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Time for a rethink on climate change?

Some relevant terms:
Hubris: excessive pride or self-confidence
Greed: intense & selfish desire for something
Golden mean: the ideal moderate position between two extremes:
- "socially destructive selfishness" vs "a fair share for all" vs "self-sacrificing"
(for useful insights, watch Christopher Kremmer on Greed, ABC Fora, 6/10/08: http://www.abc.net.au/unleashed/stories/s2381770.htm)

Hugh Outhred, Sustainable Energy Discussion Group, 7/10/08

www.ceem.unsw.edu.au

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Martin Luther King Jr (1968), *'Where do we go from here: chaos or community?'*

"Human progress is neither automatic nor inevitable. We are faced now with the fact that tomorrow is today. We are confronted with the fierce urgency of now."

"In this unfolding conundrum of life and history there is such a thing as being too late…We may cry out desperately for time to pause in her passage, but time is deaf to every plea and rushes on."

"Over the bleached bones and jumbled residues of numerous civilizations are written the pathetic words: Too late."

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Interrelated threats to global human society

(*Collapse,* Jared Diamond, 2005)

1. Destruction of natural habitats
2. Collapse of wild fish stock
3. Loss of biodiversity
4. Loss of soil quantity & quality
5. Fossil fuel flow constraints
6. Fresh water quantity & quality
7. Photosynthesis limits
8. Toxic chemicals
9. Introduced (alien) species
10. Climate change
11. Population growth
12. Per-capita human impact

Poor people in developing countries are most at risk

These threats require multi-dimensional, equity-based responses

Islamabad, Pakistan, Sept 08

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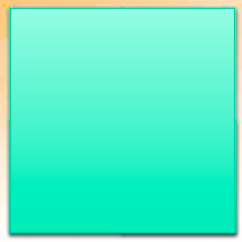
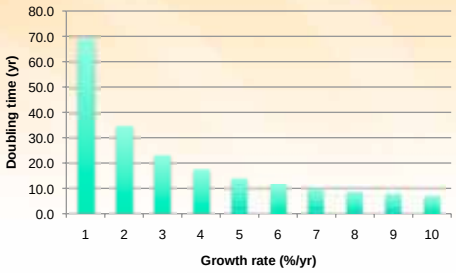
Exponential growth & binding constraints





Unless human society can develop an internal "stopping rule" to predict binding global constraints & self-manage its (population x per-capita allowances) below those constraints, exponential growth will cause one or more constraints to bind surprisingly quickly with potentially unmanageable consequences

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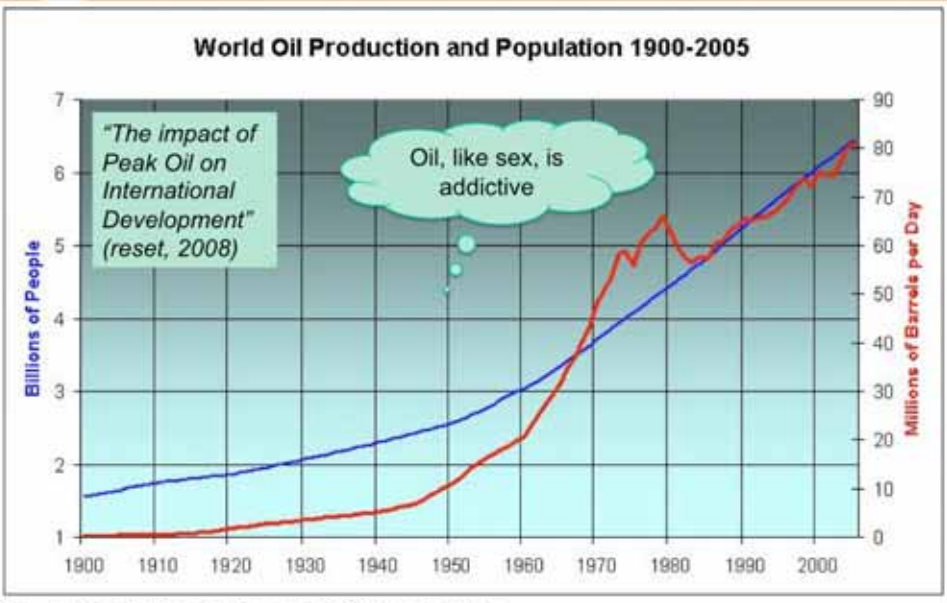

Fig. 1: World Population and Oil Production
(Source: Chefurka, P. *World Energy and Population Trends to 2100*)

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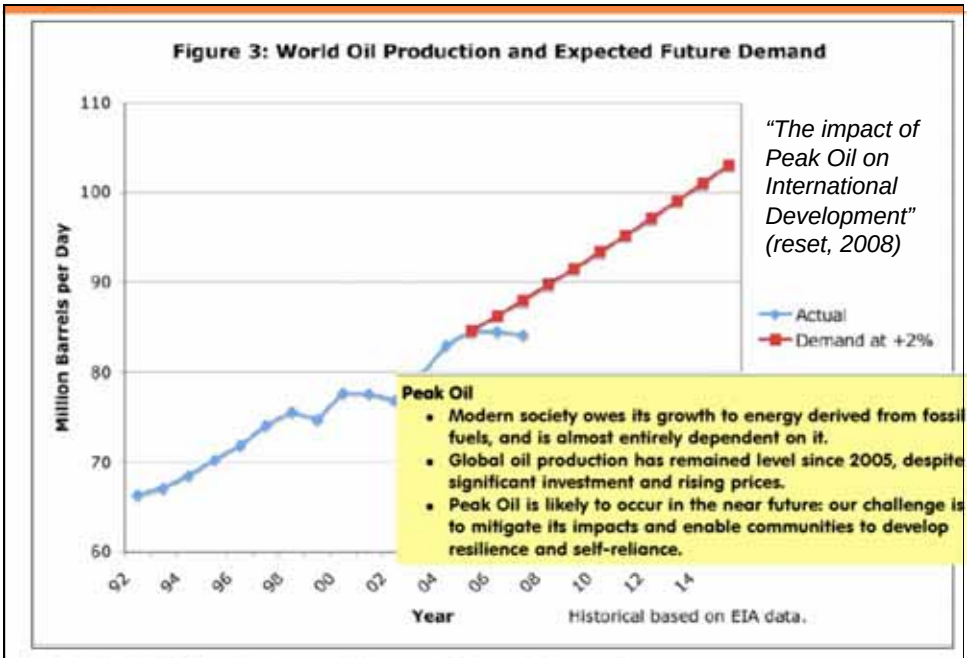
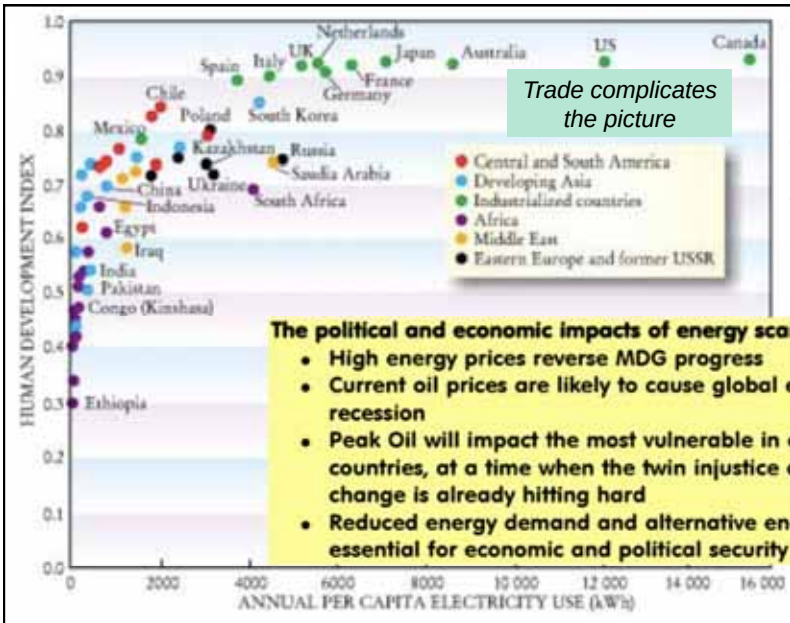


Fig. 2: World Oil Production and Expected Future Demand
(Source: The Oildrum, based on US Energy Information Association data, 2005)



Trade complicates the picture

"The impact of Peak Oil on International Development" (reset, 2008)

The political and economic impacts of energy scarcity

- **High energy prices reverse MDG progress**
- **Current oil prices are likely to cause global economic recession**
- **Peak Oil will impact the most vulnerable in developing countries, at a time when the twin injustice of climate change is already hitting hard**
- **Reduced energy demand and alternative energy sources are essential for economic and political security**

Figure 3. Paternak, Global Energy Futures and Human Development: A Framework for Analysis, Lawrence Livermore National Laboratory rep no: UCRL - ID- 140773, October 2000. *Provided by:* Practical Action

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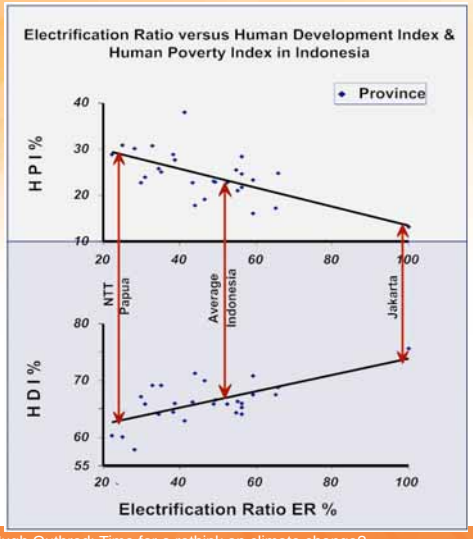
Electrification Ratio & Socioeconomic Development

Trends and Correlation of the Indonesian Provincial ER, HDI and HPI
(Maria Retnanestri)



Indonesian HDI 2005 – 0.728 (107/177)
Australian HDI 2005 – 0.968 (3/177)

HDI components: life expectancy, educational attainment and standard of living

HPI components: poor health, illiteracy, access to clean water and earning below a dollar a day

Access to clean water, health, job, education & communication to facilitate socioeconomic development required

Frugality should not mean poverty

(Sources: BPS 2004, PLN 2004, UNDP 2004, UNDP 2008).

