THE GREENS.

the perth light rail network
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1 Light rail – the time has come!

This document sketches a vision for the future of Perth as we move into an era where climate change, petrol prices and traffic congestion demand that we rethink the way our city works.

Perth can prosper in a carbon-light future if we make decisions now to shock-proof ourselves against the challenges of the 21st century, and a rapid, electrified mass transit system must be a part of this vision.

Light rail is a form of urban rail public transport, essentially a modern tram system, using electric railcars large enough to accommodate up to 60 people as well as wheelchairs and bicycles. Light rail infrastructure has a low impact on the urban environment, with rails unobtrusively laid along existing roadways or road reserves and stops along median strips.

Dublin, Ireland
A network for everyone - not just the inner suburbs

The Greens want people in the outer suburbs to have equal access to fast, efficient and safe mass transit as those living in wealthy inner suburbs.

Information about this proposal was mailed to 180,000 households in outer metropolitan Perth in September 2008 seeking feedback. That has been combined with further research and evaluation to produce this third edition which proposes light rail as an integrated facet of an overall upgrade to Perth’s public passenger transport network including well coordinated bus services, cycling infrastructure and changes to land use planning.

We are interested in your views on this vision for Perth’s public transport network – a model that integrates a clean, quick and efficient light rail system connecting the major rail lines and provides the whole city with a comprehensive and convenient public transport network.
Sustainable cities

Much of the debate around sustainability focuses on threats: rising sea levels, climate change, wars over depleting resources such as oil and significant population increases.

In truth, sustainability is also about opportunity and hope, and ways of making our communities better places to live.

Planning world-class public transport for our communities will have important payoffs for greenhouse targets and reducing our dependence on imported oil.

But the more immediate payoff will come in improvements to quality of life: less time stuck in traffic, more liveable neighbourhoods and stronger local economies.

It has been argued that public transport works best in high population centres where a critical mass of people are an easy walk or cycle from transfer stations. It helps create more vibrant local communities with areas of medium to high density dwellings, diverse and affordable housing opportunities and more public open space and parks.

Creating bustling neighbourhoods that combine residential, commercial and retail uses will generate local employment, services and social and economic opportunities for residents. Pedestrian-friendly streetscapes with safe bicycle infrastructure and a reduced emphasis on cars will improve safety and social interaction and compliment clean, frequent, safe and fast public transport links between districts.

Planners are now revisiting the idea of urban village archipelagos, networks of medium and high density human-scale settlements linked with safe, fast, frequent public transport.
Perth has a few examples of these kinds of development, but without further action, we still risk stranding tens of thousands of families on the urban fringe far from centres of employment and services. As we consider rolling out public transport infrastructure such as the combined light rail / bus transit model outlined in this report, we urgently need to reform our planning priorities as well.

Post war sub-urban development has left Perth with many square kilometres of housing with average densities between 12 - 20 dwellings per hectare, far from services and employment centres. In areas such as this where ‘urban village’ densification schemes are likely to be unpopular, impractical or would come far too late, we need to rethink the way bus services are routed and timetabled. Experience in low density cities in North America and Europe show that huge increases in public transport patronage are possible with more frequent, direct bus services and well coordinated network planning allowing easier ‘anywhere to anywhere’ access. Improving feeder networks in this way can dramatically improve the economics of trunk light rail or heavy rail routes and allows them to cross-subsidise less profitable bus services.

Around the world, public transport is making a comeback: on drawing boards, in government planning authorities, and in our neighbourhoods.

With light rail projects expanding in Melbourne, the Gold Coast, Sydney and Adelaide, and the proposition of substantial Commonwealth Government public transport funding for the first time in a decade, we are on the edge of an urban tipping point. If it is good enough for those cities, why not Perth?

As you consider this document, be mindful that this is more than an infrastructure proposal: it is an invitation for Perth to take the next step toward a more liveable, socially inclusive and sustainable community.
Why should we invest in public transport?

In 2008/09 the total number of passengers boarding public transport vehicles in Perth increased by 18.4 per cent to 128.784 million, up from 108.794 million in 2007/08.

As fuel costs inevitably rise and congestion worsens, that number will increase. In a survey conducted by the RAC, Perth public transport users cited the following as the top reasons and benefits of using public transport (multiple answers were allowed):

- Lower cost than driving (54%)
- Less stress by avoiding traffic (35%)
- Environmental benefits (29%)
- No need to find parking (23%)
- Faster than driving (13%)
- Easy to use/reliable/convenient (11%)

Decades of North-American style urban planning has left Perth as one of the most car-dependent cities in the world. While cheap oil prices have masked the greater health, pollution, carbon and community costs of private automobile dependence, all of this is set to change. With planning and foresight, we can build on existing transport assets to create a world class integrated system serving the whole city.

In 2009, the Australian Senate’s Rural and Regional Affairs and Transport Committee undertook an inquiry into public transport. This provided an important snapshot of the current state of service provision and the surge in patronage that has occurred over the past few years:

“In total in the eight capital cities public transport trips increased by 14.7 percent from 2004 to 2008, and the public transport mode share increased from 9.3 percent to 10.6 per cent. These growth rates have been well above population growth.”

Bilbao, Spain

1 Public Transport Authority Annual Report 2008/09
2 “Attitudes and Opinions to Public Transport” RAC, May 2008
3 “Rural and Regional Affairs and Transport References Committee: "Investment of Commonwealth and State funds in public passenger transport infrastructure and services" August 2009
Health benefits of public transport

People in Perth travel an average of 573m to the beginning of their public transport journey\(^4\), leading to a more physically active and healthy society. A reduction in pollution will also benefit community health: the Bureau of Transport and Regional Economics estimates the cost of the health effects of motor vehicle pollution was $2.6 billion in the year 2000\(^5\). The cost of road traffic injury and death in 2003 was estimated at $17 billion, with Western Australia contributing $2 billion to this national figure\(^6\).

Reduced traffic congestion

Public transport takes a portion of private vehicles off the road. The cost of traffic congestion in Australian cities has been estimated by the Bureau of Transport and Regional Economics to be $12.8 billion per year\(^7\). These estimates calculate the value of lost time spent in traffic and give some idea of how economically inefficient car dependence has become.

Reduction in greenhouse gas emissions

Travel for work, shopping, personal business and recreation is estimated to be responsible for 34% of household greenhouse gas emissions\(^8\) and therefore increased public transport use can make a significant cut to an individual’s carbon footprint. On average 210 grams of carbon are emitted per passenger kilometre using a private vehicle, while only 60 grams of carbon are emitted from each passenger kilometre using rail transport\(^9\).

