A Climate Risk Report

Synthesis Report: Climate Change and Infrastructure Expert Summit

Convening Partners:

Climate Risk

EVANS & PECK

INFRASTRUCTURE PARTNERSHIPS AUSTRALIA
BUILDING AUSTRALIA TOGETHER

MALLESONS STEPHEN JAQUES

ZURICH®

Climate Risk Pty Ltd provides specialist professional services to business and government on risk, opportunity and adaptation to climate change.

www.climaterisk.net

Climate Risk

Climate Risk Pty Limited (Australia)
Sydney: + 61 2 8243 5767
Brisbane: + 61 7 3040 1621
www.climaterisk.net

Climate Risk Europe Limited
London: + 44 752 506 8331

This Synthesis Report was prepared by:

Karl Mallon
karl@climaterisk.com.au

Donovan Burton
donovan@climaterisk.com.au

Maria Mackiewicz-Turner
maria@climaterisk.com.au

The Climate Change and Infrastructure Summit took place on the 29th of July 2009 and was held at the head office of Zurich Financial Services Australia in Sydney. The Climate Change and Infrastructure Summit was led by Dr. Karl Mallon and Mr. Donovan Burton of Climate Risk Pty Ltd, in partnership with infrastructure advisory firm Evans & Peck, law firm Mallesons Stephen Jaques, and the infrastructure industry peak body Infrastructure Partnerships Australia.

This synthesis report attempts to reflect the key aspects of expert analysis and discussions. The content does not necessarily reflect the opinions of the convening partners or any individual attendees.

Foreword

As this report is released at the 15th Conference of the Parties negotiations in Copenhagen, heads of state from around the world will arrive to seek a means to limit future global warming.

What few dispute, is that a significant level of warming has already occurred and more is unavoidable. These effects are already impacting the bottom line of companies around the world. This is clearly evident in the escalating weather related losses reported by the insurance sector. Just this decade the fraction of weather related losses in Australia has increased from 12% of policy payouts to over 30% according to the Insurance Council of Australia.

Infrastructure is at the front line of adaptation. Resilient infrastructure will be the corner stone of a resilient society. The criticality of infrastructure, from power to water, rail to ports, roads to telecommunications, will only increase with climate change.

This summit brought together leading infrastructure experts in Australia to further explore the emerging climate challenges. The Summit was characterised by robust and frank discussions with competing perspectives of existing and nascent issues. The Summit was also characterised by a strong meeting of minds on the real world challenges of adapting infrastructure to climate change today and the need to make swift progress on solutions and co-operation.

The major challenges identified have been detailed at the end of this report and I strongly urge professionals who are involved in infrastructure development, lending, insurance and assessments to study the Critical Issues chapter.

On behalf of the convening partners, I would like to sincerely thank all presenters and participants, and hope that we have reproduced their contributions with fidelity.

On behalf of all participants, I would like to reflect the overwhelming consensus that this Summit has been the starting point for a dialogue that must continue for the benefit of a wider society seeking to cope with one of the great challenges of our age.

Karl Mallon
Director of Corporate Risk, Climate Risk Pty Ltd

Contents

1 Executive Summary

Australia is experiencing a major nation-wide surge in infrastructure investment. At the same time, significant Federal and State Government climate change policy is being formulated, announcements are being made about the ramifications of future sea level rise, and extreme weather events including bushfires, heatwaves, heavy rainfall and flooding are highlighting the vulnerability of Australia's existing infrastructure to climate change.

These fast-emerging climate change risks to infrastructure were the trigger for this Rapid-Response Summit "by the private sector, for the private sector." Specifically, the summit's aim was to explore the implications of climate change for the future of infrastructure risk management and transition in Australia.

These risks were considered from the perspectives of multiple stakeholders, drawing on their wide-reaching expertise and lengthy experience. The format consisted of speaker sessions, panels, and discussions which aimed to focus on key issues and identify the challenges facing the sector.

1.1 Summary of Key Issues

The following key issues were identified at the summit.

1.1.1 The Information Dilemma

An important strand of discussion at the conference focussed on important gaps in information about climate change and its associated risks.

Climate change uncertainties still exist, many of them stemming from unknowns about how the Earth's physical and biochemical systems will interact with rising greenhouse gas emissions and climate change. Because infrastructure decisions still need to be made, such uncertainties have to be accepted and managed.

Multiple Stressors

Clusters of extreme events, or a single event acting in combination with other stressors such as oil shocks, may threaten the survival of businesses; industry and government need to be ready for these multiple stressor events. Current risk assessment methods do not account for the "Climate Black Swans".[1]

Variability is Critical

Managing climate variability, already a reality in Australia, will become more difficult with increasing climate change. Regardless of "mean" changes the variability will in future entail managing for even more frequent and intense extreme events and cycles.

Not All Models Are The Same

There is also a need for better understanding of regional vulnerability to climate change; time and resource investment are needed to identify the specific or ensembles of global circulation models that work best for a given region. Stakeholders need to be educated about the risks of using inappropriate data.

1 A reference to the fact that Europeans were once certain all swans were white -- until presented with evidence of black swan species; "black swans" are instances when new evidence causes old models to become immediately obsolete. The term "climate black swans" refers to the existence of weather extremes that lie outside the bounds of the majority of weather events experienced.

Auto-Adaptation Risks

Significant uncertainty surrounds the extent to which climate change will push communities' coping capacity beyond the range of their historical experience and planning. Moreover, tertiary impacts – namely how people and society auto-adapt to climate change impacts and regulation – must also be considered in infrastructure design and planning. For example, extreme weather may result in population shifts that render some infrastructure redundant.

Climate Risk Quantification

For private-sector investors of infrastructure, it is important to ensure that climate change risks are quantified within a business case of a major infrastructure project, especially where Public Private Partnerships are concerned. However, in practice the financial effects of climate change impacts are proving difficult to quantify in relation to company risk and growth. It can be done but methods and examples are only just emerging.

1.1.2 Key Areas of Climate Change Risk to the Infrastructure Sector

High Risk Regulations and Locations

There was a recognition that the greatest short-term legal risks for infrastructure developers may stem from the rapidly-changing regulatory landscape. From the perspective of investors and the financial community, the key issues are also regulatory, especially if they have a direct nexus to earnings and company viability. From the insurance perspective, areas most at risk are those that lack insurance or where cover would be denied.

Standards Are No Protection From Litigation

Whilst climate change litigation will happen, it is not a sustainable long-term solution for dealing with climate change related losses. Unfortunately, industry standards will most probably be insufficient to shield developers from litigation action. They will have to show that they have adequately accounted for climate change.

1.1.3 Managing Climate Change Risk

Adapting Society Through Infrastructure

Moving forward, summit participants also discussed the avenues open to adapt to, and mitigate, climate change risk. They recognised the need to increase business and civil society resilience to escalating extreme weather impacts, and agreed that infrastructure will be part of that process.

