

The State of the World

Is Sustainable Development Possible?

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<http://iefworld.org>

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The standard definition of **SUSTAINABLE DEVELOPMENT**

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

It contains within it two key concepts:

- the concept of 'needs', in particular the **essential needs of the world's poor**, to which overriding priority should be given; and
- the idea of **limitations** imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

Sustainability is a dynamic concept

- Not a goal to be reached but a balance to be maintained in space and in time
- Involving complex interactions in the whole system that maintains life on Earth (the **environmental** component)
- Including the human system (the **social** and **economic** components)
- That must respect planetary limits

**Sustainability
is like good health:**

**environment = body
economy = metabolism
social = mental health
ethics = spiritual health**

Ecological footprint

- Surface needed to supply the needs and absorb the wastes of an individual, community, or country
- Global average 2.7 ha/person
- Sweden 5.1 ha/person
- France 4.9 ha/person, Switzerland 5.0 ha/p.
- High income 6.2, middle income 2.2, low income 1.0 ha/p.
- Resources available 2.1 ha/person
- We overshoot the earth's capacity in 1975

<http://www.globalfootprint.org/>

<http://www.ecologicalfootprint.org/>

<http://www.myfootprint.org>



Globalization



- is the logical next step in human evolution, but
- Economic globalization is driven by powerful governments and multinational businesses for their own benefit
- Social globalization is being strongly resisted
- Globalization of environmental problems threatens future sustainability
- Globalization of information makes us aware



Planetary boundaries

**Earth system processes
with limits we must not cross**

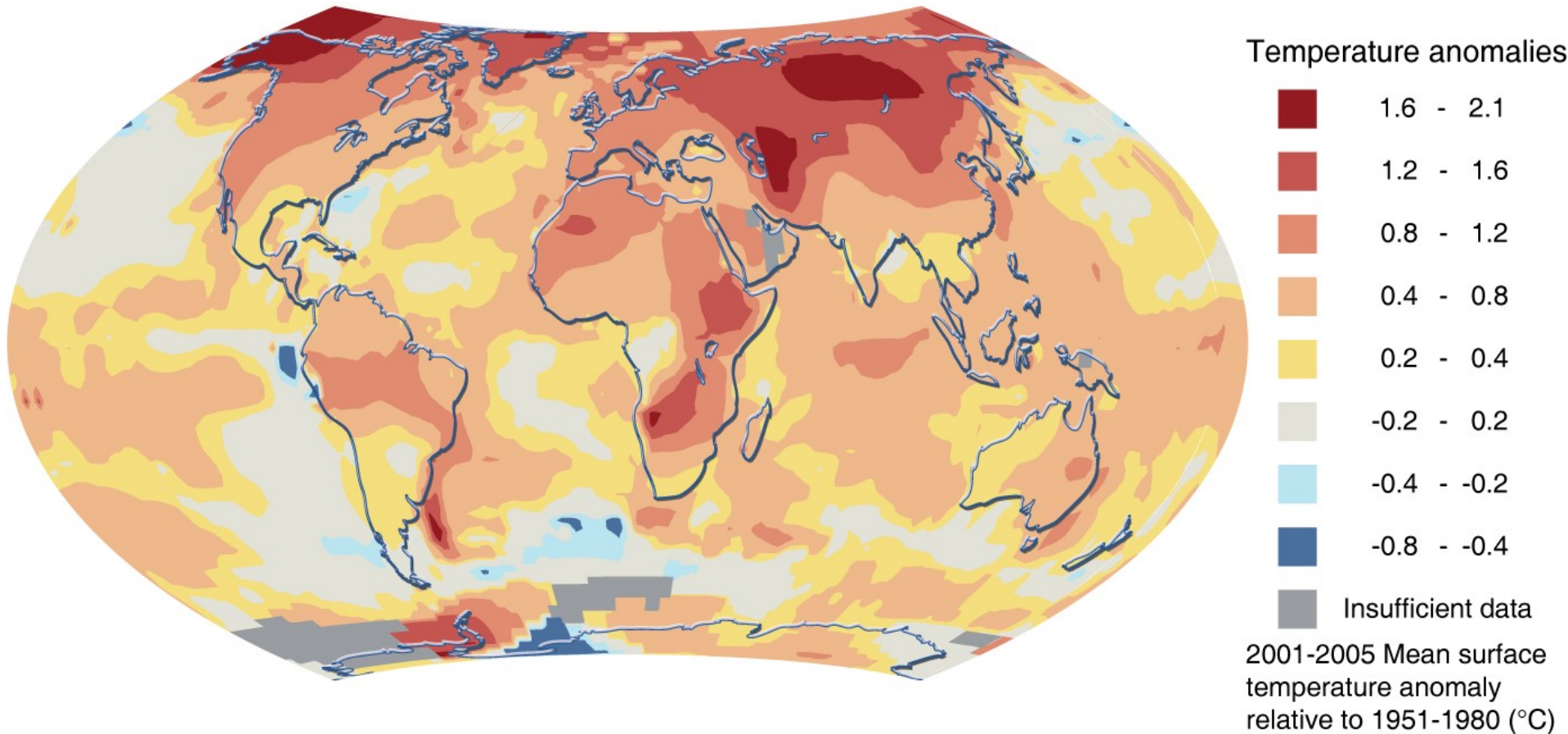
Challenges of the Anthropocene

Planetary Boundaries

- Climate change
- Rate of biodiversity loss
- Nitrogen cycle and phosphorus cycle
- Stratospheric ozone depletion
- Ocean acidification
- Global freshwater use
- Change in land use
- Atmospheric aerosol loading
- Chemical pollution

Climate Change

Temperature increase last 50 years



Atmospheric CO₂ Concentration

- CO₂ is the most important greenhouse gas, trapping heat in the atmosphere
- Pre-industrial CO₂ concentration 280 ppm; **boundary 350 ppm**; actual over **400 ppm**
- Highest in at least 2 million years
- Growth rate increasing, now **1.9** ppm/yr
- 20-35% will remain in atmosphere for several centuries

Change in radiative forcing (watts/m²):

Pre-industrial 0; **boundary 1**; actual **>100**

Carbon emissions

- Carbon emissions from fossil fuel combustion and cement production were 8.7 Gt in 2008, 41% higher than 1990
- Developing countries now emitting more fossil fuel CO₂ than industrialized countries: 55%
- Tropical deforestation 1.5 Gt/year, 15% of total anthropogenic emissions
- Fossil fuel emissions expected to rise to 12-18 Gt/yr by 2050 (2-3 times level in 2000)
- Total past emissions 500 billion tonnes carbon
- Expect to emit another 500 billion tonnes next 30 years
- Must stay below 1 trillion tonnes to avoid < 2°C rise

