

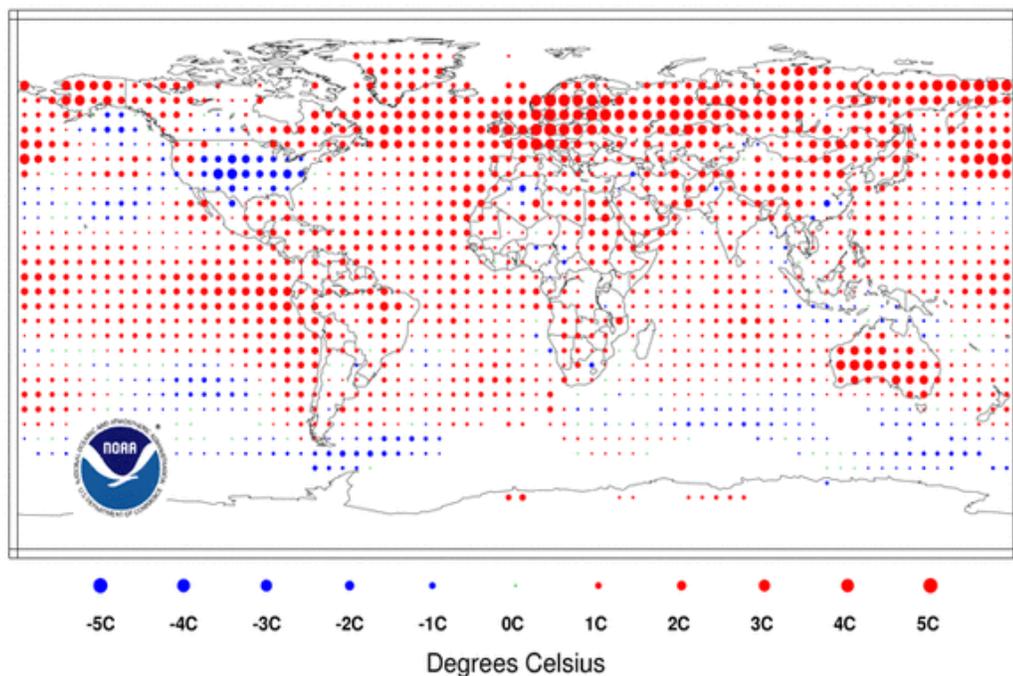
# Climate Change Impact and Response in Western Australia

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This presentation deals with WA and Perth but there are strong parallels in other Australian cities. It makes three points:

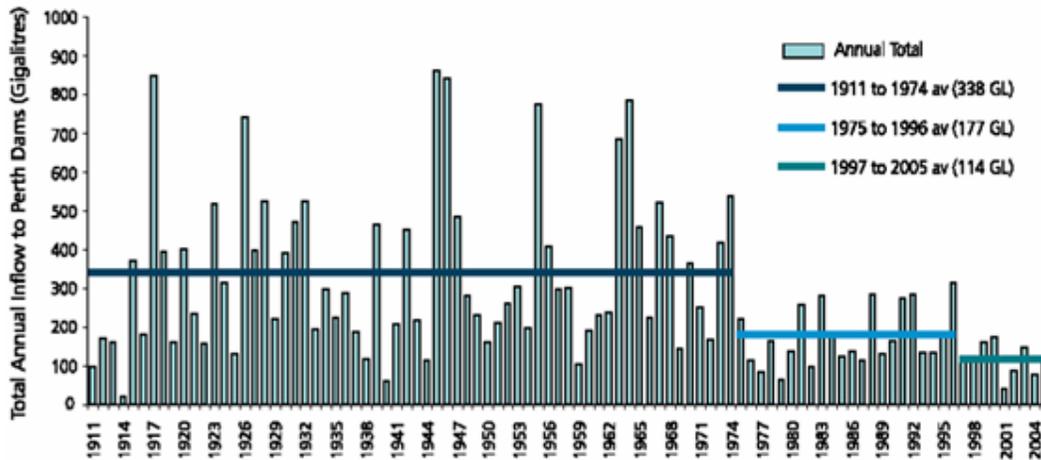
- Climate change has arrived and the impacts are severe, particularly in Australia and Europe, which are getting hotter, and North America, which is getting colder;
- Response to date in WA has been half-hearted and concentrated on reducing domestic water consumption and increasing residential densities to support public transport use; and
- The planning profession should be more involved, in both management of water resources and city form as a response to climate change.



