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ABSTRACT:

A strategic concern of governments and industry in Australia has been the extent of environmental responsiveness of companies to their natural environment. Protecting the environment involves reconciling environmental issues and values with economic interests and business responsibilities. The rise in greenhouse gas emissions, primarily due to the burning of fossil fuels and de-forestation, is attributed to global warming (Mills 1998). Evidence of increasing human impacts on the environment includes mounting levels of greenhouse gases in the atmosphere, accumulation of wastes and pollution of ground and surface water, which are the focus of the current study. A key question emerges as to which industries are environmentally more responsible than others and is raised specifically in this paper in terms of the transport task's contribution to greenhouse gas emissions. The aim of this paper is to identify and understand environmental responsiveness within the bus and coach sector of the transport industry, a major contributor to the passenger transport task. The bus and coach sector is defined in the full context of supply chain management, that is the integration of business processes from end user to initial manufacturers and suppliers of vehicles and fuel through to the providers of services and information for the benefit and value of customers. A project, investigating the perceptions that bus and coach operators have about environmental opportunities and associated risks, was conducted. Twenty-six key stakeholders were invited to participate in either a survey or case study designed to ascertain energy and waste management practices. Environmental responsiveness occurs in areas that seem to have the greatest potential impact not only in terms of the environment but also business's bottom line. While operators initiated waste and energy management programs so as to be socially responsible, they continued them because they discovered their cost-effectiveness to the business. A number of specific actions are warranted based on the study's findings.

AUTHORS: Ann M. Brewer

CONTACT:

Institute of Transport Studies (Sydney & Monash)
The Australian Key Centre in Transport Management
C37, The University of Sydney NSW 2006
Australia

Telephone:	+61 2 9351 0071
Facsimile:	+61 2 9351 0088
E-mail:	itsinfo@its.usyd.edu.au
Internet:	http://www.its.usyd.edu.au

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Introduction

In the 1990s there has been an increase in worldwide public awareness of environmental issues and the necessity for their management (Bhate and Lawler 1997). A strategic concern of governments and industry in Australia has been the extent of environmental responsiveness of companies to their natural environment. Protecting the environment essentially involves reconciling environmental issues and values with economic interests and business responsibilities.

The rise in greenhouse gas (GHG) emissions, primarily the burning of fossil fuels and de-forestation, is attributed to global warming with the increasing potential consequences of catastrophe such as potent, frequent windstorms, increased rainfall and floods, mud slides, hailstorms, drought, crop damage and wildfire (Mills 1998). Each of these catastrophes presents massive costs to society. Evidence of increasing human impacts on the environment includes mounting levels of greenhouse gases in the atmosphere, accumulation of wastes and pollution of ground and surface water, which are the focus of the current study. Many of these environmental changes are happening swiftly, and some are irrevocable (Brown, Lenssen and Kane 1995).

Since environmental pressures are continuously evolving, what was critical management in the 1970s at the height of environmental movement, may not be the case today. What is known is that the natural environment is a significant force in shaping business practice as management develops policies, programs and tools to address environmental pressures. A key question emerges as to which industries are environmentally more responsible than others and is raised specifically in this paper in terms of the transport task's contribution to GHG emissions. The aim of this paper is to identify and understand environmental responsiveness within the bus and coach sector of the transport industry, a major contributor to the passenger transport task. This paper focuses on five themes that represent the central tenets of environmental commitment and responsibility in the bus and coach industry. They are the:

1. key influences on vehicle purchases,
2. types of operations bus and coach operators believe attribute to the generation and release of GHG emission as perceived by operators,
3. nature of energy and waste management programs,
4. industry outlook in terms of the environment, and
5. attitudes of company management and staff to environmental issues, external non-regulatory influences and corporate cultural change.

The bus and coach industry in Australia

The bus and coach sector, defined over the entire supply chain, integrates business processes from end user to initial manufacturers and suppliers of vehicles and fuel such as chassis suppliers, body builders, vehicle components through to the providers of services and information for the benefit and value of customers. Table 1 demonstrates the key players in the supply chain as well as their energy and waste generation characteristics.

Table 1. SCM by Energy/Waste Generation Characteristics

Energy/Waste Generation Characteristics	Chassis Suppliers	Body Builders	Vehicle Component Suppliers	Fuel Suppliers	Bus and Coach Operators	Commercial Waste Companies
Manufacture of components - prodn system	√		√			
Materials selection						
Testing of component's quality			√	√		
Production of chassis	√					
Fuel cracking				√		
Fuel refining				√		
Fuel testing				√	√	
Fuel storage and maintenance	√	√		√	√	
Depot/plant design	√	√	√	√	√	
Materials used in depot/plant	√	√	√	√	√	
Painting	√	√	√		√	
Vehicle maintenance					√	
Depot maintenance					√	
Waste disposal methods - fuels	√	√	√	√	√	√
Waste disposal methods - solids	√	√	√	√	√	√
Waste disposal methods - other liquids	√	√	√	√	√	√

[Source: Hensher et al 1998, p. 15]

The focus on bus and coach operators should not be overlooked in the light of their potential impact on energy and waste efficiency, although as the study will show many operators are conscious of this. In 1994-95, the transport sector contributed 12 per cent of all GHG emissions, with the bus sector contributing 0.9 per cent of total GHG emissions for the transport sector (Apelbaum 1997). During the same period, bus and coach operators consumed 4.7 per cent (398 megalitres) of the total fuel used by the transport industry. In 1995-96, buses (public and private) represented 38 per cent of the urban public transport task in terms of passenger kilometres and 54 per cent of urban public transport task in terms of number of passengers (BTCE 1996). The bus and coach sector delivers long distance services to 15 per cent of total and public transport and tour/hotel shuttle services to 47 per cent of total international visitors to Australia (Bureau of Tourism Research 1996). In 1998, fleet size is estimated at 15,578, and number of private operators is about 2,456 (ABCA 1998).

