

Select Committee on Perth's Air Quality

Vehicle Emissions

Discussion Paper 3

Presented by

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Laid on the Table of the Legislative Assembly

on

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ORDERED TO BE PRINTED

Terms of Reference

The Legislative Assembly of the Parliament of Western Australia appointed on 29 May 1997 a Select Committee to investigate and report on air quality in Perth, with particular reference to the following-

- (1) (a) Assess community attitudes and concerns in relation to Perth's air quality;
(b) Investigate ways in which urban air quality can be improved for current and future generations;
- (2) That the Committee have power to call for persons and papers, to sit on days over which the House stands adjourned, to move from place to place and to report from time to time.
- (3) That the Committee present its final report by 1 April 1998.

Committee Members

Chairman

Mr Fred Tubby, MLA
(Member for Roleystone)

Members

Dr Judy Edwards, MLA
(Member for Maylands)

Mr Iain MacLean, MLA
(Member for Wanneroo)

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Preamble

It is the Committee's intention to release a series of five discussion papers in the near future, to be followed by a final report in April 1998.

Discussion papers will be released on the following issues-

- Smoke emissions from homes (released 11 September 1997);
- Smoke emissions from open burning (released 18 September 1997);
- Industrial emissions;
- Vehicle emissions; and
- Integrated transport and urban planning.

Each discussion paper will be structured into two sections-

- Section 1 of each discussion paper will present background information on the status of Perth's air quality and the major contributing pollution sources. The content of this section will remain relatively consistent throughout the series of papers.
- Section 2 of the discussion paper will focus on suggested management strategies specific to that source and problem. The strategies are presented for public comment. They are not recommendations.

Section 1

Background

The Perth metropolitan area faces two distinctly different regional air quality problems: particulate haze and photochemical smog.

Evidence presented to the Committee to date suggests that Perth's air quality is relatively good for most of the year, experiencing occasional events of particulate haze and photochemical smog. These polluting events largely result from local winds failing to disperse emissions into the environment, thereby accumulating and causing pollution. However, there is a fine balance between these occasional situations and that involving an increasing number of individual pollution events. Evidence suggests that the air pollution problems in Perth will increase unless action is taken now.

Public submissions received by the Committee indicate that the community is acutely aware of this fine balance, and is demanding action from the Government to ensure that Perth's air quality does not deteriorate in the future.

The Committee recognises the need for the development of a long term Air Quality Management Plan for the Perth metropolitan area, and that any such plan needs to be based on strategies that target the key pollutant sources in an environmentally effective and economically efficient way.

Vehicle emissions, industrial emissions, and biomass burning including domestic wood heaters and open burning are all major contributing factors to reduced air quality in Perth. Each of these three subjects will be addressed in separate discussion papers to be released this year.

Objective and scope

This paper outlines strategies designed to reduce vehicle emissions from motorcycles, cars, buses, trucks and light commercial vehicles in use in the metropolitan area.

The Committee recognises that the Perth metropolitan area has evolved and developed around the use of the private vehicle as the main transport medium for the majority of the community. With such a reliance on this form of individual transport comes the responsibility of all vehicle owners to ensure that emissions from the vehicle are acceptable at all times.

The Committee acknowledges that one of the key ways of reducing vehicle emissions is to actually use vehicles less and adopt other transport modes, such as public transport, cycling and walking. It is the Committee's intention to elaborate on the strategies relating directly to alternative transport modes in the fifth and final discussion paper.

Emissions from vehicles come from a number of sources. The most obvious is the exhaust, particularly when the vehicle is not operating effectively or efficiently. Emissions also arise from evaporation at the engine, the fuel system and the fuel tank.

Australian Design Rules (ADRs) specify limits for exhaust and evaporative emissions that vehicles must comply with when new. The emission standards specified in the ADRs have changed over time, and those relevant to exhaust and evaporative emissions are listed in Table 1 and 2.

Vehicle emissions are the second largest contributor to episodes of particulate haze. Vehicle emissions are also a major source of oxides of nitrogen (NO_x) and reactive organic compounds (ROC's) contributing to the generation of photochemical smog. These emissions also contribute a variety of air toxics including PAHs, benzene and toluene.

