

Trends and Future Scenarios - Stakeholder Engagement Report

Workshop Details

Date:	<u>Friday 13th April 2012</u>	Time:	<u>9:30am – 3:30pm</u>
Venue:	<u>Main Roads, Brisbane</u>	Facilitators:	<u>L. Whistler (QUT), C. Hargroves (CU)</u>
Team:	<u>L. Whistler, A. Farr, K. Wilson, C. Hargroves, and C. Desha</u>		

Date:	<u>Friday 27th April 2012</u>	Time:	<u>9:30am – 3:30pm</u>
Venue:	<u>Don Aitken Centre, Perth</u>	Facilitators:	<u>L. Whistler (QUT), C. Hargroves (CU)</u>
Team:	<u>L. Whistler, A. Farr, D. Sparks, and C. Hargroves</u>		

Workshop Context

As part of the Sustainable Built Environment National Research Centre (SBEnc) a research team from Curtin University and Queensland University of Technology (QUT) held a series of stakeholder and experts' workshops in Perth, Western Australia and Brisbane, Queensland. Topics investigated in the three workshops included: the post-occupancy assessment of the performance of green commercial/office buildings; an investigation into the role that roads will play in supporting Australia's response to climate change and other associated challenges; and a consideration of the application of E. O. Wilson's concept of 'Biophilia' to urban planning to enhance Australian cities. Along with a project focused on sustainable infrastructure procurement based at Swinburne University and QUT and led by Professor Russell Kenley, the projects make up the first round of projects as part of the SBEnc 'Greening the Built Environment' program led by Professor Peter Newman, Curtin University. The program is investigating important aspects of greening the built environment that will assist Australia to respond to growing environmental, social and economic issues related to climate change and other environmental pressures. The projects are designed as industry collaborations and involve a number of government and industry partners.

Interested parties, stakeholders, SBEnc partners, and experts in the field were invited to join each of the three workshops to contribute to informing the direction of the first stage of each of the projects, which will be completed in September 2012. Based on the learnings of the first stage, the second stage of each project will be developed in close consultation with stakeholders and partners, beginning October 2012. The workshops were aimed at learning from the experiences of participants, identifying a range of challenges the research team must consider, and gaining a strong understanding of how the research can directly support and enhance industry and government practices and policies. Hence, the workshops were a valuable opportunity for the research teams to engage with the project partners and experts in the field to ensure that the projects are well informed and guided towards tangible outcomes.

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Overview of Project

In the coming decades the design, construction, and maintenance of main roads will face a range of new challenges – many that will bear little resemblance to the challenges previously faced - and as such will require a number of new approaches. Such challenges will result from a growing number of interconnected environmental, social, and economic pressures, which are set to apply significant pressure on the *future of roads*. For instance, environmental pressures will include the impacts of climate change on rainfall patterns and temperature profiles; economic pressure will include materials and resources shortages and the predicted increases in energy and resource prices globally; and social pressures will include a shift to lighter vehicles, reduced use of cars due to higher fuel costs, and political pressure to respond to climate change. Given that roads typically have a design life of 20 to 40 years, with bridges being designed for up to 100 years, the level of consideration of future environmental impacts, economic risks, and social trends associated with roads in the short term will have a significant impact on the associated costs and impacts in the medium to long term.

The SBEnrc ‘Future of Roads’ project is a collaboration between academia, government and industry to combine world class research with operational understanding and policy experience to inform the consideration of the increasing pressures that will face roads in the future. Building on the successful stakeholder engagement workshops in Brisbane and Perth in 2011, a second round of workshops was held on in April 2012, again in Brisbane and Perth. The research team wishes to thank the Department of Main Roads Queensland, and Main Roads Western Australia, for again hosting the two workshops and for their ongoing support and commitment to the research project. The aim of the second set of workshops was to engage with project partners to communicate the progress on the project to date and to focus on the third area of the project, that of ‘Trends and Future Scenarios’.

