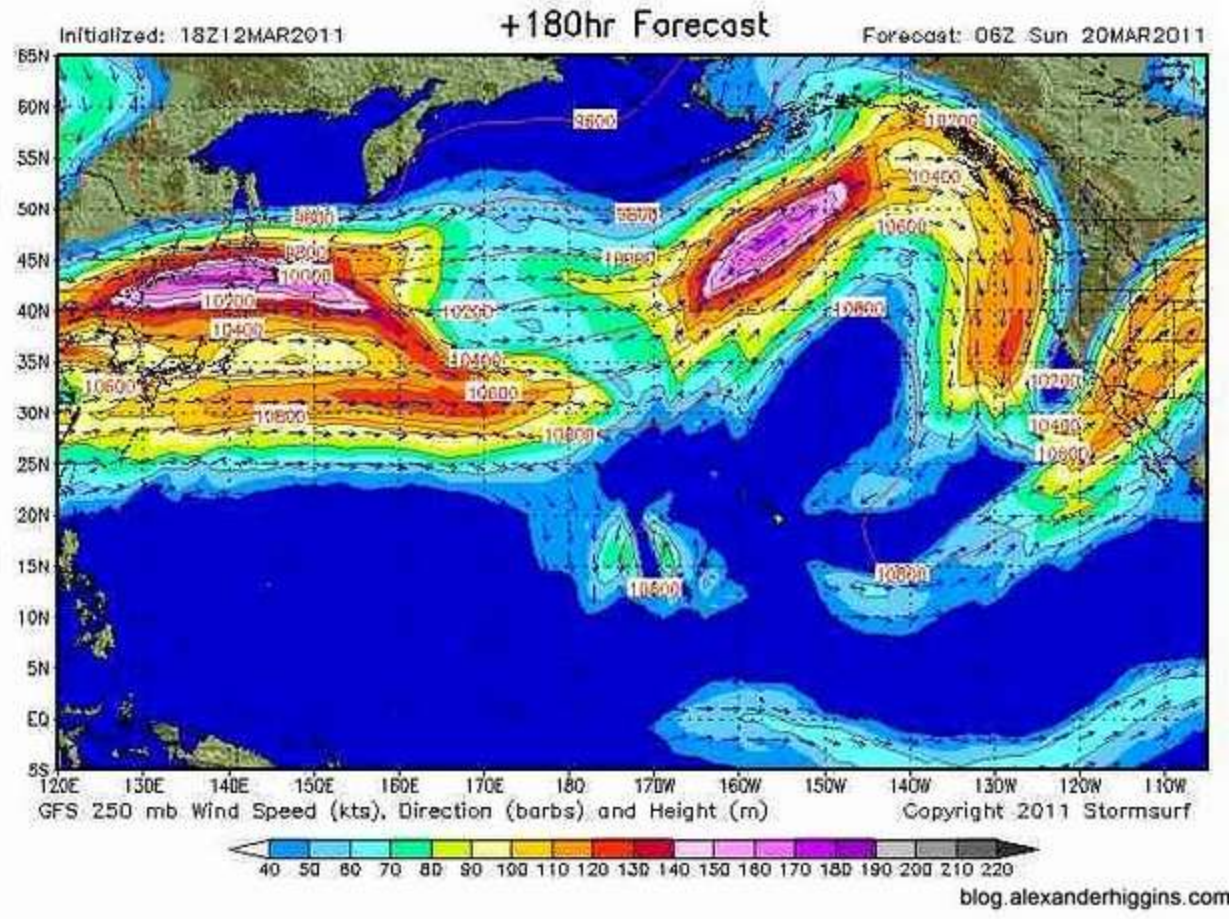
- **80%: Less CO_2 in energy**
- **10%: Less energy in wealth**
- **10%: Less wealth**

100%



Less carbon in energy? Such as nuclear? Not after Fukushima!

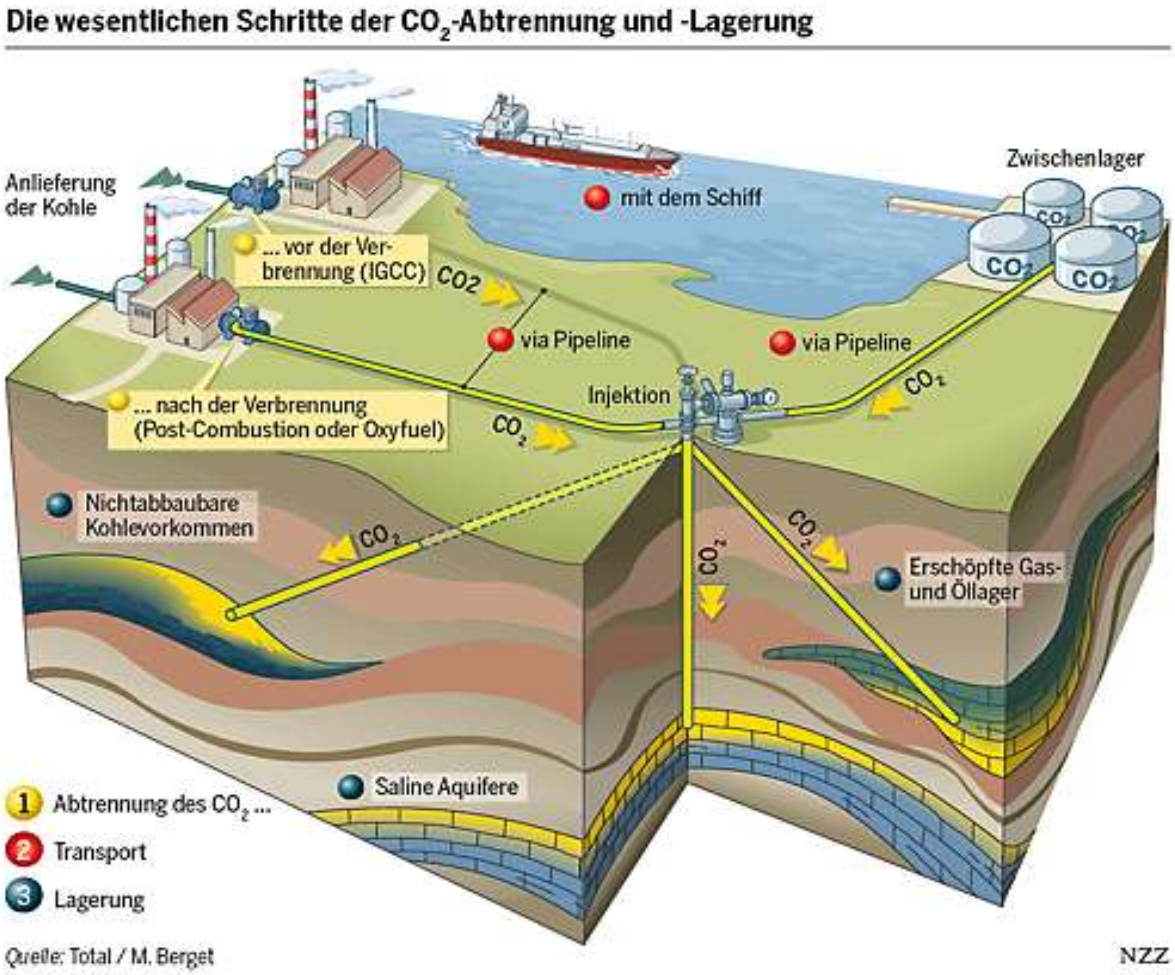
Der Tsunami löst die Katastrophe aus. (NTV Japan)



Die radioaktive Wolke nach 7 Tagen (Blog alexanderhiggins.com)

… or such as carbon capture and storage (CCS)?