Table 1 Australian Design Rule Standards for diesel vehicle emissions

Standard	Applicability
ADR30/00	<p>Diesel Engine Exhaust Smoke Emissions - To limit the opacity of Diesel Engine exhaust smoke emissions.</p> <p>Applies to the design and construction of all diesel fuelled vehicles (ie 2 and 3 wheeled mopeds; motor cycles, motor tricycles; passenger cars, forward control passenger vehicles, off-road passenger vehicles; light and heavy omnibus, light, medium and heavy goods vehicles).</p>
ADR70/00	<p>Exhaust Emission Control For Diesel Engine Vehicles - To reduce air pollution, by limiting the hydrocarbons, carbon monoxide, oxides of nitrogen, and particulates emitted to the atmosphere from the exhaust system of motor vehicles fitted with a Diesel Engine.</p> <p>Additional to ADR30/00.</p>

Table 2 Australian Design Rule Standards for petrol vehicle emissions

Standard	Applicability
ADR36	<p>Exhaust Emission Control for Heavy Duty Vehicles - To limit exhaust emissions from the propulsion engine of heavy duty motor vehicles in order to reduce pollution.</p> <p>Applies to petrol: light goods vehicles 2.7 to 3.5 tonne; medium and heavy goods vehicles. Excludes LPG vehicles.</p>
ADR37/00	<p>Emission Control for Light Vehicles - To limit Fuel Evaporation Emissions and Exhaust Emissions from motor vehicles in order to reduce air pollution, and to require new motor vehicles to be manufactured to operate on Unleaded Petrol.</p> <p>Set standards for hydrocarbon fuel evaporative emissions, and hydrocarbon, carbon monoxide and oxides of nitrogen exhaust emissions.</p>
ADR37/01	<p>Emission Control for Light Vehicles - To limit Fuel Evaporation Emissions and Exhaust Emissions from motor vehicles in order to reduce air pollution, and to require new motor vehicles to be manufactured to operate on Unleaded Petrol.</p> <p>A more stringent amendment to ADR37/00.</p> <p>Applies to the design and construction of all light petrol vehicles including motor tricycles; passenger cars, forward control passenger vehicles and off-road passenger vehicles; light omnibus; light goods vehicles.</p>
ADR41/00	<p>Mandatory Operation on Unleaded Petrol - To require vehicles to be manufactured to operate on "Unleaded Petrol".</p> <p>Applies to the design and construction of vehicles where the engine is manufactured after 1 January 1986 including: 2 and 3 wheeled mopeds; motor cycles; motor tricycles; forward control passenger vehicles and off-road passenger vehicles; light and heavy omnibus; light, medium and heavy goods vehicles. Does not apply to vehicles complying with ADR37.</p> <p>Unleaded petrol contains not more than 0.013 gram of lead per litre, and not more than 0.0013 gram of phosphate per litre.</p>

In comparison to other cities around the world, the Australian vehicle fleet is relatively old with 55.4% of the fleet estimated to be pre-1986 and with 48.5% of the fleet running on leaded fuel.¹ The Perth passenger vehicle fleet is similar with approximately 54% being 1970 to 1986 model years². This means that a large proportion of the vehicles in use today were designed to meet only the very early standards.

Table 3 is a summary of the Perth metropolitan fleet based on the 1995 Motor Vehicle Census.

Table 3 Vehicles on the Register for the Perth metropolitan area

Vehicle type and Total	Percentage Fuel type (by vehicle type)					
	Leaded	Unleaded	Diesel	LPG/Dual	Unknown	
Articulated truck	3 284	1%	0%	99%	0%	0%
Bus	4 311	2%	5%	91%	1%	0%
Light commercial	105 856	50%	33%	16%	1%	0%
Motor cycle	23 223	54%	46%	0%	0%	0%
Non-freight carrying vehicle	5 352	67%	12%	20%	1%	1%
Passenger vehicle	652 964	52%	46%	2%	0%	0%
Rigid truck	20 959	18%	1%	78%	1%	2%
Total	815 949					

The Federal Office of Road Safety's Report³ on the nature of leaded and unleaded vehicle emissions (including LPG) highlighted the following concerns-

- most pre-1986 vehicles do not meet the evaporative emissions ADR after 80 000 km;
- emission levels from post-1986 catalyst equipped vehicles could be as high as non-catalyst vehicles, and exceed the ADR limits;
- newer vehicles can have a higher deterioration rate than older vehicles, highlighting the need for regular and ongoing maintenance of all vehicles; and
- pre-1986 vehicles currently dominate the individual relative contribution to hydrocarbon and carbon monoxide exhaust emissions, but on average these vehicles tend to do fewer kilometres annually than the newer vehicles.

