Transport Portfolio Scenario-Based Planning for the Queensland Department of Transport and the Queensland Department of Main Roads 2000 - 2025
There is only one thing about which I am certain, and that is that there is very little about which one can be certain.

Somerset Maugham
(1874 - 1965)
Foreword

Queensland Department of Transport (Queensland Transport) and the Queensland Department of Main Roads (Main Roads) recognise that the future is far from certain. The unprecedented pace of change means that organisations such as ours cannot simply rely on extrapolations of past trends in planning for the future.

The decisions we make today will directly shape our ability to meet our customers’ future needs, and these decisions are themselves shaped by the assumptions we make about the future. It is therefore important that we have tested our assumptions about the future by reviewing a diverse range of plausible futures and the challenges and needs associated with each. Scenario planning is a useful tool for doing this.

Scenario planning helps us to understand the forces that drive and shape the future. By telling stories about plausible futures, scenario planning forces decision-makers to consider their plans against a range of possible outcomes. Rather than forecasting or predicting a particular future, the use of scenario-based planning allows an organisation to experience and learn from a range of futures.

The process jointly undertaken by Main Roads and Queensland Transport over a six month period resulted in the development of four scenarios – SuperCity, Coastal Bloom, Carbon Crunch and Global Bust. While the scenarios are a significant tangible output from the scenario planning process, these are merely tools that will be used in the coming months to test our planning and policy settings. This will involve the continuation of the type of collaborative activities that both departments have undertaken during the process.

While working closely together over a period of six months to develop the scenarios, senior executives from both Main Roads and Queensland Transport have strengthened the working relationship between the two departments. It is planned to build on this level of cooperative activity when the portfolio implications of the scenarios are further explored.


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A Snapshot of Scenario Planning in the Transport Portfolio

A joint Queensland Transport/Main Roads Project Team was established to research and develop Transport Portfolio scenarios for the next 25 years. The scenario planning process involved the development and exploration of plausible futures that could markedly affect how we connect people, goods and services. The process was not aimed at articulating a preferred future, nor was it aimed at determining the most probable future. The point of scenario planning is to create plausible test environments for potential strategies and policies, as a means of improving the quality of decision making. It challenges us to understand the unstated assumptions we traditionally make about the future and allows us to test whether our plans are robust in other futures.

A Steering Group comprising six senior managers from each department and five external members provided direction to the Project Team. A Working Group of 60 QT and MR managers participated collaboratively to support the development of the scenarios and explore the transport implications.

The Project Team extensively researched the wide-ranging factors that potentially impact on the transport challenge. The final product of the scenario planning process consists of four scenarios, a surrounding report and accompanying analysis. However, more important to the portfolio is the increased understanding gained by staff and management of the potential for radical changes in the needs of Queensland communities as the result of changes in technology, demographics, business practices and the like. By challenging and testing our unstated

### The Scenarios

#### SuperCity
- 4M+ people in SEQ
- High quality of life
- Growth economy Australia’s second city
- Travel demand growth equals population growth
- Pressure on the urban transport system

#### Coastal Bloom
- SEQ quality of life decreases
- Migration from interstate, SEQ and overseas to coastal Queensland
- Growth concentrated along coast — Noosa to Cooktown
- Economy based on global services and tourism
- Travel demand is higher than population growth
- Major new demands on transport infrastructure

### Scenario Planning

**DOES**
- Identify key drivers likely to shape our future
- Gauge the impact of key drivers
- Engage members of the organisation in dialogue about the future
- Build shared understanding of potential impacts and implications of change into the future
assumptions we are more likely to develop portfolio-wide plans and strategies which are sufficiently robust to be useful in a range of futures.

**The Focus**

The primary strategic issues or decisions facing an organisation provides the focus for scenario research and development. These issues are expressed as a question about the future that the scenarios are expected to answer or illuminate. The focal question selected for the project was:

*How will we be connecting people, goods and services in 25 years and what will that mean for transport?*

This question became the focus for over 100 interviews and extensive research, and guided the development of the scenarios.

**The Future**

In many ways, the report merely marks the real start of scenario planning in the portfolio. The next steps include:

- developing a vision for the Transport Portfolio;
- further exploring the implications of the scenarios for the portfolio;
- using the outcomes of the scenario planning process to inform strategic planning in Main Roads and Queensland Transport;
- using the outcomes of the scenario planning process to inform policy development and organisational planning activities within Main Roads and Queensland Transport;
- developing an on-going scenario planning capability within the portfolio that enables indicators regarding the scenarios to be developed and monitored and for scenarios to be adjusted to reflect changing circumstances;
- ensuring that the lessons and implications learned in the course of scenario development are communicated and understood by staff throughout the portfolio.

**Scenario Planning**

**DOES NOT**

- Use straight line projections from past trends
- Predict a particular future
- Identify preferred futures

**Carbon Crunch**

- Global warming occurs
- Increased natural disasters cause insurance cost to rise
- Kyoto Protocol ratified
- Global Carbon Trading
- Low carbon technology
- Coal market collapses
- Urban form and urban transport patterns change

**Global Bust**

- Initial globalisation of Queensland economy
- Social & environmental concerns reglobalisation
- Protectionism introduced
- Global computer network failure — global market crash
- Shrinking export markets
- Low capability re manufacturing
- Rise in localism and sustainability
- Triple bottom line for business — people, planet, profit (social, environmental & economic costs and benefits equally important)
Aims and Objectives

The scenario planning project aims to explore the range of potential future contexts for transport in Queensland, and to display these in the form of scenarios extending to the year 2025.

Queensland Transport and the Department of Main Roads jointly initiated the Scenario Planning project for the Transport Portfolio in June 1999. The objectives of the project were to:

- develop future scenarios for use in strategic policy and planning across the Transport Portfolio;
- develop a shared view and on-going dialogue about possible futures for the portfolio;
- develop a shared understanding of assumptions underpinning decision making and planning;
- challenge existing assumptions about the future;
- test the robustness of portfolio planning in a range of futures;
- develop effective relationships across the portfolio;
- assist the departments to develop future-oriented strategic plans;
- share resources and avoid duplication in scenario planning activities.

Transport Portfolio

It is becoming increasingly difficult to meet all of the transport needs of the community and industry. Queensland has a growing population that has a high expectation of personal mobility. Expanding tourism, minerals and other commodity markets places increased demands on the transport system.

Other issues of significance to the Transport Portfolio include:

- continuing to build the relationship between Queensland Transport and Main Roads and Queensland Rail;
- positioning the portfolio to provide integrated solutions for the government;
- responding to whole-of-government agendas and community needs in order to ensure continued relevance;
- competing demands for infrastructure funds.
Why Scenario Planning?

All organisations need to be well positioned to respond to uncertainty. It is no exaggeration to suggest that the only certainty is that things will not be like they were. Faced with the likelihood of a wildly different future, organisations must ask questions like:

- How do we plan and build infrastructure over the next two to five years in a way that will meet our customer’s needs, not only in the short-term but over the life of the infrastructure?
- How do we develop services and corporate capabilities that will not be obsolete by the time they are implemented?

Such questions have become increasingly acute as the pace of technical, social and business changes increases dramatically. These questions are especially relevant to organisations within Queensland’s Transport Portfolio, because of the need to develop services and plan and build infrastructure that will meet Queensland’s transport needs for many decades.

By developing a number of stories about possible futures, scenario planning allows decision-makers to explore the shape and nature of the transport task with a variety of circumstances – some good and others we would probably not prefer. By exploring these possibilities and examining their implications for the portfolio, we will be better prepared to react in a more reasoned and thoughtful way should these futures (or aspects of them) come to pass. In this way, scenario planning allows decision-makers to ‘remember the future’.

It is important to get our planning for the future right. If we are not alert to the range of futures that might lay ahead and plan accordingly, we risk putting in place an ineffective and inefficient transport system that will not meet the needs of Queensland 10, 15 and 25 years from now. Such an outcome could lead to a decline in the standard of living of Queenslanders, as we find ourselves unable to compete with those states and countries that got their transport planning right.

In short, it is critical that what we do now be informed by our future needs. Scenario planning is a valuable tool in this process.

‘No longer can planning be based on more of the same.’
(Internal interviewee, QT/MR)

‘The Future doesn’t just happen - it is shaped, modelled and influenced by our actions.’
(D. Espie, 1999)
What is Scenario Planning?

Scenario planning is a way of envisaging what the future might hold for a particular organisation (or industrial sector, State, country or the like). It is an attempt to identify the major drivers that are likely to shape our future and to gauge the impact these will have on the organisation and its relationships with customers and stakeholders.

Rather than using straight-line projections from past trends, scenario planning attempts to tell stories about possible and plausible futures in which the organisation may have to operate. It is as much a ‘process’ of engaging the members of the organisation in a dialogue about those futures and their implications, as it is an effort to achieve a final ‘product’.