Workshop Process and Outcomes

The workshops were structured around a new methodology developed by the research team to explore future trends related to roads and sustainability in order to consider a range of possible strategic responses. The process has been succinctly summarised in Figure 1, based on an inverted triangle to demonstrate the progression of the process, starting with a highly complex idea or goal (i.e. planning for the future of roads) and narrowing down to tangible outcomes (i.e. identifying strategies to respond to specific future risks). Each stage of the process was designed to deliver specific outputs as shown below in the figure.

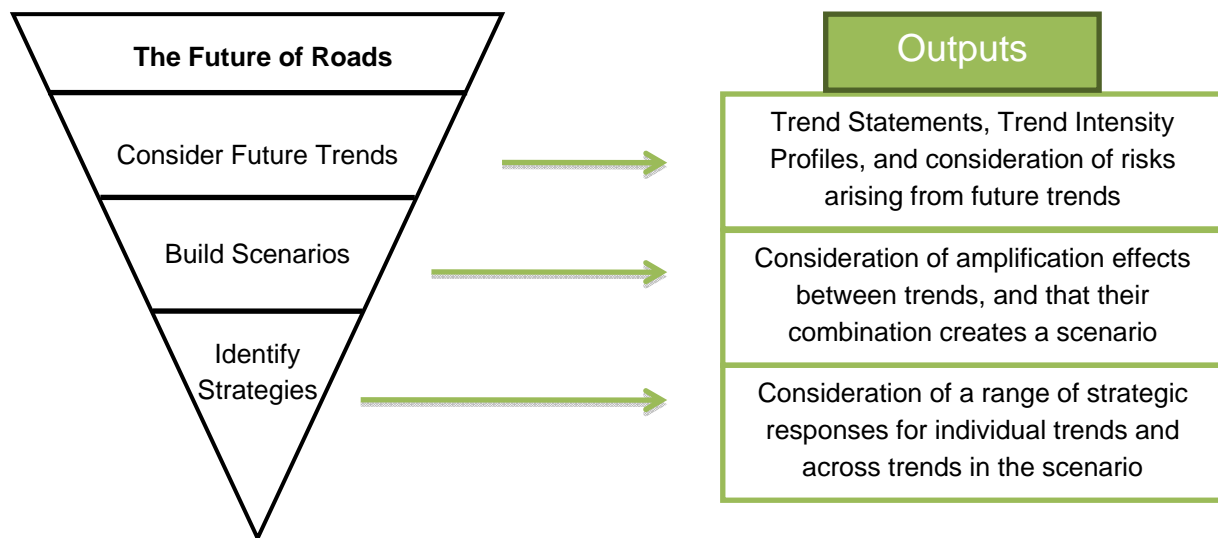


Figure 1: Workshop Process for Considering the Future of Roads

Considering Future Trends

Participants were asked to consider a short list of future trends, as shown below, and indicate the ones that they felt were important for their State and that they had a strong grounding in and where able to consider how the trend may affect main roads in the coming decades (see *Appendix A for voting results, and Appendix D for 'Trend Statements' used in the workshop*). The trends included the following:

1. Increase in the cost of road maintenance,
2. Increase in extreme weather events,
3. Oil based road surfacing unfeasible,
4. Trips by walking, cycling & public transport increase,
5. Resource shortages: aggregate shortages, fresh water scarcity,
6. Freight vehicles increase in size & quantity,
7. Funding constraints on new projects & on maintenance of existing infrastructure,
8. Transport infrastructure reaches capacity,
9. Electric & alternative fuel vehicles are mainstream, and
10. City planning requires intensification along rail lines & infill development.

The list is of course not conclusive and trends were selected for inclusion based on the outcomes of the previous stakeholder workshops and in discussions with partners. From this process four trends were selected in each workshop to then be used as the focus of small group discussion, see Figure 2 for the trends selected in each state workshop. During this part of the workshop a number of clarification questions were asked by participants related to interpretation of the language used to name and describe the various trends, suggesting that it is important to ensure the language used clarifies the nature of the trend appropriately. Feedback from participants suggested that the inclusion of a trend related to technology and intelligent transport systems was advisable.