Table 4 outlines the variety of emissions that come from petrol (leaded and unleaded), diesel and gas (LPG) vehicles.

¹ Department of Transport 1997, Correspondence dated 4 September 1997.

² Commonwealth of Australia 1997, *Australian Bureau of Statistics 1995 Motor Vehicle Census*.

³ Commonwealth of Australia, 1996, *Motor Vehicle Pollution in Australia Report on the National In-Service Vehicle Emissions Study* prepared by the Federal Office of Road Safety May 1996.

Table 4 Impact of main pollutants produced by light vehicles⁴

Pollutant	Vehicle source	Health effect
Carbon monoxide	Fuel poorly combusted in the engine - exhaust pipe emission.	Poisonous to humans when inhaled. Reduces the carrying capacity of blood and places additional strain on the heart and lungs
Hydrocarbons	Fuel unburnt or evaporative emission - 10% of emission is from refuelling process ⁵ .	Irritant. Cancer risk. Odour. Precursor to photochemical smog formation.
Nitrogen oxides	Side effect of high temperature combustion processes - exhaust pipe emission.	Irritant. Precursor to photochemical smog formation.
Lead	Fuel additive. Exhaust pipe emission.	Affects the intellectual development of children.
Air toxics ⁶	Fuel impurities or product of incomplete combustion. Exhaust pipe emission.	Increases cancer risk.
Particulates	Carbon particles formed due to improper combustion of fuels.	Contributes to haze. Increases cancer risk. Mortality effects. Aggravates respiratory illness.

The strategies presented are a compilation of those implemented in other cities within Australia and around the world, and include suggestions presented in oral and written submissions to the Committee.

The strategies listed are intended as illustrations of the type of action that could be implemented to ensure that Perth's air quality does not deteriorate in the future. The Committee is not suggesting that every strategy should be or needs to be implemented. Instead it is acknowledging the need for action across a variety of areas and is seeking your comment on: what do you consider to be the most effective measures, and what strategies you consider should be implemented for the Perth metropolitan area.

The Committee's initial evaluation of these suggested strategies has been facilitated by the investigative tour to Sydney and Canberra (4 - 9 August 1997), where specific strategies have also been proposed or are in various stages of implementation. The Committee has received 57 written submissions to date and has received oral evidence on 32 occasions. The Committee recognises the importance of community consultation, and the evaluation of these strategies will take into account all comment received in response to this paper. Therefore, the Committee is not presenting any recommendations at this stage.

This paper is the third in a series to be released by the Committee which will contribute towards the compilation of the Committee's final report and recommendations.

⁴ Department of Transport, Department of Environmental Protection & Main Roads Western Australia, 1997, *Reducing Vehicle Emissions in Perth Discussion Paper - Draft - July 1997*

⁵ New South Wales Environment Protection Authority, 1994, *The cost of motor vehicle emission controls*.

⁶ Air toxics includes compounds such as formaldehyde, acetaldehyde, 1,3 butadiene, benzene and polycyclic aromatic hydrocarbons.

Perth's air quality now and into the future

The Perth metropolitan area faces two distinctly different regional air quality problems: particulate haze and photochemical smog. An additional concern is the community's exposure to air toxics, such as benzene, toluene and 1,3 butadiene, with research having recently shown that the levels currently considered safe may in fact be too high.

Haze

Haze is caused by very small particles that are not visible to the eye but in the air they collectively cause the scattering of light and thereby reduce visibility. Particles that are ten microns in diameter (PM10 or "inhalable particles") and particles 2.5 microns in diameter (PM2.5 or "fine particles") are two measures of the concentration of these particles in the air, according to their size. These particles are small enough to be inhaled and are therefore important from a health aspect.

The Committee acknowledges the extensive amount of scientific research that has been undertaken around the world linking particulate matter, especially fine particles, with a variety of health problems, including premature death, aggravated asthma, acute respiratory symptoms including aggravated coughing, chronic bronchitis and decreased lung function. An estimated 70 premature deaths a year could be related to particulate haze in Perth.

