

Select Committee on Perth's Air Quality

Transport and Urban Planning

Discussion Paper 5

Presented by

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Laid on the Table of the Legislative Assembly

on

4 December 1997

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.

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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);
- Vehicle emissions (released 16 November 1997);
- Industry emissions (released 4 December 1997); and
- 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; and
- 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 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, biomass burning including domestic wood heaters and open burning, and transport and urban planning are all major contributing factors to reduced air quality in Perth. Each of these subjects will be addressed in separate discussion papers to be released this year.

Objective and scope

This paper outlines transport and urban planning strategies designed to bring about a long term improvement in Perth's air quality. This paper is the fifth in a series to be released by the Committee which will contribute towards the compilation of the Committee's final report and recommendations.

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 to 9 August 1997), and to Europe and North America (24 October to 10 November 1997) where specific strategies have also been proposed or are in various stages of implementation. Examples of urban planning incorporating the provision of public transport systems and other alternatives to the private motor vehicle were reviewed in Copenhagen, Vancouver and Seattle.

The Committee has received 163 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.

In the Committee's third discussion paper it was recognised that the Perth metropolitan area has evolved and developed around the use of the private vehicle as the main transport medium for most of the community, and that vehicle emissions are one of the major pollutant sources in the Perth metropolitan area.

The Committee acknowledges that one of the key ways to reduce vehicle emissions is to actually use vehicles less and adopt other transport modes, such as public transport, cycling and walking. However to achieve this there needs to be a fundamental change in how the urban areas within Perth are planned, designed and ultimately constructed. The importance of this has been highlighted through the independent

inquiry¹ funded by the Federal Government where it is stated that acceptable air quality will only be assured by the pursuit of a wide range of actions and measures, and that the measures will only succeed through coordination of transport planning, infrastructure development and environmental planning.

The Committee acknowledges that the Perth metropolitan area has evolved and developed around the use of the private vehicle as the main transport mode for the majority of the community, and for those without a vehicle, alternatives are limited. The continual development of faster and more free flowing roads leading into and away from the city centre, is encouraging people to live further away from the city and therefore commute greater distances to employment and commercial centres. The process of installing capital intensive public transport systems to these initially outlying areas is often delayed and therefore reliance on the use of private vehicle is perpetuated.

The Committee considers it essential that both Government and the community share a vision of how Perth as a region is to develop and evolve into the future so that acceptable air quality is assured. Pivotal to the success of this planning will be the acknowledgment that cities must be designed for and around people, and that urban sprawl must be contained. There must also be an integration of both short and long term transport, land use and environmental planning.

The process of developing a shared vision is not new, novel or radical. The process has been undertaken in Melbourne, Australia (*Urban Village Project*), Vancouver, Canada (*The Greater Vancouver Livable Region Strategic Plan*) and Copenhagen, Denmark (*Traffic and Environment Plan for Copenhagen*).

The Greater Vancouver Livable Region Strategic Plan of 1996 is based upon the fundamental strategy of building complete communities which are focussed on town centres to provide better balance in the distribution of jobs and housing, a wider choice of affordable housing types, a better distribution of public services, and a more effective transportation service. The plan encourages the use of public transit and discourages the dependence on single-occupant vehicle travel. The planning initiatives place a priority on walking, cycling, public transit, goods movements and then the private vehicle.

With this mixture of land use, residential density and choice of transport commuting mode, both air quality and economic gains can be made with residents shopping locally, using local services, and making less single commute trips. Both the Subiaco and East Perth redevelopments have elements in their concept and design that support this approach, however at the moment this type of development is a minority form in the Perth metropolitan area.

The Committee considers integrated transport, land use and environmental planning to be one of the key issues that Government, industry and business, and the community must address now to ensure that Perth's air quality does not deteriorate into the future.

¹ Commonwealth of Australia 1997, *Urban Air Pollution in Australia*. An Inquiry by the Australian Academy of Technological Sciences and Engineering.

