



# **Climate-change: Are we up to the challenge?**

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# **Climate-change: Are we up to the challenge?**

- **The ‘diabolical’ issue**
  - Uncertainty, complexity, urgency and inequity
- **Human dimensions**
  - What is possible, what is acceptable, what is equitable?
- **Building resilience**
- **Conclusions**

# Garnaut Climate Change Review

A diabolical issue because the problem is:

- *Uncertain* in its format and extent
- *Insidious* rather than (as yet) confrontational
- *Long-term* rather than immediate
- *International* as well as national
- In the absence of effective mitigation there is a risk of *dangerous* consequences

Climate Change Review (2008), Professor Ross Garnaut

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- 
- **Uncertainty**
  - **Complexity**
  - **Urgency**
  - **Inequity**

# Uncertainty

**Incomplete knowledge now and (likely) into the future of:**

- **The climate system**
- **Future human gas emissions (energy demand and supply technologies)**
- **Responses of physical & biological systems**
- **How to adapt to impacts**
- **Options for energy production**

# Complexity

- **Management of risk involves assessing:**
  - Probability of changes occurring (climatic or to physical and climate-dependant biological systems)
  - Severity of a impact if the change occurs (something that will also have uncertainties)
  - Pooling of individual potential risks into a measure of combined risk – what is “dangerous”
- **Systems operate interactively and are comprised of many subsystems and components**
- **Knowledge is generated at the specific or subsystem level, rarely holistically**