*The Perth Haze Study 1994-1996*⁷ found that haze levels are highest in winter and lowest in summer. The most significant contributor to winter and spring haze is smoke particles from domestic wood heaters. Vehicle emissions are the second largest contributor of which diesel vehicles are estimated to cause two-thirds of this emission. Summer haze formation is influenced more by the presence of soil, sea salt and the chemical reaction of other pollutants that may be present in the air at the time, such as smoke from wild fires.

Prolonged events of haze during autumn and spring are sometimes caused by smoke from open burning. These fires are not all necessarily in close proximity to the Perth metropolitan area. Under certain weather conditions smoke generated from open burning in the south west has been known to drift off shore and then be carried back into the metropolitan area causing an air pollution problem.

Relative contribution of vehicle emissions to causing particulate haze in Perth. (Source: Gras J L, 1996 A report to Department of Environmental Protection of Western Australia on fine-particle haze in Perth).

⁷

Department of Environmental Protection, 1996, *The Perth Haze Study 1994-1996*

Peak haze levels in the Perth metropolitan area due to particulate matter. (Source: Department of Environmental Protection, Western Australia).

In general terms, the number of days per year when haze is experienced in the Perth metropolitan area is expected to increase. Particles from domestic sources, such as home fires and wood heaters, are expected to increase over the short to medium term, mainly as a result of the number of wood heaters installed in the Perth metropolitan area that do not meet Australian Standards designed to reduce emissions.

Particles from motor vehicles are also predicted to rise over the short to medium term, principally because of the growth in diesel vehicle use, with only those diesel engines manufactured from the mid 1990's required to meet the Australian Design Rules' lower particulate emissions level.⁸ This growth in vehicle use is evidenced by the upward trend in the number of diesel vehicles registered in Western Australia, and in diesel fuel consumption.

Diesel engine vehicles emit a disproportionately high level of transport related particulates. Typically these vehicles represent only about 10% of urban traffic or 35% of fuel consumption, but about 70% of urban transport particulate emissions. Particulate levels from motor vehicles are predicted to increase over the short to medium term, principally because of the growth in diesel vehicle use and the absence of particulate emission standards until the mid 1990's⁹.

Although diesel vehicles emit some smoke on acceleration, smoke should not be emitted constantly. Black or grey smoke arises when there is incomplete fuel combustion. Blue smoke arises when engine oil is being burned or atomised, and white smoke arises when fuel is not burning. Simple maintenance procedures can often alleviate these smoke emissions if maintenance is undertaken correctly and regularly. It is a similar situation for petrol vehicles where black or gray smoke arises from incomplete combustion, blue smoke arises from engine oil being burned and white smoke if coolant and/or water is being vaporised in the combustion chamber.¹⁰

Photochemical smog

Photochemical smog is a pollution cocktail caused by the reaction of nitrogen oxides (NO_x) and reactive organic compounds (ROCs) in the presence of heat and sunlight. Ozone is a product of this reaction, and the monitoring of ozone concentration at ground level is used as an indicator of photochemical smog.

Since heat and sunlight are essential components to the generation of photochemical smog, it tends to be a summer problem for the Perth metropolitan area.

Relative source contribution to NO_x and ROCs generation. (Source: *The Perth Photochemical Smog Study, Perth Western Australia, Department of Environmental Protection, Western Australia and Western Power*).

⁸ Real, John 1997, *Vehicle Emissions and Air Quality in Australia*, paper presented to the Professional Short Course Road Transport Engine Emissions University of Melbourne, 23-25 July 1997

⁹ Real, John 1997, *Vehicle Emissions and Air Quality in Australia*, paper presented to the Professional Short Course, Road Transport Engine Emissions University of Melbourne 23-25 July 1997.

¹⁰ Bay Area Air Quality Management District (BAAQMD), 1997, In *Public Education* [Online]. Available: <http://www.baaqmd.gov/pie/smv.htm> [1997, 19 September].

Photochemical smog formation in the Perth metropolitan area (Source: Airwatch, A Monitoring Program for Schools, Department of Environmental Protection, Western Australia, Main Roads Western Australia).