SCM is the effective control of all business processes occurring within and between companies. The extent to which bus and coach operators manage the full extent of the supply chain is contingent upon the consequence of each component activity to their

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business as well as their managerial capability to do so. The principle component processes of SCM for bus and coach operators include: -

- acquiring vehicles, fuel and labour
- making efficient use of inputs (finance, people, technology, time, information) relative to outputs
- producing outputs of services
- conducting maintenance and administrative processes effectively
- investing in appropriate technologies and services
- conforming to regulations and rules governing the industry in which they operate
- satisfying the interests of primary stakeholders

Reviewing these activities suggests that what is needed for bus and coach operators to achieve organisational effectiveness is a balanced distribution of resources across each of these processes. A business remains effective as long as it strives continuously to use its resources in an efficient manner and contributes to the wider system, which requires recognising environmental opportunities and risks. Environmental responsiveness arises from the processes and arrangements that management use to take action (mostly requiring extra-ordinary effort and investment) to deal with various environmental pressures that confront operators in conducting their business (Brewer 1994). It may be from an operator's perspective that their company's action will not be effective because improvement in environmental quality also requires concerted action by others and they, as an individual company, can only act marginally, hence the requirement for extra-ordinary effort. Presumably, environmental responsiveness leads to appropriate actions mostly in situations where it costs the operator little. While environmental responsiveness can be measured by operators' activities, it is essentially a philosophical stance that management holds in relation to the environment that influences company practices, which in turn impact philosophy.

The need for evolving business responsibility towards the environment has emerged so that management can minimise future liabilities, business costs, while at the same time optimise organisational effectiveness. In general, companies need to optimise two, not necessarily reconcilable, objectives of organisational effectiveness on the one hand, and the minimisation of environmental risks on the other. There is little known about how bus and coach operators perceive their natural environment and respond to changes (including regulatory) within it. Are bus and coach operators taking the necessary steps toward managing the environment? In this regard, what influences their decisions? In order to promote effective environmental responsiveness, an essential first step is to appreciate the factors that are perceived by operators to be important enough for them to engage in strategies that sustain the natural environment.

The Study

A project investigating the perceptions bus and coach operators have in understanding environmental opportunities and risks was undertaken1. Twenty-six key stakeholders (chassis manufacturers, body builders, oil companies, government/regulator, bus and coach operators and their industry associations) representing the main sub-sectors of the

industry as a whole were invited to participate in either a survey or case study designed to elicit information about perception and strategies for managing energy and waste. A fax out/fax back self administered survey was designed (See Appendix A). The response rate was 69 per cent. In addition, interviews were conducted with management and workshop supervisors of one private and one public operator in Sydney complemented by an on-site tour of depots and workshops, to review both energy and waste management procedures in operation. Figure 1 shows the profile of the nature of respondent activity in the bus and coach sector.
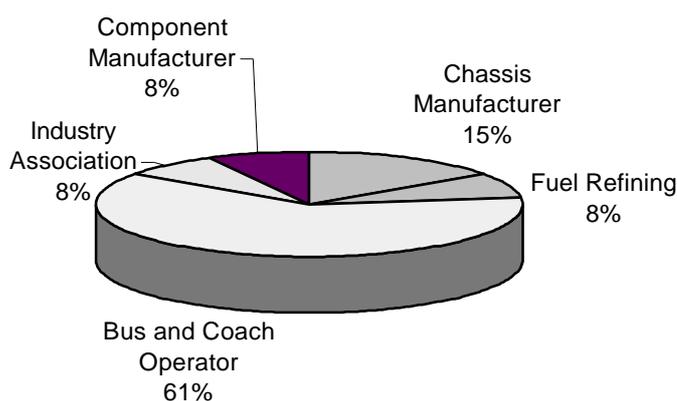
Figure 1. Profile of Survey Respondents

Findings

This section summarises the key issues identified that may facilitate or impede environmental responsiveness of bus and coach operators. Each theme represents a major business decision by operators in running their enterprises.

