

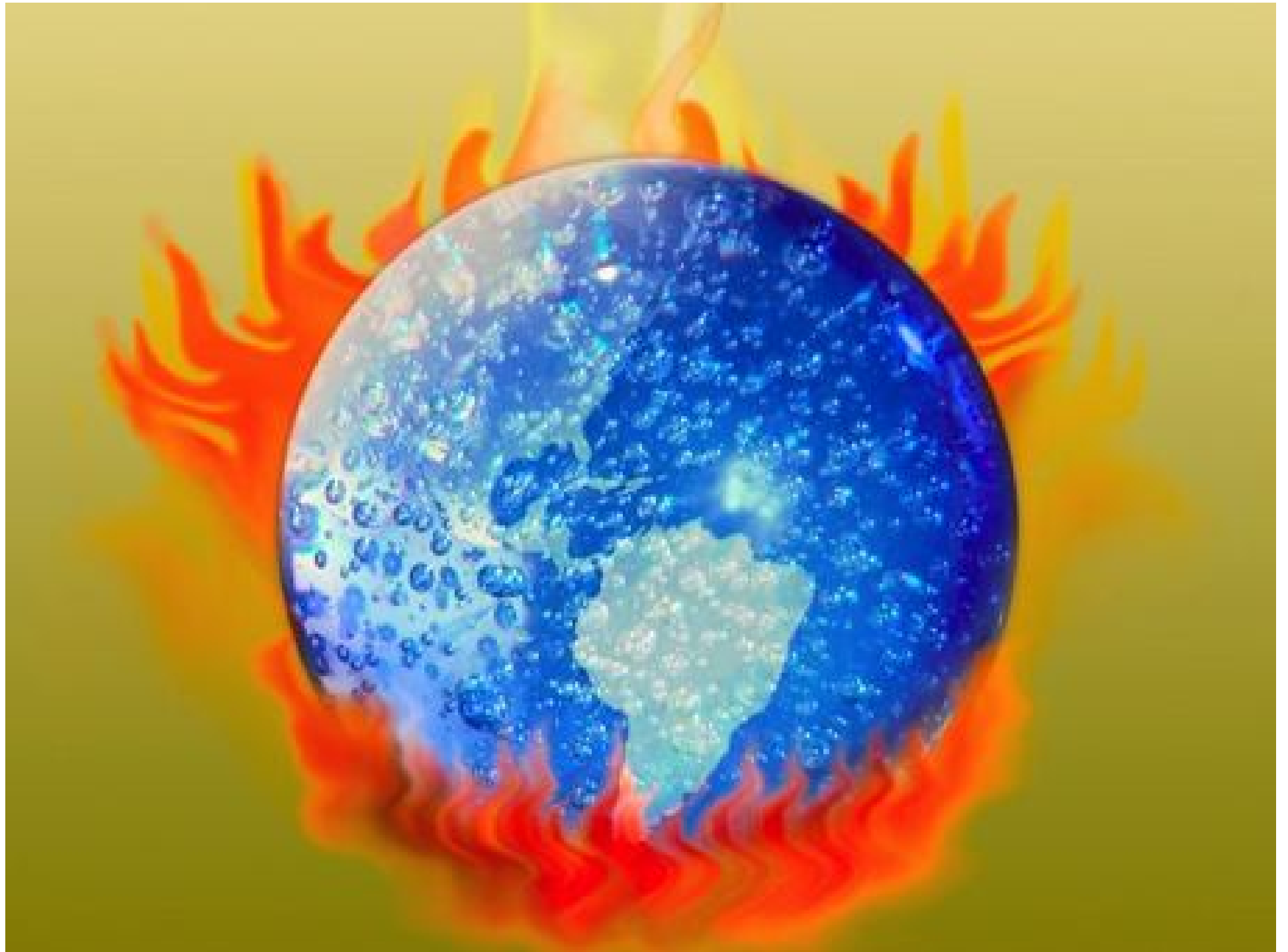
Efficiency, Equity, Empowerment

The missing variables in the sustainability equation

TARAgam Yatra

Delhi and Bundelkhand, 17-21 September 2010

**Ashok Khosla
Development Alternatives**



The Multi-Pronged Squeeze on Humanity

Human wellbeing
20/80 dilemma

Climate
550/450/350
dilemma

Ecosystems
60 % loss dilemma

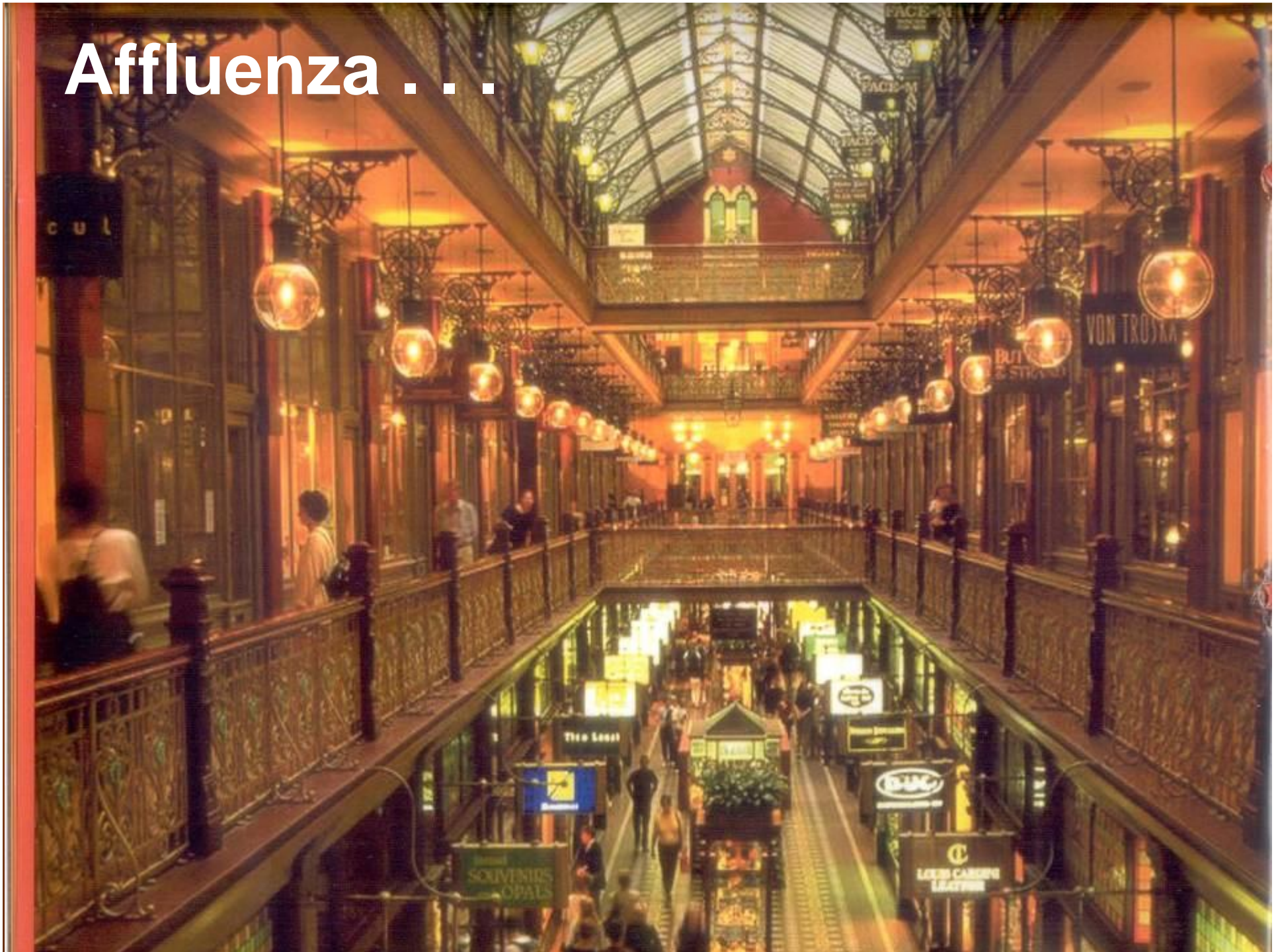
Surprise
99/1 dilemma





***The
Earth
today is
in high
fever***

Affluenza . . .



... A Very Good Life...



The 25%



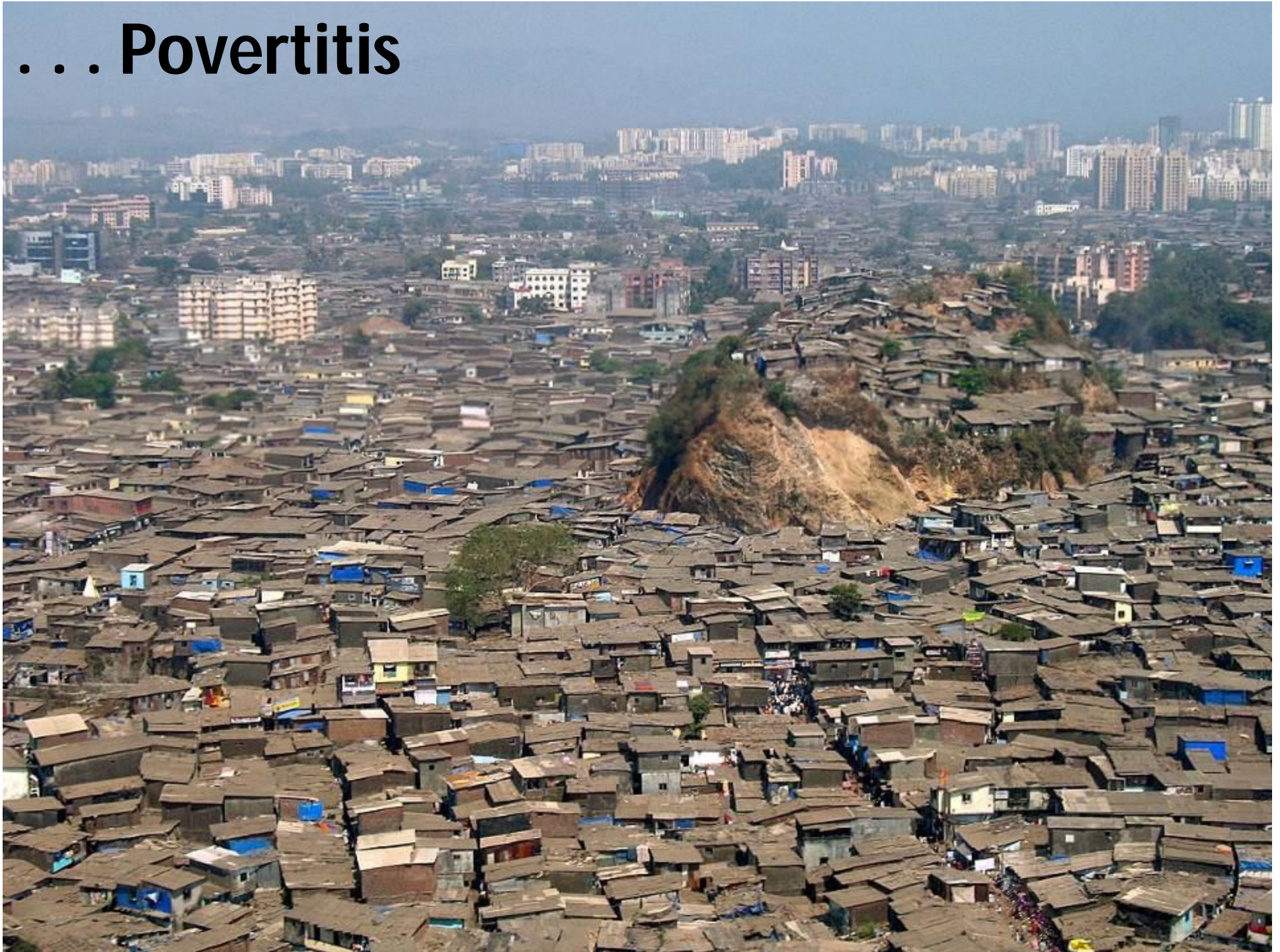


1 Week's Food for a Family in Germany: \$ 342



***The Earth
also has
another
high
fever***

... **Povertitis**







> 1.3 billion people



– No Clean Drinking Water

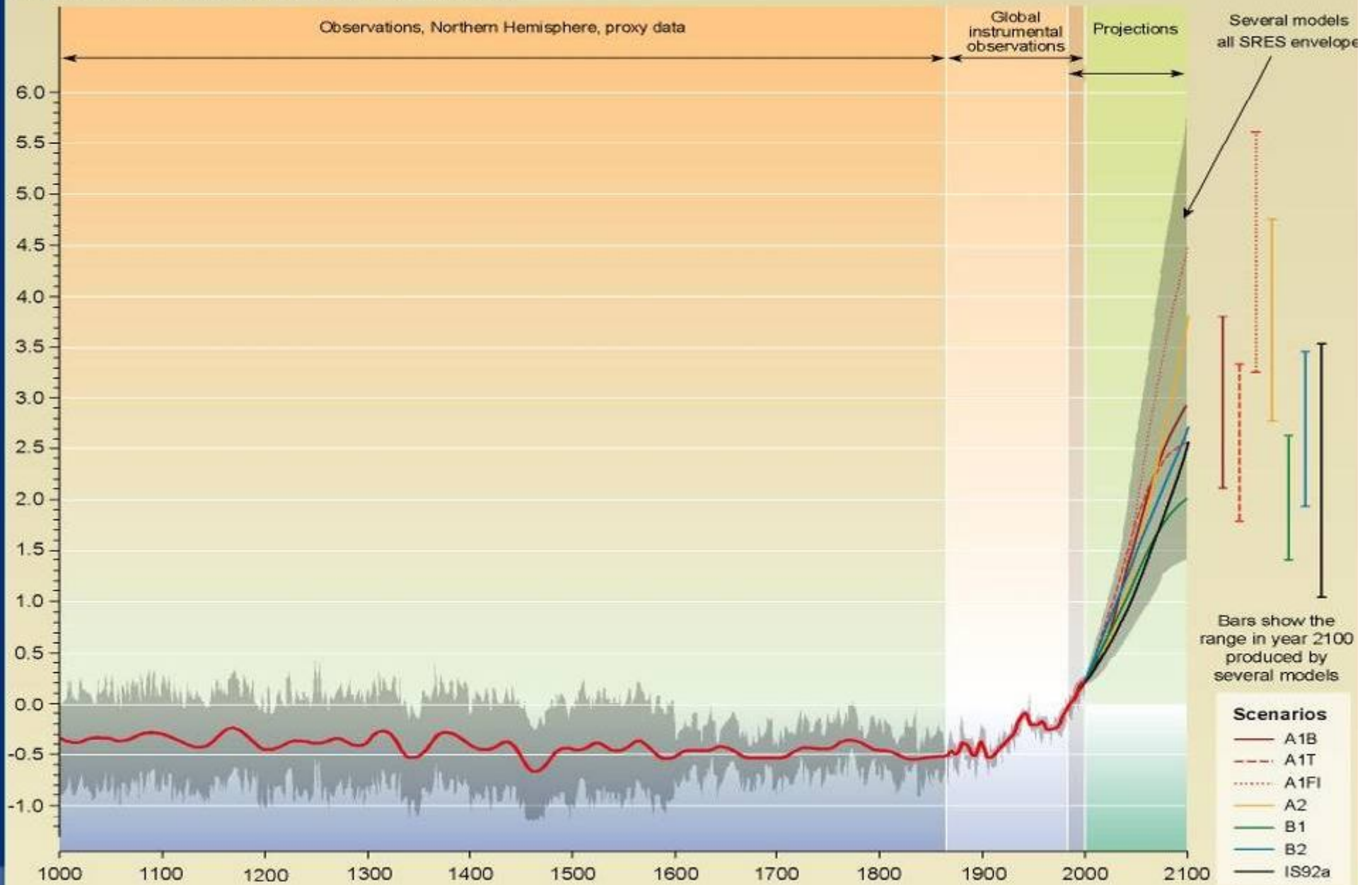


1 Week's Food for a Family in Chad: \$ 1.37



Variations of the Earth's surface temperature: year 1000 to year 2100

Departures in temperature in °C (from the 1990 value)