**The complexity is daunting and invites procrastination, skepticism, denial and fervour**

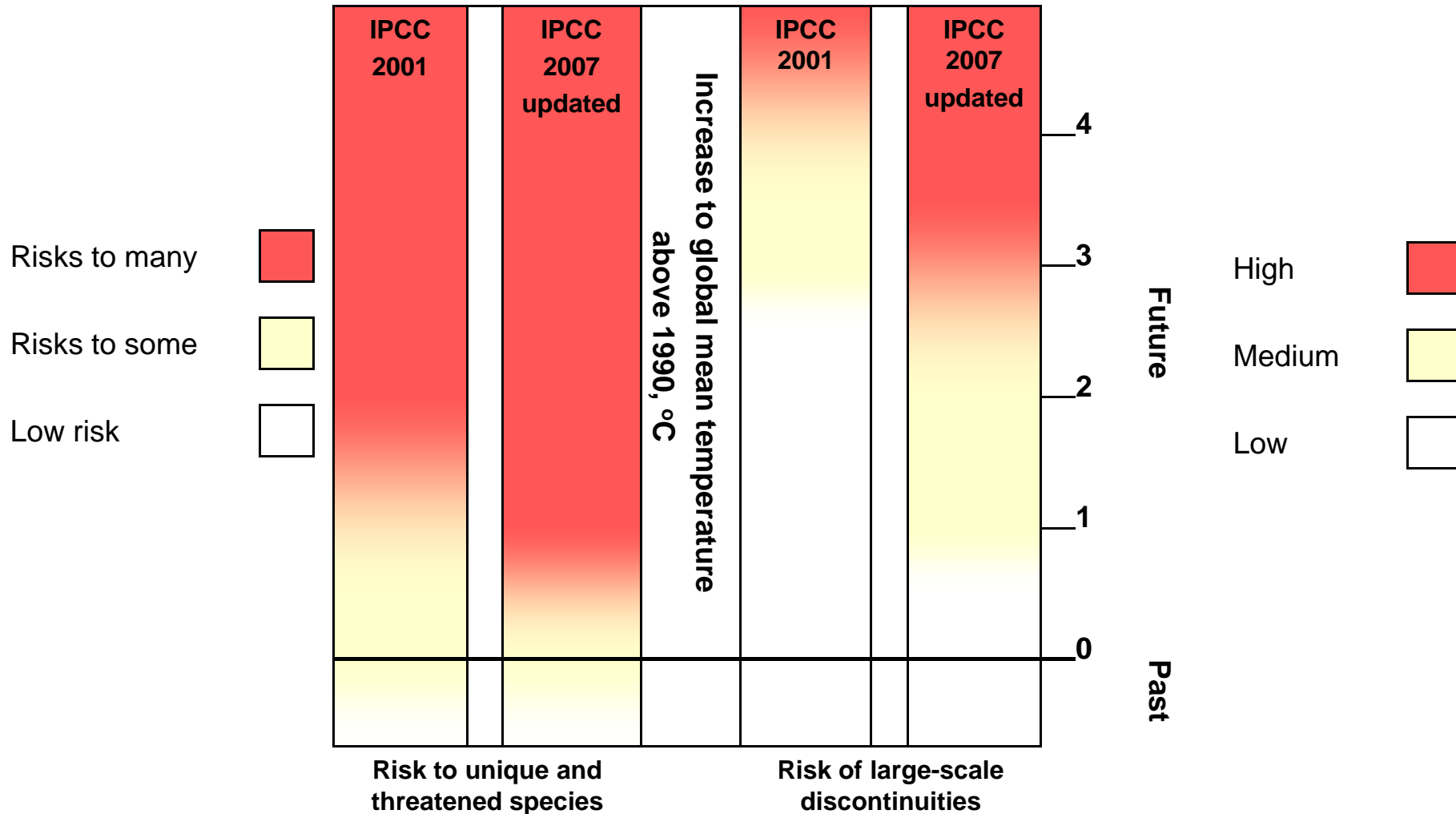
# Urgency



- **Misconception that changes are “small”**
- **Inertia of the climate and human systems**
- **Potential for non-linear unforeseen change**
- **Emerging observations of change**
- **Precaution as a part of risk management**
- **Procrastination/vested interests/inertia**

# Updated reasons for concern- urgency

Based on Smith *et al.*, 2009, Pro.Nat.Acad.Sci



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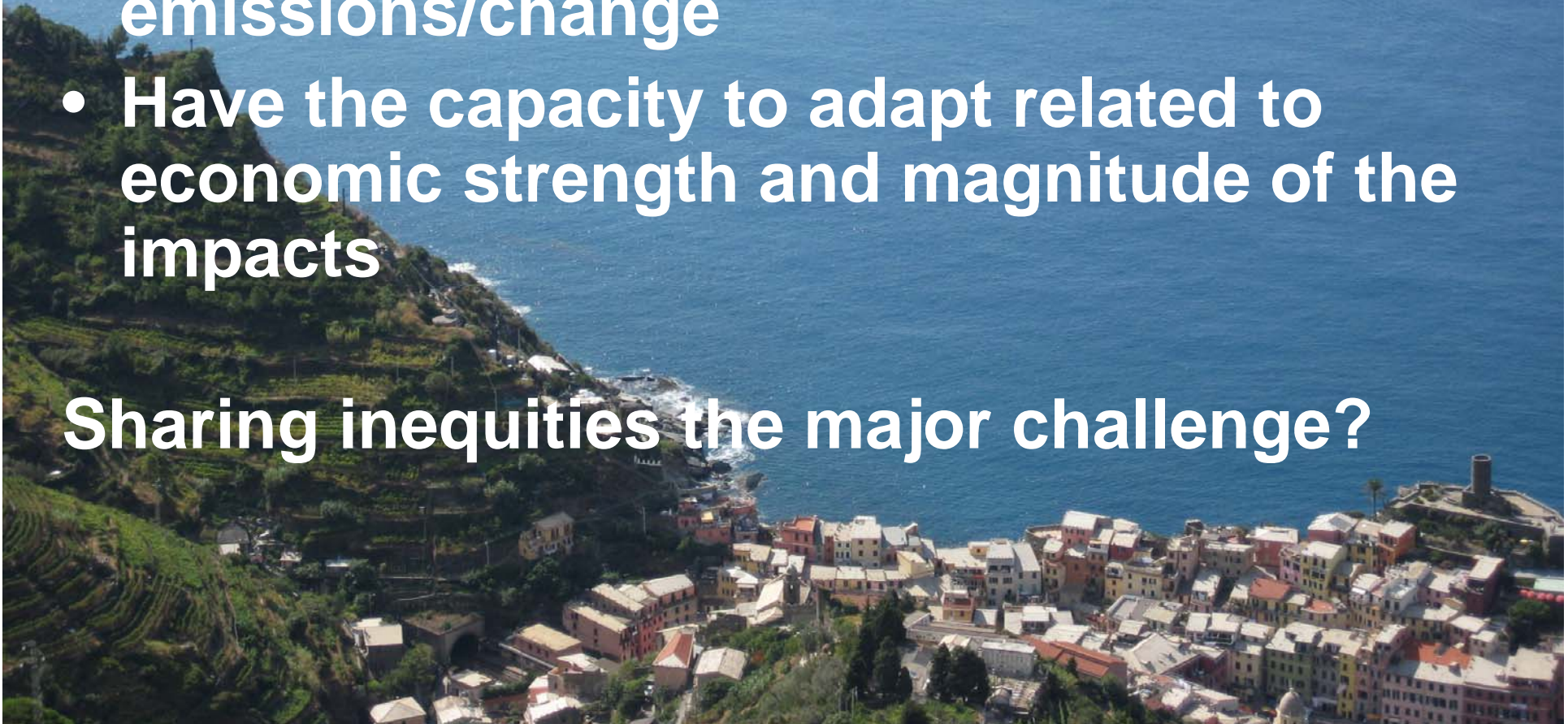
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# Equity

No two persons or nations:

- Will be impacted by same regional CC
- Are equally responsible for emissions/change
- Have the capacity to adapt related to economic strength and magnitude of the impacts

Sharing inequities the major challenge?

