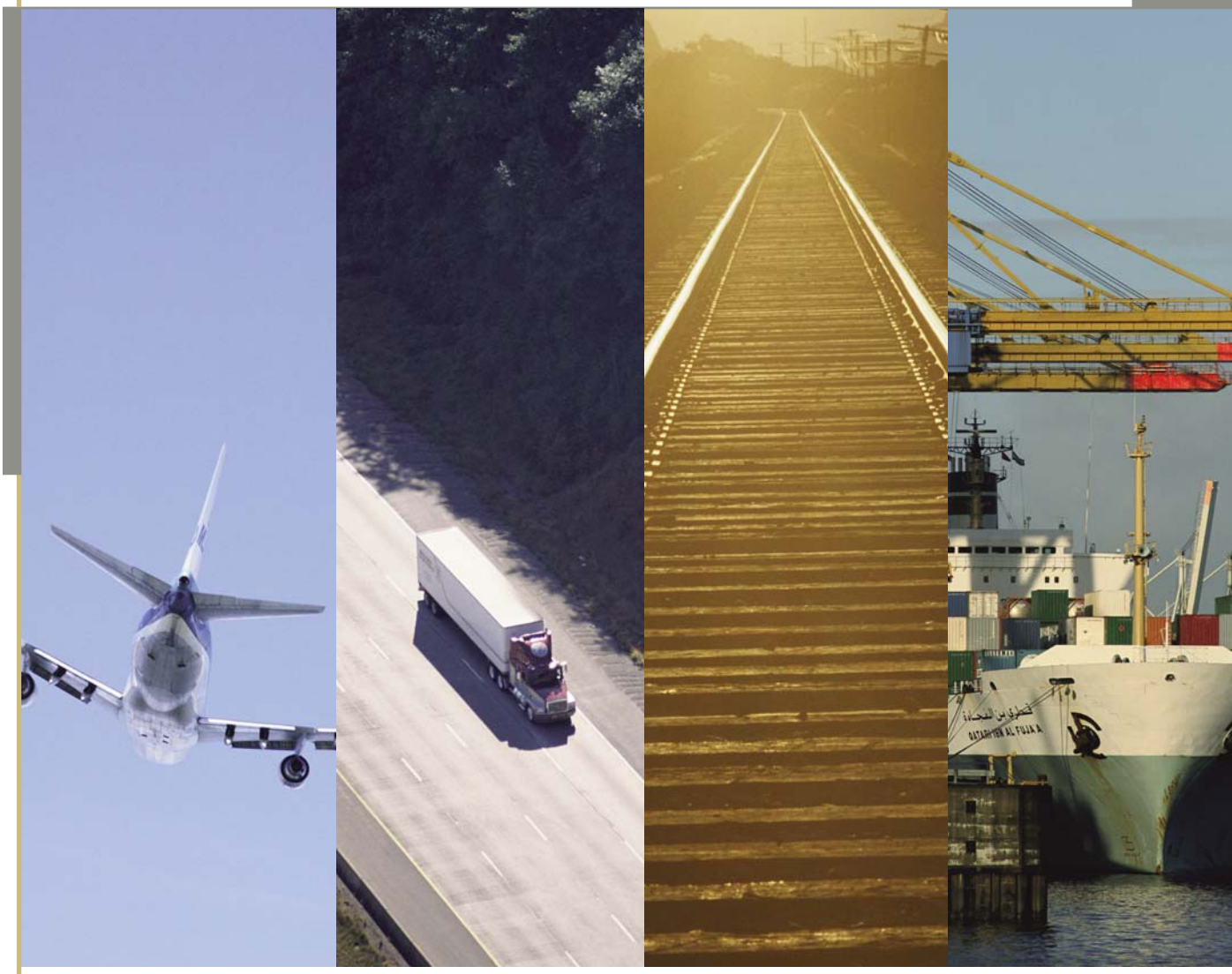

FREIGHT TRANSPORT AND CLIMATE CHANGE

EXPOSURES AND OPPORTUNITIES

Industry Partnership Program

Total Environment Centre Inc

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July 2008

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July 2008
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Produced with the assistance of the NSW Government's Climate Action Grant Program

Acknowledgements

This paper benefited greatly from the suggestions and insights offered by Dr Tom Beer (CSIRO), Dr Barrie May (CSIRO), Nicholas Morris (IPA Economics), Steve Manders (Sinclair Knight Merz), Jeff Angel and Leigh Martin (Total Environment Centre). Particular thanks goes to Dr David Cosgrove from the Bureau of Infrastructure, Transport, and Regional Economics.

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EXECUTIVE SUMMARY

Climate change is emerging as a key challenge for freight transport. As climate change gathers momentum, the responses of government, the market, and the elements will all converge to fundamentally reshape the operating environment of Australian logistics. As a result of climate change, transport companies are simultaneously exposed to demand risk, compliance risk, regulatory risk, increasing cost structures, operational disruptions, reputational risk, and broader market risks. Fortunately, the means by which freight transport can manage these risks offers individual companies cost savings and operational efficiencies that will only grow in value as Australia embraces a carbon constrained future.