Climate Change



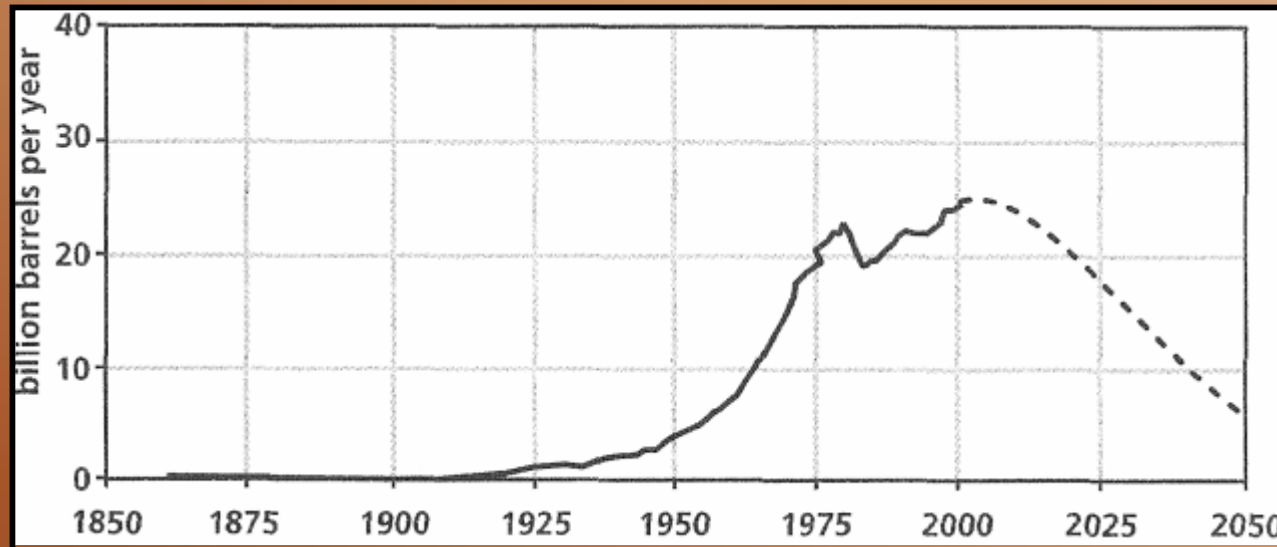






Oil and gas peaks

Oil production peaks before 2020



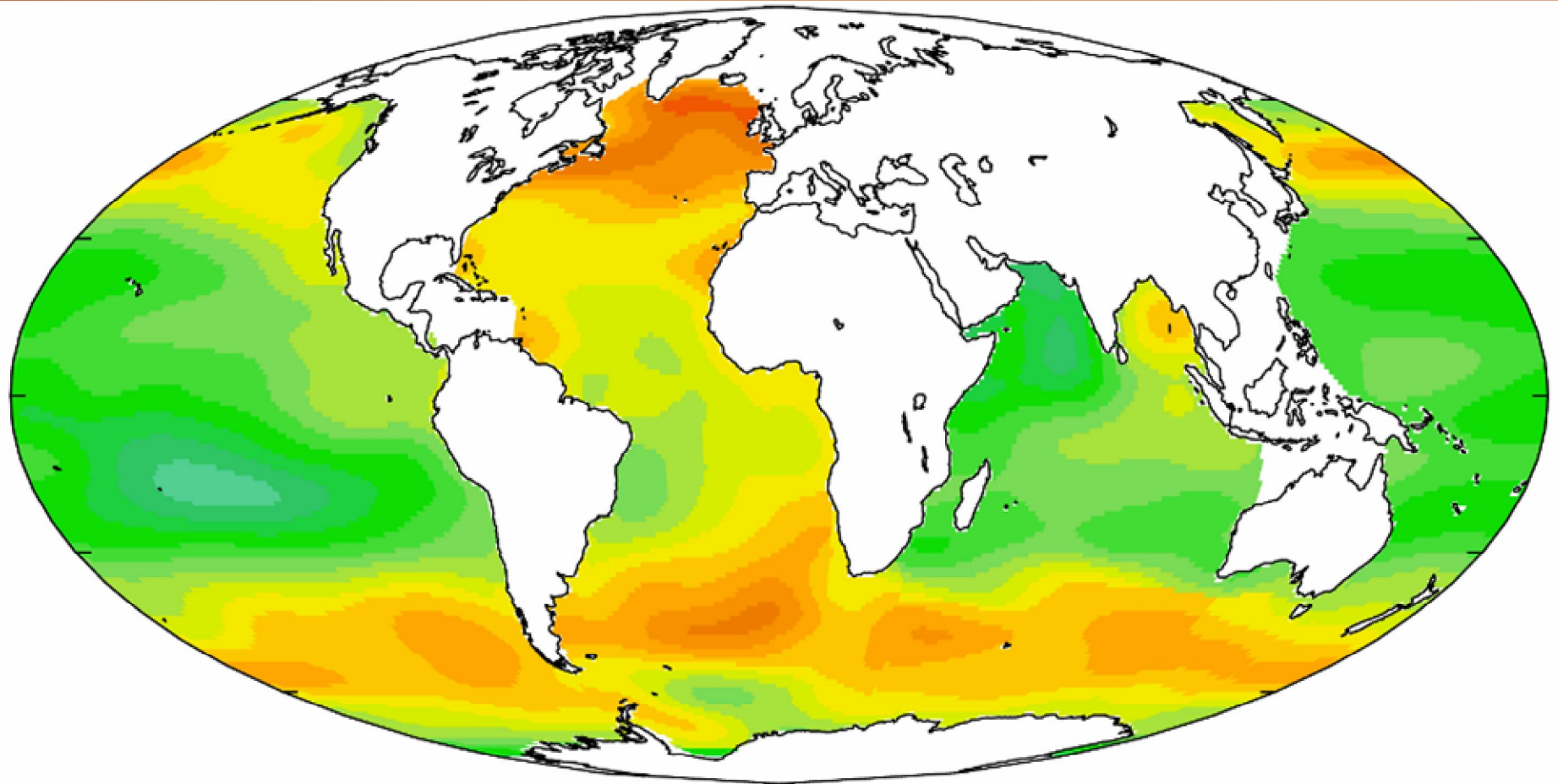
Source: Defeyes, 2001: Hubbert's Peak

Gas

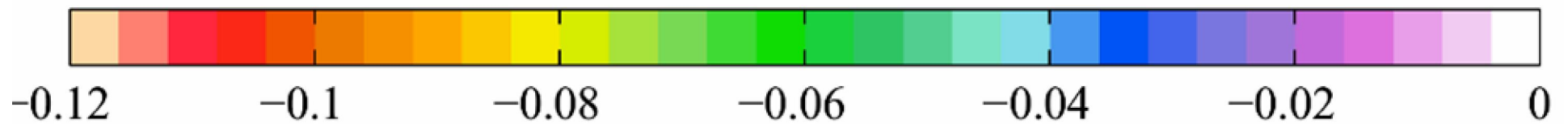
Econ. growth (%)	0	2,8	5
Year of depletion	2260	2075	2055

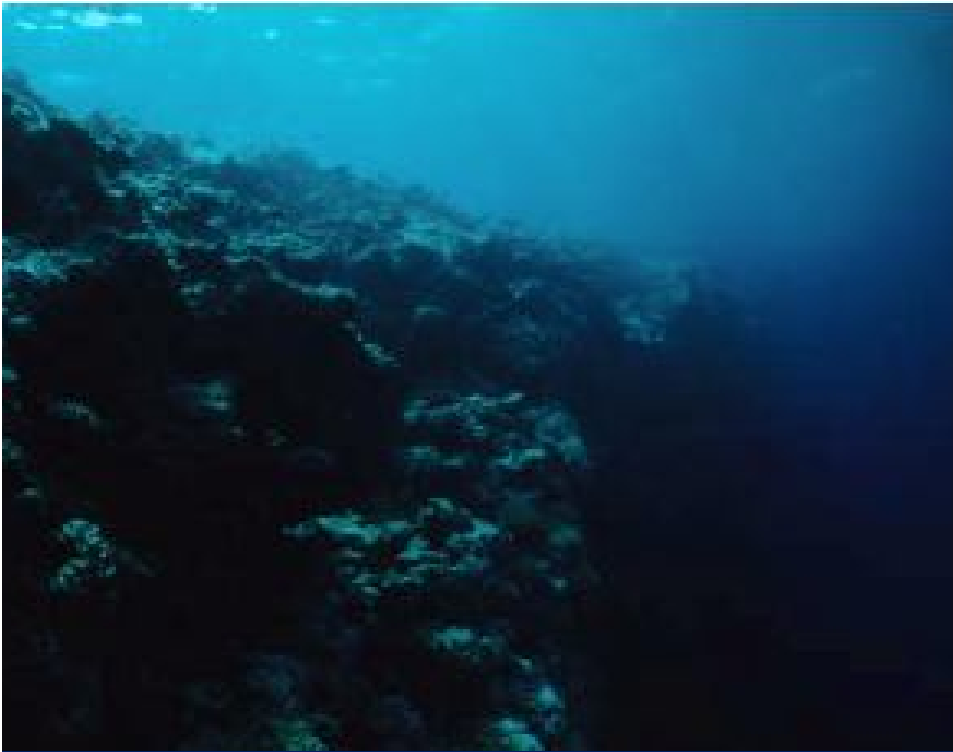


Acidification of the Oceans



Δ sea-surface pH [-]

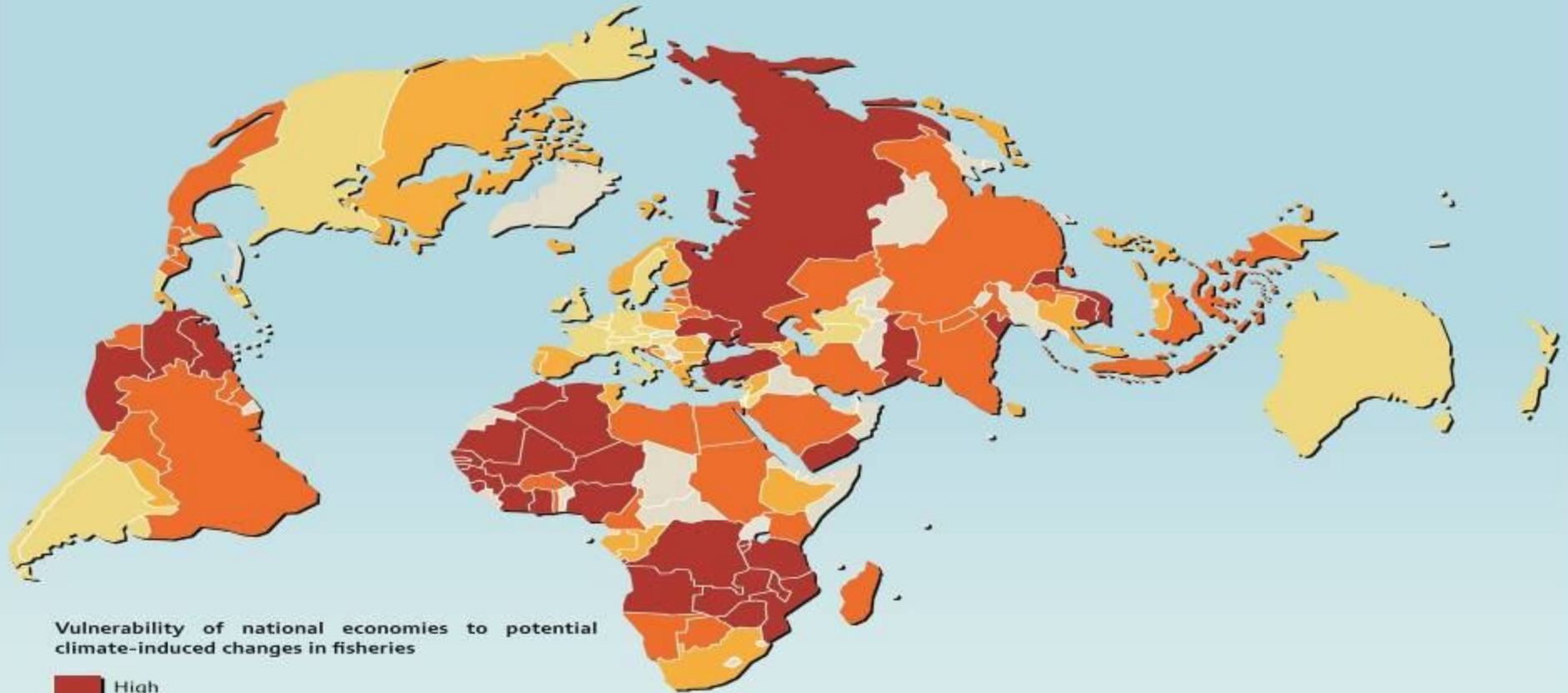




Corals being Bleached



Vulnerability of National Economies to Fisheries Affected by Climate Change



Vulnerability of national economies to potential climate-induced changes in fisheries



19 of the 33 countries included in the High Vulnerability class are Least Developed Countries. For some of the most strongly fishery dependent countries (Benin, Chad, Comoros, Maldives, the Republic of Korea, São Tomé and Príncipe) vulnerability data are not available.

Source: E. H. Allison et al, Vulnerability of national economies to the impacts of climate changes on fisheries, *Fish and Fisheries*, 2009, 10, pp. 173-196.

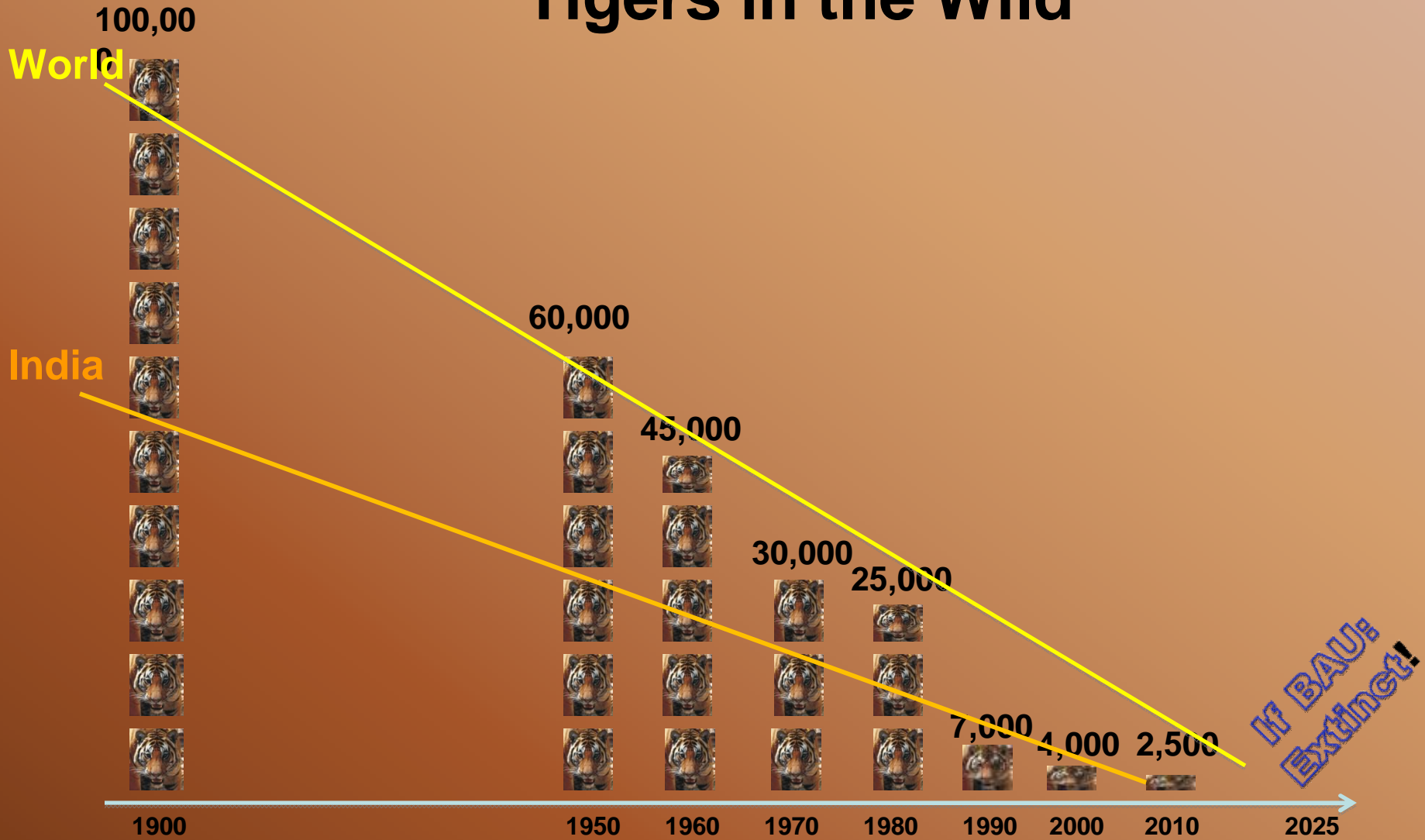
The vulnerability of national economies to potential climate change impacts on fisheries was calculated combining composite indicators that evaluate the adaptive capacity of countries, their exposure to climate change and their fisheries dependence. The adaptive capacity indicator is calculated from indexes of health, education, governance and size of economy. The country-specific mean surface temperature increase by 2050 for IPCC scenario B2 (local development, lower emissions) was considered as indicator of exposure to climate change. The indicator of fisheries dependence was deduced from the national number of fishers (absolute and relative to the labour force) and landings, the income dependency on fisheries-derived exports and per capita fish proteins as a proportion of total animal proteins consumed.