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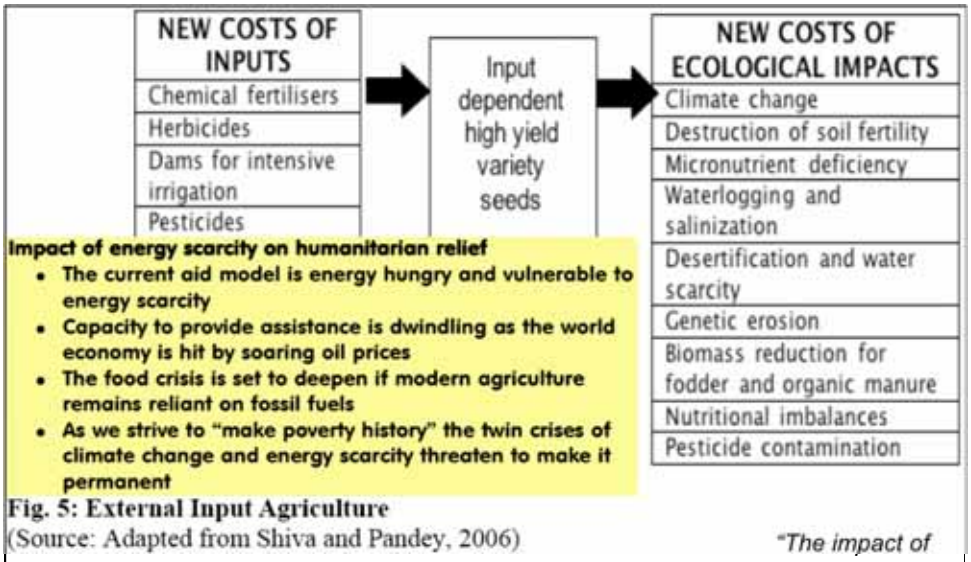

Impact of energy scarcity on humanitarian relief

- **The current aid model is energy hungry and vulnerable to energy scarcity**
- **Capacity to provide assistance is dwindling as the world economy is hit by soaring oil prices**
- **The food crisis is set to deepen if modern agriculture remains reliant on fossil fuels**
- **As we strive to "make poverty history" the twin crises of climate change and energy scarcity threaten to make it permanent**

Fig. 5: External Input Agriculture
(Source: Adapted from Shiva and Pandey, 2006)

"The impact of Peak Oil on International Development" (reset, 2008)

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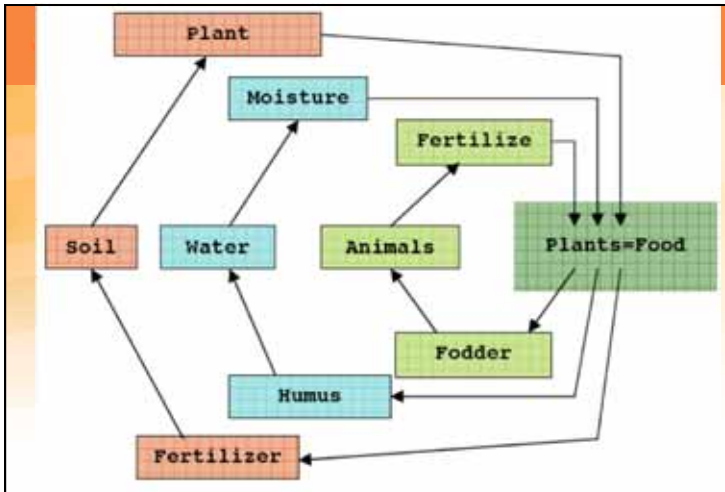

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"The impact of Peak Oil on International Development" (reset, 2008)

Fig. 6: Internal Input Agriculture
(Source: Adapted from Shiva and Pandey, 2006)

Now that external input agriculture is failing from cost and reduced availability of inputs (particularly petrochemical based inputs) and ecological collapse, it is vital that permaculture models of agriculture be targeted for more research and development funding, and introduced as a key part of development programmes.

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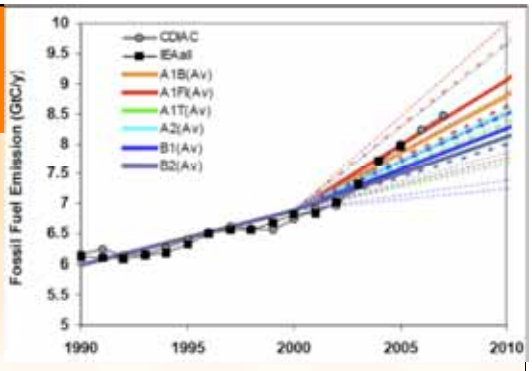
Trends in emissions & atmospheric CO_2

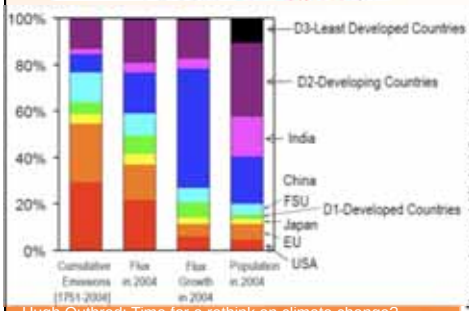
(www.globalcarbonproject.org, 2008)

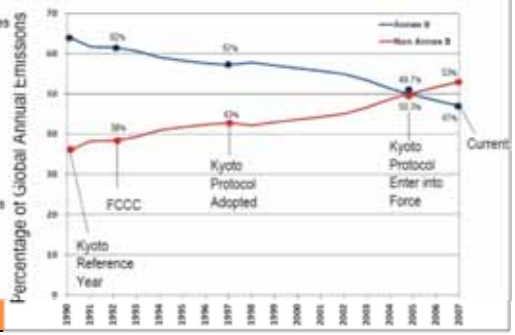
Atmospheric CO_2

1970 – 1979: 1.3 ppm y^{-1}
1980 – 1989: 1.6 ppm y^{-1}
1990 – 1999: 1.5 ppm y^{-1}

2000 - 2007: 2.0 ppm y^{-1}
2007: 2.2 ppm y^{-1}







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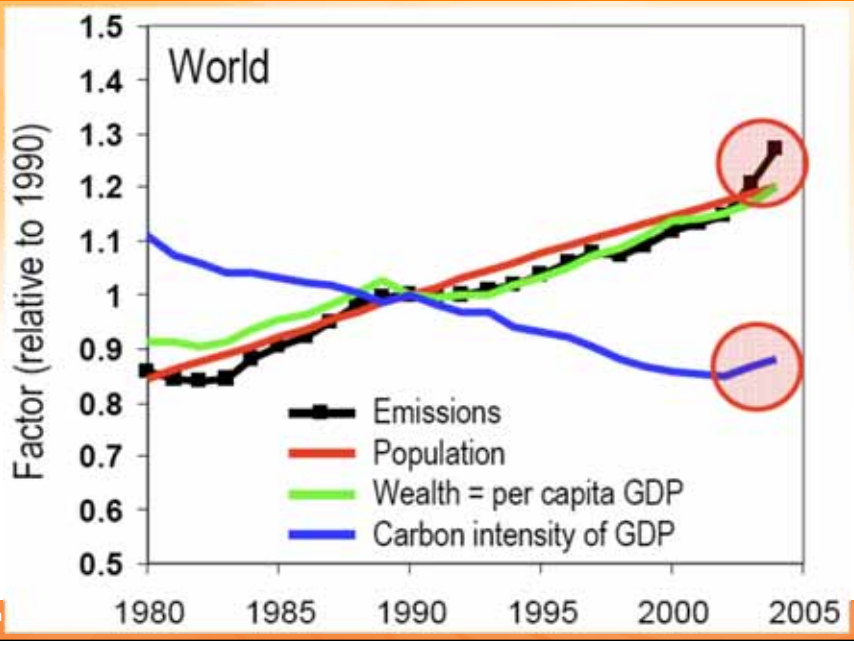
Drivers of carbon emissions (www.globalcarbonproject.org)



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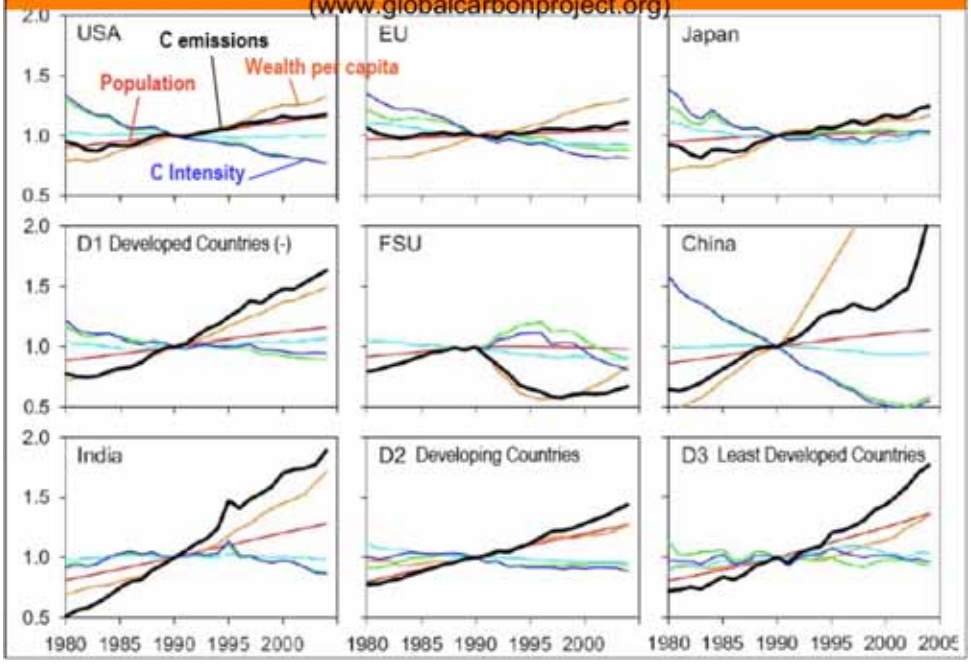
Carbon emission trends – ratios from 1990

(www.globalcarbonproject.org)



Potential climate change tipping points

(Lenton et al, 2008)