Recent years have witnessed the rise of both public and private sector concern around the burgeoning emissions profile of freight transport. Tail pipe emissions from freight transport alone are predicted to increase by almost 100% between 1990 and 2020. This growth is not only inconsistent with the deep cuts required if Australia is to play its part in avoiding dangerous climate change but is also inconsistent with the modest targets established by the first stage of the Kyoto Protocol. The rapidly growing emissions profile of freight transport, in the context of national emissions reduction goals, means that the sectors share of national emissions may more than triple between 1990 and 2020.

Concern around the emissions profile of freight transport has manifested in demand, compliance, and regulatory risk for the sector. In Australia, both Commonwealth and State governments have put in place emissions reduction goals and elements of the private sector are increasingly following suit. As government departments, companies, and individual consumers seek to reduce the carbon intensity of their production and consumption decisions it is likely that pressure will be placed on product supply chains. The provision of low emissions transport services currently offers individual operators a market advantage over their competitors. Over the short to medium term it will simply become a defensive strategy.

The broader policy responses to climate change and its environmental implications also stand to inflate the operating cost structure of transport companies. Of most immediate concern is the exposure of freight transport to increases in both fuel and electricity prices. The Commonwealth government has committed to implement an Emissions Trading Scheme (ETS) by 2010 and as transport and electricity generators are forced to pay for the greenhouse gases that they produce, both fuel and electricity prices will rise. Electricity prices will also be driven by a number of policy measures that are complementary to an emissions trading scheme- renewable energy targets, white certificate trading schemes, and Feed-in-Tariffs (FiTs).

Electricity prices will also be driven by climate change itself. As climate change gathers momentum, and the frequency of heat waves grows, greater investment in peak generation capacity will be required. This will inevitably inflate the capital intensity of Australia's energy system and thereby increase the ultimate cost borne by end users. This cost will be in addition to the cost increases already being driven by climate related water shortages.

The cost implications of climate change are not only limited to energy prices. As predictions of decreased rainfall over Australia's population centres and increases in the frequency and severity of extreme weather events continue to manifest, both water and insurance costs will rise. More

broadly, upward pressure on such basic inputs to production as energy, water, fuel, and insurance threatens to increase the price of all other goods and services demanded by transport companies. As government, the market, and the elements all respond to climate change, costs will rise and the profit margins of transport companies will be imposed upon.

In addition to the significant reputational risk that inaction on greenhouse gas emissions presents for transport companies, it is important to recognise the exposure of the sector to the broader market impacts of unabated climate change. The climatic sensitivity of the Australian economy is not only derived from the prominence of agriculture and tourism but also from the fact that the fortunes of the Australian economy are increasingly tied to that of the global economy. In this regard it is worth noting the warnings of the Stern Review that unabated climate change threatens to yield downturns in the order of the Great Depression and the Great Wars. Industrial disruptions of any magnitude will undoubtedly have direct implications for the demand for freight services.

The financial materiality of climate change has laid the groundwork for the growth of investor pressure witnessed in recent years. Internationally the Investors Group on Climate Change (IGCC) administers the Carbon Disclosure Project (CDP) on behalf of 385 institutional investors that collectively account for over US$ 57 trillion in assets under management. This pressure has been built upon by the Institutional Investors Group on Climate Change (IIGCC), the US based Investor Network on Climate Risk (INCR) and, more locally, by the recent review into the ASX Corporate Governance Principles. Following ASX guidance that listed companies will be required to disclose whether they have policies in place to manage material business risk, it is clear that there will be greater investor scrutiny of the measures that Australian companies are taking to manage their climate change-related risks.

Climate change presents significant challenges to freight transport. However, whilst the sector as a whole may only see challenges in climate change, individual companies enjoy significant opportunities. Forward looking companies that move to manage their exposures and position themselves for growth will stand ready to capture market share from those groups that remain unprepared. Preparing to prosper in a carbon constrained world requires careful planning. The optimisation of operational efficiencies will not only safeguard existing margins against rising costs but will also reduce the emissions intensity of operations. Where possible, modal switching, and fuel switching will further reduce carbon costs and allow individual companies to position themselves for growth in a carbon constrained world.

01 THE CONTRIBUTION OF FREIGHT TRANSPORT TO AUSTRALIAN GREENHOUSE GAS EMISSIONS

01

The transport sector is the second fastest growing source of Australian greenhouse gas emissions.[1] Whilst the majority of transport emissions are associated with personal travel, the growth of emissions from freight transport far exceeds that of personal travel. While overall transport emissions grew by 27.4% between 1990 and 2006, emissions from freight transport grew by almost 40% over the same period.

Emissions from freight include both direct and indirect emissions. The direct emissions of domestic logistics are generated by the use of fuel in trucks, light commercial vehicles, rail, coastal shipping, and aeroplanes. Another source of direct freight emissions are fugitive emissions from air conditioning and refrigeration units used in vehicles, warehouses, and distribution centres. Indirect freight emissions include those associated with electricity use in warehouses, distribution centres and corporate facilities such as office buildings.

Figure 1 does not provide a complete picture of freight emissions as no account is made of pipeline emissions, emissions generated by the extraction and refining of fuel inputs nor does it include fugitive emissions from air conditioning and refrigeration. Also excluded are precursor emissions generated by aeroplanes at altitude and the indirect emissions associated with the use of electricity by transport companies.[2] Figure 1 simply shows the 'tail pipe' emissions generated by freight transport. Emissions from road freight dominate with 87% of 2006 freight transport emissions coming from light commercial vehicles, rigid trucks, and articulated trucks.