*The Tiger --
battling for survival!*

Tigers in the Wild



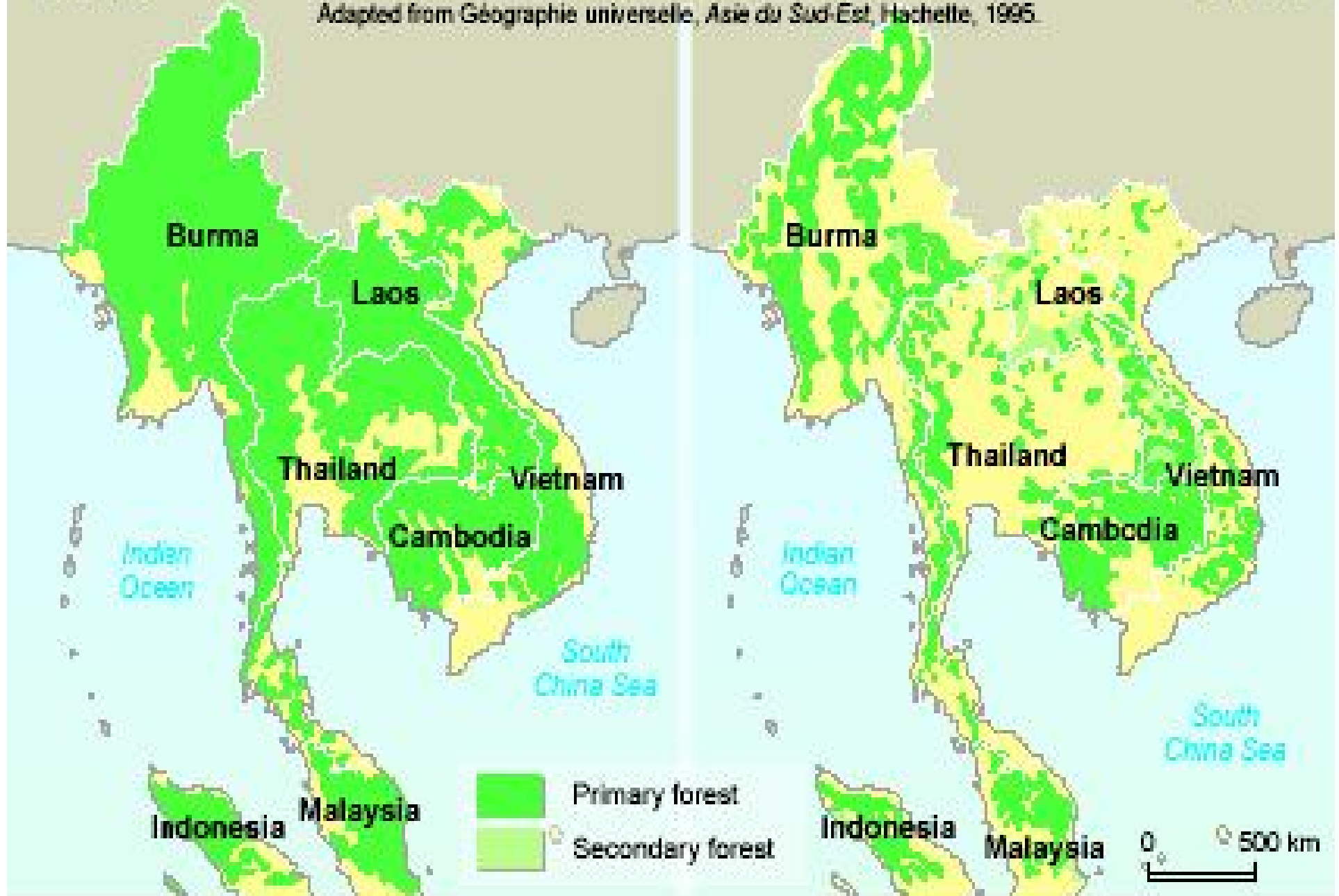
Development Alternatives

1970

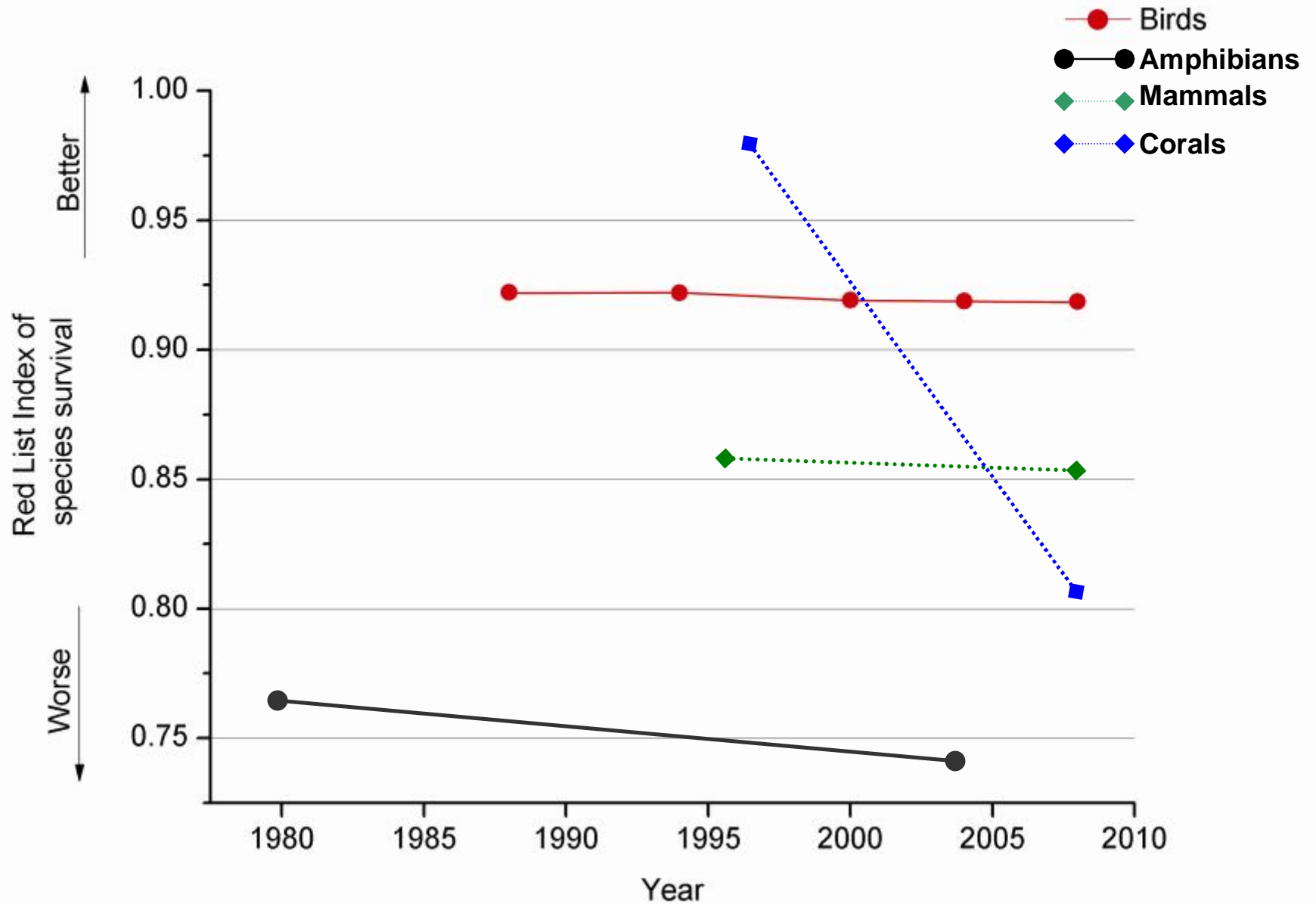
DISAPPEARING FORESTS

1990

Adapted from Géographie universelle, Asie du Sud-Est, Hachette, 1995.



Biodiversity trends (IUCN Red List Index)



The daily toll

60 million tons
of carbon dioxide
(CO₂) *emitted*



Every day
(worldwide)



50 000 hectares
of forests *destroyed*



200 000 tons
of fish *caught*



up to 100
species *extinct*



20 000 hectares
arable land
converted/deteriorated



Biodiversity

**Is Hugely
Valuable in
Subsidizing the Economy**





Pollination

*

Wild
Plants

and

Crops



Development Alternatives

Biological Pest Control

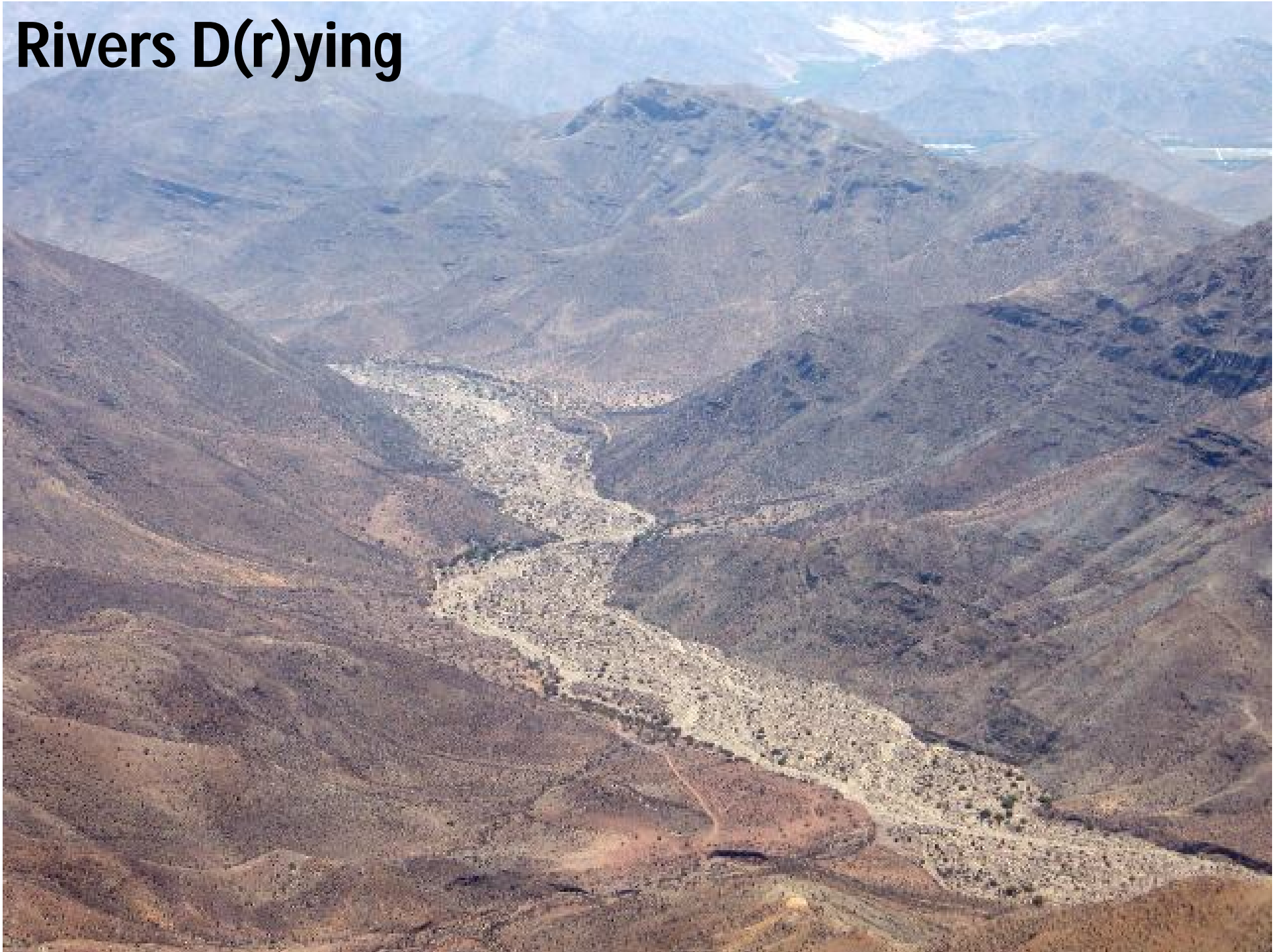


Traditional Medicines





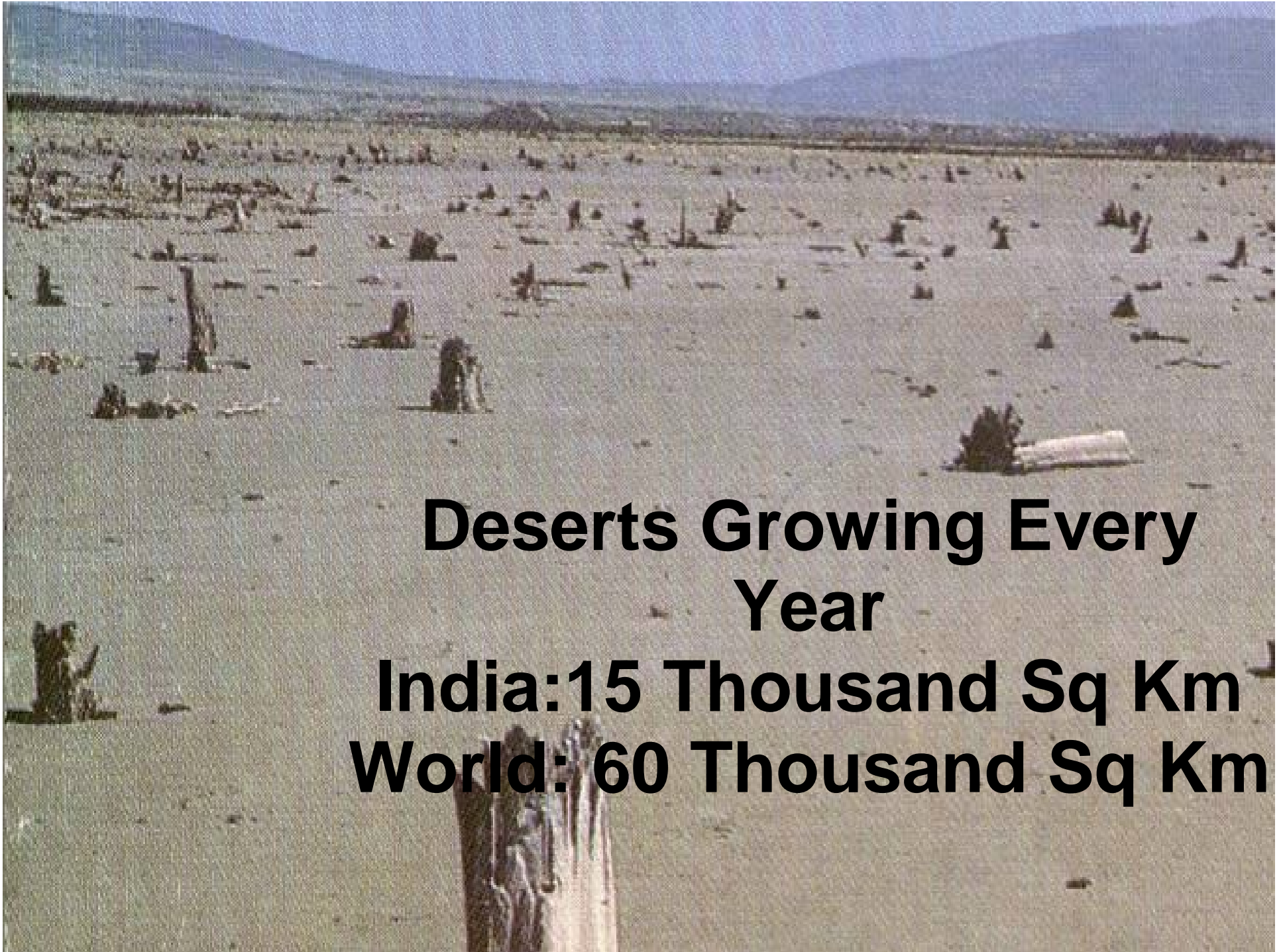
Rivers D(r)ying





DROUGHTS Worldwide

- **400,000,000 people live under extreme drought conditions**
- **“Very Dry” Land:**
 - **15% in 1970**
 - **30% in 2002**



