Australian Government

Department of Climate Change

Australasian UNEP FI Working Group Adaptation Workshop

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Settlements and Infrastructure Adaptation

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Climate change challenge

- A wicked policy problem – uncertain, insidious, long term, beyond national action alone
- Significant scientific, economic, social, environmental and strategic challenges – many of which are poorly described
- Climate system appears to be changing faster than earlier thought

"HOW ON EARTH DO WE TURN IT OFF?"

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Queensland Floods and Climate Change

- Not possible to attribute floods to climate change – Australia's weather is highly variable
- Ocean warming is creating conditions conducive to heavy flooding
- Global climate models show an increase in the frequency of intense rainfall events

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Outline

1. Overview of climate change science
2. Implications for the financial sector from climate risks
3. Australian Government's climate change strategy
4. Future directions

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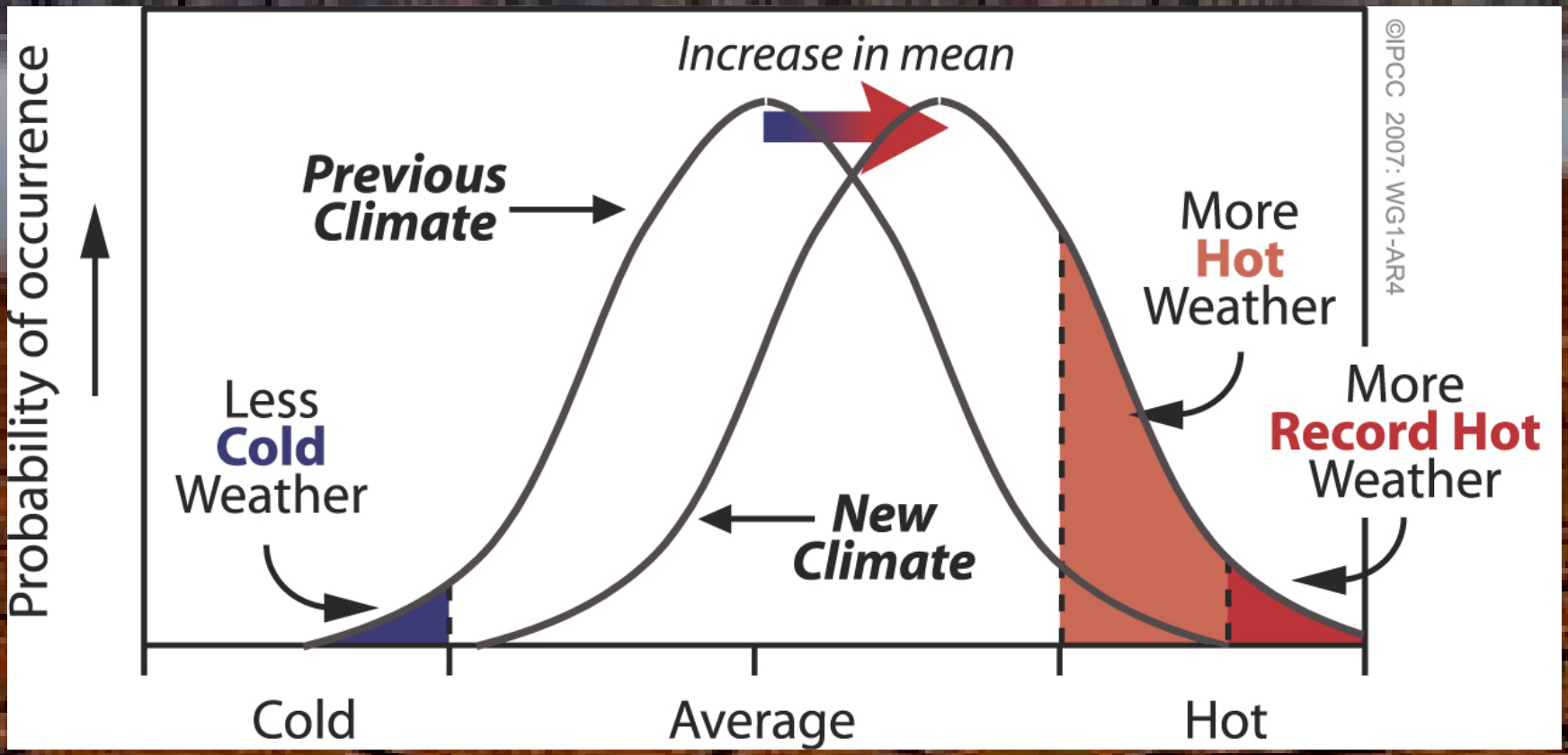
Scientific basis