That means sinking a lot of money



Endless maize fields

Endless palmoil plantations

… how about „bio-fuels“:

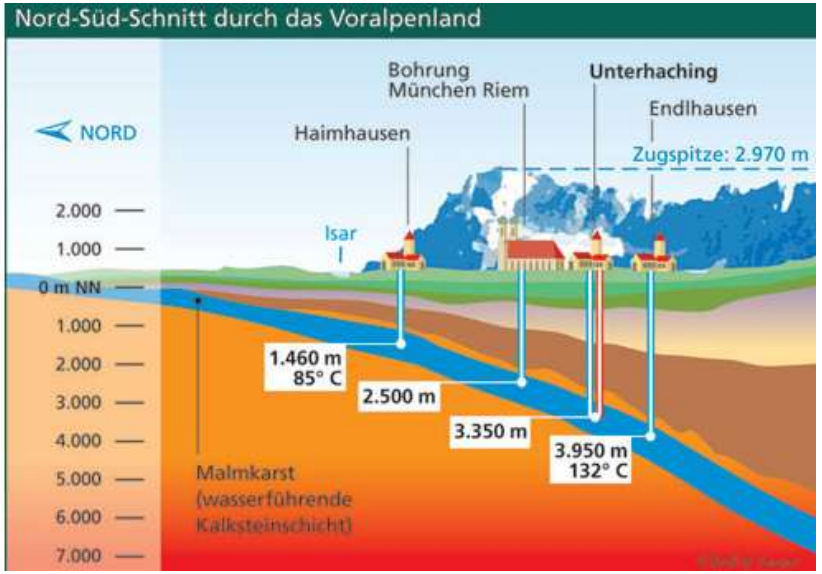
- an ecological nightmare!

…how about solar, wind, hydro or geothermal? They are fine in small sizes but can be nasty in large quantities.

PV as large as airports (Saxony, Germany)

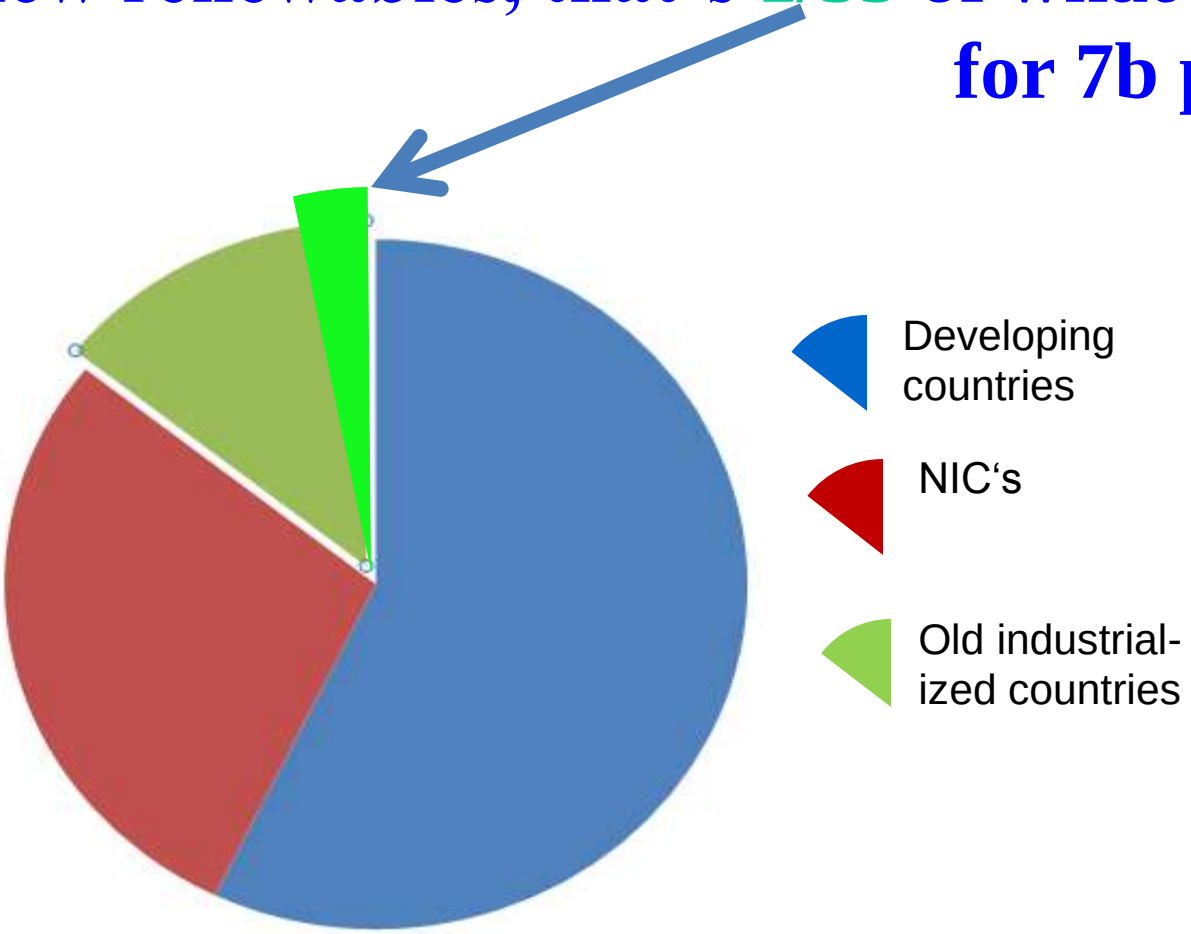
Wind turbines,- do you want such neighbours?

Hydrodams (Xiaowan, China) huge fights!



Geothermal: as deep as the alps are high…

Let‘s calculate: if 1b people (the rich) achieve 20% new renewables, that‘s 1/35 of what you would need for 7b people on earth.

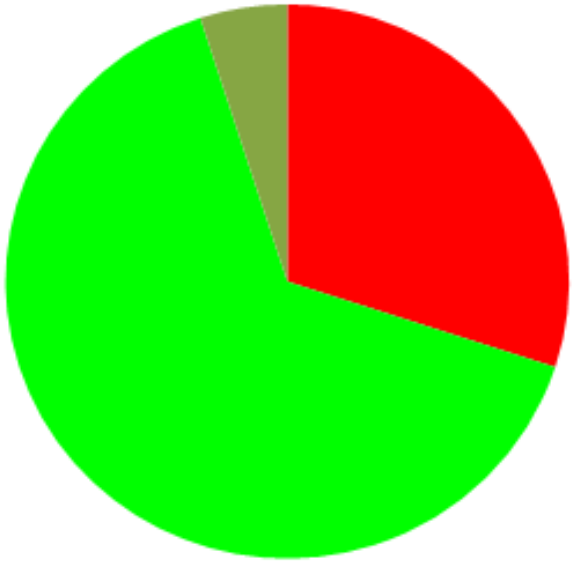


And now imagine a 35fold increase of today‘s biofuels plantations, wind power, hydopower, solar power. It‘s an ecological nightmare!

Avoiding that nightmare could mean:

- **30% Less CO_2 in energy**
- **65%: Less energy in wealth**
- **5%: Less wealth**

