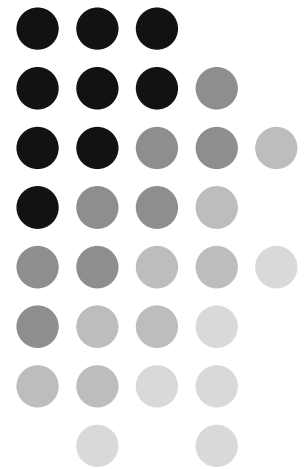


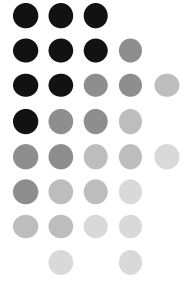
Peak Oil, Energy Security & Global Sustainability

Interconnected Challenges Conference
Club of Rome
Winterthur
Switzerland
6th November 2008

Ian T. Dunlop
Independent Governance & Sustainability Advisor
Deputy Convenor, Australian Association for the Study of Peak Oil

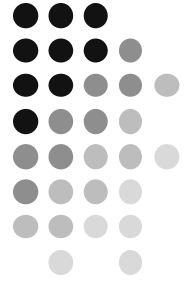


Global Drivers → Strategic Risks



- **Population Growth**
 - 6.7 billion rising to 9 billion by 2050.
 - all aspiring to improved quality of life.
- **Market Economy**
 - economic growth has delivered untold wealth & power - to some !.
 - made humanity a planetary force.
 - but under current rules, it may destroy the planet.
- **Poverty & Inequality**
 - 15% of world population enjoy 80% of world GDP.
 - 43% live on less than \$2 per day.
 - inequality in the developed world is increasing.
- **Globalisation & Technological Change**
 - essential for our survival & prosperity.
 - increasing connectivity & specialisation.
 - dissemination of power & awareness to the global community.
 - decreasing resilience to weather macro-shocks.

The Immediate Convergence



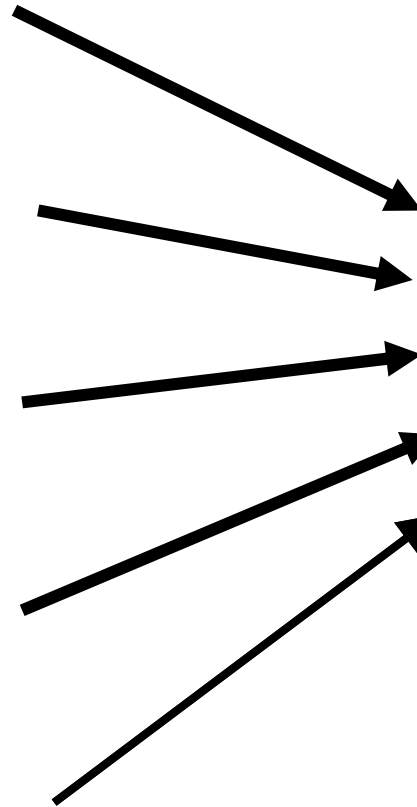
Peak Oil

Climate Change

Water

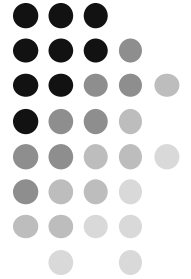
Food

**Financial
Instability**



**An Unsustainable
World ?**

Other Peaks Follow

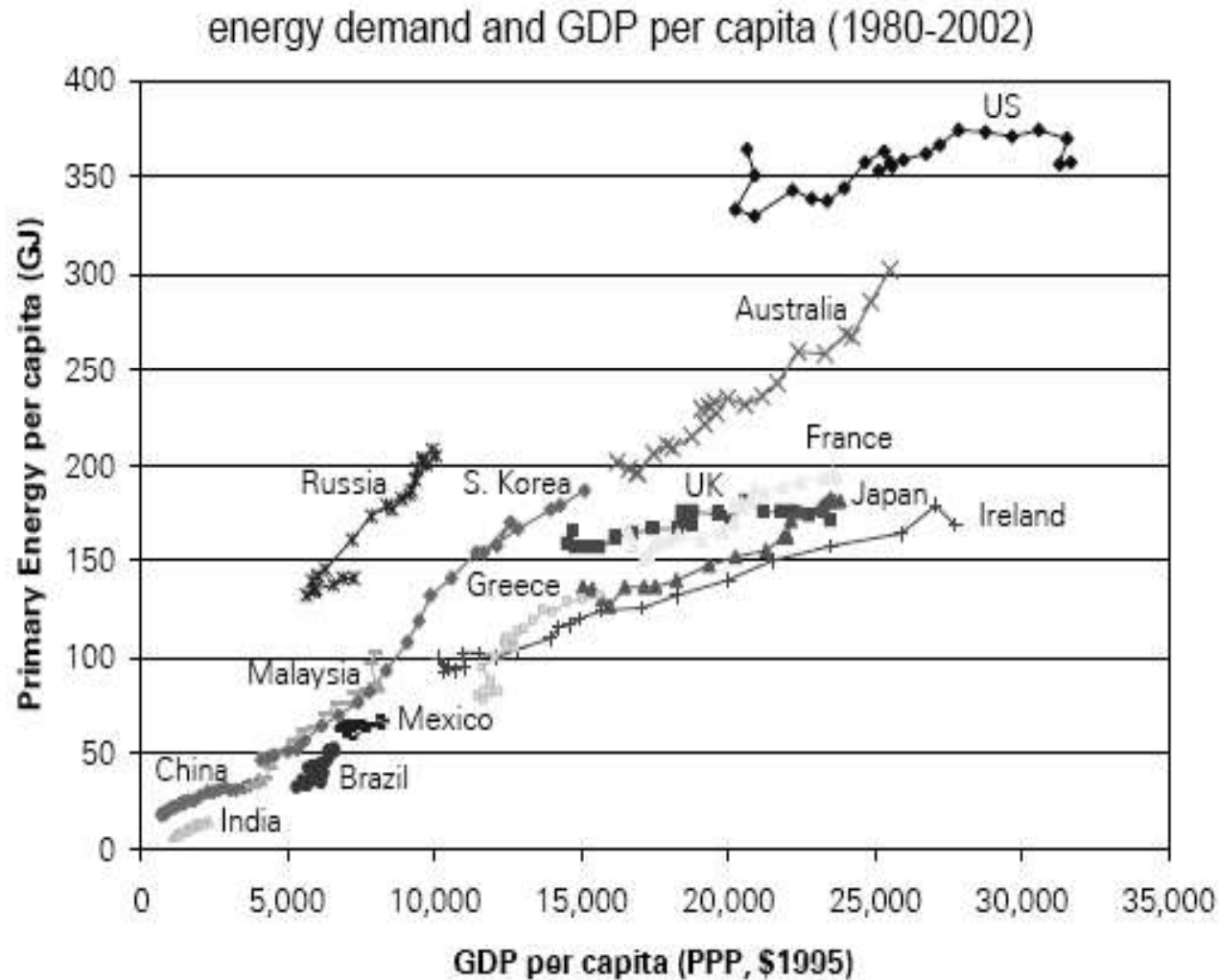
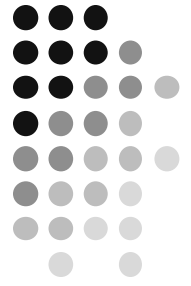


- Grain
- Wild Fish
- Fresh Water per capita
- Arable land in production
- Uranium
- Gas
- Coal
- Some metals

But the Energy Transition, to a low-carbon economy, is critical

Economy is based on Cheap Energy

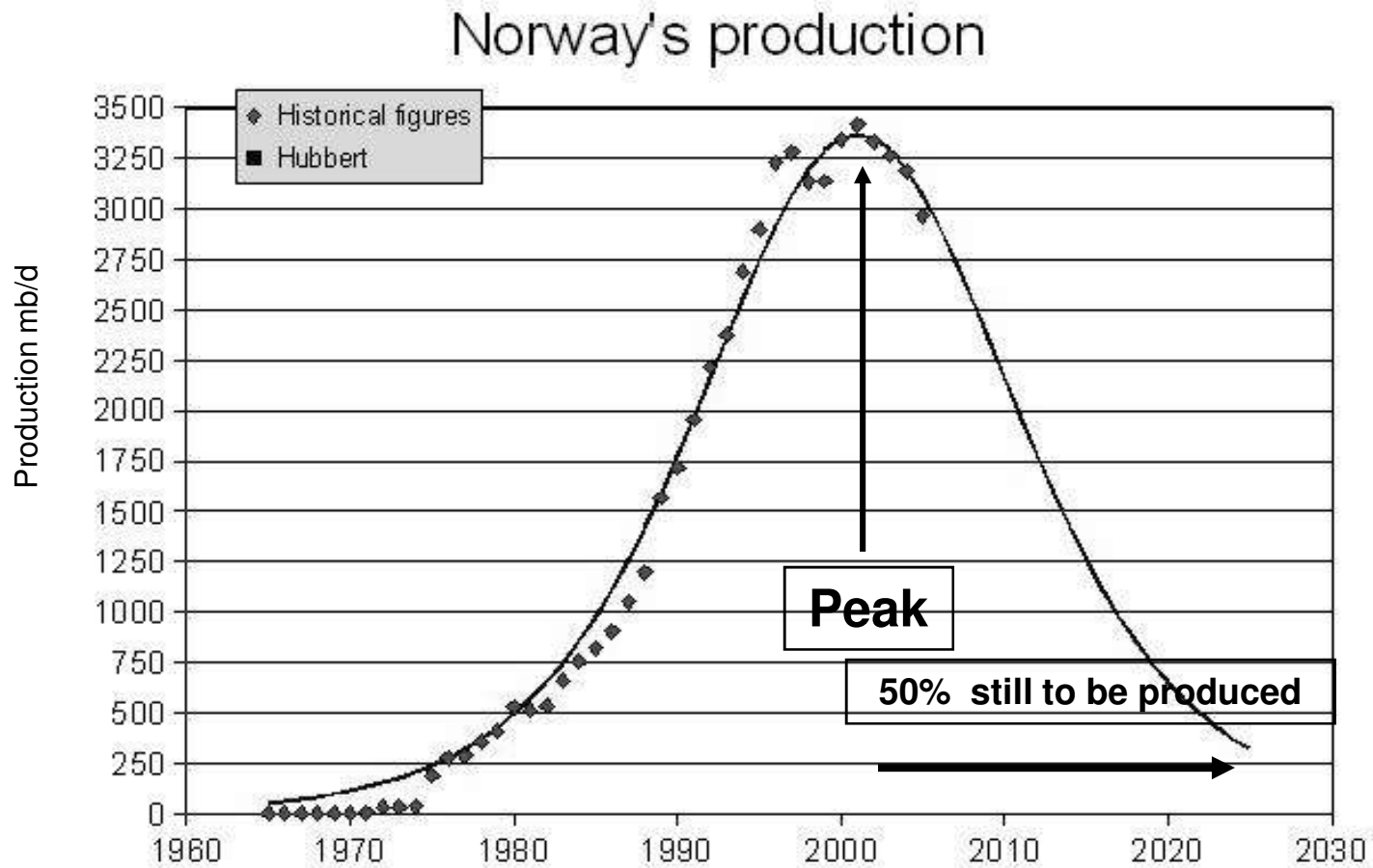
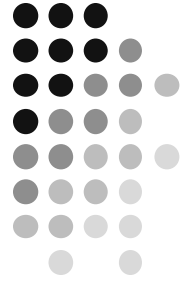
- our prosperity depends upon it