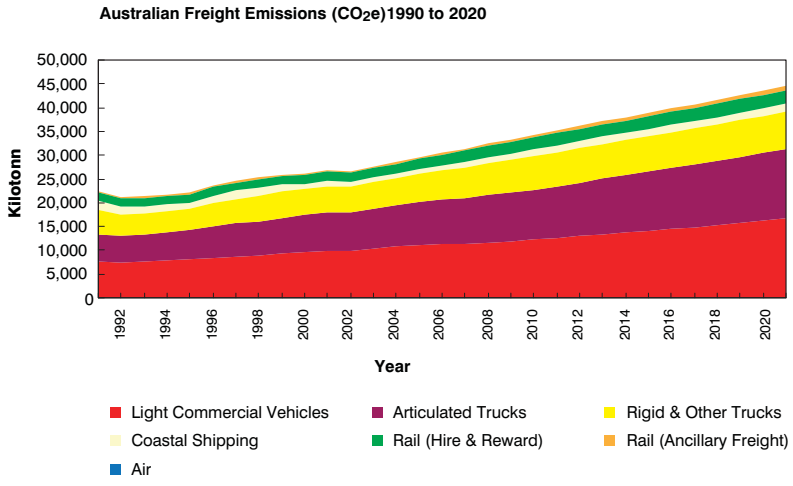

Figure 1: Freight Transport Emissions
Source: Cosgrove, 2008

[1] DCC, 2008, p.5-6
[2] Note that estimates of the approximate contribution to total transport emissions due to indirect effects have been derived by the Bureau of Infrastructure, Transport and Regional Economics, and will be available in a forthcoming BITRE Working Paper (Cosgrove 2008, 'Greenhouse Gas Emissions from Australian Transport - 2007: Projections to 2020')

01 THE CONTRIBUTION OF FREIGHT TRANSPORT TO AUSTRALIAN GREENHOUSE GAS EMISSIONS

Tail pipe emissions from freight transport are predicted to increase by almost 100% on 1990 levels by 2020 with emissions growing from 22.5 megatones (Mt) of CO2e in 1990 to 44.6 Mt by 2020. This predicted growth in emissions needs to be set aside the fact that in order to play its part in averting dangerous climate change, Australia must reduce its emissions by at least 40% by 2020 on 1990 levels and effectively decarbonise by 2050[3]. Australia's recent ratification of the Kyoto Protocol confirmed that Australia will seek to restrict its 2012 emissions to 108% of 1990 levels. Importantly, the predicted growth in freight transport emissions is not only inconsistent with the deep cuts required in the following decades but is also inconsistent with its modest target under the Kyoto Protocol.

Current projections for the growth of emissions from freight transport, within the broader context of science based national emissions reductions, ensures a growing share of national emissions for the sector. Whilst tail pipe emissions from freight transport accounted for 4.07% of Australia's emissions in 1990, this figure had grown to almost 5.5% by 2006 and is set to increase to as much as 13.46% by 2020. These figures suggest that freight transport is currently unprepared to contribute to Australia's entry into a carbon constrained world- a fact that presents a myriad of risks for the sector.

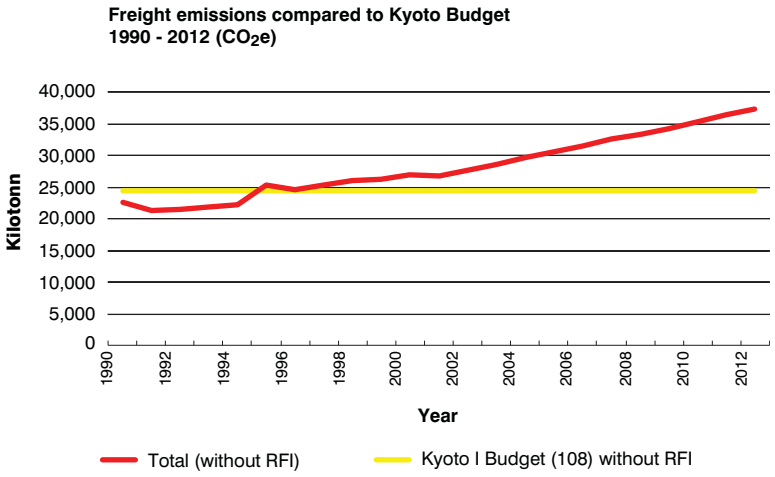

Figure 2: Freight emissions compared to 2012 Kyoto Budget

SOURCE: Cosgrove, 2008

Year	Proportion of national emissions accounted for by freight transport
1990	4.07%
2006	5.45%
2020	
With 20% cuts on 1990 emissions	10.09%
With 30% cuts on 1990 emissions	11.54%
With 40% cuts on 1990 emissions	13.46%

Figure 3: Freight share of Australian emissions

[3] IPCC (2007)

02 THE EXPOSURE OF LOGISTICS TO CLIMATE CHANGE

02

The inconsistency between the burgeoning emissions profile of Australian logistics and Australian emissions reduction targets presents a myriad of risks for the sector.

2.1 Demand Risk

Whilst policy makers have identified a range of strategies to respond to the burgeoning emissions profile of freight transport it is likely that demand management will feature prominently.[4]

As government departments and elements of the private sector look to deliver on pledges to reduce emissions it is likely that they will look to reduce their indirect emissions by avoiding the use of logistics services wherever possible. For unavoidable freight tasks it is foreseeable that contracts will begin to be awarded on the basis of the emissions intensity of prospective operators.