Improved public transport network planning can raise patronage on all routes, improving the economics and greenhouse footprint of public transport modes.

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4 “Attitudes and Opinions to Public Transport” RAC, May 2008
7 Australia’s Future Oil Supply and Alternative Transport Fuels, 2007
8 Australian Greenhouse Office, 2007, Global Warming: Cool It, Department of the Environment, Water, Heritage and the Arts
9 The Ecologist July/August 2008
Tourism

Many tourists use public transport as their preferred way of exploring a city. A good public transport system can itself become an attraction, such as Melbourne’s tram network.

Enhancing social inclusion

Public transport is most important to those people who have no alternative means of transport; this is particularly the case among youth, the elderly and people with a disability. Access to public transport is also particularly important to those in outlying areas who have to drive further and therefore pay a greater proportion of their income on fuel. This is addressed further in Section Three.

Oil vulnerability

Perth is facing two fossil fuel crises: coming oil price shocks as world markets finally acknowledge the reality of peak oil, and the unthinkable possibility of runaway climate change.

Both these challenges will impact heavily on how we travel to work, to school, and social activity. The extraordinary spike in petrol prices in 2008 will inevitably return, but almost nothing has been done at a State or Federal level to shockproof the community against oil vulnerability. Public transport systems – particularly if electrified – can play an integral role in protecting people from oil price shocks.
Could this be the future of Perth’s public transport?
The impact of rising transport costs varies according to where people live, with both petrol prices and public transport availability varying widely across the state. A strong case can be made for prioritising public transport funding in regional and outer metropolitan areas to combat public transport shortcomings in these areas.

In their 2008 study “Unsettling Suburbia: The New Landscape of Oil and Mortgage Vulnerability in Australian Cities”, Jago Dodson and Neil Sipe map the changing patterns of transport and mortgage vulnerability in major Australian cities between the census periods 2001 - 2006.

The map at right clearly demonstrates regional patterns of vulnerability, with outer metropolitan areas in the ‘growth corridors’ suffering a high degree of vulnerability both to rising oil prices and interest rates.

It is no coincidence that higher income groups tend to be located in the inner urban areas with the highest provision of public transport. At the fringes of our cities, lower income residents are more likely to be located in areas with poor public transport and a deficit of employment prospects and other services.

In Sydney for example, people living in the inner eastern suburbs use a car for approximately 48.7% of all trips and travel on average 10.1km per day, while those living in outer western suburbs use private transport for 79.7% of all trips, travelling on average 33.3km each day.10

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...outer metropolitan areas suffer a high degree of vulnerability both to rising oil prices and interest rates....
4 Deficiencies in the existing network

The WA Public Transport Authority states that 78.3% of Perth has an acceptable service level, described as the proportion of street addresses in the Perth Public Transport Area that are within walking distance (500m) of a Transperth bus stop or train station and have at least a 20 minute peak service frequency at the stop/station\(^1\). Still, more than two thirds of the Perth metro region commuter population travels to work by car or truck with only 9% of the commuting population using public transport\(^2\).

A Spatial Network Analysis of Modal Transport Systems was undertaken by Dr. Jan Scheurer and Prof. Carey Curtis\(^3\) found significant deficits in Perth’s public transport network (as shown in the map opposite). A clear correlation exists between this and the previous “VAMPIRE map”, showing that the areas most vulnerable areas to oil and mortgage stress also have public transport services that are considered below a ‘poor’ standard.

Overcrowding on trains and insufficient parking at stations are among the most common complaints from Perth commuters, despite recent improvements to station Park ‘n’ Ride facilities. Over 11,000 parking bays are provided on the Joondalup and Mandurah lines.

While further enhancements of Perth’s park ‘n’ ride facilities are being considered and are likely to stimulate increased train ridership, they will do so on the back of continued reliance on private vehicle use. What needs to be addressed is the perceived and real inadequacies of feeder networks. A light rail network would go some way towards doing this; a rethink of bus route connectivity and frequency rounds out the picture.

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11 Public Transport Authority Annual Report 2008/09

The West Australian, April 2009
more than two thirds of the Perth metro region commuter population travels to work by car or truck...
Perth commuters were once served by a vibrant tram network, established in the 1890s\(^{14}\). The 1920s and 1930s were the heyday of Perth as a “transit city”, with trams carrying in excess of six million passengers a year by 1930\(^{15}\).

The image below shows a Perth Tram in Barrack St, southbound for the Esplanade, in 1899.

The city still carries the imprints of its transit origins, with the evolution of the early city following the laying of the tramline. The spatial layout of vibrant medium density commercial zones north of the city align perfectly with the long-vanished tracks.

\[\text{Barrack St, Perth - looking south towards the river, 1899}\]

...the 1920s and 1930s were the heyday of Perth as a “transit city”, with 68 trams carrying in excess of 35 million passengers by 1933...

\[\text{Commercial Land Use Survey data for North Perth in 1997 with the former tram route overlayed}\]

which once laced central Perth together with Northbridge, Mt Lawley, Leederville, Mt Hawthorn and Inglewood. This ‘urban village archipelago’ is still a viable development option for the 21st century, if we return public transport to its central role in land use planning.

In the wake of the Second World War, the advent of cheap oil and post-war wealth saw the piecemeal abandonment of the tram and trolley-bus network in favour of a new freeway system mandated under the “Stephenson-Hepburn Plan” of 1955 and consolidated as the Metropolitan Region Scheme in 1963.

The last tram ran in 1958. The private automobile has ruled the city ever since and 100 kilometres of low-density, car-dependent coastal sprawl has been the direct consequence.
Light rail in modern cities

Light rail is a form of urban rail public transport, essentially a modern tram system using electric railcars large enough to accommodate up to 60 people as well as wheelchairs and bicycles. Light rail infrastructure generally has less impact on the urban environment than traditional heavy rail systems, with rails unobtrusively laid along existing roadways or road reserves, and stops along median strips.

Melbourne is the only Australian city that retained its light rail network, with 245km of track, 500 trams and 1813 tram stops.

Globally, light rail has been introduced to more than 100 international cities in the past decade, making a spectacular comeback in the United States, East Asia and Europe.