Deserts Growing Every Year

India: 15 Thousand Sq Km
World: 60 Thousand Sq Km

**1,500,000 die prematurely
every year in the Kitchen**



**> 2,500
million people
do not have
commercial
energy
let alone
electricity**



**> 2,000
Million
people
in
the World
still have no
toilets**





Several Billion Need More

★ Development Alternatives

Materials, Fuels, Fodder . . and Food



Green Jobs and Sustainable Livelihoods

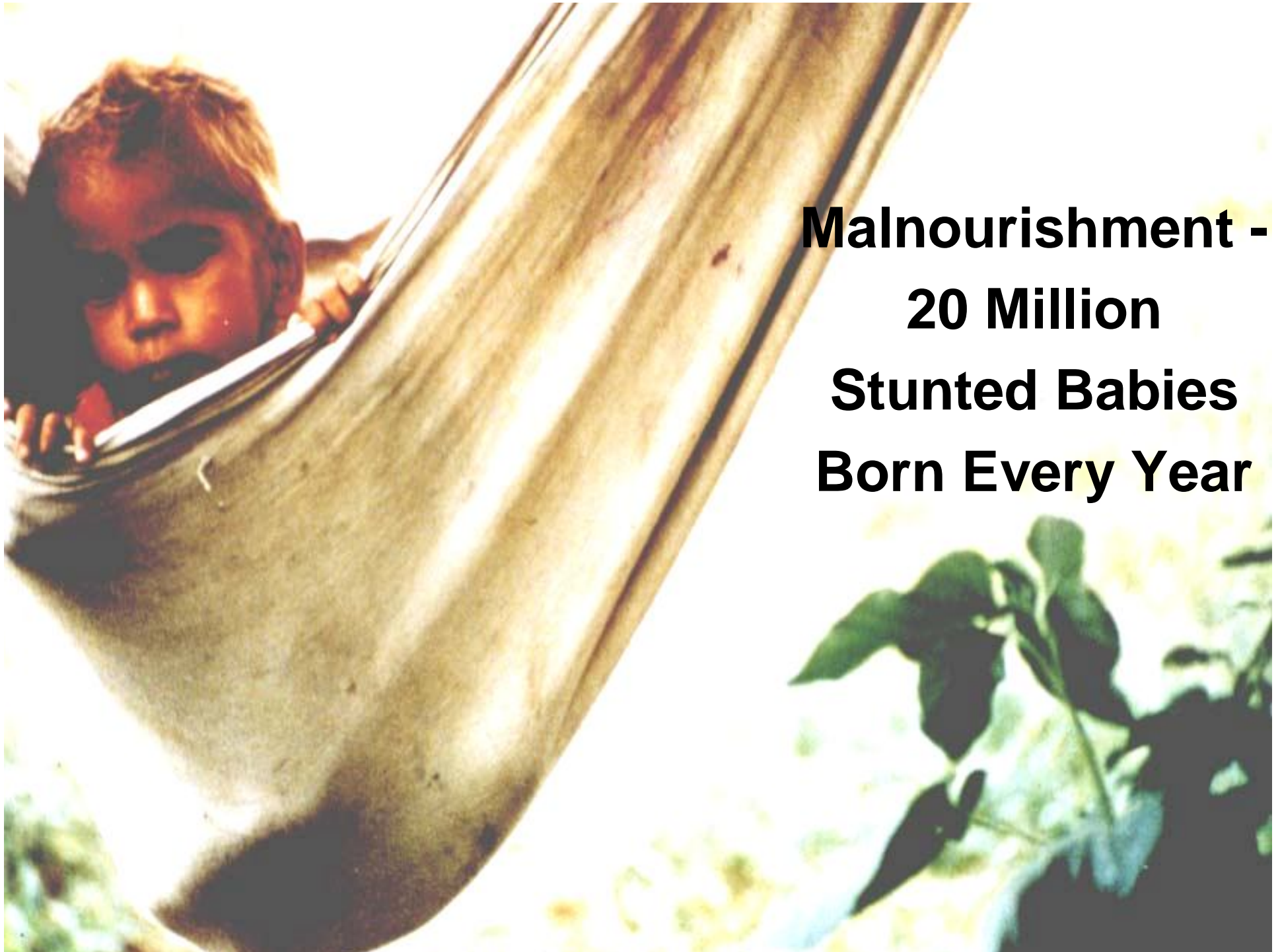


Development Alternatives

Needed in the Hundreds of Millions



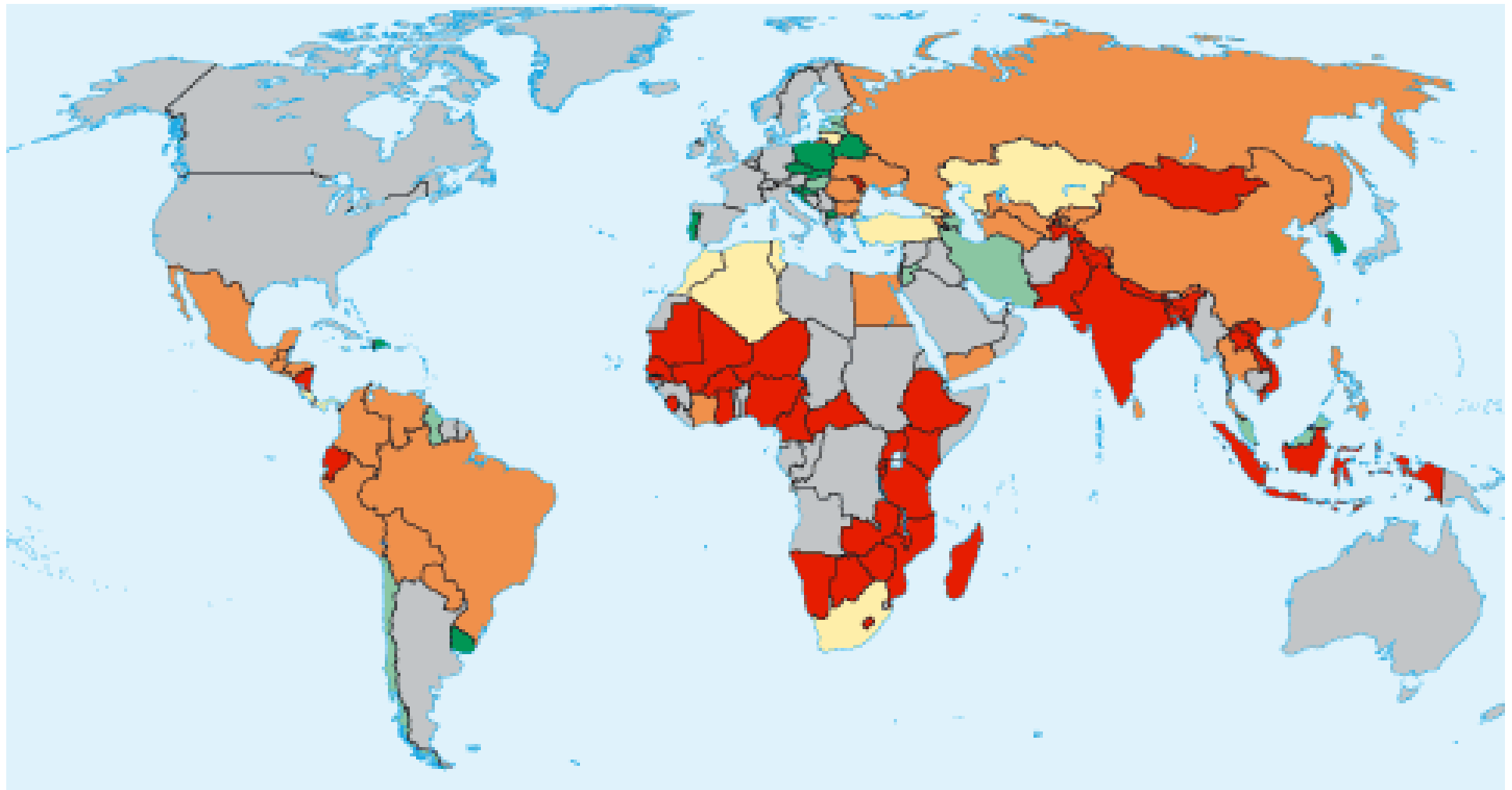
Any Kind of Job



**Malnourishment -
20 Million
Stunted Babies
Born Every Year**

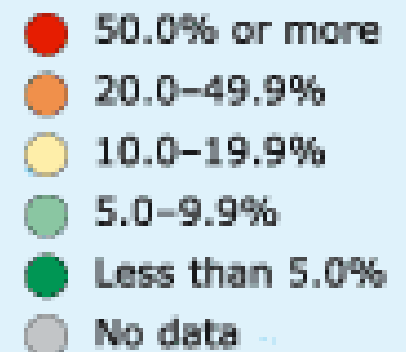
1,700 Million Illiterates





Population with under \$2 per day

 **Development Alternatives**



The history of human population growth

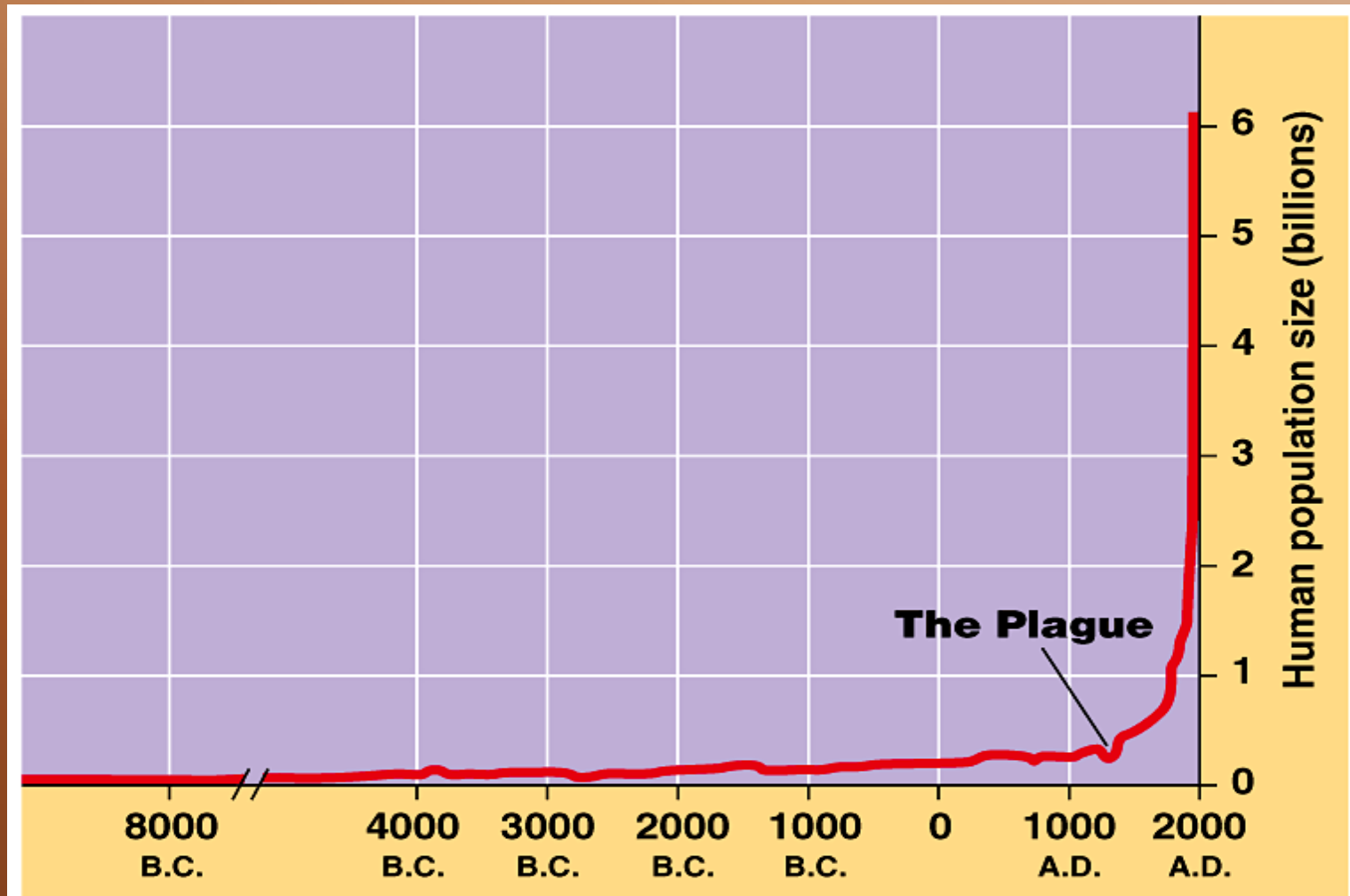


Figure 35.8A

Eco-Refugees



10/01/2006 8:08 am



Development Alternatives





**Loss of
identity**

*

Alienation

*

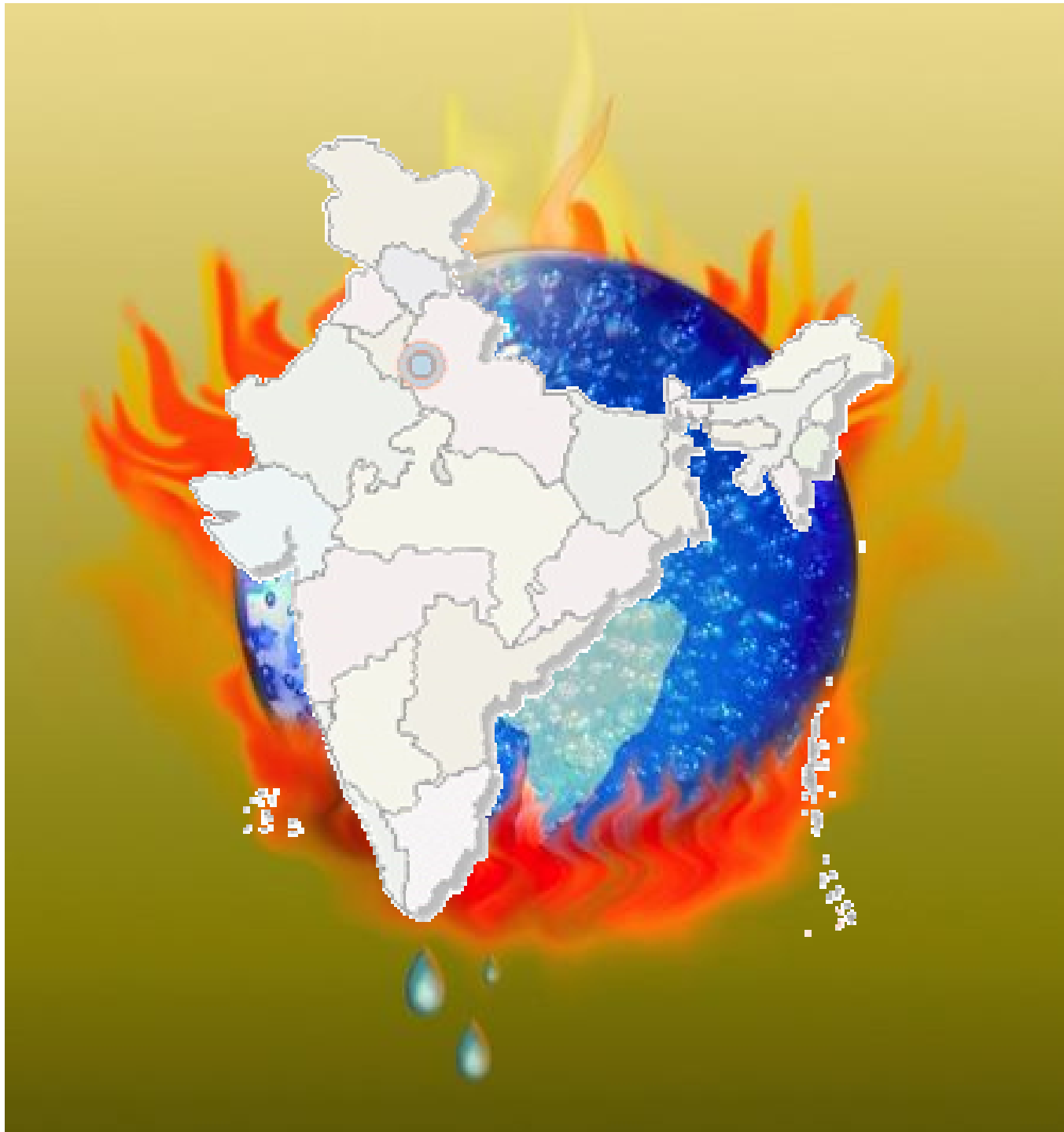
Terrorism



AAA+	80.24	+0.24	+0.24	FXX	23.300	+0.24	80.24
DATA	6547	+0.145	+0.145	QT	23.250	+0.145	6547
LOSS	987.54	+1.14	+1.14	MPS	23.200	+1.14	987.54
INDEX	8741	-0.244	-0.244	XDC	23.150	-0.244	8741
MAR	0.014	4754	4754	XXD	23.100	4754	0.014
QTT	0.578	-8.74	-8.74	FT	23.050	-8.74	0.578
NRR	7845	1421	1421	GGB	23.000	1421	7845
DS	3215	+1247	+1247	GTR	22.950	+1247	3215
XTT	7841.4	+214.4	+214.4	SEO	22.900	+214.4	7841.4
MAR	414	-0.478	-0.478	EWX	22.850	-0.478	414
FTX	-874	-0.41	-0.41	XDR	22.800	-0.41	-874
SET	-0.478	+4451	+4451	SET	22.750	+4451	-0.478
FOR	-0.784	+741	+741	FOR		+741	-0.784
UPX	87.48			UPX		-14	87.48
USD	154.0					987	154.0
GBP	20.01						20.01
EUR	1.012						1.012



***These two
Diseases –
Affluenza
and
Povertitis –
threaten
life on our
Planet –***



***These two
Diseases –
Affluenza
and
Povertitis –
threaten
life in our
Nation, too***

**Climate
Change**

**Ozone
depletion**

**Atmospheric
Aerosol
Loading**

**Biogeochemical
loading: Global
N & P Cycles**

**Ocean
acidification**



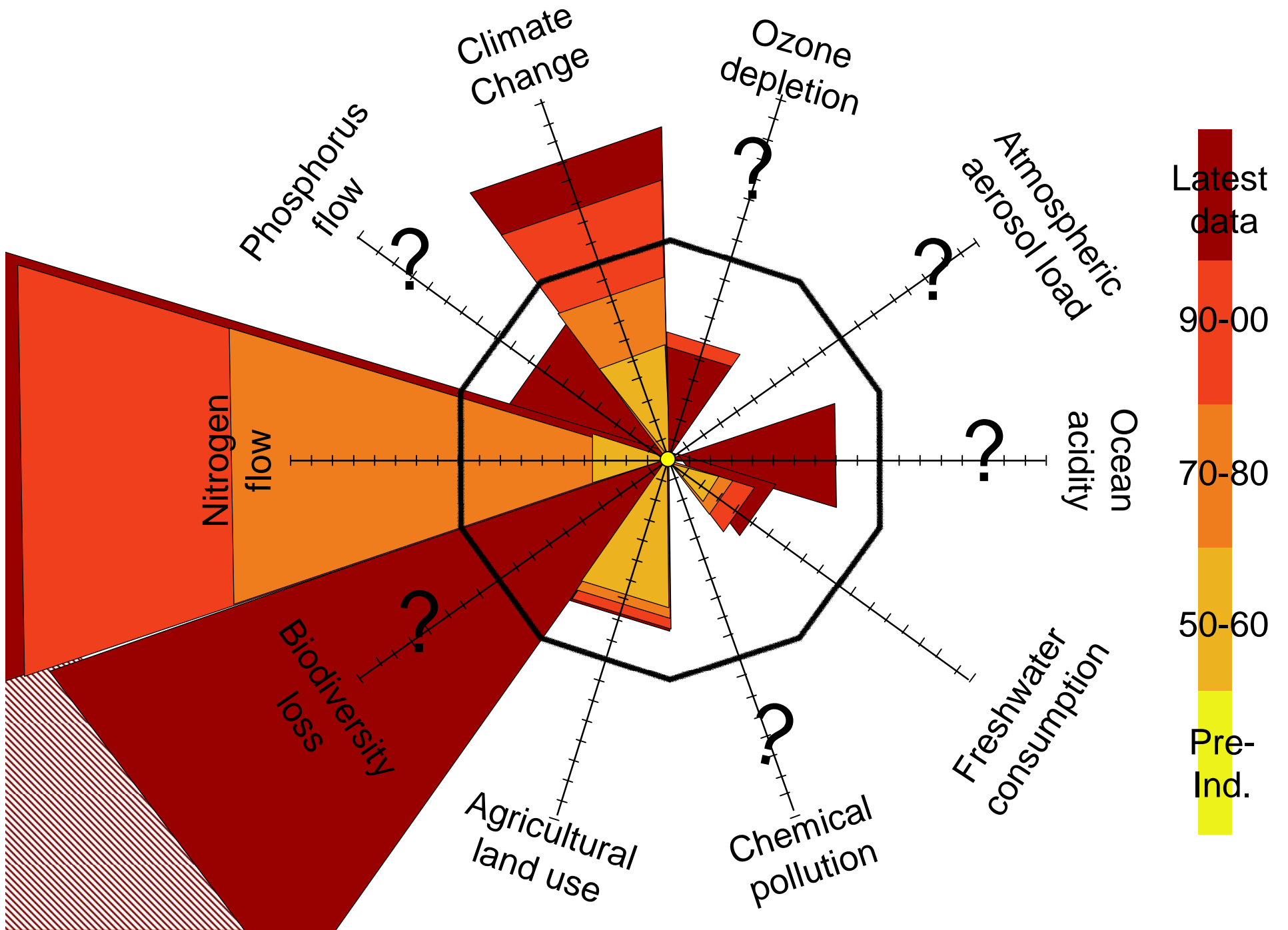
Planetary Boundaries

**Rate of
Biodiversity
Loss**

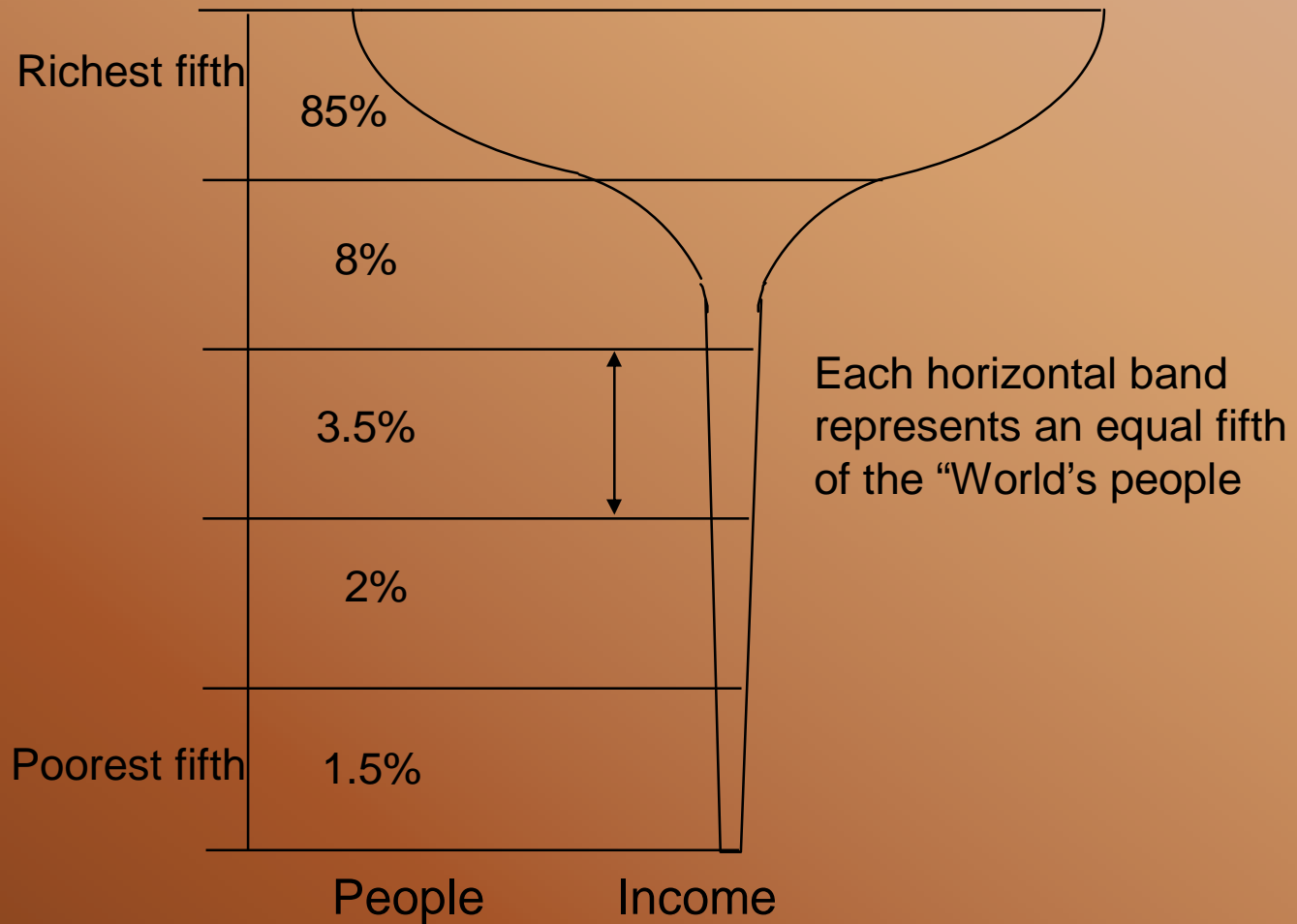
**Global
Freshwater
Use**

**Land
System
Change**

**Chemical
Pollution**



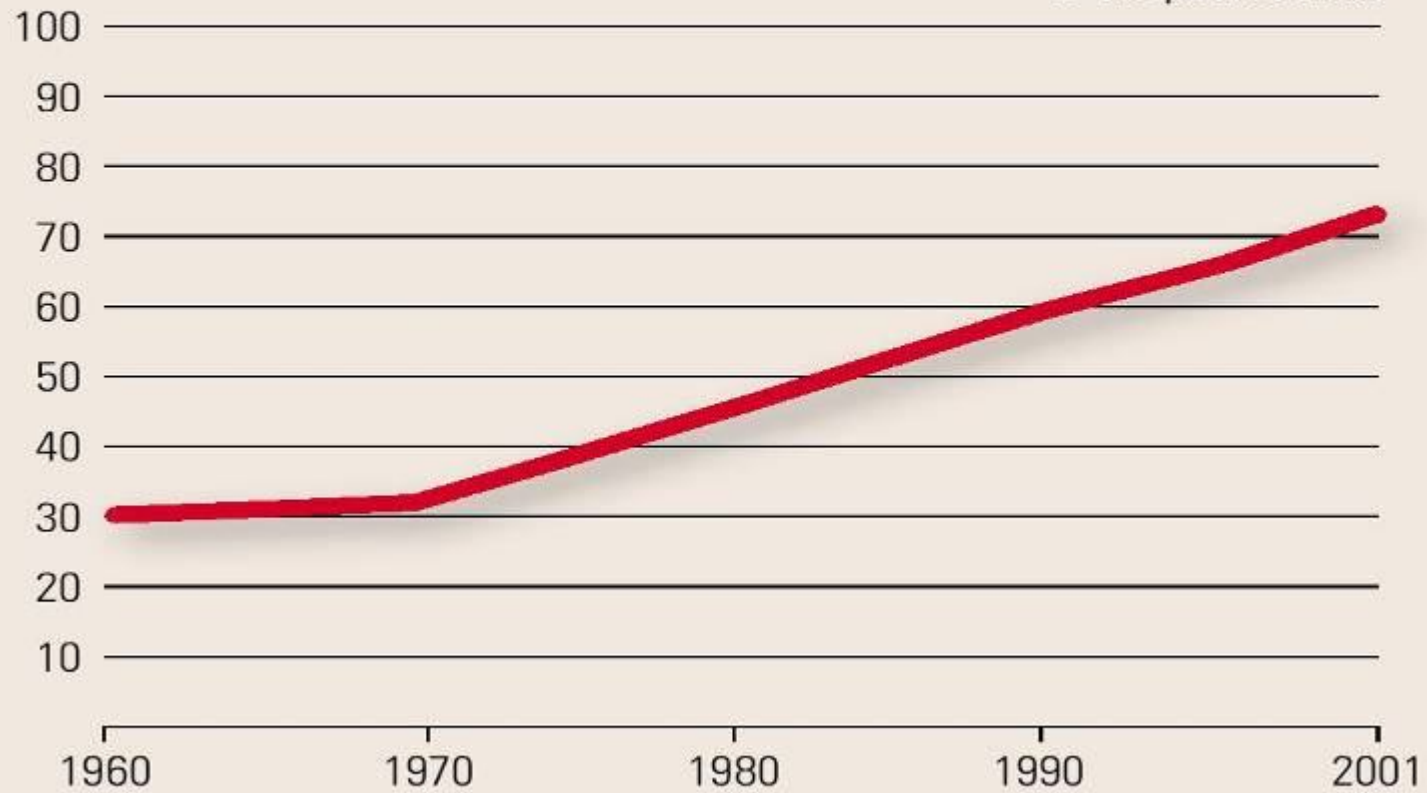
Our Income Distribution



The Gap Is Widening

Ratio of incomes
in the richest fifth of
the world population
to the poorest fifth