Scenario planning is a means of recognising and challenging existing assumptions. It involves researching key strategic variables and factors that are changing or that could change. It then assembles the findings into qualitative pictures or ‘stories’ that show the range of future uncertainty that may result. These pictures or scenarios can then be used to test the resilience of strategies and plans.

The Process of Scenario Planning

Despite its use of stories, scenario development follows a systematic sequence of steps. A focus for the work is first established, followed by research into the ‘driving forces’ – social, economic, political, and technological. Driving forces can be defined as major sources of change that impact on the future.

The next step is the ‘scenario logic’ or pattern of interactions that explain how the driving forces could combine to determine future conditions. The driving forces are divided into ‘pre-determined elements’ (i.e. what is inevitable, like many demographic factors that are already in the pipeline) and ‘critical uncertainties’ (i.e. what is unpredictable or a matter of choice such as public opinion). The critical uncertainties are prioritised according to importance and uncertainty.
This analysis is then used to create scenarios—stories of future worlds that convey a range of possible outcomes. The scenario implications are then identified and appropriate leading indicators are monitored on an on-going basis.

**The Advantages of Scenario Planning**

Scenarios explore the possible future shape of the strategic environment, the future context that could play a large role in determining the success of decisions made today. They are effective because they:

- allow ‘thought experiments’ — thinking through the implications of different strategies in different future environments;
- allow learning and rehearsal of the responses that would be required in plausible future worlds (e.g. developing strategies that might influence particular outcomes);
- challenge existing strategy and policy thinking;
- describe the conditions that decision-makers may have to face — they do not describe the actions that policy-makers intend to take, or conditions that they would necessarily like to see;
- deliberately present distinctly different possible futures—although the actual outcome may indeed be a blend of elements from more than one scenario. Portraying the future worlds as strongly different from one another allows greater learning than would a less distinct blend;
- sensitise decision-makers to unwelcome or subtle changes in the environment. If a threatening potential future is clearly seen, it may lead to actions which deflect that possibility.

Ultimately, therefore, the measure of good scenarios is not whether they get the future right, but whether they lead to better decisions in the present. Scenarios improve the quality of decision making by:

- questioning assumptions;
- developing fresh insight;
- getting the ‘measure’ of problems;

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**Forecasting vs Scenario Planning**

*Forecasting*
- Focuses on certainties and disguises uncertainties
- Conceals risk
- Results in single point projections
- More quantitative than qualitative

*Scenario Planning*
- Focuses on & legitimises recognition of uncertainties
- Clarifies risk
- Results in adaptive understanding
- More qualitative than quantitative
developing shared understanding;
rehearsing responses;
developing robust strategies effective if circumstances change.

Forecasting based on extrapolation from past trends that results in precise future predictions usually prove to be inaccurate. By contrast, scenario planning aims to build an understanding of how all the players and forces in the strategic environment interact as a system. While the pictures of the future developed through scenario planning may not be precise, they will usually expose a range of possibilities that otherwise would have remained hidden. In short, scenario planning is based on the idea that it is better to ‘get the future imprecisely right’ than it is to ‘get the future precisely wrong’.

Scenario planning has been undertaken worldwide by corporations, governments, research institutes and not-for-profit organisations. Examples of Australian organisations that have undertaken transport-related scenario planning include Transport South Australia, Main Roads Western Australia, the National Transport Planning Task Force and the Australian Road Research Board. In Queensland, government departments that have undertaken (or are currently undertaking) scenario planning include Department of Natural Resources, Department of State Development and the Department of Primary Industries.
Our Approach

The Transport Portfolio Scenario Planning Process

In June 1999, the Directors-General of Queensland Transport and the Department of Main Roads approved a joint project to develop scenarios for use in the Transport Portfolio for the period 2000 to 2025.

The project was headed by a Steering Group comprised of senior executives in the portfolio and jointly chaired by Queensland Transport’s Deputy Director-General, John Gralton, and Main Roads’ General Manager (Strategic Policy and Development), Neil Doyle. The Steering Group also contained members external to the Transport Portfolio.

The project also established a wider Working Group including the Directors-General and other senior officers of the departments in the Transport Portfolio. The Working Group engaged in substantial dialogue and significantly contributed to the scenario planning process and outcomes.

A Project Team composed of officers from both departments was established to conduct research and develop scenarios and other materials for consideration by the steering and working groups. The project also engaged the assistance of a consultant with extensive experience in developing transport-related scenarios, Hardin Tibbs of Synthesys Strategic Consulting Pty Limited in Canberra.

More than 30 Project Team meetings were held to develop materials for consideration by the Working and Steering Groups. The Working Group met on six occasions to consider issues and proposals made by the Project Team and the Steering Group met five times to determine the direction of the process and the shape of the scenarios to be developed.

Scenario Planning Project Objectives

- Develop future scenarios for use in strategic policy and planning across the Transport Portfolio
- Develop a shared view and on-going dialogue about possible future scenarios for the portfolio
- Develop a shared understanding of assumptions underpinning decision making and planning
- Develop effective relationships across the portfolio
- Assist departments to develop future-oriented strategic plans
- Share resources and avoid duplication in scenario planning activities
- Challenge existing planning assumptions

‘An organisation is the entire set of relationships it has with itself and its stakeholders.

An organisation is not a physical thing per se but a series of social and institutional relationships between a wide set of parties.

As these relationships change over time, the organisation itself changes... Since we are dealing with a system, a change in any one part potentially affects all other parts and the whole system itself.’

(Mitroff & Linstone, 1996)
The Focus

The primary strategic issues or decisions facing an organisation provide the focus for scenario research and development. These issues or decisions are expressed as a question about the future that the scenarios are expected to answer or illuminate. The focal question selected for the project was:

*How will we be connecting people, goods and services in 25 years and what will that mean for transport?*

This question became the focus for over 100 interviews and extensive research, and guided the development of the scenarios.

Research

The Strategic Environment for Transport in Queensland

At the conclusion of the initial interview and information collection phase, the project team explored the way various driving forces were interacting to shape the future of the transport system. These inter-relationships were studied as a series of subsystems within the larger transport system. In addition to the 'obvious' approach of taking specific transport modes as subsystems, a diversity of other perspectives was also taken, for example looking at the systemic issues around congestion, the impact of e-commerce and internet-based freight logistics, and the prospects for remote and regional areas.
The strategic subsystems that were explored included:

<table>
<thead>
<tr>
<th>Transport modes</th>
<th>Urban futures</th>
<th>Transport Technology</th>
<th>Information Technology</th>
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<tbody>
<tr>
<td>road</td>
<td>congestion</td>
<td>hybrid electric vehicles</td>
<td>internet</td>
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<tr>
<td>air</td>
<td>urban form</td>
<td>hypercars</td>
<td>e-commerce</td>
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<td>rail</td>
<td>prospects for infrastructure projects</td>
<td>fuel cells</td>
<td>telecommuting</td>
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<td>water</td>
<td>spatial trends</td>
<td>ITS</td>
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<td>public transport</td>
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<td>high speed trains</td>
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<td>possible new modes</td>
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<td>ground effect vehicles</td>
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<th>Government</th>
<th>Economics</th>
<th>Environment</th>
<th>Social and Demographic</th>
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<td>decline of nation state autonomy</td>
<td>globalisation and export trade</td>
<td>global climate change</td>
<td>ageing baby boomer generation</td>
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<tr>
<td>role changes from control to facilitation</td>
<td>employment &amp; the changing nature of work</td>
<td>urban air quality</td>
<td>generation</td>
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<td>levels of government community engagement</td>
<td>work in the knowledge economy</td>
<td>water availability in rural areas</td>
<td>retirement patterns</td>
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<td>localisation of decision making</td>
<td>e-commerce</td>
<td>international responses to greenhouse emissions</td>
<td>migration and immigration</td>
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<tr>
<td>balance between economic, social &amp; environmental issues</td>
<td>down sizing outsourcing and contracting</td>
<td>integrated impact assessments</td>
<td>post-industrial values, ethics &amp; spirituality</td>
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The main conclusions about each of these subsystem areas are described in Section 2 of this report.

The research involved:

- Over 60 interviews with QT and MR senior managers & staff
- Over 70 interviews with external stakeholders, including experts from a wide variety of fields
- Extensive literature review
- Staff focus groups conducted in approximately 15 locations across the State
- E-mail input from a group of 50 QT and MR staff

The research focused on:

- Exploring and understanding the current strategic environment, as a basis for identifying potential future developments
- The transport task for Queensland, taking into account:
  - the State’s vast geography and climatic range
  - concentrated urban and coastal settlement
  - the small population in the West
  - the significance of primary industries, minerals, other commodities and tourism
- Identifying the ‘right’ questions to ask, such as:
  - What determines the transport task in Queensland?
  - What key forces shape the development of transport systems?
The Focal Question
How will we be connecting people, goods and services in 25 years, and what will that mean for transport?