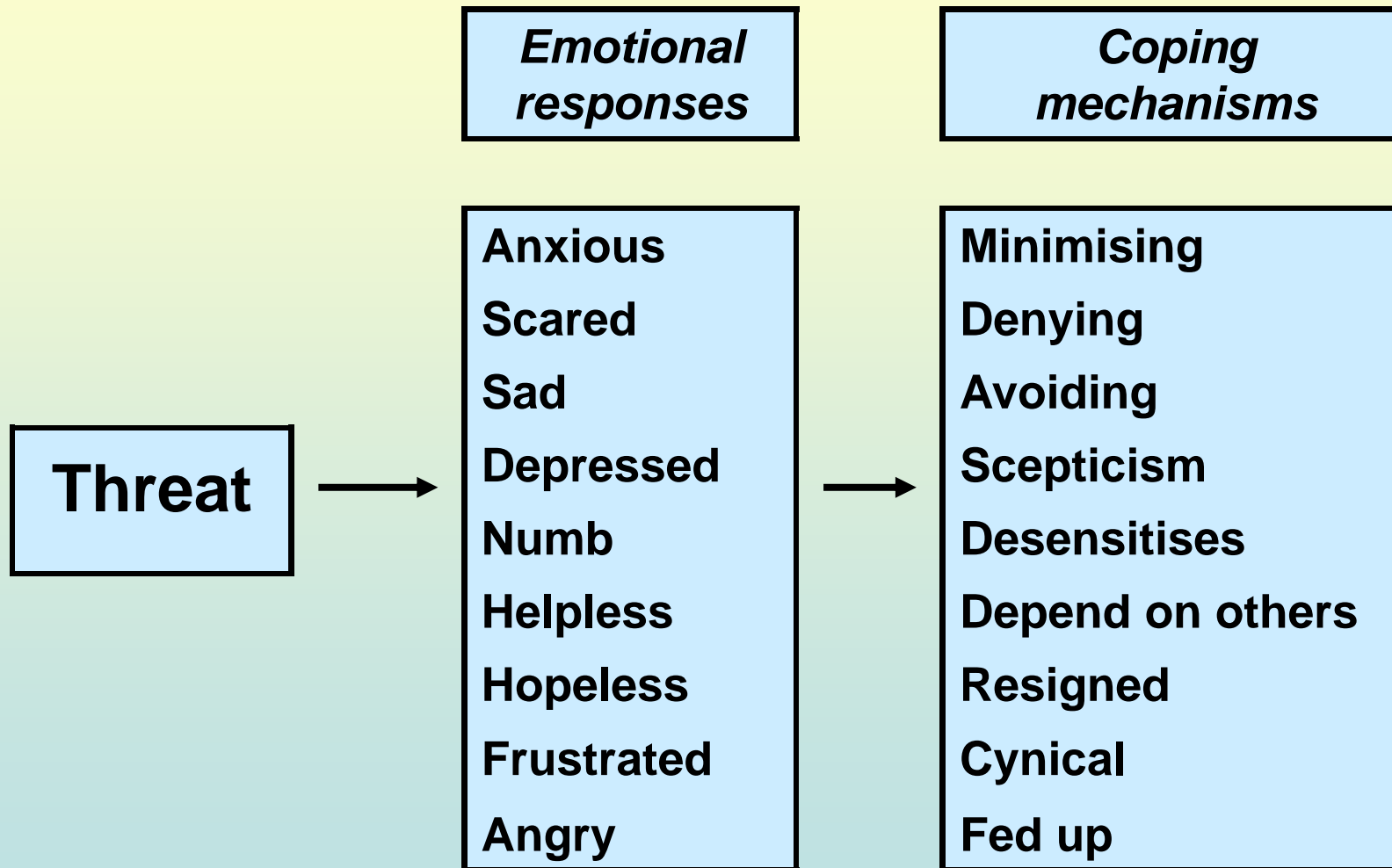


<b>What is possible?</b>	<b>What is acceptable</b>	<b>What is equitable?</b>
<p><b>Future greenhouse-gas emissions</b></p> 	<p><b>Balancing probabilities of changes occurring against magnitude of impact if they do occur, allowing for spontaneous adaptation and opportunities for managed adaptation</b></p> 	<p><b>Contribution to &amp; impact of climate change unequally shared across the community (sectors &amp; individuals) &amp; between nations</b></p> 
<p><b>Response of climate system globally and regionally to these gases</b></p> 	<p><b>Integrated assessment of combined risk, weighing capacity &amp; cost (economic &amp; other) of adaptive intervention against investment required to limit emissions/eventual levels of climate change</b></p> 	<p><b>Capacity to respond unequally shared as are current responsibilities versus those of future generations (other species) sharing Earth</b></p> 
<p><b>Potential impact on physical, biological &amp; human systems</b></p>	<p><b>Establishing global targets that confine risk below what is “dangerous”. Reassessment of targets &amp; developing practical options reflecting agendas other than just climate change</b></p>	<p><b>Agreement &amp; legislation to share costs &amp; manage inequities nationally &amp; internationally</b></p>

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# Common reactions to learning about severe environmental problems



**Change has a considerable  
psychological impact on the human mind**

**To the:**

**Fearful it is threatening *because it means  
that things may get worse***

**Hopeful it is encouraging *because things  
may get better***

**Confident it is inspiring *because the  
challenge exists to make things better***

**Based on King Whitney Jr**

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# How well do we assess risk?