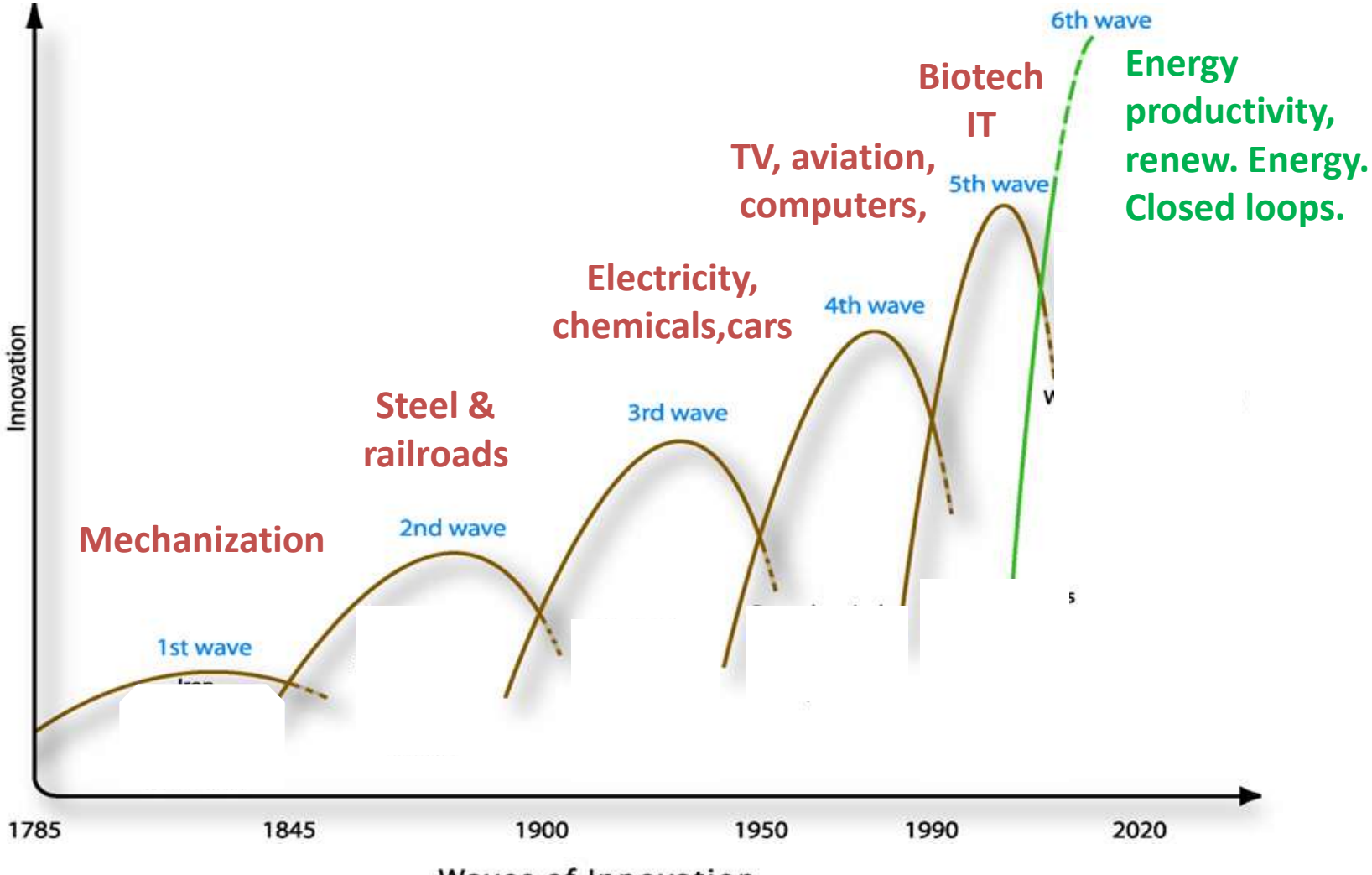
100%

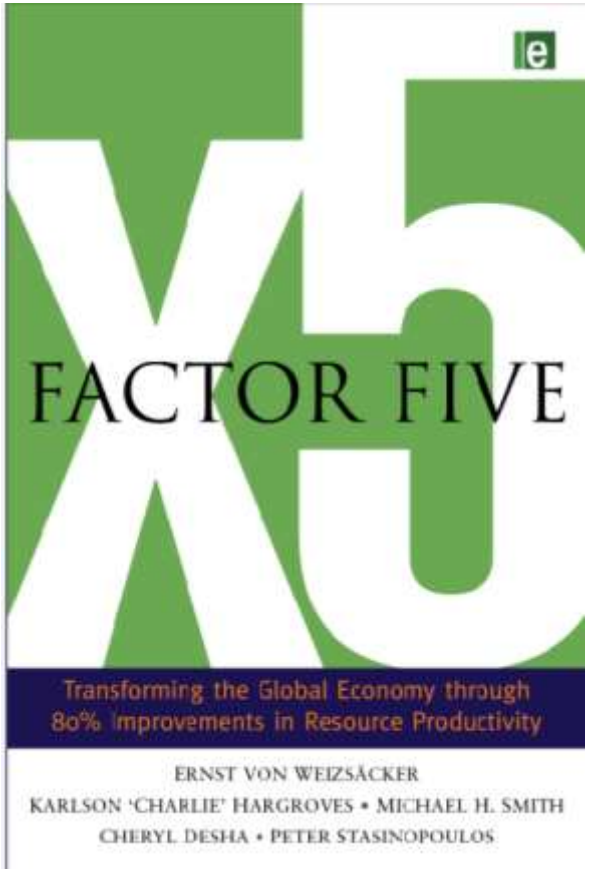


That is still a sevenfold increase of renewables, but at the core it's a new technological revolution!

That's even more light at the end of the tunnel!

In other words: a Green Kondratiev Cycle.