This process will be encouraged by the emergence of carbon labeling on products and services and the associated rise of consumer phenomena such as food miles in which environmentally conscious consumers choose products on the basis of the distance traveled between the producer and the supermarket shelf.

Over the short term, the pursuit of emissions reductions will give individual logistics operators a competitive advantage over their competitors. Over the medium to long term the pursuit of emissions reductions will simply become a defensive strategy.

2.2 Compliance Risk

Transport companies face several forms of compliance risk as a result of the ongoing rollout of climate policy throughout Australia. Climate policy that is likely to create compliance risk for freight transport operators include:

a) National Greenhouse and Energy Reporting (NGER) Act

The National Greenhouse and Energy Reporting Act 2007 (NGER Act) establishes a national framework for Australian corporations to report greenhouse gas emissions, reductions, removals and offsets, and energy consumption and production, from 1 July 2008.

From 1 July 2008, corporations will be required to register and report if:
– they control facilities that emit 25 kilotonnes or more of greenhouse gas (CO_2 equivalent), or produce/consume 100 terajoules or more of energy; or
– their corporate group emits 125 kilotonnes or more greenhouse gas (CO_2 equivalent), or produces/consumes 0.5 Petajoules or more of energy.

Lower reporting thresholds will be progressively phased in by 2010-11 with the final threshold settling at 50,000 tonnes of CO_2 equivalent. It is likely that many freight companies will be ultimately captured by NGER thresholds and will be required to report under the legislation.

b) Energy Efficiency Opportunities (EEO)

The Energy Efficiency Opportunities (EEO) program is an initiative of the Commonwealth government that requires large energy users (organisations that use more than 0.5 petajoules per annum) to identify, evaluate, and publicly report on energy efficiency opportunities that carry payback periods of 4 years or less. Through their use of fuel and electricity, large transport companies are likely to be captured by the EEO thresholds.

[4] NTC, 2006, p.36

2.3 Regulatory risk

As governments come under increasing pressure to deliver least cost emissions abatement the likelihood of further regulatory intervention will grow. This will be particularly true for sectors that fail to get 'their own house in order.'

At this stage the Commonwealth government only requires transport companies captured by EEO to identify the energy efficiency opportunities that are available to them. This is to be contrasted with state based programs such as the NSW Energy Savings Action Plan (ESAP) Program and the Victorian Energy and Resource Efficiency Plan (EREP) Program which require firms to identify and implement the energy efficiency opportunities that they identify.

These programs do not capture transport companies as they only place reporting obligations on individual sites as opposed to corporate level reporting under programs like EEO. The difference in these definitions has so far spared transport companies from the type of regulatory interventions experienced by large industrial facilities and buildings.

If the rapid growth of freight transport emissions continues unabated it is likely that regulatory obligations for freight transport will be brought into greater alignment with those currently facing large energy users. This will be particularly true for road based freight which not only accounts for the bulk of freight emissions but also presents broader policy challenges such as road congestion, noise pollution, and air quality concerns.

Options currently being considered internationally include stricter fuel efficiency standards for heavy duty vehicles, certification of individual vehicle components, differential tax rates, and road pricing for trucks.[5]

2.4 Operating cost structure exposures

The broader policy responses to climate change and its environmental implications stand to substantially increase the operating cost structure of logistics operators.

'Early' movement on operational efficiencies will not only safeguard profit margins, but will also ensure a competitive advantage over those groups that fail to pursue operational efficiencies in preparation for Australia's entry into a carbon constrained world.

a) Fuel

Of most immediate concern is the exposure of transport companies to increases in fuel costs as emissions trading becomes a reality. As transport fuels enter into an emissions trading scheme fuel costs will rise. The ultimate increase in price will be determined by the carbon intensity of the respective fuels.

Assuming that all emissions associated with the extraction, processing, transport, refining, and final combustion are priced under a future emissions trading scheme (known as 'full fuel cycle' carbon pricing), and that all carbon costs are passed to the end user (know as 100% pass through) then the likely magnitude of fuel price increases as a result of carbon pricing are as set out in figure 4. These assumptions make this pricing a 'worse case' scenario as the price sensitivity of users will ultimately determine the level of pass through.

Fuel	Market price per tonne of CO_2e ($AUD)		
	$20 per tonne	$40 per tonne	$60 per tonne
Petrol	5 cents	10 cents	15 cents
Diesel	5.8 cents	11.6 cents	17.4 cents
LPG	3.4 cents	6.8 cents	10.2 cents
Natural Gas	5.2 cents/ m^3	10.4 cents/ m^3	15.6 cents/ m^3
Ethanol	2.6 cents	5.2 cents	7.8 cents
Biodiesel (Tallow)	2.6 cents	5.2 cents	7.5 cents
Biodiesel (Canola)	3 cents	6 cents	9 cents
Aviation turbine	5.6 cents	11.2 cents	16.8 cents

Figure 4: Increase in fuel prices (cents per litre/m3) after carbon pricing*
* assuming 100% pass through over full fuel cycle in accordance with NGA Factors

[5] ECMT, 2007, p.21

b) Electricity

Logistics operators are also exposed to significant increases in electricity costs as a result of both climate change and climate change policy. As power generators are forced to pay for the greenhouse gases that they emit, electricity prices will rise. These emissions trading related price increases will be in addition to other climate policy related drivers of electricity prices such as renewable energy targets, white certificate trading schemes, and Feed-in-Tariffs (FiTs). These policies place a liability on electricity retailers to purchase renewable energy and to invest in energy efficiency projects. These policies will also impact on the price of electricity.