- **IPCC concluded that there is a 50% chance of a 20-30% of all species being at risk with a warming of 1.5-2.5°C**
  - There has been virtually no media or public attention to this risk
- **There are 6 million parts in a Boeing 747**
  - How many could be removed or rendered inoperable before you would decide not to fly?
- **What are the consequences of inoperable ecosystems?**
- **Are probabilities widely understood let alone risk?**

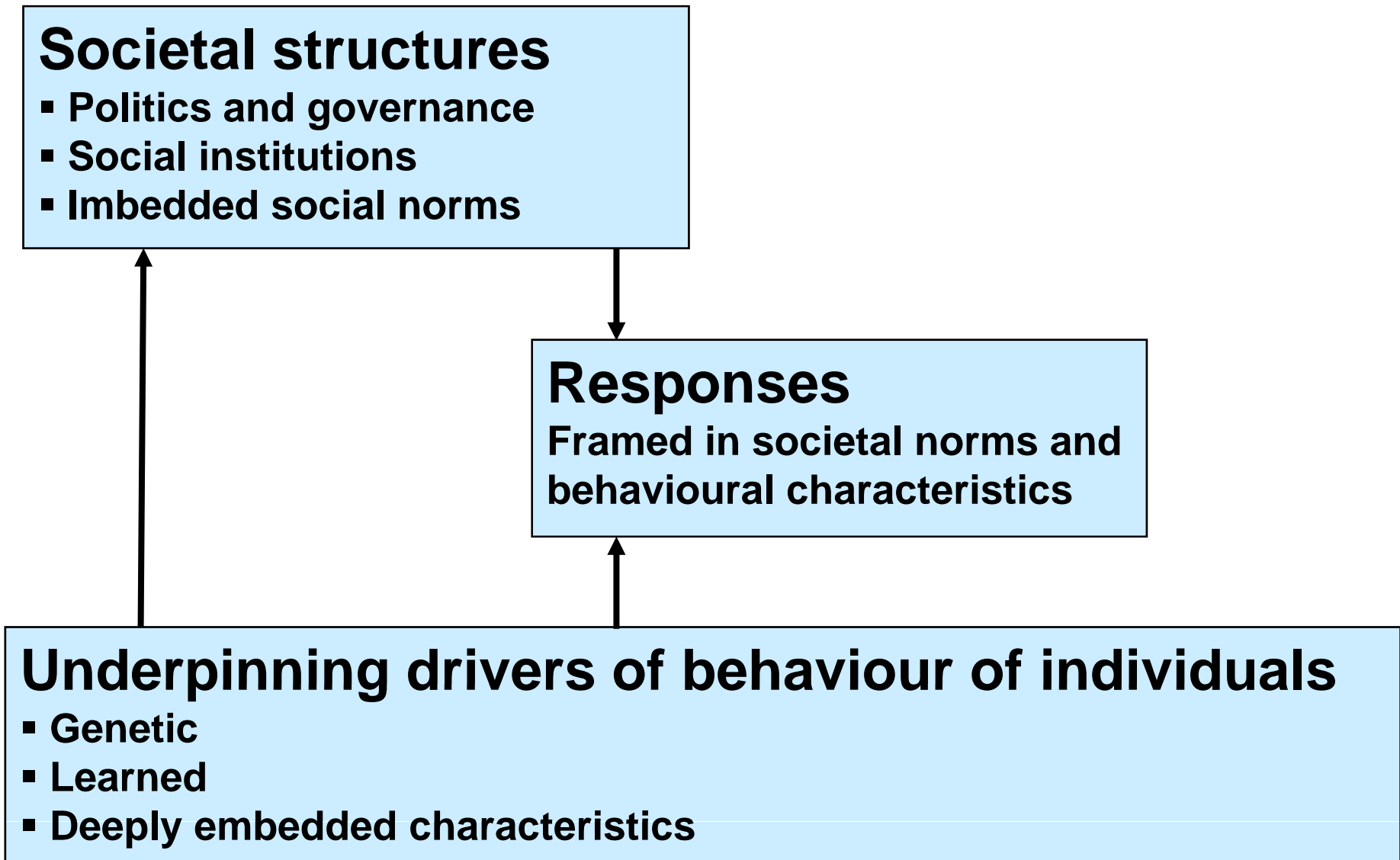
**“.....the result is a somewhat technocratic approach that fails to engage with the big questions of what our needs are and how they are constructed and reproduced”**