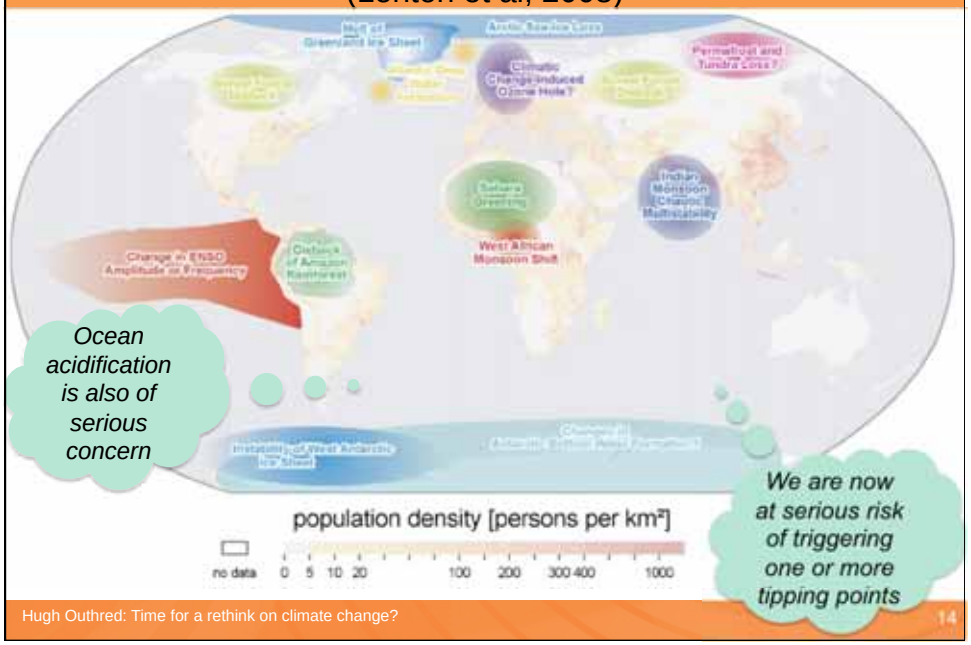
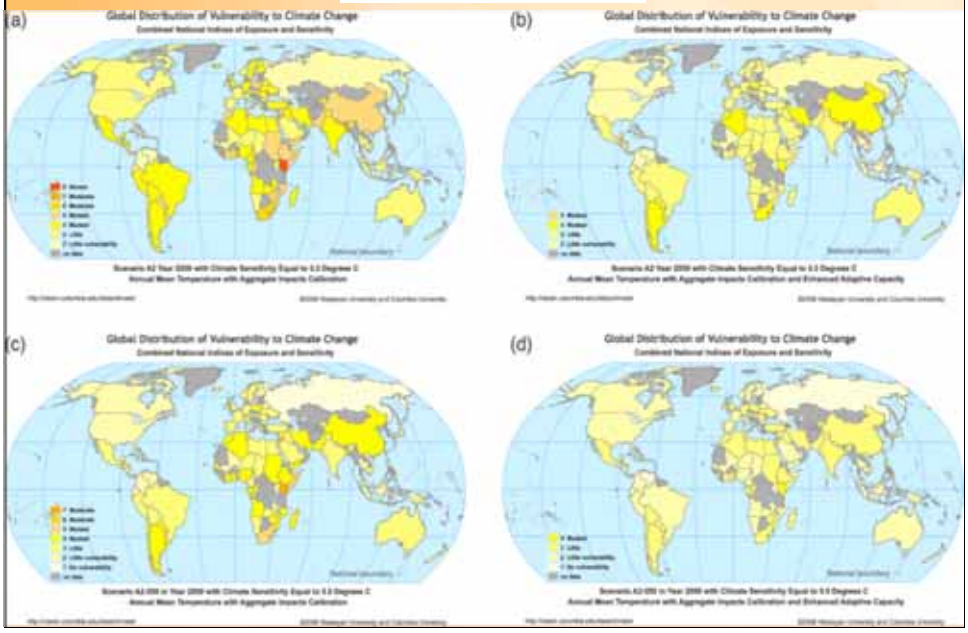


Figure TS.19. Distribution of vulnerability in 2050

(Bill Hare at ANU, 12/3/08)



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(Bill Hare at ANU, 12/3/08)

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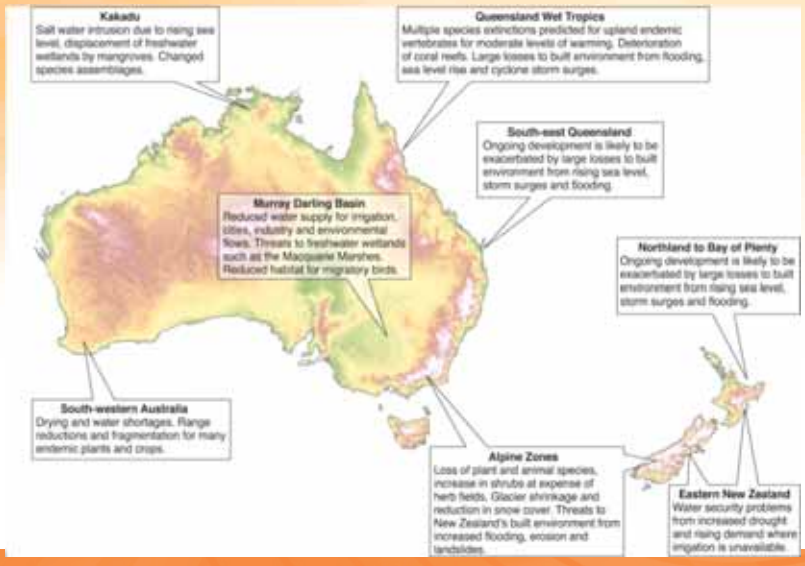
Figure TS.12. Key hotspots in Australia & New Zealand



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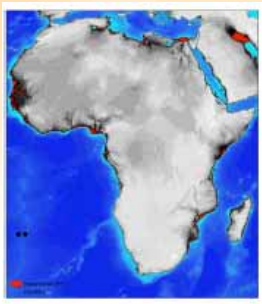
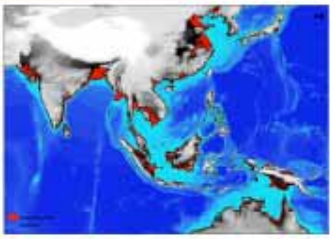
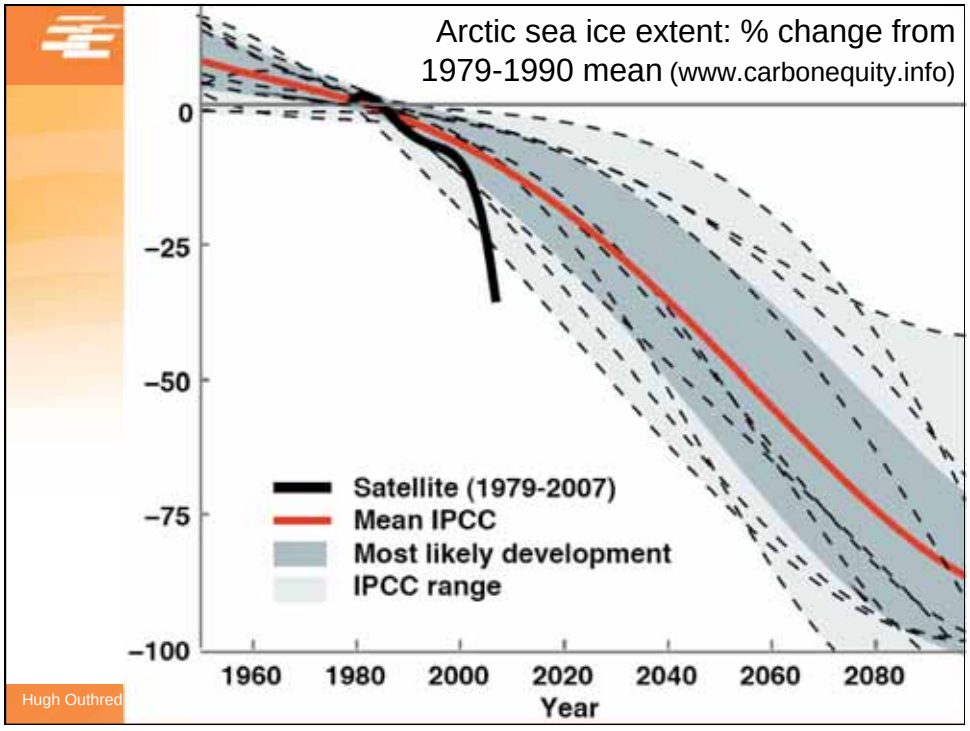
Long term sea level rise risks (Bill Hare at ANU, 12/3/08)

Areas inundated with 20m SLR





Source: Brooks Nicholls Hall 2006



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"The damage inflicted by global warming will be worse than all the floods, fires, earthquakes and tsunamis we have witnessed in our lifetime, yet we are not taking the emergency action that is necessary.
There is now a need to build political understanding that global warming and the tipping points for dangerous impacts that we have already crossed constitute a sustainability emergency.
We must take urgent, large-scale global action that takes us beyond the politics of failure-inducing compromise." (David Spratt, ABC Opinion, 2/7/08)

"The challenge is rapid transition of the economy to live within our environmental means while preserving and enhancing our general wellbeing" (Andrew Sims, "We have only 100 months to avoid irreversible environmental disaster", The Guardian, 1/8/08)

Practical implications:
- If we don't exercise self-restraint, external constraints will bind. We need to implement an "internal stopping rule".
- Our goal should be to achieve a prudent civil society but we are more likely to continue the addictions & alienations that are leading to social collapse.

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INTERNATIONAL COUNCIL ON HUMAN RIGHTS POLICY

Climate Change and Human Rights

The scope of these problems – and of the action required to treat them – reach beyond previous human challenges. Yet in the sixteen years since the UNFCCC was signed, global negotiations have proceeded at a glacial pace. We have collectively failed to grasp the scale and urgency of the problem. Climate change shows up countless weaknesses in our current institutional architecture, including its human rights mechanisms. To effectively address it will require a transformation of global policy capacity – from information-gathering and collective decision-making to law enforcement and resource distribution.

This year, as we celebrate the 60th anniversary of the Universal Declaration of Human Rights, it is worth remembering that document's injunction that "everyone is entitled to a social and international order in which [their] rights and freedoms … can be fully realized". Climate change disrupts that order. But perhaps it is also an opportunity, if we are willing to grasp it, to create the kind of international and social order that the framers of the Universal Declaration dreamed of.

Climate change is primarily a problem of equity

Mary Robinson, President, Realizing Rights: The Ethical Globalization Initiative.