Source: National Climatic Data Centre/NESDIS/NOAA

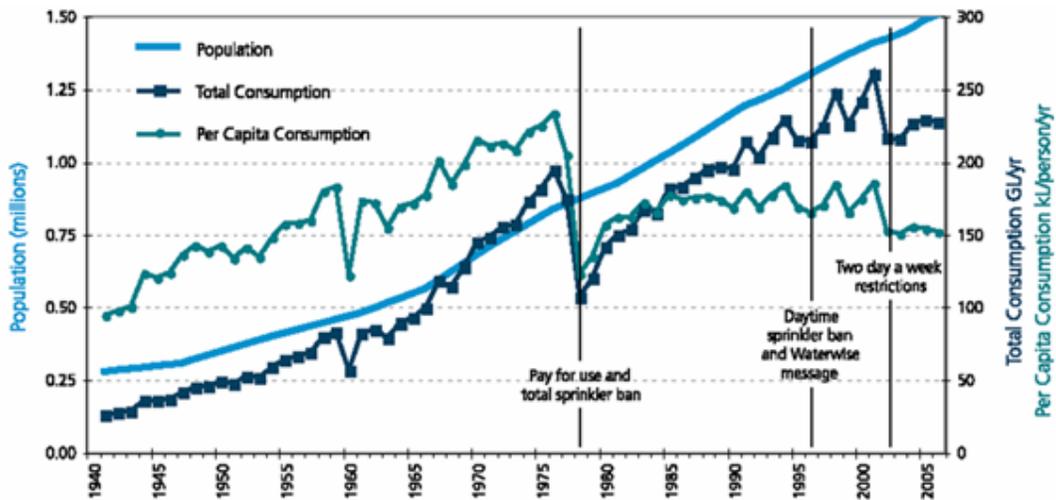
## September 2006 temperature anomalies (with respect to a 1961 – 1990 base period)

Climate change has arrived in Perth as the city is now obviously experiencing higher temperatures and reduced rainfall. Average temperatures have only risen about 1°C since 1900 but the rate of change is accelerating and a 3 to 4°C rise is expected by 2050. Reduced rainfall has been more noticeable. The city has experienced a rainfall decline of 15 per cent over the last 70 years, 10 per cent in the last 25 years, and more of that rain is falling in summer, when evaporation is higher, resulting in a 50 per cent reduction in average stream flow into Perth's water catchments.



Streamflows to Perth's public water supply dams since 1911

A period of lower rainfall commenced around 1975 and it is highly likely a new, even lower period commenced last year when we experienced the driest and warmest winter on record, with the year's rainfall half that of the last 30 year average. This is at a time when Perth's population is growing strongly and water supply has had to be doubled in the last decade. The anticipated 3°C rise in temperature will result in a 10 to 15 per cent increase in water loss in soil due to higher evaporation and plant transpiration. It is not beyond the realms of possibility that we could witness the complete cessation of all stream flow into our water catchments within the foreseeable future. And if rainfall dries up, it is only a matter of time before groundwater is exhausted.



Per person use of water from the Integrated Scheme

The initial Government response, some 30 years ago following a run of dry years, was to focus on reducing reticulated water consumption. Conservation measures were introduced in 1976 – a total sprinkler ban and a true “user pays” method of charging. These measures were an outstanding success and cut reticulated water consumption in half. In fact, they were so successful the Water Authority's revenue was reduced to such an extent that it could not service its loans. The “user pays” system of charging had to be diluted with the introduction of a “service charge” and guaranteed allocation of water, which had the effect of allowing water consumption to resume its upward path.

Other demand management measures have been tried while uncontrolled use of surficial groundwater has always been encouraged by domestic, commercial and industrial users, in the belief, with some justification, that this relieves pressure on reticulated water supplies.