Scenario Logics

The transport scenarios presented here are based on:

- A mix of ‘pre-determined’ elements, or future outcomes about which there is a high degree of confidence;
- ‘Critical uncertainties’, or future outcomes which are both highly uncertain and very important to the strategic concerns of the Transport Portfolio.

The critical uncertainties, which give rise to the differentiation between the scenarios, are related to three key dimensions – the pattern, means and intensity of travel.

- The pattern of future travel is a function of changing economic and social patterns, expressed through spatial choices such as emerging settlement patterns, the location of work and the evolution of urban form.
- The means of future travel is a function of the wealth of society and the continuing search for improved quality of life, expressed through choices such as new technology adoption, modal choice, environmental protection and attitudes to public transport.
- The intensity of future travel is a function of factors influencing demand, such as economic growth, population dynamics, the location of opportunities and relative prices.

The four scenarios represent a mix of possible outcomes along these uncertainty dimensions. These are presented in a simplified form in the following table:

<table>
<thead>
<tr>
<th>Pattern</th>
<th>SuperCity</th>
<th>Coastal Bloom</th>
<th>Carbon Crunch</th>
<th>Global Bust</th>
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<tbody>
<tr>
<td>Means</td>
<td>ITS + Public Transport</td>
<td>Car intensive</td>
<td>New technology</td>
<td>Ageing technology</td>
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<tr>
<td>Intensity</td>
<td>High</td>
<td>Very high</td>
<td>Selective impacts</td>
<td>Low</td>
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The Resulting Scenarios

In response to the focal question ‘How will we be connecting people, goods and services in 25 years, and what will that mean for transport?’, four State-wide scenarios for use in future planning and policy development within the Transport Portfolio were developed. The scenarios address a range of State-wide transport implications resulting from different sets of future outcomes. These scenarios are entitled:

- SuperCity;
- Coastal Bloom;
- Carbon Crunch;
- Global Bust.

Broadly, the SuperCity and Coastal Bloom scenarios describe two worlds in which demographic and locational trends (shaped and abetted by economic and business drivers) lead to the development of significantly different transport challenges from those currently facing Queensland.

In the case of SuperCity, the challenge is to meet the transport needs of more than 4 million people located in the South East corner of the State.

In the Coastal Bloom scenario, the challenge is to respond to the development of a series of medium-sized urban areas, some interlinked, up the coast north of Brisbane in an increasingly globalised economy.

The Carbon Crunch and Global Bust scenarios are more related to the effect on the transportation system posed by outside ‘shocks’.

In the case of Carbon Crunch, the transport challenge is shaped by the need to react to international pressures regarding ecological and environmental concerns, including those relating to greenhouse emissions.

The Global Bust scenario examines the transport implications of a world-wide and sustained economic downturn.

The detailed scenarios can be found at Section 3 of this report.
Wildcards

There is no certainty in planning. There are of course, certain developments that could occur, that are not included in the scenarios. Some of these represent transformational changes. If they come about they will have enormous impacts on all scenarios.

These changes or ‘discontinuities’ are sometimes called ‘wildcards’. They include developments such as breakthroughs in transport or energy technologies, global wars or epidemics, or a wildly changed political or social environment.

Breakthroughs in transport or fuel technologies could have a revolutionary impact on the future transport task. Likewise, a modern ‘Black Plague’ which wiped out half the population of Europe in the 13th century would drastically alter the transport future, as would other major global calamities.

If the ‘flying car’ becomes a feasible and affordable mode of transportation, the task set for transport planners would be completely different from that which they face today.

A decision was made not to base any of the scenarios on these more speculative wildcards. To do so would have made the scenarios less plausible and would have meant that many people in the organisation would not be able to engage as effectively in the process of envisioning the future. Also, to incorporate some of the more dramatic wildcards into the scenarios would distract from the understanding to be gained regarding the impact over time of the principal drivers, which form the heart of the logic of the four scenarios. People might spend more time debating whether such things as world plague, flying cars or nano-technology are possible, rather than examining how other key drivers could impact on the future. If scenarios are based on drivers that are regarded as implausible, then the tendency is for people to reject the whole scenario.
Nonetheless, certain wildcards could have a huge impact on the future of transport. For that reason, they need to be monitored and periodic consideration given to whether or not the scenarios require modification in light of underlying developments affecting the wildcards.

These ‘wildcards’ have the potential to impact on the transport system. While they have not been included in the scenarios, they do need to be monitored in the future.

<table>
<thead>
<tr>
<th>‘Transporters’</th>
<th>Industrial disasters</th>
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<tr>
<td>- Flying car or jet car</td>
<td>- Major oil spill in reef</td>
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<td>- Gravity shielding</td>
<td>- A bigger version of Chernobyl impacting areas of greater population</td>
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<tr>
<td>- Magnetic levitation trains</td>
<td></td>
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<tr>
<td>- Molecular transporters (Star Trek-style transporters)</td>
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<td>- WIG vehicles operating on rail corridors</td>
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<th>Energy</th>
<th>Political</th>
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<tr>
<td>- Cold fusion</td>
<td>- States abolished</td>
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<td>- Zero point energy</td>
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<th>Epidemics</th>
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<td>- World-wide plague/influenza</td>
<td>- Regional Government</td>
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<td>- Ebola-type fever/something more virulent than AIDS</td>
<td>- Tiers of government — 3 to 2 or 1</td>
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<td>- Nuclear/biological/weather/electronic(IT)</td>
<td>- The emergence of a World Government in response to inability of independent governments to manage their nations</td>
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<td>- Religious</td>
<td>- Terrorism; anarchy</td>
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<td>- Invasion from Asia</td>
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<td>- Nuclear contaminated oil fields</td>
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<th>Refugees/migration shock</th>
<th>People’s Values Dramatically Change</th>
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<td>- Displaced millions from Asia, Africa, India, South America</td>
<td>- Most people stop working for money</td>
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<th>Natural disasters</th>
<th>People’s Values Dramatically Change</th>
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<tr>
<td>- Catastrophic earthquake(s), tidal waves, cyclones</td>
<td>- Massive increase in spiritualism impacting how we work and interact with each other</td>
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<td>- Large meteorite strike</td>
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Underlying Questions in Transport Policy Development

The focus of scenario planning is not to make judgements about what is ‘right or wrong’, rather to provide opportunities through interviews and discussions, for people’s mental models (the way they see the world) to be shared and better understood. The interviews conducted and the dialogue that occurred during the process highlighted that people came to the discussions with a wide range of assumptions, beliefs and values. This brings richness to the discussion. However, it can also be the source of disagreement, confusion and uncertainty. When it comes to making key decisions, developing policy or designing strategies, it is important that those involved understand the range of assumptions regarding key issues and how their own values and beliefs influence the results.

In the scenario planning process, a number of ‘frameworks’ or ‘filters’ that affect the way people make decisions became evident. These ‘frameworks’ include:

- environment;
- social (e.g. access and equity);
- funding;
- congestion.

In the transport policy and planning process, each of these can act as ‘inputs’ – each is ‘rationally’ considered and decisions are made to achieve the best outcome possible. Political platforms can often develop around these ‘frameworks’ so that any one area takes on a higher profile in decision making and policy development.

People need to be aware of the assumptions or values they hold or the ‘hierarchy’ of importance they might attach to these ‘frameworks’. Without this level of awareness, it is probable that people unconsciously take positions without adequately understanding or considering other views or mental models. It is clear that significantly different transport system outcomes eventuate when one particular ‘filter’ takes...
precedence over others. For example, someone with strong environmental ‘filters/values’ is likely to make different decisions from someone who is driven primarily by economic values – both will have considered the same inputs but may draw totally different inferences from the data.

The process of thinking about the future of transport is not merely a matter of isolating ‘driving forces’ and considering their potential interactions. There are a number of areas where there are significant questions of interpretation — where the available information is inconclusive or contested. During the scenario planning process, a number of complex issues and questions arose around which there is debate, uncertainty or multiple perspectives. These questions reveal important sources of uncertainty in trying to anticipate future developments. The aim here has been to identify and articulate these uncertainties rather than attempt to answer them, since in many cases there may be no definitive answers. However, a partial range of possible answers or outcomes is reflected in the scenarios.

Key Questions and Pivotal Policy Issues that Emerged

- How can the policy and planning process ensure that decision makers hold shared assumptions and mental models around key transport-related issues, including environmental, social, funding and congestion?

- Should government make decisions on behalf of society, or should government only facilitate what society wants it to do? What might partnerships in decision making look like in the future? What is the role of Government in safeguarding community benefits/public interest in a world of privatisation and commercialisation?

- How do potentially controversial and politically sensitive transport issues (e.g. river crossings, new roads, freight corridors, road pricing, demand management) get on the agenda for public dialogue and debate? How does the media impact on public dialogue?