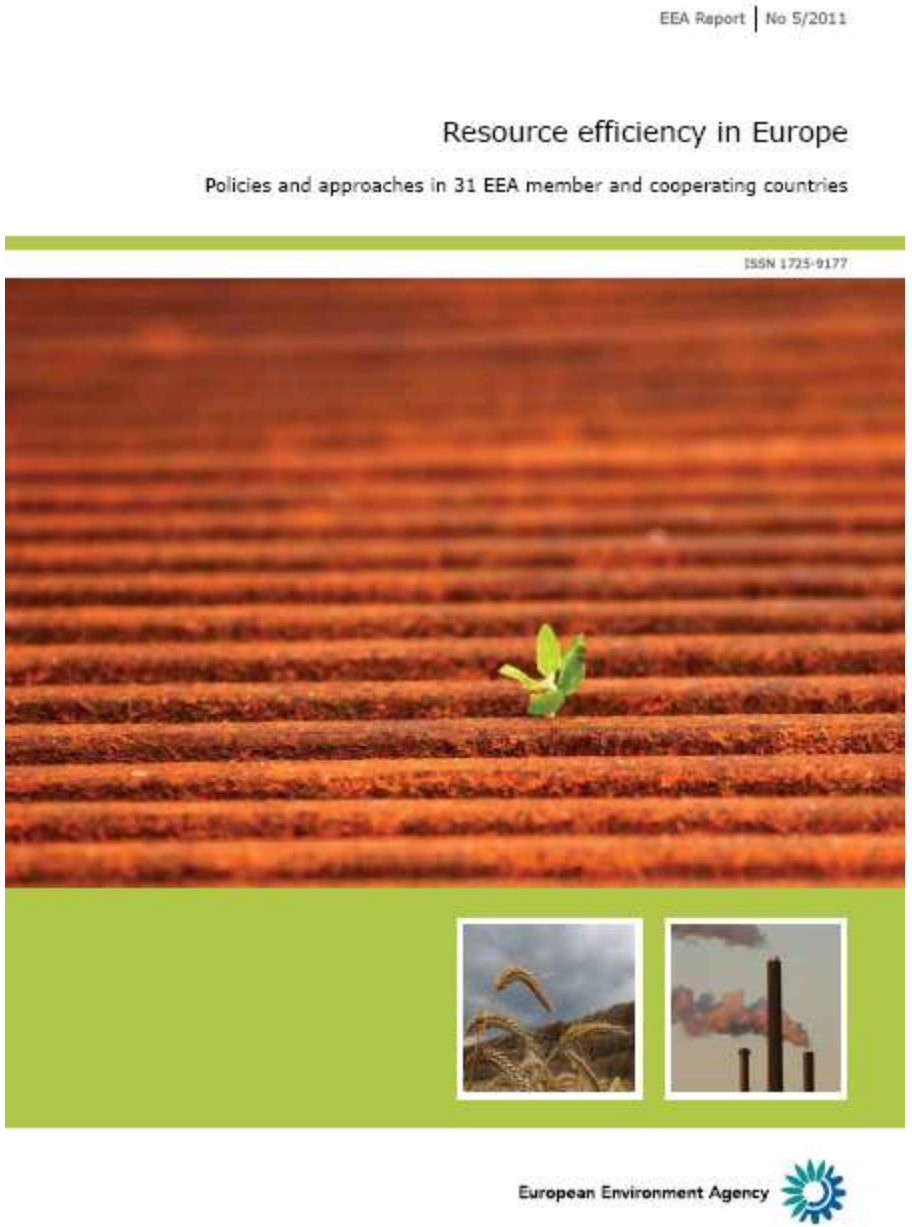




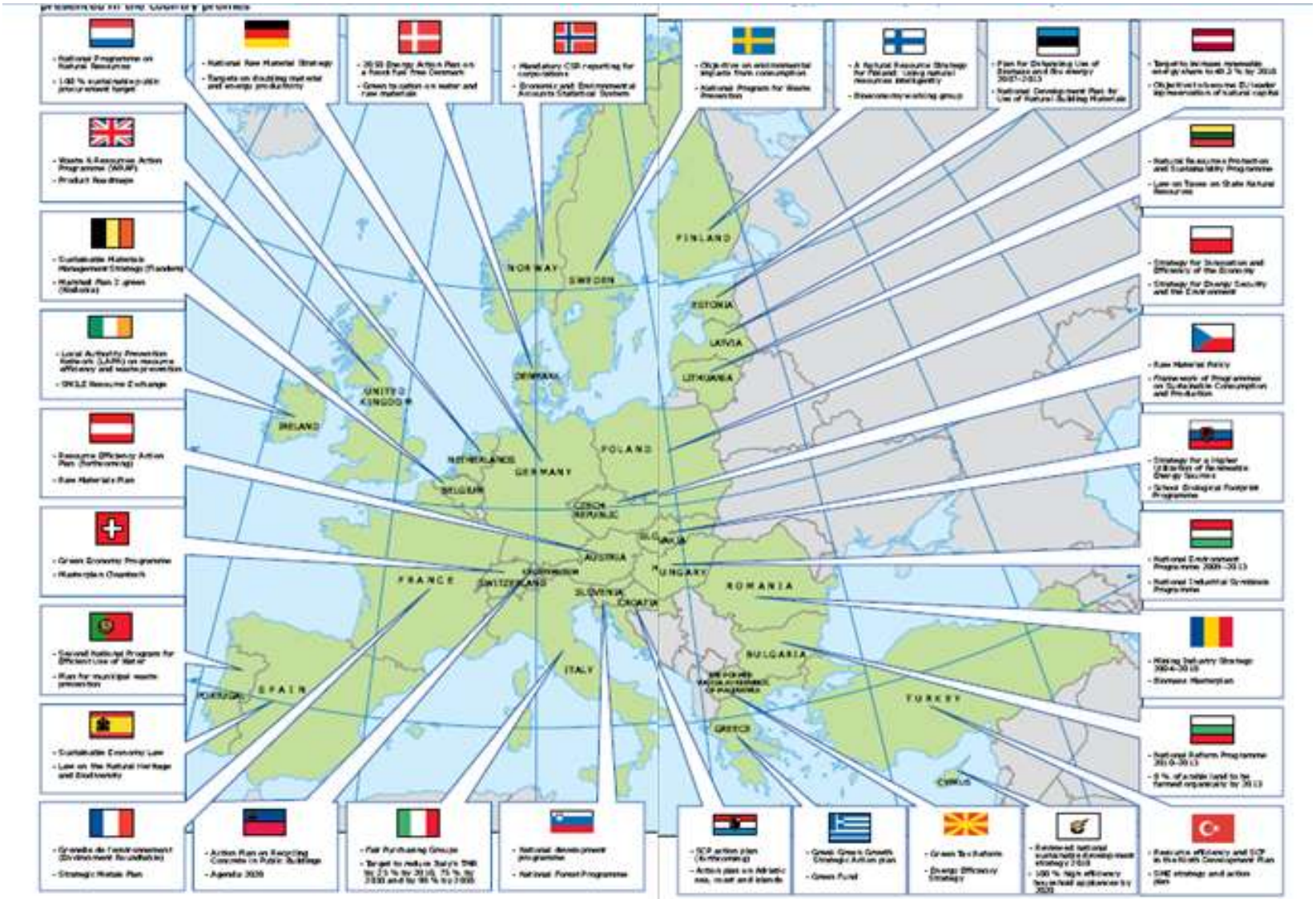
December, 2009 **March, 2010** **October, 2010**

Factor Five **is a book documenting that technologies and policies are available for a five fold improvement!**

These days, the EEA in Copenhagen is publishing a new report on resource efficiency in Europe. Corresponding the „Roadmap“ for a resource efficient Europe referred to by Commissioner Janez Potočnik.



… featuring examples from 31 European countries including Finland



But let‘s not give up. In terms of physics and technology, a factor of five of decoupling is absolutely in reach.

To convince you that we can become a lot more prosperous consuming less energy, I am asking you a question from a freshman‘s class of physics.

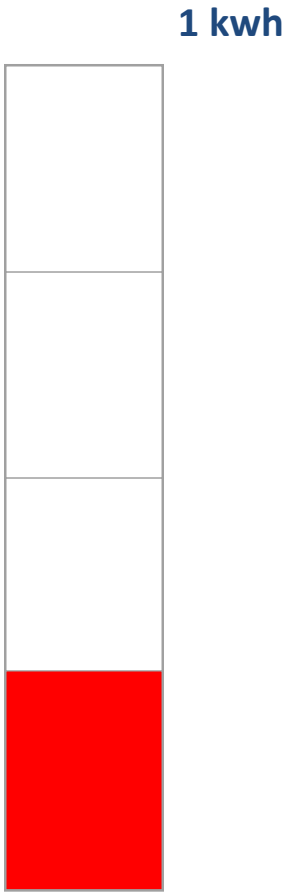
Imagine a bucket of water of 10 kg weight

How many Kilowatt-hours

do you need to lift it from sea level to the top of Mount Everest?

The answer is:
One quarter of a kilowatthour!

(knowing that one watt-second is one Joule or one Newton-meter; ¼ kwh is 900.000 watt-seconds)



Let us run through some examples of the „Factor Five“ revolution.

Amory Lovins' "Hypercar":
1,2 l/100km

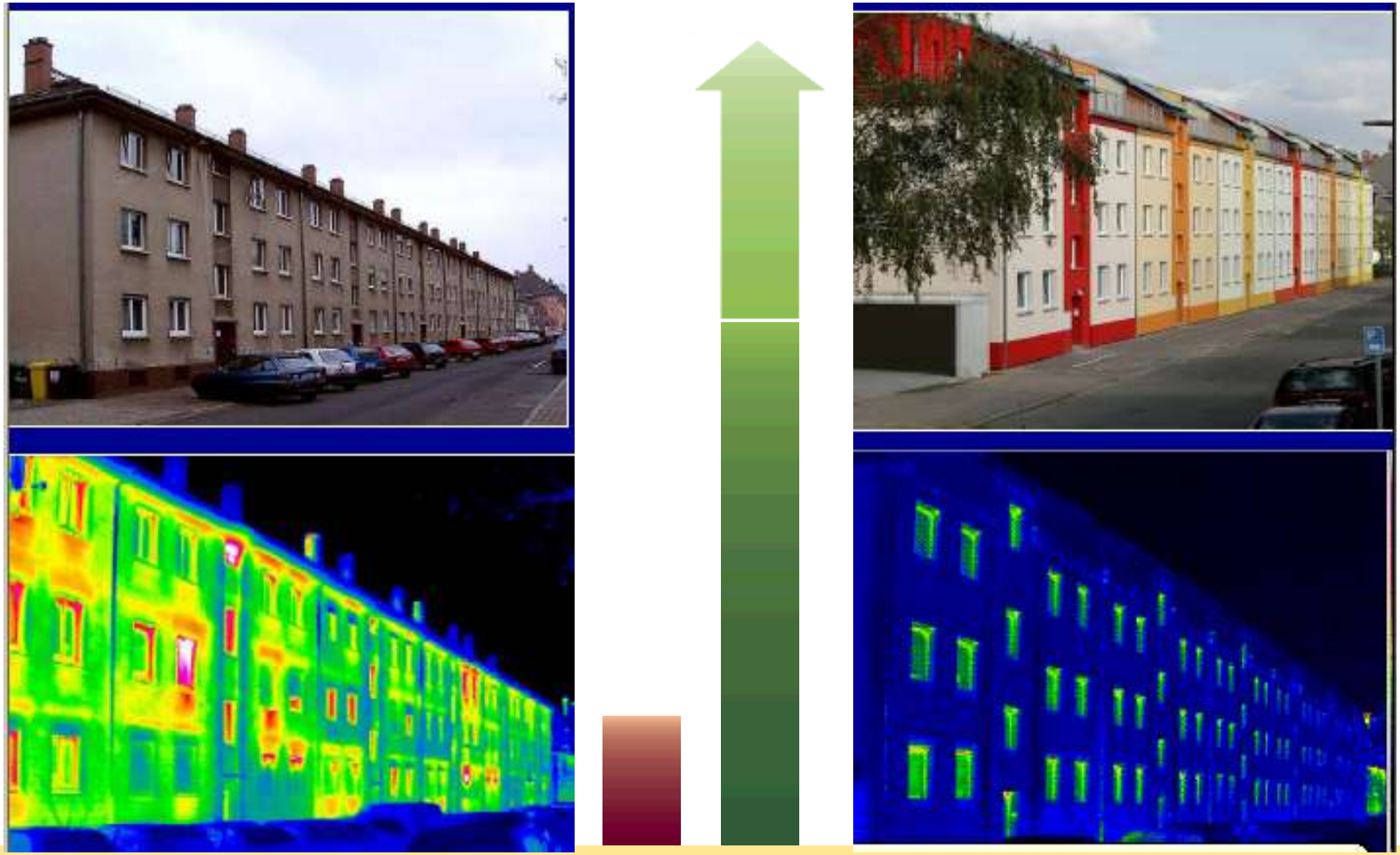
Today's fleet
6-12 l/100km

Fuel efficiency

“Passive houses”: a factor of ten more heat efficient.