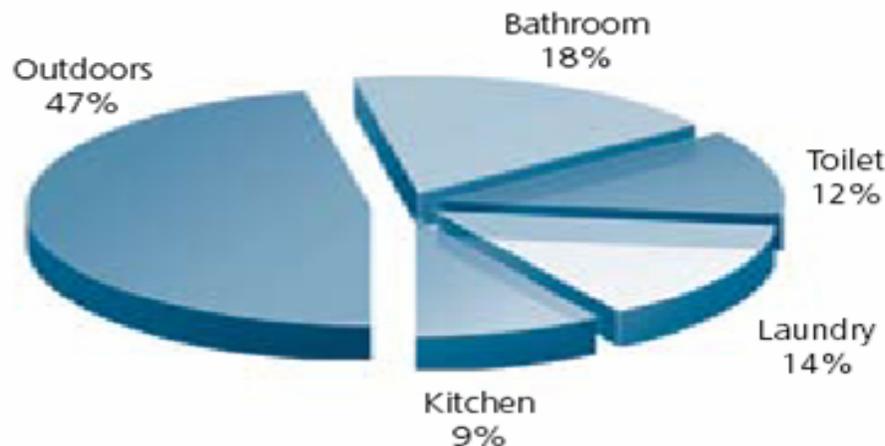
Comprehensive response to climate change really commenced with the release of the *Western Australian State Sustainability Strategy* in 2003. This trumpeted sustainability as “meeting the needs of current and future generations through an integration of environmental protection, social advancement and economic prosperity.” The document was very broad in its scope, with a “whole of Government” approach that promoted Greenhouse, Biodiversity and State Water Strategies and transition from oil vulnerability to alternative fuels.

More directly related to planning, a Sustainability Directorate within the Department for Planning and Infrastructure was proposed, along with Statements of Planning Policy and other mechanisms to coordinate the actions of local governments, regional councils and State natural resource management agencies on priority natural resource issues. There was emphasis on the revitalisation of suburbs and, as part of Greater Perth, growth management to control urban sprawl and overcome car dependence through development that builds on expansion of the rail system.

Complementary to the sustainability Strategy was *Network City: community planning strategy for Perth and Peel* released in 2004. This also covered a wide range of topics, including energy conservation, water resource protection and use of alternative energy.

The vision was that:

*By 2030, Perth people will have created a world-class sustainable city; vibrant, more compact and accessible, with a unique sense of place.*

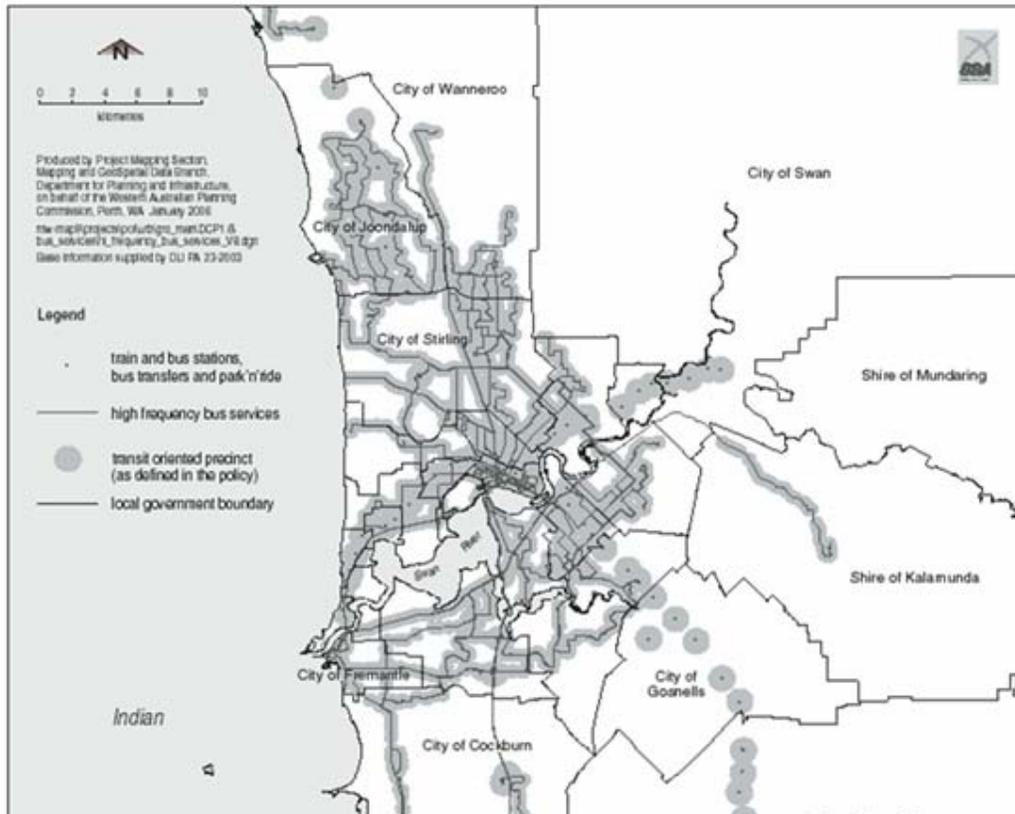


## Typical scheme water use of a household in Western Australia

The report said we needed to encourage higher residential densities to conserve water resources because more water was used outdoors than anywhere else and multi-residential used less water per household than single residential. The report also said we must decrease car usage and promote energy efficient public transport. This produced *Network City*, where an increase of  $\frac{3}{4}$  million people by 2030 would be accommodated 40 per cent