Thinking about climate change from a human rights perspective is not only a fundamental necessity in terms of guiding our international development policy framework, but also offers us an invaluable opportunity to reappraise the most pressing needs of a highly inequitable global society, with greatly differing social, environmental and economic levels of development.

The international debate on climate change has largely focused on the discussions between a handful of nations in terms of their commitments, or failure to commit, to emissions reductions. Further, much current information, statistics, and policy debate revolves around, and is generated by, States and actors that are part of the climate problem, limiting discussion of their commitments to the costs they are willing to forego in order to slow climate change.

Thinking through climate change from a development perspective and through a human rights lens, as the present report recommends, will undoubtedly serve us well as we develop national climate strategies and programs and mitigation and adaptation policies, and as we identify the appropriate and necessary financing, allocate resources, and generally set the tone for future negotiations and global policy geared to equity and balance in our global climate policy.

Throughout this process, nothing is more important than to remember and understand the perspective of the climate victim. It falls to States, and to us, acting as individuals and in organizations, to address the human emergencies that anthropogenic activities are causing in global society, because they threaten our lives, our health, our safety and our environment.

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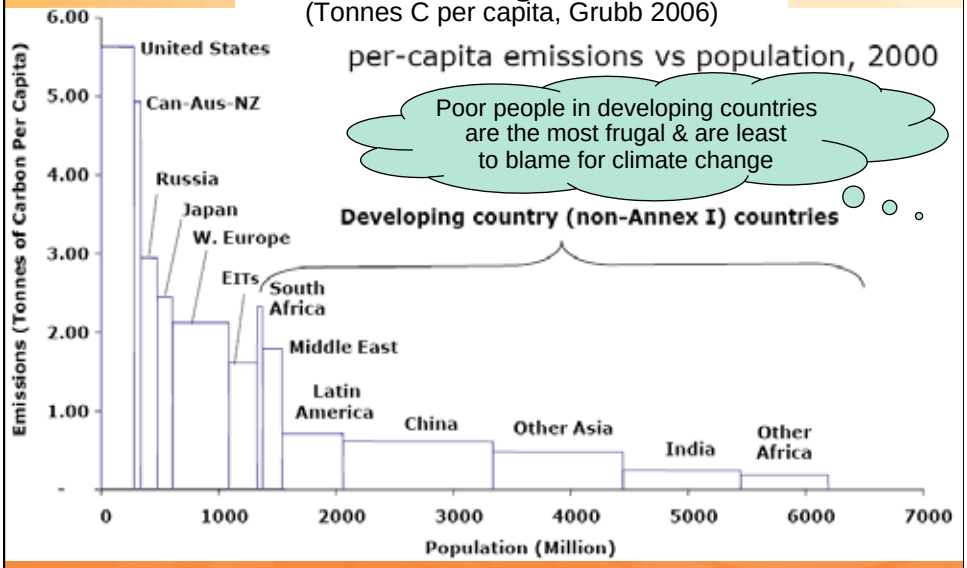
Climate change emissions

(Tonnes C per capita, Grubb 2006)



(Human Development Report, UNDP, 2007-08: Table 1, Summary Report)	CO_2 emissions per capita (t CO_2) 2004	Equivalent global CO_2 emissions [b] (Gt CO_2) 2004	Equivalent number of sustainable carbon budgets [c]
World [d]	4.5	29	2
Australia	16.2	104	7
Canada	20.0	129	9
France	6.0	39	3
Germany	9.8	63	4
Italy	7.8	50	3
Japan	9.9	63	4
Netherlands	8.7	56	4
Spain	7.6	49	3
United Kingdom	9.8	63	4
United States	20.6	132	9

a. As measured in sustainable carbon budgets.
b. Refers to global emissions if every country in the world emitted at the same per capita level as the specified country.
c. Based on a sustainable emissions pathway of 14.5 Gt CO_2 per year.
d. Current global carbon footprint.

This may be too high

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Need to phase out CO2 from coal by 2030 to avoid dangerous climate change (Hansen, 2008)

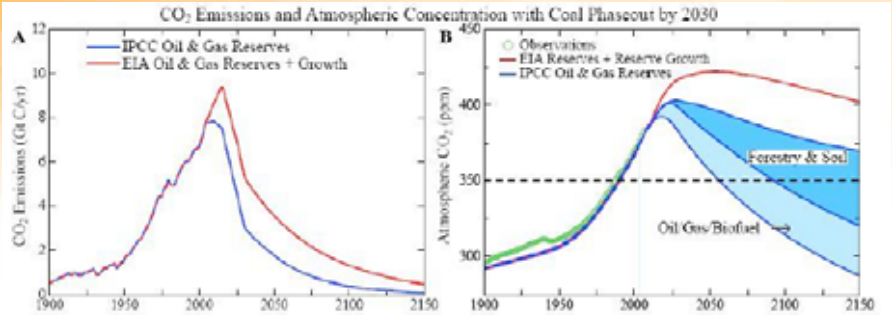

Fig. 6. (A) Fossil fuel CO_2 emissions with coal phase-out by 2030 based on IPCC (2) and EIA (58b) estimated fossil fuel reserves. (B) Resulting atmospheric CO_2 based on use of a dynamic-sink pulse response function representation of the Bern carbon cycle model (57, 58).

http://www.columbia.edu/~jeh1/2008/TargetCO2_20080317.pdf

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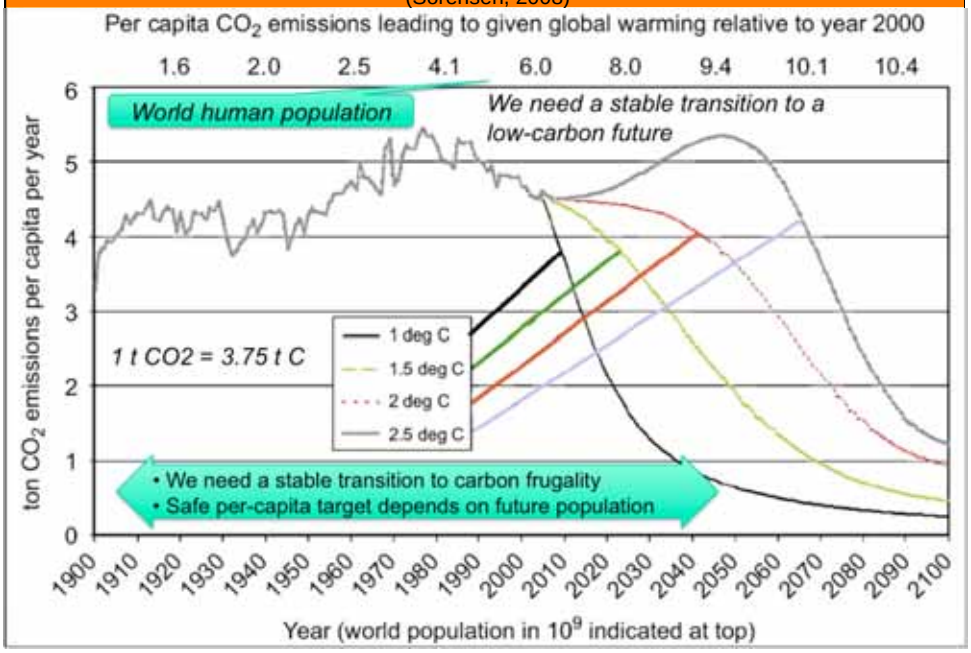
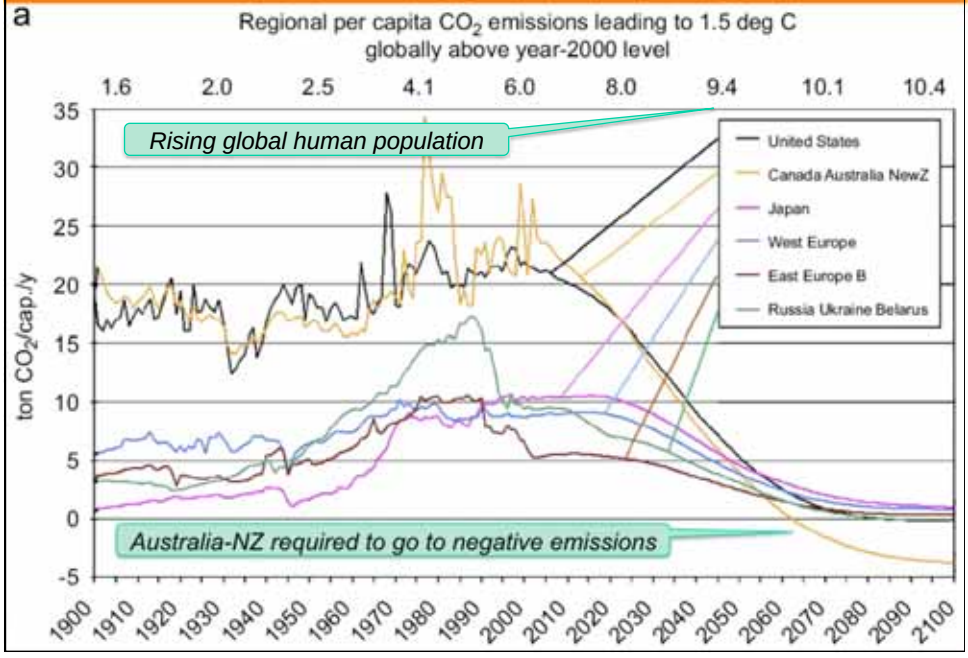
Emission trajectories & temperature rise