Key influences on vehicle purchases

The key influences in vehicle purchase decisions made by operators are summarised in Figure 2. The decision to purchase one vehicle or augment an existing fleet is a complex interaction of factors including cost and vehicle reliability, information sources and their reliability. The most important factors in the vehicle purchase decision are vehicle technology, fuel type and consumption, maintenance and repairs and similarity to existing fleet specifications. These factors are rated ahead of purchase price and vehicle resale value. The process of decision making varies for operators depending on whether they are government, private, family-owned, large or small enterprise, and physical location of depot.
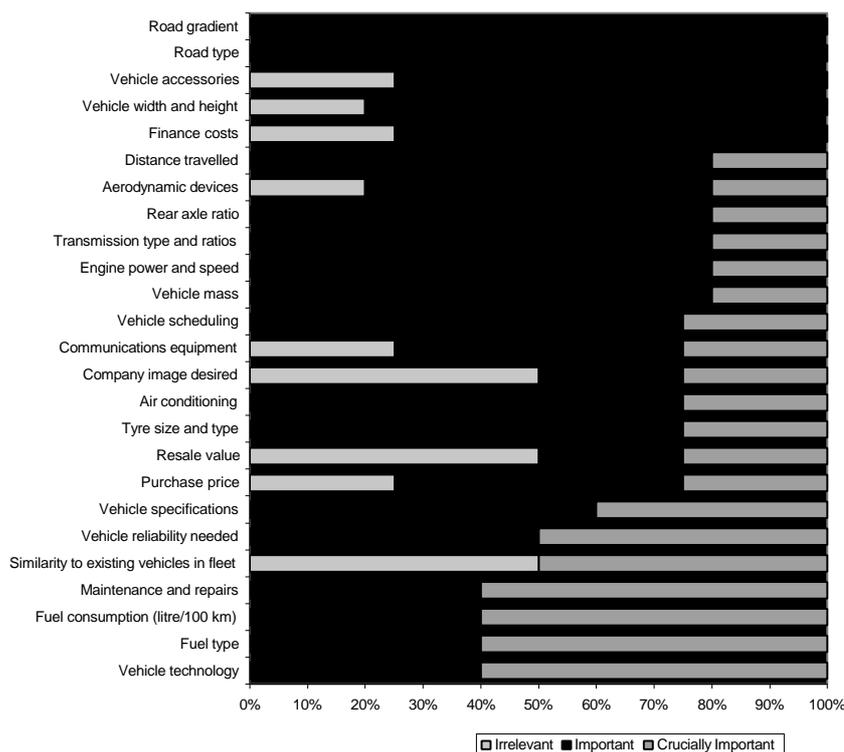
Figure 2. Survey Result Summary: Key influences on vehicle purchases

In policy terms, operators are consumers and this provides governments with an opportunity to intervene in the marketing of products by upstream suppliers to operators. The question arises as to the nature of government intervention. Information is one way to address this. This approach helps to establish the environmental advantages and disadvantages of different types of purchasing outcomes for operators. When purchasing a vehicle, for example, bus and coach operators believed, but could not substantiate, that they are provided with highly reliable information on total vehicle fuel economy. Operators believed it was important that they should be able to rely on manufacturers' and suppliers' information as well as having the opportunity to discuss options openly with experts and key industry players issues such as vehicle and fuel efficiency. The decision to purchase a vehicle was a long term one as it ultimately influences fleet type, maintenance contracts etc. If more energy-efficient vehicles are identified after an initial purchase decision, it is difficult to change manufacturer if a large fleet is already in place due to cost of maintenance and parts in dealing with more than one supplier. This is a major operational constraint for operators.

Importance of perceived factors in emissions production

The most important factors in emissions production, perceived by bus and coach operators, summarised in Figure 3 are vehicle reliability, purchase price, vehicle specifications, fuel consumption (litre/100km) and finance costs. The contrast with factors perceived as important in vehicle purchasing (Figure 2) is informative. The distinction lies mainly in the perceived importance of purchase price associated with emissions production by operators, ahead of engine power, speed, and distance

travelled. Purchase price acts as a proxy and may be confounded with a number of other factors in the decision making process. From the case studies it emerged that driver training was also an important factor in reinforcing the way driving patterns influence emission production.
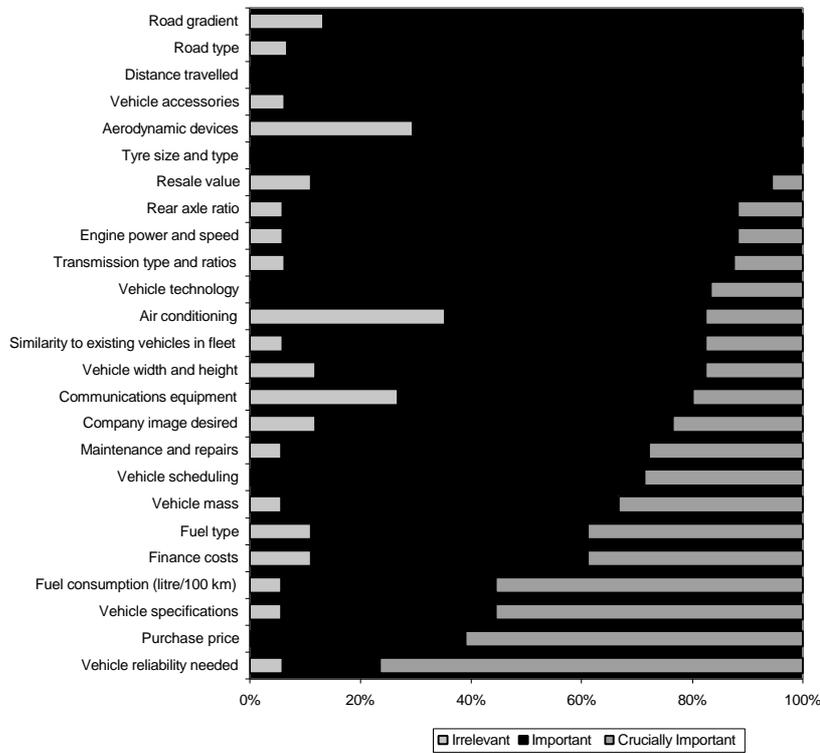
Figure 3. Survey Result Summary: Importance of various factors in emissions production