in new fringe growth areas and 60 per cent in the existing urban area. As an alternative to urban sprawl, the majority of the population growth would be accommodated as infill in already built-up areas.

Flowing from this were 2005 amendments to a six-year-old Western Australian Planning Commission Development Control Policy 1.6 *Planning To Enhance Public Transport Use*. The original policy had achieved very little but to reflect the Government's vision for a sustainable future as outlined in Network City and the State Sustainability Strategy, the policy was given extra teeth and relabelled DC 1.6 *Planning to Support Transit Use and Transit Oriented Development*.



## DC 1.6 Planning to Support Transit Use and Transit Oriented Development

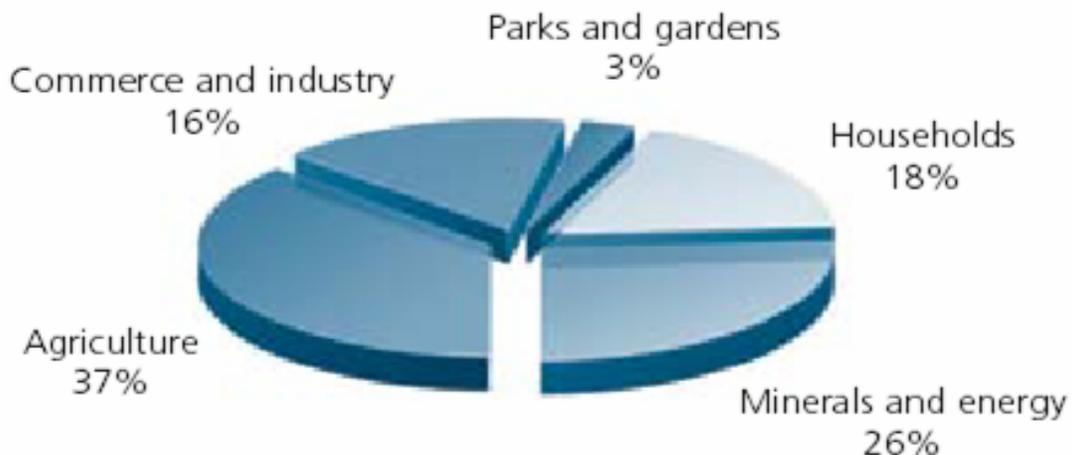
The policy identified Transit Oriented Precincts, within 400m of stops on high frequency bus routes and 800m of rail stations and major bus transfer stations. Within these precincts, which covered the majority of the Perth urban area, there was to be a minimum residential density of 25 units per hectare. This requirement would be implemented by making the higher densities mandatory when local planning schemes came to the Minister for review and amendment.

Complementing this have been Government policies of consolidating public open spaces, schools, hospitals and other institutional development, with surplus sites sold off for additional housing, invariably at densities higher than surrounding residential development. Particularly the sale of parkland has been met with strong opposition.

In recent years there have been growing signs that both our water and land use plans have been found wanting with respect to mitigating climate change effects. With sharply decreasing rainfall there has been talk about increasing water supplies by a variety of more expensive and/or extreme measures, including tapping new underground resources, recycling sewage, desalination, bringing water from the Kimberly and increasing yields from existing ground and surface water catchments by removing vegetation.

With advertising campaigns, sprinkler bans on alternate days, subsidies for sinking garden bores and a waterwise rebate program for such things as water efficient shower heads and rainwater tanks, the emphasis on demand management to reduce reticulated water consumption over the last 20 years has been successful. The per capita reticulated water consumption has reduced but at the expense of proliferate use of groundwater, the effects of which are only now being seen in diminishing wetlands on the coastal plain. Belatedly, consideration is now being given, for the first time, to metering bores, charging commercial and industrial users of groundwater and total sprinkler bans. This has given rise to scare campaigns and upset not only large water users but domestic consumers who value their gardens. Added to this, is talk of charging domestic consumers the “true cost of water” ie. significantly increasing the price.