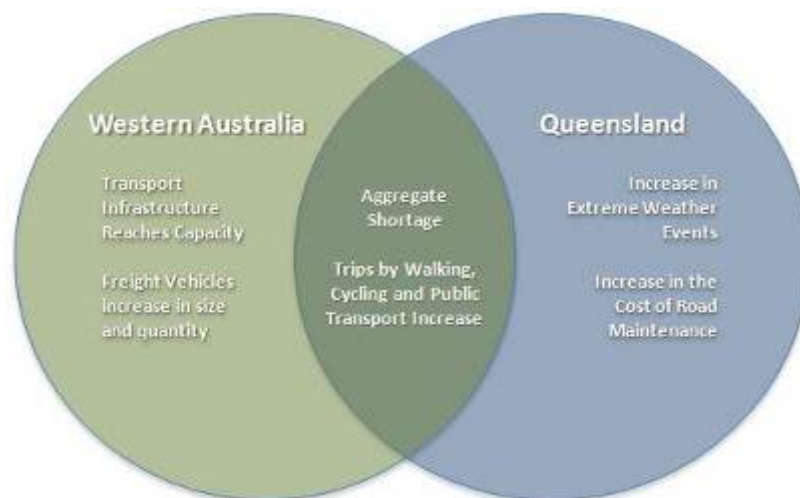


Figure 2: Future trends selected for consideration in 'Future of Roads' workshops 2012.

Reflecting on the trends selected the research team suggest that there are some key reasons why particular trends are important to each state. Both Queensland and Western Australia are experience increased infrastructure demands as a results of recent mining booms, putting enormous pressure on natural resources to service these requirements, evidenced by the '*aggregate shortage*' trend being selected with the most votes in both states. A changing social culture, population growth, and growing congestion in both capitals, Brisbane and Perth, have given rise to a greater number of trips by walking, cycling, and public transport, putting pressure on existing infrastructure, evidenced by this trend being selected in both states. The recent extreme weather events during the summer of 2011 have clearly cemented the concern regarding climate change impacts on roads in Queensland, and this is shown through the appearance of the trend '*increase in extreme weather events*'.

The next step was to consider how the impacts of the trend may change over time, and the participants formed small groups to create a potential '*Trend Intensity Profile*' for each trend. Considering a timeframe through to 2030 each of the groups developed a profile, as shown in Figure 3, and shared it with the whole group. The process of developing potential trend intensity profiles was designed to provoke discussion by the groups on the possible ways the trend may progress over time.