Sources of GHG emissions

Emission controls, according to Taylor (1988), are the most efficient means to prevent global warming and therefore, it is important to control them. In the light of this, operators rated a list of sources of GHG emissions according to where they believed the greatest and least potential gains are made in managing them as displayed in Figure 4. The most important factors in emissions production with the potential for the greatest gain in managing them include exhaust emissions, storm water, leakage of fuel storage systems, used paper, brake fluid, solvents/thinners and used batteries. Least gain include engine parts. Overall, operators were evenly divided about what had the greatest and least potential gain from the management of sources of GHG emissions. This disagreement suggests a greater need for information not only about sources of GHG emissions but also their management in the context of the workplace.

Energy management programs

Bus and coach operators were asked to list six operational processes that they perceived contributed to either the generation or release of GHG emissions. The most frequently listed activities included operating buses, painting (spray, etc.), use of diesel fuel engines, washing and cleaning of buses and electricity usage. However, identifying these activities was not straightforward for most operators.
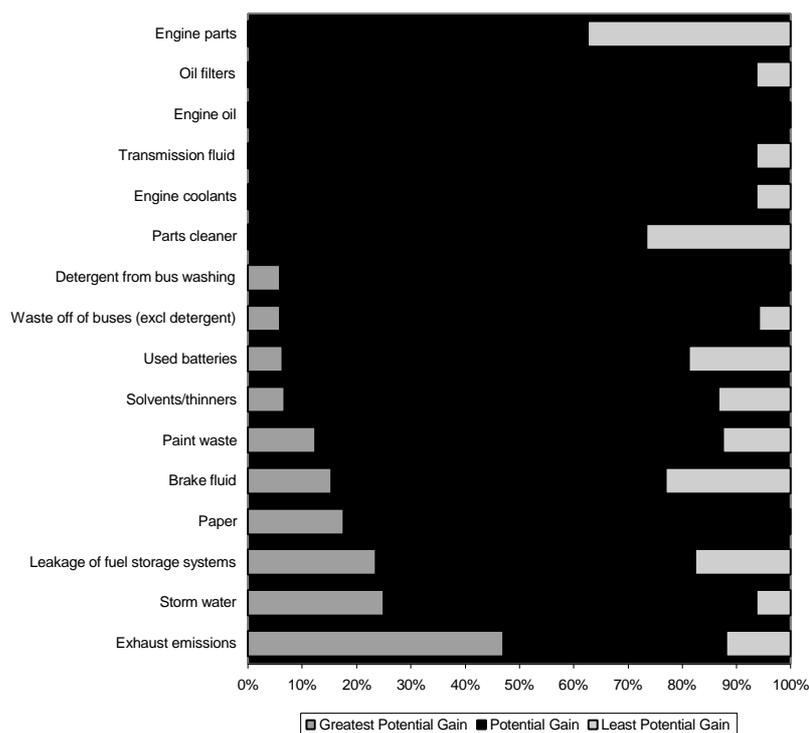
Figure 4. Survey Result Summary: Sources of GHG emissions

The two case studies confirmed, what was gleaned in the survey feedback, that one of the most difficult aspects for public and private operators is to get high quality information about sources of GHG emissions. Notwithstanding operational constraints, not least of which is cost, operators report that they are attentive to reducing energy use and improving waste management. However, there is little information forthcoming from either government or industry on the types of activities, products or by-products that contribute directly or indirectly to greenhouse gases or any other negative environmental outcome within the bus and coach sector.

Bus and coach operators were requested to identify three energy/emission programs that they believed contributed to industry best practice. The most frequently named energy management programs operating include CNG bus trials/use of CNG engines, fuel improvement programs, recycling of bus wash water, treatment of waste, use of better/higher specified engines (eg. EURO II diesel engine), reduced electricity usage and energy management.

Operators examine their energy bills carefully, making comparisons with previous billing periods, and generally look for information on how to conserve energy in their business. To cut back on use of electricity for example, some operators have installed skylights in the depots, installed improved lighting technology and added timers to switches. The use of tinted windows has also reduced air conditioning in buses and coaches as well as the use of more effective 'refrigerants' in equipment requiring this.

Despite this, there is generally not a good understanding of what is energy-intensive in the workplace, particularly the back office areas. The problem again is that most of information and search tools that operators rely on is insufficient for the purpose. Operators believe it is difficult to acquire information about the type and nature of energy management programs in use by other operators. It is up to individual operators to network with each other and gain access to each other's depots, which is difficult in a competitive situation.