Adaptation encompasses the need to reassess our view of infrastructure resilience, as well as for operational responses that reduce the risk of adverse climate change impacts. *Susceptibility* as well as *likelihood* of harm must be recognised when assessments are made of infrastructure and operations vulnerability. Furthermore, the long-term view of economic sustainability in industry must be encouraged as an avenue to build resilience against specific climate change impacts.

Affordable, Available Insurance

Insurance was recognised as an important means of addressing climate change risk. There is a need to keep insurance available and affordable to maintain asset values and attract private sector finance.

Reduce Risk Instead of Transfer

Given that transfer of escalating risk to insurers cannot continue indefinitely, there is a need for insurers and infrastructure stakeholders to develop a dialogue about adaptation to ensure risks remain insurable.

1.2 The Challenges Ahead

The summit attendees also identified key challenges faced in managing climate change risks to infrastructure, as follows.

1.2.1 Standards & Methodology

A number of key challenges for the infrastructure sector stem from issues related to the relevance of industry standards in an era of climate change, and the need for appropriate methodology to assess climate change risk.

Standards are not keeping up with fast-moving climate change science and projections; given that keeping up may be impossible, how can a standards process be put in place which is sufficiently dynamic to cope with fast-moving impacts? And where standards fail to reflect the level of climate change risk, and the onus shifts to infrastructure developers to prove they have addressed the risks, how can they demonstrate they have adequately factored in climate change? And how much is enough?

Given that the notion of "fit-for-purpose" changes rapidly in a changing environment, can we design infrastructure capable of being upgraded as the actuality of climate change impacts and risks evolve? Can we redefine fit-for-purpose to avoid the inefficient use of resources to build fortresses, yet build in the ability to fortify in the future?

Given greater awareness amongst stakeholders of climate change risks, how can the AS/NZS4360 risk assessment methodology be enhanced to specifically improve the quality of climate change risk assessment (e.g. in the area of multi-stressor confluence)?

1.2.2 Government and Policy-Related Challenges

Another important strand of challenges discussed at the summit relate to infrastructure's interface with government, including policy making.

Given concerns that climate change could impact vulnerable communities and compound existing capacity issues e.g. of the health care systems, how does the infrastructure sector ensure that its heightened importance and criticality to communities' climate change resilience is recognised and resourced today?

How can the infrastructure sector achieve greater cooperation with all levels of government to ensure proper integration and mitigation of climate

change risks, and avert the mere transfer of risks which fails to reduce them?

Given the need for an integrated, "joined-up policy" approach to decision-making on climate change, how does the infrastructure sector ensure consistent treatment of climate change adaptation across all departments and levels of Government, but ensure the risk response is not "dumbed-down"?

Get Price Signals Through

If consumers / markets are shielded from price signals required to trigger behavioural change, this can tie the hands of infrastructure developers. How can the private sector and government work together to dismantle market and regulatory disincentives to climate change adaptation in the infrastructure sector?

1.2.3 Improved Communication and Access to Information

A third strand of challenges centred on the need to access and communicate information related to climate change risks and solutions.

In the face of scepticism, debate and politicisation of climate change, how does the infrastructure sector establish a consistent, professional position on climate change impacts and risks which is accepted industry-wide by professionals, directors and officers?

Given a limited willingness to share information within and among industries, and the failure in some instances of publicly-funded research to reach the public domain, how can existing or commissioned information on climate change be placed into the public domain to ensure greater access by infrastructure developers, operators and their advisors?

Given the risks of decision-making based on inadequate information, how could the infrastructure industry more effectively access the insights and expertise of insurers on climate change?

Maintaining a Dialogue

Considering the usefulness of communication shared at this Rapid Response Summit, can dialogue on climate change impacts and adaptation continue across infrastructure and all its stakeholders?

1.2.4 Other Key Challenges

The summit attendees also recognised that mitigation and adaptation action cannot be pursued in isolation; how can the infrastructure sector ensure full and consistent integration of climate change adaptation with emissions mitigation?

Finally, another key challenge relates to the possibility that changes in insurance costs and availability may make some locations and assets less valuable. How can the infrastructure sector remain open to insights about climate change risk and insurability if they risk undermining current value (i.e. ensure that the best option is not to turn a blind eye)?

2 Introduction

On the 29 July 2009, the Climate Change and Infrastructure Summit assembled leaders engaged in all major categories of infrastructure. This included infrastructure stakeholders from the areas of finance, law, local government planning and insurance.

2.1 Summit Aims

The Summit's aim was to explore the implications of climate change for the future of infrastructure risk management and insurance in Australia.

Australia is currently experiencing a period of a major nation-wide surge in infrastructure investment — a period which also coincides with Federal and State Governments announcements on the potential ramifications of future climate-change-induced sea level rise.

Vulnerability of existing infrastructure to major weather-related events is already being emphasized by severe bushfires and heat stress in Australia's south, contrasted with heavy rainfall and flooding in the nation's east and north. The frequency and severity of extreme events – which have already caused tens of millions of dollars in damage to National, State and Local infrastructure – is expected to increase as climate change proceeds.

Infrastructure underpins the economy, thus it is imperative that Australia manage the impacts on infrastructure from climate change. The summit addressed this imperative by considering the perspectives of multiple stakeholders, drawing deeply on their wide-reaching expertise and lengthy experience.

2.2 Attendees: By Industry for Industry

The Summit was themed as an event "by the private sector, for the private sector". This focus allowed issues to be deliberated primarily from a commercial vantage point, while also considering the extent to which the private-sector can manage climate change risks internally, and the part governments may play in assisting or undermining such processes.

The summit was a "rapid response" conceived out of the need to explore fast-emerging climate change risks. Although participants were given just four to six weeks notice of the event, the uptake was robust and diverse, and the limit of 60 attendees was quickly exceeded, necessitating restrictions on attendees per organisation. This strong response emphasises the awareness of significant climate change issues across the sector, which are emerging during a rapid rollout of regulatory responses at a time when inherent uncertainties in climate change predictions remain.

Summit participants came from diverse sectors including:

- Private-sector infrastructure owners and operators
- Public-sector infrastructure owners and operators

- Infrastructure developers
- Infrastructure engineers and builders
- Major Australian consultants
- Specialist lawyers from the private sector and academia
- National climate change research bodies
- Climate scientists
- Federal and state departments responsible for climate change
- Infrastructure investors and lenders
- Policy analysts from civil society

Most major infrastructure types were represented by participants active in their industry sector, including:

- Roads
- Rail
- Water
- Telecommunications
- Ports and Maritime
- Energy Generation and Distribution
- Urban Design

3 Themes, Speakers and Issues

The Summit was separated into four sessions, of three to four speakers each, as listed below (Table 1). Each session concluded with these speakers forming a panel to respond to audience questions, challenges and debates. In the final 1.5 hours of the day a "World Café" was held to focus on key issues and identify problems and solutions.