Percent

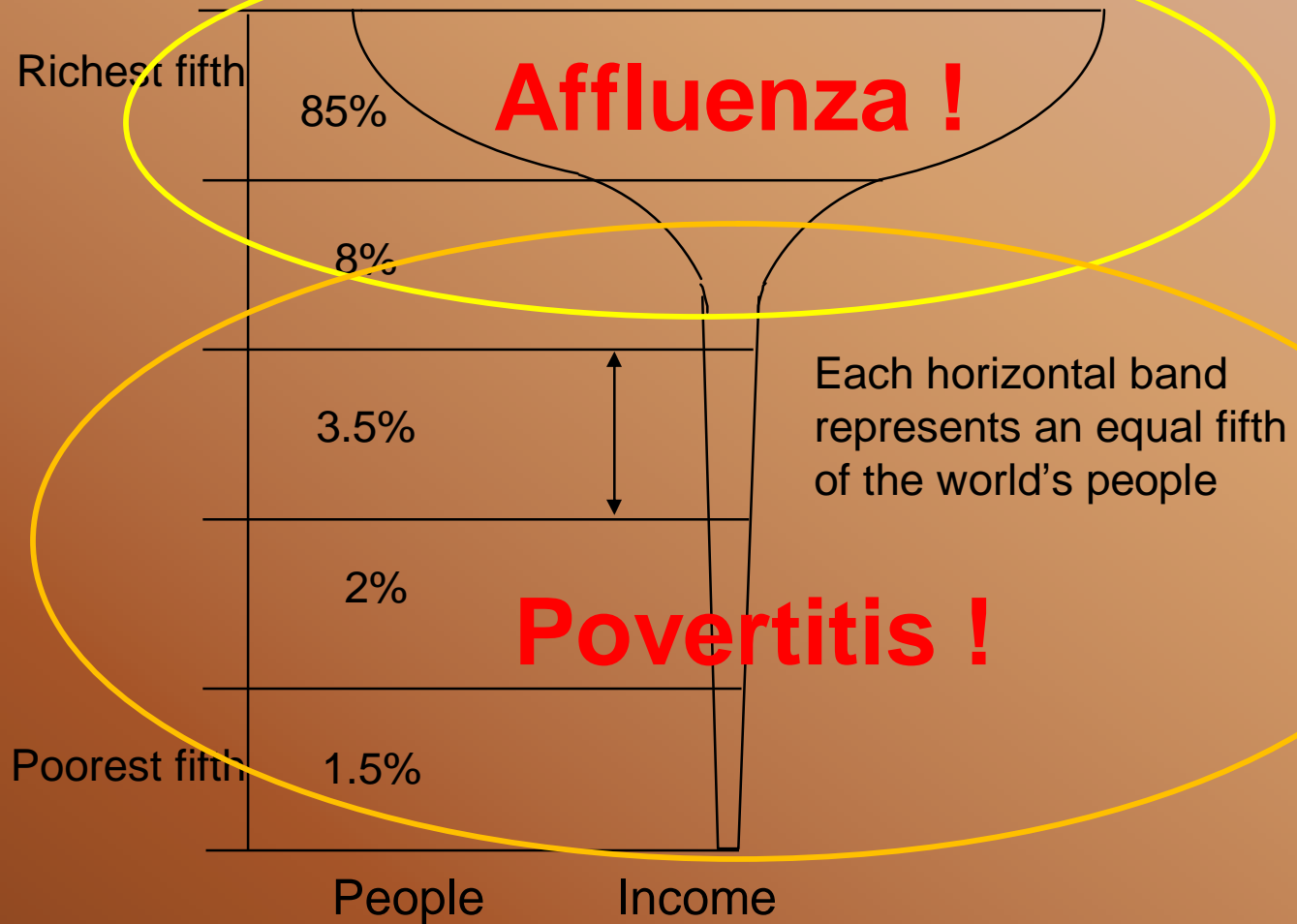


Source: UNDP 1998



Development Alternatives

Today's Inequity



Poverty

Hunger

Unemployment

Gender

Illiteracy

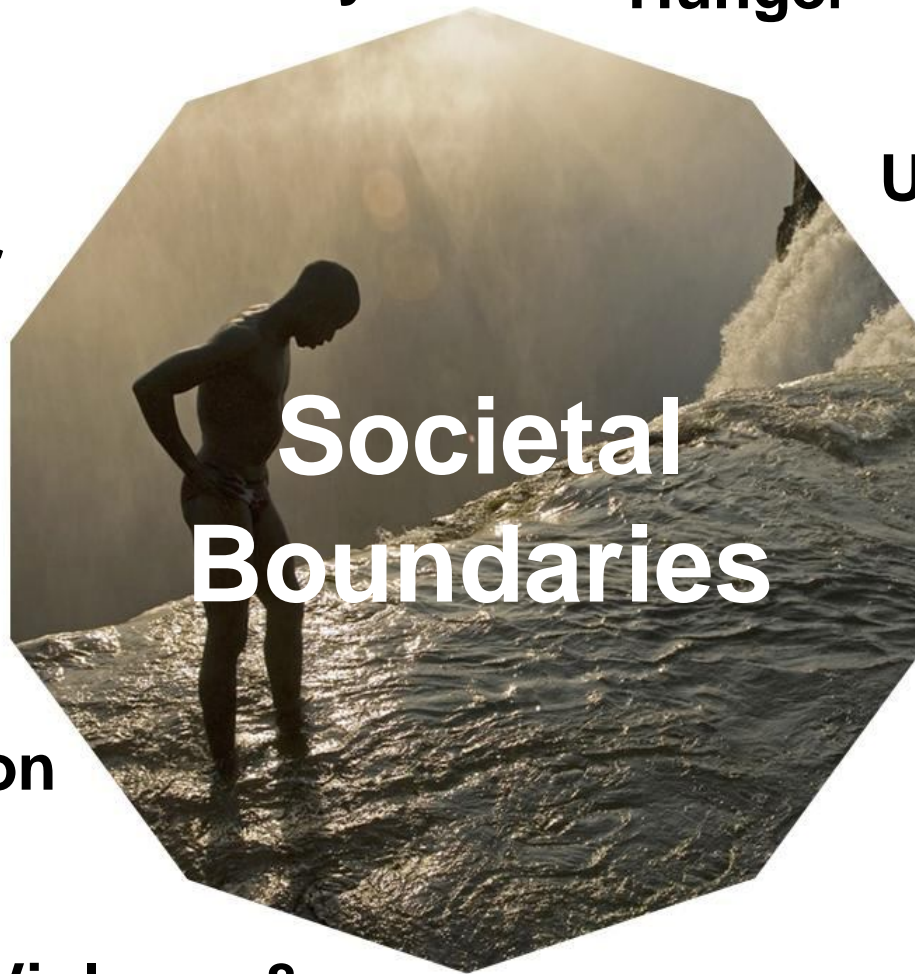
**Societal
Boundaries**

Displacement

Marginalisation

**Violence &
Terrorism**

Alienation



Today's Development Strategies

Can neither

Eradicate Poverty

nor

Strengthen Ecological Security



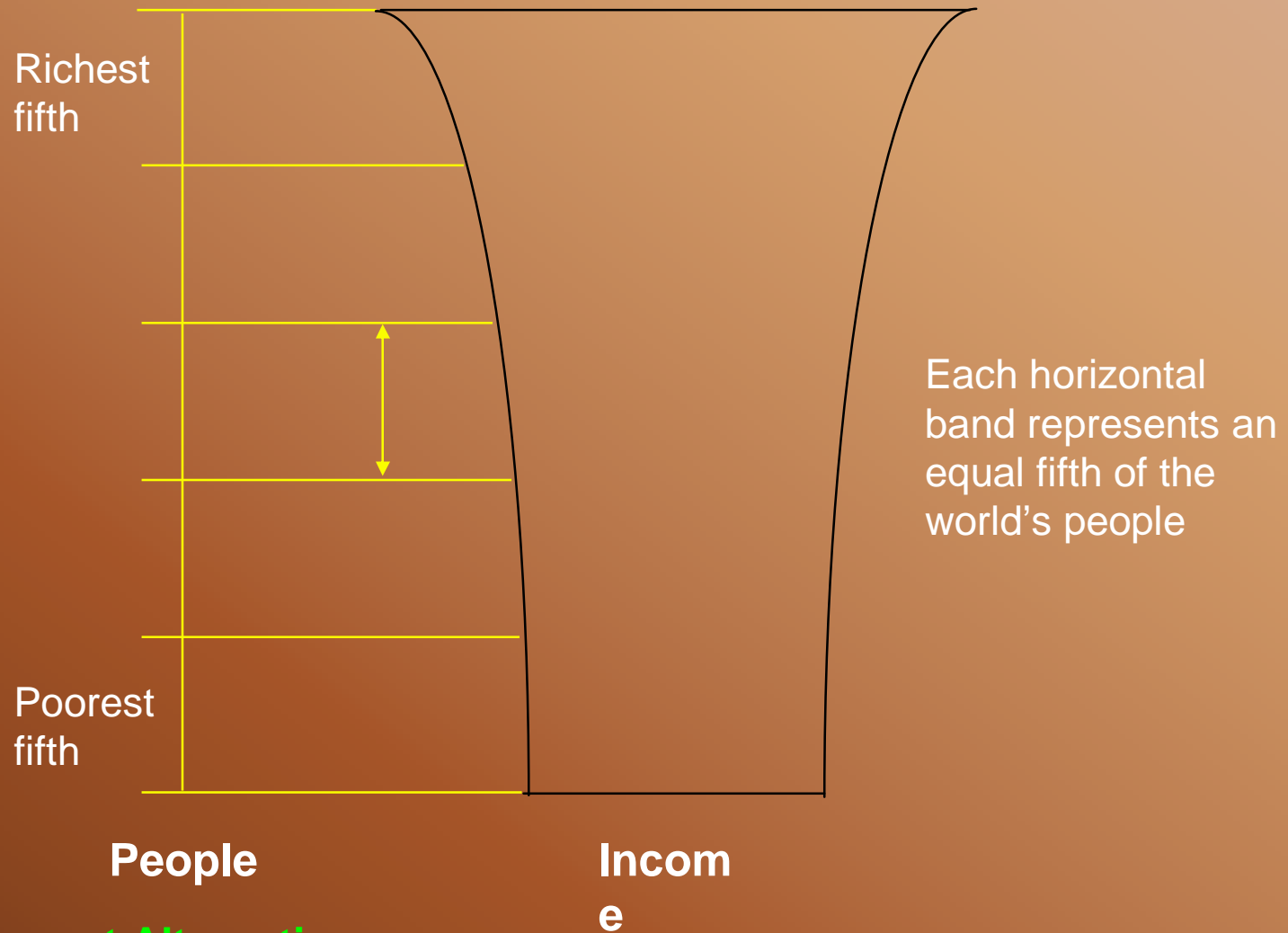
Sustainable Development

Necessary conditions:

- ❖ **Meet basic needs of all**
- ❖ **Maintain resource base**



Sustainable Distribution of Global Income



Key elements of sustainable development and interconnections

Economic

Growth
Efficiency
Stability



*Intergenerational equity
Basic needs and livelihoods*

*Valuation and internalization
Incidence of impacts*

**Poverty
Equity
Sustainability
Climate change**

*Intergenerational equity
Values and culture*

Social

Empowerment
Inclusion and consultation
Governance

Environmental

Biodiversity/resilience
Natural resources
Pollution



Choice of Production Systems

★ Development Alternatives



Projected Premature Annual Deaths due to Urban Air Pollution, Total and by Economic Group or Region, 2001–2020

Region	Premature Deaths (thousand per year)
Established market economies	20
Former socialist economies	200
China	590
India	460
East Asia and the Pacific	150
Latin America and the Caribbean	130
South Asia	120
Middle East Crescent	90
Sub-Saharan Africa	60
World	1,810

Source: World Bank.



Development Alternatives





Development Alternatives

Efficiency in Agriculture



Runoff of Pesticides, Fertilizer, Sewage and Wastes



Development Alternatives

Are Our Diets Straining the Limits of Our Environment?



Mining the Earth



High Pressure on the Environment



Logging & Clearing



The Immediate Convergence

Climate Change

Peak Oil/Energy

Water/Food

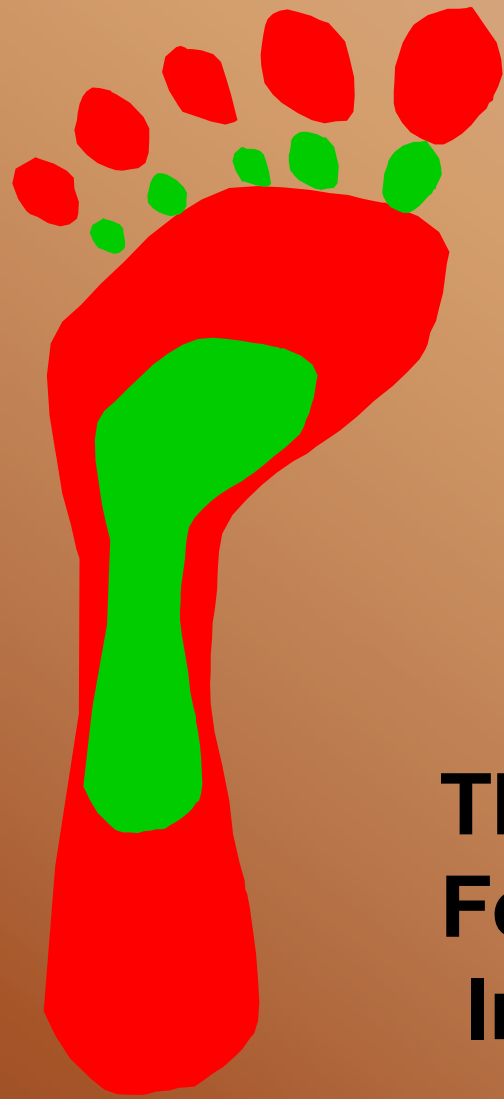
Species Loss

Financial
Instability

Population
Growth

Poverty &
Inequity

All Symptoms of
Greed above Need
in an
Unsustainable
World ?