Figure 5 shows the electricity price increases that are likely to occur as a result of emissions trading. These estimates are made on the assumption that all emissions associated with the extraction, processing, transport, refinery, and final combustion of generation fuels are priced under a future emissions trading scheme ('full fuel cycle' carbon pricing), and that all carbon costs are passed through to the end user (100% pass through). It follows that these predictions are the upper bounds of likely outcomes. The price elasticity of demand and availability of substitutes will ultimately determine the magnitude of 'pass through.'

These increases will come on top of those price rises attributable to climate change induced water shortages. The past 18 months have witnessed significant increases in both the spot and forward price of electricity as both hydro and coal fired generation has fallen below capacity.

Whilst the connection between water shortages and hydro generation is obvious to most, the implications of water shortages for coal fired generation are often overlooked. Coal fired generators rely upon the creation of steam to drive turbines and also use water for thermal cooling; if water shortages exist, turbines cannot be driven at full speed, and generation will be below capacity.

In response, the National Electricity Market Management Company, NEMMCO, recently commissioned a Drought Scenarios Steering Committee (DSSC) to investigate the impacts of water shortages on Australia's electricity supply. A subsequent report released on April 30 2007, found that the continuation of rainfall patterns experienced over the previous 12 months, an outcome that the report itself acknowledges as 'optimistic', could reduce Australia's electricity supply by up to 10% of total capacity.[6]

Within the context of ever increasing demand it is clear that water shortages, increasingly prevalent as a result of climate change, will continue to drive increases in the price of energy. Whilst there will be those who will point to the role of desalination and increased dam capacity as a potential solution, these solutions will only add to the capital intensity of electricity generation and its subsequent cost to end users.

State	Market price per tonne of CO_2e ($AUD)		
	$20 per tonne	$40 per tonne	$60 per tonne
NSW	2.12 cents	4.24 cents	6.36 cents
ACT	2.12 cents	4.24 cents	6.36 cents
Victoria	2.62 cents	5.24 cents	7.86 cents
Queensland	2.08 cents	4.16 cents	6.24 cents
South Australia	1.96 cents	3.84 cents	5.88 cents
Western Australia	1.96 cents	3.84 cents	5.88 cents
Northern Territory	1.58 cents	3.16 cents	4.74 cents
Tasmania	0.26 cents	0.52 cents	0.78 cents

Figure 5: Upper bound of increase in electricity prices (cents per kWh) after carbon pricing*
* assuming 100% pass through over full fuel cycle in accordance with NGA Factors

[6] NEMMCO, 2007, p.4

Perhaps of more relevance over the longer term is the impact of a warming Australia on the capital intensity of electricity generation and the frequency with which bushfires will initiate short-term price fluctuations. With the capital intensity of electricity generation being driven more by peak demand rather than average demand, a warming Australia that brings many more days with high temperatures[7] will substantially increase the peak demand for electricity, and subsequently increase the capital intensity of electricity generation. This will increase the unit cost of electricity production, and the ultimate cost to end users.[8]

In terms of short-term price fluctuations it is worth considering the potential impact of predicted increases in bushfires. A joint CSIRO/Australian Bureau of Meteorology (BoM) report released in December 2005 predicted that the combined frequency of days with very high or extreme fire danger in south-east Australia could increase by 4-25% by 2020 and 15-70% by 2050 as a result of climate change.[9]

The implications of bushfire for electricity prices were made apparent on January 16, 2007 when bushfires caused the largest electricity transmission link into Victoria to fail. As a result, 20% of supply was cut off and the spot price of electricity surged by more than 21,000 % to over $9585 per Megawatt hour (MWh).[10]

The implications are clear. As climate change gathers momentum, the responses of government, the market, and the elements will all converge to ensure that electricity prices will rise significantly over the short, medium, and long term.

c) Water

Implications for the operating cost structure of transport companies are not only limited to energy prices. As predictions of decreased rainfall over Australia's population centres increasingly manifest, water prices will rise. Figure 6 demonstrates the drying trends experienced around Australia's population centres over the period 1950-2003. As shown in figure 7, this drying trend is predicted to continue as the pace of climate change increases over the coming decades.