Environmental auditing

Information about environmental auditing assists in understanding the impediments to energy and waste management as well as the quality of the auditing process. Bus and coach operators were requested to identify examples of environmental auditing that specifically focused on reducing GHG emissions in each phase of the supply chain. Some examples of environmental auditing are listed in Table 2. Overall, maintenance was the main approach to auditing, which meant that isolated aspects of operations were frequently monitored. This approach is piecemeal. An auditing process would reflect a more integrated and total quality approach.

Table 2. Survey Result Summary: Examples of environmental auditing in bus and coach operations

Item (Listed in order of items with highest number of incidence)
Regular preventative maintenance
Monitor fuel consumption via transponder
Check periodically that operation comply to relevant laws
Audit of fuel usage
Audit of electricity usage
Using better gearbox and engine technology
Routine servicing to reduce oil and fuel leakage

In contrast to chassis manufacturers, fuel refining plants and the public operator, the audit process amongst private operators is largely ad hoc. On the whole, operators do not maintain audit databases so there is little opportunity at present to survey audit systems for important sources of information about energy and waste management programs. If energy and waste management are to have a significant impact on GHG emissions, their impact should be able to be traced through audit data, transforming audit databases into tools for evaluating environmental responsiveness.

Implementing more efficient forms of environmental auditing is a major challenge facing most operations. However, having an efficient management information system does not necessarily translate into good environmental practices. Reasons include the adhocracy of decision making by management, the requirement to evaluate compiled data and lack of resources to do so, and ensuring that proposed changes to current environmental practices are not implemented either through ignorance, lack of expediency or because energy and waste are not viewed as strategic business processes.

Waste Management Programs

Waste management and hence prevention is widely appreciated by bus and coach operators but is seen essentially as a cost add on, incurred through inspection, maintenance, rework, and liability. Operators in the survey identified the major waste activities using fossil fuel derived energy as vehicle operations, electricity usage, computer, office and depot operations. They attempt to recycle whatever they can, such as oil, water and tyres, to minimise cost and landfill deposits. Some operators have installed their own irrigation for washing vehicles to allow wash water and run off to be recycled for further use. Some operators engage in purchasing and other procedures that maximise use of recycled materials such as paper, toner cartridges for printers. Inevitably, operators accept products upstream on the supply chain and pass waste and costs on downstream. For example, oil sludge, old oil, dry waste, shredded paper, paint and thinners, worn-out batteries and tyres are collected by commercial operators who dispose or recycle them. The recycling does not mean a direct payoff for operators since waste collection and its dispatch is a costly exercise, although it does mean that this type of waste is not going into landfill. However, a key issue for environmental management is what these commercial operators do with the waste. Operators often know that recycling is not only environmentally beneficial but also cost-effective.

Industry Outlook in the Supply Chain

The extent to which operators can be considered environmentally responsive can be assessed by examining Table 3. Table 3 shows the most frequent statements from all members of the supply chain (not just bus & coach operators) that gained agreement and disagreement amongst surveyed operators. At the top of the list, most operators believe that as vehicles age they will be replaced by more fuel efficient vehicles. There is strong agreement with the need to improve the quality of diesel/distillate as a priority issue in reducing greenhouse gases. However respondents do not believe that the conversion to CNG saves up to 50 per cent in operating costs, as has been claimed in the technical literature (Erdos 1998). In terms of agreement, the operators' view is that the bus and coach sector is bereft of information about energy and emission management programs. The industry is optimistic that Euro II, the emission standard in Europe, is achievable by 2002. The introduction of bus infrastructure such as bus priority systems, more flexible timetabling coupled with mini-buses will also impact on reduction of GHG emissions.

In terms of disagreement, while not opposed to the use of CNG vehicles, there is some concern about the introduction of CNG vehicles into the private bus sector. The disagreement appears to be firstly about fuel efficiency and a perception that

diesel/distillate contributes to GHG emissions. Operators are not optimistic about the penetration of alternative fuels. A study reported by Dickson-Simpson (1998) suggests that studies by London Buses demonstrated that a diesel bus with a catalytic exhaust is the only cost-effective way to become environmentally friendly. 'The ECS catalyser works on today's ordinary diesel fuel with up to 0.05 per cent (500 parts per million) sulphur. London Transport uses it in conjunction with ultra-low sulphur fuel (less than 50 parts per million). The reason is that this light fuel has been effective in particulates reduction – cutting them by 32 per cent. Adding the ECS catalyser as well cuts particulates by up to 54 per cent' (p.35). Secondly, CNG poses a problem in terms of space for passengers and subsequently the number of CNG vehicles required to replace one diesel vehicle equivalent. This issue needs to be analysed in the context of real-life operations to see not only vehicle replacement but also vehicle deployment.