Fossil fuels and climate change

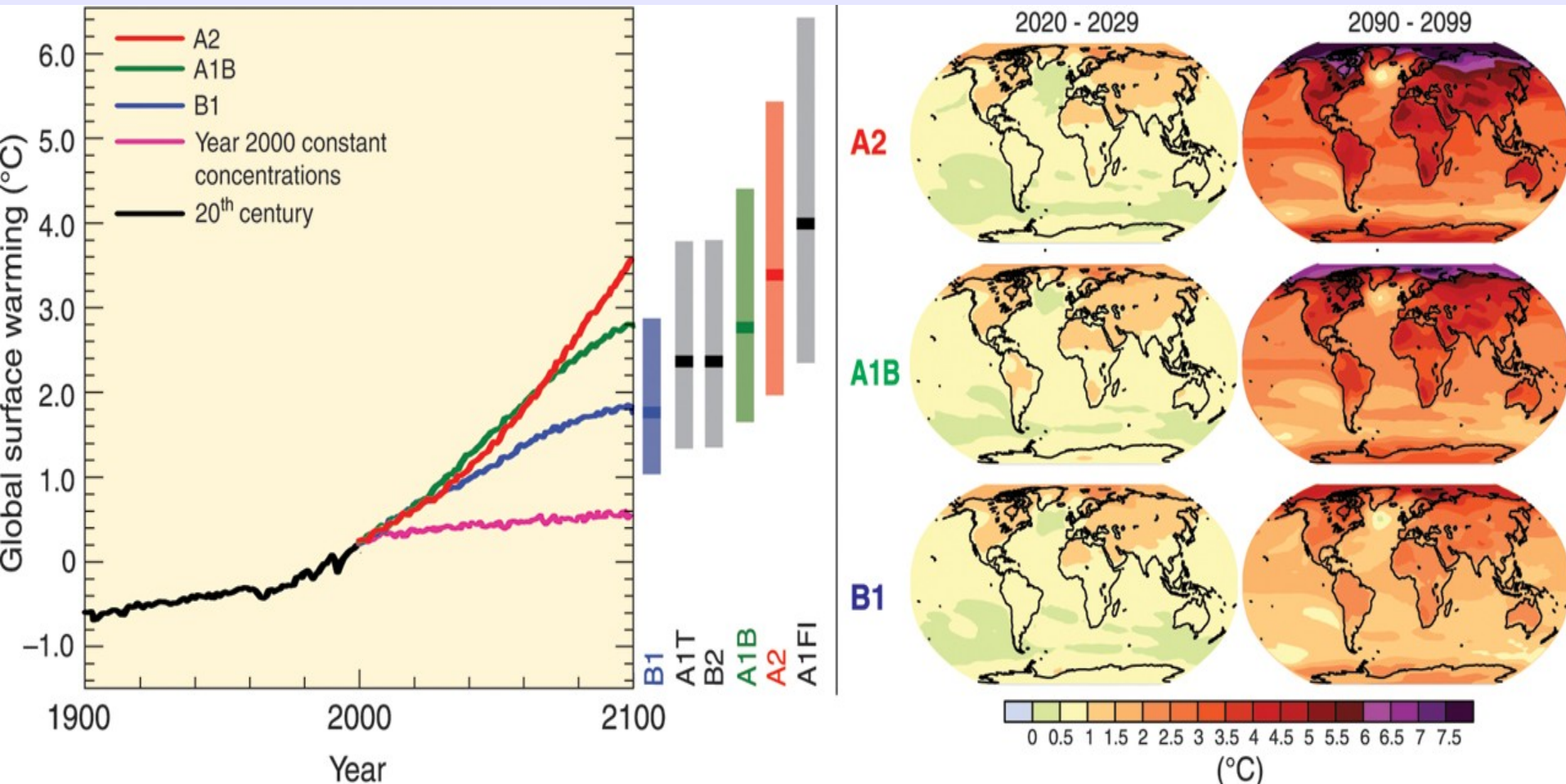
- The accepted limit for global warming without significant damage to the planet is 2°C, and this is probably too high
- The estimated remaining capacity of the atmosphere to absorb carbon without going past this limit is 565 gigatons of CO₂, which may be reached in 16 years
- Proven oil, coal and gas reserves total 2,795 gigatons (not counting unconventional sources)
- To prevent catastrophic climate change, 80% of proven reserves need to be taken off asset accounts and left in the ground

We are all responsible for climate change

- Everyone benefiting from the burning of fossil fuels is at fault
- Everyone involved in land clearing or benefiting from land use changes is a contributor
- How much we are responsible depends on our country of residence, lifestyle and consumption patterns, with the rich most responsible
- The poor will be the greatest victims of climate change, while contributing the least to the problem
- This is an ethical dilemma

What the models say

IPCC 2007



Polar areas are changing fastest


- Half of the permafrost in the Arctic is expected to melt by 2050 and 90% before 2100, releasing methane
- The permanent ice in the Arctic Ocean is melting rapidly; North-West Passage opened in 2008; worst melting ever in 2012; now mostly thin first- year ice; permanent ice in the Arctic Ocean may be gone by 2015-2030
- Greenland glaciers have doubled their rate of flow in the last few years
- Melting of the West Antarctic ice sheet is accelerating; Pine Island Glacier passed tipping point 1996, could add 26-52 cm sea level rise by 2100

Arctic Sea Ice September 1982 and 2008

20,000 km³

8,000 km³



 Median minimum extent
of ice cover (1979-2000)

Arctic Methane

- Warming temperatures in the Arctic are releasing methane from permafrost and hydrates under the sea
- Plumes of gas a kilometer in diameter have been observed in the East Siberian Sea
- The release of 50 gigatonnes of methane over a decade will bring forward the date of a global 2°C increase by 15-35 years
- The resulting impacts from flooding, sea level rise, damage to agriculture and human health will cost \$60 trillion (the size of the global economy in 2012)

Accelerating sea level rise

- Present estimate 80cm to 2m by 2100 and continuing
- This would displace 130 million people living within 1 m of mean sea level
- In Europe, 13 million people displaced and \$600b in lost property

Climate change effect on the economy

- The Stern Report estimated the annual cost of uncontrolled climate change at more than \$660 billion (5 to 20% of global GDP, as compared to 1% for control measures for greenhouse gases).
- Climate change represents the greatest market failure in human history

Threat to Security

- If climate change goes unchecked, its effects will be catastrophic “on the level of nuclear war”.
- falls in available resources and economic vitality
- increased stress on their armed forces
- greater instability in regions of strategic import
- increases in ethnic rivalries
- a widening gap between rich and poor.

BIODIVERSITY LOSS



- Extinction rate (species per million species per year) preindustrial 0.1-1, **boundary 10**, actual **>100**
- The annual cost of forest loss is \$2-5 trillion
- There will soon be no natural ecosystems left, requiring increasing human intervention to maintain some biological diversity

Nitrogen Cycle

(part of a boundary with the phosphorus cycle)

- Amount of N_2 removed from atmosphere for human use (mt/yr): preindustrial 0; **boundary 35**; actual **121**
- More than half the fixed nitrogen on the planet now comes from human activities (nitrogen fertilizers and burning fossil fuels)
- The excess causes eutrophication, ecological imbalances and release of CO_2 from plants

Phosphorus Cycle

(part of a boundary with nitrogen cycle)

- Quantity of P flowing into the oceans (million tonnes per year)
- Pre-industrial -1; **boundary 11**; actual **8.5-9.5**
- Exploitable reserves remaining 142-345 years

Global Freshwater Use

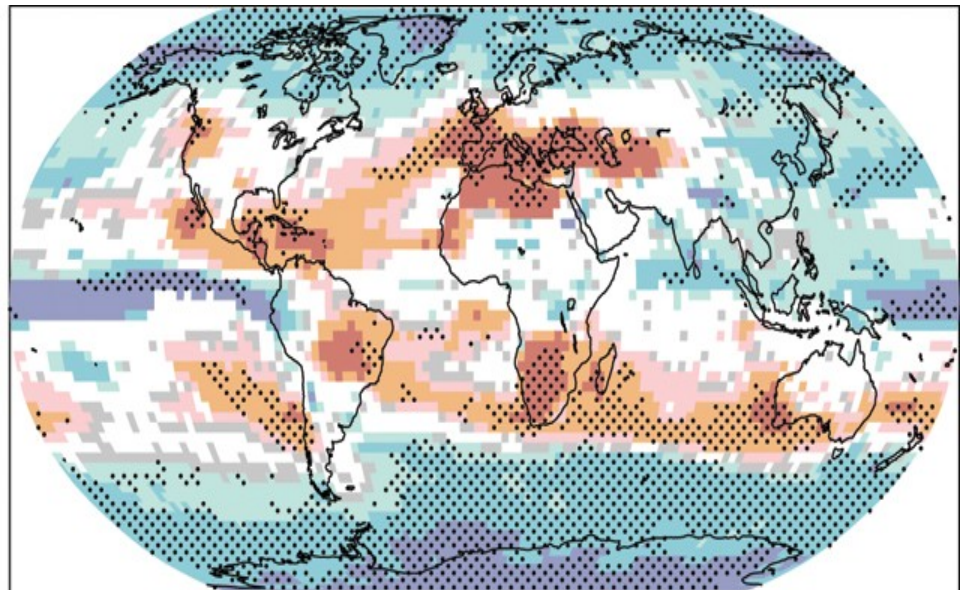
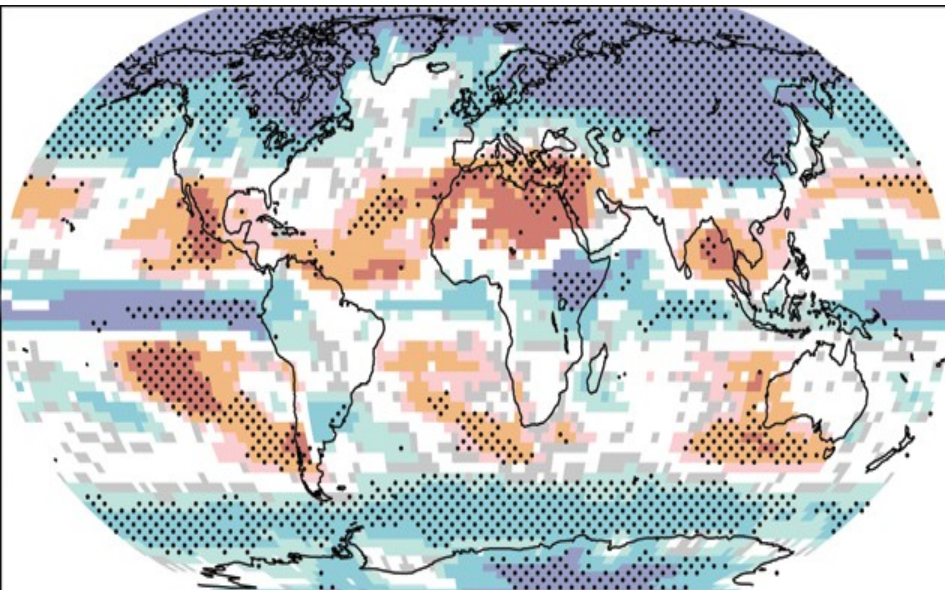
Most freshwater from streams and groundwater is used for agriculture