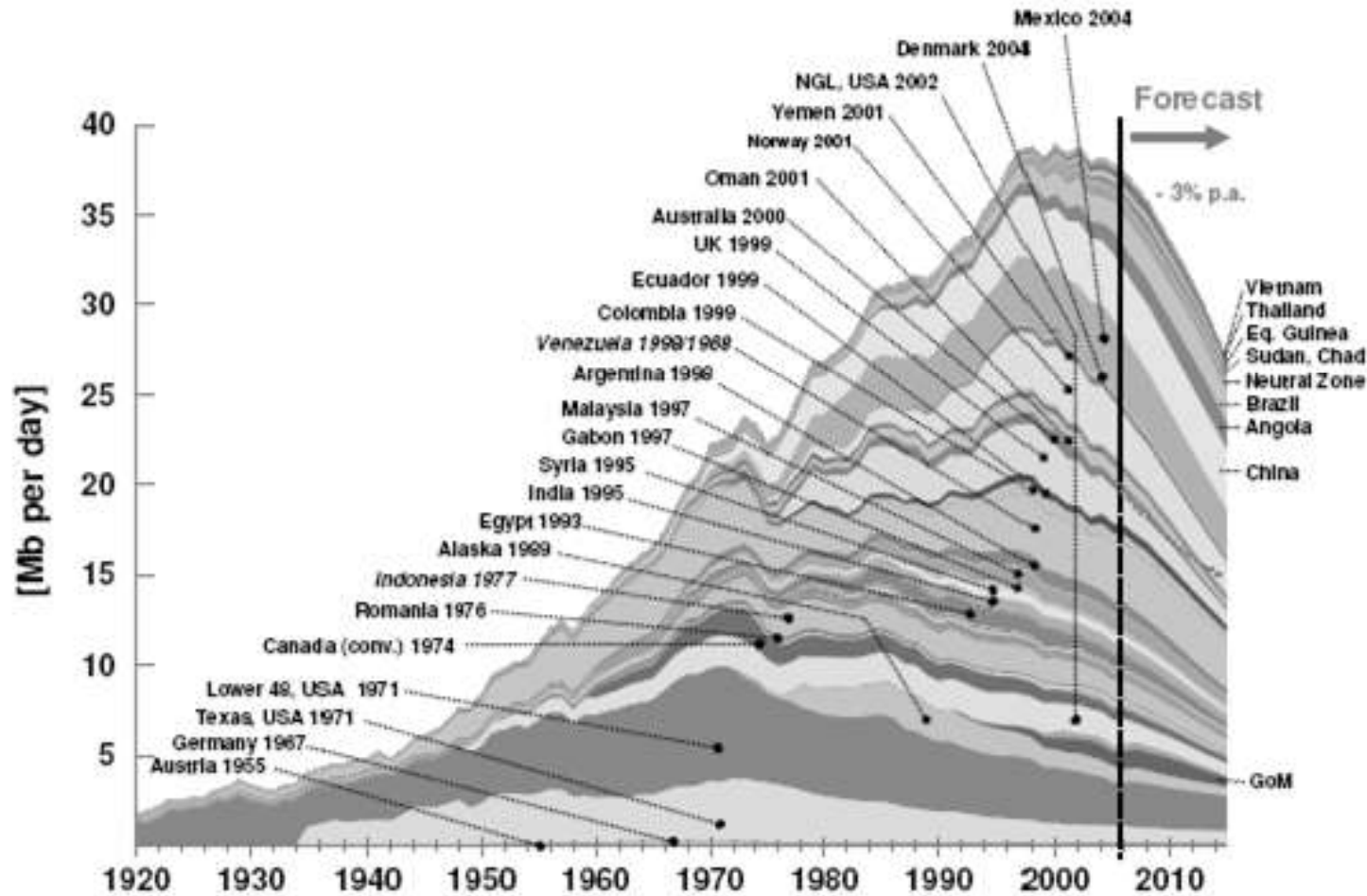
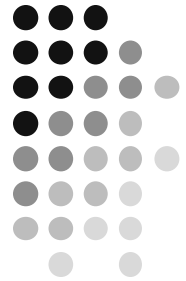
Source: UN and DOE EIA

Peak Oil

- Typical Oil Production Profile



More and more countries are past their peak..

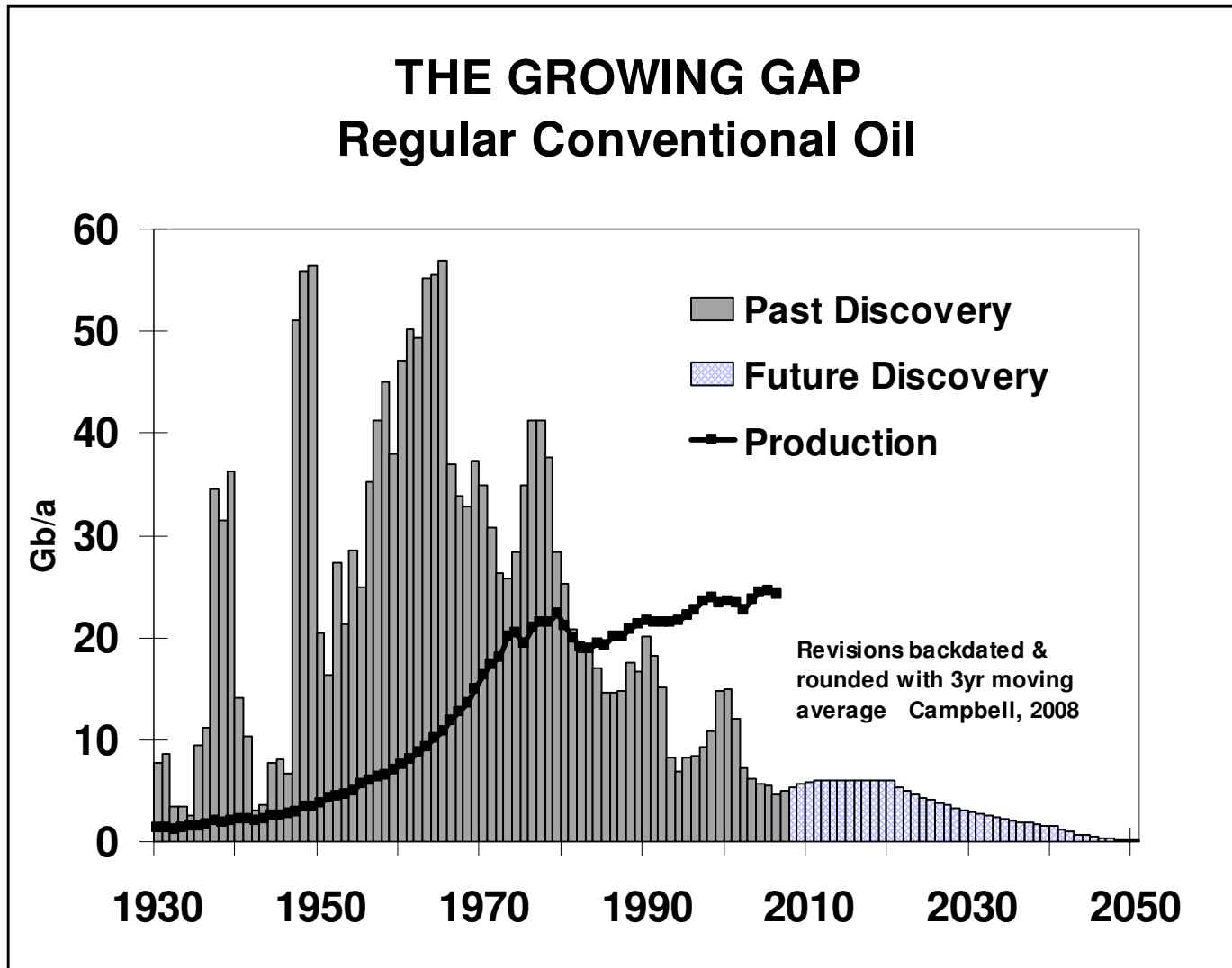
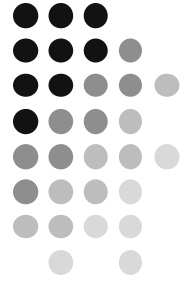


Ludwig-Bölkow-Systemtechnik GmbH, 2007

Source: IHS 2006; PEMEX, petrobras ; NPD, DTI, ENS(Dk), NEB, RRC, US-EIA, January 2007