Energy efficiency

Refurbishing existing buildings



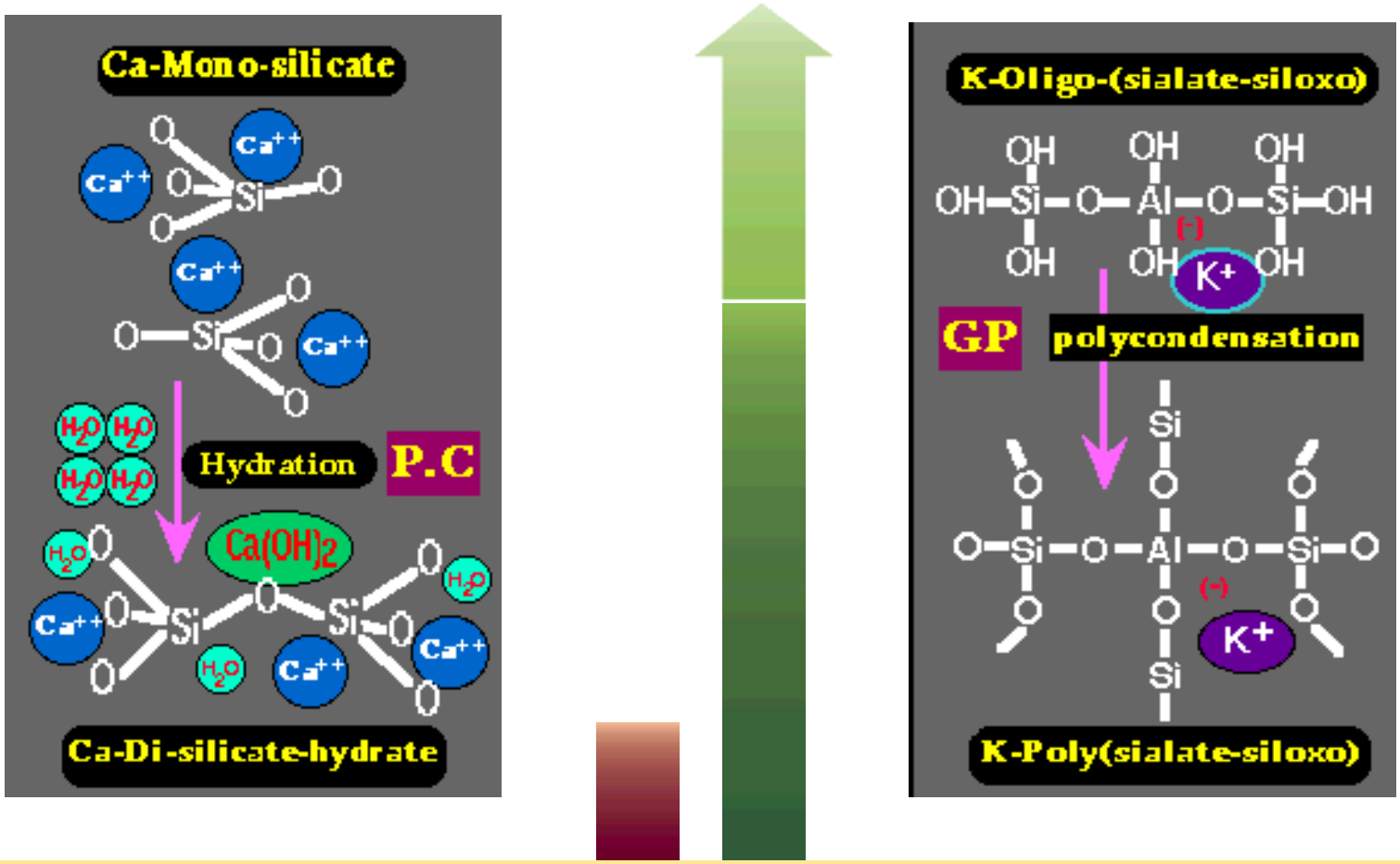
Upper row: Photographs
Lower: Thermograms

LED replacing incandescent bulbs: a factor of 10

Philips 7W Master LED

Energy efficiency

From Portland cement to geopolymer cement



Carbon efficiency

City structure

USA

Energy and space efficiency

Copenhagen (above)
Freiburg , Vauban (below)