Water use for crops will have to double by 2050 to halve the number of hungry

But, by 2025, 1.8b people will live in regions with absolute water scarcity, and 2/3 of the world population could be subject to water stress as climate change reduces rainfall in these areas

Consumption of freshwater by humans (km^3/yr):
pre-industrial 415; **boundary 4000**; actual **2600**

Predicted changes in precipitation from climate change



December-February

June-August

Percent change 1900-1999 to 2000-2099

IPCC 2007

Change in Land Use

- The growing population and technologies for changing the land surface and exploiting its resources are converting natural landscapes and ecosystems for human use, often degrading the land and reducing ecosystem services
- Percentage of global land cover converted to cropland: pre-industrial low; actual **11.7**; **boundary 15**

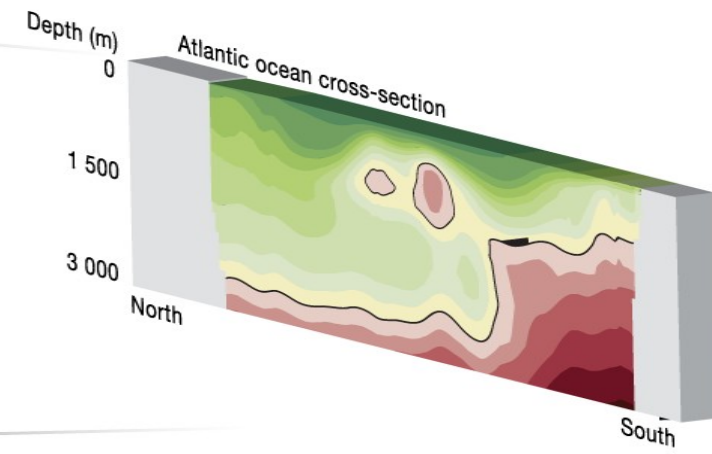
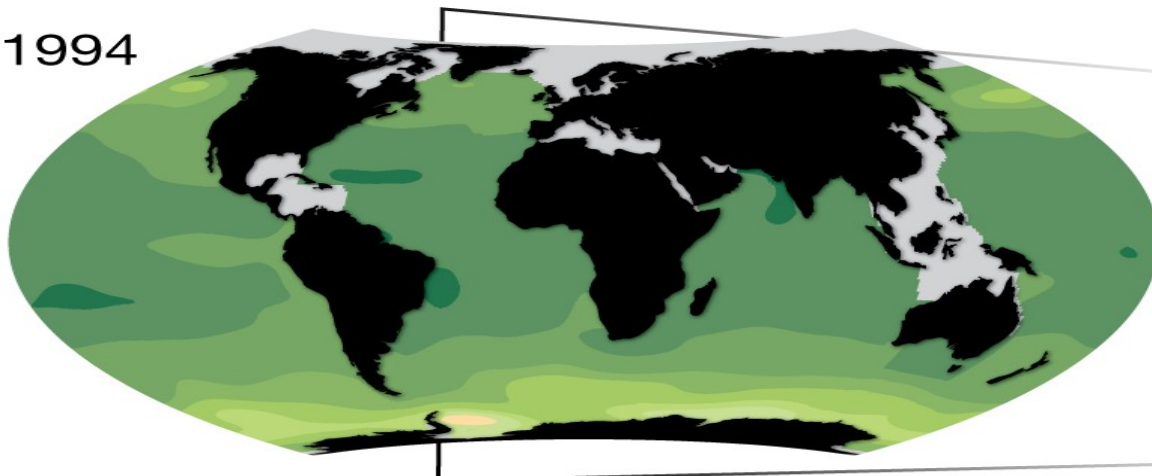
Stratospheric Ozone Depletion

- Stratospheric ozone screens out harmful ultraviolet radiation
- Its destruction is catalyzed by man-made chemicals containing chlorine or bromine, like PCBs
- Concentration of ozone (Dobson units): pre-industrial 290; **boundary 276**; actual **283**

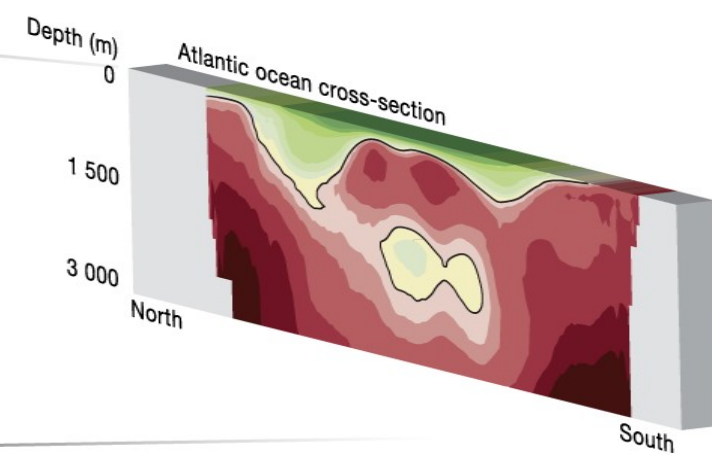
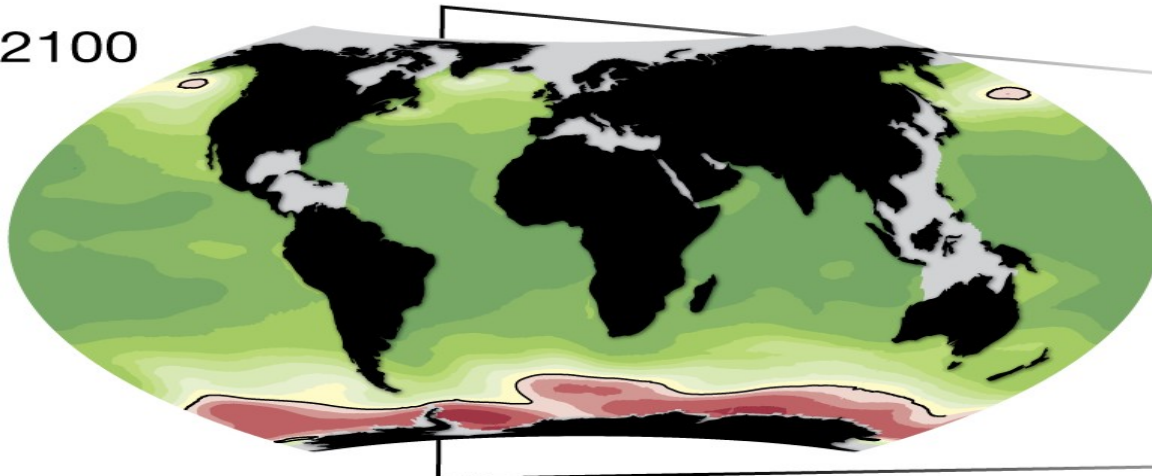
Ocean Acidification

Pre-industrial 3.44; **boundary 2.75**; actual **2.90**

1994



2100



Atmospheric aerosol loading

Particles of dust and soot in the atmosphere block solar energy from reaching the surface

A brown cloud from East Asia has reduced sunlight over India and the Indian Ocean by 15%

The **boundary** for overall particulate concentration in the atmosphere on a regional basis is to be determined

Chemical Pollution

(image IKONOS – Lang, ESRI 1998)

Man-made chemical pollutants have contaminated the entire planet, interfering with biological processes, upsetting hormonal balances and immune systems, causing cancers and other diseases, damaging the ozone layer, and having other as yet unknown effects
(**planetary boundary** not yet determined)