Table 3. Survey Result Summary: Stakeholder Views

Strong Agreement.	*Rank*	*Strong Disagreement*	*Rank*
As vehicles are replaced the replacement is much more fuel efficient than the disposed vehicle	1	Private bus companies are not taking up the opportunity to use CNG buses simply because the success of the technology in penetrating that market is very slow	1
Staff in the industry generally have little idea of what an energy/emissions management program is	1	The conversion to CNG saves up to 50% in operating costs	2
Establishing ways of improving the quality of diesel/distillate to reduce sulphur content and GHG emissions is a priority issue	2	Private bus and coach operators are generally currently opposed to alternatively fuelled vehicles (eg CNG)	3
Better infrastructure for bus movements will reduce GHG emissions from bus operators substantially	3	Having CNG tanks in a bus and coach depot takes up too much space	4
Staff in the industry generally have little idea of what a waste management program is	4	An impediment to the take up of alternative fuels is the small market for new buses and coaches in Australia	5
Most bus and coach operators are not prepared to invest in CNG vehicles until fuel prices are as attractive as conventional fuel prices	4	Using smaller vehicles such as mini-buses will enable operators to provide more flexible timetabling of services	5
An impediment to the take up of alternative fuels is the small market for new buses and coaches in Australia	5	The diesel/distillate supplied to the bus and coach operators is the major culprit in producing GHG emissions in end-use operations	6
To have Euro II or US 98 Standards by 2002 is achievable	5	Most bus and coach operators are not prepared to invest in CNG vehicles until fuel prices are as attractive as conventional fuel prices	6
If government introduced new more stringent regulations and fines on levels of sulphur in diesel then the oil companies may finally sort out this major pollutant problem.	6	My industry sector does take environmental protection seriously enough	7
Bus and coach operators are committed to reducing GHG emissions	7	The regulatory environment under which we operate imposes a major constraint on our industry's ability to reduce GHG emissions	7

Commitment to the environment might be judged by the fact that the majority of respondents (94 per cent) believe that energy and waste management are important components of the business strategy for the industry. For example, waste management is an official part of the occupational health and safety program for operators. About 50 per cent of management conduct regular (ie. weekly or monthly) official depot audits to ensure efficient energy and waste practices. Reviewing energy costs was also a high priority. While commitment to the environment reflects the reported perceptions of operators, it is perhaps not surprising that such perceptions are not mirrored in their communication to or training of staff. All managers and operators in the supply chain tend to communicate infrequently with staff about energy and waste management programs, only once or twice a year. Staff (less than one-third) received little training in either energy or waste management. Lack of communication and training for staff in time is reflected in how customers view the quality of service as it is modified to meet effective environmental-business policy. Service indicators that are potentially modified by environmental responsiveness include vehicle specification and reliability, response time, staff competence, and communications with customers.

Overall, it can be deduced from Table 3 that there is a high level of industry support for enhanced management of energy and waste. However it is one thing to observe how to improve energy and waste efficiency, it is another to find a remedy. Drawing on the information it appears that the most appropriate means for achieving this is by integrating energy and waste management with the business strategy, auditing process, benchmarking, driver training and education programs for operators. Good feedback and information are likely to encourage operators towards environmental responsiveness.

Table 4. Survey Result Summary: Regulatory changes assisting the industry

Item (Listed in order of items with highest number of incidence)
Education
Introduce more bus priority measures
Vehicle mass limits
Better control of emission on vehicles
Testing of vehicles for pollution
Diesel fuel standard CEC (500 PPM) Maximum
Introduce EURO II
Give incentive to pollute less
Tax car usage in urban areas
Financial incentives for use of CNG
Legislate excise on CNG – "NIL EXCISE"
Reduced tax on low sulphur fuel
Focus should be on EURO Standards (EPA current reliance is on California Standards)

Table 4 summarises suggestions for regulatory changes that could assist operators in the supply chain to become more environmentally responsive. The highest priority is education, followed by implementing bus priority measures (by road authorities),

minimising vehicle mass limits, and controlling emissions on vehicles. Education is a priority because lack of knowledge about alternative energy sources and best practice waste management coupled with uncertainty about government policy leads many operators to be environmentally risk-averse. The path from regulatory changes to enhanced environmental responsiveness by operators is a major challenge. Justification for other desired regulatory changes such as increased incentives or taxes on car use, the major competitor to the bus and coach industry, would need to be based on social benefits not already reflected in other pricing structures. Alternatively it may be preferable to choose some other means of having environmental factors influence operator choices about energy and waste management.

Conclusions

Environmental responsiveness occurs when it has the greatest potential impact in terms of both the environment and business's bottom line. Operators may initiate waste and energy management programs to be socially responsible, but continue them because they are cost-effective. A number of specific actions are warranted based on the study's findings, including:

- Educating and re-educating operators enabling them to integrate environmental responsiveness within their business strategy
- Switching from polluting and resource-degrading vehicles to efficient, environmentally effective vehicles
- Switching from polluting and resource-degrading fuels to efficient, environmentally effective fuels
- Better information systems and auditing of operational processes in relation to energy conservation and waste management, and
- Involving and training employees to ensure that individual enterprises can extract pertinent and specific information about everyone's perception regarding business' responsibility to the environment

Operators in the supply chain perceive that it is important that they adopt a conserving attitude towards their environment, albeit that their industry contributes a relatively small percentage to GHG emissions. It is accepted that the switch to improved fuel and vehicle technologies and information management industry-wide will lessen the environmental impact of the bus and coach industry on the natural environment. More efficient practices and better use of information could potentially reduce environmental degradation. The main perceived obstacle in operators becoming more environmentally responsive is a lack of information and data about vehicles and fuel efficiency.

