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Introduction

'Network City', the new regional planning strategy for metropolitan Perth, Western Australia, was finalized in 2004. It sets the framework for urban development for a 25 year period to 2029. Its preparation has provided the impetus for a new debate on urban form and sustainability. That debate, and also the production of the strategy, has taken shape through a new collaborative planning process which required a significant change in the practice of planning as genuine attempts were made to engage the wider community.

This paper reports on the new planning approaches established during the development of the new regional planning strategy. It describes the procedural changes to plan production aimed at creating a community planning strategy. The new spatial framework is outlined and the way in which it is envisaged that more sustainable city outcomes can be achieved through changes to planning practice.

The need for a more sustainable approach - past planning practice

The Perth metropolitan area has a population of 1.4 million, but forecast population growth required the metropolitan strategy to plan for up to 2.22 million people. There has been little to constrain the physical growth of the metropolitan area which has taken place principally in a coastal strip that spreads some 130 kilometres north-south along the Indian Ocean. Perth has a tradition of low density suburban development, currently about six dwellings per hectare gross (WAPC, 2003). The Swan Coastal Plain where Perth is located contained a rich variety of wetlands and twenty-six major vegetation complexes prior to settlement in 1829. Since that time many of the wetlands and vegetation complexes have been significantly modified, reduced in extent or destroyed altogether predominantly through land clearance for urban development. Seven of these vegetation complexes cover less than 10% of their original extent whilst the Cannington complex has been reduced to less than 1% of its' original coverage (WAPC, 2000). In addition, Perth has the unenviable reputation of being defined as one the most car dependent cities in the world. Car ownership and use are the highest of all Australian cities with 723 vehicles per thousand people. Single occupant car use dominates the transport mode share, and

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the road network absorbs the bulk of transport expenditure (Gleeson et al, 2003) making delivery of a quality public transport system a major challenge.

A legacy of Regional Planning Strategies

Metropolitan Perth has a long history of strong regional planning. The State has maintained a strong grip on local and regional planning processes through a State planning department, and a State-appointed Planning Commission (WAPC). A Metropolitan Region Scheme, controlled by the State, provides the statutory mechanism to zone land for development. Since 1955 a series of regional planning strategies have set out the aspirations for urban form and development. The State monitors and coordinates the servicing of land development through its Metropolitan Development Programme. The State is in an extremely powerful position to influence the nature of development through its control over powerful public land developers such as LandCorp (industrial land supply, and more recently residential and commercial development) and the Department of Housing and Works (subsidised housing), as well as its control over all town planning schemes and subdivisions.

The first regional planning strategy, the Stephenson-Hepburn Plan of 1955, proposed a reasonably compact region with a 60km north-south limit (Alexander, 2003) aiming to create a series of self-contained communities by placing employment land in close proximity to residential areas (Carr, 1979). Although new railway lines were proposed, the main thrust of this planning strategy and subsequent ones assumed private cars would transport people to activity, therefore providing for accessibility through mobility. The car was seen as a sign of a modern prosperous city, with public transport provision seen as serving only a social welfare function (MTT, 1961). The railway proposals were never implemented but the road network proceeded at speed. This has worked against the plan's ideal of a compact city. The notion of people living and working locally in self-contained communities floundered as employment shifted predominantly from the manufacturing sector to the service sector, and the road network facilitated travel into Perth CBD where the service sector dominated.

The 1970 Corridor Plan replaced the 1955 Stephenson-Hepburn Plan. In response to traffic growth the strategy focused on the need to establish an efficient public transport system to balance the inevitable increase in fuel costs for travel by car (Carr, 1979).

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However this was to be achieved with buses rather than rail, sharing the proposed high speed, high capacity roads. The plan proposed an urban form based on four corridors each surrounded by non-urban wedges. Four regional centres placed at the ends of the corridors were to provide local employment as a means of counterbalancing congestion in the Perth CBD.

The 1990 Metroplan replaced the Corridor Plan and continued this polycentric approach. The strategy sought to slow the outward growth of the corridors by widening them. The aim was to concentrate employment-generating activities and higher residential densities around public transport routes while discouraging the location of commercial and community facilities away from the public transport network. Twenty percent of new housing was to be suburban renewal or infill, justified by the argument that this would reduce travel distances and lead to transport improvements. These were the beginnings of a shift in planning practice towards addressing concerns about the impact of development on the environment. However the dominant concern was economic; concerns in the 1990s were mainly about the high costs of delivering infrastructure to the outer edges of a now sprawling city.