Other sustainability issues

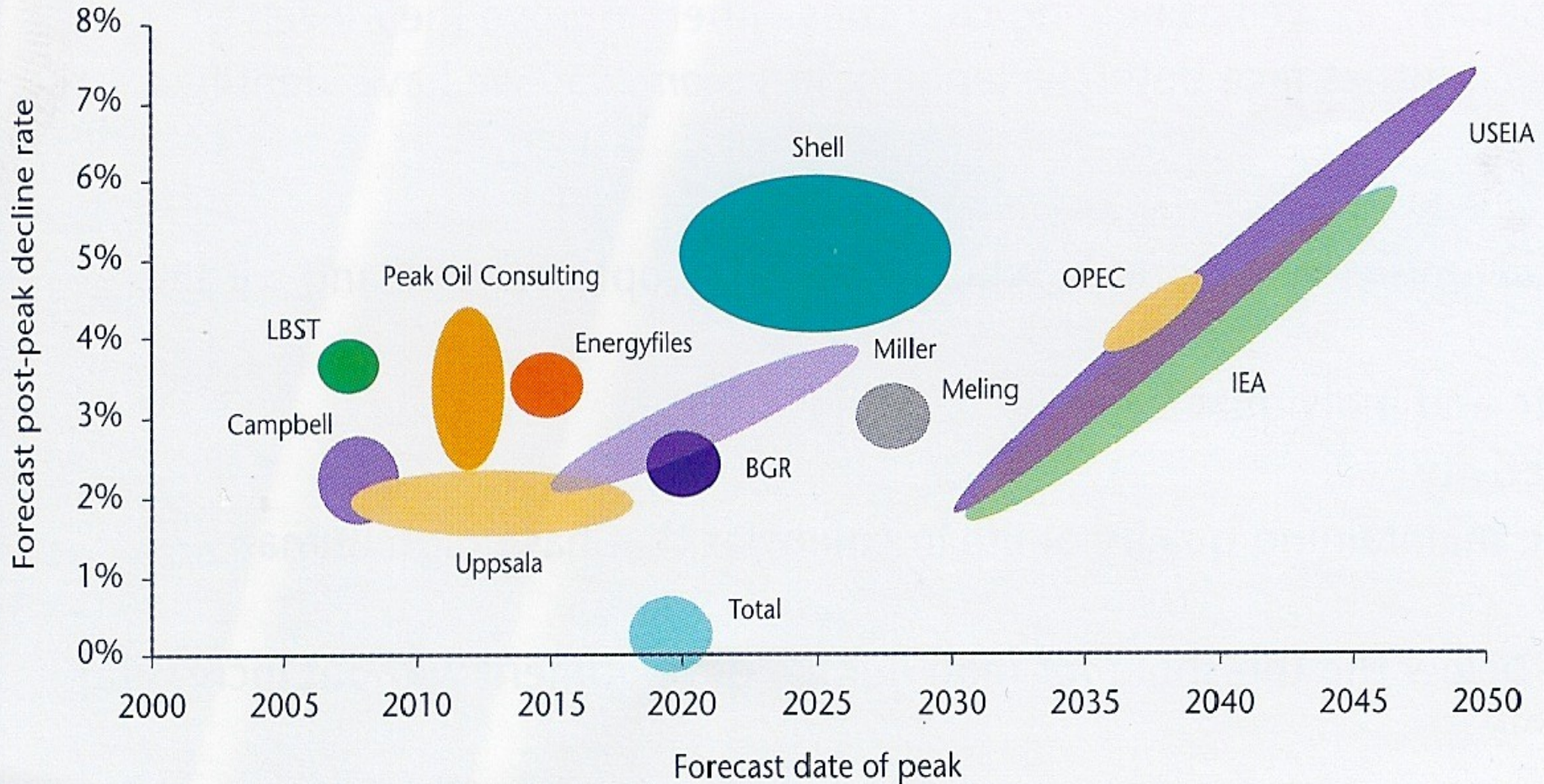
- Energy
- Population
- Food security
- Health
- Resource depletion
- Economic crisis
- Moral vacuum
- End of the growth paradigm

The energy challenge

- Industrial economy, agriculture, transportation, communications, trade, urbanization, consumer lifestyle all depend on cheap and abundant energy
- Energy demand will grow 50% by 2030, but oil production is peaking and will decline 75% in 30 years; coal may also peak by then
- A fossil-fuel-based civilization is unsustainable

Forecasts of Peak Oil

(WBCSD, *Vision 2050*, 2010)



Fracking

- Hydraulic fracturing (fracking) of shale can make new gas and oil reserves available (15 bB in California's Monterey shale)
- Requires large amounts of water and toxic chemicals, many drill pads and deep wells with road access
- Well life is short and abandoned wells are often left unplugged (20,000 in Wyoming alone)
- 9% of methane produced leaks into the atmosphere
- Surface spills are common, and fracking fluids can contaminate groundwater

The Energy Transition

- Wind, tidal and wave turbines; photovoltaic panels; hydroelectricity; geothermal energy can be scaled up today to meet 100% of energy needs
- Conversion to renewables will reduce demand by 32%
- Battery-electric and hydrogen fuel cell vehicles
- Technologies combined and coordinated over a global grid
- Fossil fuels can be phased out in 20-40 years
- No nuclear, carbon capture or biofuels

Double economic challenge

“On current trends, ...humanity will need twice as much energy as it uses today within 35 years.... Produce too little energy, say the economists, and there will be price hikes and a financial crash unlike any the world has ever known, with possible resource wars, depression and famine. Produce the wrong sort of energy, say the climate scientists, and we will have more droughts, floods, rising seas and worldwide economic disaster with runaway global warming.

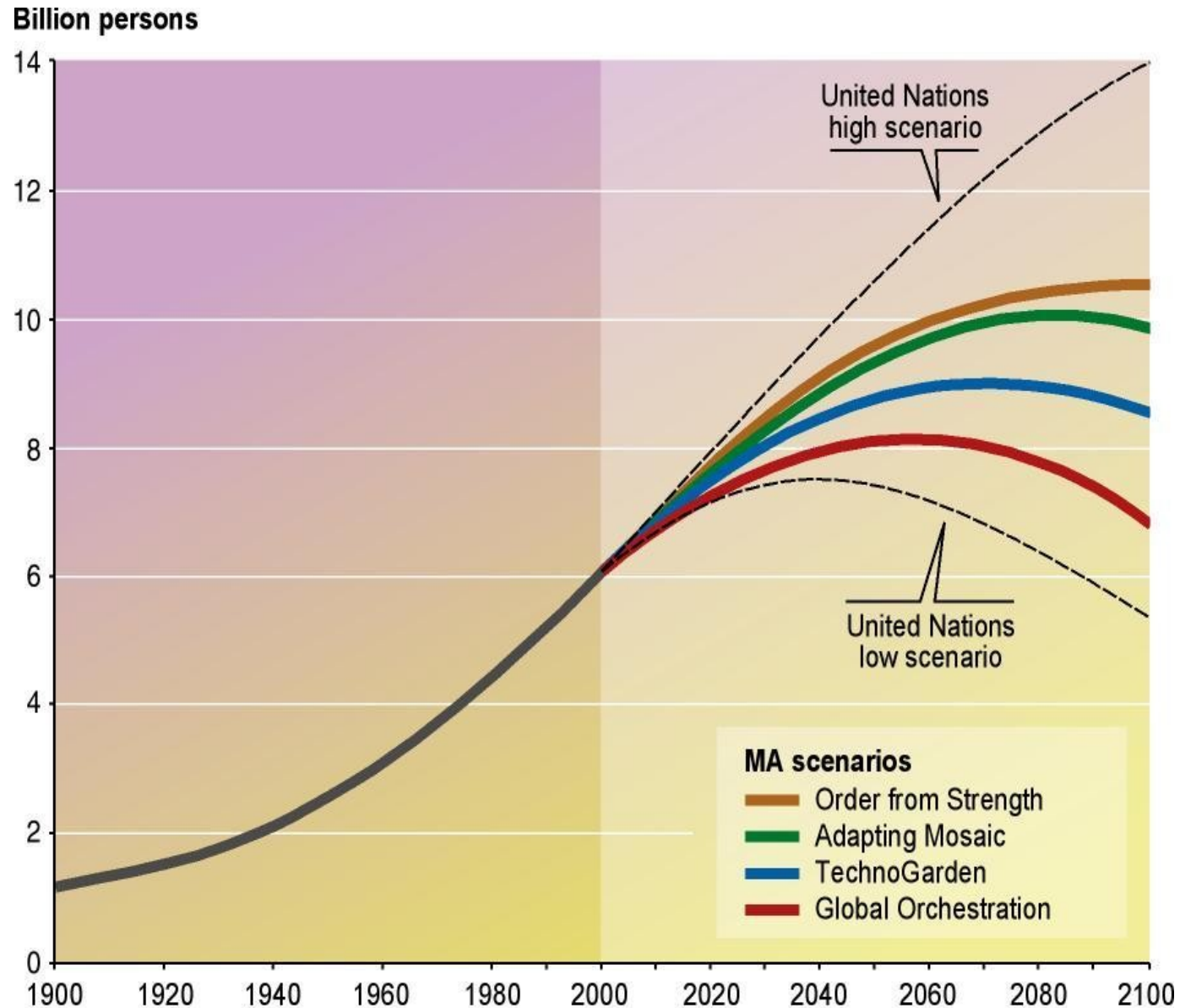
John Vidal in *The Guardian Weekly*, 9-15 February 2007, Energy supplement, p. 3