- How will the Transport Portfolio determine future growth in the use of the car/road system? Does it matter if there are different models used across the portfolio?
Is travel demand management an absolute requirement or is it a response related to social, economic and environmental externalities specific to the current transport technologies and urban form?

What values drive public transport policy in Queensland? Do all public transport providers share a common view of an integrated public transport system? What is the role of the Transport Portfolio in ensuring a sustainable public transport system into the future?

How will government allocate scarce funding; and what whole-of-government responses will be required in the future? What impacts would whole-of-government funding have on the Transport Portfolio?

How can the portfolio continue to build effective relationships between Queensland Rail, private operators and Queensland Transport and Main Roads to ensure efficient and effective integrated transport outcomes for the future?

How can the Transport Portfolio as a whole become better positioned to lead, manage and respond to technological change? (e.g. ITS, new vehicle technology, information systems, e-commerce use and implications)

How sustainable is the current structure of the Transport Portfolio? What key factors need to be considered regarding duplication, policy, planning and infrastructure development across the portfolio and whole-of-government?

What would whole-of-government project focus and funding at Cabinet level mean for individual portfolios or departments?
Research Findings

The information from the environmental scanning process presents an overview of the possible and plausible trends and forces shaping the future over the next 25 years. This material has been gathered from interviews, literature searches and focus groups.

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SECTION 2
Social & Demographic Factors

The following key forces have been identified as having major impacts for the future:
- ageing population;
- population growth;
- population distribution;
- immigration;
- employment and the changing nature of work;
- wealth distribution;
- community and generational values;
- nationalism;
- spiritualism.

**Ageing Population**

In June 1999, the world’s population reached 6 billion people. By 2050, the world’s population will be 8.9 billion (UN Publications, 1996). This figure shows a significant decline in world population growth rates. In much of the developed world, lower birth rates will eventually lead to a net loss in population and a dramatic increase in median age. This signals a trend towards an ‘elder boom’ and the implications of this are profound. From 1946 – 1971, only 8% of Australia’s population was aged 65 years or over. By 1997, this had climbed to 12% and this age group is projected to climb rapidly after 2011 until it exceeds 21% of Australia’s population by 2031 (Australian Bureau of Statistics (ABS), 1999a).

The effects of an ageing population will be felt in the workplace as ageing ‘baby boomers’ and Generations X and Y will remain in the workforce beyond traditional retirement age. The ageing population is wealthier and healthier than any previous generation. They are better educated and are canny consumers. Ageing ‘boomers’ hold a strong conviction that ‘ageing well’ is their right. They desire ‘retirements’ where they are busy, contributing their skills and experience.
contributing to their communities and ensuring that the world is a fit place for their grandchildren. Their plans include travel and touring and adventure, exotic locations, historic sites and pilgrimages are favoured options for over 65s. The fastest growing internet user group in the USA is people aged over 50 years.

In Queensland, the current trend suggests that by the year 2020, 45% of the population will be aged over 55 years.

**Queensland Population Growth and Distribution.**

Currently 85% of Queenslanders live within 50 kilometres of the coast. Only three large cities exist further than 50 kilometres from the coast - Mt Isa, Toowoomba and Charters Towers. Since 1991, Queensland has experienced significant population increases due to interstate migration, with population increasing by 40 207 per annum between 1991 and 1996. In 1998, this dropped back to an increase of 16 000 per annum. However, over that time, overseas immigration to Queensland has also increased. Overall, 80% of population growth occurred in the South East corner (Department of Communication and Information, Local Government and Planning (DCILGP) 1999b).

Queensland is perceived as offering better quality of life opportunities - good climate, clean environment, available employment, cheaper cost of living, adequate services - than other Australian centres.

**Imigration**

Overseas immigration to Queensland increased from 8000 per annum in 1991–1996 to 18 903 in 1998 (DCILGP, 1999a, 1999b). Migration patterns are capturing the attention of governments around the globe. ‘Guest workers’ are fast becoming the labour force of the global economic village as transnational companies create a work force of global citizens. In many parts of the world, this has created economic, social and political concerns regarding undocumented and unskilled workers.

However, the big issue for the 21st century will be how governments address the issue of an increasingly mobile, global population of professionals who view themselves as global citizens and expect to
work in any country as projects, profits or productivity demands. These global citizens are not interested in being absorbed by the host country and fully intend to return home or move onto the next destination.

Traditionally, world migration patterns show that large groups of poor, mostly unskilled people migrate to richer countries to improve their prospects or to escape persecution. Research shows that these groups usually contribute more to the overall economy than they take from it. Today more than 125 million people live outside their country of origin. It is predicted that by 2020 that number will have doubled as highly skilled, highly mobile workers travel the globe in search of career development. There will be policy (and economic) tensions for governments grappling with immigration policies that do not recognise global citizenship (The Global Network, 1999).

Australia has one of the most multicultural populations in the world. Sydney is already attracting transnational companies which want to take advantage of its well educated, multi-lingual population.

**Employment and the Changing Nature of Work**

What will ‘work’ look like in 25 years time? Some estimates state that 70% of the jobs in 2025 have not been thought of yet.

There have been significant changes in employment patterns in Australia over the past 20 years. All indications are that transformation in the nature of employment and of work itself will continue. Some of the indicators regarding employment changes include:

- In 1998, 25% of full-time workers worked more than 49 hours per week;
- In 1999, part-time jobs accounted for 26% of employment;
- Small businesses have provided over 50% of all private sector employment since 1990;
- Casual employment increased from 19% in 1995 to 27% in 1999;
- The services sector provided 93% of jobs created in Australia between 1985 and 1995 – over the past 30 years, jobs in the goods industries...
have fallen by 25% while employment in the personal services and knowledge-based industries has risen from 25% in 1966 to over 44% of the jobs market in 1996;

- female participation rates in employment have risen from 40% in 1964 to 54% in 1998 when women comprised 43% of the labour force;
- in 1998, 48% of women with pre-school age children were working;
- in 1997, 27% of full-time workers took work home and 6% worked principally from home;
- by 1999, 12% of employees were individual contractors.

(ABS, 1999b, 1999c; Sloan, 1993; O’Connor, 1993; Kemp, 1994, 1996; DBIRD, 1995)

By far the greatest force impacting on the world of work is information technology. The internet, e-commerce and the advent of globalisation mean that where things happen, who they are done by, how they are tailored to meet the customer’s needs and who or how they are controlled result in profound changes to employment patterns and the nature of work.

Today in Queensland, the bus schedules for some areas are developed in the UK; calls to Hervey Bay taxis are answered through a Call Centre on the Gold Coast; pay an insurance bill by phone and the operator sits in Tasmania. USA payrolls are processed in Asia; forget 24 hour businesses - IBM has invented the 48 hour day. At 6pm in Beijing, Java software programmers download to IBM in Seattle, where at the end of the day, that team downloads to a team in Latvia and they do likewise to colleagues in India. At the end of their shift the data is returned to Beijing in time for the morning shift (Friedman, 1999). Twenty four hours a day, seven days a week is already here in many industries.

The rise in part-time and casual employment signals a trend for the future already recognised and affecting the thinking of the Federal Department of Finance. One economic forecasting group paints a picture of a world where 30% of people are in full-time, secure employment, 40% move in and out of temporary, casual or contracted jobs and 30% of people never have a job. The move towards temporary,...
casual and contracted work is already evident. In many cases, workers now choose this option, driven by career development needs, and a need to operate at the leading edge. Contracted project work, based anywhere in the country or overseas is the norm for many workers.

Young people especially have a different set of values around work. They look for organisations which offer learning and challenges. In the USA, the brightest young graduates no longer choose the traditional Fortune 500 companies but look to young, entrepreneurial organisations. Values do not include company loyalty or ‘jobs for life’. Many workers in the 21st century will place flexibility, quality of life and learning on the top of their employment requirements and will remain masters of their own destiny through contracting rather than trust an organisation to ‘look after them’. This group of people will be ‘income rich but time poor’.

However, for people with fewer skills, this move towards part-time and casual employment means increased insecurity and lower income. They will be ‘income poor but time rich’. A significant number of jobs will be created to service the needs of the ‘income rich’.

**Wealth Distribution**

The changing nature of employment and the divide between income rich and poor signals a potential future issue for government and communities. One view identifies the rise of movements such as ‘One Nation’ as signifying dissatisfaction within sectors of the community of perceived inequities in the social and economic fabric of society.

According to the ‘Gini Index’ used by the OECD to measure social indicators, Australia has the fourth highest level of poverty across OECD countries and has the highest level of welfare payments (Shann, 1999).

In the future, the gap between ‘haves’ and ‘have nots’ is likely to be evident through:

- location - where people live;
- levels of education and health;
- ability to choose transport and other services;

### Implications for Transport Portfolio

- The new paradigm around work and employment (e.g., contracting) will change employment practices in government.
- Information technology will impact on travel demand— but likely to result in fewer but longer trips.
- The ‘income rich/time poor’ and ‘income poor/time rich’ mix will change the transport task.
stress-related mental health issues;
access to information;
access to services;
increased crime against property.