This proposal features light rail as its centrepiece due to the extensive and varied benefits of light rail as a preferred transport mode, which include:

- Cities that use light rail have:
  - 41% lower energy use per passenger/km than bus cities;
  - 18% lower automobile passenger kilometres per capita;
  - 23% lower transport emissions per capita;
  - 38% fewer transport deaths;
- Light rail can draw on any electrical energy source including renewable energy and regenerative energy from braking, transferring a large fraction of the transport task away from liquid fuels;
- Evidence has shown that rail, including light rail, attracts greater patronage than buses (including bus rapid transit);17
- Although the initial financial outlay is higher for light rail, the operating costs are lower than for a bus network;
- The introduction of light rail has been used as part of urban renewal schemes, improving property values and stimulating economic activity to create new urban hubs;
- Light rail is more comfortable and has higher passenger capacity than buses;
- People, including infrequent public transport users, feel confident about the service when they can see where it goes and feel confident that something will come;
- Light rail integrates well into pedestrian areas, e.g. Bourke Street Mall in Melbourne;

17 http://www.lightrailnow.org/facts/fa_brt_2006-08a.htm
• Potential exists for dual-current vehicles, such as those used in Karlsruhe or Saarbrucken in Germany, which can run on light and heavy rail routes;

• Currently in development in Japan are Dualmode Vehicles that can switch between roadways and rail tracks in a matter of seconds18. This will mean that diversions can be made without the infrastructure traditionally associated with rail, e.g. diverting to a nearby school in the morning and afternoon.

• Other recent systems incorporate a combination of induction rail, contactless power system and high capacity lithium ion batteries for propulsion, removing the need to hang overhead cable along light rail corridors.


...cities that use light rail have 38% fewer transport deaths...

Melbourne, Australia
An integrated light rail network as proposed in this report would be incorporated into the existing network of public transport services, providing services on major feeder routes where the level of demand sits between the capacities of heavy rail and bus routes.

“Li-Ion battery-based light rail (LRT) has a Contactless Power Supply (CPS) in the ground at each station that powers it up. These stations can be green icons with renewable energy powering the CPS directly. It is inherently cheaper than the Bordeaux LRT (no catenary) which has CPS all along its track but is very successful as it brought light rail to an historic area without the overhead wires. It can travel at over 70kph and carry 120 people so it’s much better than a bus and can be renewably powered. It combines all the smartness of plug-in electric vehicles and the sustainability of public transport,”

Professor Peter Newman, Curtin University.
Ultra Light Rail

Ultra Light Rail (ULR) claims many of the benefits of light rail at a lower cost and represents another option for flexibly meeting the wide range of needs in an expanded integrated public transport network.

ULR focuses on improved vehicle efficiency and features greatly reduced energy consumption and appropriately sized cabins to economically meet a range of ridership demands.  

ULR lowers infrastructure costs, can run on clean fuels, is easily upgradeable and provides the option to remove light rail electrification infrastructure completely, as it can be powered by an onboard energy supply, via contact rail at stops or by a traditional wired system.

20 http://www.ultralightrail.com
The Perth Light Rail Network

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Getting the transport mix right: Light rail in context

Several decades of effective transport advocacy has left Perth with nearly 190km of heavy rail network, with the Perth-Mandurah rail line adding the final 88km in December 2007. A fleet of diesel and natural gas buses and a handful of ferry services make up the balance of our public transport.

Despite this, it is still virtually impossible to live in the outer metropolitan suburbs without a car, as the oil vulnerability maps show. Even when the proposed light rail network becomes a reality, it will still be beyond walking distance of many people – there is a need to integrate it carefully with existing heavy rail services, cycling and pedestrian initiatives, and to take a new look at how our bus system operates.

Ultimately, the aim is to create a completely integrated system with coordinated network planning and timetabling, seamless ticketing between modes and an emphasis on pedestrianised, human-scale land use planning and to eliminate the necessity for many trips altogether.

Average passenger capacity ranges:

Freeway = 1,800 - 9,000 people per hour
Bus Rapid Transit = 8,000 - 25,000 people p/hr\textsuperscript{21}
Light Rail = 10,000 - 28,000 people p/hr\textsuperscript{22}
Heavy Rail = 18,000 - 54,000 people p/hr\textsuperscript{23}

Light rail has been introduced to more than 100 international cities in the past decade, making a spectacular comeback in the United States, East Asia and Europe.

\textsuperscript{21} Transit Cooperative Research Program Report 13: Rail Transit Capacity, 1996
\textsuperscript{23} Transit Cooperative Research Program Report 13: Rail Transit Capacity, 1996
The Perth bus system

Perth has a well coordinated and widely available bus network, linking 12,853 bus stops with more than 1100 buses. The services are operated by three private companies contracted with the WA Public Transport Authority under the overarching ‘Transperth’ brand.

While there is evidence that people prefer high quality electric rail services to buses, there is still a threefold role for buses:

• To fulfil the line-haul function of a rail line prior to the line being built, and to assist in designing future rail links by trialling different routes and timetables prior to the construction of the rail.
• To work in concert with rail timetables to distribute people to and from rail hubs, particularly in a low density city such as Perth.
• As a local service in areas of lower demand or where there seems little likelihood of a light rail service. In this instance we would include a frequent low cost service linking areas such as Ellenbrook, Kalamunda, Roleystone, Mundaring and other peri-urban suburbs.

Expanding bus capacity can also occur much more rapidly than the deployment of a light rail network. It is important that in the short term, the State Government prioritise enhanced bus services and cycleways to outer metropolitan areas to offset oil vulnerability while the light rail proposal moves toward implementation.

As Paul Mees notes in ‘Transport for Suburbia - Beyond the Automobile Age (2010), low density should not be used as an excuse for neglecting public transport provision in outer metropolitan or peri-urban areas. Overseas examples including Toronto, Zurich and Vancouver vividly demonstrate the power of public transport network planning, incorporating more direct bus routes and greatly increased frequency or pulse timetabling to dramatically increase public transport patronage.
Bus Rapid Transit (BRT)

BRT can play an important role in Perth’s expanded integrated public transport network. BRT is a roadway based rapid transit system that offers a high capacity transport service in dedicated right of way lanes using sleek modern vehicles, very similar to light rail vehicles. BRT can also be used to trial a potential light rail route as the BRT infrastructure can be converted to a permanent light rail infrastructure in due course, as is the intention in Brisbane BRT network.

Rapid or high frequency bus services are already operating down dedicated lanes in Perth’s northern suburbs and south of Fremantle, providing a useful transition model for identifying future light rail corridors.