Footprint



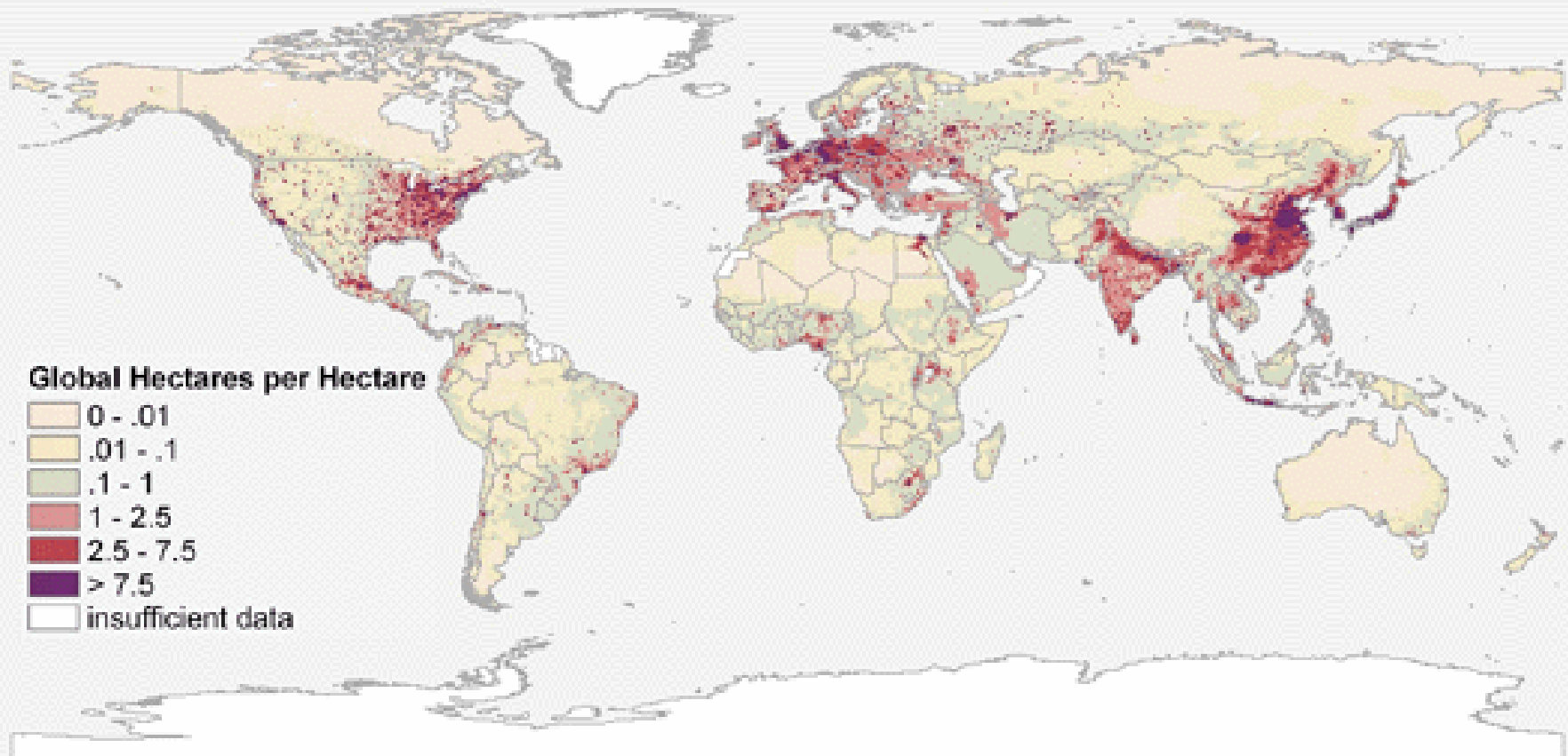
Bio-
Capacity

The Ecological Footprint of an Industrialized Country



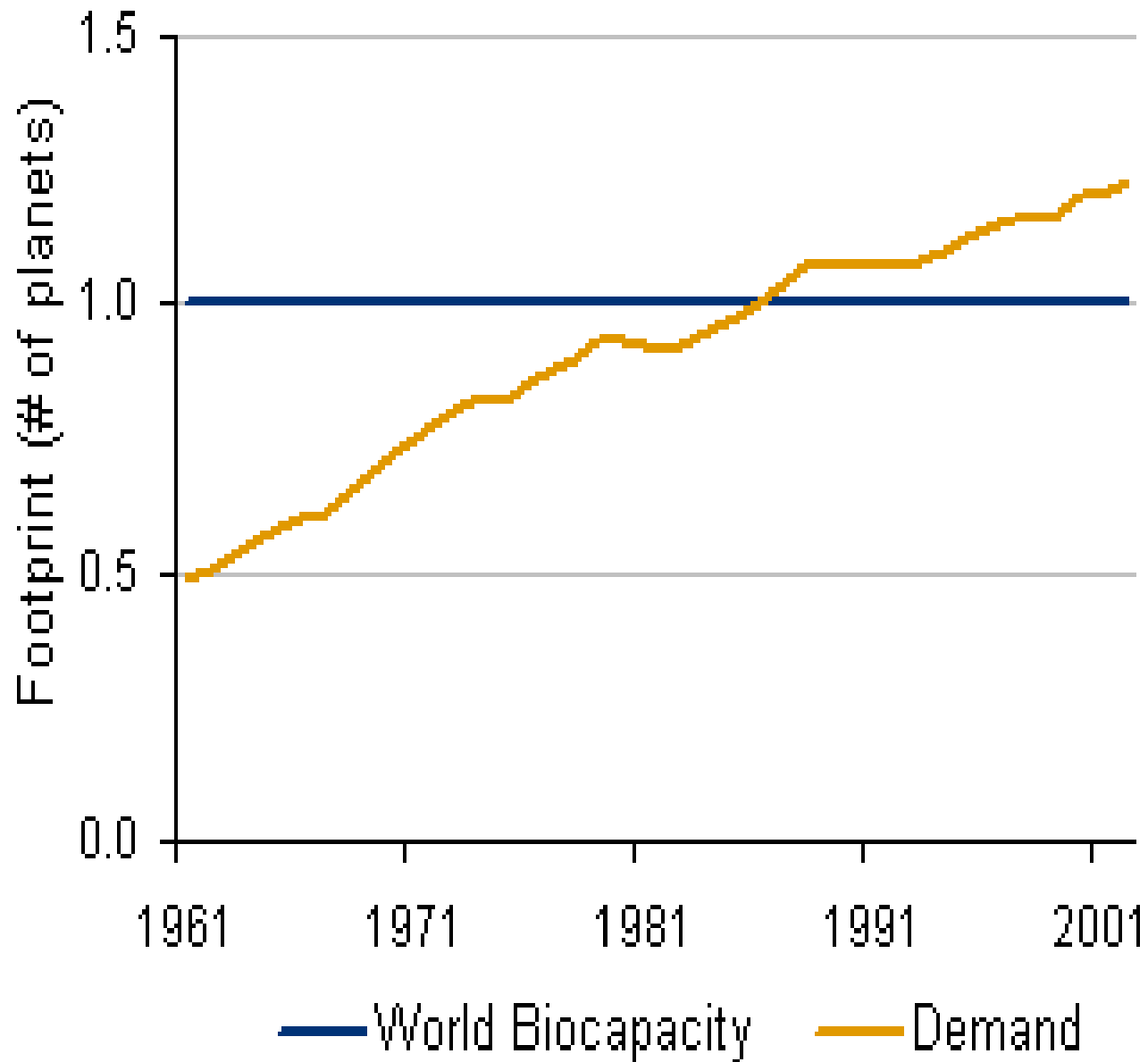
Development Alternatives

The Ecological Footprint of Nations



Percent of Earth Used (2010): > 140%

Demand vs. Biocapacity

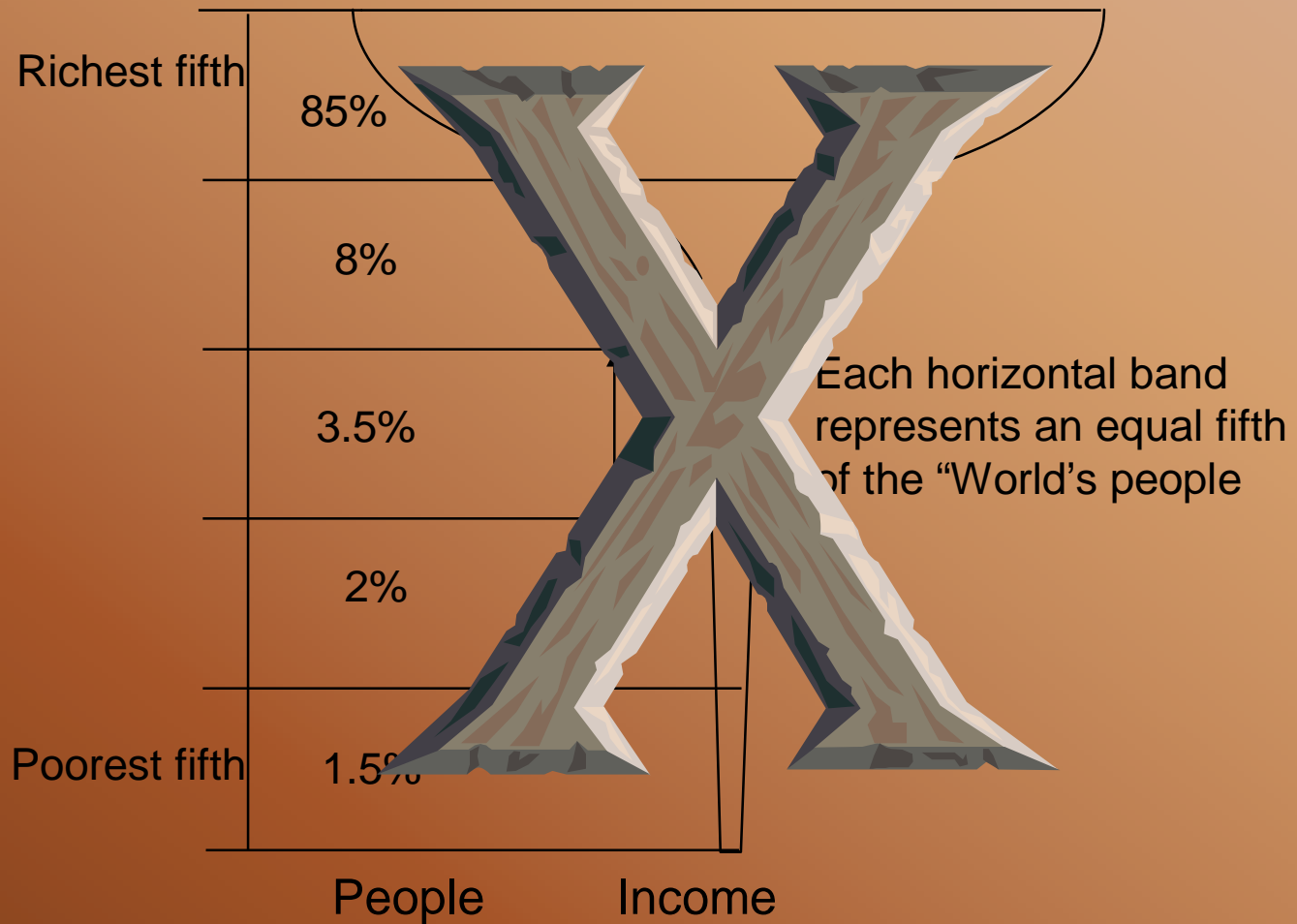


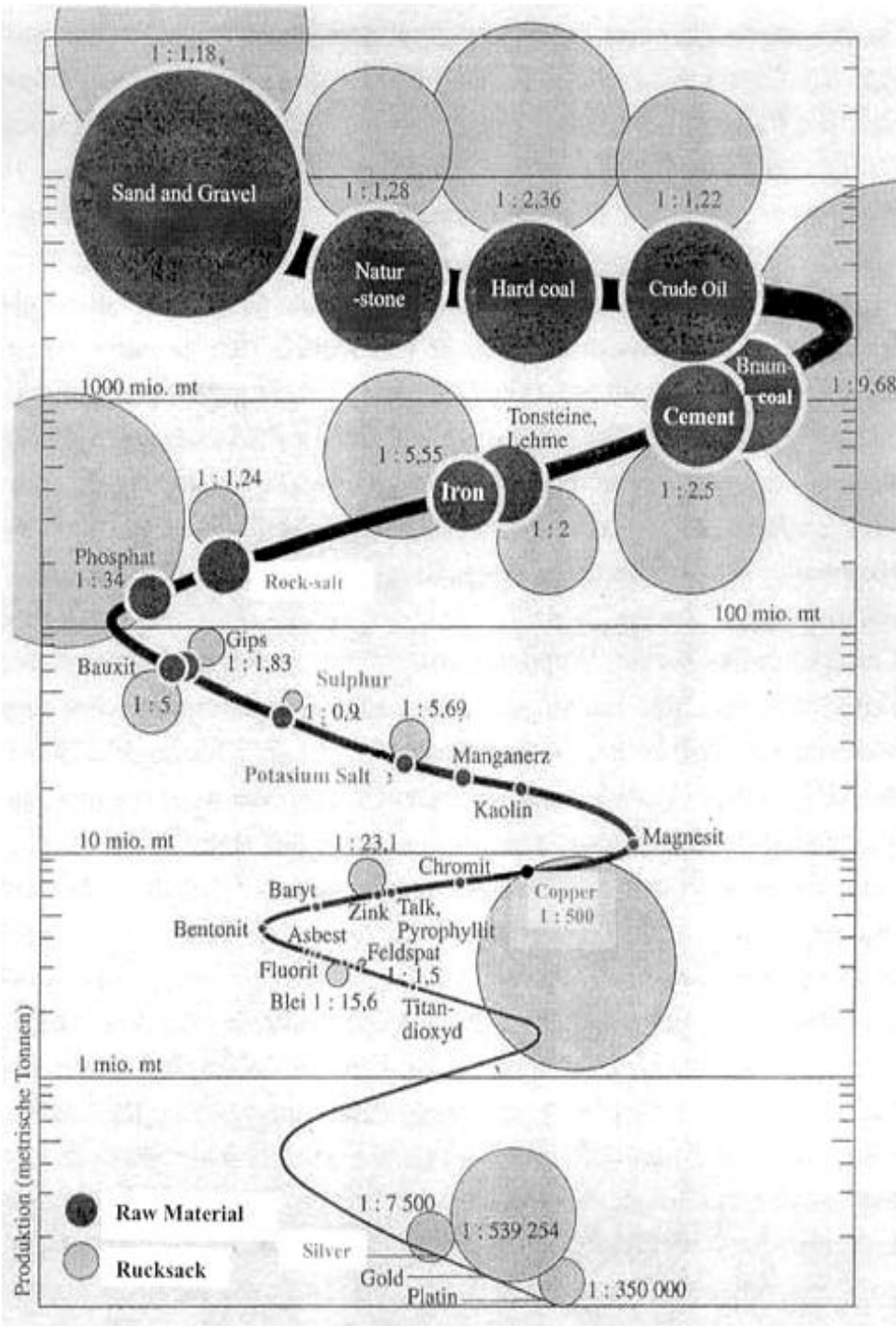
World



2010

Our Income Distribution





Ecological Rucksacks

Raw
Material

Rucksack



Gold Ring

Weight?

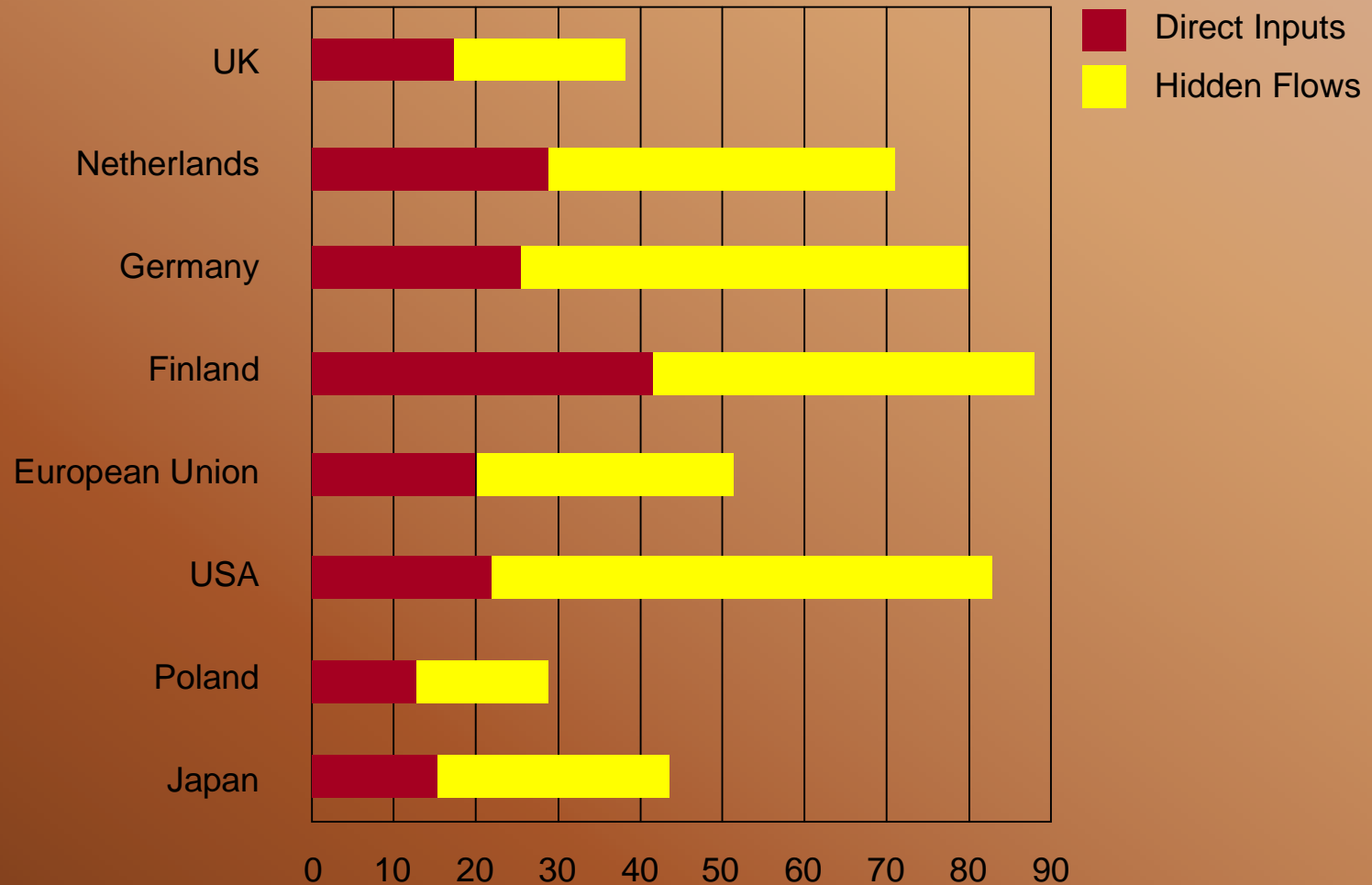
20 gms?

20

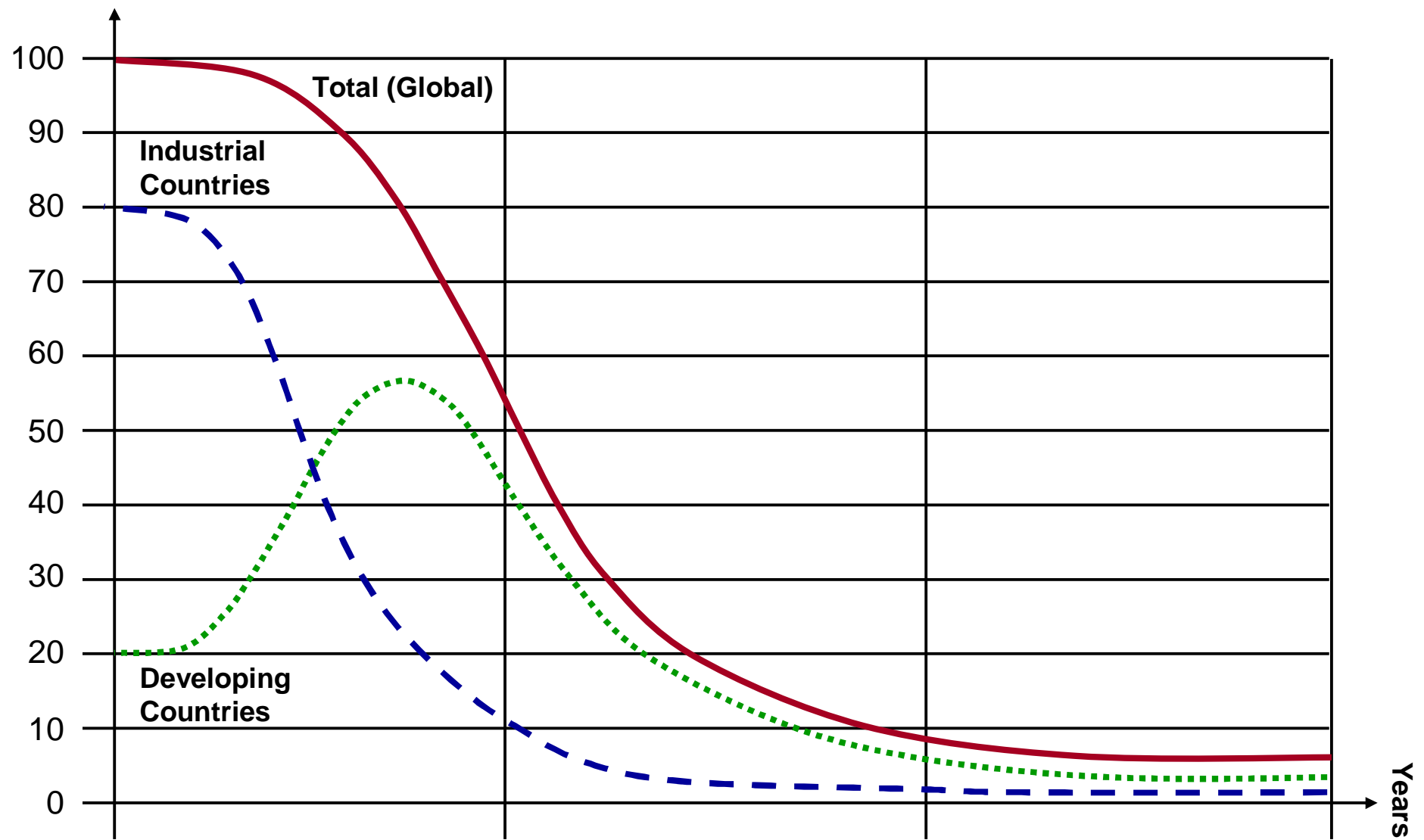
Tonnes !