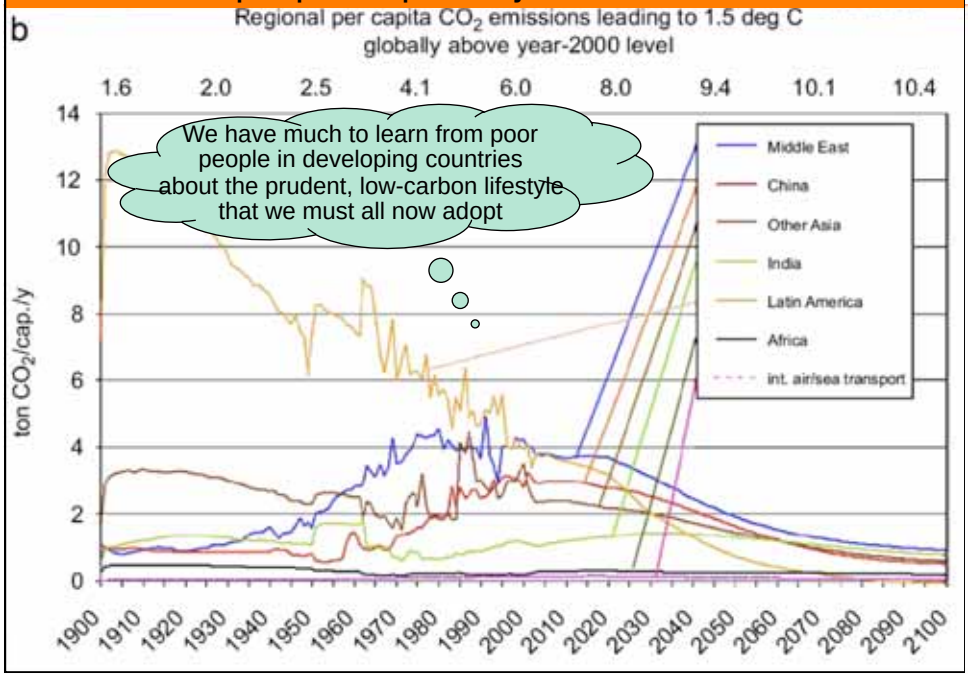
(Sorensen, 2008)



Example per-capita trajectories (Sorensen, 2008)



Example per-capita trajectories (Sorensen, 2008)



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Characterisation of the climate change challenge: *From Scientific to Economic then to Socio-technical (humans + their technologies are the cause)*

Must now achieve a stable transition path to frugality in prudent civil society

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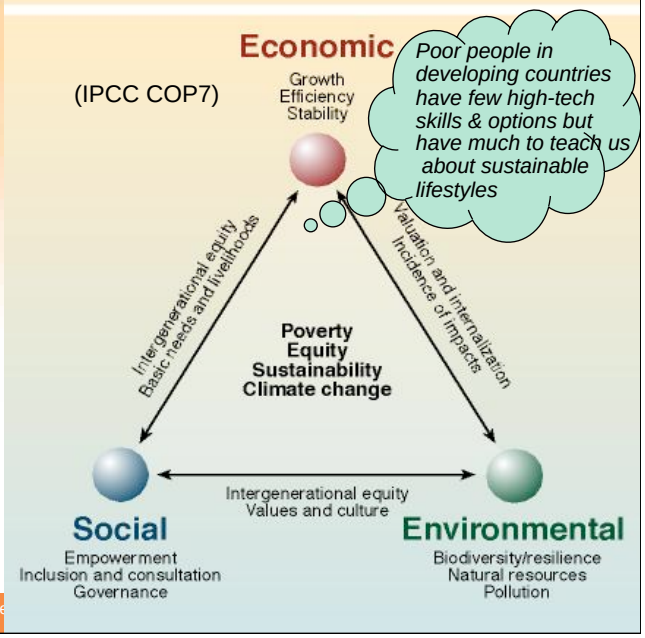
Key elements of sustainable development and interconnections



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What is technology?

(www.iiasa.ac.at)

Software & orgware are critical issues in complex technological systems such as an electricity industry

The Art of Knowing and Doing

The study of **technology** concerns *what* things are made and *how* things are made. Technology, from the Greek *science of* (practical) *arts,* has both a *material* and an *immaterial* aspect.

Technology = Hardware + Software + "Orgware"

Hardware:	Manufactured objects (artifacts)
Software:	Knowledge required to design, manufacture, and use technology hardware
"Orgware":	Institutional settings and rules for the generation of technological knowledge and for the use of technologies

Technology's most important characteristic: ***Continuous change >>***

Hugh Outhred, Prospects for wind e

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Technology acculturation into local community life

(Maria Retnanestri, 2008)

Innovation Attributes & Local adaptation: Relative Advantage, Compatibility, Complexity, Re-invention

Re-invention: the degree to which an innovation is changed or modified by users in order to solve a wide range of user's problem (Rogers, 1995, 2003).

→ Facilitators need to understand the extent to which technology can enhance pre-existing resources to support beneficial social innovation

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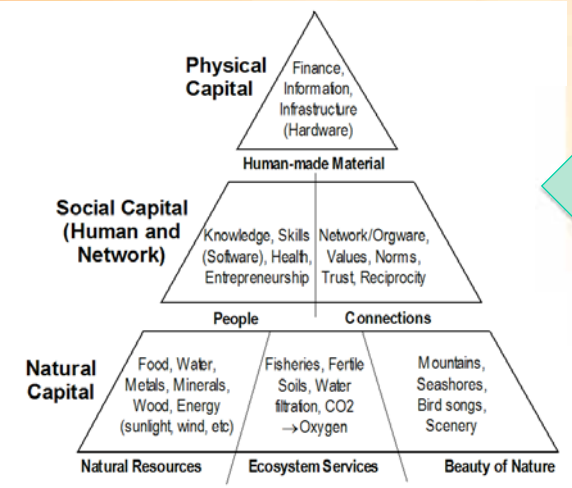
Community Capital/Resources (Maria Retnanestri, 2008)



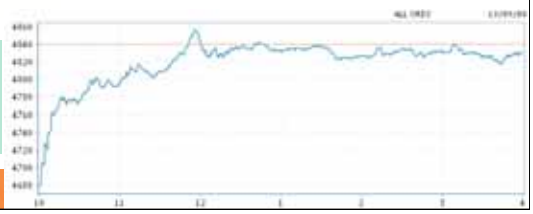
Threats to physical, social & natural capital

Reproduced from Hart, 1998, with some modifications.

What is the matter with markets #1?

- "The Australian Securities and Investments Commission has announced that short selling of all stocks will not be allowed because it may have been causing unwarranted price fluctuations of stocks…"
- "CommSec's chief economist Craig James says the practice should have been banned years ago" (ABC News, 22/9/08)

ASX All Ords, 19/9/08



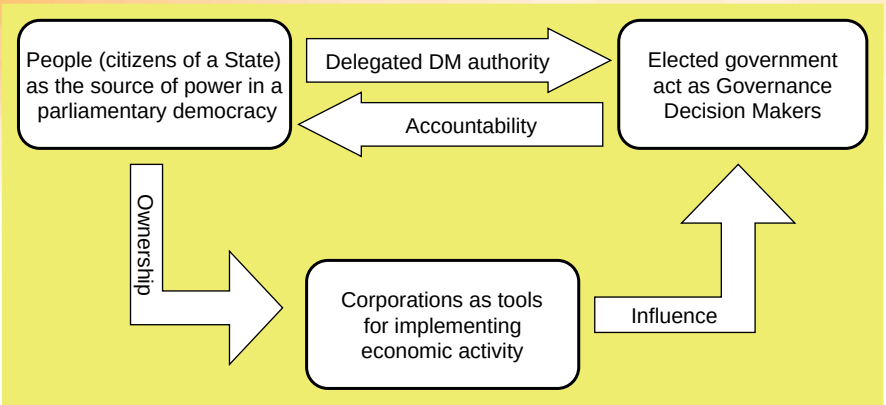
- Stocks have no physical spot market & so poor short term price discovery
- Stock prices are also strongly influenced by government policy & regulator action

What is the matter with markets #2?

- "With the situation becoming more precarious by the day, I faced a choice – to step in with dramatic government action or to stand back and allow the irresponsible actions of some to undermine the financial security of all" (Bush, quoted by ABC, 25/9/08)
- "Decisions by the (Treasury) Secretary pursuant to the Authority of this Act (to spend $700 billion) are non-reviewable and committed to Agency discretion, and may not be reviewed by any court of law or any administrative agency" (quotation from draft legislation in article by Michael West, SMH, 24/9/08)
- "Let us rebuild capitalism in which credit agencies are controlled and punished when necessary, where transparency … replaces opaqueness. We can do this on one condition, that we all work together in our globalised world" (Sarkozy, 24/9/08)
- "The global financial crisis endangers all our world. Financing for development, social spending in rich nations and poor, the Millenium Development Goals" (Ban KiMoon quoted by Michael Rowland, ABC, 24/9/08)

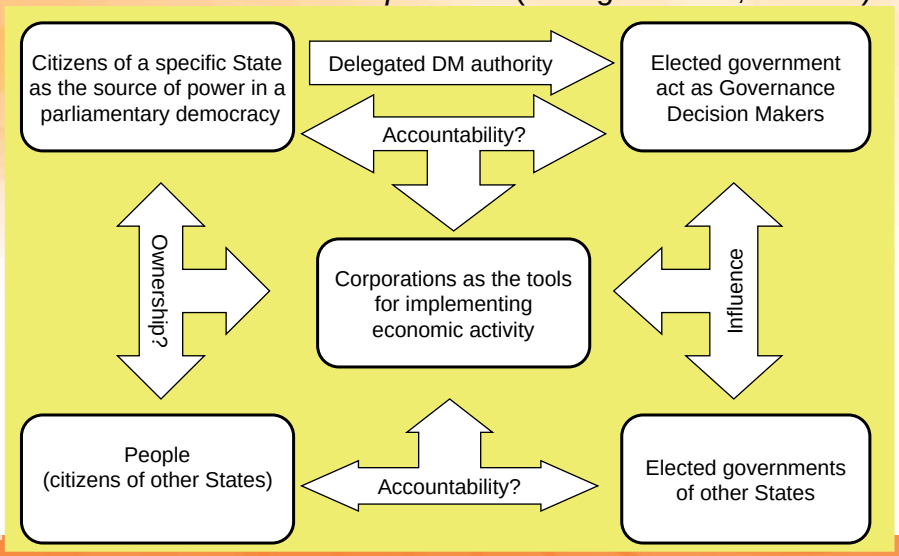
What is the matter with markets #3?

Governance in an isolated, "pure" parliamentary democracy



What is the matter with markets #4?

Governance in the real world: *"Corporate welfare is a consistent feature of advanced capitalism"* (Georg Monbiot, 30/9/08)



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What is the matter with markets #5?

Robert Skidelsky, "The Moral Vulnerability of Markets" (www.project-syndicate.org)

"Today, there seems to be no coherent alternative to capitalism, yet anti-market feelings are alive and well, expressed for example in the moralistic backlash against globalization. Because no social system can survive for long without a moral basis, the issues posed by anti-globalization campaigners are urgent – all the more so in the midst of the current economic crisis…

Moral criticisms of the market focus on its tendency to favor a morally deficient character type, to privilege disagreeable motives, and to promote undesirable outcomes…

While the market today has no serious challenger, it is morally vulnerable. It has become dangerously dependent on economic success, so that any large-scale economic failure will expose the shallowness of its moral claims. The solution is not to abolish markets, but to re-moralize wants."