- Science robust – disjunct between weight of evidence and public awareness
- While IPCC has been criticised, its core findings on climate change remain solid
- Uncertainties still exist – but most operate toward more rapid and severe change, and larger impacts
- Climate change not proceed smoothly – extremes, abrupt change and non-linearities will drive impacts

Change in means – non linear response in extremes



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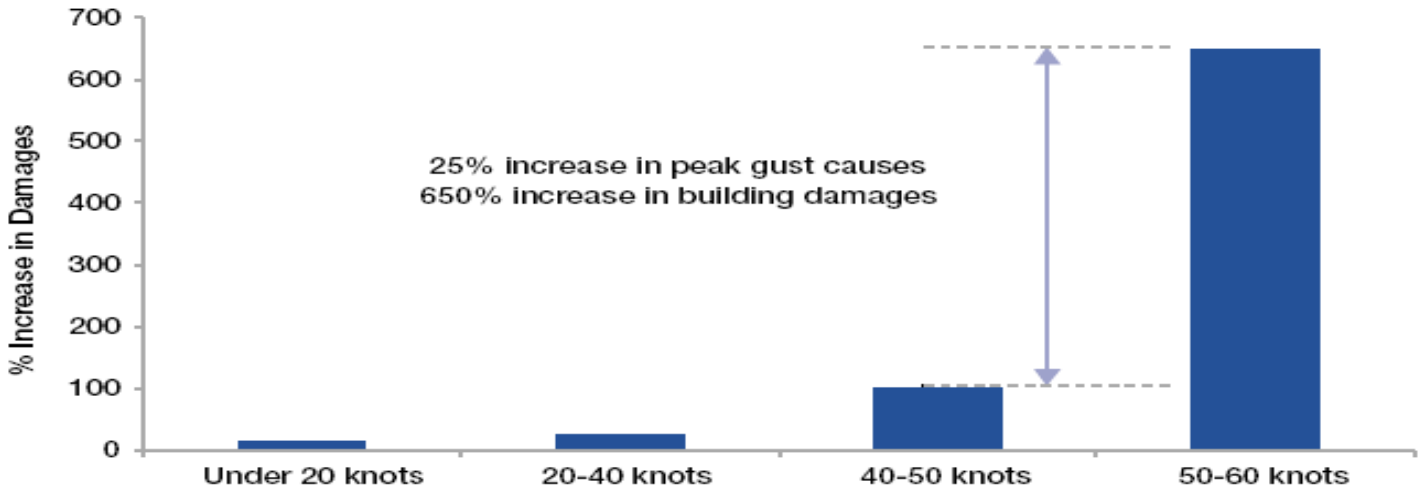
Non Linear Damage Functions



Hazard	Cause Of Change In Hazard	Resulting Change In Damage/Loss
Windstorm	Doubling of windspeed 2.2 ˚C mean temperature increase	Four-fold increase in damages Increase of 5-10% in hurricane wind speeds
Extreme temperature episodes	1 ˚C mean temperature increase	300-year temperature events occur every 10 years
Floods	25% increase in 30 minute precipitation	Flooding return period reduced from 100 years to 17 years
Bushfire	1 ˚C mean summer temperature increase Doubling of CO2	28% increase in wildfires 143% increase in catastrophic wildfires

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Cost of extreme weather events

- 1974 – Cyclone Tracy and Brisbane floods - $7 billion
- 1989 – Sydney hailstorm - $5 billion
- 2003 – Canberra bushfires - $500 million
- 2007-08 - Drought - ↑ 85% in global wheat price
- 2009 – Victorian bushfires - $2 billion (low estimate)
- 2011 - Queensland floods - $5.6 billion (low estimate)
- 2050 – GNP ↓ 1.2%
- 2100 – GNP ↓ 2.4%