The outcome of past Regional Strategies

Implementation of these regional strategies has been selective, not least because of a lack of corporate and political commitment to all aspects of the strategies. The road proposals were mainly implemented whereas not all rail proposals have been. The aspirations for land use change around rail stations have seen limited implementation (they were never made a statutory requirement). There has been little attempt to resist proposals for commercial use in poorly served transit locations. Suburban infill is resisted by the community. This has facilitated the unabated outward spread of the city. Now fifty years since the 1955 Plan, Perth has "spread over two and a half times the Plan's allocated land area" (Alexander, 2003, p5), running 120kms along the coast.

One method to determine the environmental sustainability of a population is to calculate its ecological footprint. An ecological footprint has been described by Wackenagel et al, (1993) as 'the amount of productive land required to support the lifestyle of an individual, a nation or an industry, particularly the area of productive soils needed to supply food, forest products, urban areas and to assimilate the waste products

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generated by our consumption patterns'. The Australian Bureau of Statistics (ABS) has calculated that the ecological footprint for the average Australian is 7.4 hectares (ABS, 2001), a level comparable with residents of the United States, and second only to New Zealand at 8.4 hectares per capita. This is slightly lower than the footprint calculated by the WWF which estimates a figure of 7.7 hectares per capita in Australia. Assuming that these figures can be applied to Perth residents then a figure of between 16.3 – 16.9 million hectares would be needed to feed, clothe and house the population of Perth. Even at the very low population densities currently experienced in Perth, this figure greatly exceeds the current area covered by the Network City strategy (735,714 ha. – including some major water bodies). This is an urban population which clearly needs to address its current consumption practices in order to reduce impacts on the environment.

Undoubtedly the strong regional planning approach in Perth has resulted in some important environmental outcomes in the development of Perth. The introduction of open space requirements (ten per cent of gross subdivided area) as a standard in 1956 has seen the design and protection of the regional open space system in the generous foreshore reserves which protect many beaches and dunes in their largely natural state, in the protection of river banks and lake foreshores, and more recently the protection of some tracts of native bush through 'Bushplan'.

However, since the early 1990s critics had pointed out failures of efficiency, equity and sustainability in metropolitan planning (Yiftachel and Hedgecock 1992). These criticisms remain relevant today. Metropolitan planning has had only a marginal influence on density, land use and employment locations, and is failing to prevent urban sprawl (Yifchatel and Kenworthy 1992). Employment development has spread from a tightly confined CBD, where it was accessible by public transport, into inner and middle suburbs in locations that are difficult to access by all modes of transport. Between 1960 and 1980 gross residential densities actually fell across the region (averaging 6 dwellings/hectare gross). They are a long way short of the 30 dwelling units per hectare density identified by Newman and Kenworthy (2001) as critical for the maintenance of public transport, and ensure that Perth remains Australia's lowest density, most heavily automobile dependent city. An extensive road network has been planned and substantially built, but the public transport system has a level of service that varies from a very minimal and infrequent service for areas at the urban fringe to frequent services on radial routes serving the Perth CBD. Most travel is undertaken by private car (in 2003 81% of trips) reflecting this

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dispersed land use pattern and road-based transport network. But depending on location, between 6% and 15% of households do not own a car (Curtis, 2001). The impact of this level of car ownership and useage is substantial. The National Pollution Inventory (Australian Government, 2005) has recorded over 15 significant pollutants emitted from motor vehicles in the Perth airshed. This includes 200 million Kg/pa of carbon monoxide, 280,000 kg/pa of formaldehyde, 16 million kg/pa of toluene in the Perth airshed alone (NPI, 2005). Another major pollutant within the Perth airshed is caused by burning wood fuel for domestic heating during the cooler winter months. The NPI has recorded 19 significant pollutants caused by domestic solid fuel burning including the production of over 3 million kg/pa of particulates under 10 micrometers in size (NPI, 2005). All of these emissions can have significant health impacts including increased levels of allergenic and hypersensitivity responses, fibrosis, cancer etc.