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What is the matter with markets #6?

- *"Effective policies are those that support socially valued outcomes not only by harnessing selfish motives to socially valued ends but also by evoking, cultivating, and empowering public-spirited motives"* Gintis et al, 2005
- Emission trading is intellectually & morally bankrupt:
  - It attempts to convert an equity issue to a commercial one
  - It will suffer from poor price discovery & poor efficiency:
    - There is no meaningful spot market – *integral emission constraint* > poor spot price discovery > operating decisions > poor derivative markets > poor investment
    - Market influenced greatly by policy: > *the interaction destabilises both…*

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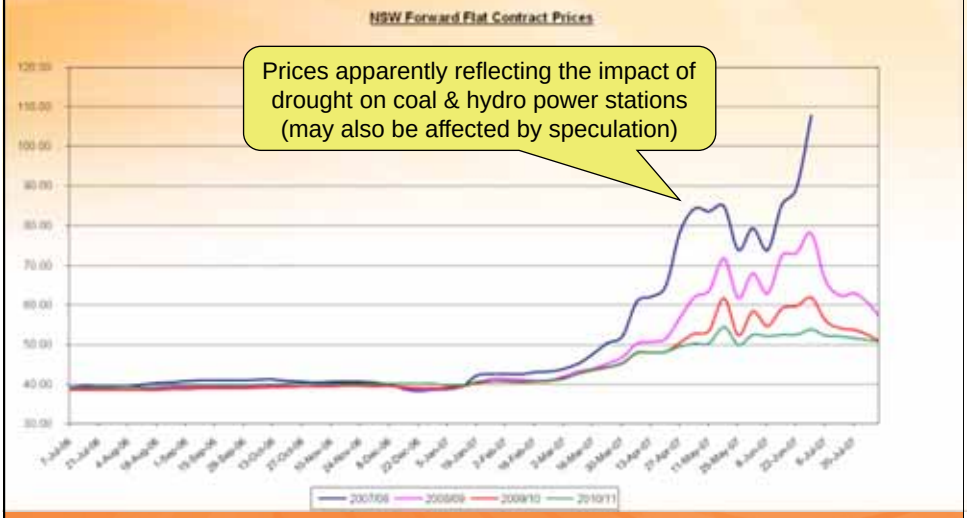
Flat annual CFD prices for NSW (NGF, 2007)



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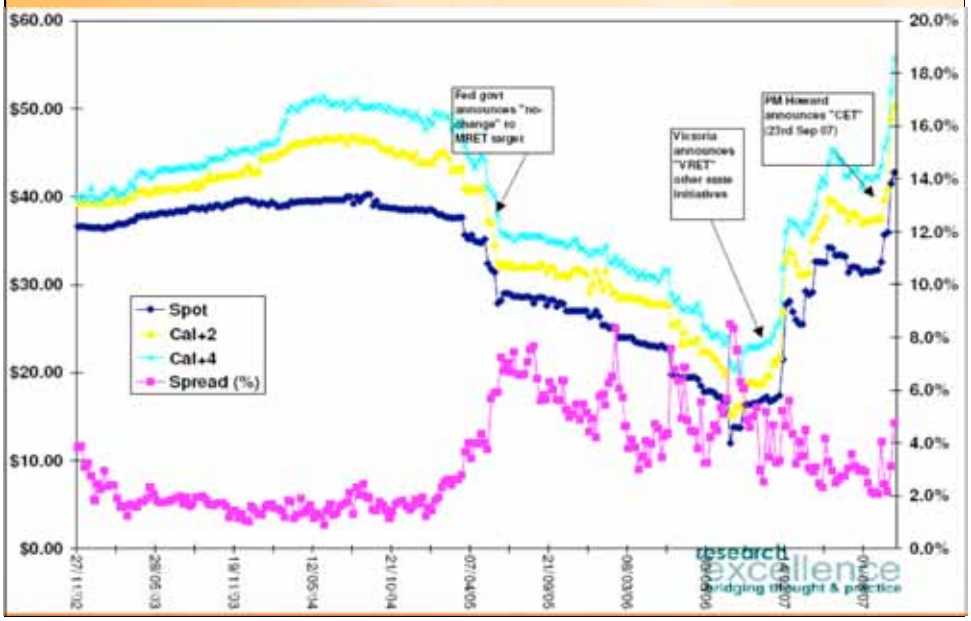
REC spot & derivative market prices

(Nolles, Garnaut Review Presentation, 2007)



Price history – NGAC & REC (ANZ, 2008)

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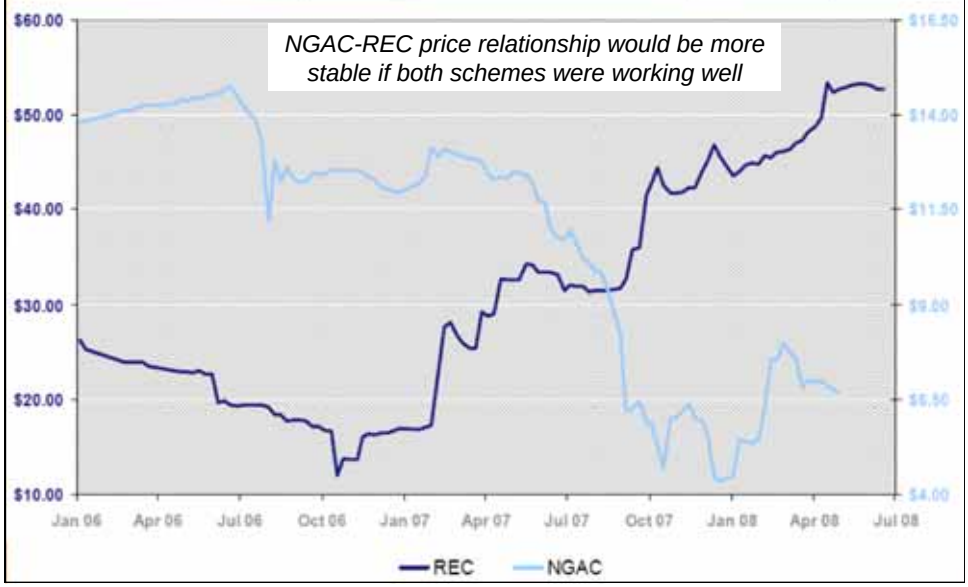

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EU emission allowances – Dec 07 & Dec 08 contracts (PWC, 2008)

Highly volatile prices possible early on

- Lead times associated with abatement activities mean that carbon prices may rise quickly when the ETS starts
- The EU ETS rose to 30 Euros ($40) based on an 'easy' target. Prof. Garnaut is talking about a serious target

Volatility will impact valuations

- Volatility will have a significant impact on valuations
- Investors will quickly begin to report on the expected impact of carbon prices
- The ability to hedge carbon price exposure may be key to protecting value

The graph shows daily bid-offer close EUA Dec 2007 prices from Dec 2004 (blue line) in the OTC market, and EUA Dec 2008 from Sept 2005 (red line). The data was updated 1 February 2007.

Source: Point Carbon

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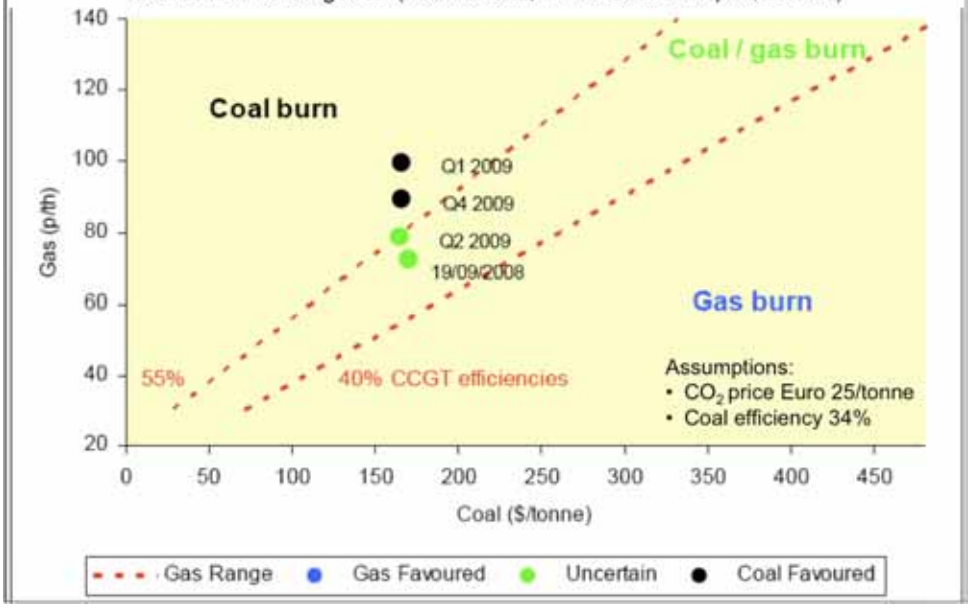
EU emission allowances – Dec 08 contract (ANZ, 2008)

Price discovery poor

"UK & Continental gas prices are much higher than those in the US providing an incentive to deliver spot LNG cargoes to Europe in preference to the US. However as experienced last winter, the Far East may be again prepared to pay a premium to secure LNG cargoes." (National Grid, Winter Outlook Report, 2/10/08)



Garnaut final report, Ch 14 – Aust ETS

An emissions permit represents a tradable instrument with inherent value that can be exchanged between sellers and buyers in an emissions permit market. This enables the movement of permits about the economy to their highest value (or most economically efficient) use. It does this while ensuring the integrity of the volumetric control, or emissions limit, imposed in order to satisfy the policy objectives of climate change mitigation.

"I believe in emission trading therefore it works"

Other policy objectives—be they economic, environmental or social—should be pursued through alternative policy instruments that operate alongside the scheme.

Market participants must have confidence that permits are in scarce supply and reflect the targets and trajectories for national emissions reductions discussed in Chapter 12. Where the scarcity of permits is uncertain, market participants will factor in risk premiums (if they suspect that the commodity will become more scarce) or risk discounts (if they suspect that the commodity will become more abundant). This will distort resource allocation decisions and impose unnecessarily high costs on the economy.