We shall probably do both at the same time

Human Population

- The world population has tripled in one lifetime, and is expected by the UN to rise to 9.2 billion by 2050 before stabilizing
- By some estimates, world resources can only sustainably support 500 million people
- We seem to be following a classic ecological pattern of overshoot and collapse
- The planetary carrying capacity depends on numbers versus standard of living; increasing one reduces the other
- Science may find ways to increase carrying capacity, but only at longer time scales

Population Growth Scenarios

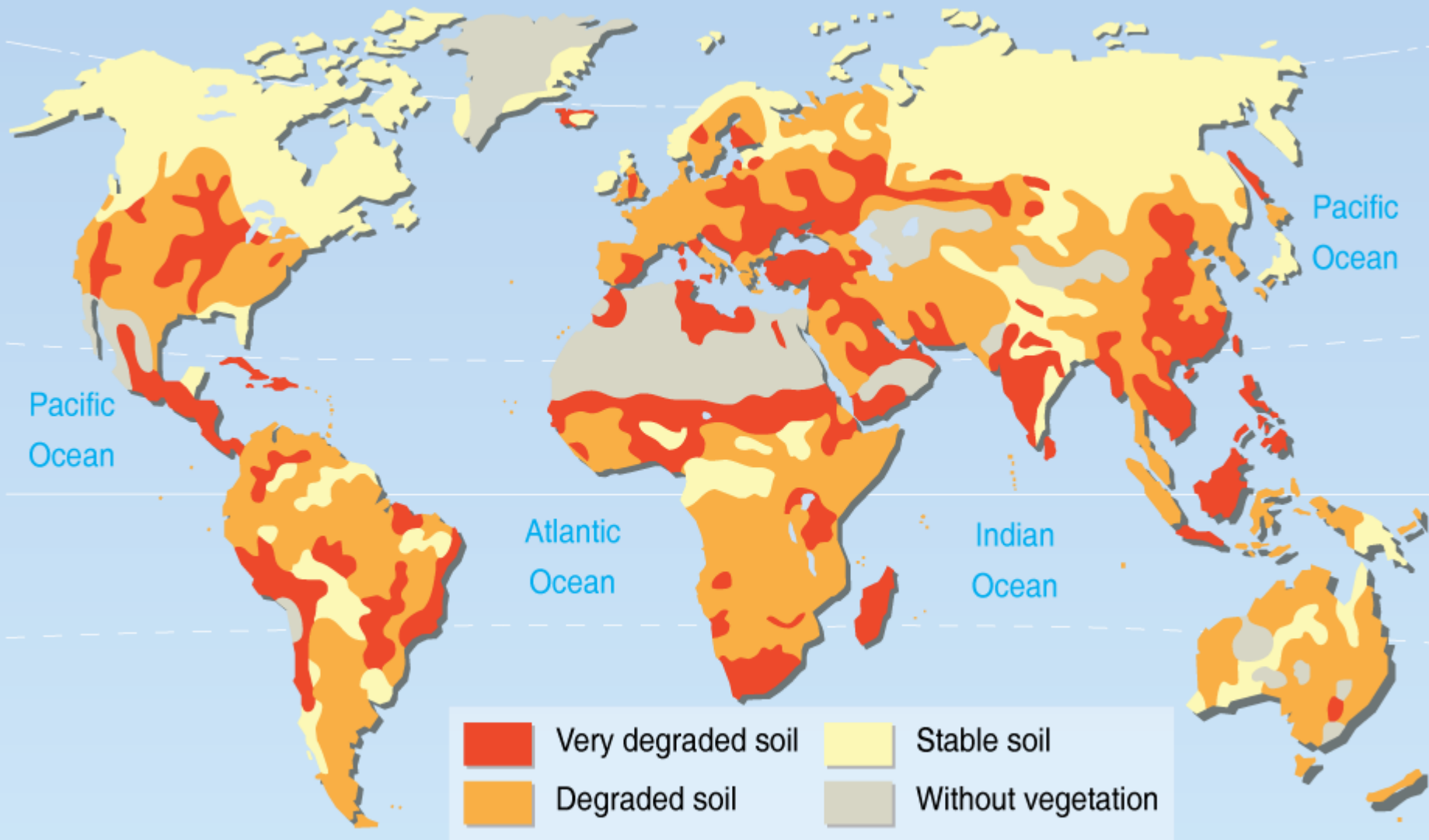


Source: Millennium Ecosystem Assessment

Crisis in Food Production

- Crop production reached 2.5 t/ha. but such intensive agriculture requires high energy, fertilizer and petrochemical inputs
- World cereal production per person peaked in the 1980s and has decreased slowly since
- Feeding the growing world population and reducing hunger by half will require doubling world food production by 2050
- There were absolute planetary food shortages 2008 and 2012, with rising prices
- Land, water, phosphate, energy are all limiting

Soil degradation



Source: UNEP, International Soil Reference and Information Centre (ISRIC), World Atlas of Desertification, 1997.

Philippe Rekacewicz, UNEP/GRID-Arendal

The coming soil crisis

- Many past civilizations collapsed because they degraded their soil
- In Indiana, USA, for each ton of grain harvested, a ton of soil is lost
- Since 1945, erosion has degraded 1.2 billion hectares, equal to China plus India, 38% of global crop land
- 12 million ha abandoned each year, 1% of total

Global land grab

- Wealthy governments and large companies are buying/leasing large areas of land in poor countries for export to ensure their own food security
- Area now = all arable land in Europe
- South African businesses 8m ha in DR Congo; China 2.8m ha in Congo and 2m ha in Zambia, with 1 m Chinese farm labourers in Africa in 2009

Health Threats to Sustainability

- Risk of bird/swine flu pandemic
- Rise of malaria and tuberculosis; no profit in medicines for the poor
- Emerging epidemic diseases (SARS)
- Growing antibiotic resistance from overuse
- Fraud and counterfeit pharmaceuticals
- Unhealthy products: tobacco, alcohol, infant formula, junk foods
- Food system: hunger and obesity 1 billion

Resource Depletion

Many key materials are being exhausted rapidly
(estimated years left: **predicted**/today's rate)

- Phosphorus (fertilizer) **142-345**
- Antimony (drugs) **15-30**
- Copper (wire, coins, pipes) **40-60**
- Hafnium, Indium (chips, LCDs) **5-15**
- Platinum (catalysts, fuel cells) **15-360**
- Silver (jewelry, catalysts) **15-30**
- Tantalum (cellphones, cameras) **20-115**
- Uranium (weapons, power stations) **30-60**
- Zinc (galvanizing) **20-46**

THE PROBLEMS ARE GLOBAL BUT GOVERNANCE IS STILL NATIONAL

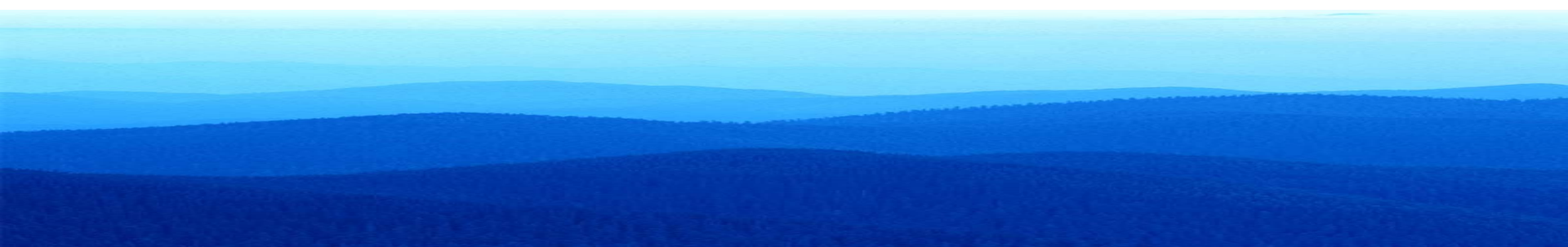
- Legislation: social definition of ethical limits
- Taxation: wealth redistribution for common services and social security
- International frameworks largely non-binding (labour, health, transport, intellectual property)
- No global mechanism for economic management (IMF, G8, G20, etc.)
- No mechanism for global wealth redistribution
- No international legislation providing common standards or a level playing field for business