Table 1: Summary of speakers and overview of issues covered.

Name	Organisation	Issues Covered
Mr. David Smith	Chief Executive Zurich Financial Services	Opening address – included examples from NZ and the role that insurance plays in community resilience.
Prof. Roger Stone	Professor in Climatology and Water Resources Director, Australian Centre for Sustainable Catchments University of Southern Queensland	Science of climate change – climate change variability, ENSO phenomenon, confluence of sea level rise, storm surge and cyclone intensity.
Mr. Mark Conlon	State Coordinator, Impacts and Adaptation DECCW	Climate Change and Infrastructure implications for state government, covering issues relating to climate change risks for infrastructure, and the NSW DECCW action plan in relation to climate change mitigation and adaptation.
Mr. John Verhoeven	Water Security, Natural Resources and Climate Change Risk Evans & Peck	The direct and indirect climate change impacts on infrastructure, and management implications for infrastructure owners and managers. Areas explored include water, power, ICT, built environment, mining and quarrying, and transport.
Ms. Narelle Daniels	Economist and Project Manager Queensland Main Roads	Presentation on the integrated climate change risk assessment for the Port of Brisbane Motorway Upgrade Business case. Included information on how climate change impacts were quantified for tolling.
Dr. Greg Allen	Manager Science and Technology Sydney Water	Sydney Water response to climate change – included an outline of the operating context for Sydney Water and their climate change strategy including risk assessment, adaptation and response.

Name	Organisation	Issues Covered
Dr. Turlough Guerin	Group Manager Environment Telstra Corporation Limited	Presentation on the Carbon Disclosure Project and the climate risks facing Telstra and the telecommunications industry – identified risks from physical damage to network due to extreme weather events, to the lack of understanding of implicated risks in international offices. Telstra's actions to manage and adapt to climate change risks and its impacts were also discussed and examples were given.
Dr. Ian Woods	Senior Research Analyst AMP Capital Investors Sustainable Alpha Fund	Climate change, infrastructure, insurance and investment; focus on regulatory risks and other aspects with a direct link to earnings. Investor-based action for understanding investment risks related to climate change was also discussed.
Prof. Jan McDonald	Griffith University Law School	Exploring anticipated litigation for failure to address climate change (including mal-adaptation). Focussing on the future and how land use planning can be utilised to reduce the potential for litigation.
Mr. Vishal Ahuja	Partner Mallesons Stephen Jaques	Regulatory risks from climate change. Issues surrounding due diligence, lending and exposed industries under anticipated nature of CPRS.
Mr. Karl Sullivan	General Manager Policy - Risk and Disaster Directorate Insurance Council of Australia	Overview of the insurance industry in Australia, how insurance works, the types of extreme weather risks, and how to adapt to the pool of increased risks.
Adj. Prof. Peter Best	Cindual Pty Ltd and Australian Centre for Sustainable Catchments, University of Southern Queensland	Climate prediction, insurance and adaptation in the energy and agricultural sectors. Including climate variability and change of equal importance for extreme weather impacts on much infrastructure; multi-scale nature of future energy and agricultural systems – opportunities for climate risk products; and seasonal climate forecasting, insurance innovations & adaptation incentives.
Ms. Alice Cahill	Corporate Responsibility Manager Zurich Financial Services Australia	Issues of mutual dependence and mutual benefit. Interaction between insurer, broker and business customer and importance of insurance being available and affordable despite increasing risks.

4 An Overview of Some Climate Change Hazards to Australian Infrastructure

John Verhoeven, of international infrastructure management consultants Evans & Peck, provided an overview of the various hazards that climate change poses across the different classes of infrastructure. This included both the direct and indirect risks faced by infrastructure owners and managers, and management implications for asset owners and managers.

Beginning with water infrastructure, Mr. Verhoeven highlighted critical risks to potable water supply. These include water shortages, which may be further exacerbated by increased demand, and the wide threats posed by bushfires to water storage catchments. Irrigation water suppliers face similar vulnerabilities. Stormwater drainage and sewerage infrastructure would also need to withstand a range of climate change hazards, such as increased sewer spills to stormwater / waterways.

Electricity generation/transmission infrastructure top-flight hazards include reduced water availability for coal-fired power station cooling, summer peak demand spikes outstripping supply, the elevated costs stemming from the need to increase plant water use efficiency, and bushfire damage to transmission lines and substations. Extractive energy industries also face risks, such as reduced water availability for coal processing and dust suppression (many coal extraction hazards overlap with those faced by the mining and quarrying industries generally). The risk of more frequent or prolonged shut-down of offshore oil and gas infrastructure due to storm damage was also raised. Renewable generators face risks as well, such as wind turbine damage from extreme winds.

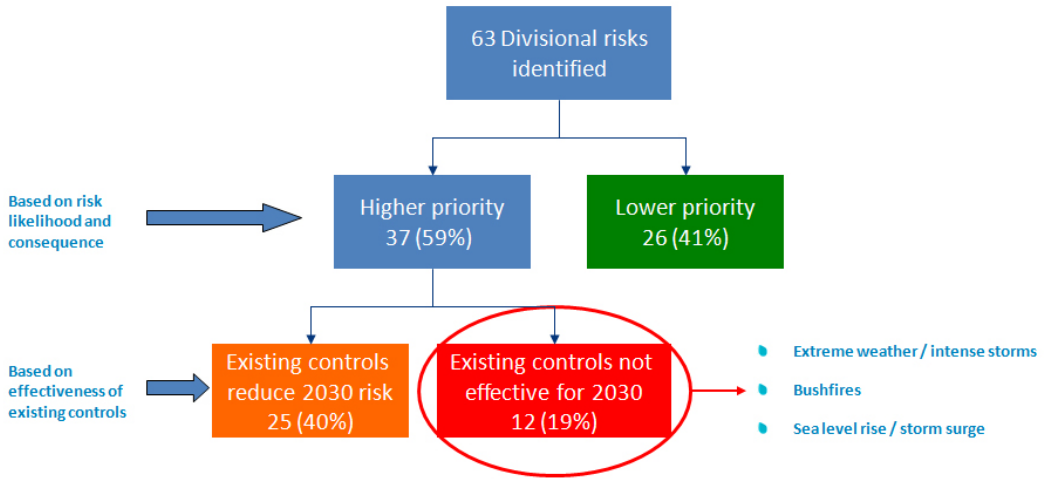

Figure 1: Sydney Water risk ratings for a 2030 climate change scenario (Source: G. Allen, Sydney Water).

Transport infrastructure faces a range of hazards. For roads and tunnels, this includes costs associated with degradation of foundations and bitumen, and flooding. Potential rail infrastructure hazards include damage to overhead wiring, damage and disruptions from increased electrical storm activity, and degradation and stress of tracks, bridges, railway foundations, embankments. As society adapts to climate change, rail infrastructure may incur increased train use, and greater demand for air-conditioning on trains. Sea ports also face hazards, with a significant risk being damage to assets and disruption of operations. As for airports, flooding and damage could be key hazards, especially in Sydney and Brisbane where infrastructure lies close to coastal waters.