Ecological Rucksacks

Direct and Hidden Material Flows in Different Economies



Consumption of Materials



★ Development Alternatives



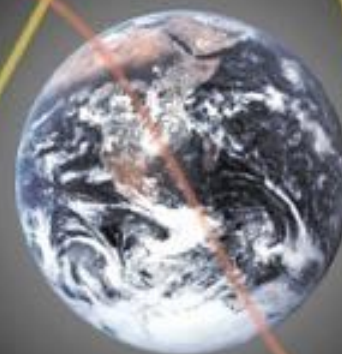
THE LIMITS TO GROWTH



Donella H. Meadows Dennis L. Meadows
Jorgen Randers William W. Behrens III

A report
for the
CLUB OF ROME'S
project on the
predicament of mankind.

LIMITS TO GROWTH

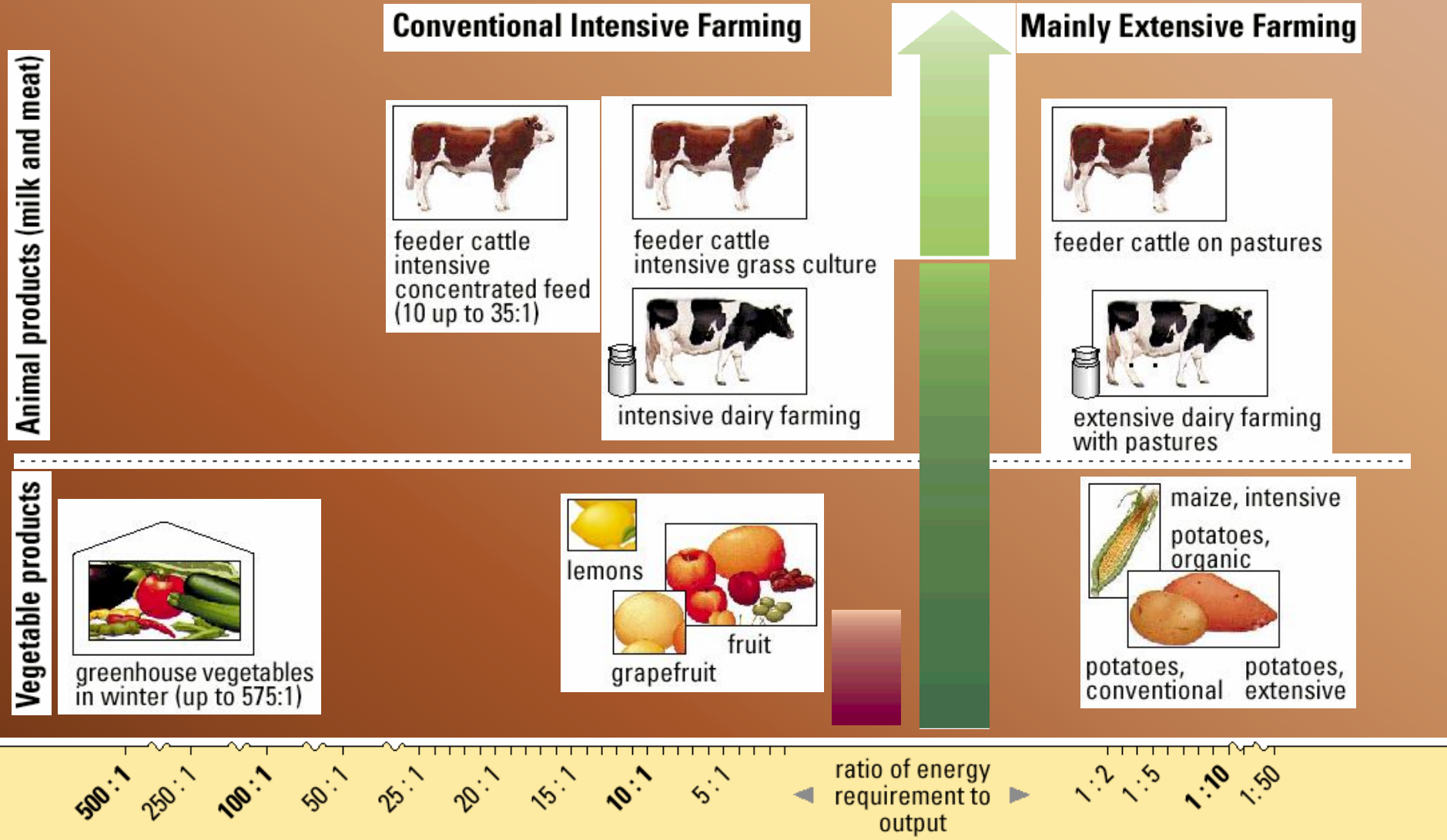


The 30-Year Update

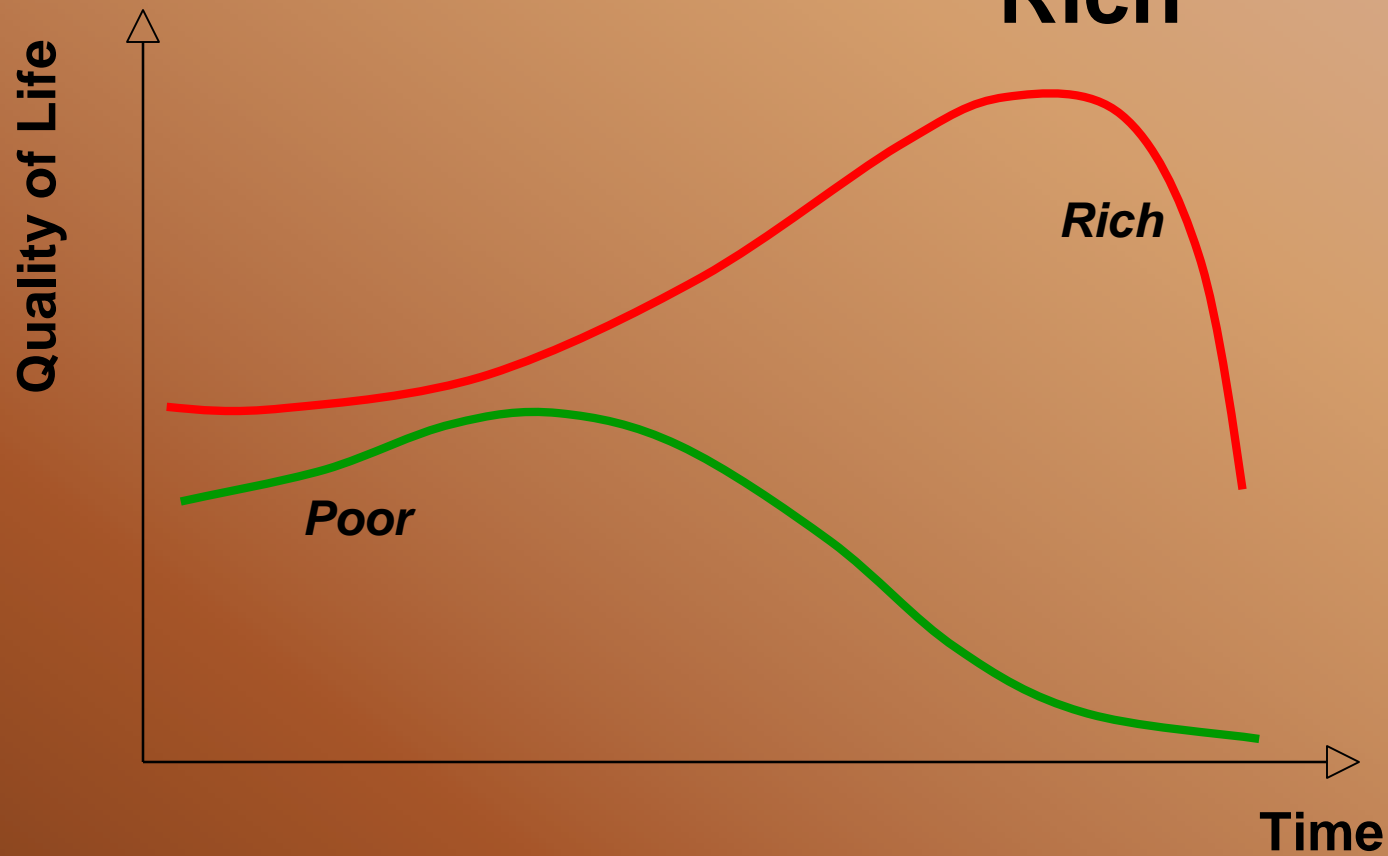
DONELLA MEADOWS | JORGEN RANDERS | DENNIS MEADOWS

Choice and Production of Food on Ecological Costs

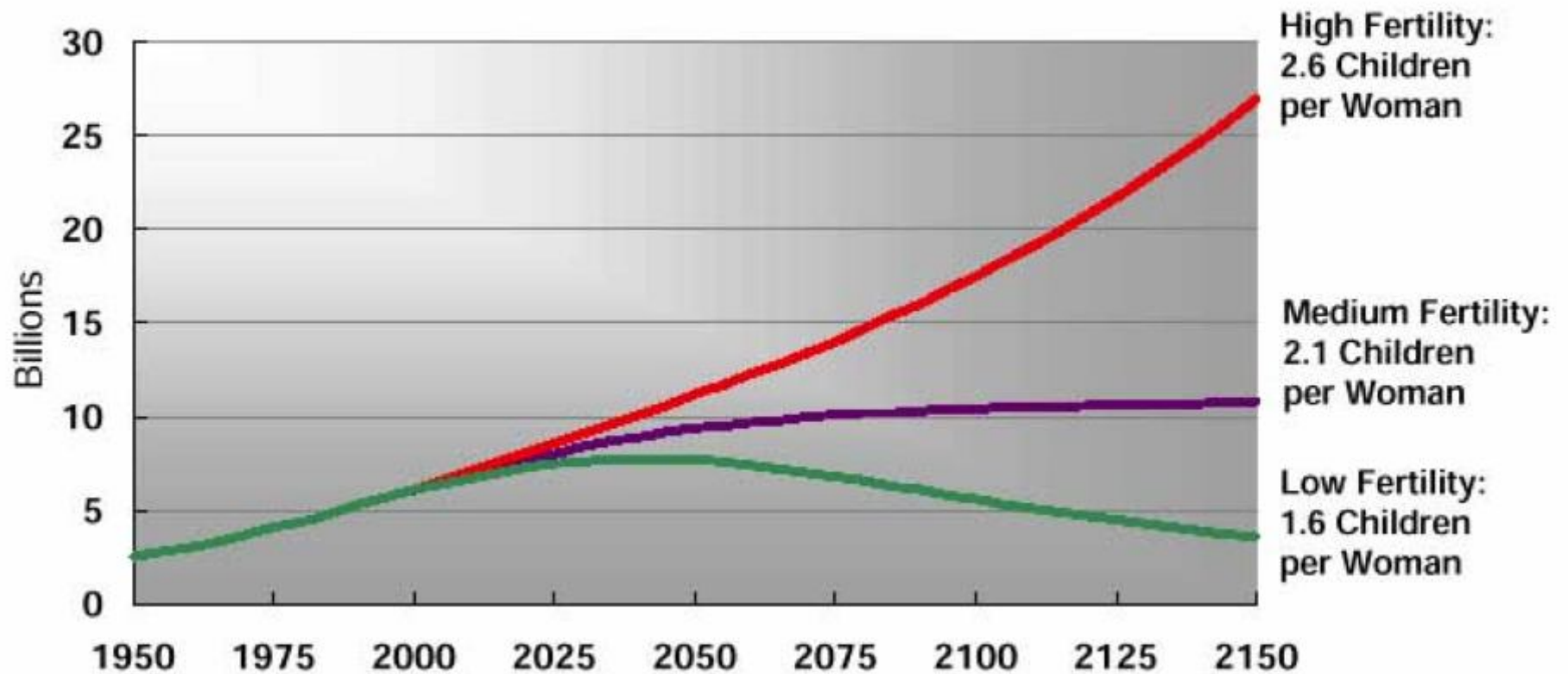
High values correspond to low energy efficiency. For greenhouse vegetables in winter we expend over 500 calories of foreign energy for one calorie of food.



When Too Big a Slice of the Pie is Hijacked by the Rich

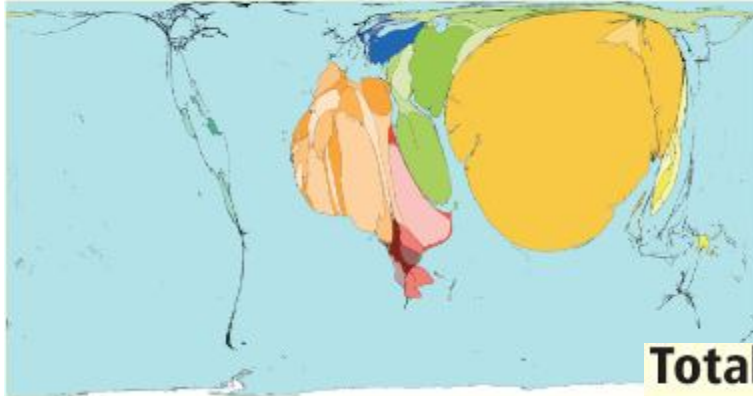


Projected World Population to 2150

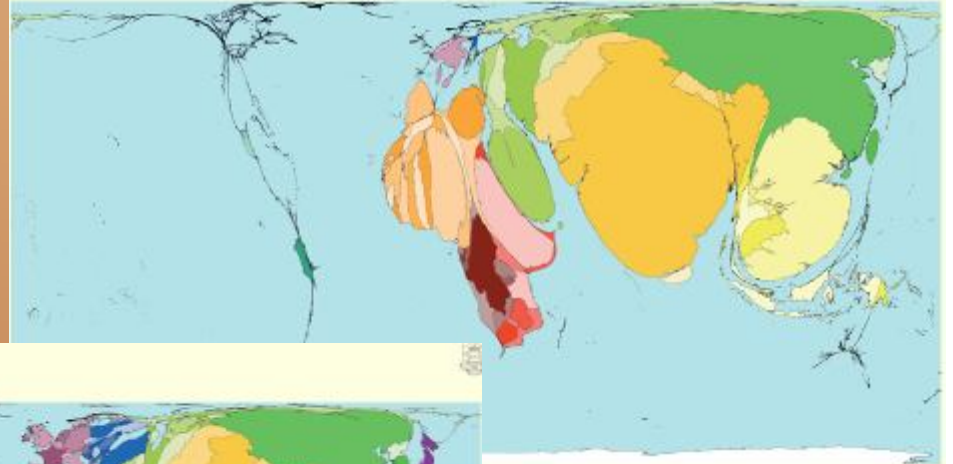


Source: UN, *World Population Projections to 2150*, 1998.