Generational & Community Values

There have been significant values shifts over the years and nowhere are they more apparent than the attitudes and values of different generations. Research from the USA Human Resources Institute and Australian author Hugh McKay signal profound differences in values held across generations (Read, 1998). These issues are critical when decisions are made regarding the type of workplaces and the type of cities and towns we are developing for the future.

If decisions are made by ‘baby boomers’ (those born 1946 – 1964), and reflect only their values and aspirations, then will our cities, our towns and our organisations attract and keep bright young people? This generation, termed ‘Click & Go’ or ‘the Net Generation’ is the first to grow up with computers and will be the first to fully and profitably exploit labour saving and information sharing technology, according to Don Tapscott, author of ‘The Digital Economy’ and ‘Paradigm Shift’ (Tapscott, 1993, 1996).

Values and attitudes of ‘baby boomers’ have shifted with age. Trends to consider for the future include:

- volunteerism - living a meaningful life and doing things for others;
- spirituality - seeking answers through traditional and non-traditional forms of worship; pilgrimage travel; less driven by materialism;
- entrepreneurship - wanting to remain productive; using skills and experience; starting home-based businesses; consulting; small business;
- community activism - supporting causes; lobbying; taking on community responsibilities; strong sense of making the world a better place for future generations; political and legal ‘savvy’;

Implications for Transport Portfolio

- Government will need new ways to engage in decision making with communities
- An increasing challenge will be helping communities to balance environmental, economic and quality of life agendas
- Values of different age groups will impact on the transport task in communities – especially public transport modes
- The Transport Portfolio will need to implement changes in workforce planning and practices to attract young people and offer them the career challenges and learning they value
- Increase in project teams comprising part-time employees and external members
Learning and personal development - retirement planning; further education; adventure, luxury and educational travel; nostalgia for the past - old music, movies, places, reunions; genealogies; moving back to place of origin.

With an ageing population, this cohort of people will be a powerful and well informed force in Queensland communities.

Nationalism

Another key value to consider for the future is that of nationalism. In 1950 there were 58 nations in the United Nations. In 1999, there were 185. The internet and the global economy have been major forces in ‘fracturing’ countries into new nations. The net makes nationalism easier to express and share.

Globalisation of the economy makes it easier for small places, with something valuable to sell, to ‘go it alone’. With regional security arrangements, small countries do not need to bother with their own armed forces. However, this new nationalism, can have catastrophic effects. Currently there are 90 wars occurring across the globe and 90% of causalities in today’s wars are civilians (Lateline, 1999).

While transnationals move across the globe conducting business and talking money, nationalists across the world hold values rooted in ancient grievances, religious difference and loyalties. While it is possible to handle nationalistic fervour in a relatively civilised fashion, the risk for small isolated nations is that they will be left out of the transnational confederations (e.g. USA and Western Europe) and become economically and socially disadvantaged.

Spirituality, Ethics and Values

A resurgence of interest in religion and spirituality is occurring around the world, especially in countries such as China and the former Soviet Union where religious observances have been suppressed. Everywhere, people are searching for meaning in their lives. In the USA, religious radio has seen an increase of 44% in the past 10 years and there are now 1648 religious radio stations. Researchers at Kings College, London
have identified more than 500 new religious movements. Religious sales over the internet are booming and in 1997, over $US3 billion worth of religious merchandise was sold through retail stores in the USA.

The interest is not only in ‘organised’ religion. As more people exchange materialism for spirituality, ethics and values take on meaning in workplaces and business. The Clemenger Report identifies two key characteristics (as well as profitability) that Australians look for when investing in the share market:

➡ companies that have good employment practices and treat staff well;
➡ companies that demonstrate strong civic and environmental values.

(Clemenger Melbourne, 1998)

With 40% of Australian adults owning shares, this is a powerful force for business to adopt explicit ethical business values and practices. In fact, ‘triple bottom line’ (people, planet, profit) reporting is expected to be mandatory on the New York stock exchange within the next five years.

Government

Globalisation - the increasing integration of the world’s economies through trade, finance, transport and communications - is changing the shape and role of national governments. Geography is no longer the defining element. It is not enough to think locally for the 21st century. ‘Think globally, act regionally’ is the call for the new millennium because domestic markets and domestic companies are a thing of the past.

Federal Government Reforms

In Australia in 1996, reforms within the Federal Government signalled new roles for federal, state and local governments. The moves towards devolution of funding and responsibility; national competition policy reforms; new accountability measures; a customer-driven focus; integration of services and tax reforms have changed the way government does business. There has been constant debate for many

Implications for Transport Portfolio

➡ ‘Triple bottom line’ reporting (equal business focus on people, planet and profit outcomes) requires values shifts and different performance measures
➡ Strong environmental values exist in the community – how can they be harnessed to ensure a sustainable transport system?

‘About the USA: Founded in 1789, the USA is the most successful nation in the history of the world and has been a beacon of democracy and opportunity for over 200 years. Headquartered in Washington DC, the USA is a wholly owned subsidiary of Microsoft Corporation.’

(Anonymous spoof of Microsoft from the internet reported by Friedman, 1999)

Interview Quotes

‘We need a more genuine whole-of-government approach with the ability to take in external perspectives and new ideas. This approach is essential in the development of “full” transport solutions.’

‘A Department of Infrastructure is very close to politicians’ hearts.’

‘Government needs to take a long-term view. Series of short-term decisions will be damaging for transport, the community and the environment. Government needs to be backed by a good public service.’
years regarding the viability of the three spheres of government in Australia. While most pundits believe that this structure will not continue, few are willing to predict when such a change might occur.

**Globalisation**

The power of global corporations and the growing influence they hold over the world and regional economies is a key factor in the changing role of government. In the 21st century, government will not ‘control’ big business, rather they will facilitate outcomes for the ‘common good’; governments cannot ‘control’ the information channels; the movement of capital globally and global or regional trade alliances will be more powerful than any one government. The new global economy will demand changes from governments and governments will constantly balance the tension between ‘public interest’ and ‘the good of big business’. While global corporations may set new rules, rising community engagement will demand that standards are set, especially in the realm of the environment.

**Localisation**

At a State level, growth of global networks and new business structures combined with significant population growth in Queensland, signal that traditional ways of operating between Commonwealth, State and Local Governments will not deliver necessary outcomes. The rise of localisation which can engender self interest-driven responses on an ad hoc level will demand different responses from government. Coordination issues across local government boundaries will demand a regional focus. State Government could find itself playing a role that demands facilitation of coordinated State-wide responses across policy, planning and infrastructure with service delivery either devolved, abolished, outsourced or privatised. In 1996, the Commonwealth Government set a target that sees 60 - 70% of traditional services either devolved, outsourced or privatised. In some states in the USA, 80% of government funding is devolved to local authorities.

‘Customers in Australia want hi-tech and hi-touch. That is, they value the relationship with the service provider.’

(Telstra Survey, 1998)

‘Sooner or later all tyrannies crumble. Those that keep putting their customers on hold tend to crumble sooner.’

(Advertisement in the Washington Post announcing Star Power, a new phone, cable and internet service provider)
## Major Issues for Government

| National and state governments will have significantly less influence over emerging agendas in the future. Globalisation and the associated mobility of both people and capital will oblige governments to behave more competitively. Reaction to globalisation could result in communities being more interested in local issues & the local good. | Rising complexity will force governments to act in a more facilitative manner. The old view of government as an entity that sets the rules across all agendas is becoming less valid. Government is more and more emerging as only one (albeit key) player in any agenda. | The emergence of ‘Third Way’ politics will mean that there will be a greater emphasis on community capacity building. The community is increasingly demanding of government and better informed than ever before. This could lead to greater localisation and less reliance on centralised decision making. Need to work with communities and focus on trends and options. |

## Community Engagement

Trends around the world indicate that many people have lost faith in governments and politicians. Open access to information, better educated citizens, global travellers, a skilled and mobile ageing population with an agenda to contribute to making the world a better place for future generations mean that communities will demand and expect to be involved in government decisions. The internet sees the rise of ‘E-Poli’ which allows citizens to vote on many issues. Already in Australia, media web sites offer daily voting which gauge the community’s support on a wide range of policy and ethical issues. Up to 25 000 people per day vote on particular issues on the ‘ninemsn.com’ web site. This information provides the media with a powerful ‘pulse’ on opinion.
The internet is arguably the single most important technological development of the twentieth century. A mass medium, a marketing channel, a mechanism for efficient, cost effective business transactions - more than all of those, the internet will be the infrastructure of commerce for the 21st century.