In the built environment, bushfires pose a threat to buildings and human health, whilst floods present clear hazards to buildings in low lying areas. Longer-term and less acute hazards revolve around deterioration and damage of building materials and foundations. Structures on coasts are also vulnerable to climate change hazards. Essential services such as health and education may be in greater demand, whilst coastal services may undergo damage.

With global warming, agricultural producers face the risk that climate change could reduce production, increase losses, and reduce, or cause salination of, groundwater supplies.

As for telecommunications infrastructure, hazards include damage to above-ground transmission lines or towers, and deterioration and flooding of transmission infrastructure and exchanges cables.

Mr. Verhoeven discussed how managing the risk and liability of these climate change hazards requires a two-pronged approach: addressing climate change impacts; and actions to reduce the chance of impacts on assets. This would require decision-making about infrastructure from the planning through to management stages, and also raised fundamental questions about where cities should expand and where infrastructure assets should be built.

5 360° Perspectives

An important aim of the Summit was to provide participants with the opportunity to see climate change issues from the perspective of others in Australia's infrastructure industry. This section summarises insights from various vantage points.

5.1 Climate Scientists – Educating on the Science of Variability

Professor Roger Stone of the University of Southern Queensland provided an overview of the current science and anticipated impacts of climate change. Setting a context for the day's discussion, Professor Stone showed that average global temperatures have increased by approximately 0.9°C over the 1890-1919 average, and gave evidence demonstrating the majority of this increased warming is attributable to anthropogenic activities.

A specialist in climate variability, Professor Stone also illustrated that climate variability was already an issue for Australia, and that climate change is anticipated to alter not just mean values but also variability around the mean (e.g. the El Niño Southern Oscillation phenomenon) and lead to more extreme weather, such as intense rainfall, increased hail days and heatwave events. Professor Stone argued that the critical challenge posed by this variability will bring forward the challenge of climate change management.

As an illustrative example, Professor Stone set out changes in the anticipated return rate of extreme cyclones. Under present climate conditions, a cyclone with a pressure level of 953 hPa (hectopascals) is expected to have a 1-in-100-year return rate (between the latitudes of 14° S and 20° S). That is, such an event would be expected to occur once a century. Under enhanced greenhouse conditions, the frequency of this type of event increases, becoming a 1-in-20-year event. This frequency shift has considerable repercussions for infrastructure design and planning.

5.2 Regulators – the Role of State Government

Mark Conlon of the NSW Department of Environment and Climate Change presented a state government perspective. As a large provider of infrastructure, he noted that the New South Wales Government aimed to lead on climate change science development and work with partners (such as emergency services and the Australian Local Government Association).

Mr. Conlon presented results from recently-commissioned, regionally-specific climate change projections undertaken by the University of NSW. The regionally downscaled maps, he stated, significantly contributed to improved understanding of regional climate change vulnerability. Essential to the creation of the new maps was investing time and resources to identify which global circulation models are best suited to a given region.

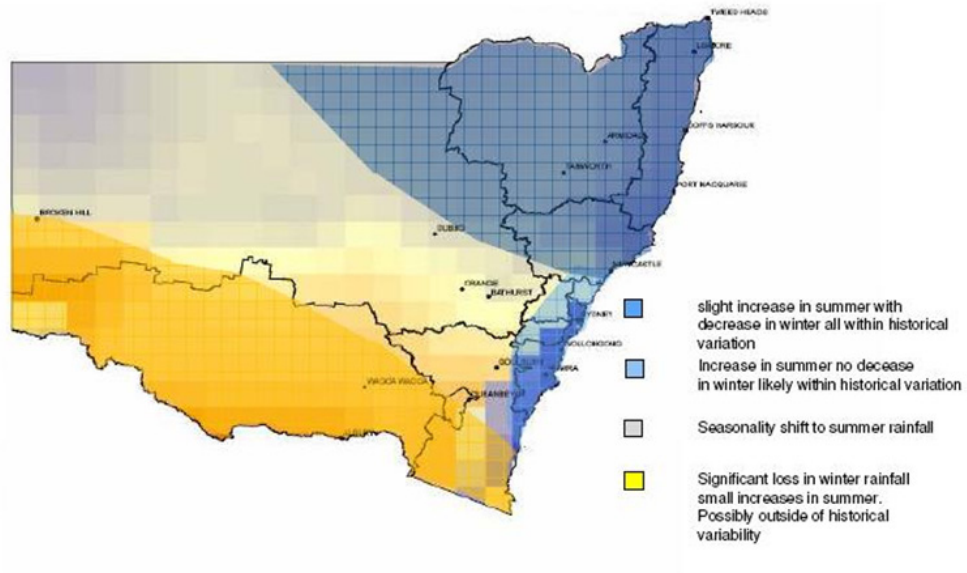

Figure 2: Projected changes in rainfall for the state of New South Wales (Source: M. Conlon, Department of Environment, Climate Change & Water).

A major theme of Mr. Conlon's presentation was the importance of understanding the extent to which climate change pushes communities beyond the range of their historical experience. He made a powerful case that such a benchmark provided a strong indicator of a community's coping capacity or resilience, which encompasses the coping capacity of a community's infrastructure and its owners and managers.

5.3 Infrastructure Owners & Developers – Water

Dr. Greg Allen from Sydney Water presented his corporation's response strategy for climate change, from identification and assessment of risks to their process for adaptive actions.

The operational scope for Sydney Water was outlined to emphasise the extent of risks posed by climate change impacts. These encompass water security, supply and demand balance, impacts on Sydney Water infrastructure and operational performance, employee health and safety and the need to meet customer and stakeholder expectations.

Dr. Allen also discussed the steps made along the path of adaptation, such as new infrastructure for recycling water, desalinisation plants and investment in increased water efficiency to improve the sustainability of fresh water supplies.

Adaptation also extended to: (a) the need to increase the resilience of infrastructure; and (b) operational responses to reduce the risk of adverse impacts of climate change. This included the need for vulnerability identification through recognising *susceptibility* to harm and not just the likelihood of harm to stated infrastructure and operations.

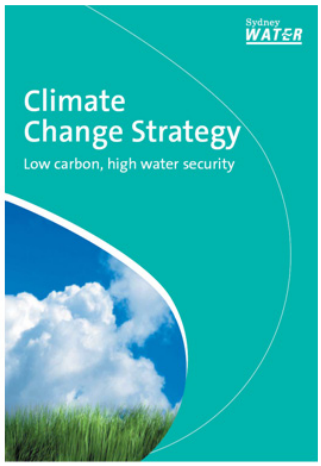

Figure 3: Sydney Water climate change strategy (Source: G. Allen, Sydney Water).