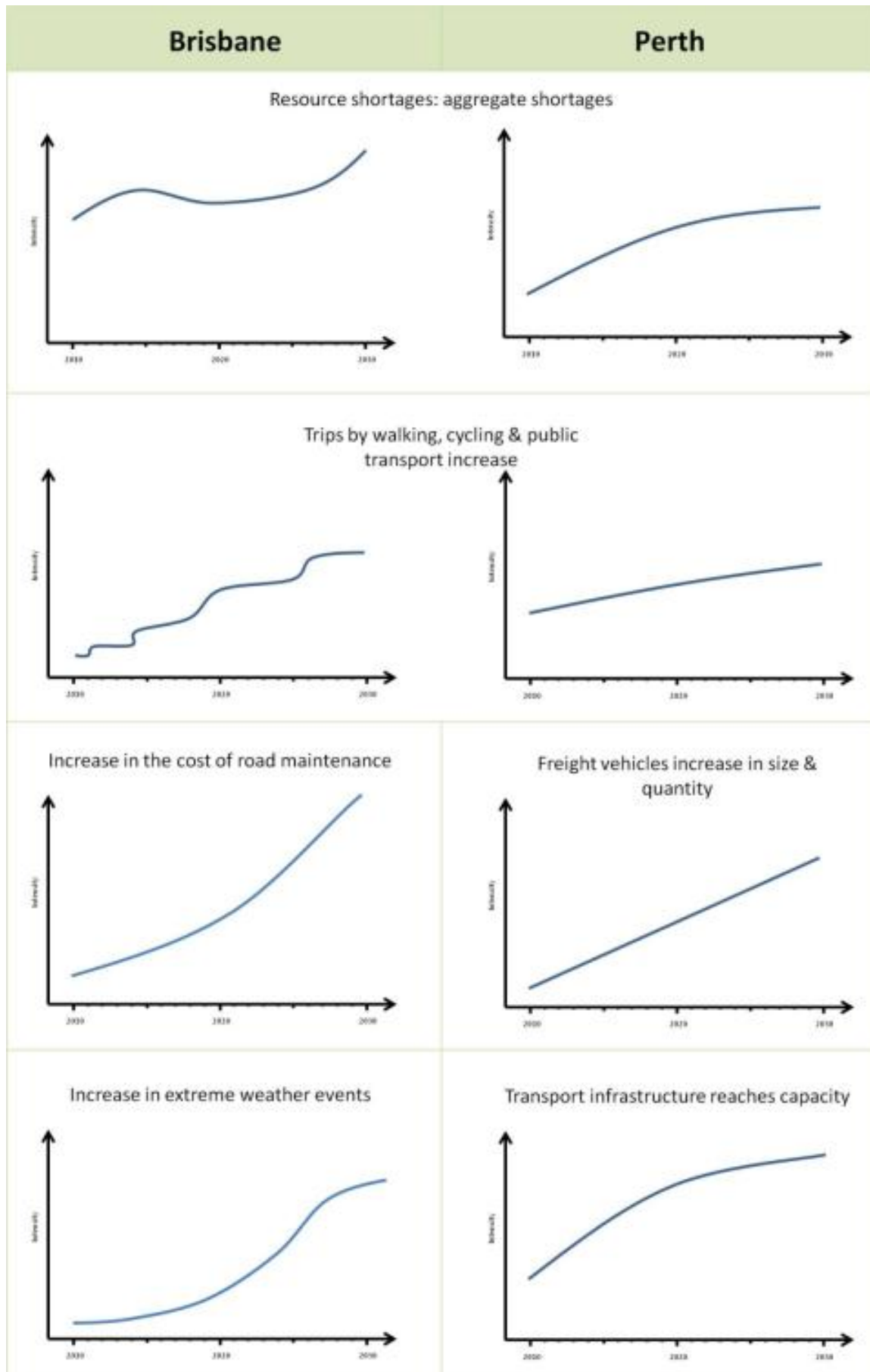


Figure 3: Trend Intensity Profiles from Queensland and Perth Workshops, 2012

After considering the behaviour of the trends over time, the control groups then brainstormed potential risks to road agencies associated with the trends and annotated the hand drawn plots (See Appendix E for actual profiles created by each group). Once the groups had identified a number of potential risks a 'Rotating Pairs Method' designed by the research team was used to invite two participants from each group to rotate progressively around each of the other groups. This allowed participants to review the other group's findings and suggest additions and comments to strengthen the discussions.