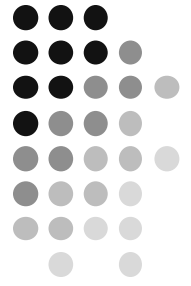
Forecast: LBST estimate, 25 January 2007

The Growing Gap

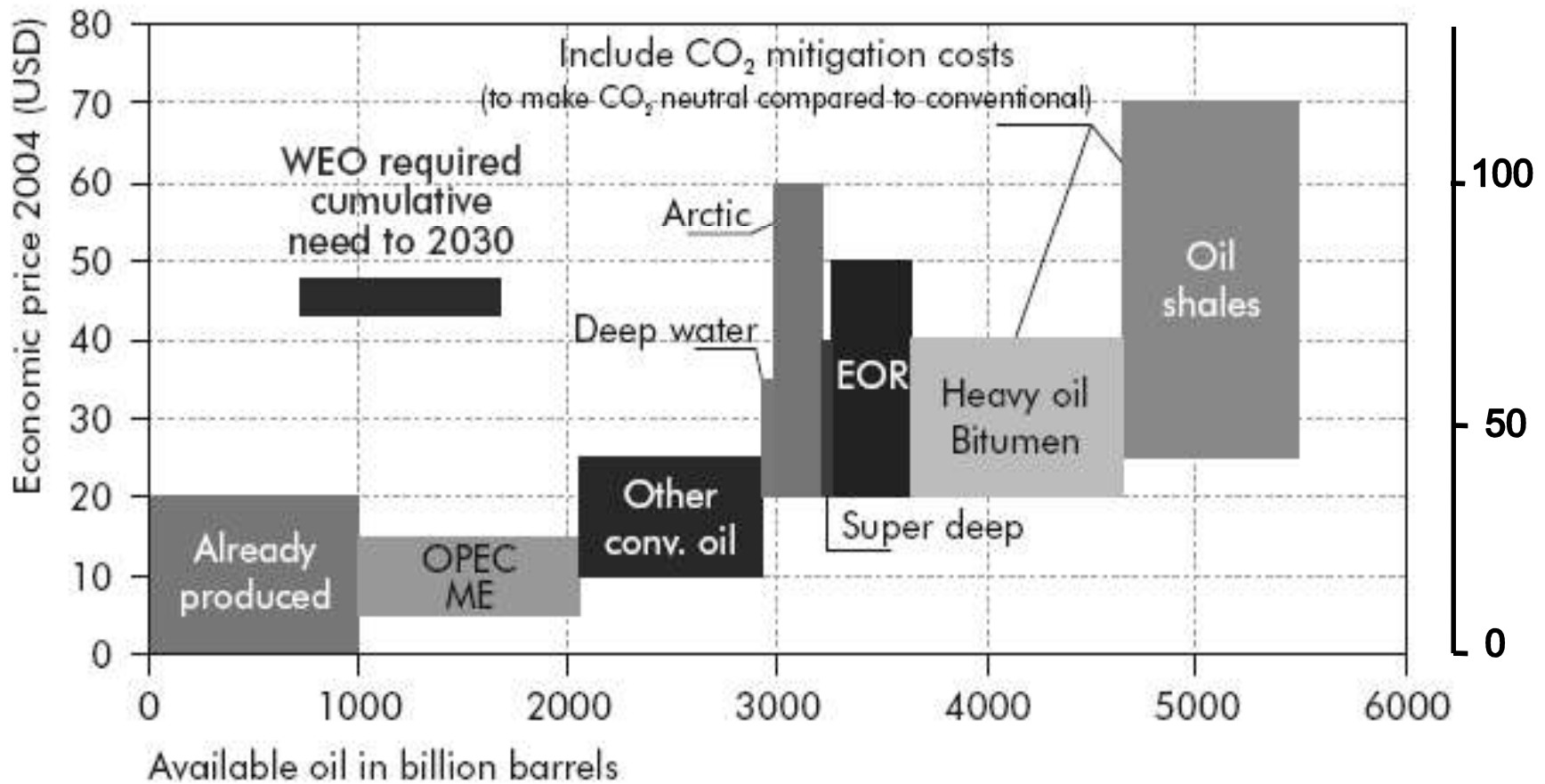


Oil Availability “Official Future” 2005

- abundant resources - no worries !



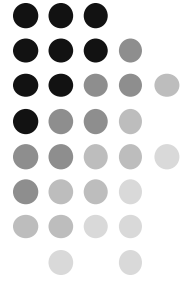
2008 IEA Estimates
US\$ (FT report)



(2005)

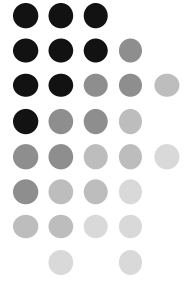
Ian Dunlop 2008

Converting resources to oil flows is proving difficult

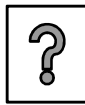
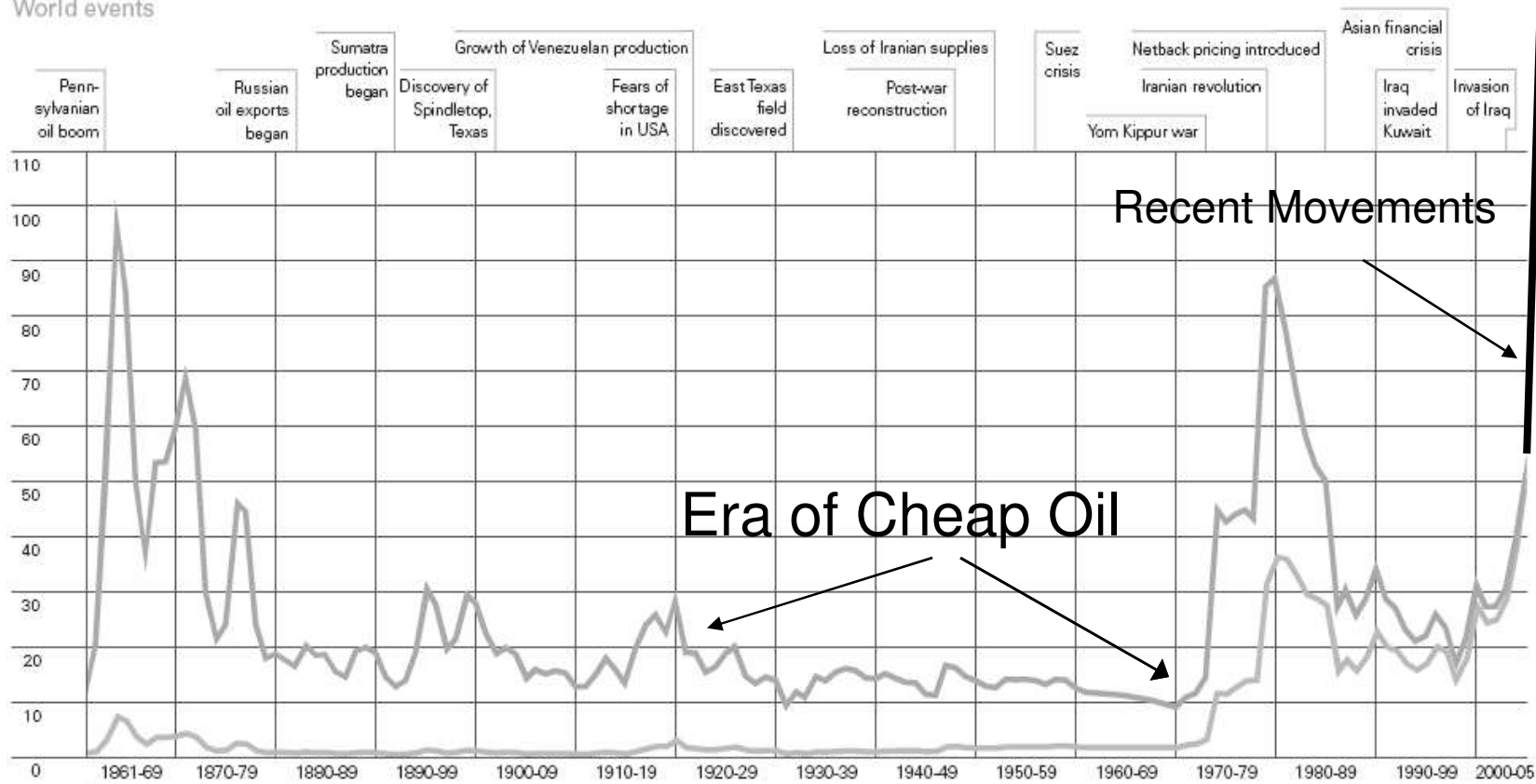


- Not discovering new oilfields quickly enough
 - certainly no giant fields
- Data on existing oil reserves is suspect
 - particularly in the Middle East - “ the paper barrels ”
- Many established oil provinces are in decline
 - depletion rates may be more rapid than officially admitted
- Unconventional resources proving difficult to develop
 - technically and economically
- Oil producing nations
 - using more oil domestically & exporting less
 - conserving for future generations

Long term oil prices

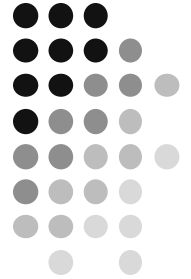


Crude oil prices since 1861
US dollars per barrel
World events



1861-1944 US average.
1945-1983 Arabian Light posted at Ras Tanura.
1984-2005 Brent dated.

The Changing “Official Future”



“ --putting these two things together, the short and medium term security of our oil markets, plus the climate change consequences of this energy use, if we don't do anything very quickly, and in a bold manner, our energy system's wheels may fall off -- within the next seven years ”

*Fatih Birol, Chief Economist, IEA
Financial Times, London
7th November 2007*

“-----we must leave oil before it leaves us.”