Looking forward, Dr. Allen made it clear that Sydney Water acknowledged adaptation action to be an ongoing business process. In terms of mitigation, he stated that Sydney Water's objectives were to become carbon-neutral by 2020 and engage with business and the community to reduce their own carbon footprints.

5.4 Infrastructure Owners & Developers – Telecommunications

Dr. Turlough Guerin presented Telstra's experiences with climate change mitigation and adaptation as described in their most recent response to the Carbon Disclosure Project.

Being in the majority self insured, Telstra recognises the need to anticipate and manage the impacts of climate change on their industry. Physical impacts on infrastructure and network function were discussed as well as their flow-on effects on the industry, work force and civil society.

Dr. Guerin also raised tertiary impacts, i.e. those to do with how people and society auto-adapt to climate change impacts and regulation. Dr. Guerin raised as an example the prospect of possible redundancy of some infrastructure in the long-term due to population shifts caused by repeated extreme weather events.

The business pressure to reduce emissions was also discussed. Major clients of Telstra factor greenhouse gas emissions into their supply-chain decisions. This puts the telecommunications corporation in a position to actively mitigate and adapt in order to retain business with these large clients.

Dr. Guerin stated that part of Telstra's mitigation and adaptation response

is already in place through the use of the Global Operation Centre (GOC). This centre monitors and restores telecommunications facilities, and this includes the monitoring and assessment of weather conditions and patterns throughout Australia. The creation of the Major Incident Control Centre within the GOC is now used to facilitate protection of telecommunications infrastructure by sharing information with other sectors and industries during extreme events.

5.5 Infrastructure Owners & Developers: Transport

Ms. Narelle Daniels, an economist from the Queensland Department of Transport and Main Roads, used the Port of Brisbane Motorway Upgrade Business Case as an example of how her agency considers climate change risks.

Ms. Daniels stated that it was now becoming critical to consider climate change in the business case, design and implementation of major infrastructure projects. This is in a major part due to the shift toward Public Private Partnerships (PPP) which requires private-sector investors to be satisfied that climate change-related risks have been addressed and will not undermine future returns.

In particular, Ms. Daniels was interested in how market changes, population shifts, extreme weather events, carbon prices, freight and transport changes affect the viability (and the delivery model) of a business case based on tolling revenues.

Ms. Daniels outlined how a partnership between the department and Climate Risk Pty Ltd identified new methods to incorporate climate change sensitivities into freight movement and local traffic models. These results were in turn fed into the final economic analysis.

Importantly, the project set out by Ms. Daniels was able to prove to

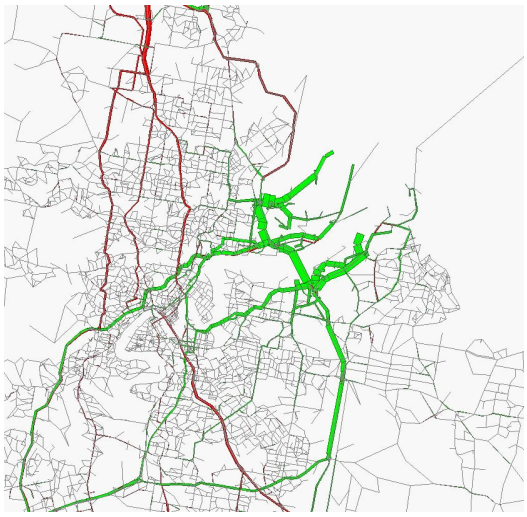

Figure 4: An example of the quantified impact of multiple climate change hazards on freight movement density in the Brisbane road network (Source: K. Mallon, Climate Risk)

infrastructure developers such as theirs that climate change risks could be successfully quantified within a business case, and that the climate uncertainties were managed with reasonable ease within such a process.

5.6 Law, Liability and Litigation

This section of the summit explored the legal ramifications of climate change. Professor Jan McDonald of Griffith University suggested that although litigation around climate change impacts and adaptation was likely to emerge and grow initially, litigation was a highly unsustainable solution to deal with climate change related losses.

Areas of potential litigation raised by Professor McDonald were issues of regulatory change – and lack thereof – as well as mal-adaptation (failure to avoid areas of high risk in new development). On regulation, Professor McDonald emphasised that the continued use of industry standards without also considering climate change would not necessarily shield infrastructure developers from litigation. Such industry standards have generally not been updated to reflect emerging climate change science and may therefore be inadequate or obsolete. This may result in significant legal exposures through potential mal-adaptation in infrastructure development which is not climate resilient.

Professor McDonald identified areas likely to be hardest hit: areas where no insurance exists or where cover would be denied. This dearth of coverage will further expose sectors such as lenders, leading to lender withdrawals, higher interest rates and /or shorter lending terms. Under such circumstances, legal recourse may be the only option for some stakeholders who seek to recover losses.

Professor McDonald considered how increased litigation may further complicate the situation, and given a lack of historical experience to draw on, the issues would be dealt with on a case-by-case basis. Her view was that this should be a major focus of all stakeholders, in order to explore ways to avoid and reduce climate change related litigation. Professor McDonald stressed that future development should aim to avoid risk and future damage, to prevent potential legal challenges.

5.7 Legal Risks from Carbon

Mr. Vishal Ahuja of the law firm Mallesons Stephen Jaques proposed that, in the short term, the most pressing legal risks arise from the rapidly-changing regulatory landscape (i.e. the Carbon Pollution Reduction Scheme, or CPRS). He noted that more than $380 billion dollars of infrastructure spending will be delivered in Australia over the next decade. According to Mr. Ahuja, the potential for the introduction of the CPRS will create a range of exposed industries; it has led to a standoff between coal generators which need re-financing and bankers apprehensive of this infrastructure's exposure to carbon pricing and mandatory renewable energy targets.

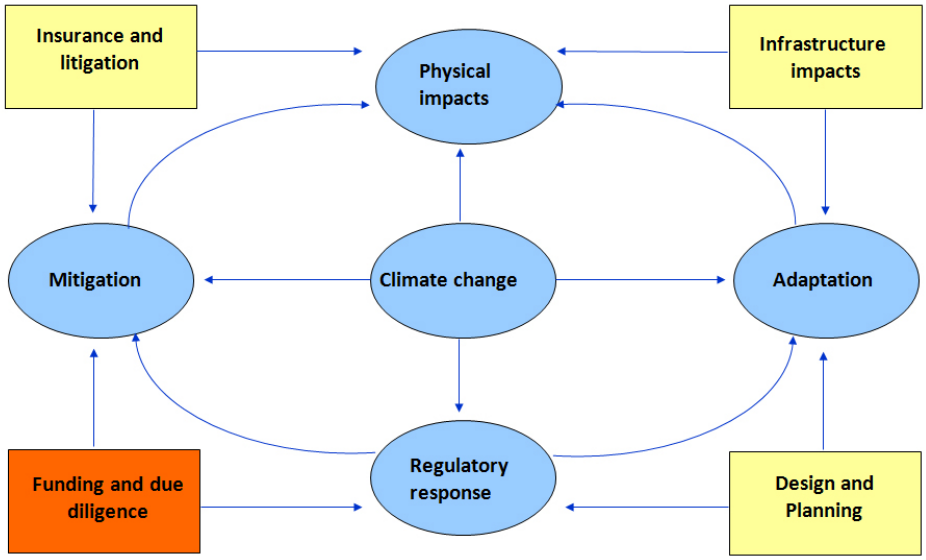

Figure 5: The context for a discussion on funding, due diligence and climate change (Source: V. Ahuja, Mallesons Stephen Jacques).