Many of the strategies in this study fit a 'pro-enterprise' perspective whereby individual operators accept products from upstream in the supply chain and pass waste and costs downstream. This economic rationalist approach is primarily company-focused and short-term rather than community-based and long-term (Stern and Dietz 1994). To minimise a 'pro-enterprise' stance and to enhance operators' relationship with the environment, requires an improved understanding of environmental responsiveness. This includes an enterprise orientation, an industry one or ideally, both. Environmental

responsiveness embodies knowledge, attitude and strategic action as depicted in Figure 5.
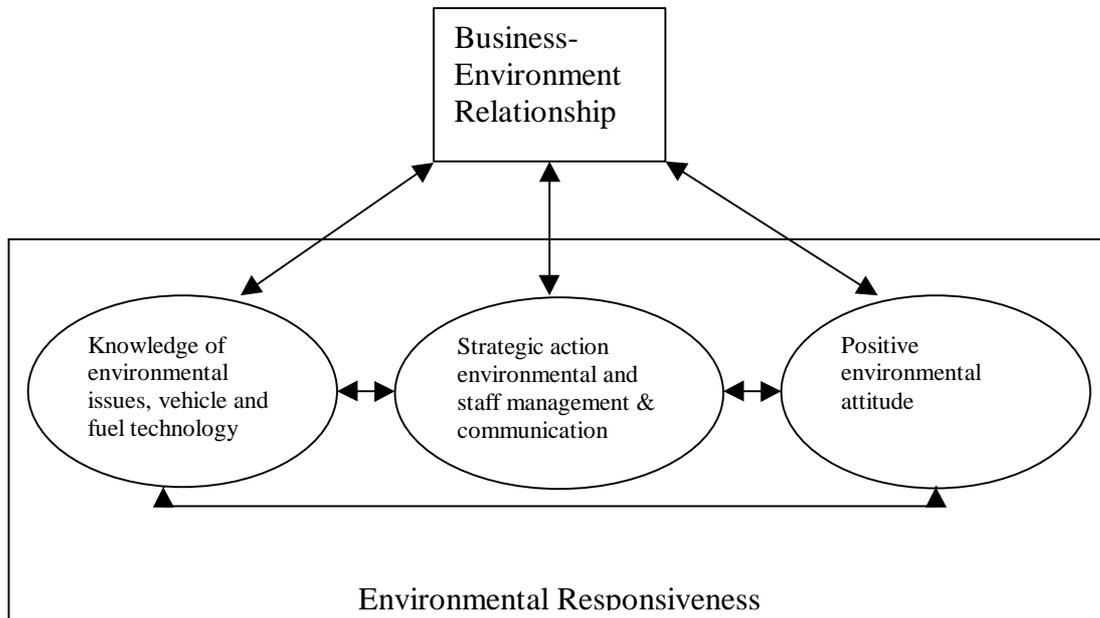
Figure 5: Factors contributing to environmental responsiveness

Sometimes initial costs may pose resistance from operators not conditioned to business planning in the short-term. Savings can offset costs, providing operators know what is available and are prepared to see these realised in the long term. This study suggests that one of the major impediments to responsible environmental action is a lack of knowledge about issues and a subsequent inability to develop and mobilise strategic action to manage the environment. Lack of knowledge may add to the perception of complexity associated with protecting the environment. That is, operators want to act but do not have the know-how. Conversely, some operators may have the knowledge but not the expertise nor the financial capacity to take sustainable environmental action. Other operators may be concerned that, as a single company, their action will not make the difference to the environment so their potential investment will be dissipated.

Schein's (1984 p.3) frequently quoted definition of culture assists in understanding the basis of environmental responsiveness. Culture is the pattern of basic assumptions that a business has invented, discovered, or developed in learning to cope with environmental issues, and that have worked well enough to be considered logical. In this way, environmental responsiveness diffuses throughout a business, affecting all people and facets of operation and business practice. As suggested in Figure 5, maintaining a business-environment relationship requires knowledge, a shift in attitudes from 'pro-enterprise' towards 'pro-environment' and action which leads to environmental responsiveness (Ranniko 1996). Communication with and training of staff so they understand the 'correct' way to perceive, think, and feel in relation to these problems is essential for the transformation to environmental responsiveness to occur.

Becoming environmentally-responsive is a complex change for any business. It involves engendering moral responsibility (Hines et al 1987) or what might be termed 'good citizenship'; understanding processes of social diffusion of industry knowledge (Manzo and Weinstein 1990) as well as managing strategically. If environmental issues are officially recognised by management by integrating them into the business strategy, the likelihood of employees and customers being more receptive to environmental issues and activities increases. One of the problems may be that operators do not know how to integrate environmental expenditure into their planning and budgets; nor is there a systematic process of environmental auditing in place. The need for engaging in industry-wide education, as well as informal discussion with industry peers, to encourage businesses to *know how* to become more supportive of protecting the environment is of foremost importance. Training may be one of the most effective routes to improvement in energy and waste management in the bus and coach industry. Further, benchmarking all energy and waste comparisons across businesses would also empower bus and coach operators in running their businesses and the industry as a whole. Of course, benchmarking relies on an efficient process of environmental auditing that is common to all bus and coach operators.