The current \$154 Water Corporation service charge represents more than half the average WA household’s water bill of \$296. It is distorting the true cost of water and subsidising heavy water users. In 2001 the water Corporation received 77 per cent of its income from service charges, the highest ratio of income from service charges compared with water rates of any water authority in the country.



## Estimated water use by sector

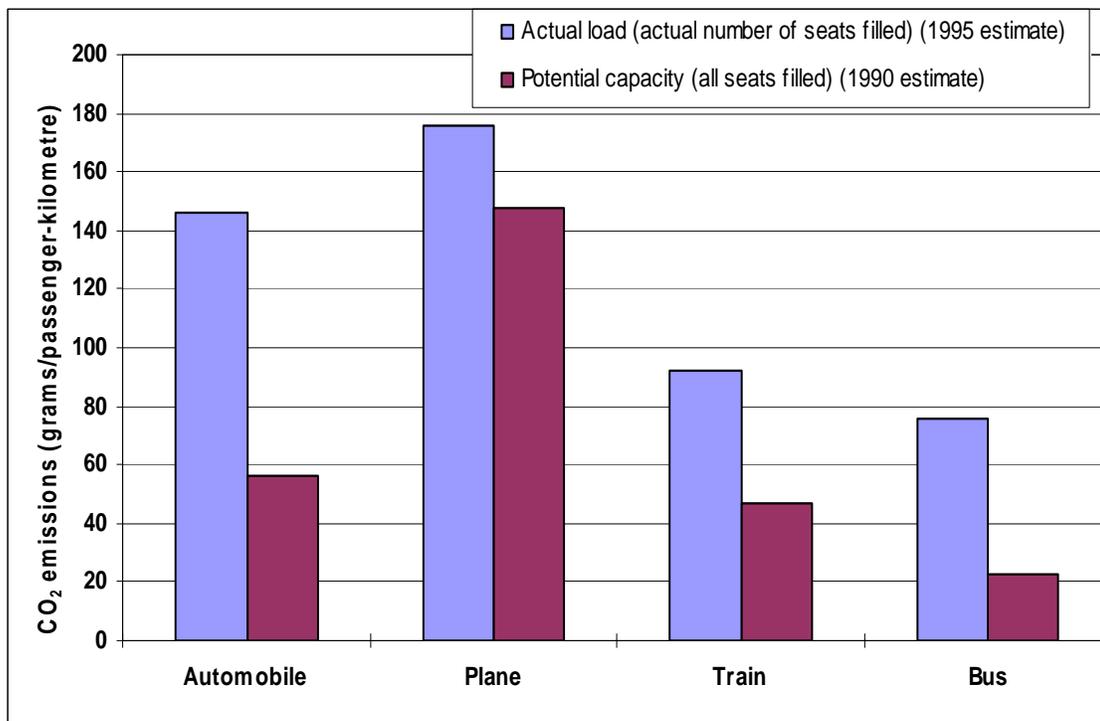
Households are not the greatest users of water and if the domestic cost of water is increased while retaining the high service charge and guaranteed allocation, this will be nothing more than a revenue raising exercise. The aim has to be to reduce overall water consumption. This means that control of all groundwater withdrawal is essential. A good place to start is to require local authority planning approval for bores, which has already begun in Western Australia, and a total sprinkler ban - not only for domestic customers but also for commercial and industrial users. For the domestic consumer, I believe a change in the method of charging is necessary. Return to a true “user pays” system that was so

successful in the 1970s – for example, supply the first 150 kilolitres free as a public health safeguard and bill for any water used in excess of that.

Turning to land use planning, I would argue that the advantages claimed for increasing development densities do not stand up to scrutiny and, rather than it being part of the solution, it is adding to the problem of global warming and climate change.

The argument that houses at higher density use less water than those at lower density has been debunked by Patrick Troy, who found demand management and increased summer rain has resulted in less water being used on gardens. Also, that there is greater correlation between water use and number of people per household, and water use and income. Research by Troy also found residents living at high density don't use their motor vehicles any less than residents living at lower densities, other things being equal.