Refusal of Social Globalization

when climate change will cause mass migrations

- Reinforcing frontiers
- Rejection of immigrants
- Rise of xenophobia
- Fear of delocalizations
- Failure to deal with poor governance

Globalization should include the free movement of people as well as capital, goods and services



Consumption-based economy in trouble

- The consumer society is living beyond its means, accumulating debt
- Information technologies and media have globalized this and created a generation of passive consumers
- People expect constantly increasing purchasing power
- Head of European Central Bank (Feb. 2009): "We live in non-linear times: the classic economic models and theories cannot be applied, and future development cannot be foreseen."
- Derivatives over \$700 trillion in 2010
- European countries on brink of insolvency
- Returning to consumption-driven growth is unsustainable

The attractions of consumer culture

- Materialism's vision of human progress produced today's consumer culture with its ephemeral goals
- For the small minority of people who can afford them, the benefits it offers are immediate
- The breakdown of traditional morality has led to the triumph of animal impulses and hedonism
- Selfishness has become a prized commercial resource; falsehood reinvents itself as public information; greed, lust, indolence, pride, violence are broadly accepted and have social and economic value

The present economic system cannot deal with sustainability

- Economic thinking can no longer insist that there is no limit to nature's capacity to fulfil any demand made on it
- Attaching absolute value to growth and to the satisfaction of people's wants is no longer realistic
- Economic decision-making tools cannot deal with the fact that most of the major challenges are global

Where does money come from?

- 3% of money supply created by governments
- 97% is debt created by bank loans
- Only 8% of loans are to businesses
- 92% represents speculation, mortgages and consumer debt

Growth-debt Trap

- Economic growth today is largely fueled by consumer, corporate and government borrowing
- As long as the growth rate is higher than the interest rate, reimbursement is possible
- If growth slows or stops, defaulting is inevitable
- The consumer society was a necessary creation to maintain the economic growth/debt paradigm
- Growth in energy and resource consumption cannot continue much longer

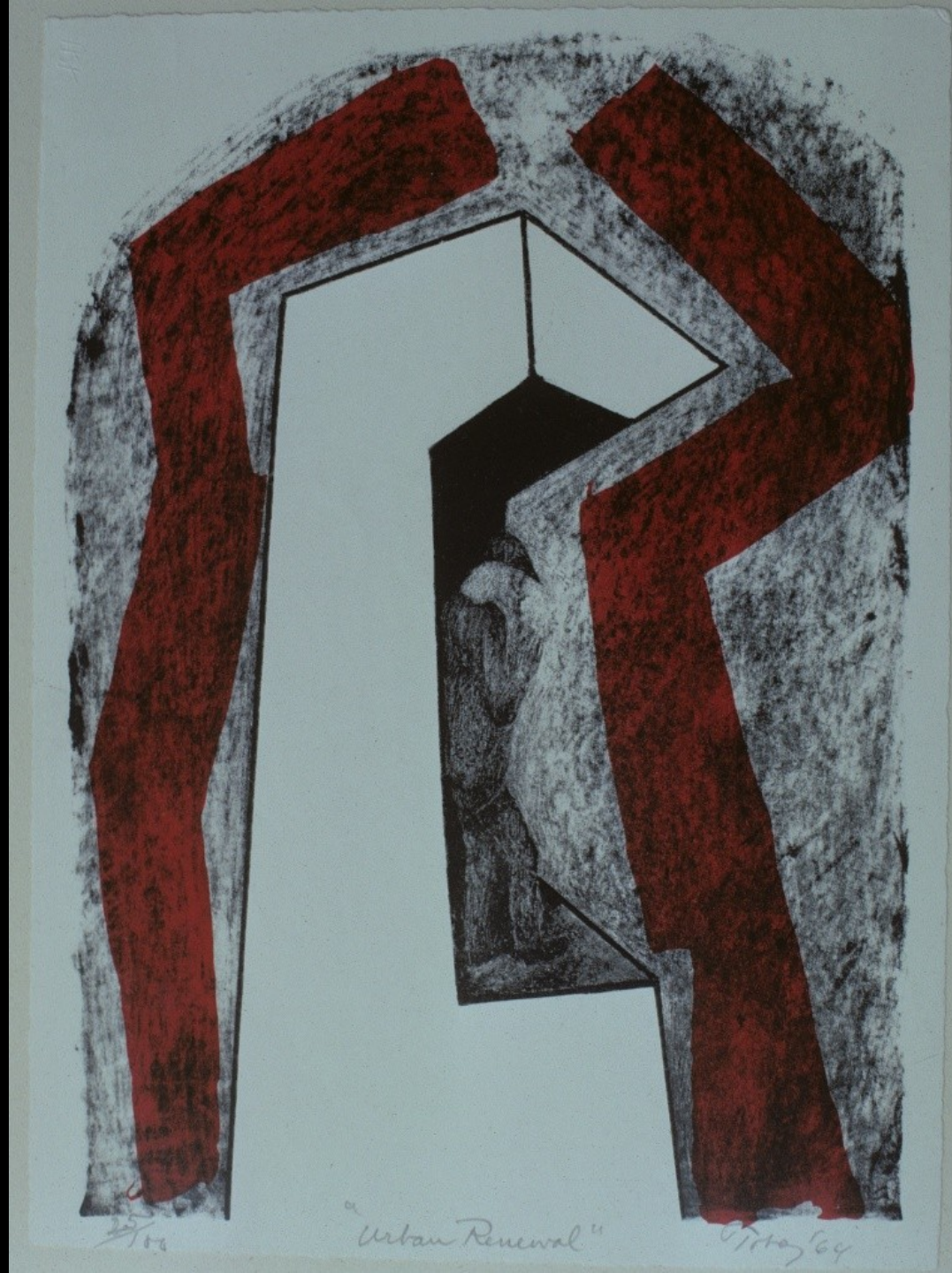
Moral Failures in Business

- Madoff, Enron, Worldcom and other frauds
- Transfer pricing, “creative” accounting, offshore tax havens allow escaping taxation
- Exorbitant salaries of corporate leaders and bonuses of bankers
- Corporate funding of disinformation
- Powerful lobbies influence “democratic” processes

CORRUPTION

- The illegal economy from organized crime is now \$2 trillion/year, or twice all the world's defense budgets, including \$870 billion for international crime syndicates
- Bribery \$1tr; counterfeiting and piracy \$520bn; drug trade \$320bn; human trafficking \$44bn; traffic in endangered species \$20bn; identity theft \$1bn
- Political corruption is everywhere; the vast majority of bribes go to people in rich countries

At the root
of all this
is what could
be called an
ethical
deficit



Has national sovereignty become unethical?



Even at the UN, national sovereignty is jealously protected, yet global problems require a global response. Governments do not realize that true national self-interest today is best reflected in global solidarity and a willingness to make short-term sacrifices in the common interest

20th century consumer society rooted in materialism

- The early twentieth century materialistic interpretation of reality has become the dominant world faith in the direction of society
- Dogmatic materialism has captured all significant centres of power and information at the global level, ensuring that no competing voices can challenge projects of world wide economic exploitation

**Integrating all the driving forces:
environmental, social, economic,
ethical**

**What are the implications
for planetary
sustainability?**

Scenarios plausible futures

- Business as usual in a materialistic society ignoring the future
- Retreating to a fortress world of old values
- Making a transition to sustainability



Converging problems

- UK Chief Scientist (19 March 2009): the world faces a 'perfect storm' of problems in 2030 as food, energy and water shortages interact with climate change to produce public unrest, cross-border conflicts and mass migrations

Scenarios from World 3

(Meadows et al. (1992) Beyond the Limits)