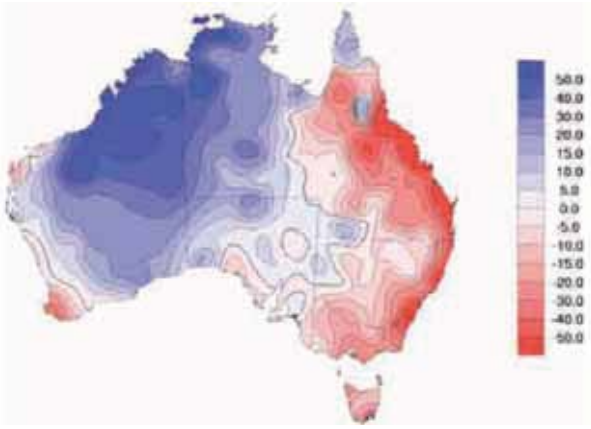

Figure 6: Australian trend in rainfall 1950-2003
SOURCE: Commonwealth of Australia
http://abareonlineshop.com/PdfFiles/pc13021.pdf

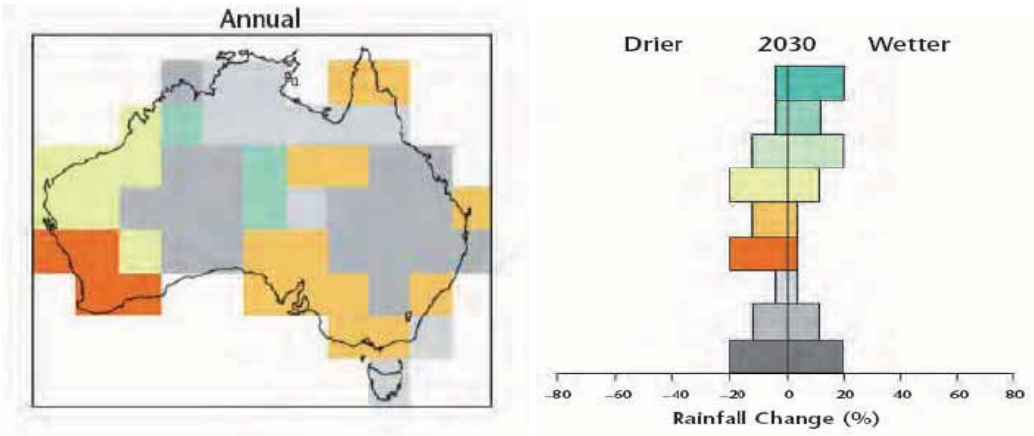

Figure 7: Predicted change in rainfall by 2030
SOURCE: CSIRO, 2001, Climate Change Projections for Australia, available at http://www.cmar.csiro.au/e-print/open/projections2001.pdf

[7] CSIRO, 2001, p.4
[8] AGO & DEH, 2006, p.12
[9] CSIRO & BoM, 2005, p.5
[10] NEMMCO Market Data

Even areas of Australia that are predicted to experience increased rainfall are also predicted to be drier than current levels. This simply reflects the predicted impact of increased evaporation throughout a warmer Australia.[11]

In considering the industry's water use and efficiency impacts of such drying it is worth noting a recent report from the Water Services Association of Australia which predicted that $30 billion in urban water infrastructure investment would be required to diversify water infrastructure away from rain-dependent systems. Movement away from rain fed systems requires capital intensive options such as desalination and water recycling and would have 'to be paid for in some way' with the report noting that these costs would ultimately be passed onto end users.[12]

In this regard, the warning that Melbourne water prices will double within the next 5 years as a result of such investments should be taken as a sign of things to come.[13] This reality was confirmed on October 23, 2007 by the ACT Chief Minister who announced that water prices in the ACT would rise by more than 60% as $308 million in capital expenditure was undertaken in response to the water supply challenges presented by climate change.[14]

This announcement was followed on June 16, 2008 by the announcement that Sydney Water would increase retail water prices by over a third by 2012. These price increases were sought and allowed for by the regulator largely to cover the cost of Sydney's desalination plant and water recycling grid.

City	Retail Price Increases
Sydney	Over 1/3 increase by 2012
Melbourne	Over 100% increase by 2012
ACT	Over 60% increase

Figure 8: Increase in metropolitan water prices

d) Insurance

Logistics operators are also likely to face increasing insurance costs as a result of two climate change related phenomena; the increasing frequency and severity of extreme weather events, and greater uncertainty around weather patterns.

One of the key predictions of climate change is an increase in the frequency and severity of extreme weather events. This will not only drive supply chain disruptions but will also increase the likelihood of damage to warehouses, distribution centres and other buildings.

Of 8,820 natural catastrophes analysed worldwide between 1960 and 1999 85% were found to be weather-related, as were 75% of economic losses and 87% of insured losses.[15] These figures closely accord with the Australian experience in which 87% of economic losses in the period 1967–1999 were found to be attributable to weather related events.[16]

Of particular concern for operators are the 'non-linear' impacts of severe weather events. Whilst some have pointed to the fact that a doubling of wind speeds results in a four-fold increase in related damages[17], the experience of Insurance Australia Group (IAG) suggests that a 25% increase in peak wind gust strength can generate a 6.5 fold increase in building claims.[18]

As the frequency and severity of extreme weather events increase, and insurers are forced to contend with greater uncertainty, insurance premiums will rise. Transport companies that pursue emissions reductions will be simultaneously contributing to broader efforts to manage the likelihood of such outcomes.

2.5 Reputational risk

While the commercial implications of climate change are significant, climate change is not solely a commercial issue. Climate change is ultimately a human rights issue. Global warming will drive changes that amount to a redistribution of the world's resources. When considered within the context of fixed national boundaries, climate change threatens to reduce the resource base upon which

11 CSIRO, 2001, p.6
12 WSAA, 2007, p.15
13 Media Release: August 14, 2007.Reform of Melbourne's Water Industry. The Premier of Victoria
14 Media Release. Chief Minister ACT. October 23, 2007.
15 Munich Re, 2000 cited in Coleman, 2002, p.2
16 BTE, 2001 cited in Coleman, 2002, p.2
17 Mills et al, 2001, p.72 cited in Coleman, 2002, p. 5
18 Coleman, 2002, p.4

the living standards of individual nations are built.