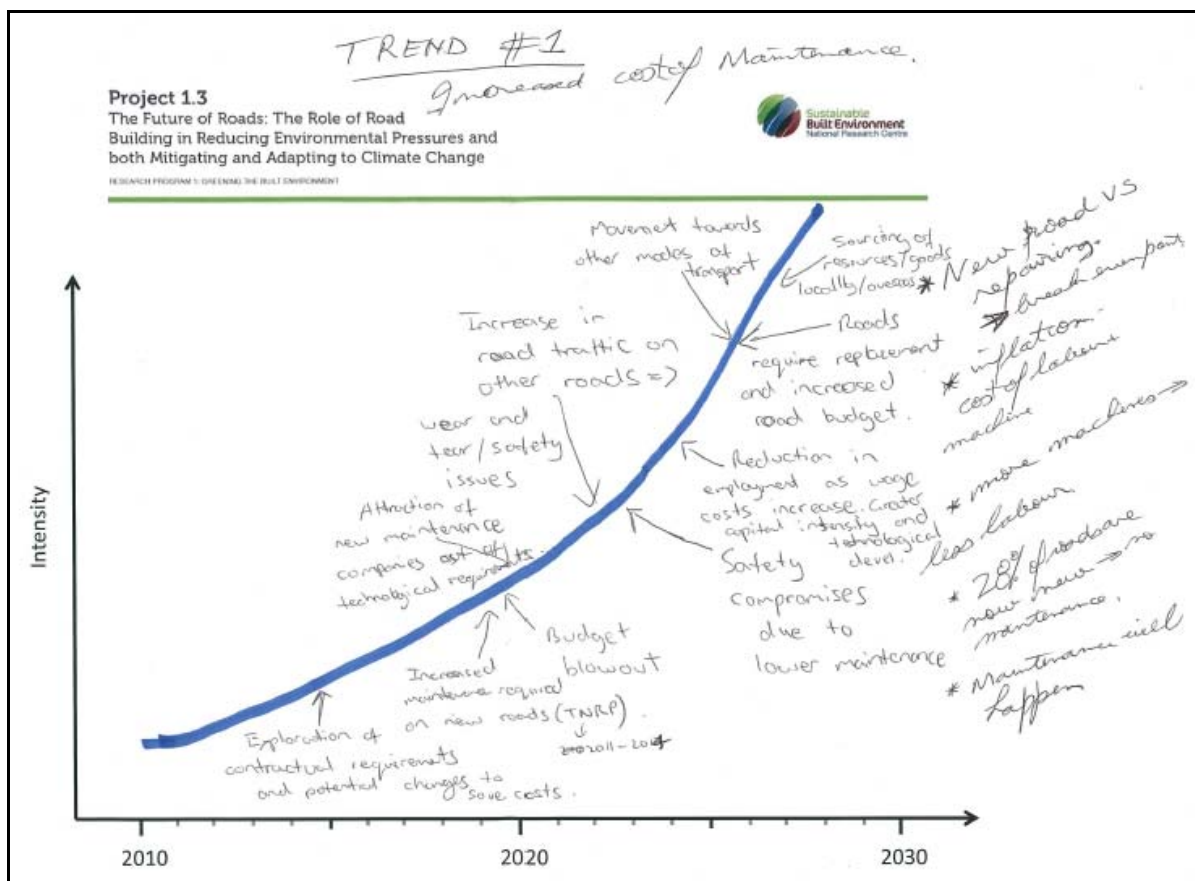


Figure 4: Example of Trend Intensity Profile annotated with Potential Risks to Road Agencies

Build Scenarios

Having focused on an individual trend and considered the associated risks, each of the four trend profiles were brought forward and hung together at the front of the room to create a possible 'scenario'. The participants were invited to consider how each of the trends may interact with the others to potentially amplify or reduce the impacts.

Trends that may amplify another trends impact include:

- 'Increase in extreme weather events' leading to increased damage of main roads and an 'increase in the cost of road maintenance' in Queensland,
- 'Aggregate shortage' leading to increased costs of aggregates and an 'increase in the cost of road maintenance' in Queensland,

- ‘Freight vehicles increase in size & quantity’ leading to increased design strength requirements for road base, contributing to ‘aggregate shortages’ in Western Australia,

Trends that may reduce another trends impact include:

- ‘Trips by walking, cycling & public transport increase’ leading to reduced car ridership and reducing the impact from ‘Transport infrastructure reaching capacity’ in Western Australia,
- ‘Trips by walking, cycling & public transport increase’ leading to reduced car ridership and reducing the impact from ‘increase in the cost of road maintenance’ in Queensland,