CAT bus services

The highly successful Perth CAT (Central Area Transit) initiative came about through the Commonwealth ‘Better Cities’ programme that ran from 1991-1997 - the last time the Australian Government played an active role in funding urban public transport. It has been complemented by similar services in Fremantle and Joondalup. Services consist of high frequency shuttle buses serving the commercial centres. Expanded CAT services operating around major transit oriented development nodes will help people get to rail stations and provide an easy alternative to driving to park and ride stations.

Walking and cycling

In Australia it is estimated that 50% of all car trips made are less than 5km. This is a distance that could easily be taken by a bicycle. Cycling is the fourth most popular physical activity in Australia and participation grew every year from 2001 to 2006. While the 1985 Perth Bikeplan and 1996 Perth Bicycle Network Plan were progressive policies in their time, Bikewest and the cycling section in Main Roads have been in decline in recent years and the new cycle infrastructure promised is now long overdue. It is essential that more emphasis be put on investment in cycleways and bike shelters at bus and train stations.

Light rail vehicles can be designed to carry bicycles without affecting passenger capacity, on hooks in the front of the vehicle such as those used on buses in San Jose, California (pictured opposite) and on some services in Canberra, enabling passengers to incorporate cycling into their commute at both ends of their journey.

Adequate, safe pedestrian connections between major places of interest and public transport nodes are necessary, ending the practice of surrounding commercial centres with acres of car parking. The absence of footpaths in new residential developments must be corrected, as this has only further increased the dependence and dominance of cars.

The Greens are strongly supportive of urban planning policies that encourage and safely facilitate walking and cycling, and support the extension of the State Government’s TravelSmart program which encourages sustainable transport choices.

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25 The Australian “Transport Planners Ignore Light Rail” 13 January 2009
27 Cyclists’ Action Group, June 2009
Santa Cruz, California
Density and land use planning are vital in the success of any public transport system, particularly light rail.

The conventional wisdom is that low-density sprawl cities such as Perth are not well suited to light rail systems—the housing densities are so low that even with an extensive system such as the one proposed, most people will still not be within an easy walk of a station. Yet light rail works well when it connects medium and high density mixed use urban villages, which are starting to take shape around the Perth metropolitan area.

Perth’s population is expected to increase by 116% over the next 50 years, increasing from 1.6 million people at 30 June 2007 to 3.4 million in 2056. This means that 651,078 new homes will need to be built and the entire infrastructure of the city will have to double in extent. These projections are contested and a variety of factors may see them realised, but there is little doubt that the city is set for growth in the medium term. How we plan for this will shape the city and will need to include public transport infrastructure.

As the future costs of car-based urban planning become increasingly apparent, there is a growing move towards re-orienting Perth as a ‘transit city’ with medium and high-density ‘transit-oriented developments’ (TODs) clustered around public transport nodes. The logic of a post fossil-fuel society favours the re-establishment of Perth’s light rail network to meet the needs of the city’s burgeoning population.

Perth is still at an early stage in its evolution toward a transit city: European and Asian cities with a head-start of several decades provide striking examples of how rail recoups its costs over time while moving people more efficiently than buses or private automobiles.

Stockholm is one example of a city designed around a combination of heavy and light rail, whereby semi-self contained communities cluster around transit stations, tapering from high density to low with increasing distance from the stations. The benefits of increased land values around stations, improved community values and neighbourhood amenity, decreased reliance on imported oil, improved health benefits and lower air pollution, are well-documented and substantial.

As noted previously, density arguments should not be used to deflect the wisdom of improved network planning and increased service frequency into suburban areas which can not be realistically recast as medium density urban villages.

East Perth, Western Australia
Planning for the future of metropolitan Perth

The Western Australian Planning Commission (WAPC) has released the Draft Spatial Framework for Perth and Peel “Directions 2031” as part of the planning for future growth in metropolitan Perth over the next 25 years\(^1\).

Citing the creation of more sustainable and liveable cities as a priority, the Plan aims to “connect communities with jobs and services”, to “improve the efficiency and effectiveness of public transport network” and encourage a shift to more sustainable options\(^2\). The focus of development is centred on the existing rail network, with possible expansion to include cross connections. The WAPC has indicated that light rail is likely to be a component, potentially replacing the Central Area Transit (CAT) buses at least.

A number of urban centres have been identified as strategic centres for growth and development under the Directions 2031 plan: Armadale; Cannington; Fremantle; Mandurah; Midland; Morley; Stirling, and Yanchep; in addition to the specialised strategic centres of Murdoch; Curtin, UWA / QEII and the Perth Airport.

Notably, these areas are within the existing urban footprint, and many along a spine of the existing rail network. This is positive as it is likely to result in densification of existing urban areas rather than further urban sprawl as would have occurred, had the new centres been positioned at the end of the rail line as often presumed. This lends itself well to the future introduction of light rail in Perth.

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\(^1\) "Directions 2031” WAPC June 2009
\(^2\) "Directions 2031” WAPC June 2009: 25, 26
New Transit Oriented Developments for Perth

The Murdoch Activity Centre:

The State Government released the Murdoch Activity Centre Structure Plan in June 2007. The plan identifies a mixed-use residential and commercial precinct adjacent to the Murdoch rail station and the South Street bus interchange and the establishment of several major health, education and commercial facilities\(^{33}\) expected to create up to 35,000 new jobs\(^{34}\) in the immediate vicinity.

The Cockburn Coast District:

The revitalisation of a section of former industrial land has been designed with transit oriented development principles in mind through the clustering of activity around a central public transport spine, with bus rapid transit proposed to service the area in the short to medium term; as well as initiatives relating to energy efficiency, water sensitive urban design, affordable housing and employment self sufficiency\(^{35}\).

Stirling City Centre:

The Stirling City Centre will prioritise walking, cycling and public transport modes over private vehicle use and aims to have 12,500 dwellings, 30,000 jobs, 25,000 residents, 30% affordable housing, within 800m of the Stirling train station\(^{36}\). The Stirling example represents a best practice model of cross-agency collaboration, community consultation and sustainability principles incorporated at the foundation planning level.

Canning Bridge Precinct

Intended to “evolve to become a unique, vibrant, creative community centred on the integrated transport node of the Canning Bridge rail station”\(^{37}\), this precinct will eventually include an integrated mix of office, retail, residential, recreational and cultural uses and hopes to create a pedestrian friendly enclave that will integrate with public transport networks.

Transit Oriented Developments have become a popular and necessary urban design initiative that a number of local government authorities are undertaking in their area, such as the revitalisation of Maddington-Kenwick.