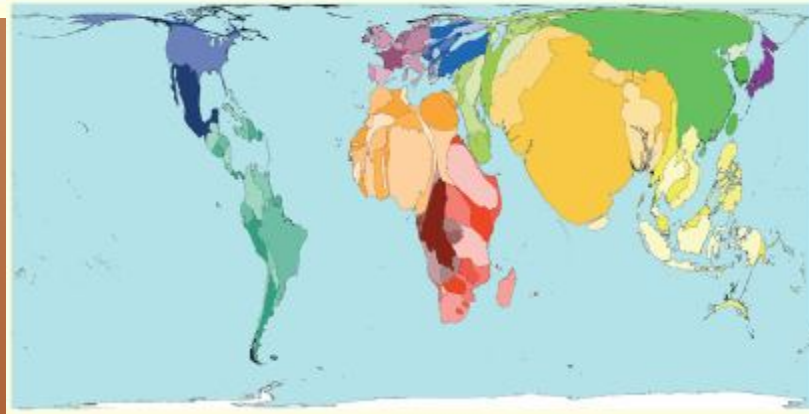
Girls not at Primary School



Girls not at Secondary School



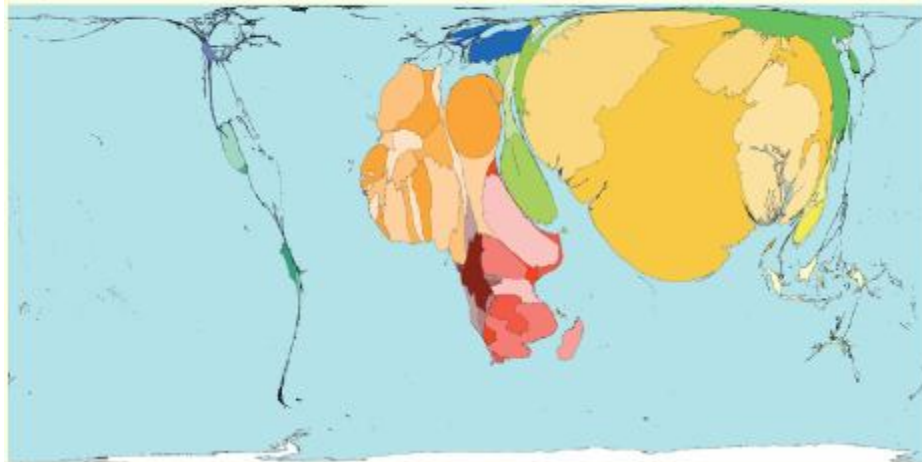
Total Births



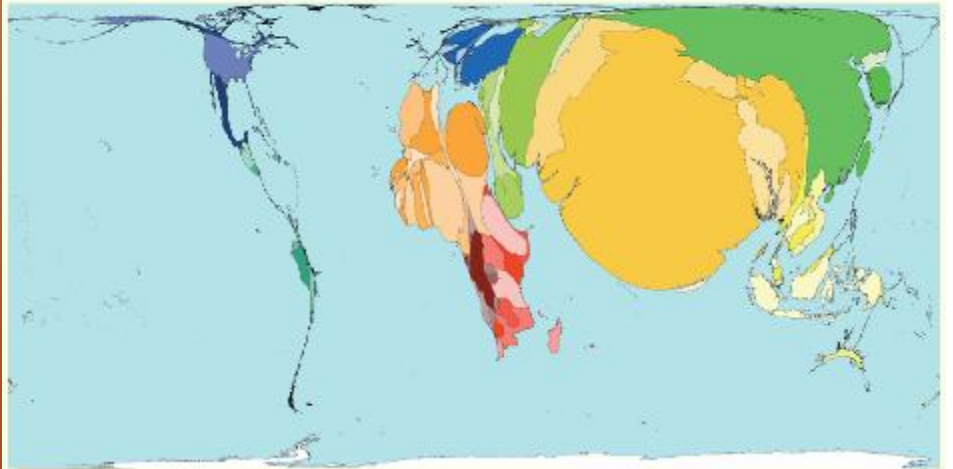
**Positive
Correlation**

+

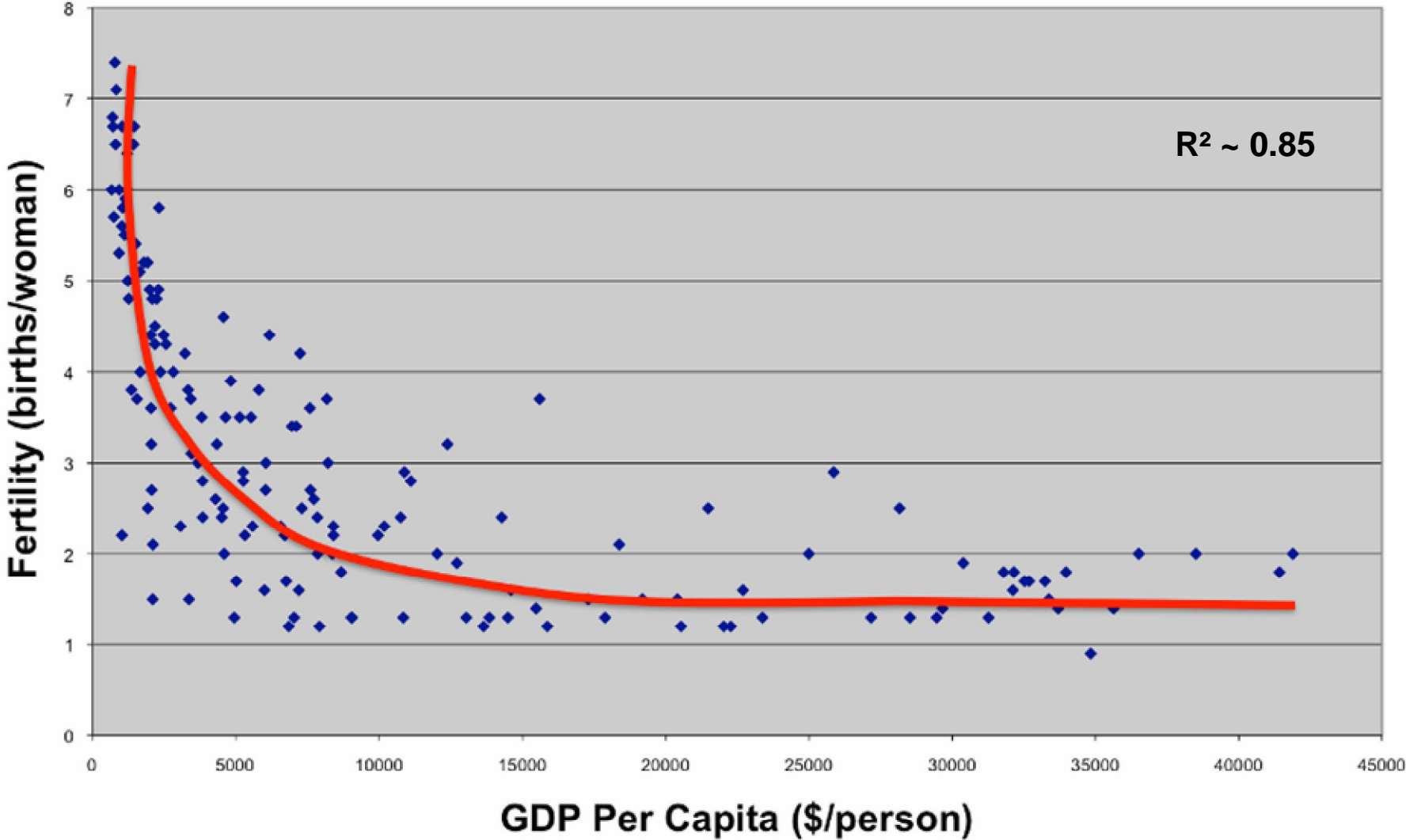
Illiterate Young Women



Illiterate Women



Fertility vs GDP Per Capita (2005)

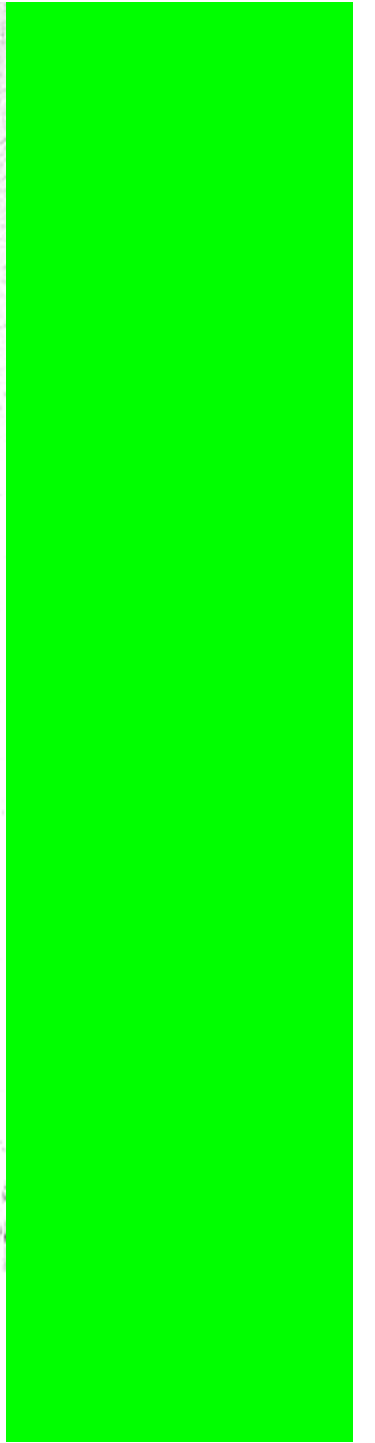
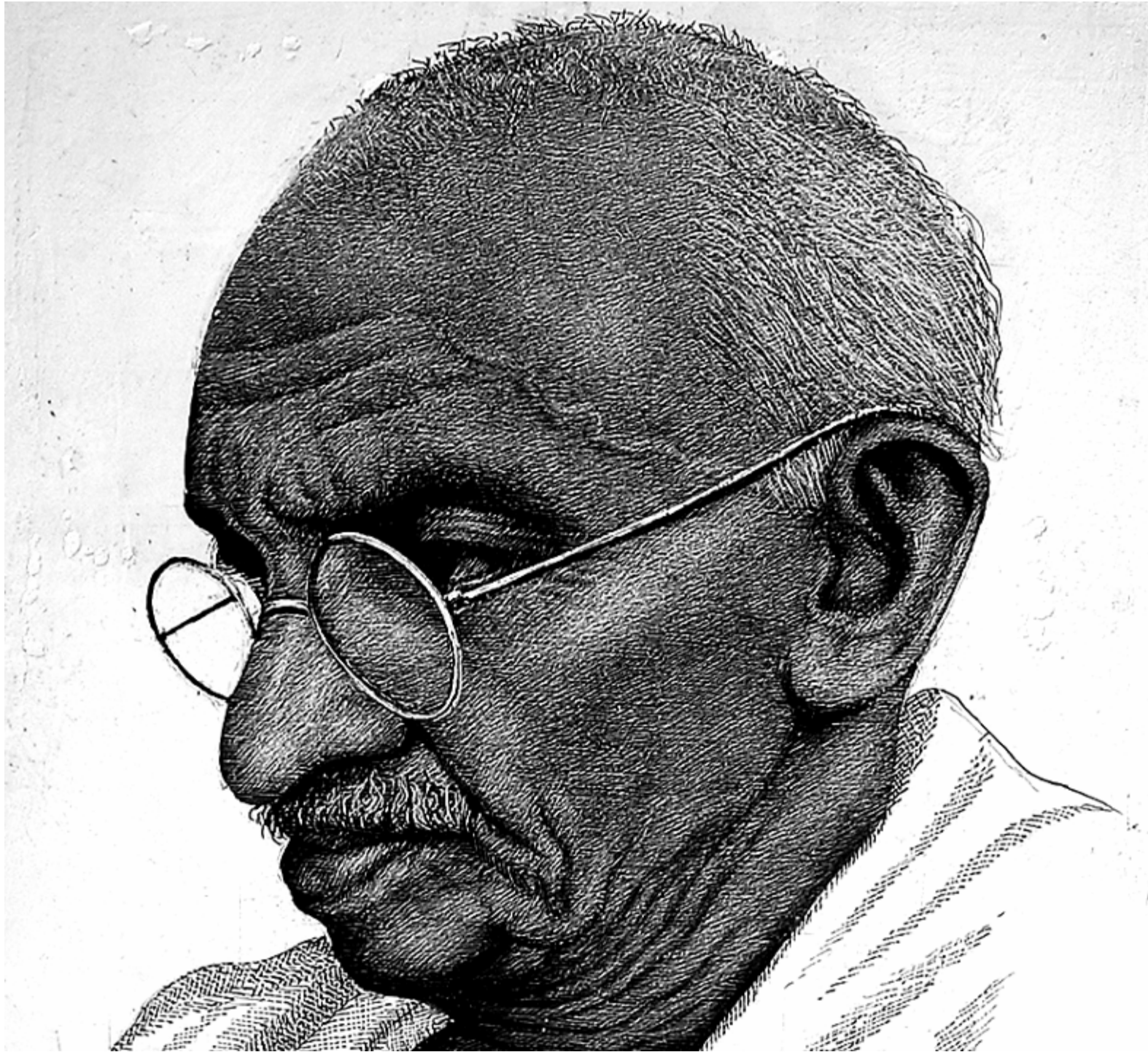


The Pursuit of Gross National Happiness

**Necessarily Depends
On Leap-Frog
Strategies**





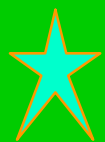


factor



Latent Productivity

**Clean Technologies
Mainly Material Saving
Innovation Incentives
Wide Awareness
Regulation**

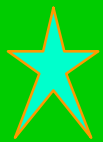


Development Alternatives

Sustainable Development

Needs

Sustainable Livelihoods



Development Alternatives





Development Alternatives



**IGNCA
Exhibition Gallery**



Development Alternatives

The Micro Concrete Roof Tile







\$50 per Sq M.



Development Alternatives

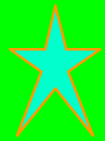
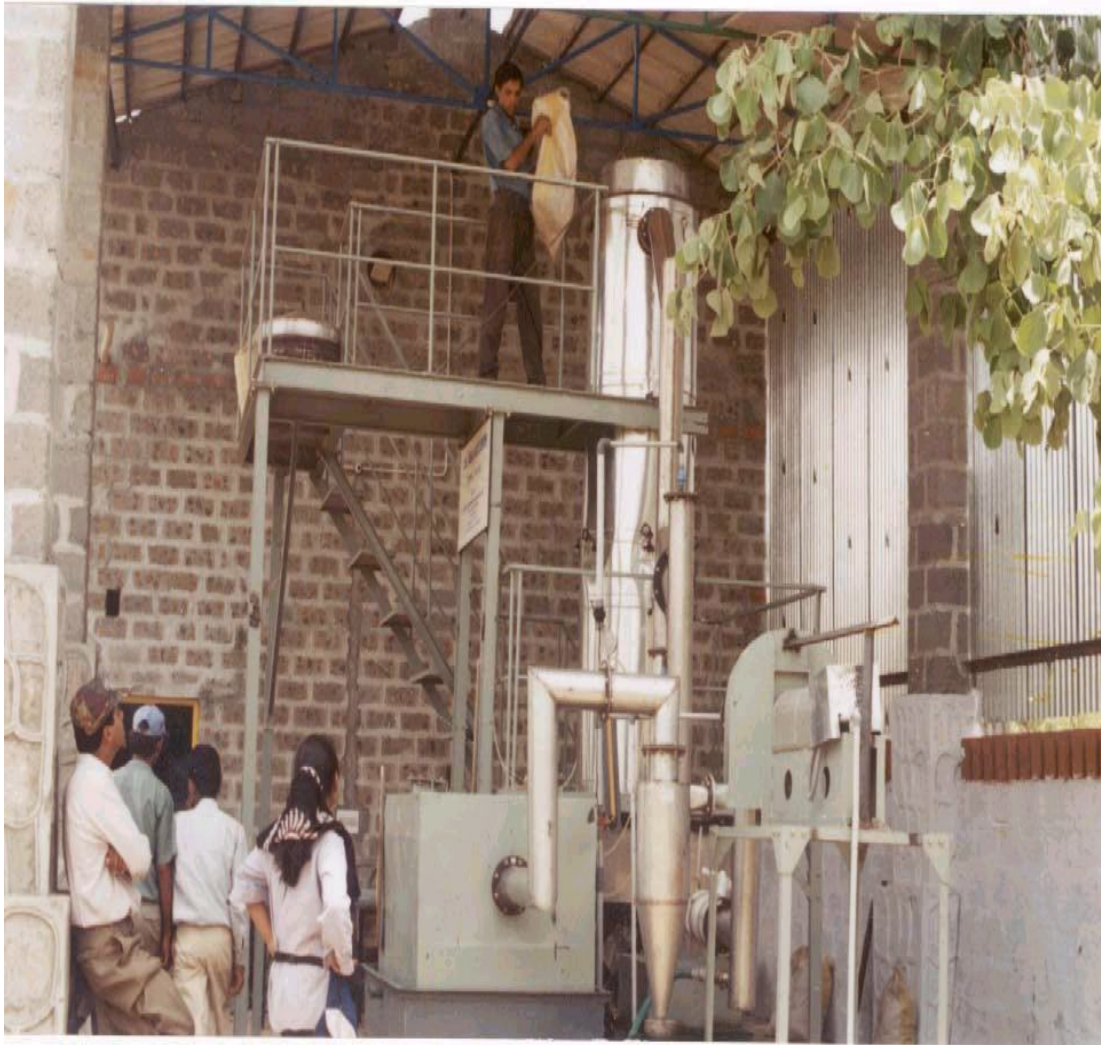


**Vertical Shaft Brick Kiln:
50% CO₂ Reduction**





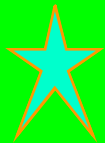




Development Alternatives

DESI Power

Wasteland Development



Development Alternatives



Check Dams



TARA Akshar













The Five Kingdoms of Nature

*

- Animals
- Plants
- Fungi
- Algae
- Bacteria



Savannah



Drinking Water
Carbon Sink
Biodiversity
Tropical Forest
Biodiesel
Sustainable Communities





Development Alternatives

**0.7 Billion Dollars -
One Time Investment**



how can we have
cool air
without aircon?



Eastgate in Harare,
Zimbabwe



Introduction

Innovation Today

Case Studies

Flame Retardant

Anti-bactericide

Pacemaker

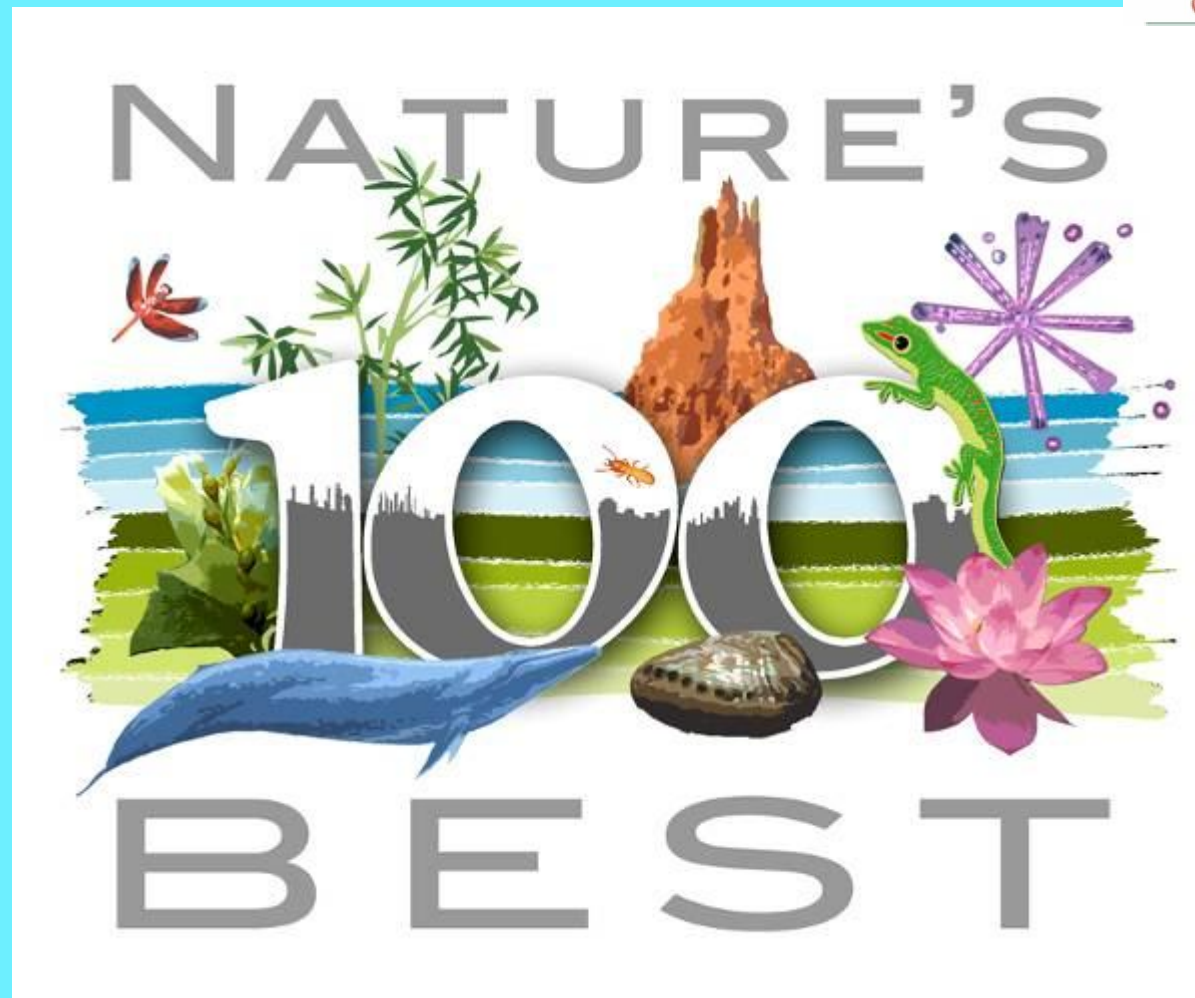
Propeller Design

Water Efficiency

White color

Solutions

from Nature



Innovation Conference

Boston 20 May 2008



Our One Earth



Development Alternatives