Infrastructure

The reliable supply and performance of infrastructure underpins the Australian economy

TABLE 1: Estimated three largest national cost impacts of climate change to infrastructure in Australia over the three time periods (discounted at 3 per cent)

Time period	Top 3 Largest Cost Impacts		
	1	2	3
2008-2030	**Residential Buildings** Reduced Life Expectancy $20,381 million	**Residential Buildings** Operational Expenditure $9,091 million	**Residential Buildings** New Buildings $4,865 million
2031-2070	**Residential Buildings** Operational Expenditure $22,143 million	**Electricity T&D** Capital Expenditure $16,795 million	**Residential Buildings** New Buildings $10,652 million
2071-2100	**Electricity T&D** Capital Expenditure $11,787 million	**Residential Buildings** Reduced Life Expectancy $11,031 million	**Residential Buildings** Operational Expenditure $10,145 million

Decisions made today about design, location, structure and form will have lasting consequences for the resilience of settlements and essential services

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TABLE 10: High level analysis of drivers influencing adaptive capacity for infrastructure sectors

		Adaptive Capacity								
		Adaptation Drivers								
		1	2	3	4	5	6	7	8	9
Infrastructure Sector Type	Infrastructure Type & Time-frame	Level of climate change impacts on asset	Impacts to level of service	Level of impacts to human health & potential community outrage	Higher operational costs	Federal/ state/ local regulation and ac-countability currently applied to influence sector	Compensa-tion and legal liability issues	Insurance issues	Critical rat-ing (inter-dependen-cies)	Reduced asset life
Transport	Roads	M	W	W	W	W	M	W	S	W
	Rail	M	M	W	W	W	M	W	S	M
	Bridges	M	W	M	W	W	M	W	S	M
	Ports & Maritime	M	M	W	W	W	M	W	S	M
Energy	Transmission & Distribution	S	S	M	M	W	M	W	S	S
Buildings	Residential	W	W	W	W	M	W	M	W	W
	Commercial	W	W	W	W	W	W	W	W	W
	Urban Facilities	W	W	W	W	W	W	W	M	W
Water	Water Supply & Sewerage Treatment	S	S	M	M	M	M	W	S	M
Telecommunications	Fixed Line & Towers	W	W	W	W	W	W	W	M	W

W = Weak M = Moderate S = Strong

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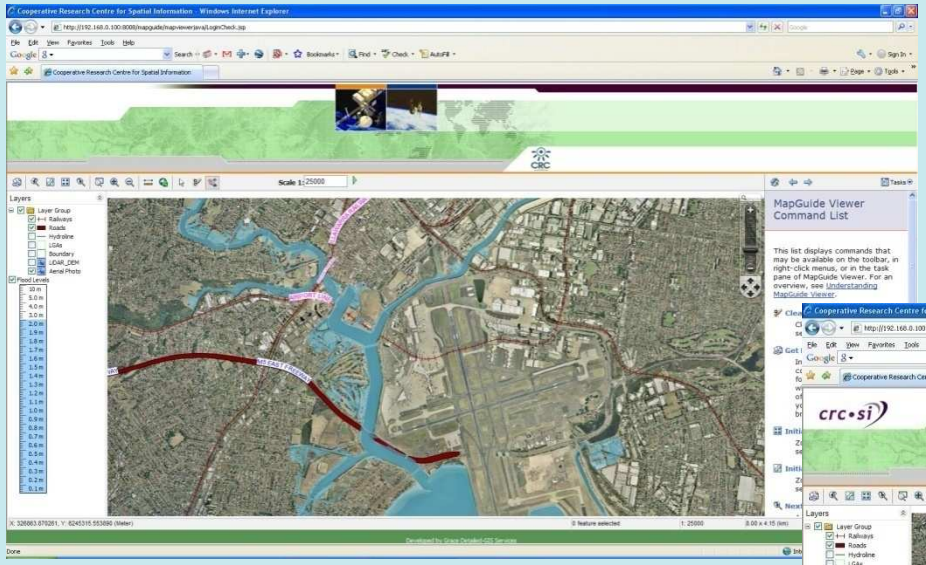
TABLE 11: High level analysis of barriers hindering adaptive capacity for infrastructure sectors