The net is open to anyone with a PC, a telephone line and an increasingly low cost monthly access fee. With net cafes, interactive game consoles and e-mail vending machines it gets more accessible daily. It has given a whole new meaning to the term knowledge management - it facilitates the sharing of information; enables business across the globe to form strategic alliances and collaborate on business ventures and it builds relationships between companies and suppliers. It is non-hierarchical - in cyberspace race, colour, gender, age are not issues! What is more, it requires little capital for any entrepreneur to enter the game.

Competition in business today is not between products - it’s between business models – and those which exploit the internet's architecture are the most successful.

E-commerce

E-commerce has been defined as ‘the transformation of business and industry structures and principles in order to take full advantage of electronic capabilities and compete in the global information economy’ (Department of State Development, 1999). It is turning the business world upside down.

From a consumer’s point of view, one of the significant business changes is the introduction of the ‘auction economy’. Already in the USA, 16% of new car buyers ‘shop’ the internet to gain information or negotiate the best price. 140 million ‘net surfers’ visit a site called e-Buy daily to bid against each other for over 900 000 products listed for sale on the
Airline tickets, home mortgages, cars and other big ticket items are ‘auctioned’ over the net and in Australia, GoFish.com has entered the auction market. USA company EnergyMart allows suppliers of natural gas (and soon electricity) to compete for the business of big corporate users and soon the domestic market will be able to select their utility suppliers in the same way.

In the USA, online shopping revenue is expected to surpass $40 billion in 2002, up from $2.7 billion in 1997. It is predicted that 50% of household products (food, white goods etc.) will be purchased over the net in ten year’s time. This means big changes for the retail industry. Shopping centres and malls are already starting to reinvent themselves as ‘recreational experiences’ for customers.

Companies that assemble, deliver and distribute goods increasingly rely on the internet to remain competitive. Enterprise Software, including enterprise resource planning software (such as SAP) is a growth industry which creates a seamless path between automated finance, manufacturing and HR and customers, dealers and suppliers and has now moved into providing decision making support.

Software products that help companies increase sales and profits and manage customer relations; support supply chain planning and make resource allocation decisions are in the latest wave of products that are transforming the way business is done.

As at November 1999, anecdotal evidence suggests that Australia is 18 months behind the USA in the take-up of e-commerce. The USA Department of Commerce puts Australia in fourth position (31%) behind USA (37%), Canada (36%), Nordic countries (33%) in internet take-up rates. Australia’s access rate is more than double that of the UK, three times that of Germany and Japan and almost four times that of France. This puts Australia in a relatively strong position to exploit the e-commerce opportunities afforded. However, Queensland has been slower to embrace e-commerce than some other States (NSW and Victoria). As the telecommunications and networking infrastructure improves, so too will take-up rates.
E-commerce opens up not only new business models but a new paradigm about the who, what, where and when of work. Businesses no longer need to be located in CBDs or traditional commercial or industrial centres. Where work is done is not important. This offers great opportunities for regional development; already people are making quality of life choices about their locality, confident in their ability to connect with the world from wherever they settle.

E-commerce is also about customisation. No longer will ‘one size fit all’ as products and services are customised to fit individual needs. New car purchasing in the USA is an example of where people can design their own requirements (colour, features such as ITS, GPS, sound systems, safety extras) over the net and have their customised car home delivered within eight days.

Governments are moving towards e-commerce for the delivery of services. The UK is aiming for 100% of Government transactional services to be delivered over the net by 2010. Using domestic WEB TV, the UK Government is negotiating band space for services that will be delivered in relation to customer life events. For example, the birth of a child necessitates registering the birth, securing a passport, family benefits, health nurses. The ‘Birth’ site will join up related services so that any life event (e.g. unemployment, retirement, health related etc.) will make it easy to negotiate the government services maze. The decision to have services accessible through home-based appliances supports the belief that people are most comfortable with domestic technology. The TV in the lounge room will become the gateway to the government office, recreation, shopping, travel, education and health.

**Telecommuting**

Currently in the Brisbane/Moreton districts, it is estimated that 3.5% of workers regularly telecommute (Thomas, 1999). Data suggests that many corporations have yet to understand the different work practices, employment standards and the new business paradigm that is involved with a telecommuting workforce.

However, organisations that have introduced telecommuting in well thought out ways have introduced new workplace designs including...
'hot-desking', and 'hotelling' where employees can come into the office at any time during the week and simply 'plug in' to a workstation. These offices have multiple small meeting rooms for team and client meetings - gone are the days of large corporate offices and individual 'cubby holes'.

While telecommuting lowers the number of work-related trips and certainly lowers peak hour trips, there is debate as to whether it also results in fewer but longer trips due to the wide networks established through telecommuting. International, national and project-based telecommuting is common with numerous examples of teams being established to develop projects where members are located in countries across the globe.

Telecommuting is a force that can profoundly change the nature of work and impact significantly on travel demand, especially at peak periods. Yet, in order to overcome some of the problems associated with it, organisations must quickly come to grips with new workplace management practices, standards, employment conditions and contracts, OHS, staff satisfaction issues and training. 'E-ghettos' are seen as replacing the 'sweat-shops' of the 1980s unless warnings are heeded.

Science & Technology

Science and technology is dynamic and growing at a rate never experienced before in human history. Human knowledge is doubling every ten years. In the past decade, more scientific data has been generated than in all of human history. So in the next 25 years, what can we expect in relation to technology? There are three obvious areas of development: the computer age and information technology, biotechnology and nanotechnology.

The Computer Age

The very rapid development of computers is expected to continue, based on Moore’s Law which holds that computer power doubles or the cost halves every 18 months. Keeping on this trajectory will require major new technologies for miniaturisation, including such concepts as

Implications for Transport Portfolio

- E-commerce, e-business and telecommuting will change:
  - the freight task in urban, regional and remote areas
  - the role and location of shopping centres and warehouses
  - home and business delivery — 24 hour delivery of multiple small packages
  - the delivery of Government services
  - work-related travel patterns and demand
  - transport services that will be required to service the needs of e-commerce businesses

- The jury is still out on whether telecommuting will dramatically alter travel demand. What role does the Transport Portfolio need to play in the introduction of telecommuting in Queensland?

- What will telecommuting mean for our staff?

“Silicon Intelligence is going to evolve to the point where it’ll get hard to tell computers from human beings.”

(Gordon E Moore, Chairman Emeritus, Intel Corporation)
quantum computing. At present rates of development computers may reach the power of the human brain by 2020. According to Gordon Moore, co-founder of Intel Corporation, ‘Silicon Intelligence is going to evolve to the point where it’ll get hard to tell computers from human beings’. (Kaku, 1997)

**Biotechnology**

Biotechnology will allow us to read the genetic code of living cells as a matter of routine. In the future, diseases may be managed by genetic engineering. Prevention may become the dominant approach as new genes are introduced into people to avoid and treat diseases. Tissue engineering will replace body parts by growing new ones, making organ donations obsolete. The ethics of cloning will be strongly debated and access to genetic information will be a concern for society in the future.

**Nanotechnology**

Nanotechnology is the emerging ability to construct engineering components with dimensions smaller than a hundred nanometres (a nanometre is a millionth of a millimetre), using positional control of individual atoms. The emergence of nanotechnology would have huge impacts on many aspects of society. Computers no bigger than a grain of salt could be built into clothes, appliances and furniture allowing them to interact with each other and with a ‘smart house’. Computers could be produced by changing the magnetic properties of groups of molecules with the real possibility of downloading hardware from the Net, just as we can now download software.

**Transport Modes**

**Road**

The car-road system has a number of drivers that influence and shape the existing system. The primary drivers and ‘shapers’ include car manufacturers, energy companies, government, the travelling public, tourism and urban form. Secondary drivers include business and lobby groups, the economy and quality of life issues.
There is evidence that the use of the car-road system in Queensland is growing and over the past decade has been substantially in excess of population growth (Apelbaum Consulting Group, 1998). However, there is a body of thought that argues that a number of ‘one-off’ demographic factors has been responsible for the 100% increase in road travel in Australia over the past 20 years. These factors include: the peak of ‘baby boomers’ reaching driving age during the 1960s and 1970s; and the significant growth in female participation in the workforce since 1960.

The combined effect of these factors means that the vehicle driving population is now effectively saturated. Given this situation and the overall ageing of Australia’s population, it is argued that the increase in road travel over the next 20 years is more likely to be in the order of 35% rather than the 100% increase experienced over the past two decades (Cox, 1997).

The existing car-road system and the accompanying urban form generates a range of social and environmental externalities. In addition, a number of external developments such as those in the areas of fuel, transport and information technology, and post-industrial economic patterns and policies also influence the evolution of the system. In the medium-term, it is likely that low carbon and high energy efficiency vehicle technologies will be introduced. These include hybrid electric driveline vehicles, extreme lightweighting (ultra-lightweight hybrid electric vehicles have been described as ‘hypercars’), fuel cells and hydrogen storage systems etc. These technologies do not promise to transform the fundamental urban car-road system but are likely to allow it to continue to evolve while alleviating some of its more obvious problem areas.