Mr. Ahuja raised questions regarding the standardisation of risk assessment for climate change. This triggered discussion on reassessing response programs to extreme events, given the imperative to base them not on past experience but future predictions which factor in climate change.

Mr. Ahuja noted the problem within the infrastructure sector of gaps in risk awareness in relation to climate change. This creates a delay in mitigation and adaptation response of industries. A proposed solution for this gap in awareness was to take funds garnered through a carbon emissions trading scheme and transfer these funds to areas needing assistance with climate change adaptation.

5.8 Infrastructure Investors and Financiers

Dr. Ian Woods of AMP Capital Investors discussed the impacts of climate change on infrastructure, insurance and investment.

Dr. Woods raised regulatory risks, in particular those with a direct nexus to earnings that have the potential to reduce industry / business profitability and viability. The risks identified revolved around the increased probability for business interruption, earnings volatility, and business costs including insurance. These in turn would impact growth opportunities of a given company.

There is a very real probability that these impacts will increase. However, it is difficult to quantify the financial effect

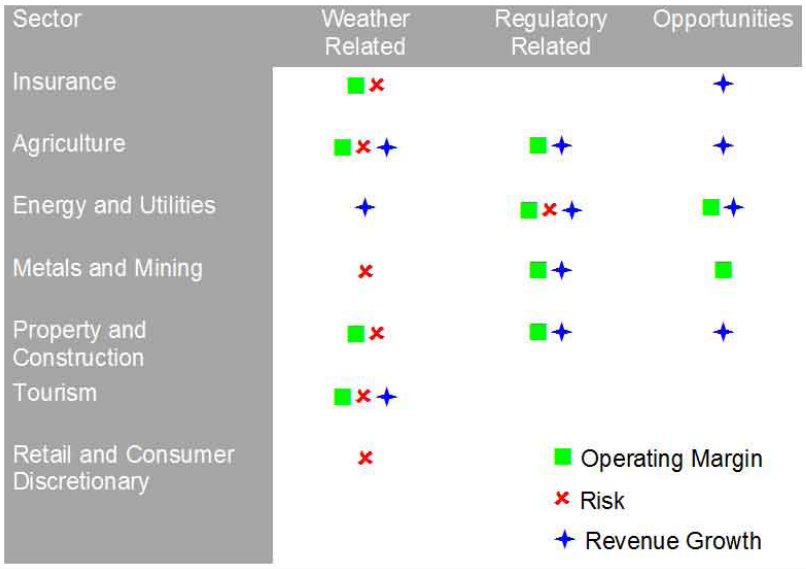

Figure 6: Key sectors and risks (Source: I. Woods, AMP Capital Investors).

of these hazards in terms of risk and growth of a company or sector.

Dr. Woods stated that, as an analyst, he is compelled to work out contingencies for climate change-related impacts to a given business or sector. Therefore, if a business is unable to provide its own such analysis, he would be required to formulate his own estimates. Either way, some quantification of climate change effects is imperative to serve investor interests.

Dr. Woods asserts that the main risks revolve around extreme weather impacts in all sectors (insurance, agriculture, energy and utilities, property and construction, tourism, metals and mining and retail and consumer discretionary). However, in all these sectors he also recognised opportunities for revenue growth in weather and regulatory-related impacts of climate change.

Understanding of investor action that is focussed on climate change mitigation, risks and adaptation is now very tangible for many companies, thanks to the Carbon Disclosure Project and the Institutional Investors Group on Climate Change. Both these initiatives aim to help investors understand how assets are exposed and whether or how risks relate to climate change are being managed. Such processes help companies (and their investors) better understand their risks, and use this information to encourage long-term sustainability and help guide investment decisions.

5.9 Infrastructure Insurers

Mr. Karl Sullivan of the Insurance Council of Australia addressed the issues of extreme weather impacts and exposures, and the Australian insurance industry's adaptive response to climate change challenges. Mr. Sullivan summarised the role of insurance in Australian economy and society, and emphasised that a healthy insurance sector is essential to a healthy, prosperous economy.

To demonstrate the scale of extreme weather exposures Mr. Sullivan showed that, looking at the sector as a whole, annual community and business natural disaster costs more than doubled in the 07/08 financial year ($2.7 Billion) compared to the average annual cost over the previous four decades ($1.2 Billion).

Insurance claims data revealed that the majority of compensation costs stem from flood, cyclone and severe storm damage. Mr. Sullivan also noted that increased risk not only flows from increasing extreme weather event occurrence, but also from intensified development in high-risk areas such as coastal high-rise developments. That is, hazards are increasing but so is the economic exposure.

Mr. Sullivan outlined the response of the Australian insurance industry. The main objective appears to be actions to improve community resilience to extreme weather events. This is achieved by seeking reform of policy and standards in infrastructure, building code and land-use planning; another approach is augmenting awareness and understanding of climate change risks amongst businesses and communities.

5.10 An Insurance Company Viewpoint

Mr. David Smith, CEO of Zurich Australia, opened the summit and also spoke about the ability of a company such as Zurich to identify new needs in their market and act on these needs

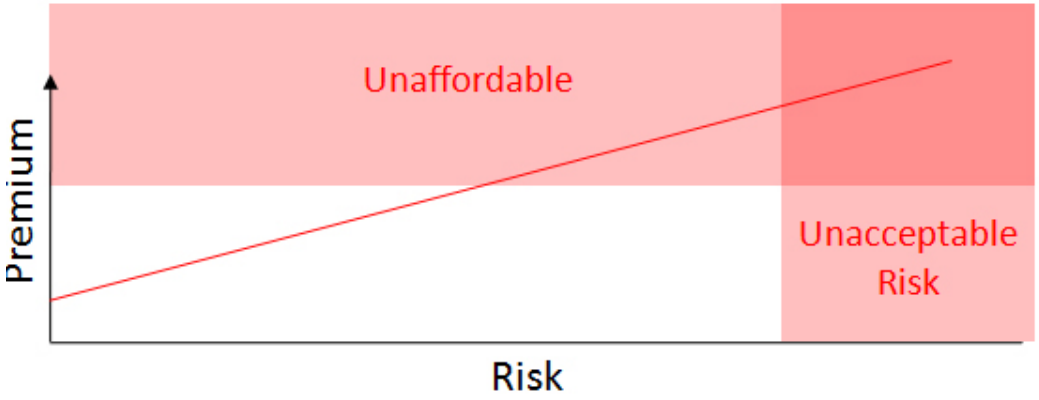

Figure 7: How insurance works: The insurance pool monetises risk and buys peace of mind; risk drives premiums which drive the pool (Source: K. Sullivan, Insurance Council of Australia).