All of these recommendations indicate a policy change for the bus and coach industry. Governments need to view operators in the bus and coach industry as conservative consumers. By focusing on the improvement of processes it will be necessary to identify the (often competing) interests of business and environmental objectives and seek realignment of a common objective. The policy change has to be an approach that seeks to change attitudes and business strategies by addressing the costs of not doing things by operators in relationship to the environment, and by identifying typical problems and preventative management programs.

Acknowledgments

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Appendix A

Section 1: Identifying the Key Influences on Vehicle Purchases

1.1   In your experience, what role does each of the following factors play in purchasing a bus or coach; and how important are they in your view in producing greenhouse gas emissions?

Answers were on a scale from 1-5, with: 1 = not important at all (irrelevant) and 5 = crucially important. Participants were asked to answer this question in terms of a specific vehicle type (heavy duty route bus, school bus, or coach).

Following are a sample of factors listed: Vehicle specifications, purchase price, resale value, vehicle width and height, similarity to existing vehicles in fleet, aerodynamic devices, distance travelled.

1.2   The following products produce greenhouse gas emissions. Where would you see the greatest potential gains in reducing such emissions?

Products were rated from 1 to 5, with 1 = greatest potential gains and 5 = least potential gains. Amongst the given products were parts cleaner, transmission fluid, oil filters, used batteries and paper

Section 2: Energy Management Activities - Past, Present and Future

2.1   Can you list up to 6 operations in your organisation/industry which involve the generation and release of greenhouse gas emissions:

2.2   We would like you to select up to 3 energy/emission management programs you are aware of which are examples of good practice in your organisation or in other organisations in your industry.

2.3   Please indicate examples of environmental auditing that explicitly look at ways of reducing greenhouse gas emissions in each phase of the manufacture, maintenance

and use of buses and coaches (Chassis manufacture, Body construction, fuel refining, bus and coach operations).

Section 3: Waste Management Activities - Past, Present and Future

3.1   Please list up to 5 operations in your organisation/industry which make an indirect contribution to emissions through the use of (a) fossil fuel derived energy and (b) emissions from industry generated waste

3.2   We would like you to select up to 3 waste management programs you are aware of which are examples of good practice in your organisation or in other organisations in your industry:

Section 4: Assessment of Industry Outlook

4.1   We have identified a number of features of the bus and coach industry and seek your comments on them. We would like you to consider each statement and select a point on a 5-point scale which you believe reflects your view in terms of whether you agree with it or not. If you are not qualified to comment, select scale "9".

The following statements were used (amongst others) in this question:

- My industry sector does take environmental protection seriously enough

- Using smaller vehicles such as mini-buses will enable operators to provide more flexible timetabling of services

- Establishing ways of improving the quality of diesel/distillate to reduce sulphur content and greenhouse gas emissions is a priority issue

- Having CNG tanks in a bus and coach depot takes up too much space

- There is little interest in Greenhouse Challenge sponsored energy and waste management projects in the body building sector

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- Better infrastructure for bus movements will reduce greenhouse gas emissions from bus operators substantially

- The conversion to CNG saves up to 50% in operating costs

4.2   Please list up to three regulatory changes that you believe would assist your industry in achieving more responsible environmental practices:

Section 5: Assessment of Cost of Production Components

5.1   In this section we would like to identify the **cost composition (ie percentage**) of the major production components (e.g. fuel, labour, energy, paints) within the main industry sub-sectors – Chassis Suppliers, Body Builders, Fuel Suppliers - who are the downstream suppliers of equipment and fuel to the bus and coach operators:

5.2   If you were invited to be on a committee to define and rank specific Greenhouse Challenge sponsored energy and waste management projects, what projects would you support? List 1 or 2 projects associated with each phase of the manufacture, maintenance and use (Chassis manufacture, body construction, fuel refining and operations) of buses and coaches.

5.3   Finally, please indicate if there are any issues not discussed above which you believe have an important positive or negative impact on the amount of greenhouse gas emissions produced by your industry.

Section 6: Company Perspective

6.1   Please indicate by ticking against the appropriate Response Scale what your company's policy is in respect of the following:

- Energy management is an important component of my company's business strategy

- Official depot audits are conducted to ensure efficient energy and waste practices

- Waste management is an important component of my company's business strategy

- When purchasing a vehicle our company is provided with high confidence information on total vehicle fuel economy

- Our company officially reviews its energy costs

- Our company officially communicates with staff about energy and waste management programs

- Waste management is part of our OH & S program

- Staff receive special training in waste management

- Staff receive special training in energy management

Section 7: General Background Information

7.1 Name of organisation/association and details of contact person (name, phone, fax, email, mobile)

7.2 Nature of activity in the Bus and Coach Sector (engine manufacturer, body builder, chassis manufacturer, fuel refining, bus and coach operator, industry association (BIC, ABCA), government agency, regulator)

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