In the longer term, fundamentally new transport technologies may emerge which do have the potential to transform the system. Candidate technologies include exotic and speculative developments such as ‘zero point energy’, flying cars and gravity shielding — but even if these are demonstrated they would be unlikely to appear in a practical form until close to the end of the scenario period. For the majority of the scenario period, urban transport is likely to be dominated by some incrementally-improved form of the car-road system.

### Increases in Queensland domestic transport (1985 – 1995)

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<table>
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<tr>
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<tbody>
<tr>
<td>Total domestic passenger vehicle (km)</td>
<td>66%</td>
</tr>
<tr>
<td>Total domestic passenger (km)</td>
<td>73%</td>
</tr>
<tr>
<td>Total domestic freight (tonne-km)</td>
<td>65%</td>
</tr>
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(Queensland Transport, 1999)
Air

The primary drivers for air travel are related to the globalisation of the economy, increasing affluence of developed societies, tourism and the increased access needs of rural and remote communities. The current air travel system is one in which there are close links between domestic and international freight and passengers and these operate within tight regulatory regimes. Aviation infrastructure such as airports, involves substantial resources and creates enormous benefits to public and business interests. However, this type of infrastructure exerts significant impacts, both positive and negative on the physical, economic and environmental life of communities.

Air travel in its current form not only has a high environmental impact due to the emissions it produces but also due to the noise produced by aircraft during take off and landing. The ready availability and relatively low cost of air travel in high volume routes has exerted significant influence over the pattern of both international and domestic tourism, patterns of work and rural population levels. Fly in/fly out operations have tended to decrease some rural populations while better, faster access to other rural and remote communities has provided opportunities for growth.

Growth in air travel for both passenger and freight has shown and continues to show high growth (approximately 6% per annum). This growth must be viewed in the context that for passenger travel, road travel dominates in urban areas while air travel dominates international travel. Overall, air travel constitutes almost one-fifth of Australian non-urban passenger travel.

The period of the scenarios will see incremental development of the air system with trends towards:

- cleaner, faster and longer haul aircraft for international travel;
- smaller, cleaner and quieter aircraft for domestic travel;
- increasing pressure on the availability of land for infrastructure;
- increased pressure from other modes of travel such as high speed rail.
The evolved state of the air transport system will result from continued rapid growth in both the passenger and freight movements. Air travel may be the most viable option for rural and remote communities as traditional transport infrastructure is withdrawn or becomes too costly.

In the longer term, technology may produce the transformational change that will result in a fundamentally altered air transport system. Candidate technologies are similar to those mentioned in the road transport mode. As with road travel, even if these technologies are demonstrated in the next few years, it is unlikely that they will appear in any practical form until close to the end of the scenario period.

**Rail**

The rail system in Australia has been the subject of significant rationalisation in recent times. An analysis of this process carried out by the Bureau of Transport and Communications Economics shows that while the economic benefits exceed the costs for closing rail services, the social impact regarding employment and the viability of rural and country towns due to rationalisation and rail closures is significant (Cox, 1997).

Queensland’s rail system has not been exposed to the same level of rationalisation as has been the case in states including New South Wales and Victoria where there is a growing trend towards private operation and ownership in the rail system.

Rail is regarded as a key component of the passenger and freight transport picture. The importance of rail in the future is largely dependent on the success or otherwise of operational cost savings, further infrastructure investment and the response of institutional reforms regarding private access to rail tracks. A challenge for rail in the future will be the requirement to cope with new integrated intermodal freight logistics. This will require changes in work practices and an updating and upgrading of technological capability.

High speed passenger trains could play an important inter-city transport role in competition with airlines if the necessary investment is forthcoming.

<table>
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<tr>
<th>Freight movements in Australia (1993)</th>
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<tr>
<td>Freight moved (% of total)</td>
</tr>
<tr>
<td>Road</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Within Australia</td>
</tr>
<tr>
<td>International</td>
</tr>
<tr>
<td>Total</td>
</tr>
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</table>

(Cox, 1997)
The real growth in the maritime scene in Queensland is in recreational boating. With growth in this sector standing at 4% per annum (compounding), the challenges lie in developing infrastructure, education and compliance strategies to meet the needs of this rapidly growing market.

Shipping accounts for only a small percentage of freight transportation within Australia. This sector is dominated by road transport. One of the reasons is the longer transit times for freight moved by sea. It is also difficult for sea transport to compete with the overnight service provided by road for the Adelaide-Melbourne, Melbourne-Sydney and Sydney-Brisbane routes. While road is quicker, it could be asked if businesses are paying for a service that could be just as well served by a slower and cheaper service, when speed of delivery is not critical.

Improvements in technology will increase the importance of sea freight by improving transit times. New, so-called ‘FastShip’ designs now under development promise to substantially enhance the role of sea freight in international transport logistics. International transport logistics increasingly relies on reliability and speed. FastShips combine a number of technologies to not only reduce total sea freight transit times by more than two-thirds but also practically eliminate delays.

Wing-in-ground (WIG) or surface effect vehicles may also prove to be significant in terms of coastal shipping. The WIG vehicle technology is described in the ‘Transport Technology’ section of this report. WIG vehicles have the potential to improve not only the speed but also the convenience of coastal shipping for passengers and freight. There is already a company in Cairns that has a permit to conduct tests on WIG technology.

Cruising is one of the fastest growing tourism markets in the world. However, facilities and berths for large cruise ships in Queensland are limited. The cruising market is segmented, ranging from 3 000 passenger ships (many of whom ‘live’ on the ships permanently), luxury cruising and exotic location cruising. The largest ships have the capacity to
anchor outside harbours and transport passengers into shore using their own boats. For Queensland to benefit from the growing cruise market, significant infrastructure development is necessary.

**Public Transport**

There is a widely held view that there is a need to improve the public transport system. When this issue was researched in the 1995 ANOP national study (ANOP, 1995), improvement to the public transport system was seen as the most important transport issue, even though almost 90% of those surveyed said that they were not very likely to use this mode of travel (Cox, 1997).

The results of studies conducted by the ABS and other bodies indicate that even though voters espouse public transport, in practice, they are reluctant to use it. As a result, fare box receipts do not cover rising costs. Slowness, the safety and reliability of services and the interconnections between services are seen to be the major problems in using most forms of public transport.

A range of mechanisms to increase public transport usage include privatisation, integrated ticketing, ‘travel blending’, full-cost road pricing, and long-term changes to urban form. Of these mechanisms, travel blending appears to be one of the easiest to introduce and is the least bureaucratic in nature. It relies on educating the travelling public so that more informed choices may be made regarding the mode and frequency of travel.

<table>
<thead>
<tr>
<th>Reasons for not using Public Transport</th>
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<tbody>
<tr>
<td>No service available</td>
<td>36%</td>
</tr>
<tr>
<td>Too slow</td>
<td>26%</td>
</tr>
<tr>
<td>Vehicle needed for work</td>
<td>11%</td>
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(ABS, 1995)

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<th>Household transport expenditures, 1993</th>
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<tr>
<td>Motor vehicles</td>
</tr>
<tr>
<td>Public transport</td>
</tr>
<tr>
<td>Other</td>
</tr>
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(ABS, 1996)
Urban Futures

Congestion

While cities can be defined socially or demographically, they are also seen as collections of economic activity that rely on the ability to move goods and services. They are also generators of wealth and creators of diverse lifestyles.

Congestion serves to hinder mobility and hence reduce productivity, consume time, erode livability and lifestyles. In addition, the presence of congestion causes producers and sellers of goods and services to build in safety margins to account for the uncertainty of delivery times.

The recent and apparently continuing trend towards 'just in time delivery' will tend to increase congestion – especially in major cities.

Inefficient levels of congestion tend to reduce the productivity of cities which, in turn, flows on to the national economic well being. Measures available for the control of congestion include road pricing, however its impact is much greater if integrated with other initiatives such as appropriate urban form and land use, public transport initiatives and the use of ITS. However, pressures toward increasing congestion remain, especially in the main urban centres of SEQ and reversal of this trend will be difficult especially with continued economic growth.

Urban form

The design of local areas can facilitate a reduction in car dependence. Strategies related to achieving a better fit between land use and transport include:

- the location of services, diverse employment and facilities close to where people live;
- planning transport for the 24 hour needs of people;
- increasing residential densities in corridors where transport can be provided;

"Congestion costs Australian cities approximately $5 billion per annum." (Cox, 1994)
selective concentration of housing and employment as cities grow;
integrating land use and transport in growth corridors and provision of orbital routes.

The future prospects for large infrastructure projects is different now when compared to the past. The NIMBY (not in my back yard) and NOTE (not over there either) syndromes are evidence of the reluctance of local communities to support changes aimed at large scale development that impacts on urban amenity.