Organisations not pursuing practical emissions abatement opportunities will be increasingly open to the criticism of environmental and social disregard. The capacity for third parties to make such claims will only increase as individual entities are forced to publicly report their emissions profile as well as the energy efficiency opportunities that are available to them.

Reputational risk clearly has the potential to have a financially material impact upon commercial entities. As recently noted by Finsia an 'increasing component of company value (book and market) is held in intangibles (eg. brand, image, reputation). If reputation factors are not properly managed (and disclosed), returns are exposed to greater volatility and risk.'[19] The pursuit of emissions reductions may act to safeguard or promote the reputation and brand value of the firm - thereby safeguarding or promoting company value.

2.6 Broader market risks

In addition to these direct impacts it is important to recognise the exposure of transport companies to the broader market risks of climate change. The Stern Review on the economics of climate change estimated that the onset of unabated climate change could present social and economic disruptions in the order of the Great Depression and the World Wars[20].

Furthermore, models that seek to predict the impact of emissions reductions on the Australian economy have found that the later that emissions reductions are implemented, the greater the risk of severe industrial disruption- as nations are forced to accept increasingly onerous annual emissions reductions to achieve required cuts.[21]

The Draft Report of the Garnaut Review confirmed the macroeconomic vulnerability of Australia to climate change.[22] This vulnerability is not only derived from the fact that Australia's fortunes are increasingly tied to that of the global economy but also because of the prominence of highly climate dependent sectors such as agriculture, and tourism.

Transport companies are clear stakeholders in such outcomes and those that pursue emissions reductions are simultaneously contributing to broader efforts to manage the likelihood of climate-induced downturns.

2.7 Growing investor demands

The financial materiality of climate change-related risk has laid the groundwork for the growth of investor pressure witnessed in recent years. Internationally the Investor Group on Climate Change (IGCC), whose members collectively account for USD $57 trillion in funds under management, administers the Carbon Disclosure Project (CDP) which requests information from the world's leading companies on how they are addressing the climate change-related risks that they face.

Such pressure has been built upon by the Institutional Investors Group on Climate Change (IIGCC), the US based Investor Network on Climate Risk (INCR) and, more locally, by the recent review into the ASX Corporate Governance Principles. Following ASX guidance that listed companies will be required to disclose whether they have policies in place to manage material business risk, it is clear that there will be greater investor scrutiny of the measures that Australian companies are taking to manage their climate change-related risks. Failure to move on emissions reductions comes with the risk of facing a decreasing pool of investment funds.

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[19] Finsia. Submission to ASX Corporate Governance Council Review of Principles. 14/02/07 p. 3
[20] Stern Review on the economics of Climate Change. 2006. p.iv.
[21] ABRCC, 2006, p.5
[22] Garnaut, 2008, p.233

03

3.1 Operational efficiencies as a hedge against rising costs and demand risk

Both climate change and climate change policy will drive increases in the price of electricity, water, and fuel. Organisations that optimise operational efficiencies in their use of transport fuel, electricity, and water will safeguard existing profit margins against inevitable cost increases.

Ultimately, the pursuit of such efficiencies will also act to reduce the emissions intensity of individual companies. Optimising the emissions intensity of supply chain movements will ultimately safeguard forward thinking companies against the various forms of demand risk currently facing freight transport.

For warehouses, distribution centres, and corporate offices this will involve maximising the energy and water efficiency of individual facilities. For freight transport this will involve modal switching where possible, fuel switching where possible, and maximising the fuel efficiency of vehicle fleets. The full range of fuel efficiency options can be most comprehensively revealed by undertaking an Energy Mass Balance assessment but commonly available options include:

a) *Maximising vehicle efficiency*

- purchasing fleet vehicles on the basis of their fuel efficiency
- purchasing the optimally sized vehicle for the task
- ensuring that fleets are well maintained
- installation of aero-dynamic features

b) *Optimal freight loading*

- minimise empty running
- optimise freight loads
- reduce packaging and packaging weight to maximise use of productive space and minimise weight

c) *Driving behaviour*

- slow acceleration to average driving speed
- driving at speeds that optimise fuel efficiency
- driving at speeds that avoid the need for heavy braking
- using roads at times of least congestion
- minimising idling losses by turning vehicles off when not driving. Cab comfort can be maintained through the use of generators allowing engines to be switched off.

3.2 Modal Switching

Freight is moved throughout Australia by a variety of transport modes; trucks, planes, rail, and ships. As shown in figure 9 the emissions generated by the movement of a tonne of freight per kilometre varies significantly between the various transport modes. Air freight is the most emissions intensive and rail and coastal shipping the least.

Transport mode	gCO_2e per tonne/km
Air	1,422
Road Transport	
Light Commercial Vehicles	1294
Rigid Trucks	183
Articulated Trucks	60
Rail	
Government	20
Private	5.4
Coastal shipping	13

Figure 9: Emissions Intensity of alternative modes of transport
Source: AGO, 2007, p.71

Whilst these emissions intensity differentials theoretically offer freight companies an opportunity to reduce the emissions intensity of their operations the fact that all modes do not always compete in the same freight markets presents some practical limitations to the exploitation of these abatement opportunities. [23] Whilst it is foreseeable that rail and coastal shipping can be ready substitutes for interstate and intercity truck freight movements they may prove less practical for freight movements within population centres.