*Fatih Birol, Chief Economist, IEA
International Politik, Germany
2nd May 2008*

“World leaders need to take action on the energy crisis that is taking shape before our eyes. ---We need to act before crisis turns into catastrophe”

*Mohamed El Baradei, Director General, IAEA
Financial Times, London, 24th July 2008*

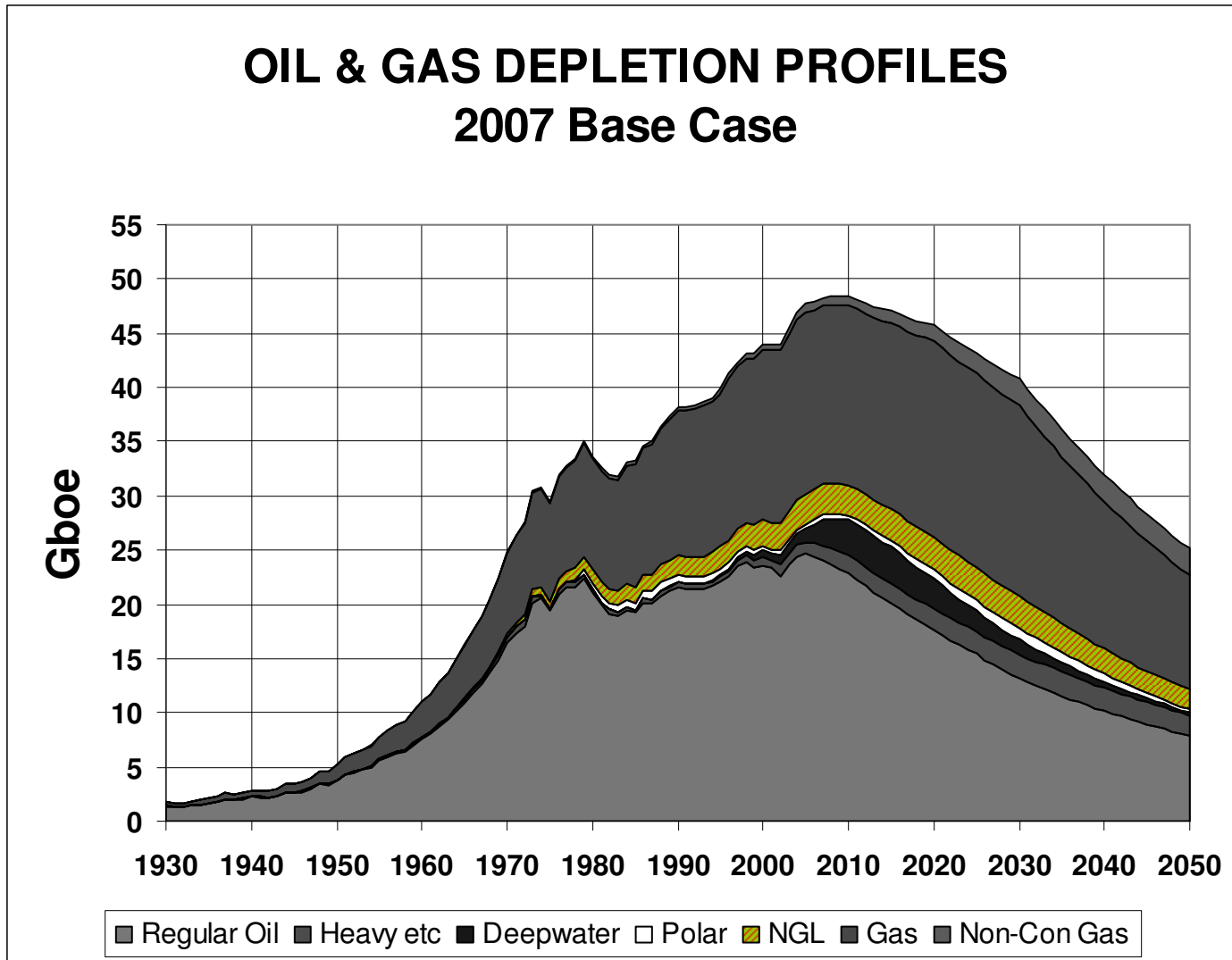
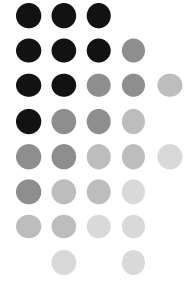
“THE Stone Age did not end for lack of stone, and the Oil Age will end long before the world runs out of oil.”

Sheikh Ahmed Zaki Yamani, 2003

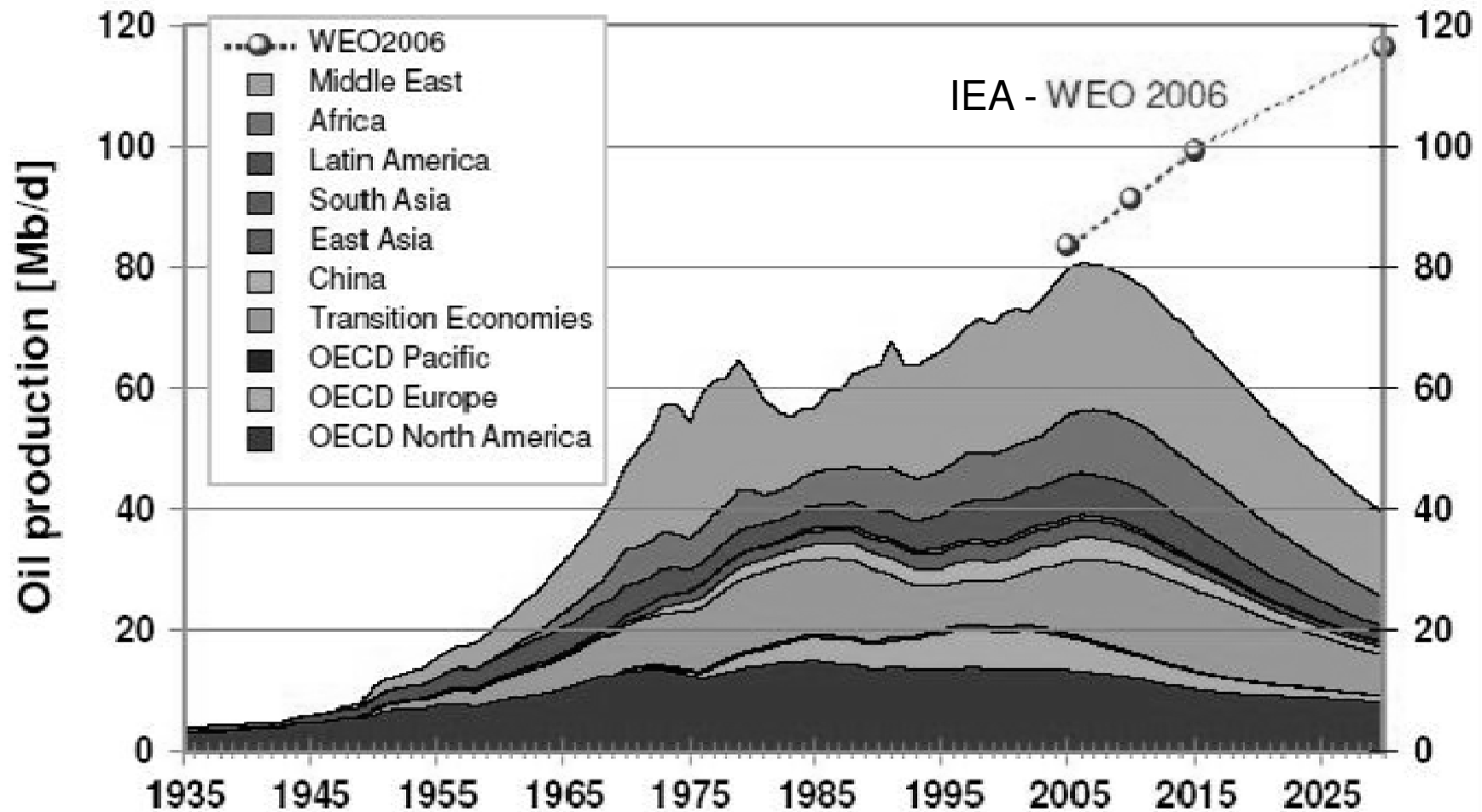
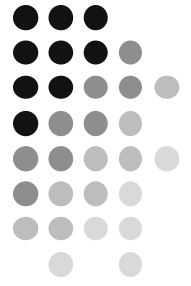
“No, leave it in the ground-----our children will need it.”

King Abdullah of Saudi Arabia, June 2008

Global Oil & Gas Depletion - ASPO



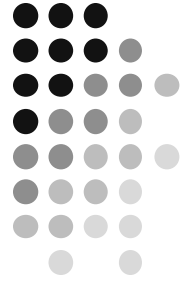
Global Oil Supply - Opinions Differ !



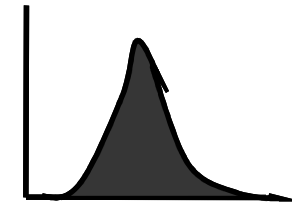
Source: Energy Watch Group, Germany, October 2007

Ian Dunlop 2008

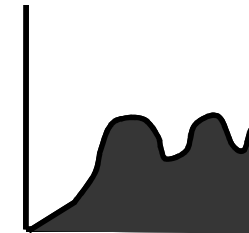
What will the Peak look like ?