There will be increasing pressure for a more integrated approach in regard to diverse transport solutions and infrastructure projects. This approach will need to take account of and successfully accommodate the issues of land use, quality of life, accessibility and the environment.

Spatial Trends
There is a likelihood that coastal growth may prove to be more significant than continued metropolitan growth. This situation is explored in the ‘Coastal Bloom’ scenario. Urban and coastal growth is likely to occur in an environment that will see a continued decline in rural and remote population. While these populations are likely to decline as a percentage of the total State population, absolute numbers will remain steady assuming that State population levels continue to rise.
Transport Technology

Hybrid Electric Vehicles

The continuing pressure to improve fuel efficiency, reduce tailpipe emissions and reduce carbon dioxide emissions is likely to lead to the demise of conventional motor vehicles with mechanical drivelines driven by internal combustion engines. This means that the internal combustion engine is likely to be an early casualty of the 21st century, being replaced by technological advances such as the Hybrid Electric Vehicles (HEVs).

The HEV has a small internal-combustion engine and an electric generator on board which feeds power to the wheels and charges the batteries. HEVs do not share an electric vehicle’s main drawback: limited range between charges. HEVs are extremely fuel efficient and ‘clean’, being one-eighth as polluting as a conventional well-tuned internal combustion engine.

The Hypercar

The ‘Hypercar’ is an advanced automotive design concept proposed by Amory Lovins of the Rocky Mountain Institute in Colorado, and is now being explored by several of the world’s major car manufacturers. The Hypercar would achieve very high fuel efficiency by means of a combination of advanced, innovative technologies. Amory Lovins estimates that such a car would be able to achieve between 0.7 – 0.4 litres/100 km (300 – 600 miles per US gallon) with 1% of current automobile tailpipe emissions.

The Hypercar would be an extremely light vehicle with a hybrid-electric drive train. It would use carbon-fibre reinforced plastic composite body panels—the same material now used for the wings of advanced aircraft. It would have a small gas turbine engine able to run on a variety of fuels, powering an electrical generator which would drive the wheels via four independent high-efficiency electric motors, as well as charging a small battery bank for zero emission vehicle (ZEV) mode operation in
urban areas. The electric motors in the wheel hubs could also create a braking force to stop the car by acting as generators, and the electricity generated would be returned to the batteries.

**Fuel Cells**

Fuel cells should make it possible to produce genuinely eco-friendly vehicle propulsion systems. Fuel cells emit only water vapour, can make use of renewable fuel, and offer the advantages of quiet operation and high energy efficiency. Existing fuel cells require hydrogen, which must be carried in the vehicle, and oxygen, which is drawn from the ambient air. While some experts believe that hydrogen is the basis of a future environmentally-benign economy, at present hydrogen is still relatively expensive to produce, and there are still technical difficulties with on-board storage in vehicles. Nevertheless, many car manufacturers are actively experimenting with hydrogen-powered fuel cell vehicles.

**Intelligent Transport Systems**

Intelligent transport systems (ITS) are poised for widespread adoption. ITS are sophisticated multimodal tools that combine advanced technologies to equip vehicles and transport networks and systems with computers and sensors that increase safety, increase capacity, redistribute demand and reduce congestion. This is achieved by automating some of the functions now carried out by drivers.

ITS will become increasingly significant as vehicles are factory fitted with the necessary electronics and communications capability. Initially, ITS will be used for electronic tolling, but will increasingly play a greater role in urban traffic management. In this way, ITS will help to reduce congestion and accidents and allow ‘autopilot’ functions well beyond the scope of current cruise control features.

The gradual introduction of ITS may well prove to be the prelude to real-time road pricing, as motorists get used to the convenience of electronic tolling and increasingly come to accept electronically levied road charges and congestion fees.
Public Rapid Transit

Public Rapid Transit (PRT) is a proposed system of small driverless vehicles about the size of a passenger car, running on a local web of light monorails. The system is controlled by a computer system that has much in common with air traffic control systems. PRT automatically brings individual vehicles to selected destinations in the system without intermediate stops. It thus resembles a cross between a taxi and a train.

High Speed Trains

In addition to existing high speed train technologies, such as the French TEGV and Japanese Shinkansen, various forms of magnetic levitation train may see widespread adoption in the future. Maglev trains are able to travel at 500 to 550 km/h suspended over a special track. However, the cost of constructing Maglev infrastructure is currently about three times more than for high speed trains. The Swiss have proposed a concept for a magnetically levitated train running in an underground evacuated tunnel at a mean speed of 3000 km/h.

Ground Effect Vehicles

Ground Effect Vehicles (GEVs), Wing in Ground (WIG) Effect or Surface Effect Vehicles have the potential to provide efficient transport and cost savings with a minimum of transport infrastructure. GEVs are able to travel at 350 km/h over water, landing and taking off from ground or water. They fly just above the surface by taking advantage of the extra lift effect produced by the airstream flowing through the gap between the bottom of the wing and the ground or water surface.

GEVs can carry passengers or freight and are suitable for both long- and short-haul trips. However, GEVs can travel to places where neither ships nor planes could go before. A GEV can operate at up to 40% less fuel burn than an equivalent sized and loaded aircraft. This means that GEVs have the potential to make fast, cheap marine transport a viable alternative to air transport, in an ever increasingly cost conscious global market place.
Environment

The environmental movement is gaining momentum internationally. There is general recognition that the earth’s resources are not infinite, and that environmental and ecological systems are fragile. Economic development initiatives worldwide are being guided by the ‘3 Rs’ of the environmental movement - reusable, recyclable and renewable. Internationally, partnerships are being formed to cooperate on projects that attempt to find a compromise between economics and environment and protect endangered ecosystems. Organisations such as the Smithsonian Institute and Conservation International (USA) work with corporations, governments, land owners and farmers to ensure sustainable economic development and environmental protection.

Kyoto Protocol – 1998

International action resulted in the Kyoto Protocol in 1998. The protocol attempts to halt greenhouse emissions caused by industry, commerce, land clearing and transport. A key international assessment of the Kyoto Protocol is that it will require a reduction in global emissions of some 60% from 1999 levels to prevent greenhouse gases continuing to rise. Kyoto proposes targets for emissions and provides for response actions including carbon taxes, carbon sinks (i.e. tree planting) and carbon trading.

The Australian Experience

Some of the trends with the worst implications for Australia and Queensland are apparent at the global level. Reports by the United Nations and some private agencies in recent years have highlighted some of these adverse trends. They include the steady trend to forest and native vegetation clearing in many countries, with a series of attendant problems including erosion, loss or fragmentation of species habitat, loss of fertile soils, losses of water quality and reliability, saltation, and deterioration of allied ecosystems such as wetlands and species breeding zones. Urban sprawl is continuing rapidly in many areas, resulting in many forms of degradation in surrounding areas and a

‘Human activities inflict harsh and often irreversible damage on the environment and critical resources. If not checked, many of our current practices put at serious risk the future that we wish for human society and may so alter the living world that it will be unable to sustain life in the manner that we know.’
(Rio de Janeiro Earth Summit, 1992)

‘Of the 130 people interviewed 40% of internal and 80% of external interviewees raised the environment as a major concern.’
steadily rising transport task (and emissions). Air quality is causing health problems in many major cities and towns.

The pressures from development (and transport systems) do not always occur in a regular trend form. Some risks to the environment occur in one-off or occasional events - such as oil spills near coral reef systems, or in major urban systems such as the 1999 oil spill from a sea freighter in Sydney harbour - or in road or rail transport such as spills of toxic chemicals (and on occasions with major toxicates in local streams and town water systems).

Queensland

In Australia, following the early work on the National Greenhouse Strategy, the Queensland Government endorsed the initial Queensland Implementation Plan in October 1999. At this stage, the Queensland economy relies heavily on the coal, other mining and service industries. Land clearing accelerated during 1999 in an attempt by some farmers to beat the new environmental legislation which sought to restrict this practice. In 1995 Queensland’s domestic greenhouse emissions were 13% over the 1990 levels. Queensland’s transport emissions had grown by 40% between 1990 and 1998 and were expected to grow by a further 30 - 40% up to 2010 (for a total of 80+% over 1990 by 2010). Sectors of government and business accept that many measures which could reduce transport emissions would offer significant benefits to Queensland in terms of reducing emissions to meet Kyoto targets.

What’s the future for the environment?

The OECD now regularly evaluates the performance of member nations in environmental management - Australia was reported on in 1998 and the next appraisal is due in 2001. The number of treaties concerned with environmental protection has risen sharply in the past decade and the body of allied law is also increasing in most countries. In Queensland one of the major tenets of the Environmental Protection Act is the concept of ‘due diligence’ - this commits the community to at all times to give due care and attention to ensuring that environmental damage does not occur as a result of poor planning, work programs and daily operations and activities.