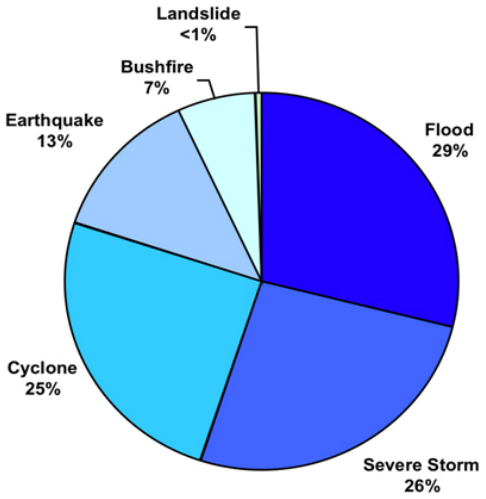

Figure 8: Community and business natural disaster costs, 1967-2004 versus 2007-08 (Source: K. Sullivan, Insurance Council of Australia).

to introduce new products. Mr. Smith discussed how the introduction of standard flood protection in Australia challenged the received market wisdom, yet once initiated led to widespread adoption within his industry.

Mr. Smith also indicated a significant problem with insurance taxation in many states, citing examples in which taxes and levies more than doubled insurance costs to the end consumer. This provides a disincentive to insure and a "free ride" for the uninsured.

Ms. Alice Cahill, Head of Zurich Financial Services Corporate Social Responsibility, gave the perspective of a policy provider and emphasised the need for companies such as hers to keep their eye on their core business with effective yet competitive risk pricing.

With escalating risks from climate change, managing those risks provide a new business opportunity, but only so long as policies remained affordable and available. There were known examples from overseas where this had not been the case.

Ms. Cahill pointed out that insurance companies did not possess bottomless pockets, in that they could not sustain pay outs for increased losses without a corresponding increase in premiums or a change in terms. Infrastructure owners and operators must understand that the transfer of escalating risk to insurers could not continue indefinitely without a consideration of ways to reduce losses.

Mr. Cahill described her interest and experience in the use of risk management techniques within the client business as a means to curb losses in the face of escalating hazards. In the infrastructure context this implies the application of some level of

adaptation. Ms. Cahill touched on the Zurich Climate Change Broker Training, which aims to use insurance channels to promote awareness in the market of opportunities for adaptation.

5.11 Market Mechanisms: Weather Watching for Energy and Agriculture

Adjunct Professor Peter Best, from Cindual and the Australian Centre for Sustainable Catchments, University of Southern Queensland, identified some uncertainties associated with climate change. Professor Best has extensive experience in the use of climatic indicators within energy markets, and more recently in the agricultural sector.

He stated that despite a growing understanding of the climate change impacts stemming from greenhouse gas emissions, uncertainties still exist about the nature and interactions of the cryosphere (ice portions of the earth's surface) and the Earth's biochemistry. These areas are currently untested in climate change models.

Professor Best showed that although a portfolio of insurance-based options (e.g. hedging, re-insurance and index based insurance) exist for multiple stressor events, industries and government need to be prepared for such events. Commenting on the risks associated with these events, he stated that:

- A single extreme weather event can damage structures and interrupt business;
- A cluster of extreme weather events without time for significant recovery can threaten business survival; and
- A single extreme weather event combined with other stressors or shocks (e.g. oil price surge, reduced insurability) may affect industry viability.

6 Critical Issues

Attendance at the summit was on the basis of invitation only, and attendees were invited based on their expertise in both climate change and specific aspects of infrastructure. The aim of this selection process was not merely to inform delegates through presentations, but also to stimulate discussion and capture opinion. This was made possible through audience questions to panels members, and through the World Café session which saw specific challenges and questions put to small groups.

Discussions aimed to elucidate the nature of climate change challenges facing the infrastructure sector, and although a major focus on solutions was discouraged, simple solutions did emerge at times.

The following are the key challenges and opinions raised by these discussions.

6.1 Standards are not, and perhaps cannot, keep up with climate science

Many participants stated that standards are not being maintained in line with fast-moving science and projections. Indeed, it was pointed out that given the time required to change standards, this task may be impossible due to the yearly or even shorter timeframe with which modelling and climate change evidence are updated.

Challenge: How do we put in place a process for standards which is sufficiently dynamic to cope with fast-moving climate science?

6.2 Lack of standards leaves developers in legal limbo

The above-noted opinion that standards may fail to reflect climate risks implies that infrastructure developers are in a legal grey area in terms of their responsibilities and liabilities. The onus appears to rest on asset owners and developers and their consultants to prove that they have addressed these climate change risks to the best of their ability.

Challenge: How can infrastructure developers demonstrate that they have adequately factored in climate change? And how much is enough?

6.3 Fortress approach could be inefficient use of resources

Summit attendees were apprised of the urgent need for new investments to be made climate resilient. This need must be balanced by an ongoing requirement for additional coping capacity and re-engineering of existing assets to limit disruptions due to climate change.

However, participants noted that future investment must balance the benefits of enhanced climate change resilience against increased building costs. Critically, a reshaping of the notion of "fit-for-purpose" must be considered in a rapidly-changing environment.

Building infrastructure that will cope with a range of possible climate change

impact outcomes, some dependent on mitigation efforts, will increase costs substantially and may result in "over-building" for hazard levels that do not eventuate. This diversion of resources would result in less infrastructure being built overall. The potential waste may be compounded if infrastructure designed to last for 100 years is actually replaced sooner due to new development demands. The discussion weighed the efficiency of an "options" approach against the "fortress" approach.

Challenge: Can we design infrastructure capable of being upgraded as the actuality of climate change impacts and risks evolve? Can we re-define "fit-for-purpose" to avert the costs entailed in building fortresses, yet build-in the ability to fortify?

6.4 Risk assessment techniques found wanting

Some participants called for risk assessment "best practice" or standards which are tailored specifically to climate change risk. There was a strong consensus that the current Department of Climate Change (DCC) approach has not been appropriately tested, yet is recognised as the "default" method despite weaknesses when used in practice. The challenges encountered in use of the DCC method generally revolve around the difficulty workshop participants had in understanding the "likelihood" of a hazard event, and the inability of this method to consider multiple stressors.