- It could be sharp and nasty
 - geopolitical supply disruption / constraint
 - major oilfield depletion acceleration
 - producing countries consume more oil internally
 - climate change impact - Hurricane Katrina



- It could be an “undulating plateau”
 - demand destruction or recession
 - world cannot afford high prices
 - climate change emissions constraints
 - extra supply accelerates
 - to balance depletion

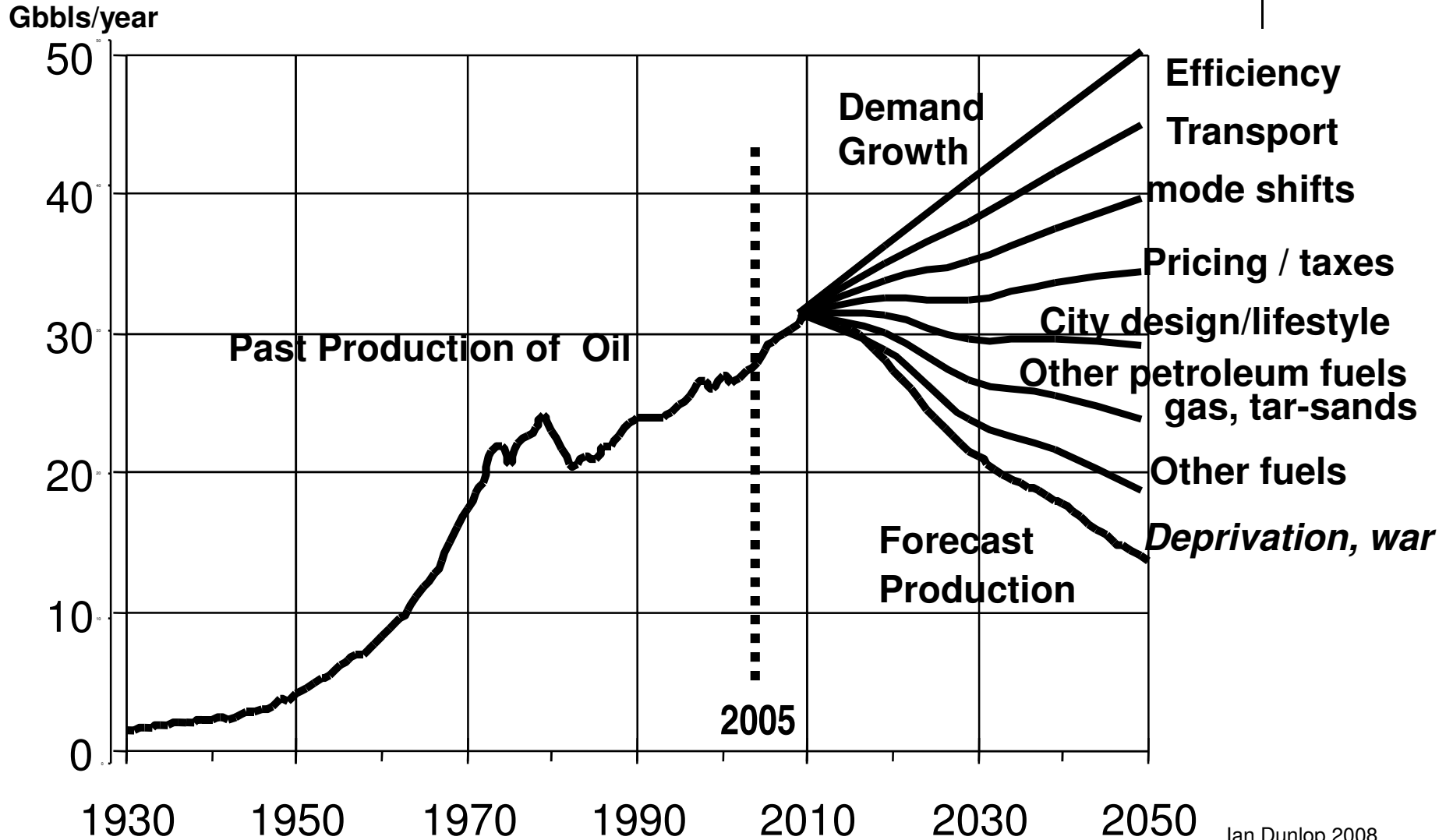
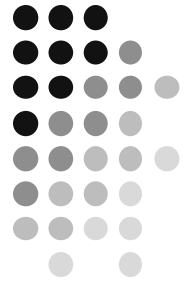


- We will probably only see it in the rear-vision mirror
 - we may already be there

Recent high prices are a warning
- take heed, the problem has not gone away ! -

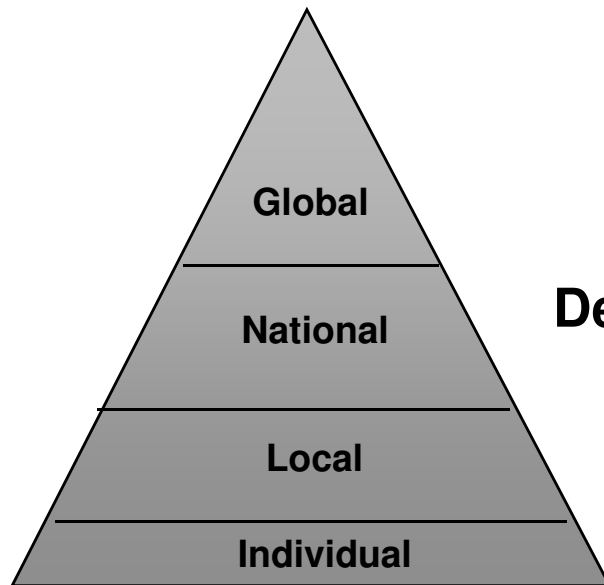
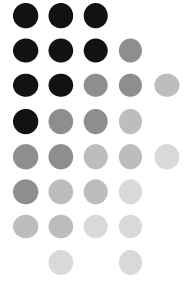
Global Oil Solutions

-no silver bullet, much silver buckshot!



Climate Change

- the ultimate “Tragedy of the Commons”

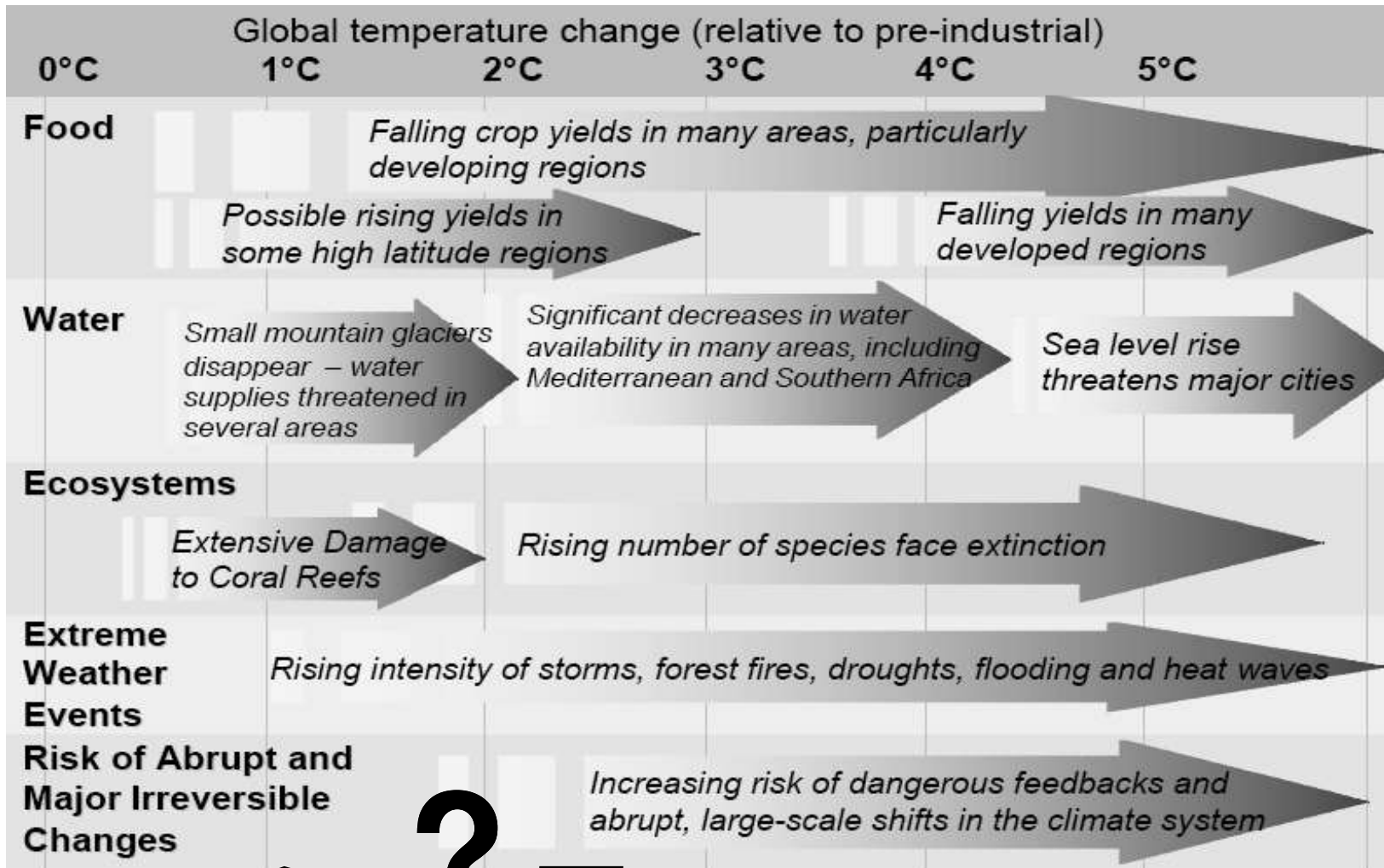
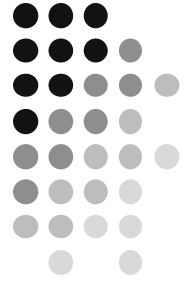


Decreasing concern for the “ Commons ”

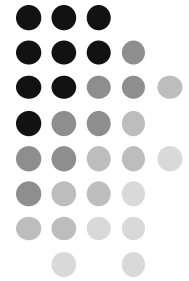
“ What is common to the greatest number has the least care bestowed upon it. Everyone thinks chiefly of his own, hardly at all of the common interest ”