*The Perth Photochemical Smog Study*¹¹ found smog events in Perth to be closely linked to the weather pattern. The highest smog concentrations occurred on those days during spring through summer and into autumn when a weak low pressure trough was situated very close to the coast and subsequently crossed the coast in the afternoon (morning easterly winds, afternoon sea breeze).

¹¹ Western Power Corporation & Department of Environmental Protection, 1996, *The Perth Photochemical Smog Study*, Perth, Western Australia

Number of days in the month when peak 1-hour ozone concentration exceeded 80 ppb somewhere in the Perth metropolitan area. (Source: *Air pollution and You*, Department of Environmental Protection, Western Australia, and *Main Roads Western Australia*).

Over the past four years, the Perth metropolitan area has experienced on average 10 days per year when photochemical smog levels were unacceptable from a health perspective. These events, except when associated with bushfire smoke, tend to be of short duration (around two hours) and are not necessarily experienced across the entire metropolitan area.

To put Perth's air quality into context, it is useful to compare it to other Australian cities that have similar airsheds and similar sources of both NO_x and ROCs.

Comparison of relative contributions of NO_x and ROCs from sources in Perth, Sydney, Brisbane and Melbourne. (Source: *Australian Academy of Technological Sciences and Engineering*).

On a per capita basis, the Perth metropolitan area has a relatively high loading of pollutants when compared to Sydney and Melbourne. The key factor is the influence that emissions from the Kwinana industrial area are having on Perth, in particular NO_x emissions resulting from power generation.

Air toxics

The United States Environmental Protection Agency has identified one hundred and eighty nine air toxic substances. This list includes benzene, 1,3 butadiene and polycyclic aromatic hydrocarbons (PAHs). These come from a wide variety of sources but, in the Perth metropolitan area, the greatest source is vehicle emissions, unless one is a smoker or is regularly exposed to passive smoking.

Each air toxic has a different level at which it will pose a health risk to people. Recent research highlights the need for concern about the effects of long term low level exposure, particularly as some air toxics attach themselves to fine particles (those present as haze) which can be taken in by our bodies.

Vehicle emissions have a toxic component which contains traces of a number of air toxics including carcinogens, such as PAH which adsorb onto particles in the air.

There is no regular monitoring of air toxics in the Perth metropolitan area.

Section 2

Community perception and opinion of Perth's air quality and vehicle emissions

Written and oral submissions received to date have come from individuals, community groups and associations, businesses, industry, academics, health professionals, and Government agencies. A complete list of submitters will be provided in the Committee's final report.

The general perception presented in the submissions is that-

- Perth's air quality is relatively good on most days;
 - but it is getting worse, and
 - it is causing health problems.
- The key pollution sources in the Perth metropolitan area are considered to be;
 - motor vehicles, especially those with smokey exhausts,
 - backyard burning of waste,
 - smoke from home wood fires and heaters,
 - industrial emissions close to the city, and
 - smoke from bush fires and controlled burns of bush land, development sites and agricultural land.

An opinion expressed in the submissions was that the Government had failed to adequately deal with vehicles that were contributing to Perth's pollution problem. The *Smokey Vehicle* reporting program (operated by the Department of Environmental Protection) was seen as a "band-aid" approach, and the policing of vehicles that had an exhaust problem was inadequate.

Other submissions outlined the technological inadequacies of vehicle, engine and fuel design as being contributing factors to the amount of pollution coming from vehicles in Perth. It was estimated that 25% of the car trips made in Perth are less than 3 km in length. Since the effective operation of catalytic converters is temperature dependent, and that it takes between 10 to 15 km of driving for the catalyst to reach optimum operating conditions, there are many instances when emissions from vehicles are higher than expected.

Concern was also expressed in some submissions that, whilst all new vehicles were required to meet the Australian Design Rules (ADRs) for emissions when the vehicles came onto the market, it was considered to be a well known fact within the servicing and maintenance industry that tampering with fuel systems and removal of emission control equipment were taking place. This was considered to be prevalent amongst the diesel and trucking industry. There was no policing of this and there appears to be no penalty for those requesting or undertaking that work.

An underlying theme from the community submissions was that no individual has the right to pollute the air everyone has to breathe. There is also a general perception that, whilst there are technical fixes to improve Perth's air quality, the community is not convinced that the Government is committed to fixing the problem.