Challenge: Given greater awareness amongst stakeholders of climate change risks, how can the AS/NZS4360 risk assessment methodology be enhanced to specifically improve the quality of climate change risk assessment?

6.5 Culture and behaviour change: Essential but not simple

Summit participants widely recognised that cultural and behavioural change – in industry and government as well as society – is one of the biggest challenges. To smoothly incorporate climate change risks, their recognition must occur equally throughout the sector and throughout a business. However, the current level of debate, politicisation and scepticism makes this process far from smooth.

Challenge: How does the infrastructure sector establish a consistent, professional position on climate change impacts and risks which is accepted industry-wide by professionals, directors and officers?

6.6 Treating mitigation and adaptation in isolation does not work

Given that climate change impacts are expected to defy historical experience, new solutions will be needed, and this includes innovation within the existing sustainability paradigm. Summit participants furthermore recognised that mitigation and adaptation action cannot be pursued in isolation; at present these strategies are competing for skills and resources.

Challenge: How can the infrastructure sector ensure full and consistent integration of climate change adaptation with emissions mitigation?

6.7 Insurance and infrastructure have much to offer each other on climate

The insurance industry's role in climate change mitigation and adaptation actions found an interested audience at the summit. This begged the question of whether both the insurance and infrastructure industries adequately understand the significance of climate change risks.

If both industries make critical risk management decisions based on inadequate information, there is a concern that negative flow-on effects could arise and erode the resilience of businesses and society as a whole. It was acknowledged that the insurance industry could do more to provide advice, guidance and tools to customers to mitigate their exposures, and could improve their ability to customize products around customers' needs in relation to local climate changes.

Some participants suggested the insurance industry should adopt a more proactive approach to identify high-risk areas, when other more appropriate development areas are available. At the same time insurance was recognised as a potential tool for determining the appropriateness of certain developments (*vis*-à-*vis* weather and climate risks).

Challenge: How could the infrastructure industry more effectively access the insights and expertise of insurers on climate change?

Challenge: Changes in insurance costs and availability may make some locations and assets less valuable. How can the infrastructure sector remain open to insights about climate change risk and insurability if they may undermine current value?

6.8 Government departments and policies are not consistent on climate

The summit audience voiced concern that Australian governments, particularly at the local level, lack the knowledge and skills necessary to provide integrated decision-making and risk assessment. There was a prevailing sense that whilst some planning approvals were being made with climate change in mind, others were not. This makes consistent operations difficult for infrastructure providers given the additional costs of including climate change adaptation.

The bearing of climate change on the responsibilities of various government levels and their geographical boundaries emphasizes the need for a whole-of-government, "joined-up policy" approach. Each government level – Federal, state and local – as well as industry has a critical role in an integrated decision-making process.

Participants of the summit expressed apprehension about the objectivity of

individual local governments. It was suggested that local governments lacked the resources and capacity to make evidence-based decisions on complex issues such as the speed and scale of local climate change impacts.

There was consensus amongst the audience that at present there is too much focus on the mitigation debate where global consensus is needed, at the expense of equally-pressing local adaptation. Furthermore it was perceived that local responses to extreme events need to be reassessed to include other possible impacts in relation to climate chain in their local areas.

Challenge: How does the infrastructure sector ensure consistent treatment of climate change adaptation across all departments and levels of Government, but ensure the risk response is not "dumbed-down"?

6.9 Increased importance of infrastructure in a climate changed world

Many among the audience raised concerns about climate change impacts on the mental and physical health and general well-being of vulnerable communities, as well as government community assistance agencies' ability to manage these risks.

Examples were raised regarding the criticality of all infrastructure before, during and after major weather-related events and disasters.

The increased likelihood of impacts on the vulnerable among Australian society may be expected to increase pressures on the health care system, and compound its existing capacity issues. Summit attendees were concerned that the focus on industry and government risk management often neglected the community aspect of risk assessments and adaptation plans.

Should the vulnerable be made more marginal by climate change, disruptions to infrastructure for power, water, transport and communication may have a disproportionate impact on this group.

Challenge: How does the infrastructure sector ensure that its heightened importance and criticality to communities' climate change resilience is recognised and resourced today?

6.10 The risk of risk transfer

A major topic of discussion was the problem of unwitting transfer between stakeholders of risk, rather than its elimination or mitigation.

Some summit participants called for greater government and private-sector cooperation to increase the integration of infrastructure planning – shifting the focus to *outcomes* rather than *outputs*.

Operational contracts for infrastructure tended to be focussed on asset life, viability and revenue capacity, with little formal regard given to broader outcomes – including climate change, environment, social and workforce issues – particularly in revenue agreements.

Challenge: How can the infrastructure sector achieve greater cooperation

with all levels of government to ensure proper integration and elimination of climate change risks, and avert the mere transfer of risks which fails to reduce them?

6.11 Avoiding market and regulatory disincentives

The summit presentations initiated discussion about impacts that could occur if industry and government shield consumers / markets from price signals that are required to trigger the behavioural changes that would address climate change risks.

The participants recognised the importance of government assistance that ensures society's disadvantaged do not disproportionately bear climate change impacts; at the same time they recognised that consumer price signals were important to realise the benefits of behavioural change.

Current anti-adaptation interventions range from retail price caps on energy and water to taxes and levies on insurance. In addition to inhibiting changes in consumer behaviour, the scope for innovative delivery mechanisms is artificially limited if pricing not reflective of real costs is enforced. This ties the hands of infrastructure developers in a commercial market.

Another issue raised by attendees concerned the character of short-term investors and analysts who fail to include climate change issues in their investment-related decision-making processes, since they consider these impacts to be beyond their investment time frame.

Challenge: How can the private sector and government work together to dismantle market and regulatory disincentives to climate change adaptation in the infrastructure sector?

6.12 Access to science and control of information

A major issue of debate among summit participants was access to information.

Participants remarked on the urgent need for sharing accurate and relevant climate change research and information.

They felt there was limited willingness to share information and knowledge about risk disclosure and loss between and within industries. While this reluctance to disclose may maintain competitive advantage, it could also erode society's resilience to climate change.

This problem highlighted the importance of public-domain research. Concerns were raised that some taxpayer funded information commissioned by government from government agencies, universities or private-sector research companies was not reaching the public domain.

Challenge: How can existing or commissioned information on climate change be placed into the public domain to ensure greater access by infrastructure developers and operators?

6.13 Maintaining dialogue momentum

Participants considered the summit a major step forward in creating good communication pathways and sharing perspectives across the sector. Many participants suggested that further meetings of this kind be arranged.

Challenge: Can dialogue on climate change impacts and adaptation continue across infrastructure and all its stakeholders?






Climate Risk Pty Limited (Australia)
Sydney: + 61 2 8243 5767
Brisbane: + 61 7 3040 1621

Climate Risk Europe Limited
London: + 44 752 506 8331

www.climaterisk.net

Climate Risk