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 scientific research that has been undertaken around the world linking particulate matter, especially fine particles, with a variety of health problems, including premature death due to respiratory causes, cardiovascular causes and cancer causes, aggravated asthma, acute respiratory symptoms including aggravated coughing, chronic bronchitis and decreased lung function. International research has highlighted that there may be no safe level for exposure to fine particles, that is, health effects may be experienced even at extremely low levels. Whilst it has been estimated that 70 premature deaths a year could be related to particulate haze in Perth, it must be noted that a higher proportion of the community will experience the other more immediate health effects of particles, such as needing to increase medication or seeking medical attention. The following diagram illustrates the heirachial health outcomes of particles².

The heirarchical effect of particles on human health. (Source: Dr Sverre Vedal, 1995).

² Vedal, Sverre 1995, *Health effects of inhalable particles: Implications for British Columbia*, prepared for the Air Resources Branch, British Columbia Ministry of Environment, Lands and Parks, June 1995.

In this triangle of adverse health effects, the effects are ordered from the least adverse at the base to the most adverse at the top. The area corresponding to a health effect roughly corresponds to the proportion of the population affected. As exposure increases, the area devoted to “no adverse health effects” becomes smaller.

*The Perth Haze Study 1994-1996*³ 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.

Relative contribution of emissions from vehicles in 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*).

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.

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 1990s required to meet the Australian Design Rules' lower particulate emissions level.⁴ 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.

³ Department of Environmental Protection, 1996, *The Perth Haze Study 1994-1996*.

⁴ 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.

Peak haze levels in the Perth metropolitan area due to particulate matter. (Source: Department of Environmental Protection, 1996, The Perth Haze Study 1994-1996).

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, such as tuning the engine or replacing old spark plugs, can often alleviate these smoke emissions if maintenance is undertaken correctly and regularly. It is a similar situation for petrol vehicles where black or grey 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.⁵

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.

Photochemical smog formation in the Perth metropolitan area (Source: Department of Environmental Protection, Western Australia and Main Roads Western Australia, 1996, *Airwatch - A Monitoring Program for Schools.*).

⁵ Bay Area Air Quality Management District (BAAQMD), California, United States of America, 1997, In *Public Education* [Online]. Available: <http://www.baaqmd.gov/pie/smv.htm> [1997, 19 September].

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: Department of Environmental Protection, Western Australia and Western Power, 1996, *The Perth Photochemical Smog Study*, Perth Western Australia).

*The Perth Photochemical Smog Study*⁶ 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).

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.

Number of days in the month when peak 1-hour ozone concentration exceeded 80 ppb somewhere in the Perth metropolitan area. (Source: Department of Environmental Protection, Western Australia, and Main Roads Western Australia, 1997, *Air pollution and You.*).

⁶ Western Power Corporation & Department of Environmental Protection, 1996, *The Perth Photochemical Smog Study*, Perth, Western Australia

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, ROCs, sulphur oxides (SO_x) and carbon monoxide (CO).

Comparison of relative contributions of NO_x, ROCs, SO_x and CO from sources in Perth, Sydney, Brisbane and Melbourne. (Source: Commonwealth of Australia, 1997, *Urban Air Pollution in Australia. An Inquiry by the 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 and ROCs from petrol refining.

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 PAHs 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 transport and urban planning

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 urban and transport planning policies in this State had historically lead to the reliance on the private vehicle as the main way of moving around the metropolitan area. Some submissions also considered that too much money was being spent on new road construction without any detailed consideration of the related air quality impacts. Another suggestion was for a small proportion of the money currently spent on new road construction to be diverted to education programs such as subsidising "free public transport" days.

Other submissions outlined the need for an improved public transport system, such as increasing the frequency of service, extending the period considered to "peak hour" and extending the rail service south of Fremantle to Rockingham with a direct link to Perth. It was also suggested that the public transport system needed to improve in its radial connections across suburbs and in its links to major centres, such as all the Universities, major shopping centres and service facilities such as hospitals.