Aristotle, Politics, Book II ch.3

Re-calibrating Risk

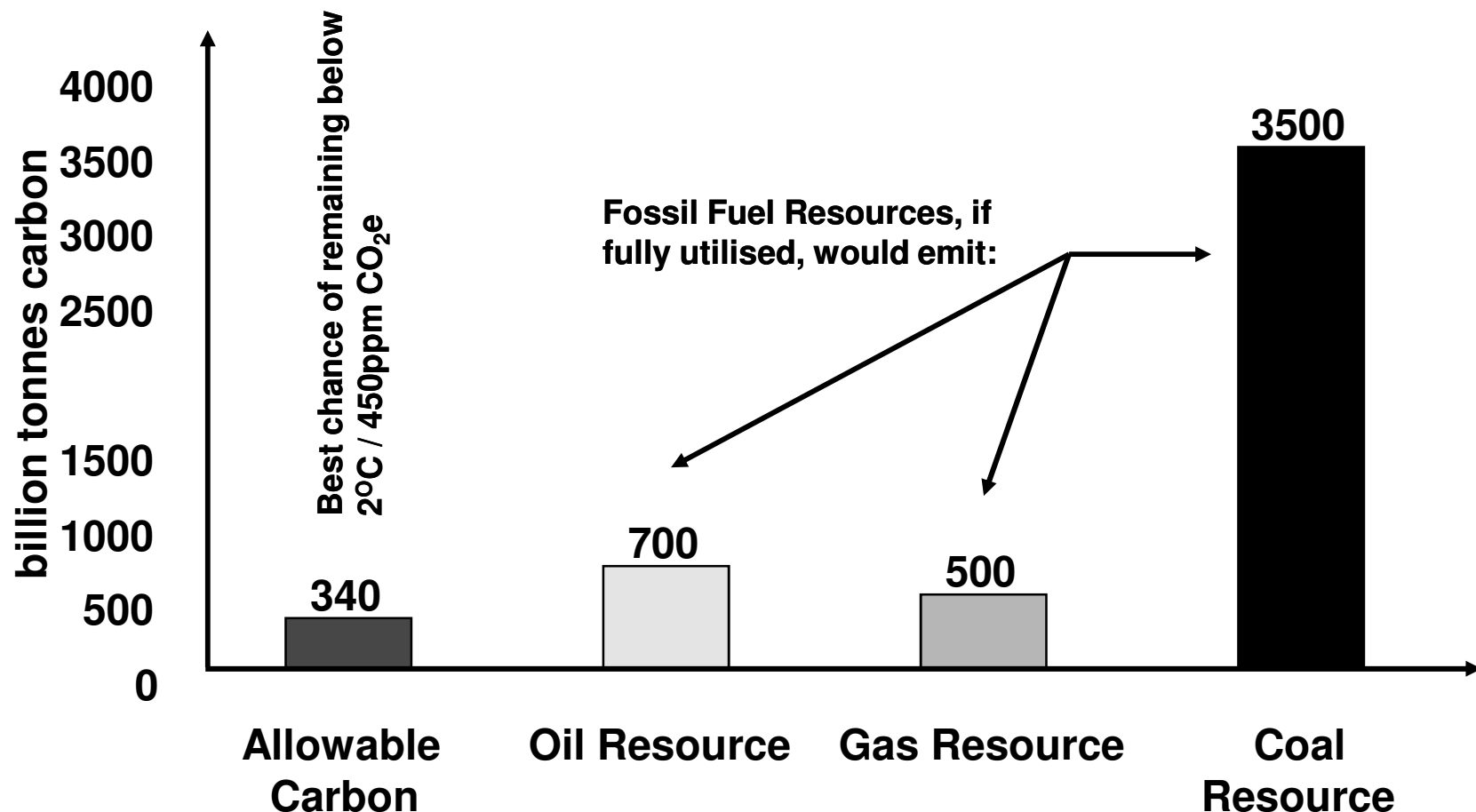


Global Carbon Budget



Maximum Future Emissions to avoid Dangerous Climate Change was thought to be below 340 billion tonnes carbon < 450ppm CO₂e

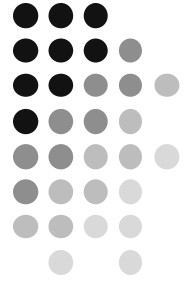
CO₂ limit is now < 350ppm CO₂, therefore need lower carbon budget.
How should that budget be allocated ?



Source: IPCC 3rd & 4th SAR

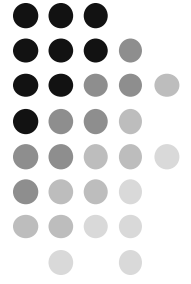
Ian Dunlop 2008

Allocation of Carbon Budget



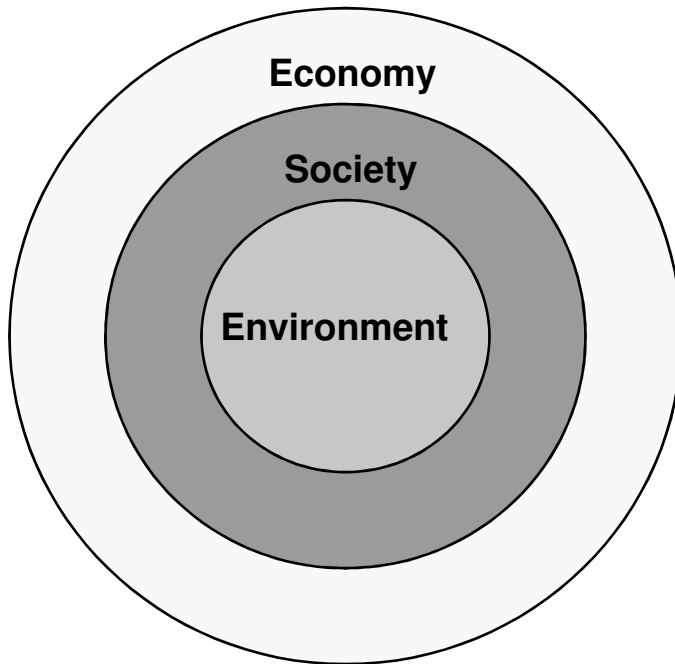
- First
 - oil, due to transport premium
- Second
 - gas, due to lower carbon emissions than oil or coal
 - 0.5 / 0.7 / 1.0 emission ratio in conventional electricity generation
- Third
 - Coal, which must be shut down rapidly
 - unless carbon can be safely sequestered (CCS) within 5-10 years – which is unlikely

A Paradigm Shift

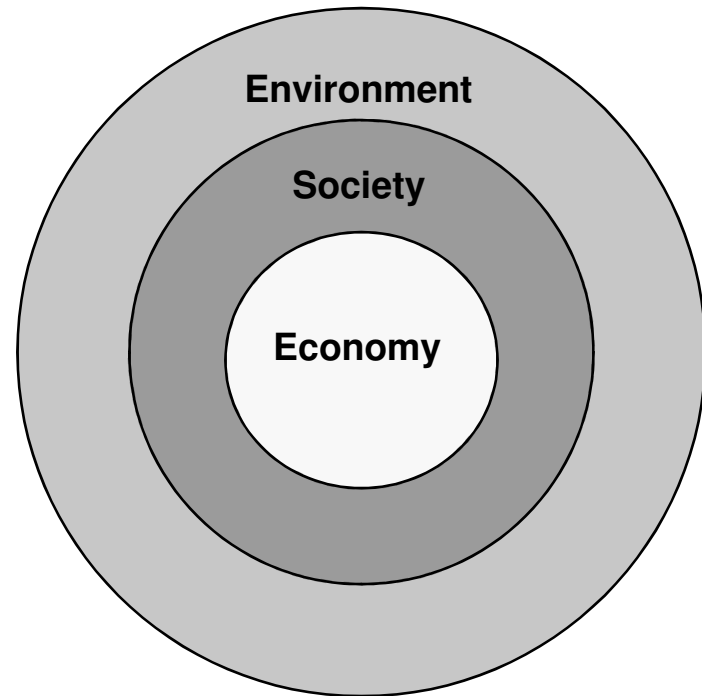


Hitting the Limits to Growth

20th C



21st C

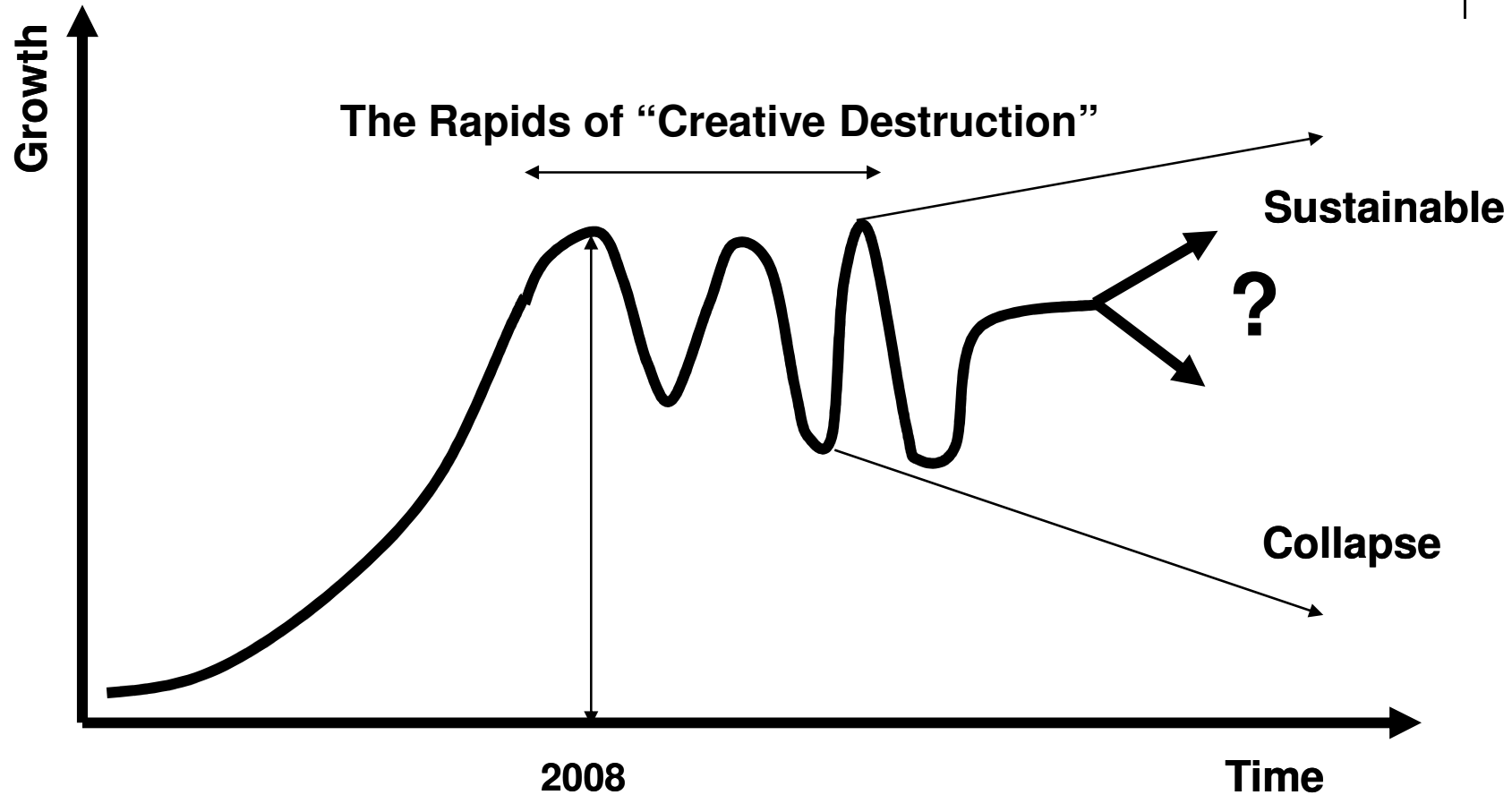
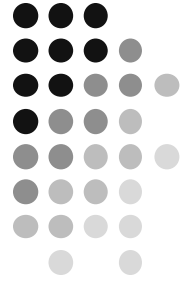