Planning Process – a new approach

The production of a new metropolitan planning strategy for the Perth and Peel regions began in 2003 with the launch of 'Dialogue with the City', described as a new way of 'doing planning' by collaborating with the community. In reality the plan production process had begun some years earlier. The decision to prepare a new metropolitan planning strategy to replace Metroplan was made in 2000 (MfP, 2000). What followed then was a series of discussion papers produced under the banner "*Future Perth*" and later changed to "*Greater Perth*". These were produced in the conventional mode by officers (and consultants) and were aimed at exploring and debating the issues facing Perth.

The incoming labor state government (2000) espoused a new approach to government. Conscious of the vocal community opposition to regional plans and projects they determined that planning should be inclusive of substantive community involvement. 'Dialogue with the City' is just one example of this new approach, other examples included the 'Freight Network Review which involved community and industry in a discursive approach and utilising multi-criteria assessment to explore future options and the use of citizens juries at Scarborough Beach and Leighton Beach to seek an acceptable approach to coastal urban development pressures.

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'Dialogue with the City' comprised a one day planning forum designed to set the values, vision, planning objectives and spatial parameters for the future development of metropolitan Perth. The day itself was the culmination of a process which included several other information gathering and promotion exercises. A random survey of 8,000 people was conducted. This sought feedback on desires for housing and location choice, views on urban form, transport strategies and density. The local newspaper ran a series of discussion pieces about the future development of the city. Channel 7 screened a documentary and panel discussion about the issues. There was also an on-line discussion group, school essay writing and painting competitions and listening sessions. Dialogue Day itself (September 2003) included 1,110 participants drawn a third from the random survey, a third from community groups and stakeholders, a third from government agencies. This forum was an interactive consultation that involved group discussion about the future urban form of the metropolitan area and a mapping game, whereby groups selected one of four planning scenarios and experimented with the actual development of the city. The four planning scenarios were designed to accommodate future housing for 375,000 and 350,000 jobs. These included two extremes - 'Dispersed City' and 'Compact City', plus two polycentric approaches - 'Multi Centred or Regional City' and the 'Connected Network City'. The scenarios were designed to reflect distinctly different choices for development to the year 2031. Perth already reflects elements of all four of these scenarios - a city would rarely fit as one of these 'pure' forms and the reality is a complex and mixed pattern of urban form (Lynch, 1961). The 'connected network city' scenario was ranked the first choice by 35% of delegates. Following group discussions at each of the 110 tables, 80% of tables chose this scenario for the mapping game; with 72% of tables producing a 'connected network city' as the final output (Government of Western Australia, 2003).

The collaborative process did not end on Dialogue Day. One hundred Dialogue participants were involved in the development of the Community Planning Strategy itself (WAPC, 2004). Starting with a one-day workshop in December 2003 the group refined information from Dialogue Day to arrive at a vision and a set of values, principles and objectives. These were captured by eight headline statements (Table One). This group also devised the governance approach to ensure community stayed engaged in the process. Six working groups were established, broadly one for each chapter of the strategy (spatial plan and strategy; governance and process; liveable city; economy and employment; environment and heritage; transport and infrastructure). This work was

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overseen by three liaison teams (community; local government; industry) and an implementation team (drawn from these groups) led the process. By September 2004 the strategy was complete and a product of an entirely different process to any regional plan produced before. The latest phase in the process will see ongoing partnerships between state, local government, community and industry in the implementation of the strategy.

Table One: Network City Community Planning Strategy – Headlines

1 Manage growth by sharing responsibility between industry, communities and government	5 Encourage public over private transport
2 Make fuller use of urban land	6 Strengthen local sense of place
3 Plan with communities	7 Develop strategies which deliver local jobs
4 Nurture the environment	8 Provide for affordable housing

Planning Practice – a new way forward

Spatial Framework

At the heart of Network City is a spatial framework designed to realise the integration of land use and transport networks. Land use transport integration (LUTI) is seen as a means of achieving sustainable travel outcomes, recently reinforced by Australia's National Charter on Integrated Land Use and Transport Planning (DoTARS, 2003). The common approach to achieving sustainable travel is to seek a shift away from single occupant private car travel towards high occupancy vehicles (both private and public), cycling and walking, and the replacement of some trips with tele-shopping and tele-commuting. Three different strategies can achieve this outcome: land use solutions – aimed at increasing the proximity of uses in order to reduce both the number of trips and distance of trips undertaken by car; managing the demand for car travel; and the

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promotion of alternative transport modes. The spatial framework proposed in Network City attempts to achieve all three of these strategies.