Identify Strategies

Having considered how trends may interact with each other and also having identified a number of potential risks for each trend the groups then considered possible strategies across a number of key areas. Groups were invited to consider 5 main themes of strategies, in-line with agency strategic planning themes previously used by partners, namely: Economic, Technological, Environmental, Socio-cultural, and Governance. As part of this process and building on from the possibility that the trends were interconnected the groups were then asked to share their suggested strategies while the other groups listened to see if the strategies suggested by other groups may in fact assist them to respond to the risks of their own trend (*when a connection was identified the groups were connected with flagging tape as shown in Figure 5*).



Figure 5: Uncovering links between strategies for the future of roads (April 2012)

As can be seen in Figure 5 there were a number of strategies identified in the workshop that were applicable across a number of the selected trends. This suggests that a focus on a particular strategy may deliver results in reducing risks from a number of trends. In academia and complex systems analysis, these are known as ‘leverage points’, and identifying such points and understanding the interrelationships between them provides a significant opportunity to increase the success of particular strategies.¹ This was further

¹ Meadows, D (1999) “Leverage Points: Places to intervene in a system”, *The Sustainability Institute* [website] http://www.sustainer.org/pubs/Leverage_Points.pdf, accessed 20 June 2012.

reinforced through analysis of the workshop data following the event, with the research team creating a method to extract key findings. The method involved compiling a master list of proposed strategies from both workshops, examining them for broad overarching themes in order to create ‘clustered mechanisms’, and then identifying opportunities for the clustered mechanisms to mitigate risks across each of the selected strategies (See Table 1).

Table 1: Strategies identified by workshop participants mapped across selected trends

Clustered Mechanisms	Potential Future Trends impacting on Main Roads							
	Resource shortages: aggregate		Trips by walking, cycling & public transport increase		Increase in extreme weather events	Increase in the cost of road maintenance	Transport infrastructure reaches capacity	Freight vehicles increase in size & quantity
	QLD	WA	QLD	WA	QLD	QLD	WA	WA
Road Pricing mechanisms	•	•		•	•	•	•	•
Government Action to support change	•	•	•	•		•	•	•
Investment in Research and Development	•	•	•		•	•		
Analysing Investment Priorities		•	•	•	•		•	
Incentivising preferred practices	•	•	•		•	•		
Increase the efficiency of existing infrastructure	•			•			•	•
Adaptable Design Standards	•	•	•		•			
Knowledge Sharing and capacity building	•		•			•		
Investment in Carbon Management				•	•			
Transit Oriented Developments				•			•	

Each of the clustered mechanisms in Table 1 have a number of strategies that can be used to reduce the risk of future trends, namely:

1. *Road Pricing Mechanisms:* A road pricing mechanism can both generate revenue to adapt and maintain assets, and influence road user behaviour, for example encouraging alternative modes and reducing congestion. Road pricing may be implemented in a number of ways, including: additional tax added to fuel price; increased costs of vehicle registration and insurance; increased pricing of freight charges; and direct charging for use of specific roads at specific times of the day.

2. *Government Action to Support Change*: Enabling change by implementing new policies and making efforts that align with preparing for the risks of future trends more economically competitive. This can be achieved by: make strategic risk taking possible and attractive by removing policy barriers (i.e. lessen the fallout from a failure); improve inter-agency integration within transportation agencies; and mandating the inclusion of preferred materials or practices (i.e. recycled materials in road projects).

3. *Investment in Research and Development*: Funding and investing in targeted research and development is critical in identifying and evaluating alternative road building materials, new design methods, and enhanced transport planning processes. This may be achieved by: funding industry collaborative applied research in the area; investing in targeted research programs to develop key innovation areas (i.e. stabilisation techniques, alternative and recycled road materials, mode integration, and efficient use of local and marginal materials).