Some submissions outlined the need to provide more *Park and Ride* facilities and to improve security at these locations.

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 through transport and urban planning

It was acknowledged in the Committee's third discussion paper that one of the key ways to improve Perth's air quality was to reduce vehicle emissions by minimising the number of vehicles trips made and the length of these commuter trips. This could be achieved by the community maximising the use of alternative transport modes such as public transport, walking and cycling. However to achieve this there needs to be a fundamental change in how the urban areas within Perth are planned and designed such that a variety of compatible land use types can be integrated within residential areas with a variety of convenient and attractive transport options being provided.

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 and that for those within community who do not have easy access to a private vehicle have limited options to move about the metropolitan area easily. It also acknowledges that the *Perth Metropolitan Transport Strategy 1995 - 2029* aims to redress this situation.

Strategies to maximise the use of alternative transport modes are presented in this discussion 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 or the understanding of the community;
- *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 a community education program on the health effects and causes of haze and photochemical smog, and the actions needed to reduce or prevent the problem.
2. Encourage Universities to be involved with air pollution monitoring and research.
3. Implement school based education programs on air quality issues.
4. Encourage the use of energy efficient processes, design features and fuel sources in all aspects of the community, particularly at the detailed planning level, including the design of individual buildings, and the design and layout of subdivisions and blocks.
5. Promote to the community the benefits of integrating a variety of housing densities and compatible land uses within new subdivisions and redevelopments, and encourage the community to live and work locally (urban village concept).
6. Organise seminars in conjunction with the Urban Development Institute to inform developers of new trends and urban design initiatives occurring internationally.
7. Encourage key government planning staff to visit international cities that are aiming toward, or have already achieved, a high level of integrated urban development.
8. Develop a government officers exchange program for key government staff to visit international cities that are aiming toward, or have already achieved, a high level of integrated urban development.
9. Implement voluntary "no driving" days combined with free or reduced rate public transport fares on days when air pollution is likely to occur.

10. Increase funding to campaigns that promote the use of public transport, walking and cycling.
11. Implement workplace education programs to encourage employees to walk, cycle, car pool or use public transport to commute to work.

Technical Strategies

12. 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.
13. 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.
14. Develop an Air Quality (Clean Air) Management Plan for Perth, including area specific local air quality management plans, in conjunction with local government. Plans need to include components for education, monitoring and reporting of results.
15. The Department of Environmental Protection to expand the air quality monitoring network throughout the metropolitan area by increasing the number of sites and including the monitoring of air toxics.
16. Government to carry out research to determine the health impact of air pollution on the Perth community, including quantifying both short term and long term exposure impacts.
17. Carry out seasonal research throughout the Perth metropolitan area, analyse the ambient dust monitoring samples for the nature of adsorbed chemical species on the particles, and therefore the source.
18. Undertake a detailed economic analysis of the public subsidies provided to various form of public and private transport modes and facilities.
19. Create an Economic Advisory Committee of mainly non-transport economists to review and advise Government on all new major transport and urban projects.
20. Undertake a cost benefit analysis of the impacts of air quality on human health and the expenditure required to meet desirable air quality standards.
21. Build a light rail system in appropriate parts of the Perth metropolitan area with land zoning of higher density along the rail route and around the stations, and without the car parking requirements.

Regulatory Strategies

22. Increase the severity of penalties for breaches of the *Environmental Protection Act 1986 (as amended)* particularly for causing pollution.
23. Implement planning policies that require the integration of public transport, walking and cycling facilities as part of the overall development plan for all new subdivisions.
24. Implement planning policies that locate industrial sites away from the metropolitan area, and away from the prevailing wind direction of regional populations.
25. Require dedicated public transport access ways and high occupancy vehicle lanes in all new major road, highway and freeways that are planned or in the development stage.
26. Require dedicated public transport access ways and high occupancy vehicle lanes in all existing major road, highway and freeways that are planned for expansion.
27. Require dedicated bicycles lanes to be built along all existing major roads and future proposed major roads.