The land use strategy revolves around re-structuring the existing urban area in order to deliver these LUTI strategies. Three key components comprise the 'Network City' concept for the Perth Metropolitan area. '**Activity corridors**' are centred on either a main arterial road or suburban railway line utilising land up to 400m on either side of this transport spine. '**Activity centres**' are developed at intervals along the activity corridor as the focus of daily activity needs including small scale employment, shopping and services, and medium to higher density housing all placed within walking distance of the public transport stop at the centre. '**Transport corridors**' are paired with one or more activity corridors to form a network, and provide a fast moving route for inter-urban travel, so overcoming the need for longer distance through-traffic to use activity corridors.

The transport network provides the key metropolitan structure, and is based on achieving a high level of accessibility. The network of activity corridors and transport corridors are anchored by strong regional centres. This network not only creates a hierarchy of centres suited to serving the different needs of the population at different spatial scales (regional, district, neighbourhood), but also provides a key role in integrating and supporting a transport network of different modal layers. It provides an excellent walking and cycling network to and within centres close to home, high frequency public transport between centres, and high speed car, freight and public transport movement across the region but outside these centres. There is a strong interconnection between corridors so that they become part of a logical network.

The main benefit of the development of Network City is in promoting sustainable urban growth. By accommodating urban population growth within higher-density activity corridors it is possible to contain urban sprawl and use developed land more efficiently. It provides an alternative to a choice of inaccessible locations at the urban fringe (particularly by choice of transport modes). Locating major trip generators within activity corridors and close to residential populations has several benefits. It supports an efficient public transport service and provides the opportunity for a mode shift to green transport modes since commercial and employment activity is dispersed to activity centres in close proximity to residential areas. This offers the opportunity to reduce individuals' travel

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distance and travel time. This approach helps to reduce congestion on radial routes to the CBD. It also reduces the transport investment requirement at the fringe.

In addition to these over-arching environmental outcomes, a series of targeted and specific environmental objectives have been identified. One of the most significant is the creation of an interlinked and continuous greenway combining areas of public open space and areas of high biodiversity value from beyond the northern limit of the Network City area in Moore River to beyond the southern limit in Busselton. Whilst the specific areas have yet to be identified this would create a continuous corridor linking many of the twenty-six vegetation complexes within a network of more highly protected reserves. Other initiatives include the introduction of urban growth management mechanisms and the inclusion of environmental and heritage issues into equal partnership with social and economic factors in the planning decision-making process. This is potentially a major change as there has tended to be a public perception of growth at any cost even at the expense of major landscape and environmental features.

New ways of working

Land use-transport integration requires the "need to deal simultaneously with both transport and urban development issues" (Bertolini & Spit, 1998, p. 17) – this is at the heart of Network City. In developing the concept, the need for new planning techniques and new ways of working became evident. The existing pattern of development is not energy efficient and public transport systems are designed to meet peak-direction peak-hour flows and are therefore inefficient (Lloyd-Jones et al, 2001; Tanner, 2003). The new approach accords with the communities desire to make better use of existing infrastructure (Government of Western Australia, 2003), it will also provide the rationale for proposing particular densities and development locations. It will be necessary to work with public transport providers to define the density and intensity of land use in order to support efficient and balanced public transport capacity.

The structure of the urban network, the relationship of corridors to the CBD and other activity centres, will be a more important consideration than density as it is this that determines travel patterns (March, 1969; Gordon et al, 1991; Brindle, 1996; Schwanen et al, 2001; Naess and Jensen, 2002). An urban structure capable of supporting an efficient public transport service suggests particular parameters for the composition, size and

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location of centres within the network of activity and transport corridors. The past separation of employment locations from housing has made inefficient demands on transport infrastructure and services.

The 'Network City' concept requires a new approach to the design of arterial roads. A change is needed to take into account not only traffic function, but also land use and quality of the urban environment (Westerman, 1998; Curtis, 2005). Arterial roads running through activity corridors will need to be redesigned to create a street, a public place where activities bring people together (Jacobs, 1993). Private car access will be maintained, but in a low speed environment, sharing road space with public transport, bicycles and pedestrians. The concentration of more intensive activities, including residential, along these corridors is unlikely to increase traffic noise and air pollution since the aim is not to increase car traffic along the corridor but rather to replace these trips with green or active transport use. Most inter-suburban traffic will be redistributed to 'transport corridors' and 'within activity corridor car traffic' is redistributed to other modes.