Fien *et al.* (2008 - personal communication)

**“Responding to the complex set of issues raised by the problem of climate change requires a deeper understanding of the behaviour, values and norms that drive the consumption of energy intensive services”**

Shove (2006) In: *Efficiency and Consumption: Technology and Practice*, Jackson, T (Ed.) *The Earthscan Reader in Sustainable Consumption*, Earthscan, UK and USA

# Human behavioural response determinates



# Dimensions of *What is Possible?*

Knowledge generation	Physical science of the climate system				Economics and energy technology				
	Biogeo-chemistry of greenhouse gases	Physics of radiation exchange & the hydrologic systems; fluid dynamics of the atmosphere and oceans		Biological <b>feedbacks</b>		Future human <b>energy use</b>			
				Dynamic response of the <b>Earth's biology</b> in turn affecting the physical climate		Future <b>energy demand</b> related to population growth, affluence & technological development		Anticipate <b>global climate change</b> for alternative human societal futures	
Past/future levels of atmospheric <b>greenhouse gases</b>	Other factors affecting <b>climate change and variability</b>	Explanation of <b>observed change</b> to the physical climate system	<b>Complexity of ecosystems</b> , limited predictability & the changing role of conservation		<b>Population growth &amp; immigration</b> policy	<b>Available technologies &amp; current infrastructure</b> investments	<b>Economic costs</b> of new technologies including impact of carbon trading on international agreements		
Behavioural science areas	Capturing complex, uncertain yet important expert <b>advice</b> for policy development & community understanding	<b>Scepticism</b> its role in Science & in the wider community	<b>Factual versus emotive drivers</b> of uptake or otherwise of expert advice	Emotive connections to land & biodiversity		Paradigms of success & drivers of emissions growth: Consumer behaviour, materialism, post materialism	Drivers and constraints on <b>community attitudes towards threats</b>	Growing <b>ethos of sustainability &amp; social/environmental responsibility</b> of corporations, conservation	
		<b>Attitudes</b> towards population growth as a related to demography, wealth, religion, education		<b>Risk perception</b>	Dealing with <b>probabilities</b>				<b>Attitudes</b> to wealth generation as paradigm of success and driver of emissions growth
		<b>Acceptance of change</b>							
Behavioural issues	<b>Role of Science</b> in modern societies	Commitment to <b>experiential evidence</b> of reality versus descriptions based on rationale argument		<b>Construction of attitudes</b> based on fact, manipulation & perception		Role of <b>markets</b> in selection of strategic options & maintenance of resilience			
	Purpose, <b>funding and management of Science</b> , impact of purchaser-provider model	Role of the <b>Media</b> in transference or distortion of knowledge		Religious demography of <b>beliefs/attitudes</b>		Role of government <b>intervention</b> in the maintenance of resilience		Nature & role of <b>leadership</b>	
		Role of <b>Education</b> in public awareness and policy development			Perceived <b>value of heritage</b> , environmental protection & international responsibly				
		Role of <b>Vested Interests</b> in stifling or promoting change of wider community value				<b>Holism</b> in the determination of options		Modification of <b>consumerism</b>	
	Complex, largely <b>ad hoc processes</b> ; exposure to weaknesses & manipulation		Role of <b>governments</b> , management of diabolical problems: uncertainty, complexity, timescales, equity			Management of responsibilities across <b>competing economic sectors</b> , self interest and jurisdictional regions			

# Information, behaviour and rationality

## *Common assumptions*

- People are essentially rational
- Rationality is conscious (we choose)
- Denial is a kind of irrationality
- Irrationality and denial can be overcome by more information

## *Alternative assumptions*

- What is rational in one context may be irrational in another
- Most rationalities are “stored” in the unconscious
- Every rationality is guided by emotion

De Kirby *et al.* (2007): *In what can you do to fight global warming and spark a movement*, Island press, Washington DC

Fien *et al.* (2008): personal communication

## At Copenhagen, this month scientists said they:

- Were worried that people could not psychologically deal with the enormity of the problem and were reverting to doing nothing
- Had failed to convey to the world how close Earth is to climate catastrophe

"At first, I thought that we could convince people. But there is a terrible inertia" "I fear that society is not up to the challenge of a crisis like this. Today, as a human being I am pessimistic." *French glaciologist Claude Lorius*

"Perhaps society has realised the seriousness, but it certainly hasn't realised the urgency" "But even if you are pessimistic - and sometimes I am - it does not help. What are you going to do? Chop off your hands and give up? That's not a solution either," *John Church Antarctic CRC*

"The risk is that when science pumps out more and more evidence that we are facing dangerous tipping points" - triggers that would make climate change irreversible - "that you put your head in the sand and move from denial to despair" *Johan Rockstrom, Stockholm Environment Institute*