Strategies to improve Perth's air quality by reducing vehicle emissions

There are three key ways of controlling emissions from vehicles. These are based on the principles of-

- minimising the emission from each vehicle through improved technology and maintenance;
- modifying the way vehicles are driven, such as avoiding heavy acceleration and providing traffic management systems that reduce traffic congestion; and
- minimising the number of vehicle trips by maximising the use of alternative transport modes and improving urban design.

The Committee recognises that the Perth metropolitan area has evolved and developed around the use of the private vehicle as the main transport medium for the majority of the community. With such a reliance on this form of individual transport comes the responsibility of all vehicle owners to ensure that emissions from the vehicle are acceptable at all times.

The Committee also acknowledges the relative importance of reducing vehicle emissions by actually using vehicles less and adopting other transport modes, such as public transport, cycling and walking. Strategies to maximise the use of alternative transport modes are not presented in this discussion paper. The Committee will consider this issue in detail in the fifth and final paper.

The strategies listed here are a range of actions that could be implemented to ensure that Perth's air quality does not deteriorate in the future. The Committee is not suggesting that every strategy as listed here should be or needs to be implemented. Instead, it is seeking your comment on what you consider to be the most effective measures and those which you consider should be implemented for the Perth metropolitan area.

The strategy options have been classified as either *educational*, *technical*, *regulatory* or *market based* where:

- *educational* strategies aim to improve the actions of individual people which may be leading to the creation of excessive vehicle emission;
- *technical* strategies involve making changes to existing technology and implementing technologies;
- *regulatory* strategies are those which require some form of legal enforcement such as local council By-Laws or state regulations or legislation; and
- *market based* strategies which are direct financial incentives or disincentives.

Educational Strategies

1. Implement vehicle owner education programs on the importance of regular vehicle maintenance.
2. Implement voluntary "no driving" days combined with free or reduced rate public transport fares on days when air pollution is likely to occur.
3. Implement a driver education campaign relating driver actions to vehicle emissions.
4. Implement a community education program about the importance of regular inspection and servicing of vehicles.
5. Educate the service and repair industry on approved and desired practices.
6. Promote the use of alternative but cleaner fuels, such as LPG, CNG and cell battery vehicles.
7. Incorporate emission and pollution information as part of the mechanical and servicing trade courses.
8. Encourage vehicle and driver trade magazines to incorporate air quality issues in their articles.
9. Implement school based education programs on air quality issues.
10. Provide education information to driving instructors and traffic police.
11. Continue the Department of Environmental Protection's "Smokey Vehicle" Program.

12. Provide free or inexpensive vehicle testing facilities in Perth as a part of an education campaign.

Technical Strategies

13. Improve vehicle technology such as better engine design and aim for zero emission targets.
14. Improve fuel (petrol and diesel) quality, such as lowering the sulphur content of diesel.
15. Expand Perth's air quality monitoring network both in the number of the sites where monitoring is undertaken, and in the parameters measured. Monitoring for air toxics should be included.
16. Estimates of vehicle emissions should be included in Western Australia's pollutant inventory.
17. Examine the usefulness of "remote sensing device" or "radar" to detect vehicles with excess emissions.
18. Examine the effectiveness of in-service maintenance of vehicle emission control equipment.
19. Undertake further research on the health effects of exposure to vehicle emissions. Consideration should be given to determining driver exposure during periods of traffic congestion, cyclist and pedestrian exposure, and contribution to indoor air quality of homes and schools along major roads.
20. Improve road design, both existing and planned, to integrate into a network with traffic management techniques designed to reduce the likelihood of traffic congestion, such as integration of pedestrian crossing with traffic light changes, and left turning against the red light on a "give-way" to pedestrians and traffic basis.
21. Encourage business to make more efficient use of light commercial vehicles for deliveries in the Perth metropolitan area by developing "just in time" inventory systems for delivery of goods.