“The 21C will be the Age of Nature. We will learn, probably the hard way, that nature matters: we are not separate from it, we are dependent on it. When there is trouble in nature there is trouble in society ”

Thomas Homer-Dixon

Ian Dunlop 2008

Negotiating the Rapids



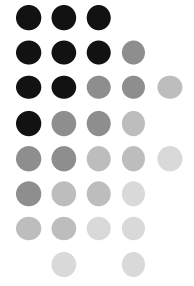
"In times of change, learners inherit the Earth, whilst the rest find themselves beautifully equipped to deal with a world which no longer exists"

Eric Hoffman

Ian Dunlop 2008

Global Response Scenarios

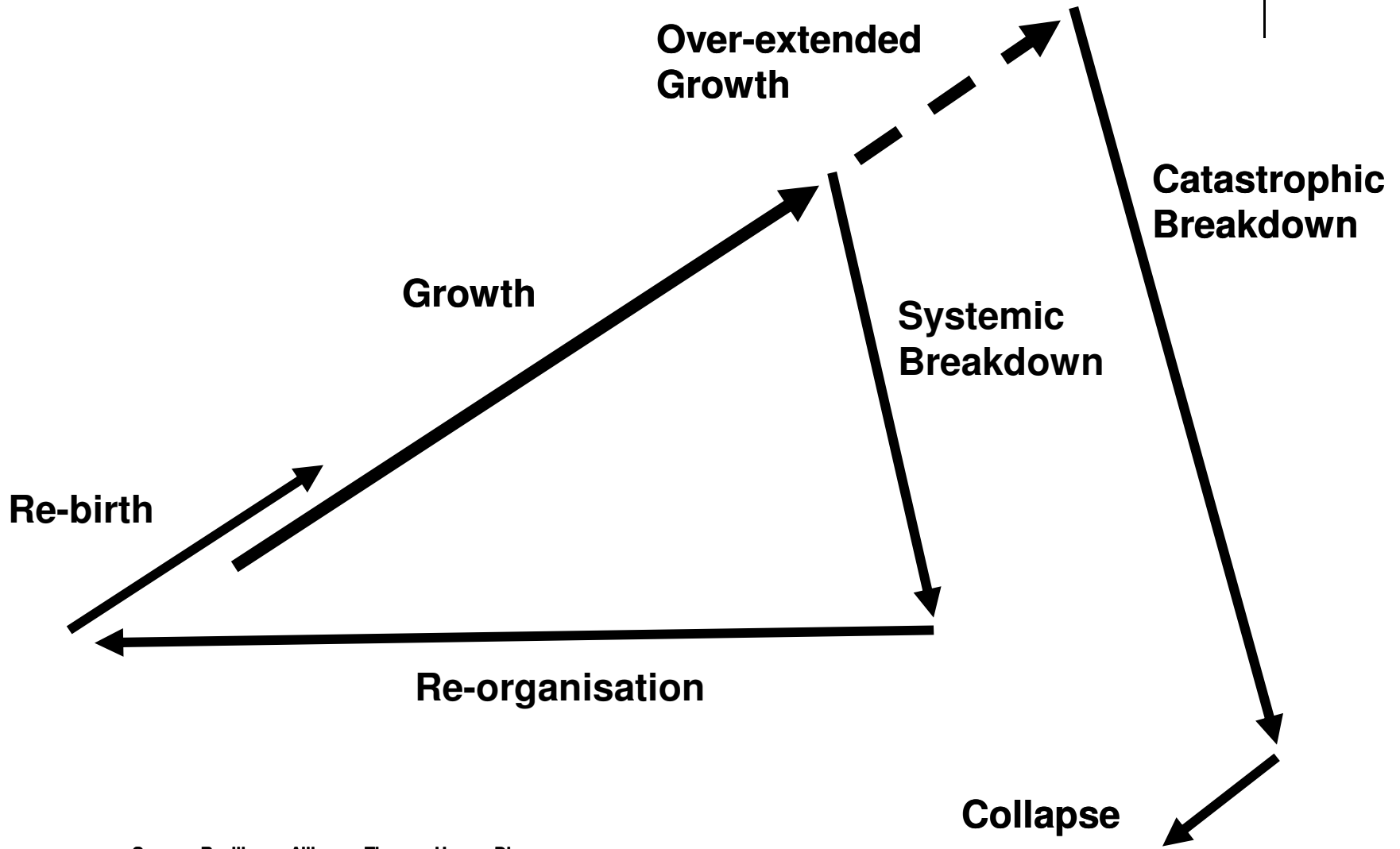
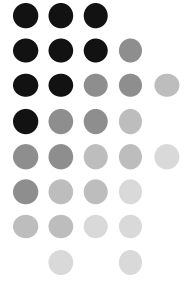
- Continued Denial
 - “business-as-usual”
 - the market, & technology, will fix any problems that do occur
 - the wealthy win - perhaps !
- Grudging acceptance of a problem
 - but “what we have, we hold ”
 - reinforce national sovereignty
 - defend bi-lateral resource & commercial arrangements
 - if need be, military intervention
- Unreserved acceptance of the problem
 - solutions beyond the capacity of any individual nation state
 - emergence of global government
 - cede sovereignty in the interests of global stability
 - equitable sharing of burden eg:
 - Kyoto Protocol Stage 2 & onwards
 - Oil Depletion Protocol
 - global per capita carbon, and perhaps oil, allocations



Increasing
recognition
of the
“Global
Commons”



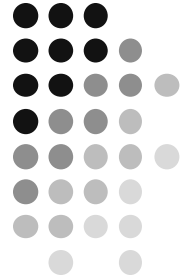
Resilience Matters



Source: Resilience Alliance, Thomas Homer-Dixon

Ian Dunlop 2008

We face a Global Sustainability Emergency



“ This is an emergency and for emergency situations we need emergency action”

*Ban Ki-Moon, UN Secretary General
7th November 2007*

FT.com
FINANCIAL TIMES

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US optimism can benefit all

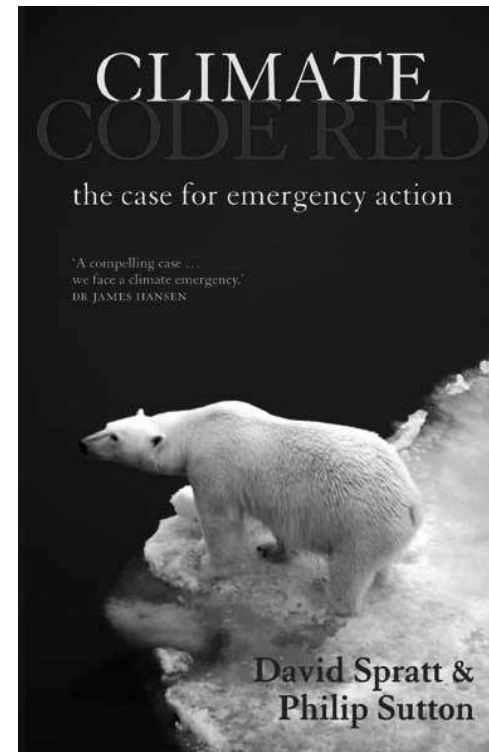
By Gideon Rashman

Published: February 4 2008 17:48 | Last updated: February 4 2008 17:48



Here is a proposal for the next American president. The US should take the lead in setting up a massive, publicly funded research project to tackle climate change. The American government has, in the past, shown that it is capable of sponsoring pioneering science – from the Manhattan project that produced the atomic bomb to the space programme. Why not apply American energy, money and know-how to a new Manhattan project on global warming?

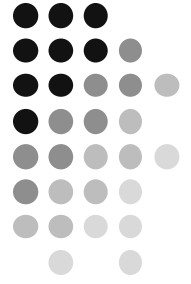
*Financial Times, London
4th February 2008*



“Today I challenge our nation to commit to producing 100% of our electricity from renewable energy and truly clean carbon-free sources within 10 years. This goal is achievable, affordable and transformative. --
-The leading experts predict that we have less than 10 years to make dramatic changes in our global warming pollution lest we lose our ability to ever recover from this environmental crisis.”