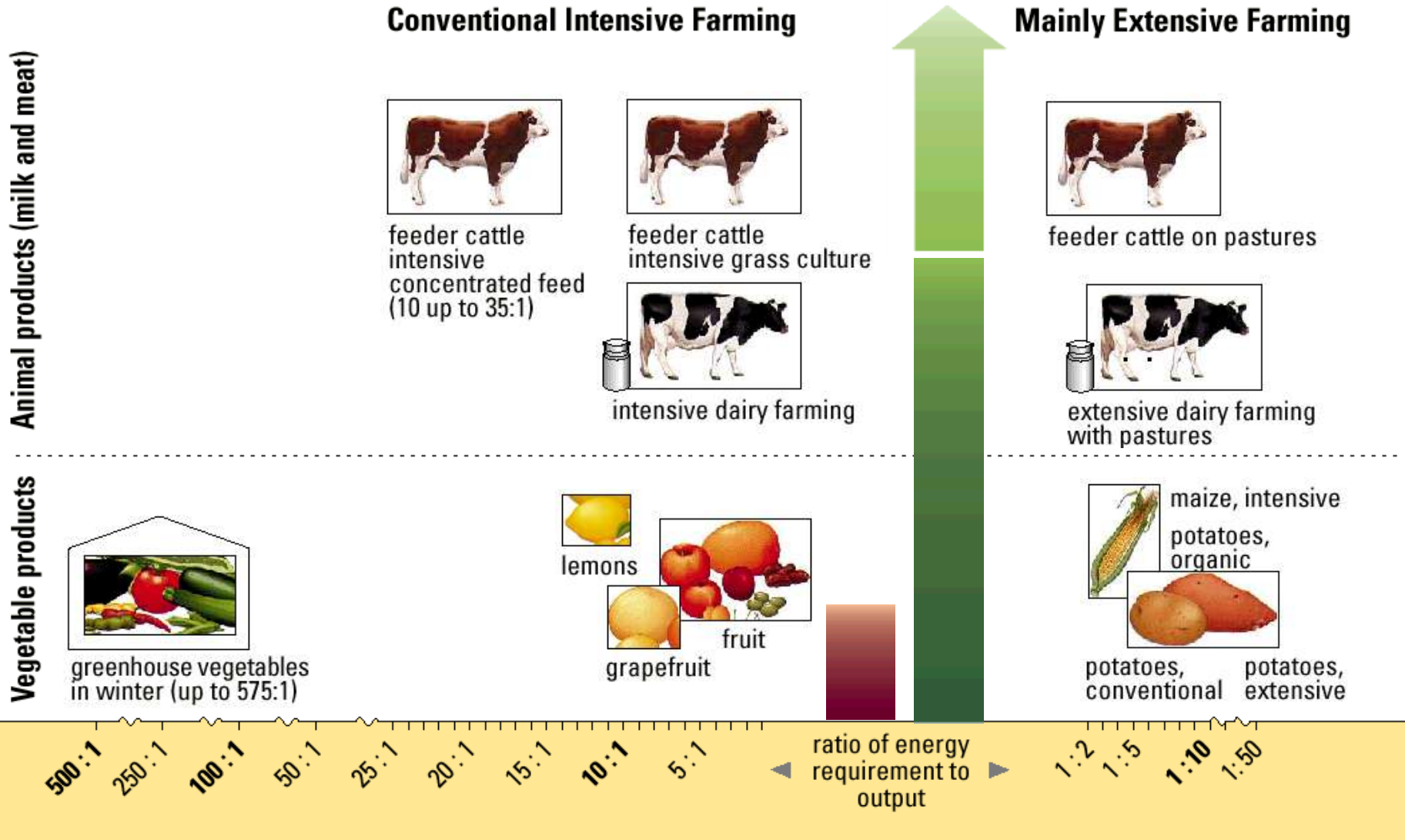
From rotten trains to high speed trains

Amtrak

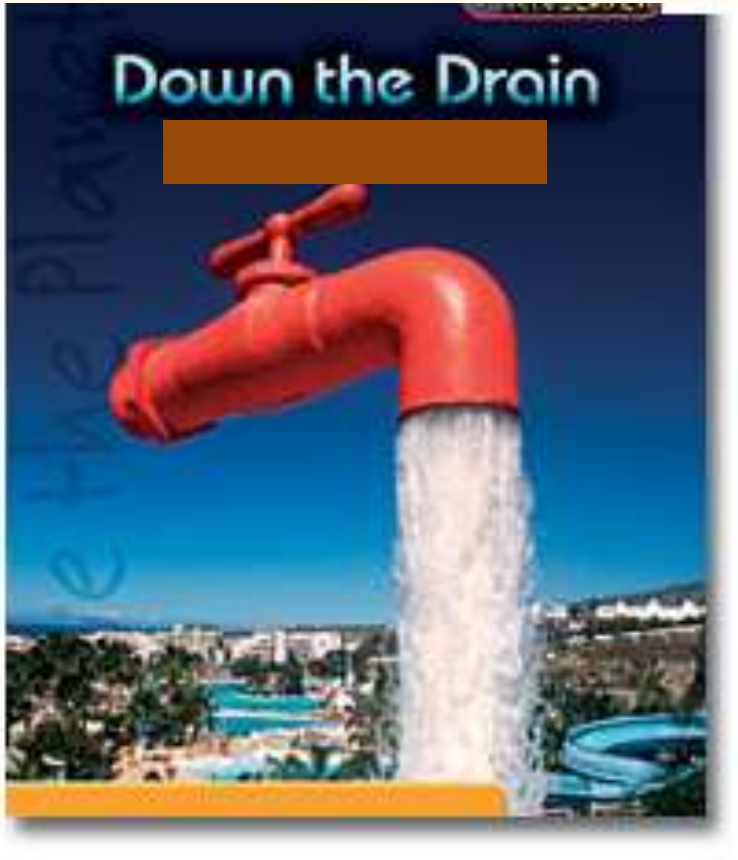
Shinkansen

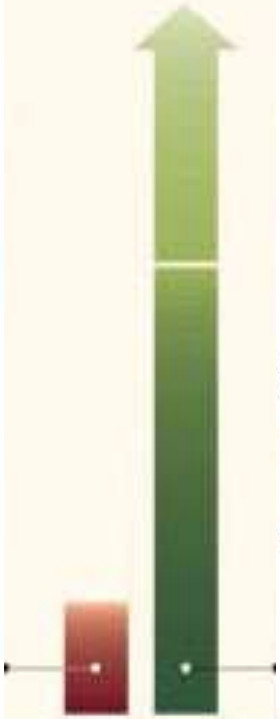
Time and resource efficiency

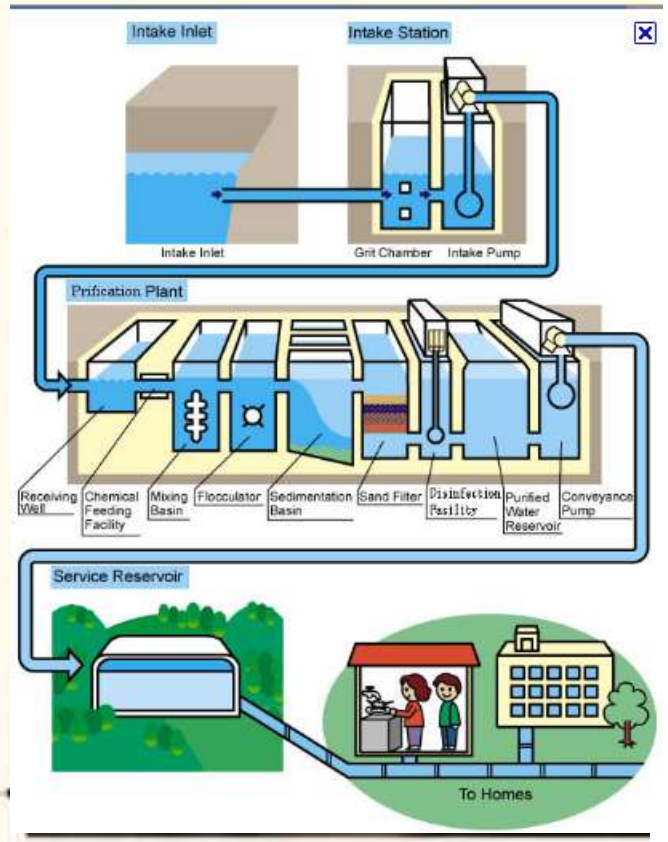
Seasonal diets, organic farming, a little less beef