"Efforts to stabilise carbon dioxide and temperature are no better than planetary alternative medicine" We have already passed a point of no return, and that it is now impossible "to save the planet as we know it." *James Lovelock*

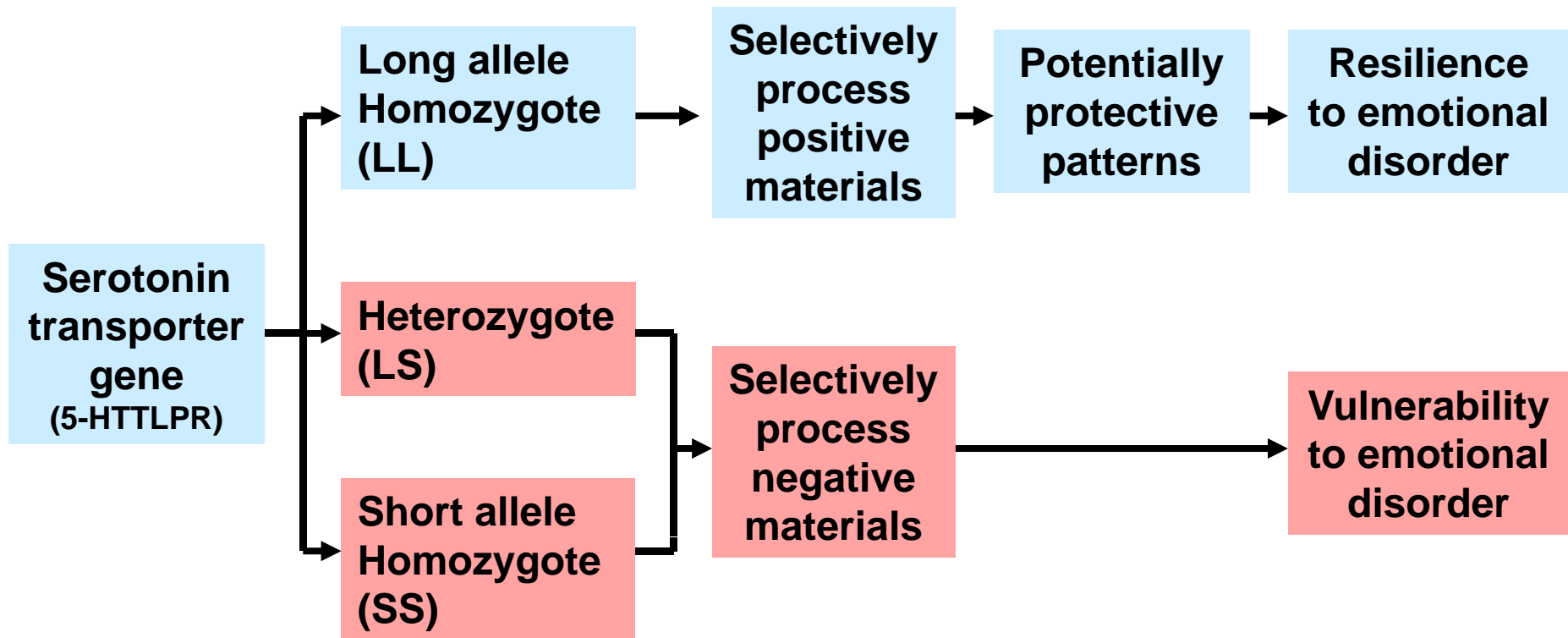
# Human dimensions of *What is Possible?*

- **Capturing of advice**
  - Role of science, media, education
- **Nature of scepticism**
  - Experiential versus observational/theoretical views
  - Scepticism as a tool or a crutch
- **Formulation of attitudes**
  - Perception of success
  - Belief/value structures, religion, cultural, ethos of sustainability
- **Basic belief structures**
  - Conservatisms, consumerism and competition
  - Vested interests
  - Managing risk
  - Perception of risk and probabilities, response to threat
  - Role of companies, governments and the individual

**“Scientists have been too dogmatic about scientific truth and sociologists have fostered too much scepticism”**

**“Post-modernists have become comfortable in their cocoon of cynicism”**

**Collins (2009). We can not live on scepticism alone- Nature 458, March 2009.**



Based on: Fox et al. (2009), *Proc.Roy.Soc.B*, doi: 10.1098/rspb.2008.1788 March 01

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# Dimensions of *What is Acceptable?*