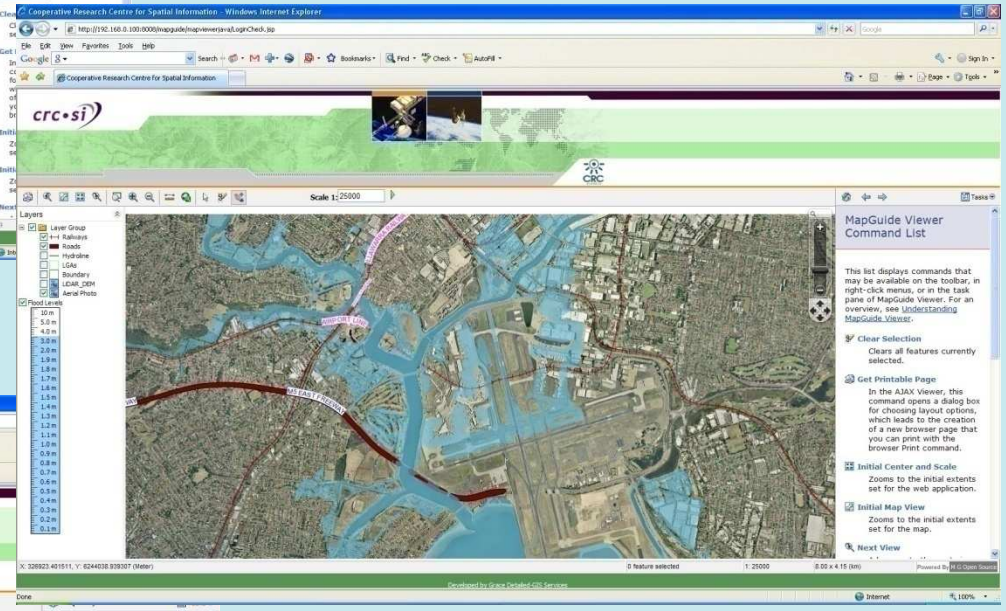
		Adaptive Capacity						
		Adaptation Drivers						
		10	11	12	13	14	15	16
Infrastructure Sector Type	Infrastructure Type & Timeframe	Higher capital costs of adaptation for new infrastructure	Higher replacement & upgrade cost for existing assets	Size of operation	Coverage of operation	Absence of climate change adaptation in planning, standards & investment decision-making	Lack of climate change adaptation in government grant & funding programs	Knowledge gaps of climate change impacts (variables, modeling, data)
Transport	Roads	L	H	H	H	H	H	M
	Rail	L	H	H	M	H	L	L
	Bridges	L	H	M	M	H	L	M
	Ports & Maritime	M	H	M	M	H	M	H
Energy	Transmission & Distribution	M	H	H	H	H	M	M
Buildings	Residential	L	L	L	M	M	L	M
	Commercial	L	M	M	H	M	L	M
	Urban Facili-ties	L	H	H	H	M	L	M
Water	Water Supply & Sewerage Treatment	M	H	H	H	H	M	H
Telecommunications	Fixed Line & Towers	L	M	M	M	M	M	H