From using water once to purifying (recycling) it

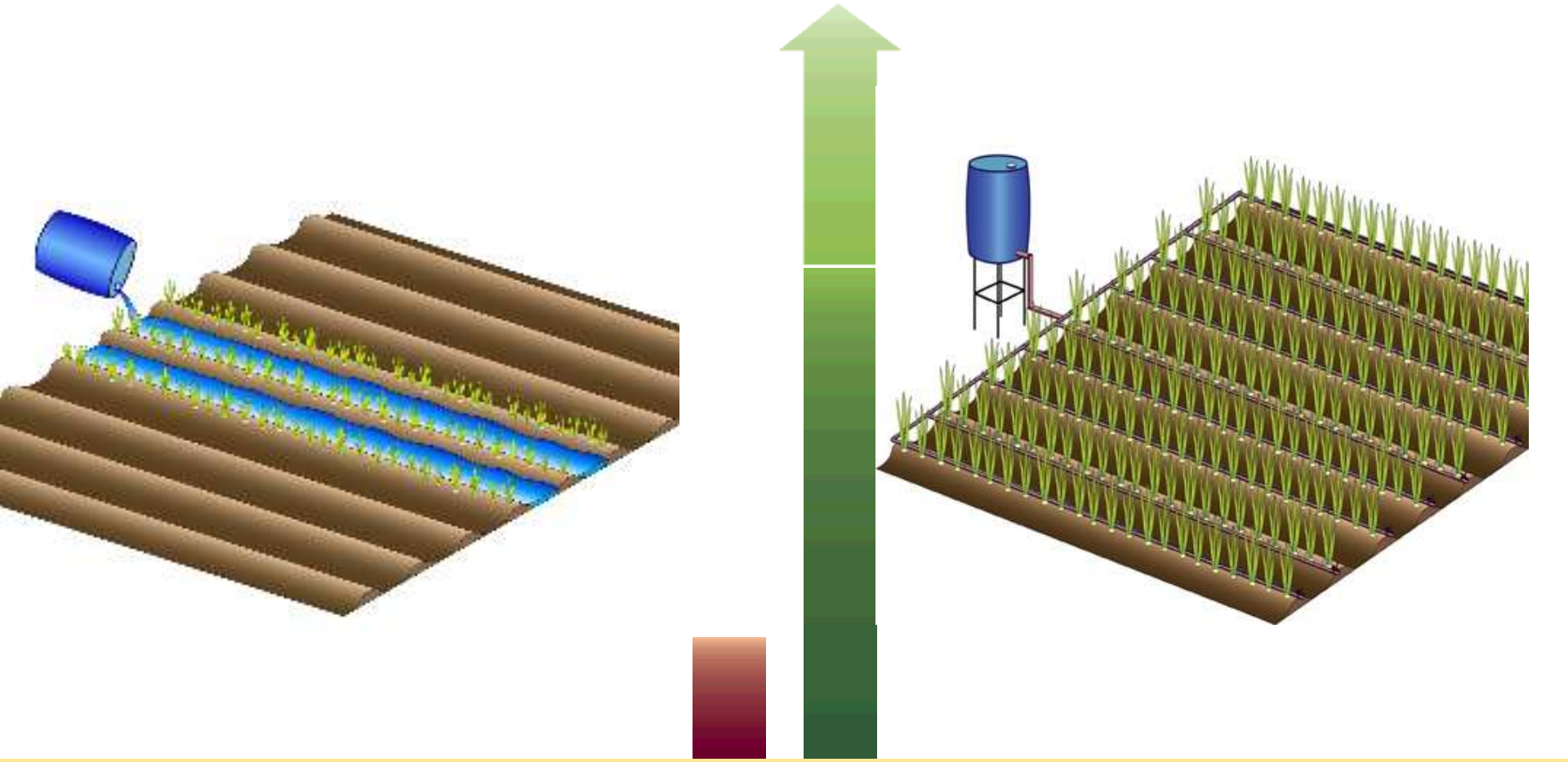






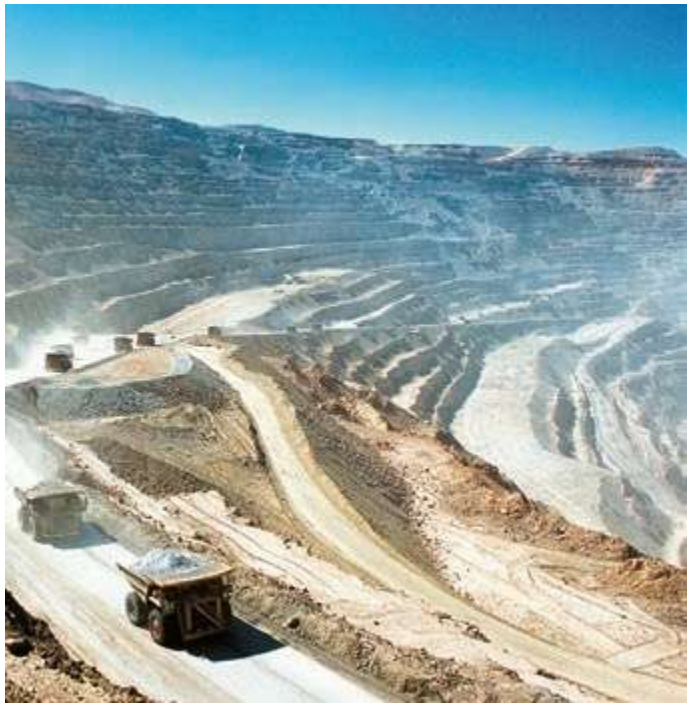
Water efficiency

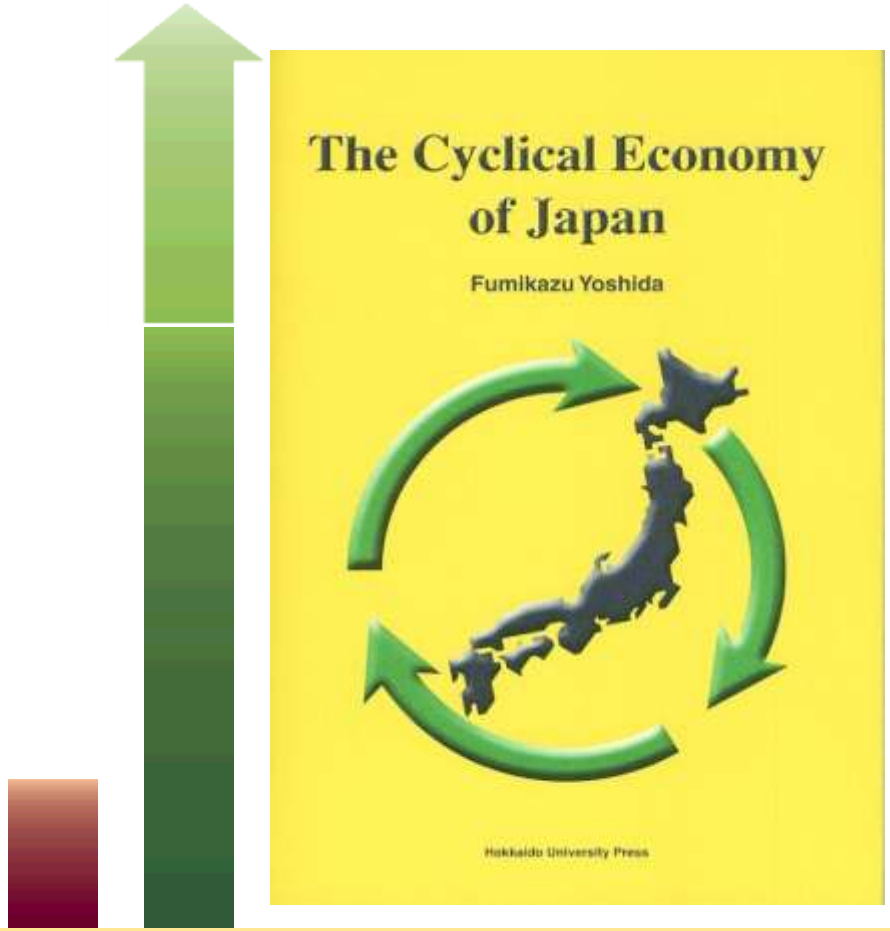
From flood irrigation to advanced drip irrigation



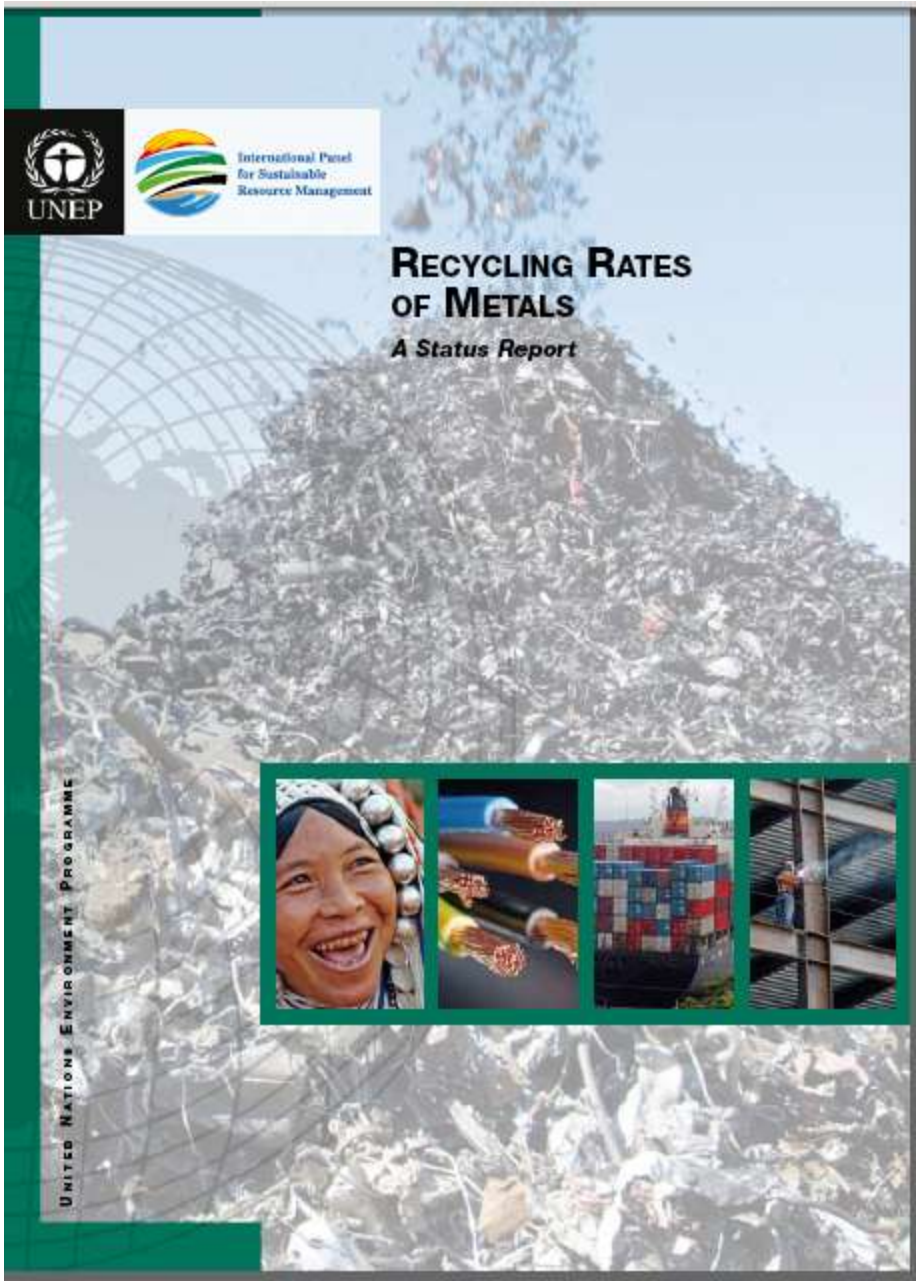
Water efficiency
(Source: www.driptech.com)

From excessive mining to the “cyclical economy”





Minerals efficiency



Another 2011 Report by the International Resource Panel, on recycling rates of metals.