As an emissions trading scheme exists entirely at the behest of government, market participants will be alert for any signs of shifts in policy, management protocols or operating procedures that may undermine the integrity of the market.

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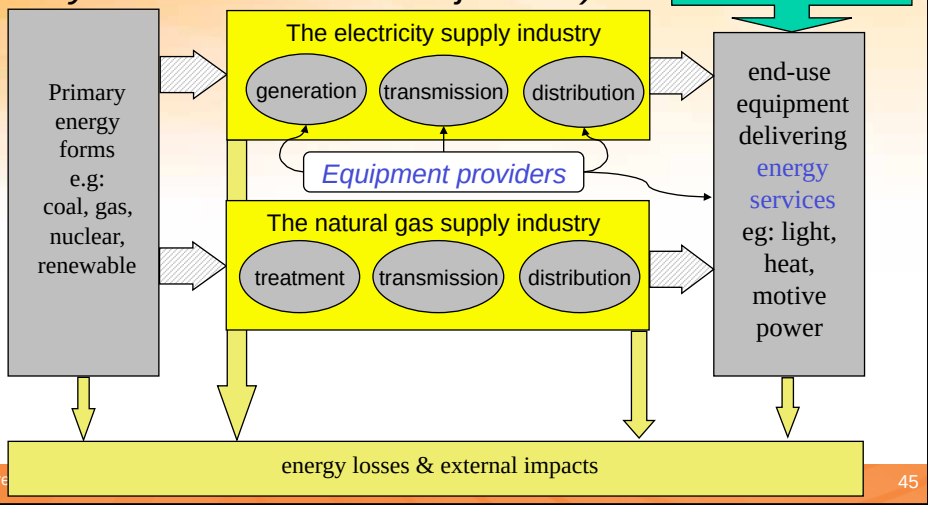
Energy service delivery in the stationary energy sector

(many decision-makers & objectives)



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The energy sector challenge

- Growing concerns about climate change, energy security & broader environmental & physical constraints, eg:
  - Flow constraints & high prices for oil, natural gas, coal & uranium & related commodities (eg metals, plastics)
  - Human society facing many other challenges
- Energy use facilitates most human activities:
  - Involuntary rationing may lead to social instability
  - Rural communities in developing countries lack even basic access to affordable and reliable energy services
  - Frugality, efficient energy use & renewable energy resources are key options to explore *(require changes in orgware & software)*
- Emission trading can have poor price & volume discovery:
  - *Not suited to influencing operating behaviour in a volatile spot market*
  - *Not suited to driving rapid change in orgware & software*

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Decision-making framework for a restructured electricity industry (EI)

Governance regime	▪ Formal institutions, legislation & policies ▪ *Informal social context including politics*
Security regime	▪ Responsible for core integrity on local or industry-wide basis, with power to override
Technical regime	▪ Engineering design to allow industry components to function as single, industry-wide machine when connected together
Commercial regime	▪ Decentralised decision-making according to commercial criteria within a market context ▪ Includes formally designed markets ▪ *Needs adequate competitive pressures*

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How might we understand our predicament?

- *"Technology advancing so rapidly that it has replaced older values and left nothing in their place except the value of efficiency"* (Pastore (2008) quoting Jacques Ellul (1954))
  - Computer-based markets are technologies to support competition
  - They "mine" rather than support cooperative behaviour
- Global human population such that trust necessary to support collection action hard to achieve, but:
  - *"History suggests that when social communication media grow in capability, pace, scope or scale, people can … construct more complex social arrangements"* (Saveri, 2008)
  - *"Technologies of cooperation"* may emerge (www.iftf.org)

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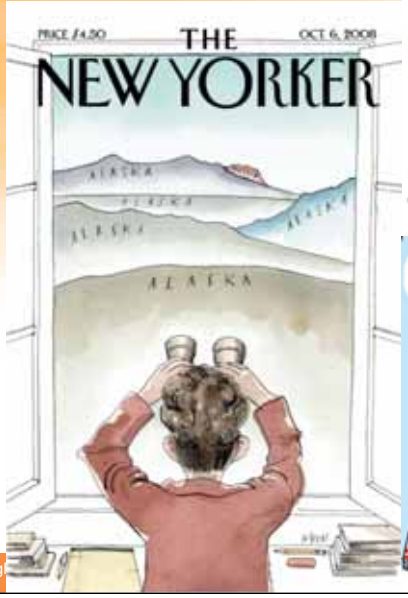
Technologies of cooperation

(Institute for the Future, Jan 2005, www.iftf.org)

Can high-tech cooperation technologies unite 7 billion people, or will they be misused?

Palin & the visual media

(www. politicalhumor.about.com)
(www.huffingtonpost.com)



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Questions posed by Steb Fisher, ABC Opinion, 15/9/08

Are we willing to root out those assumptions that have turned out to be destructive and find new principles that are needed to tackle the problems?

Will we explore new models of governance and, importantly, the processes to get us from here to there?

Will we accept the world as finite and so the need for cooperation rather than the conflict of adversarial systems of thought and their adversarial institutions?

Can centralised leaders in politics and business find the courage to acknowledge the paramount role that local communities have in determining what is best for their local governance and ecosystems, of which they are the natural stewards?

Will we codify the principles for cooperative lateral relationships between communities and between countries and will we design governance which interconnects and supports rather than rules and dominates?

Will we define the principles of our relationship with the air, the land and the sea and all the creatures of the earth?

Will we synchronise and align our systems of governance with the timescales of the great cycles of life of our planet and the physical and ecological principles which govern its existence?

Will we re-examine the fundamentals of economics on the basis of human needs rather than greed and desire?

Can we keep lifting our gaze to a new level of awareness that keeps the whole system, the earth, always in mind?

Will we include a regular process in every generation of complete examination and renewal of society and its organisation, and so inspire each new generation to engage deeply with its governance?

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How might university researchers contribute?

- Energy is a *facilitator* of services:
  - Approach from the perspective of end-use services
  - Recognise the importance of maintaining social coherence & strengthening civil society
- Many countries face similar issues:
  - Poor, rural communities are most at risk but have much to teach us
  - Need less emphasis on competition, more on cooperation
- Correctly applied project management techniques can help:
  - *But only if PM skills are transferred to the community level*
- Adopt a genuinely inter-disciplinary approach to research:
  - Science, technology & society
  - Across all related issues, eg energy, water, education, health

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Examples of relevant UNSW research

- "Beyond Right & Left", David McKnight, 2005:
  - Connecting a moral stance – which begins at a personal level – to social goals
  - A moral vision of the nation built around core values
  - Centrality of caring & caring values
  - Conservation values
- Wind integration in the National Electricity Market
- Enhanced energy sustainability for poor rural Indonesian communities
- *No doubt there are many more*

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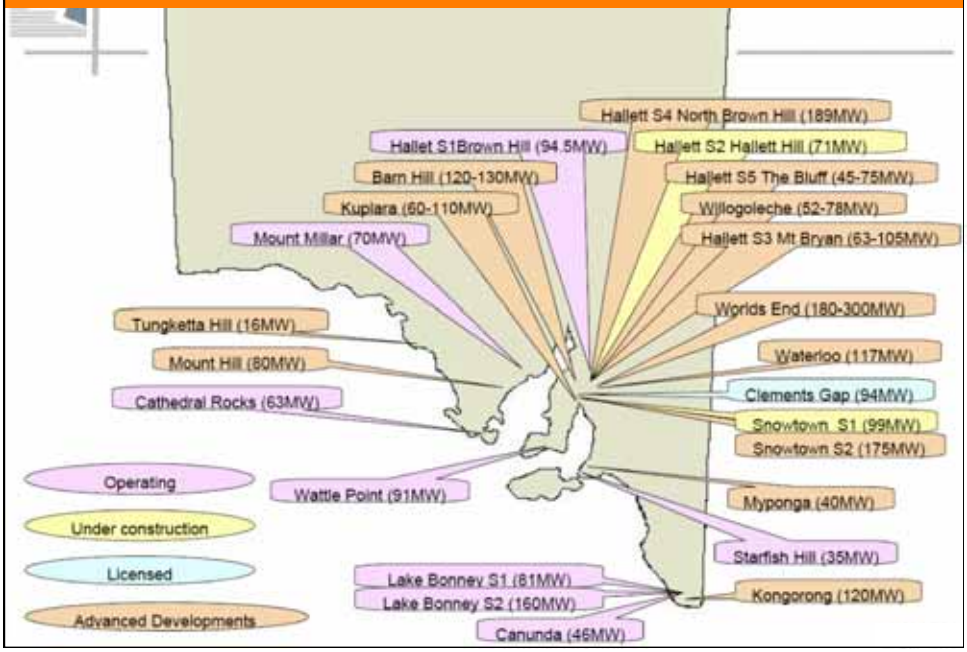
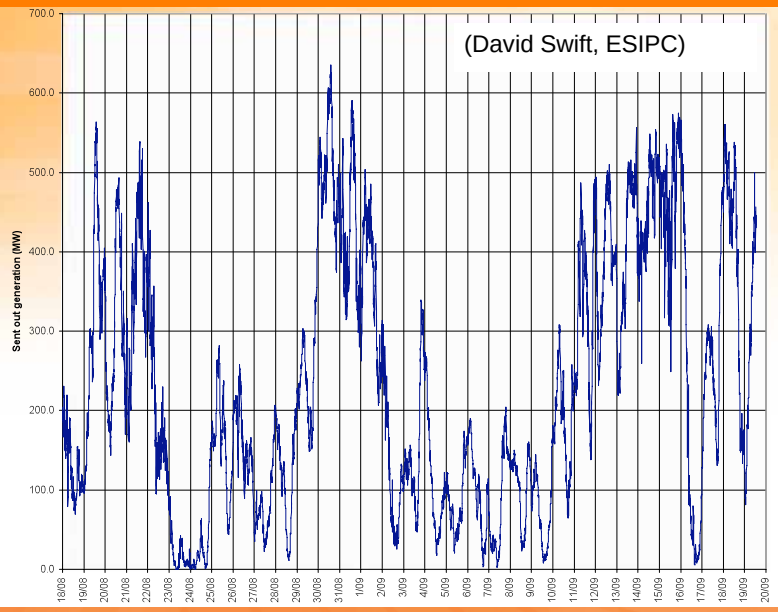
Wind farms in South Australia (ESIPC APR, 2008)