Regulatory Strategies

22. Introduce an annual or biennial vehicle emission inspection program requiring all vehicles over a defined age to be licensed as road worthy from an emissions (exhaust and evaporative) perspective. To include testing of cars, trucks, buses, light commercial vehicles and motorcycles.
23. Introduce a random road side vehicle exhaust inspection program for all vehicles, regardless of the age of the vehicle.
24. Introduce a radar vehicle emission identification program requiring all those vehicles detected to undergo an exhaust and evaporation emission test.
25. Introduce standards for vehicle emissions to comply with during the life of the vehicle. To include cars, trucks, buses, light commercial vehicles and motorcycles.
26. Reduce government spending and subsidisation of the private vehicle, such as reducing expenditure on constructing freeways, and divert these monies to education programs and supporting alternative travel modes.
27. For a trial period, ban private vehicles from the Perth CBD during peak hours and encourage the use of alternatives, including taxis and public transport.
28. Provide powers to the police and other authorised persons (under provisions of the *Environmental Protection Act 1986*) to issue on the spot fines to trucks, buses, motorcycles and cars that are visibly emitting excessive smoke from the exhaust.
29. Introduce an interchangeable number plate system for vehicles, such as that used in Switzerland, where two vehicles may be registered to a household but only one vehicle can be in use at any time.
30. Amalgamate the roles and responsibilities of the Department of Transport and Main Roads Western Australia to streamline the integration of road design and construction with the priority provision of facilities for public transport and non-private vehicle mobility options.
31. Reduce vehicle speeds (during peak traffic times) within the metropolitan area to balance the

relationship between vehicle speed and emissions to a practical minimum.

32. Introduce (stage II) vapour recovery processes in fuel systems and petrol stations to reduce evaporation of fuel and release of air toxics during vehicle refuelling.
33. Require the introduction of two-way catalysts in diesel vehicle emission control systems.
34. Require fuel imported and produced in the State to comply with specified standards.
35. Regulate the number of light commercial vehicles that can operate within the CBD and the Perth metropolitan area.

Market Based Strategies

36. Provide incentives to owners of pre-1986 vehicles without catalytic converters to convert the exhaust system to a cleaner alternative or trade the vehicle for scrapping.
37. Government and agency fleet vehicle purchasing and hiring policies to include preference for cleaner emission vehicles. Cradle to grave analysis methods of true costs to be used in comparing the cost of alternatives, including contribution to air pollution.
38. Provide car owners with incentives to trade in old vehicles, such as a Government funded buy-back program.
39. Introduce incentives for the use of less polluting vehicles, particularly commercial vehicles.
40. Review the vehicle licensing system to incorporate incentives for new vehicle owners.
41. Review the vehicle licensing system to incorporate incentives for vehicle owners with cleaner emission vehicles.

Criteria for assessing strategies to reduce vehicle emissions

The Committee will assess the strategies outlined in this paper by giving consideration to the eight measures outlined below.

Measure 1: Emission reduction potential

- What is the unit reduction in pollution per year, per capita?
- What total emission reduction is possible?

Measure 2: Timing of effectiveness

- What time frame is needed for the strategy to have an effect?
- How long will it take to fully implement the strategy?

Measure 3: Equity

- Are there individuals or groups within the community who will be disadvantaged by the strategy?
- Is the original source of pollution being targeted?
- Will the polluter pay?

Measure 4: Technical feasibility

- Is the technology currently available?
- Are there administrative or public perception barriers to the introduction of the strategy?
- Is there a high likelihood of new technology being developed in the future to solve the problem?

Measure 5: Enforceability

- Are regulatory mechanisms in place to support the strategy?
- Is there a need to enhance the mechanism?
- Is there a need to create a new mechanism?
- Is the mechanism enforceable?

Measure 6: Cost effectiveness

- What is the cost to the individual?
- What is the cost to the community?
- What is the cost to industry?
- What is the cost to Government?

Measure 7: Public acceptance

- What is the community's opinion of the strategy?

Measure 8: Additional social, economic or environmental impacts and benefits

- Does the strategy support any other federal, state or local Government strategy (eg Greenhouse Strategy)?

How to have your say

This paper is one in a series of five to be released which will contribute towards the Committee's final report and recommendations. These papers are being developed to not only bring information to the community, but for the community to bring information to the Committee.

To have your say on the strategies presented in this paper, written comments can be sent to:

Select Committee on Perth's Air Quality
Legislative Assembly
Parliament House
Perth, Western Australia, 6000

Telephone: (08) 9222 7381

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Submission period closes 30 November 1997.