28. Implement planning policies that require a mix of urban density dwellings combined with compatible land use zoning within new subdivisions and for proposed redevelopment areas.
29. Commission a study to investigate the feasibility and infrastructure requirements of constructing a radial light rail system to link all major public venues within the suburban area, such as Universities, hospitals, major shopping centres and corporate locations.
30. Reduce Government spending and subsidisation of the private vehicle, such as expenditure on constructing freeways, and divert these monies to education programs and supporting alternative travel modes.
31. For a trial period, ban private vehicles from the Perth central business district during peak hours and encourage the use of alternatives, including taxis, public transport and bicycles.
32. Commission a study to investigate the feasibility and infrastructure requirements for constructing light rail in the vicinity of the Kwinana Freeway to connect the southern suburbs with the central business district.
33. 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, such as bicycle and pedestrian paths and vehicle free zones.
34. Amalgamate the roles and responsibilities of the Department of Transport and Main Roads Western Australia with the Ministry of Planning to streamline the integration of road design and construction with the priority provision of facilities for public transport and non-private vehicle transport options and with the overall planning for the State.
35. Reduce vehicle speeds (during peak traffic times) within the metropolitan area to balance the relationship between vehicle speed and emissions to a practical minimum.
36. Enforce the air quality standards proposed in the draft *National Environment Protection Measure for Ambient Air*.
37. Establish guidelines for the use of the *Environmental Protection Act 1986 (as amended)* to declare air pollution alerts.
38. Amend legislation to require increased urban densities in the vicinity of existing and planned future rail stations.
39. Implement a review of the bus and train transport systems to ensure maximum integration of connecting services and the enhancement of peak hour services. Consideration to be given to expanding the hours considered to be peak, and the running of limited stop services on routes connecting major centres with the central business district.
40. Require air quality considerations to be included as part of the planning process.
41. Introduce By-Laws requiring energy efficiency in building design.
42. Introduce By-Laws requiring domestic use of renewable energy resources.
43. Require all industrial emissions to be included on a statewide pollutant inventory.
44. Amend legislation to allow the revenue raised from parking fees to be used in programs other than maintaining and increasing parking facilities.
45. The environmental impact assessment of planning proposals to include consideration of predicted traffic flows and transport options, and the subsequent estimate of emissions to the atmosphere.
46. Increase security patrols on public transport at night as a deterrent to anti-social behaviour, and increase penalties for those behaving in an anti-social manner as a means of increasing patronage on public transport.
47. Require all new building developments or redevelopments to incorporate free or minimal cost facilities for people who walk and/or cycle to work. This could include secure bicycle lock up areas, lockers and showering facilities.

48. Amend or introduce legislation to provide local government with local pollution control powers and air quality control powers.
49. Local government be required to develop local public transport plans that also integrate with neighbouring authorities.
50. The State Government to assist local government by developing model By-Laws for the development of energy efficient housing.

Market Based Strategies

51. Provide planning concessions for buildings incorporating energy efficient design features.
52. 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.
53. Increase private development and funding of rail and public transport systems through enhancing developing opportunities along the transport routes.
54. Provide planning concessions to developers that incorporate pedestrian and cycling facilities as a priority to cars in new developments or redevelopment areas.
55. Increase government funding of the public transport system to ensure that fees for using public transport do not increase as a means of cost recovery.
56. Significantly increase parking fees in the central business district for all day parking.
57. Reduce the amount of parking space in the central business district progressively over the next 5 years and divert the funds to support public transport, cycling and walking modes of transport.
58. Encourage the style of urban planning that incorporates energy efficiency in all forms, such as the Leichhardt, New South Wales model.
59. Encourage developers through various mechanisms (such as provision of Crown land, attractive land zoning) to construct light rail/heavy rail or parts there of in key new development areas within the Perth metropolitan area.

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 -

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Submission period closes 28 February 1998.