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\(^{33}\) [http://www.planning.wa.gov.au/Plans+and+policies/Metropolitan+planning/Murdoch+Activity+Centre/default.aspx](http://www.planning.wa.gov.au/Plans+and+policies/Metropolitan+planning/Murdoch+Activity+Centre/default.aspx)

\(^{34}\) City of Melville, correspondence 31 March 2010

\(^{35}\) [http://www.planning.wa.gov.au/Plans+and+policies/Metropolitan+planning/Cockburn+Coast/default.aspx](http://www.planning.wa.gov.au/Plans+and+policies/Metropolitan+planning/Cockburn+Coast/default.aspx)

\(^{36}\) Stirling City Centre Structure Plan Framework: October 2008: Hassell

\(^{37}\) Draft Canning Bridge Precinct Plan, WAPC February 2010
Placemaking attributes of light rail

Light rail can catalyse vibrant ‘corridor’ development, as any visitor to Melbourne knows. Case studies demonstrate that with complimentary zoning and streetscape enhancements, the introduction of light rail can stimulate economic activity and development in an area along the transport route.

In Portland, Oregon for example, the initial 10km light rail route went from being fairly subdued urban streets and underutilized former industrial lands to a vibrant hub providing local employment and activity once its modern tram system was built. Between 1997 and 2008, development adjacent to the tram line increased dramatically. The US$55 million dollar investment in the tram has spark investment within two blocks of the line. This represents over 10,200 new residential units and 5.4 million square feet of additional commercial space. The Pearl District, located along the tram route, is one of America’s most successful urban redevelopment projects.

Economic and community-enhancing flow-on effects from the addition of light rail to a city’s transportation mix are both inherent and a product of design. Light rail is a flexible, attractive and clean transportation option with routing certainty provided by easily observable rails and platforms. Business, developer and passenger certainty in light rail routes, combined with street-level activation, has been shown to substantially enhance property values around stations.

“Developers in Australia can usually add a premium of 15 to 20% on the value of land adjacent to train stations. In Perth this appears to be even higher in places like Subiaco which has been transformed into a highly attractive urban centre since the electric rail was introduced in the early 90s.”

Professor Peter Newman, Curtin University.

38 Community Building Sourcebook - Land use and transportation initiatives in Portland, Oregon, December 2007
Years after implementation, stations can continue to have a positive impact on local economies. This has been seen in Amsterdam where it is now a requirement for major employers to locate new facilities near public transport facilities\textsuperscript{40}.

Light rail is a high quality option for integrating urban transportation system modes and expanding passenger opportunities to combine work, shopping, dining and relaxing into a single enjoyable journey\textsuperscript{41}.

\textsuperscript{40} Walljasper, Jay. 2006. How to fall in love with your hometown. Technology in Society 28 (1-2):81-93.
The track layouts shown in this document are indicative only, being possible ways of connecting transit oriented developments with each other, and with existing public transport nodes. It presupposes a reorientation of the bus feeder network, displacing some routes and requiring the realignment of timetables and route planning.

The proposed layout of the Greater Perth Light Rail Network focuses on delivering high quality service to areas of Perth in dire need of accessible public transport, especially to areas of high automobile dependence and areas of concentrated low incomes, health care and disability access issues, and housing affordability. The proposed network would supplement the existing heavy rail network with spur and loop lines to population centres adjacent to stations. The building of the Perth to Mandurah line brought attention to the ‘park and ride stations’ which destroyed valuable urban bushland and are already over capacity; the light rail feeder lines will make it easier for many people to get to connecting rail services without driving at all.

Phased introduction of light rail routes can work in concert with the introduction of more direct high frequency bus services across the whole network, establishing routes and priority lanes that can be progressively converted to light rail as budgets permit.

In August 2008, Greens Senator Scott Ludlam mailed a leaflet outlining the proposed light rail network for Perth to 180,000 households, primarily in outer metropolitan areas. The feedback received from the community was overwhelmingly supportive.

Specific feedback on the route highlighted Perth residents’ desire for easier, faster travel between suburbs through cross-city light rail routes.

Common themes were the need for links to or between major shopping centres, universities and TAFEs, hospitals and major medical facilities, recreation facilities, beaches and even national parks. Other issues raised were sufficient frequency of services, provision of adequate shelters, ability for elderly, people with prams, bicycles or a disability to be able to access the vehicles, and assurance that the system would be easy and cheap to use.

The Greens propose that further public participation be undertaken to establish the actual rail layout and the order of priority, through deliberative processes as described in Section Fifteen.
These maps suggest a possible order of priority for the phased roll out which could occur over 10 to 15 years.

Phase 1 on this page incorporates proposals in development by the Stirling Alliance, City of Fremantle, Alexander Drive corridor study and Professor Peter Newman’s ‘Knowledge Arc’ proposal.
phase three
Amsterdam, Holland
The 2007 Department of Planning and Infrastructure’s Light Rail Study

Released in August 2007, this feasibility study for light rail between Subiaco and East Perth[^42], while on a smaller scale than that described in this report, provides valuable information on how a larger system could operate.

The study estimates that infrastructure costs would be around $252 million, rolling stock costs $140 million and annual operating costs $10 million. These estimates include indicative costs for land acquisition for two depot sites and a 10 percent provision for urban design and place-making initiatives to ensure the successful integration of light rail infrastructure into the surrounding streetscape. Notably, if weekday passengers were only charged a $1 flat fee per trip, annual revenues from the anticipated 45,000 journeys each average weekday would more than cover the operating costs of the system.

However, the key critique of these studies is that it continues the focus on areas already best served by public transport: the wealthy inner suburbs and the CBD. There is no doubt that the patronage would be high and the system would be instantly popular, but the plan will leave Perth’s most vulnerable residents exactly where they are now – stranded.

The Knowledge Arc

A business case study for a light rail route that stretches from Curtin University through Victoria Park, East Perth, the Perth CBD and on to Sir Charles Gardiner Hospital and UWA was published in May 2010[^43].

The proposal has been developed collaboratively with local government and the institutions connected by the system, and triggered an increase in public interest in light rail.

The intention is that these light rail links would become the core of a new light rail network for central Perth, which in future could branch out across the inner metropolitan area. To offset the tendency of transport planners to improve services in high-income inner city neighbourhoods while abandoning outer suburban areas to housing and transport vulnerability, the State Government must begin a process of broad consultation to establish the framework of an integrated city-wide public transport system available to all regardless of income.