SCENARIO 1

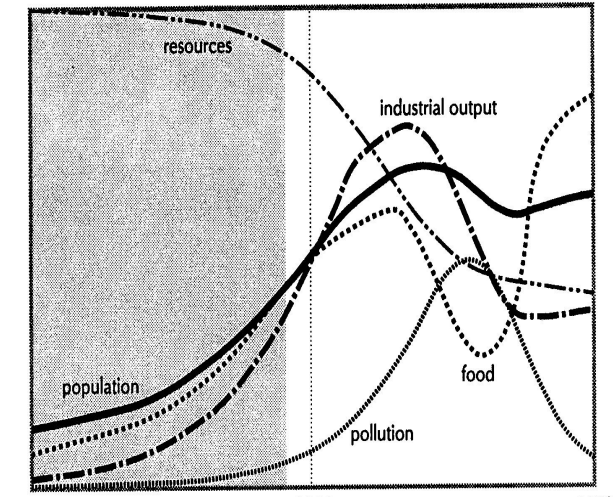
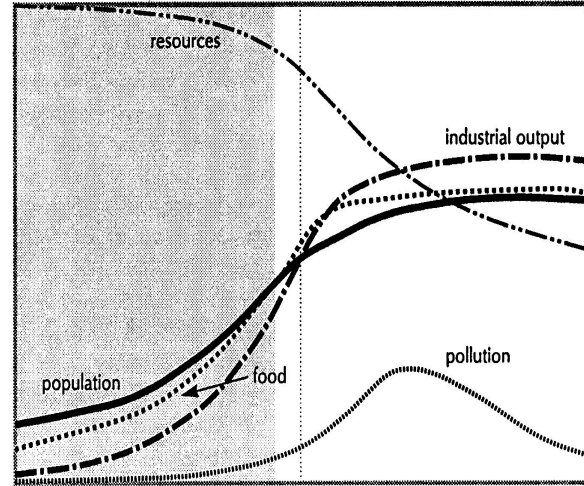
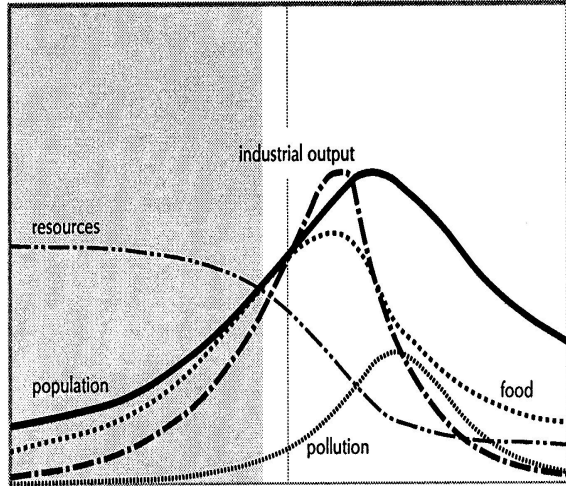
SCENARIO 10

SCENARIO 12

State of the world

State of the world

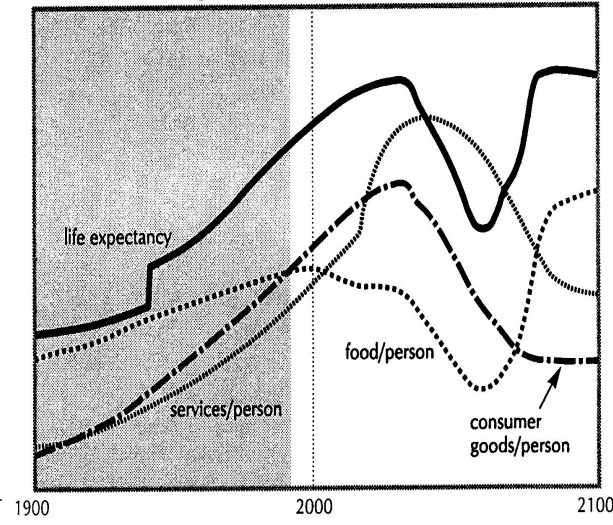
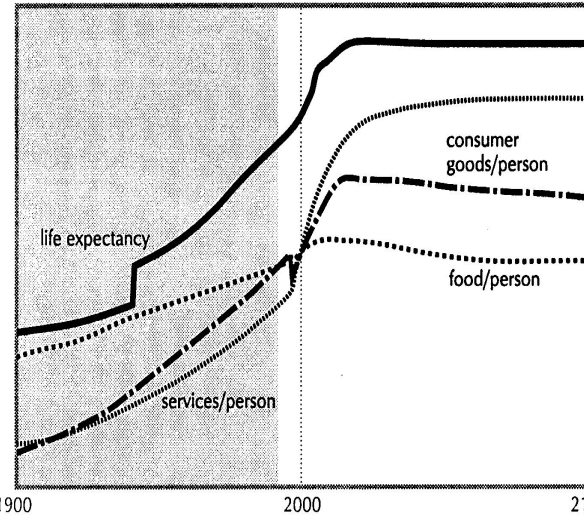
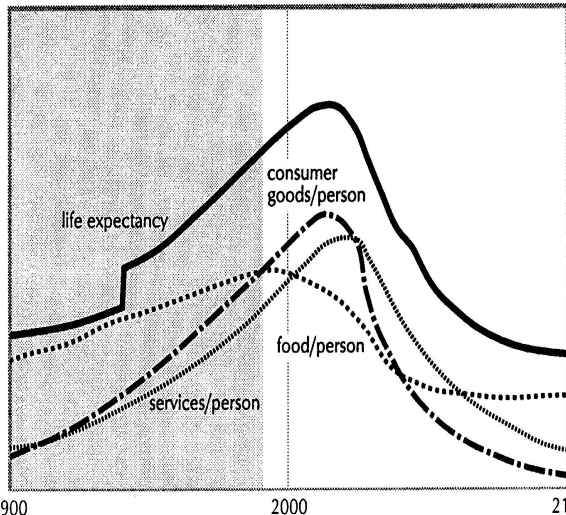
State of the world



Material standard of living

Material standard of living

Material standard of living



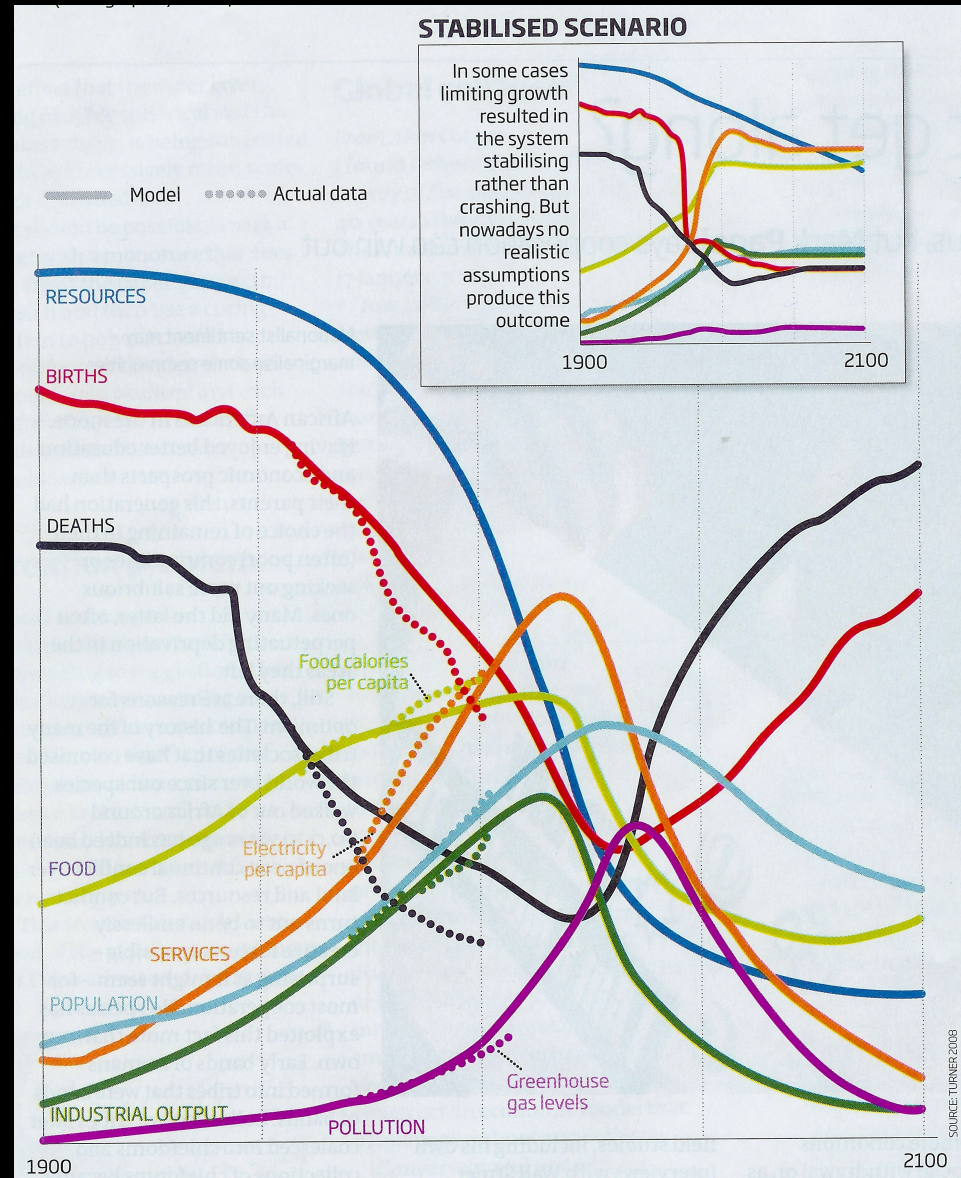
Business as usual

Transition 1995

Transition 2015

Where are we now?