<b>Knowledge generation</b>	<b>Physical science of the climate system</b>						<b>Medical science</b>		<b>Engineering</b>	
	<b>Hydrology</b>	<b>Oceanography</b>		<b>Agriculture</b>		<b>Ecosystems</b>	<b>Health</b>		<b>Diseases</b>	<b>Infrastructure</b>
	Impacts on stream flow & other <b>hydrologic features</b>	Sea-level rise & storminess, coastal inundation & <b>impacts</b>	Water availability, storminess, seasonality <b>affects on production</b>	<b>Regulation</b> , ownership, & cultural connections	<b>Land rights</b> , tenure & heritage	<b>Responses</b> of individual species & complexes of species to CC	Stress, & mental health	<b>Response</b> of humans/organisms to CC	Change distributions & <b>efficacy of diseases</b>	<b>Power generation</b> water demands
	Defined regionality and persons-specific impacts of climate change albeit with uncertainty									
<b>Areas in behavioral science</b>	<b>Experiential evidence</b> of variability vs. acceptance of trends	<b>Impact</b> on safety, material ownership, well being	Water as a <b>given right</b>	<b>Cultural &amp; historical connection</b> to the land as motivator	Key species determine <b>compassion, concern</b> for biodiversity	<b>Perceived value</b> of species, conservation and heritage	CC impact <b>personal coping capacity</b>	<b>Behavioral &amp; institutional change</b> appropriate for new regimes of health risk		Community <b>sectors at risk</b> from CC
	Dealing with <b>probability</b>	<b>Acceptance of change</b> , adoption of new methodologies for new conditions			Propensity to <b>migrate</b>	Potential for conflict over <b>resource ownership</b>		<b>Protection of the <i>status quo</i></b> , personal exposure to change and the wider community interests		
	Conscience and sub-conscience <b>weighing of probability</b> that a projection may come true with the magnitude of its impact if it does				Enhanced <b>humanitarian aid &amp; conflict</b> with other development goals		Nature of <b>conservatism</b>		Nature of <b>strategic-ness</b>	
	Views on <b>intergenerational responsibilities</b> , based on religious or other belief structures				What determines " <b>powerlessness</b> " in the face of threats and/or personal versus community outcomes				<b>Opportunities</b> for new investments, jobs, work place & settlement	
<b>Behavioural issues</b>	<b>Opportunity</b> to act			<b>Reluctance</b> to act		Personal <b>lifestyles</b>		Acceptance of <b>responsibility</b>		
	<b>Empow erment</b>	<b>Personal response</b> /coping actions to potential threat	Personal <b>responsibility</b> poorly defined or lacks meaning	<b>Loss of inherent identity</b> , loss of <b>place</b>	<b>Values</b> , culture, ideology, nurture	Look for technological solutions rather balance these with <b>behavioural change</b>		<b>Valuing present</b> against future (intergenerational), incorporation into religious/faith-based views of stewardship role of humans		
	Perceptions of <b>what is possible for individuals</b> vs. community/government			Perceptions of <b>what is dangerous</b> and what constitutes risk in the face of uncertainty, misinformation or ignorance				<b>Conflict resolution</b> at personal, regional, national & international levels		
	Determination/examination of multi-dimensional <b>risk</b>						<b>Environmental stability &amp; human wellbeing/health</b>			
	<b>Government intervention/regulation</b> to provide least-cost, resilient & broader community balance				<b>Sectoral/corporate intervention</b> , balancing risk across sectors for corporate/community aspirations, wealth, well being, environmental protection & intergenerational equity					

# Human dimensions of *What is Acceptable?*

- **Dealing with uncertainty and probability**
  - Weighing probabilities, reality & the non-reality world
  - Acceptance of change vs protection of *status quo*
- **Risk assessment**
  - Capturing opportunities, reluctance to act/change
  - Concerns/perceived responsibilities for culture & environment
- **Sharing responsibility**
  - Government &/or personal or corporate responsibilities
  - Behavioural &/or institutional change
  - Technologies &/or behavioural change
  - Mitigation &/or adaptation
- **Perceptions of danger**
  - Value of present &/or future
  - Perceived values of biodiversity
- **Personal responsibility and empowerment**
  - Given “rights”, cultural connections, loss of identity and place
  - Strategic-ness vs conservativeness