UNEP

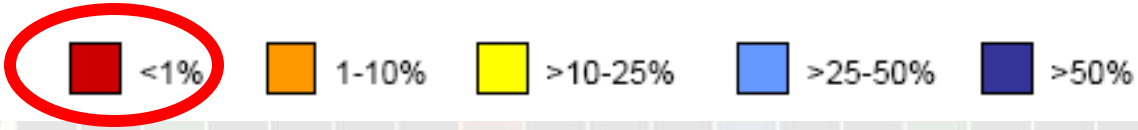
International Resource Panel

Specialty metals recycling rates are below 1%!!

(Int. Resource Panel: Graedel et al, 2011)

1 H																2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	**	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub	113 Uut	114 Uuq	115 Uup	116 Uuh	(117) (Uus)	118 Uuo

* Lanthanides	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
** Actinides	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr



The 6th Kondratiev needs a new understanding of productivity

Old :

Increasing labour productivity

New :

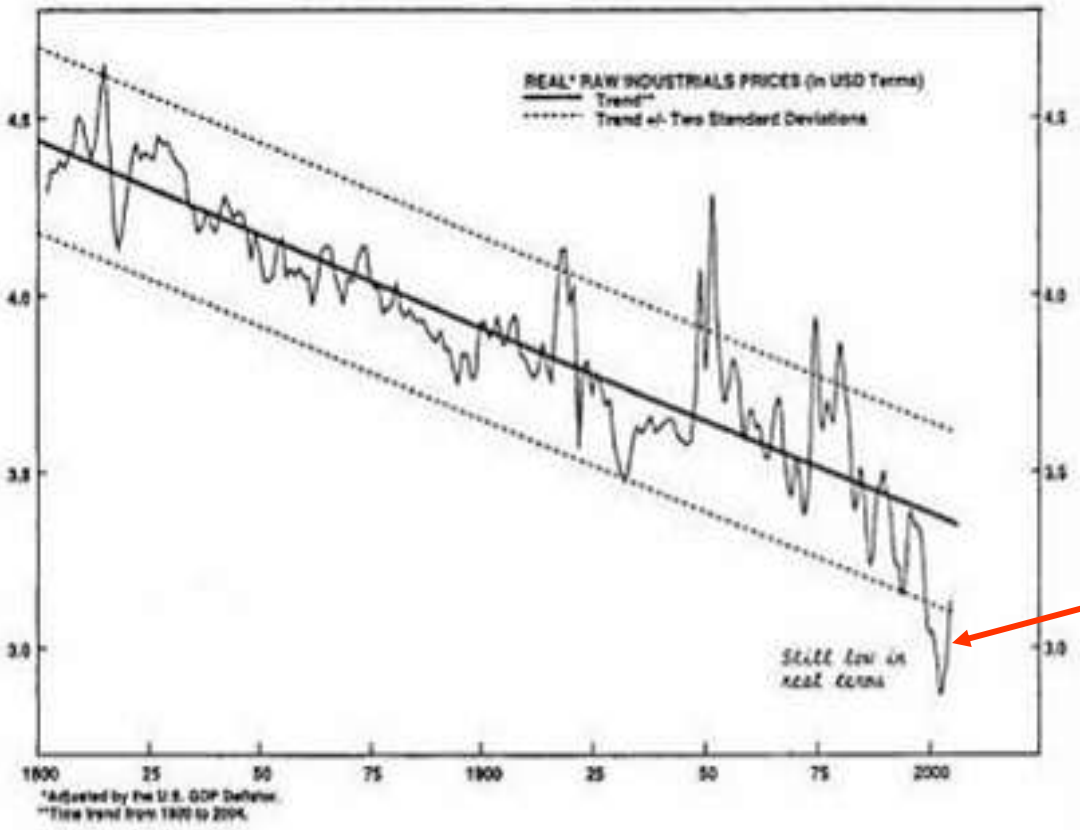
Increasing resource productivity

Labour productivity increased twentyfold since 1850. After learning about the Factor Five opportunities, I assume that resource productivity could easily increase fivefold in 50 years and perhaps tenfold in 100 years! That‘s the Green Technology side of the game.

Labour productivity rose in parallel with labour costs

How about resource prices? For 200 years they were falling.

Prices of industrial commodities & energy, in constant dollars

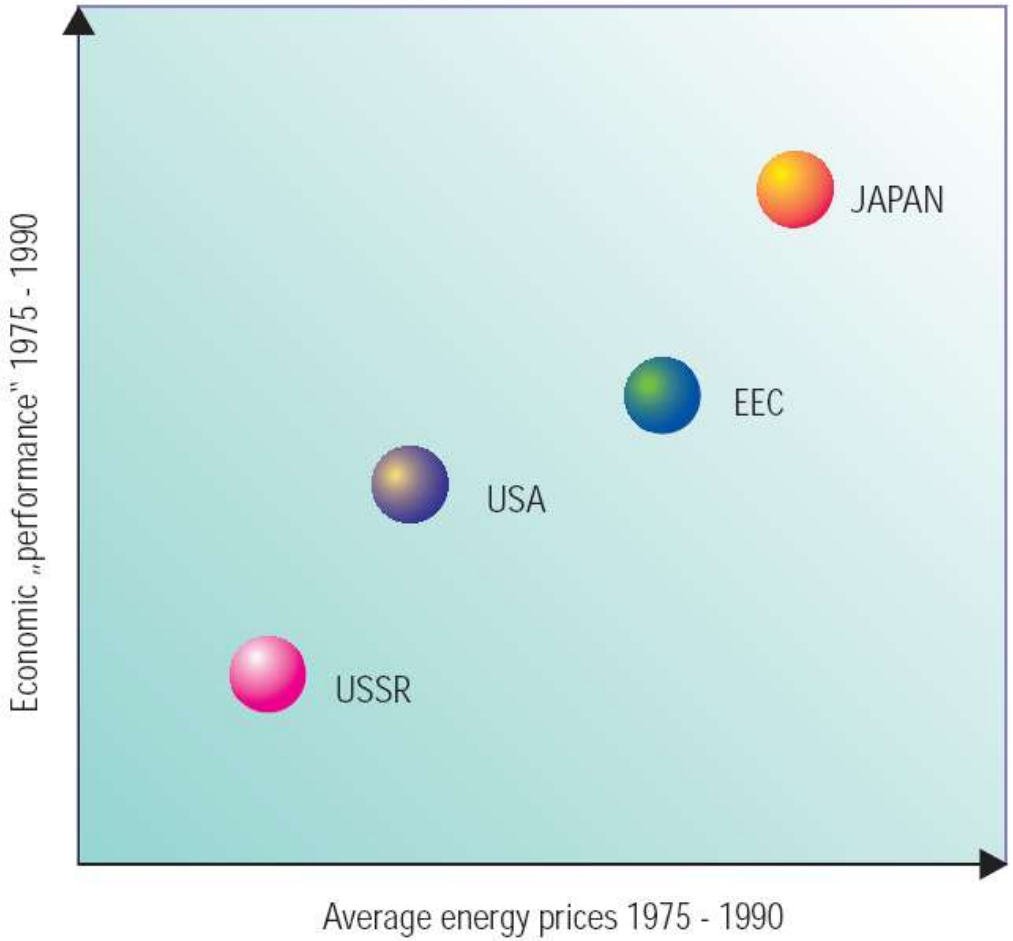


2000-2004

Source: The Bank Credit Analyst

In the context of the China Council, I developed the idea of letting prices of energy and primary minerals increase in line with the documented efficiency gains, so that on average you wouldn‘t pay more for energy services any year. The Chinese side was quite excited about the idea. That‘s the Green Politics side of the game.

High energy prices need not hurt the economy. Japan blossomed during the 15 years of highest energy prices.



Who would win, who would lose?

Winning: green business including recycling, renewable energies, water purification, high tech; crafts; science; education; communication; railroads; consultants (not all!); culture.

Losing: heavy transport industry, heavy industry, urban sprawl, wasteful consumers, extractive industries.

The winning team may represent 80% of the people of the world! And it would include the next generations!

Thank you!