Wind generation, South Australia, Aug 08



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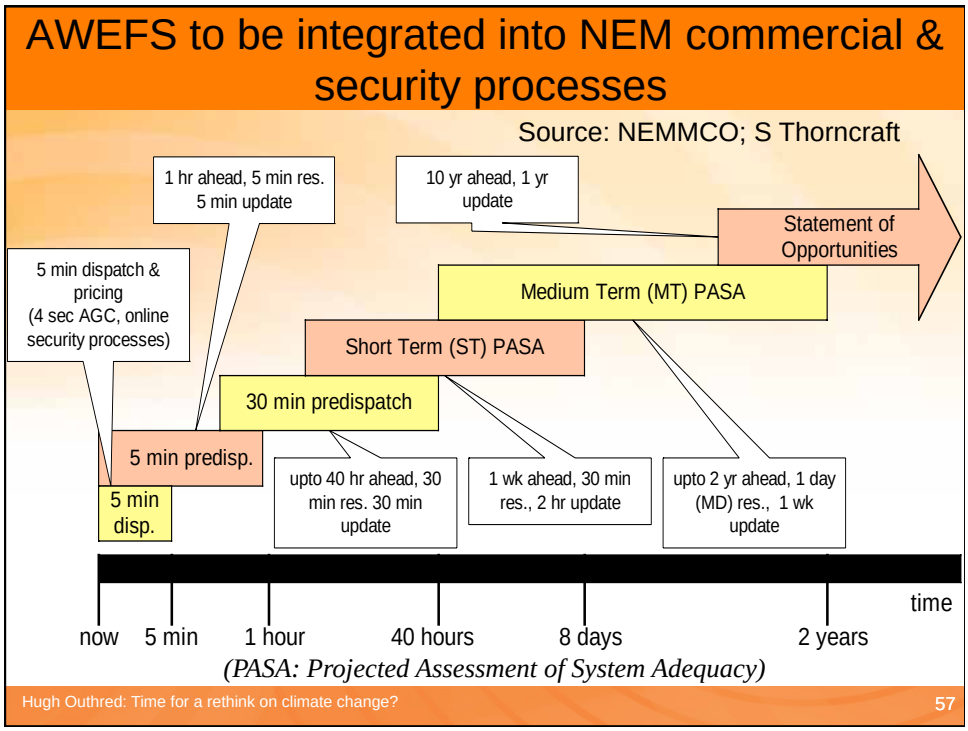
Wind generation, South Australia Aug 2008

- The aggregate output of wind farms in South Australia varied from -2.6 MW to 635.5 MW
- The maximum variation from one 5 minute interval to the next was 155 MW
- The maximum change in other generation required to meet demand and the variation in wind from one 5 minute interval to the next was 214 MW
- Wind generation contributed up to 51% of customer demand
- There were 143 dispatch intervals where the spot price for energy in SA was negative

(David Swift, ESIPC)


AWEFS to be integrated into NEM commercial & security processes
Source: NEMMCO; S Thorncraft
1 hr ahead, 5 min res. 5 min update
10 yr ahead, 1 yr update
Statement of Opportunities
5 min dispatch & pricing (4 sec AGC, online security processes)
Medium Term (MT) PASA
Short Term (ST) PASA
30 min predispatch
5 min predisp.
5 min disp.
upto 40 hr ahead, 30 min res. 30 min update
1 wk ahead, 30 min res., 2 hr update
upto 2 yr ahead, 1 day (MD) res., 1 wk update
time
now
5 min
1 hour
40 hours
8 days
2 years
(PASA: Projected Assessment of System Adequacy)
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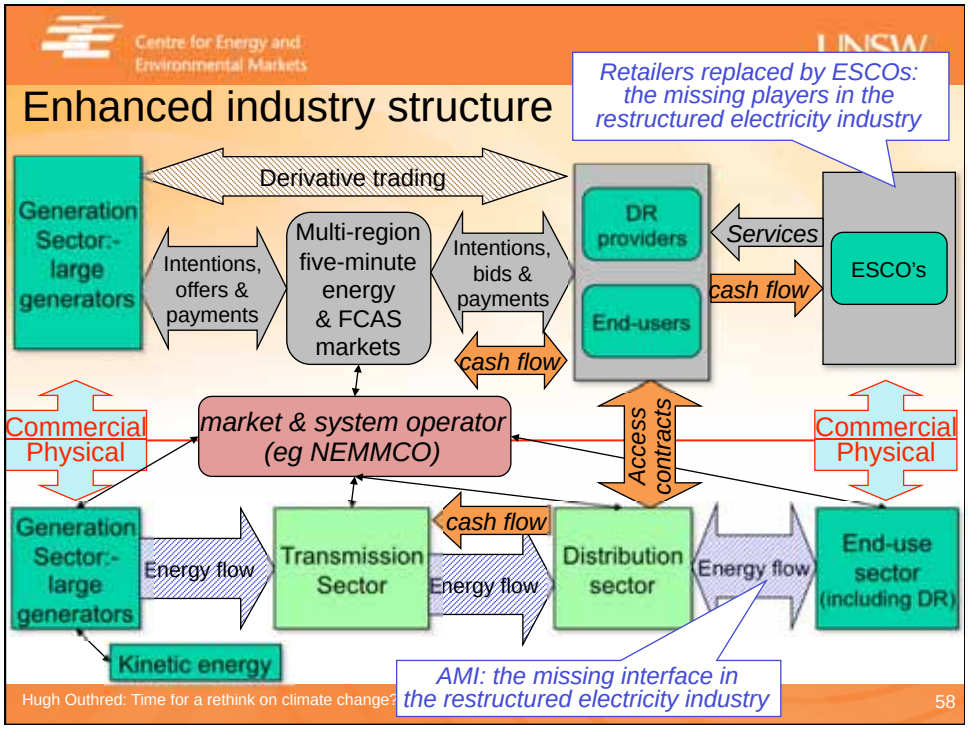
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Enhanced industry structure
Retailers replaced by ESCOs: the missing players in the restructured electricity industry
Derivative trading
Generation Sector:- large generators
Intentions, offers & payments
Multi-region five-minute energy & FCAS markets
Intentions, bids & payments
DR providers
End-users
Services
cash flow
ESCO's
cash flow
Commercial
Physical
market & system operator (eg NEMMCO)
Access contracts
Commercial
Physical
Generation Sector:- large generators
Energy flow
Transmission Sector
cash flow
Energy flow
Distribution sector
Energy flow
End-use sector (including DR)
Kinetic energy
AMI: the missing interface in the restructured electricity industry
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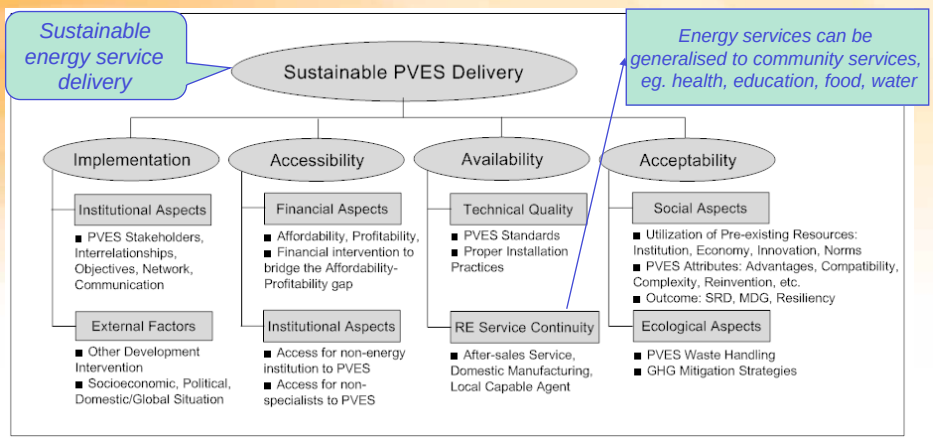
The I3A *Community Service* Sustainable Delivery Framework



To be sustainable it is necessary that off-grid energy services are **implemented**/delivered in a framework that addresses:

Accessibility (financial, technical, and institutional),
Availability (technical quality and continuity of energy service) &
Acceptability (social and ecological goals).

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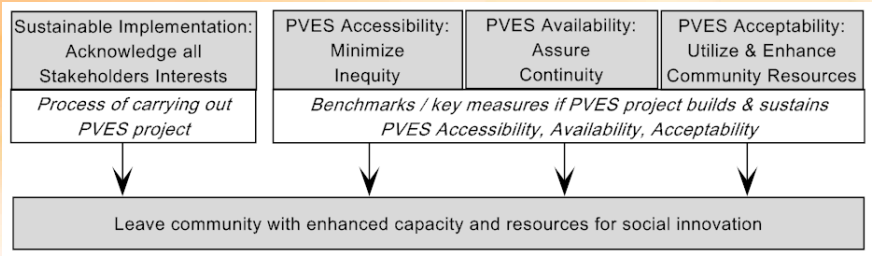
The I3A Framework: Assessment & Design Tool for a PVES Project



To be sustainable it is necessary that off-grid energy services are **implemented** /delivered in a framework that addresses:

- **Implementation:** Guide for project implementation taking into account of PVES stakeholders, their relationships & objectives
- **3A:** PVES sustainability benchmarks
  - **Accessibility:** Financial, Technical, Institutional
  - **Availability**: Technical quality & continuity of energy services
  - **Acceptability**: Social & Ecological goals

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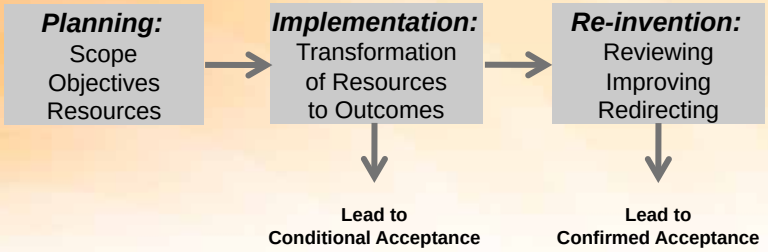
Project management techniques & the I3A Framework



- The I3A Framework: an **Implementation** that maintains PVES **Accessibility, Availability & Acceptability** by looking at:
  - PVES delivery objectives/outcomes to be achieved
  - PVES delivery mechanism (PVES hardware & its stakeholders/orgware)
  - Resources required
  - Ongoing energy service delivery following PVES hardware installation

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www.ceem.unsw.edu.au