Network City Activity Centres, Perth. June 2009

44 “Network City Activity Centres Developing an analysis, conception and communication tool for integrated land-use and transport planning in the Perth metropolitan area”
Prof Curtis & Dr Scheurer, June 2009
Another study was recently conducted by Dr Jan Scheurer and Dr Carey Curtis from Curtin University for the Department of Planning and Infrastructure, looking at similar issues and routes to those identified in this report. They have investigated a number of different potential models for upgrading Perth’s public transport - with the most effective being the ‘composite wishbone’ scenario shown opposite.

A number of local government authorities in Perth are also considering light rail for their area. While some are no more than an idea, projects are currently being discussed for Fremantle, Cockburn, Stirling and Rockingham.

Local authorities can help marshal local knowledge which will be essential in creating a final track layout sensitive to community needs. However, without overarching coordination by state and federal planning authorities, these proposals are piecemeal and unlikely to cohere.

The fact that so many projects and studies are being conducted sends a clear signal that light rail is firmly on the agenda.

Leadership is required from state planning authorities, both to assess and aggregate the proposals from local governments and local communities, and also to accelerate the process of developing transit-oriented developments at key sites around the metropolitan area.
The costs of building light rail are highly sensitive to the degree of tunnelling, elevated sections, shared rights-of-way and so on. The figure below shows the variability in capital costs (including both infrastructure and rolling stock), measured as AU$ million per kilometre of track, for 37 completed light rail projects in the US, Canada and UK. Projects with extensive tunnelling, such as the London Docklands extensions and Buffalo’s Metro Rail, run to the high end of the spectrum. A large rolling stock is also a factor in busy cities such as London. Perth’s outer suburbs are well suited to light rail systems that share roadways, with wide avenues and extensive median strips available. Therefore in these areas it is reasonable to expect that costs would run to the low end of the spectrum, below the average of AU$29 million per kilometre.

Light Rail Capital Costs
Comparison of Cities in the US, Canada and UK

Data Sources:
• The Urban Transportation Monitor, May 16, 2008
• Rapid Transit Monitor 2006, Volume 1: UK Light Rail Systems, TAS Publications

Conversion to Australian Dollars was based on exchange rates of 0.9, 0.8 and 0.5 for Canadian, $US and EUK respectively.
The DPI study of 2007\textsuperscript{45} estimated an infrastructure cost of $17 million per track kilometre for the 14.3km line between Subiaco and East Perth, including two maintenance depots, 25 stops and two small electricity substations, running through some of Perth’s most expensive medium and high density real estate. Transport infrastructure company Bombardier have backed this calculation, estimating that the cost of building light rail infrastructure in Perth would be between AU$12- $17 million per km (or up to $20 million in complicated situations), based on their work in Melbourne and Queensland. Rolling stock (31 carriages at $4.5 million each) takes the total capital cost for the DPI proposal to about $27 million per km.

In June 2009, the City of Stirling was provided with advice that light rail options along the proposed Stephenson Boulevard alignment would have capital costs in the order of $15-20 million per km\textsuperscript{46}. Most of this cost is for rolling stock (estimated at $4 million per tram), due to the short length of the proposed route. However, these figures are only “concept level” with an accuracy of +/- 50%.

\textsuperscript{45} http://www.dpi.wa.gov.au/cityregionalplanning/15642.asp
\textsuperscript{46} http://www.bombardier.com/en/transportation

Brussels, Belgium
The Perth Light Rail Network

Perth light rail: estimated capital cost

The proposed Greater Perth Light Rail Network could be expected to have some economies of scale relative to the DPI study, from bulk purchasing, integrated design and engineering work, a greater distance between stops in lower density areas and lower costs of land acquisition. Based on these considerations, phases 1-3 of the proposed Greater Perth Light Rail Network is estimated to cost:

<table>
<thead>
<tr>
<th>Phase</th>
<th>Track (km)</th>
<th>Track ($15m/km)</th>
<th>Operating ($0.6m per km)</th>
<th>Rolling stock ($4m ea)</th>
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<tr>
<td>1</td>
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<td>$882 m</td>
<td>$35.28 m</td>
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<tr>
<td>2</td>
<td>138.4 km</td>
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<td>$82.72 m</td>
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<tr>
<td>3</td>
<td>166.5 km</td>
<td>$2497.5 m</td>
<td>$99.9 m</td>
<td>$640 m</td>
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<tr>
<td>Total</td>
<td>363.7 km</td>
<td>$5455.5 m</td>
<td>$217.9 m</td>
<td>$1440 m</td>
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</table>

For the purposes of this study, build-out of phases 1 and 2 are considered:

**Total capital costs of building phase 1 and 2 (track, ancillary + rolling stock):** $3.67 billion

Seattle, Washington
Even spread over a period of 15 years, the $3.6 billion capital cost is a significant outlay.

It should be seen in the context of road spending in Western Australia, which averages $1.3 billion dollars a year\(^{47}\). If the capital costs of the light rail proposal are spread over 15 years, then the approximate annual cost of $245 million (assuming the construction of about 13km of light rail track per year) would be less than one fifth that of the annual road related expenditure. It would be a much smaller fraction of the overall cost of road accidents in WA, which totaled $1.67 Billion for 2006\(^{48}\), or Western Australia’s pro-rata defence spending of $2.7 billion.

When the political will is available, the WA Government has found the funding to improve, upgrade and build new infrastructure such as the Perth to Mandurah Train line or the proposed massive freeway extensions around Perth Airport. This is the kind of project that warrants such priority.


\(^{48}\) Bureau of Infrastructure, Transport and Regional Economics (BITRE), 2009, Road crash costs in Australia 2006, Report 118, Canberra, November.
## Phase 1

<table>
<thead>
<tr>
<th>South</th>
<th>Distance (km)</th>
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## Phase 3

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</table>
Operating costs

The operating costs for 22 light rail systems, across cities in the US, Canada and UK, are shown in the figure below. London, with its exceptionally high usage and labour costs\(^\text{49}\), is understandably expensive to run. Buffalo is an outlier probably due to outdated technology and its subway nature\(^\text{50}\). Perth could expect to have operating costs closer to, if not below, the average of AU$1.1 million per kilometre per year. This concurs with the DPI study and the 2004 draft feasibility study for the Gold Coast Light Rail\(^\text{51}\), which both estimated operating costs at $0.7 million per kilometre per year. The City of Stirling study estimated operating costs between $0.9 and $1.7 million per kilometre per year, but these estimates are “concept level” and the very short route would have poor economies of scale.