MacKenzie, Debra. 2012
Doomsday Book. *New Scientist*,
7 January 2012, pp. 38-41.



Historical cycles

Peter Turchin (mathematical ecologist) 2010:

- a civilization or empire depends on social cohesion (indicator: collective violence)
- population growth and new technology generate wealth for elite → oversupply of labour increases poverty → concentration of wealth → factionalism → anarchy → collapse → restart (200 year cycle)
- predicted political instability/impending crisis in Western Europe and US peaking 2020
- need to reduce social inequality

**ARE WE
SEEING THE
FIRST SIGNS
OF THE
COLLAPSE
OF
CIVILIZATION?**



(image IKONOS – Lang, ESRI 1998)

End of the growth paradigm

- Can we expect endless material growth in a finite planetary system?
- Economic growth has depended on population growth, the fossil energy subsidy, resource discoveries and technological innovation
- The first two end in this century, resource discoveries are shrinking, and technological innovation faces diminishing returns

Denial, Depression or Action? Do we have a choice?



Can we go and hide on a remote island?

Welcome to the new sustainability paradigm

- **balance**
- **optimal size**
- **subsidiarity**
- **efficiency**
- **de-materialization**
- **closed systems**

HOW DOES NATURE DO IT?

Sustainability in the coral reef ecosystem:

- Efficient solar energy and materials capture by generating large surface area
- Efficient energy transfers within system, symbioses
- Little waste, effective recycling
- High complexity and integration
- Maximizes total productivity, not just most productive

**Sustainability
is fundamentally an
Ethical Challenge**

egotism versus **altruism**
me first versus **all together**

An alternative to the consumer society

- sufficiently attractive to overcome resistance and habit
- worth sacrificing the superficial for what is deeper and more fundamentally rewarding
- effort comparable to religious conversion
- combines individual transformation with social action

Sustainability - an ethical concept

- As trustees or stewards of the planet's resources and biodiversity, we must:
- ensure sustainability and equity of resource use into distant future
 - consider the environmental consequences of development activities
 - temper our actions with moderation and humility
 - value nature in more than economic terms
 - understand the natural world and its role in humanity's collective development both material and spiritual

Sustainability - fundamental responsibility

Sustainable environmental management must come to be seen not as a discretionary commitment mankind can weigh against other competing interests, but rather as a fundamental responsibility that must be shouldered, a pre-requisite for spiritual development as well as the individual's physical survival.

Why the priority on ethics?

- Both law and ethics are concerned with the application of justice
- Law: institutions for enforcement, top-down regulation of society, punishment, use of force if necessary, costly
- Ethics: individual attachment to the principle of justice and its application, bottom-up, self-motivated, reward more than punishment
- The stronger the ethical framework and its application, the less need for law; more cost-effective; process-based solution

The importance of values

- Values: qualities on which worth, desirability, utility depend
- Principles or rules generated by an ethical or spiritual framework
- Values are what determine how humans relate to each other
- They are the social equivalent of DNA, encoding the information through which society is structured
- For society to evolve, its values must also progress

Values for a sustainable society

- Justice
- Solidarity
- Altruism
- Cooperation
- Trust
- Moderation
- Unity



JUSTICE AND EQUITY

- It is unjust to sacrifice the well-being of most people -- and even of the planet itself -- to the advantages which technological breakthroughs can make available to privileged minorities

(based on Baha'i International Community, *Prosperity of Humankind*)

Solidarity and Altruism

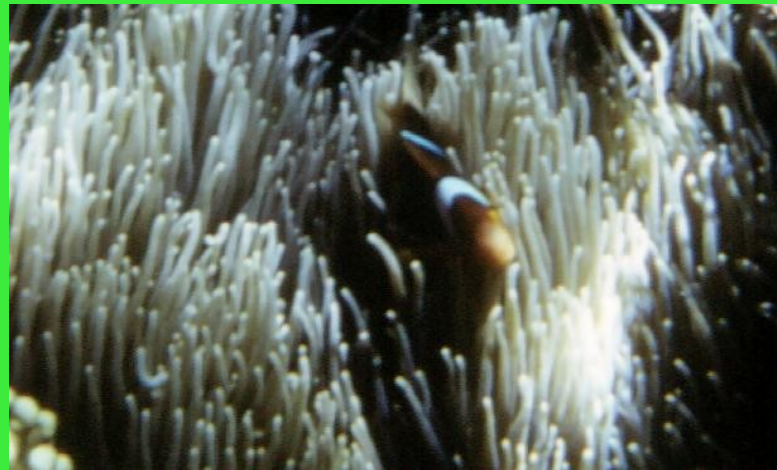
We should consider every human being as a trust of the whole.

The goal of wealth creation should be to make everyone wealthy.

Voluntary giving is more meaningful and effective than forced redistribution.

Cooperation and Reciprocity

Cooperation and reciprocity are essential properties of all natural and human systems, increasing in more highly evolved and complex systems



Trustworthiness

Trust is the basis for all economic and social interaction

Would you sign an agreement with someone you did not trust?



Moderation in Material Civilization

The civilization, so often vaunted by the learned exponents of arts and sciences, will, if allowed to overleap the bounds of moderation, bring great evil upon men.... The day is approaching when its flame will devour the cities...

Bahá'u'lláh (1817-1892)

Voluntary simplicity

Take from this world only to the measure of your needs, and forego that which exceedeth them.

(Bahá'u'lláh)

Primacy of Oneness of Humanity

- Since humanity is one, each person is born into the world as a trust of the whole, and each bears a responsibility for the welfare of all humanity
- This collective trusteeship constitutes the moral foundation of human rights and environmental governance
- The welfare of each country and community can only be derived from the well-being of the whole planet

Globalization Requires World Order

A **world federal system**, ruling the whole earth and exercising unchallengeable authority over its **unimaginably vast resources**,... liberated from the curse of war and its miseries, and bent on the exploitation of all the available sources of **energy** on the surface of the planet,... such is the goal towards which humanity, impelled by the unifying forces of life, is moving.

(Shoghi Effendi, *The World Order of Bahá'u'lláh*, p. 203-204)

Ethical guidance for the economic system

- The financial crisis has raised serious ethical issues of greed, fraud, corruption, etc.
- Increasing regulation and raising ethical standards are two responses
- What moral/ethical approaches could guide the development of a new international economic system and green economy?

The true purpose of economics

Economics has ignored humanity's broader social and spiritual needs, resulting in:

- Corrosive materialism among the wealthy
- Persistent poverty for masses of the world's peoples

Economic systems should give the peoples and institutions of the world the means to achieve the real purpose of development: the cultivation of the limitless potentialities in human consciousness.

(adapted from Bahá'í International Community, *Valuing Spirituality in Development*, 1998)


We need new economic models that

- further a dynamic, just and thriving social order
- are strongly altruistic and cooperative in nature
- provide meaningful employment
- help to eradicate poverty in the world

Living within environmental limits is possible

To maintain the planet's ecological balance, we must:

- base the economy on renewable energy and resources (agriculture, forests, fisheries, bio-industries), closed materials cycles and integrated product life-cycles
- reduce human impacts to a level appropriate to the vulnerability and resilience of the systems
- restore damaged systems to the level necessary to maintain natural and human ecosystem services
- allow population growth and development only to the extent that system improvements extend the carrying capacity of the planetary system

A tropical beach scene with clear blue water, white sand, and palm trees under a clear sky. The text is overlaid on the image.

The goal:
an organically
united world

A sunset over the ocean with palm trees in the foreground. The sun is low on the horizon, casting a golden glow across the sky and reflecting on the water. The palm trees are silhouetted against the bright sky.

***To achieve sustainability
we need an ethical transformation
in our lives and communities***

**The years ahead will be difficult,
but sustainable development is possible**