Nevertheless, emissions abatement opportunities remain in freight markets where there exist a range of available transport modes. It is likely that the cost competitiveness of alternatives to road based freight will be further compounded once carbon is monetised under an emissions trading scheme.

3.3 Low emissions fuels

The inconsistency between the burgeoning emissions profile of freight transport and the desire to reduce emissions has created significant interest in the development of low emissions fuels. While fuel switching possibilities already exist between diesel and petrol and relatively lower emissions intensive gas, much recent policy attention has been directed towards the development of biofuels.

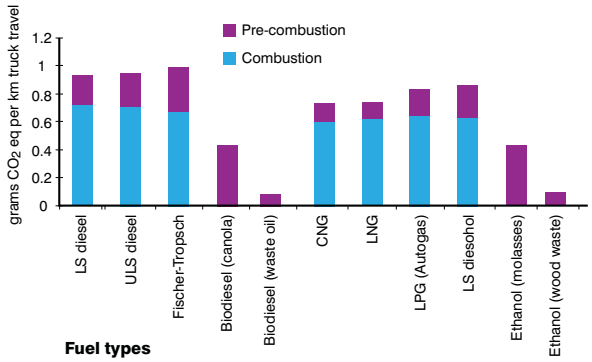

Figure 10: Emissions intensity of competing transport fuels

SOURCE: Grant, 2008

Figure 10 shows the superior emissions performance of selected biofuels over conventional oil based energy and explains why biofuels have proven so attractive to policy makers throughout the world.

However, the initial enthusiasm for biofuels has begun to waver with many now questioning the desirability and efficacy of biofuels- can biofuels actually generate more greenhouse gas emissions over their lifecycle[24]; will biofuels ever be produced at a scale required to provide a meaningful substitute to oil based transport fuels[25]; will biofuels inevitably come at the broader expense of biodiversity[26] and global food supply? [27] In responding to climate change is land best used to grow biomass or would it be better to reestablish permanent forests[28]; or is available biomass best used to generate electricity rather than produce liquid fuels?[29]

Whilst many of these questions remain unresolved it is likely that the answers will be different for each biofuel,[30] each feedstock, each fuel conversion process, and for each country.[31] Furthermore, it's likely that the ultimate role of biofuels will be influenced by other considerations such as questions around the security of future oil supplies.

Whilst biofuels are yet to prove themselves as a truly sustainable long term global solution it is foreseeable that Australian biofuels will play some role in the decarbonisation of transport. The question is to what extent and within what time frame. The answer to these questions will ultimately turn on the extent to which second generation biofuels can overcome the limitations presented by their first generation counterparts.

[23] Macintosh, 2007, p.viii
[24] Righelato & Spracklen, 2007
[25] Doornbosch & Steenblik, 2007, p.4
[26] ibid, p.4
[27] OECD, 2008, p.2
[28] Righelato & Spracklen, 2007
[29] Gilman, 2007, p.39
[30] O'Connell et al, 2007, p.3
[31] Doornbosch & Steenblik, 2007, p.5

04 PLANNING TO PROSPER IN A CARBON CONSTRAINED WORLD

04

Preparing to prosper in a carbon constrained world requires systematic planning and carefully considered positioning. Fundamental steps include:

4.1 Understand your legal obligations

The very first step to coming to terms with what climate change means for your organisation is to understand what compliance obligations you face as a result of climate policy.

4.2 Measure your carbon footprint

Measuring your carbon footprint allows you to assess your carbon intensity, to understand the magnitude of cost increases you're likely to face once carbon is monetised, and to identify priority areas for emissions abatement.

4.3 Explore modal switching opportunities

The first step that freight transport providers should take in addressing their emissions profile is to explore, and implement, all modal switching opportunities. The implementation of modal switching opportunities will reduce the emissions intensity of freight movements and further reduce costs once carbon is monetised.

4.4 Identify all resource efficiency opportunities

a) Transport- energy mass balance

An energy mass balance assessment offers organisations a comprehensive assessment of energy efficiency opportunities that are available in vehicle fleets. Implementing fuel efficiency opportunities will not only safeguard existing margins against rising fuel prices but will also reduce the emissions intensity of freight operations.

b) Buildings- energy and water efficiency audit

Undertake an energy and water efficiency audit in warehouses, distribution centres, and corporate offices. Implementing resource efficiency opportunities will not only safeguard existing margins against rising electricity and water prices but will also reduce the emissions intensity of freight operations.

4.5 Identify fuel switching opportunities

Fuel switching from diesel or petrol to gas, or to truly sustainable biofuels, will allow transport companies to reduce the emissions intensity of vehicle fleets.

4.6 Identify other emissions abatement options

Pursuing resource efficiencies will allow transport companies to reduce their emissions profile. Emissions may be further reduced by the purchase of accredited Green Power and the purchase of credible carbon offsets.

4.7 Position yourself as a low carbon emissions operator

A rigorous, comprehensive, and credible approach to emissions reductions offers individual logistics providers the opportunity to benefit from the rapid growth in low carbon transport that is likely in a carbon constrained world.

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July 2008

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