Operating costs: $118 million per year for phase 1 and 2
($0.6 million per km per year x 197km)

Data Sources:
• The Urban Transportation Monitor, May 16, 2008
Conversion to Australian Dollars was based on exchanges rates of 0.9, 0.8 and 0.5 for $Canadian, $US and £UK respectively.

\(^{49}\) Rapid Transit Monitor 2006, Volume 1: UK Light Rail Systems, TAS Publications
\(^{50}\) http://hamiltonlightrail.com/article/light_rail_lessons_from_buffalo/
Funding the project

It is reasonable to project that a metropolitan light rail project could be funded within a 15 year timeframe, with concerted action by State and Federal governments, noting that there will also be significant funding demands for regional rail and other regional transport priorities.

It has been noted many times that the up-front costs of light rail should be set against the context of huge and largely unaccounted costs of road-dependence, including pollution, traffic accidents, congestion, degraded community amenity, and the costs of maintaining a military presence in oil-rich areas.

One funding option explored in greater depth in Professor Peter Newman’s ‘Knowledge Arc’ light rail proposal is that of improved land value capture and developer concessions based on the windfall gains reaped by landowners and developers as a result of the arrival of light rail. While modelling the potential of such a mechanism to fund the project is outside the scope of this study, experience overseas demonstrates the enormous potential to fund public transport systems by capturing a fraction of the improved land values surrounding light rail stops.
Commonwealth public transport funding

There is a strong need for major investment in public transport by the Federal Government. Several new funding opportunities exist for Federal investment in public passenger transport. This includes, but is not limited to:

Economic stimulus packages

Major investment in public passenger transport through State or Federal economic stimulus plans brought on by the global financial crisis and subsequent economic slow down could provide employment, enhance economic activity and go some way to shielding the community from further oil shocks while meeting our goals to mitigate climate change.

Overcrowding on public transport is one of the most significant problems in the sector. Establishing a public transport vehicle manufacturing industry in Australia could go some way towards alleviating that difficulty while also providing employment (perhaps by retooling the car manufacturing plants that are currently facing closure).

In February 2009, the Federal Government announced an unprecedented $42 billion government spending package, however public transport was entirely absent from the package.

Infrastructure Australia / Building Australia Fund

The Building Australia Fund was established by the Labor Government in 2008 in order to direct $20 billion investment into the nation’s infrastructure through Infrastructure Australia. Infrastructure Australia had identified specific goals, including “saving time for commuters battling traffic congestion in our major cities” and “meeting the challenge of climate change”. Public transport clearly meets these criteria and should be a major component of the projects that receive funds.

Sadly, two WA Government submissions to the Building Australia Fund did not include any requests for public transport projects, whereas nearly all other states have requested and received funding for public transport infrastructure or feasibility studies.

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52 Media Release from Anthony Albanese MP, Minister for Infrastructure, Transport, Regional Development and Local Government (21 January 2008)
Revenue from future emissions trading scheme or carbon tax

Any future Emissions Trading Scheme (ETS) or carbon tax will provide a new annual Federal revenue stream as a quantity of carbon credits are sold each year or from a flat tax imposed per tonne of carbon emissions. This new revenue should be put towards projects that will assist in the mitigation of climate change.

Commonwealth transport funding

The Greens propose to allocate at least 25% of Commonwealth transport funding (previously through AusLink) for 2009-10 to 2013-14 to major infrastructure projects that shift people or freight off roads and onto more efficient alternatives. Beyond 2013-14, the Greens propose that at least half of future transport funding be dedicated to public transport, which could see the Commonwealth contribute as much as $1 billion to WA’s public transport expenditure.

The Federal Government has not funded metropolitan public transport infrastructure since the early 1990s, leaving this vital but costly responsibility entirely to the states.

The current lack of Federal public transport funding is a major deficit in the Commonwealth’s vision for Australia’s transport future. This was confirmed by the recent Senate Committee Inquiry which found that in the 30 years to 2004, the Federal Government spent $58 billion on roads, but only $2.2 billion on rail, and $1.5 billion on public transport53.

State Government and local authorities can offset some of the costs of light rail against improved land values in areas where new services run. The private sector could also become involved through a public private partnership with the WA Government.
Getting the private sector involved

Using private sector funding for some, or all, of the project could take many different forms. For example:

- Private sector finance could be sought for the construction phase on contract to the WA Government.
- Private companies could operate the day to day activities of the light rail system, in the same manner as companies tender to operate the bus network under the overarching coordination of Transperth.

This public/private approach has been used in other states and overseas jurisdictions with mixed success. However, WA could use this opportunity learn from previous public private partnership experiences to address mistakes made by others (for example, inadequate sharing of project risks between the private sector and government).

 Governance: keep it public

Long experience in Australia and elsewhere has demonstrated that well coordinated public authorities are essential to well functioning public transport systems. Privatisation of systems in Sydney and Melbourne has led to highly dysfunctional outcomes where busses, trains and trams compete against each other rather than against private cars.

If anything has been learned from post-war transport planning globally, it is the importance of well resourced, centralised planning authorities to develop coordinated public transport networks where different modes support and enhance each other.

Perth is fortunate in that our institutional arrangements fit this model, which bodes well for any proposal to add a new layer of rapid transit into the mix.
Making transport clean requires a three part effort in Western Australia: shaping personal transportation choice through a combination of expanded high quality options, equitable distribution, economic incentives, effective leadership, and well crafted policy; supporting innovation and increased efficiencies in current and emerging transportation technologies; and undertaking a fundamental clean shift in the way personal mobility is thought about and powered.

An efficient light rail network supported by the community and powered by a combination of renewable energy sources combines the required efforts into a single substantial step towards making transport clean in the Perth Metropolitan region.

A 100% clean light rail system is not purely a vision of the future. The City of Calgary in Alberta, Canada, runs its entire light rail system on 7.2MW of installed wind power sourced through a local renewable energy provider. Calgary’s light rail network, called the CTrain, is by no means minor. It covers 44 kilometres of rail, stops at 37 stations, carries 280,000 passengers a weekday, saves 26,000 tonnes of carbon emissions annually
\(^{54}\), and makes over 70,000 station stops a week
\(^{55}\).

Electricity consumption is very sensitive to the weight of the vehicle – the 22 tonne “City Class” tram in the UK uses only 1kwh/km, while the 46 tonne “Manchester Metrolink” uses 4.1 kwh/km
\(^{56}\).

In Melbourne, Yarra trams purchased 100MWh of GreenPower to run one tram for eight months in a demonstration project
\(^{57}\).