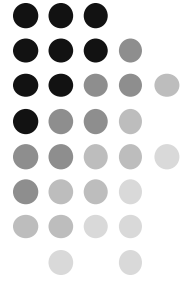
Al Gore, 17th July 2008

Emergency Response - technical components



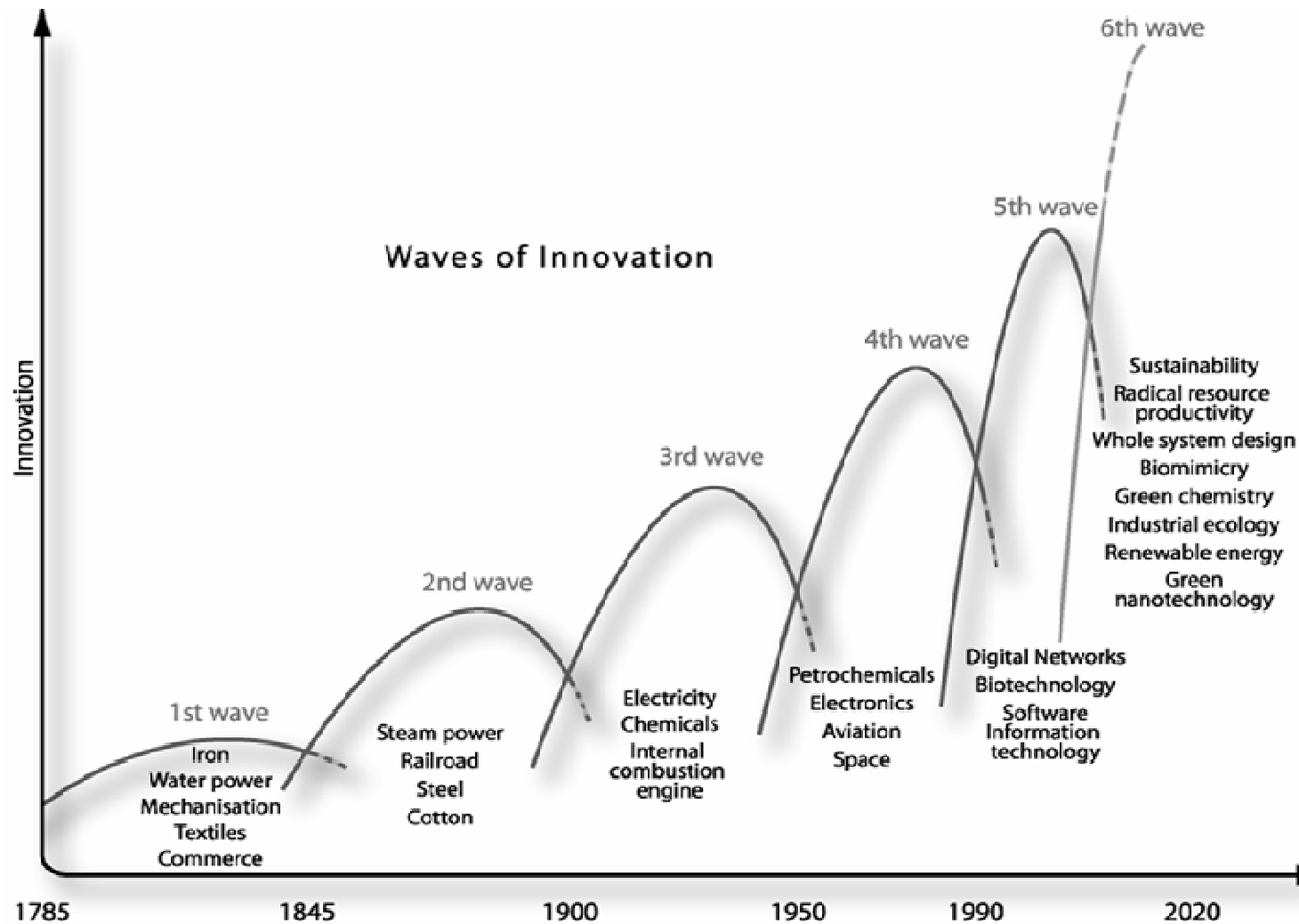
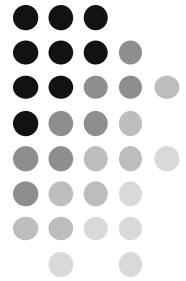
- Rapid phase out of high-emission assets
 - unless carbon can be sequestered
- Major, nation-building, investments in:
 - Energy conservation & efficiency
 - Renewable energy
 - Efficient public transport
 - High-speed broadband
 - Low-emission technologies

Our Great Opportunity - stop the fatalism !



- Mobilisation to establish sustainable, resilient societies
 - conventional economic growth is untenable
- Re-defining success
 - based on long-term sustainability, not maximising consumption
- Re-designing markets
 - based on enhancing the “Commons”, not short-term profit maximisation
- New forms of community involvement & democratic structure
 - essential, given the extent of change required
- Developed / developing world cooperation
 - new paradigm built on climate / energy solutions
- Business & governance models re-structured
 - incentives re-focused
- Technology is critical
 - combined with changing values
- Peak Oil & the Financial Crisis
 - essential circuit-breakers to trigger a sustainability transformation

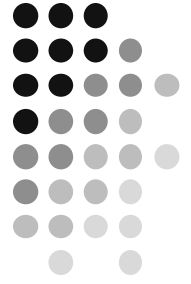
Technology is necessary - but not sufficient !



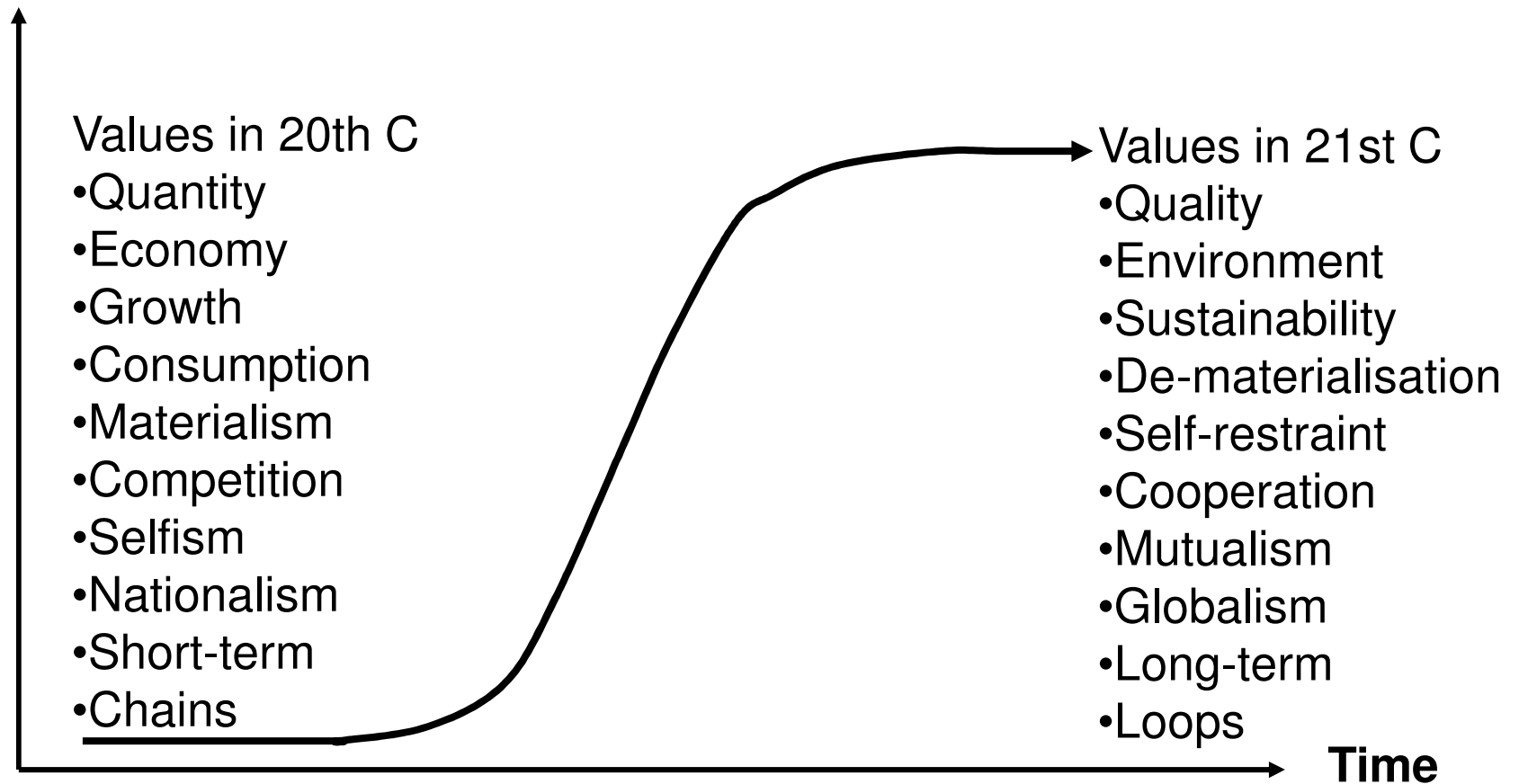
Source: The Natural Edge Project

Ian Dunlop 2008

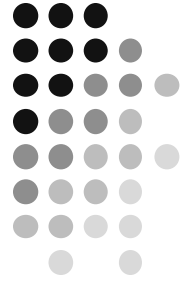
We need a Value Shift



Population



Nothing new under the sun !



“They go on in strange paradox, decided only to be undecided, resolved to be irresolute, adamant for drift, solid for fluidity, all-powerful to be impotent.....Owing to past neglect, in the face of the plainest warnings, we have now entered upon a period of great danger..... The era of procrastination, of half-measures, of soothing and baffling expedients, of delays, is coming to a close. In it's place we are entering a period of consequences..... We cannot avoid this period, we are in it now.....”

*Winston S. Churchill
12th November 1936*

Time for real leadership

Thank you

www.aspo-australia.org.au

itdunlop@ozemail.com.au

Ian Dunlop 2008