Is public transport, particularly railways, really more energy efficient and less polluting than private vehicle use? The combustion of transport fuels creates about 13 per cent of all emissions and with cleaner engines on the way and the rise in popularity of smaller vehicles, this figure is declining. Over 50 per cent of emissions come from stationary energy sources, 35 per cent from generating electricity, mainly from coal-fired power stations. The State Government is still building coal-fired stations without greenhouse reduction measures – the 400MW Blue Waters plant now under construction at Collie and there are proposals for a further 400MW coal-fired plant at Eneabba. When no reduction in CO<sub>2</sub> emissions from clean coal technology is expected until 2020 at the earliest, does it make sense to shift private vehicle travelers onto electric railways that are reliant on energy generated from coal-fired power stations?



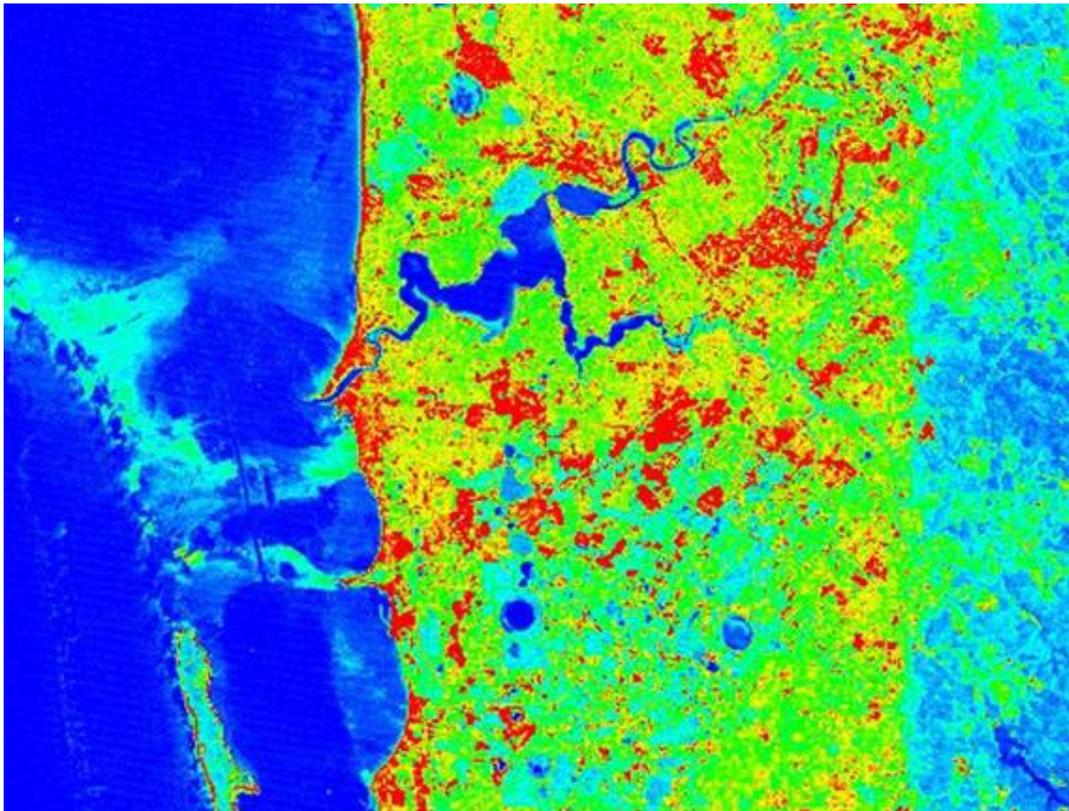
Source: Jaques, A.; F. Neitzert and P. Boileau. 1997. *Trends in Canada's Greenhouse Gas Emissions (1990-1995)*. Cat. no. En49-5/5-8E. Environment Canada

## Carbon Dioxide Emissions per Passenger Kilometre

I have found very little research on the relative efficiency of private vehicles vs. public transport and what there is, is inconclusive. Burning coal to make electricity to run electric motors in trains is less energy-efficient than burning fuel in an internal combustion engine directly, to drive cars. However, the key deterrent is the load factor. If public transport carries very few passengers on average, greenhouse emissions per passenger will be higher than driving a car.

The above graph illustrates Canadian data from the 1990s, when auto emissions are assumed to have been higher than occurring today in Perth because of larger engine sizes; train emissions are assumed to be much the same. It shows the reduction in emissions that can be achieved by car-pooling. The graph suggests there is likely to be little difference between auto and train emissions in Perth today.