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55 Calculated from CTrain schedules at http://www.calgarytransit.com/index.html
56 http://www.london-trams.co.uk/reducingcosts.htm
“Electrified public transportation... provides an exceptionally clean, energy efficient form of mobility. The electrification of public transport is a natural and highly efficient response to the problem of “Peak Oil” and climate change.”

CRC for Rail Innovation, 2009, Transforming Rail: A Key Element in Australia’s Low Pollution Future

Amsterdam, Holland
The Melbourne tram system has 501 vehicles that travel a total of 24.8 million kilometres each year\textsuperscript{58}. The energy consumption of that network was calculated by Sustainable Energy Now to be approximately 75,150MWh per year\textsuperscript{59}.

This could be provided by a 30MW wind farm (presuming average generation capacity of 35%); equivalent to roughly one third of Alinta’s ‘Walkaway’ windfarm east of Geraldton.

The additional operating costs associated with using renewable energy would be the cost of purchasing the Renewable Energy Certificates (RECs) to match the amount of energy used. Current estimates put RECs for wind farms at $40 - $50 to reflect the actual cost\textsuperscript{60}.

Based on REC’s costing $45 per MWh, the additional cost for using renewable energy would be $3.4 million annually.

Therefore the annual operating cost would increase from $118 million to $121.4 million per year, or $0.61 million per km, up from $0.6 million.
Renewable energy projects currently approved and in development in Western Australia total 447MW proposed installed capacity\(^61\). This is 15 times the capacity required to run a light rail system of the scale proposed here.

Western Australia has the natural resources, expertise, and leadership to implement an electric light rail system powered by renewable energy. Solar and wind energy resources are abundant and already being tapped in the State to power the equivalent of more than 125,000 average Australian homes a year\(^62\). Current installed wind capacity provides more than 25 times the energy required by the Calgary light rail network.

Local companies supplying renewable energy can be teamed with integrated regenerative breaking technology and improved efficiency features to create a world-class clean efficient transport network in Perth.

A light rail network does not have to be tied to one source of renewable energy but can leverage emerging economic and cooperative synergies to create a system powered by renewable energy systems on the roofs of businesses and houses as well as from large centralized systems.

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This proposal is primarily advocating for improved public transport that is clean and efficient and will go towards future-proofing Perth’s suburbs as we face peak oil and climate change. It proposes this is done through an electric light rail network run on renewable energy and has outlined an initial route that would serve the greater community of metropolitan Perth.

The route presented here is intended as a discussion starter rather than the final word on track layout. A comprehensive consultation is now required with industry, government and the community. A number of community engagement processes are proposed to ensure that stakeholders can contribute to the creation of the network.

A deliberative approach

This should be modelled on the successful ‘Dialogue with the City’ process that led to the ‘Network City’ document in 200363.

To effectively run a deliberation of this nature, the following process would be undertaken:

• Create a steering committee made up of a range of stakeholders to determine the aims and purpose of the deliberation.
• Organise at least three 21st Century Dialogues, one in each of the metropolitan regions:
  • South – e.g. Cockburn / Murdoch;
  • North – e.g. Stirling / Morley; and
  • East – e.g. Maddington / Thornlie / Cannington
• Determine questions to be put to participants for deliberation.
• Seek a commitment from policy makers and elected representatives regarding the outcomes of the deliberation.
• Distribute balanced information prior to meeting and utilise online information and discussion tools.
• Invite speakers to present information on the issue, ensuring a balance of expertise and representation
• Sample questions for deliberation:
  • What, if anything, are you willing to change - travel habits, look of streetscapes, give up parking spaces, median strip or a lane of traffic for fast efficient public transport?
  • What would you want to see in return?
  • Roads vs public transport government spending – what do you think is a good break down / proportion?
  • Mapping exercise – place where the light rail, or enhanced public transport services should go on a local map (and select what mode is suited), and identify where the higher density development should be to support it (where appropriate).
• Produce a preliminary report and evaluation.

63 http://www.21stcenturydialogue.com
Roles for Government

Conditional on the results of the deliberative process, each tier of Government will need to assume differentiated responsibilities.

Local Government

• Direct community liaison and development of locally appropriate transport strategies.
• Identification and preservation of key corridors and rights of way.
• Local scheme amendments to foster appropriate mixed use, medium and high density land uses around key light rail stops and transfer stations.

State Government

• Development of a detailed feasibility study for a metropolitan light rail system and integration with existing public transport networks.
• Production of a robust, costed proposal for submission to Infrastructure Australia for consideration of Commonwealth funding.
• Reallocation of budget priorities away from metropolitan road funding (regional road funding to be quarantined) to prioritise annual light rail appropriations.
• Realignment of metropolitan planning policy to support medium and high density mixed use development around key public transport nodes.

Federal Government

• Infrastructure Australia consideration of the light rail submission for ongoing annual funding.
• Direct liaison by the Major Cities Unit with State planning and transport authorities to maximise social, environmental and economic synergies of public transport development.
• Development of a coherent, scientifically defensible climate change policy including the immediate introduction of a robust carbon price.
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time traveller

It’s mid morning. You’ve just jumped the tram in William Street and lean back on the railing to watch the old town roll past. You look back to see the city receding down the hill behind you, the towers of the CBD rising behind the cheerful bustle of Northbridge.

The tram pauses to take on more passengers, and the carriage momentarily fills with laughter. Moving again, Asian supermarkets and internet cafes giving way to quiet townhouses and villas shaded by peppermint and melaleuca. Briefly against the skyline, a cluster of compact wind turbines; nothing like the scale of coastal installations but making up in numbers what they lack in size. You can’t see the sheer expanse of rooftop PV from down here, but you know its there; sunlight coursing down to the rail that propels your transport. Someone waves from one of the gardens above; three stories up they’re harvesting olives and tomatoes.

The serene expanse of Hyde Park rolls by on your left; less lawn than when you were a kid but the Balga bushes and Tuarts are soaking up the sun and you can see people on one of the cultural walks making their way down to the lakes. The sound of birds momentarily overwhelms the quiet rumble of the tram.

A right turn and the polished rails are bearing you toward your destination; swinging onto Beaufort Street under the spreading arms of hundred-year-old street trees. Here you’ve left your childhood behind; the slow-moving, noisome columns of traffic are gone, replaced with crowds of people walking under shade-sails through an open air fresh produce market.

Alight, watch the elegant tram moving slowly away, and try and remember the last time you sat behind the wheel of a car. Forget it. Someone in here is baking the perfect loaf of bread.