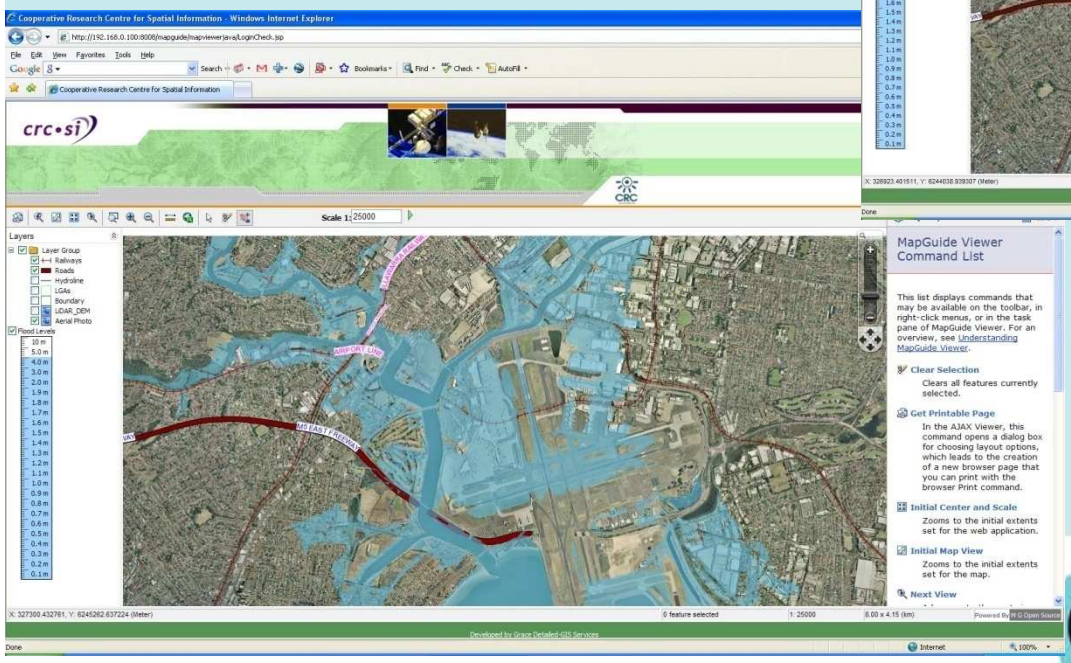
L = Low M = Medium H = High



2 metres

3 metres





4 metres

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Implications for the financial sector

- No investment will be immune to the impacts of climate change
- The severity of impacts will be a function of the level of interdependence with sectors more directly affected by climate change