4. *Analysing Investment Priorities*: Determining the best areas for investment in road and transport infrastructure through a process of cross modal collaboration and strategic transport network planning. This may be achieved by: the use of low-cost high-impact scale for investment analysis, encouraging the resilience of primary networks through route prioritisation for maintenance and investment.

5. *Incentivising Preferred Practices*: Enabling change towards outcomes in line with preparing for future trends by making such practices more economically competitive. This may be achieved by: the inclusion of specific performance requirements in tenders; providing financial incentive for particular practices in project; and aligning procurement practices to prefer products and services that support efforts to prepare for future trends.

6. *Increase the Efficiency of Existing Infrastructure*: Improving the efficiency of existing infrastructure can dramatically reduce the need for new infrastructure, reducing pressures on resources and capital. This may be achieved by: creating additional intermodal transit hubs to harness existing road infrastructure (such as truck to train freight, bus to train passenger); the use of operative intelligent transport systems (ITS); the use of managed lanes (such as high occupancy vehicles and public transport vehicles); encouraging decentralised operations to harness existing infrastructure in satellite or regional locations; support flexible work hours to spread out peak traffic loads.

7. *Adaptable Design Standards*: Creating and using standards that are adaptable and site specific to allow optimum use of resources and money for a specific site. This can be achieved by: providing material specifications that are flexible for different areas; and by using and allowing site specific technologies/solutions.

8. *Knowledge Sharing and Capacity Building*: Encouraging rapid uptake of tested innovative technologies and practices through providing awareness raising and capacity building. This can be achieved by: funding research projects to create educational and capacity building materials; incorporating a 'lessons learned' requirement in project reporting; improving

regional communication; providing targeted skills training to address shifting roles of road agencies.

9. *Investment in Carbon Management*: Reducing carbon emissions by removing the barriers to cleaner technology and shifting to low carbon fuels and energy. This may be achieved by: carbon measurement and reporting of road projects; the provision of enabling infrastructure (e.g. electric car charging stations); preference for low carbon cars in government and industry fleets; requirements for low carbon options in tendering; and disclosure of carbon liability of projects.

10. *Transit Oriented Developments*: Coordinate the road network with urban planning, aiming for compact urban development in close proximity to urban corridors and existing retail and employment centres. This can be achieved by: infrastructure for decentralization, and urban planning to allow for a hub-and-spoke model of development.

This analysis shows that there are a number of strategies that are applicable across multiple trends such as '*road pricing mechanisms*', '*government action to support change*', and '*investment in research and development*', which may provide powerful leverage points to strengthen efforts to prepare for the future trends selected. For example road pricing has the potential to simultaneously reduce congestion and user pressures on roads whilst generating revenue to invest in road maintenance and the provision of low carbon alternatives to car use. The implementation of road pricing is being trialled and used in a number of countries around the world and its use will involve consideration of a range of political, social, and economic issues and opportunities.

Key insights into workshop methodology

A key outcome of the workshops was to run through a facilitated process developed by the research team to assist road agencies and stakeholders to consider the future of roads. The process is intended to simplify the consideration of future trends and the associated risks to provide a way of identifying strategic responses that may be called for in the future and that can be prepared for in the short-term. Participant feedback, both formal and informal, indicated that the process was clear and well facilitated and no major issues were raised.

The scenario building process takes a complex idea and provides a framework for deconstructing the issues involved, leading to tangible outcomes and quality discussions. The workshops certainly demonstrated a process that achieved these outcomes and the research team is excited by the findings. The research team found that a group of 20-30 participants is a suitable number to gain significant insights into the range of issues and trends facing the industry. The outcomes of such a process will inevitably be dependent upon the level of participant's prior knowledge and experience, however the aim is to achieve a considerable spread of people to gain a broad perspective. Processes such as these always bear the risk of oversimplifying complex issues. The research team believe that this risk is overshadowed by the quality of discussion that is able to occur between participants and also the emergence of tangible strategies ready for further consideration by governments and road agencies.