The most damaging aspect of increasing development densities is the heat build-up that results – the urban heat island effect. By replacing open spaces and greenery with buildings and carparks of bricks, concrete and bitumen that retain heat, we are increasing temperatures and reducing rainfall. We make matters worse when we remove greenery to save on maintenance bills.



Perth Heat

If any proof is needed of the heat build-up from urban activities, look at infra-red aerial photography of the metropolitan area, where blue and green represent cool areas and red the hottest. Perth's hills and lower density riverside suburbs of South Perth, Applecross and Nedlands, with relatively large lots that are well vegetated, are heat sinks and five degrees or more cooler than other more heavily built-up parts of the city, like Fremantle, central Perth, Subiaco and the Osborne Park and Welshpool industrial areas.

Our low density suburbs are world-class and the best examples we have of how to live with nature and minimise heat build-up that contributes to climate change. The alternative, our present approach of increasing densities and temperatures, is further reducing rainfall and compounding the effects of climate change from other sources.

I believe planners have a responsibility to do something about matters within their control and they can address those factors that are contributing to the heat build-up and declining rainfall in our urban and rural areas – land clearing, the increasing building bulk and hard surfaces and the corresponding loss of vegetation, wetlands and open spaces that provide shade and moisture.



Traditional low density housing



Recent higher density housing

Thinning of trees in water catchments is not the way to go. What appears as a way of increasing run-off will result in rising watertables and salinity, as well as higher temperatures and less rainfall. With a more open tree canopy, the sun will increase ground temperatures and under-storey growth will be encouraged, producing greater fire risks. While there may be more run-off when it does rain, it will rain less often. In an attempt to obtain more water we will actually end up with less by thinning water catchments and adding to the global warming effect.

In already built-up areas we should actively resist rezonings that increase residential densities, the removal of mature trees, the selling off of parkland and the filling and draining of wetlands. Redevelopment authorities are doing more harm than good. We should be lowering allowable densities, not increasing them. We should see the bigger picture and recognize that higher density development reduces birdlife and biodiversity, is more dependant on air-conditioning, which requires greater energy output from power plants that further contributes to global warming and climate change.

We should be encouraging, even requiring, through planning instruments, more retention and enhancement of vegetation - roof-top gardens, preservation of existing trees, landscaped car parking areas and even grassed overflow car parking instead of bitumen eg. bays furthest removed at shopping centre car parks.



## Landscaped car parks

On the metropolitan fringe and in rural areas we should prevent wholesale land clearing and instead opt for low density development. As the rule rather than the exception, we should require tree planting and landscaping as a condition of subdivision and development approval. In this State we once asked for 50 per cent of every residential site to be landscaped. Something like this should be brought back and also applied to commercial and industrial development. Carparks have to be landscaped.

There are many flow-on climate change effects that we are now becoming aware of: crop failures, loss of plant and animal species; higher ocean acidity, which will attack coral and affect our tourist industry; rising sea levels that will increase coastal erosion and, when combined with less rainwater run-off, will lead to increased salt water intrusion; more extreme weather events, such as storm surges, cyclones and flash flooding, which increase pressure on sewage and drainage systems; increased peak summer energy demand for cooling; longer bush fire seasons; health effects that include more heat related deaths, increased respiratory and eye problems from more dust generated in parched landscapes and increased mosquito borne diseases.

In the fields of urban and regional planning the risks from global warming are high. As planners, what should be our response to climate change? What can we do locally, to tackle this global problem? Should we do what we can to assist the transition to changed climate regimes? Should we passively accept the inevitable and put our efforts into managing the risks— promoting energy efficient design to reduce emissions, ensuring infrastructure resilience, prohibiting development in high risk areas such as adjoining the coast? While I believe there is a role for adaptive responses, I also believe that we, as planners, have a responsibility to be more pro-active in a broader range of issues, including water resource management and pricing.

Land use planners have to be more involved with water planning. Water planning should inform and integrate with, land use planning. It not only provides an important natural resource management context for land planning, but identifies resource opportunities, constraints and incompatible land use activities.

It is our duty to enlighten others that there is more to global warming and climate change than emissions from fossil fuels. Above all, planners need to stimulate local debate about urban form and question the accepted but misguided practice of increasing urban densities to boost public transport patronage. I believe one of the most important contributions planners can make is to decrease our development densities and promote landscaping to cool our planet, to counter global warming and climate change.

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