# Dimensions of *What is Equitable?*

	Physical science of the climate system			Economics, technology, sociology and ethics				Personal		
Knowledge generation	National & international <b>exposure to projected CC</b> with integrative climate models		National & international <b>contributions</b> to CC through emissions documentation & reporting		National & international capacity to respond to <b>changed energy resourcing</b> & application		Acceptance of <b>global</b> responsibility	Appreciation of "what I do matters"		
	Extremely different circumstances for each person and each nation, changing over time									
	<b>Regional CC</b> likely to be significantly different for all people & all nations, defined with relatively low confidence	Key regional differences lie in <b>exposure</b> to sea-level rise, water availability, storminess, ecosystem resilience	Well understood in terms of present & accumulated contribution but <b>less clear about the future</b>	Natural energy <b>resource distribution inconsistent</b> with geopolitical distribution	<b>Investment/commitment</b> too (jobs, income, tradition) particular energy sources <b>varies</b>	Technological <b>capacity varies</b> with economic & education levels	<b>Community awareness</b> of CC is relatively high, understanding is weak	<b>Public support</b> for action is growing but still based on poor understanding & vulnerable to short-timescale personal interests, views of vested interests or skeptical views		
Areas in behavioral science	<b>Matching potential impacts</b> against the community/sectoral interests & exposures to ascertain regional & socio-economic differentiation of exposure		Policies from a <b>whole-of-community perspective</b>	<b>National energy</b> use/applications for personal, regional, national value	The relationship between energy systems, natural resources & energy dependency and economic structure	Energy costs and the purchasing power of companies & individuals	<b>Promotion of alternative energy</b> resources & energy-use efficiency	<b>Public education</b> , marketing of ideas, promotion of legislation, promotion of behavioural change	<b>Formal education</b> of community at large & managers	
	<b>Matching potential impacts</b> against the community/sectoral interests to ascertain regional & socio-economic differentiation of exposure				Understanding, acceptance or rejection of <b>alternative emerging energy technologies</b>		<b>Behavioral change</b>	<b>Conflict</b> and reinforcement of perceptions of well being & long-term responsibilities		
Behavioural issues	Policy options that <b>account for inequities</b> at all levels to all levels of governments, local, state, national and international, recognizing a whole-of-community/economy perspective				<b>Nature of workforce requirements</b> for future energy infrastructure construction, maintenance, trade & management			Personal <b>lifestyles</b>		
	Management methods that include climate-change within general <b>management practices</b> within corporations					Promote <b>alternative energy resources</b> and energy-use efficiency through education, regulation and ethos				
	Formal education requirements of the community at large & managers related to the climate-change issue that <b>maximize resilience</b> , societal well-being & economic options				Respond to the <b>challenge in wider context of sectoral differences</b> in energy systems, natural resources & energy dependency & economic structure & how this impinges on energy costs & the purchasing power of companies & individuals					

# Human dimensions of *What is Equitable?*

- **Recognising personal/regional differences in:**
  - Exposure, capacity to adapt mitigate & fund responses
  - Understanding/awareness of CC & available options
  - Matching differential exposure to aspirational needs of wider community
- **Responding with**
  - Formal, workforce & public education
  - Improved/new management & energy practices
  - Balance across all sectors & jurisdictions
  - Changes to personal lifestyles & expectations
  - Protections in transition for exposed sectors/persons



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# Building resilience

- ***Holism***
  - CC coexists with poverty alleviation, energy & national security, etc.
  - Mitigation & adaptation impact on employment, competition, economics, other environmental problems, etc.
  - Disciplinary, sectoral, national, personally isolated strategies often fail to deliver to those jurisdictions or to whole community needs
- ***Uncertainty***
  - Uncertainty exists & will always exist concerning the future. Rather than attract delay it should demand actions & with urgency. It is a matter of the risk.
- ***Strategic-ness***
  - Where we wish to be over time, economically, socially & environmentally. Not set in stone but guidance towards broad, widely shared aspirations
  - Incorporate issues of future food, water, health, environmental security, disaster mitigation, security issues, etc.
  - Builds options & thus resilience into the future, in face of uncertainty

***“Research must be interdisciplinary because human-environment relations are natural and technological as well as behavioral and because the relevant human actions are those not only of industries, but also of communities, organizations and political-economic institutions”***

Stern *Annual Review of Psychology* (1992) 43, 269-302

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**“recent assessment reports suggest.... the contributions of the social sciences require not only a robust engagement with the natural sciences, but also a “scaling down” of research sites in order to study the institutional and cultural logics informing the adaptation and responses of communities susceptible to the unpredictable effects of environmental change”**

US Social Science Research Council.

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# Building resilience

- ***Flexibility***
  - Provides options as new knowledge emerges
  - Avoids dead-ends or undesirable dislocations
- ***Resilience***
  - Diversity & flexibility maximises the chance of dealing with unforeseen futures:
    - Avoids narrow systems approaches that can be so focussed as to lose the capacity to respond
    - Recognises complexity & limitation of knowledge at any point of time; that perfect anticipation of outcomes for any approach is not possible

**Climate-change:  
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**Conclusions**



# Conclusions

**The issue is indeed diabolical requiring:**

- **Acceptance of uncertainty as an on-going component of risk management**
- **More fundamental knowledge**
  - **Particularly concerning human behaviour**
- **Improved**
  - **Holism, strategy, flexibility, building of resilience**

# Conclusions

- **Climate change is a problem seeking solutions**
- **But more: It is an indicator that social evolution has led to directions, attitudes, aspirations, institutions and governance structures that are not sustainable**
- **Climate change offers a framework/opportunity to consider these behavioural/social directions in a much wider range of outcomes for humanity**

# Conclusions

**Are we up to the challenge?**

- **There is no *a priori* reason why the anticipated problems will be avoided**

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