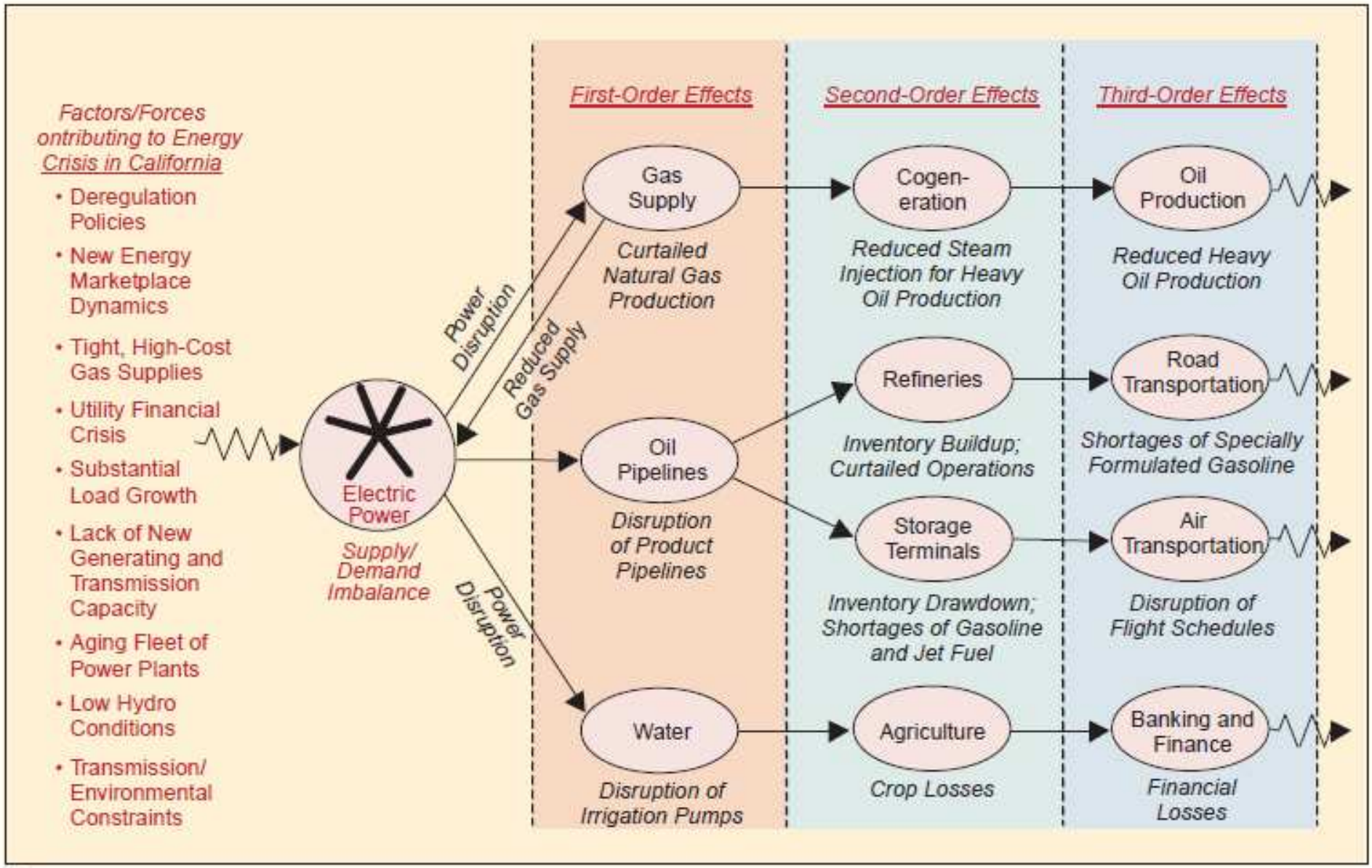

Figure 4. *Examples of nth-order interdependencies and effects.*

Rinaldi, S et al, Identifying, Understanding, and Analyzing Critical Infrastructure Interdependencies ***IEEE Control Systems Magazine***, December 2001, p. 19.

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Climate Change impacts on debt and equity

- Climate change impacts on prices will affect the competitiveness of investments
- CAPEX and OPEX is projected to increase
- Asset depreciation rates are likely to increase
- Efficiency and productivity may decline
- Loss contingency reserves may need to increase
- Investment in overseas activities may be put at increased risk

Stenek, V et al, Climate Risk and Financial Institutions, International Finance Corporation, 2010.

Climate change and insurance

- Individuals, organisations and governments have a tendency to discount future risk
- Lack of information and the nature and extent of risk contribute to the problem
- Moral hazard and high levels of disaster relief support underinsurance by individuals
- Better linkages between compensation and action to reduce risk are needed to foster resilience

Where to from here .....

- There is a need to take better account of whole of life costs (investment, real assets) including those that are likely to arise from climate change
- There is enough information in the public domain **now** to support consideration of climate impacts in investment decision-making
- It is in the interests of the financial sector to require its investment partners to have considered risks arising from climate change

Australian Government's adaptation agenda

- Key role in national efforts to increase Australia's ability to respond to climate change impacts
- Build knowledge base and adaptive capacity
- Work with partners to assess major climate risks and encourage solutions
- Adaptation policy development

Specific Adaptation Activities

- Climate change science and adaptation research – Networks – NARPS – Research Grants
- Risk assessments – infrastructure and local government
- Digital Elevation Models
- Extreme events – e.g. Wind, cyclone zones, intense rainfall, extreme heat
- Australian Rainfall and Runoff Handbook
- Damage curves and materials analysis
- Development of models to value and optimise investment in adaptation
- Identification of barriers and constraints to adaption and actions to reduce them

Emerging issues and needs

- Work with research organisation on climate change scenarios
- Filter & translate climate change data through engineering design standards to identify those needing review
- Risk analysis of infrastructure vulnerability at a variety of levels
- Review adequacy and/or application of existing standards/codes
- Tools & guidance for planners and designers
- Cost-benefit analysis of adaptation options – much better info needed
- Identify potential and priorities for partnerships between industry and government

In conclusion

- Climate change science is robust
- Climate change impacts on buildings could be economically significant
  - Climatic shifts occurring within design life of structures
  - Magnitude of legacy risk unknown but could be large
  - Assumptions of static climate no longer valid
- Adaptation agenda very new
  - Being informed by initial national risk assessments
  - Will need further consideration of risk allocation, cost-benefit analysis of alternatives, appropriate timing of adaptation, legal liability, etc., etc.,

Source: Environment Victoria

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