The 'activity corridor' requires a new approach to traffic modelling and new ways of assessing road capacity, rather than relying solely on 'predict and provide' demand forecasting and simple technical, engineered systems (Graham & Marvin, 2001). The objective of an activity corridor is to provide a shared street at centres, contrary to traditional traffic modelling based on capacity, level of service, speed and travel time reduction. Designs based on assumptions about mode split predicated on behaviour change towards public transport and non-motorised modes will be needed that draw from examples of existing accessible places. Also designs where land use function and the role of streets as multi-use meeting and public transport spaces dominates rather than the carrying capacity of the road for vehicular traffic alone (Barton et al, 2003).

Protection of the Environment

Like most capital cities in Australia, Perth has a range of mechanisms to protect the environment, open space and areas of significant biodiversity. These include National Parks and Regional Parks designated by the Department of Conservation and Land

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Management (CALM) and the designation of reserves for open space, groundwater control, rural areas etc through the Metropolitan Region Scheme.

One initiative unique to Perth is the Bush Forever scheme, a programme to conserve at least 10% of all twenty-six original vegetation complexes of the Swan Coastal Plain. Bush Forever receives \$100m over a ten-year period funded through the Metropolitan Development Improvement Fund. The conservation of Bush Forever reserves can be through negotiated planning outcomes with public and private owners as well as the outright purchase of properties. The Bush Forever initiative has been able to protect approximately 52,000 hectares of regionally significant bushland in 287 sites (WAPC, 2000). This includes approximately 33,000 hectares was already under an existing conservation reserve or designation and 4,500 hectares privately owned with a rural, urban or urban-deferred zoning under the Metropolitan Region Scheme (WAPC, 2000).

Sustainable Outcomes – A Reflection

One key challenge for the Network City approach will be the extent to which changes to the structure and form of metropolitan Perth will result in sustainable outcomes. There has been an extensive debate about the extent to which urban form can result ultimately in changes in travel behaviour. Most agree that urban form has an impact on travel behaviour, but research on the extent of this impact is inconclusive and there is no consensus as to the ideal urban form (Hickman and Banister, 2002; Sorenson, 2000; Williams et al, 2000). There are however, a variety of urban forms that are more sustainable than typical development patterns of recent years (Williams et al, 2000). The debate has 'crystallized' towards 'decentralised concentration'. This reflects the reality that both decentralisation and concentration processes are at work in the city (Bertolini, 1999), some business and residences are decentralising, while others remain in centres of Australian cities.

The most widely agreed solution for sustainable transport outcomes in cities appears to be one of multiple nodes of concentrated activity, a transition from a 'Uniplex City', with one central core of activities surrounded by suburbs, to a 'Multiplex City', with several centres connected both physically and by telecommunications (Srinivasan, 2002: Sorenson, 2001; Lloyd Jones et al, 2001; Filion, 2001; Healey, 2000; Newton, 2000; Frey,

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1999; Brotchie, 1992; Newman, 1992, 1996; Van der Valk and Faludi, 1992; Kumar, 1990; Van Til, 1979). Our argument is that providing an urban structure that can support the possibility of modal choice will enable travel behaviour change once other conditions are favourable, such as price, fuel shortage, increased environmental awareness and so on.

Previous regional plans and strategies for the Perth Metropolitan Regional have created a long, linear, low-density urban environment which has produced a series of ever-increasing environmental problems. Perth is experiencing major air quality issues from motor vehicle emissions, domestic and industrial sources. There are major problems associated with land clearance and the impact on biodiversity. In addition, Perth is reliant on a small number of dwindling sources for its drinking water, including groundwater extraction which is not sustainable in the long-term. Despite the recent decision by the State Government to diversify water resources, including the construction of a desalination plant, the provision of potable water for an increasing population remains of major concern.

The Network City strategy does have the potential to address a number of these environmental issues. The creation of activity corridors with a greater integration of landuses has the potential to increase public transport usage and consequently reduce car useage. An integrated green corridor linking reserves has some environmental potential although the inclusion of recreational areas and public playing-fields may dilute the conservation benefit. However, a population increase of approximately 750,000 by 2029 will place significant extra stresses under a system already under strain.

The environmental strategies identified in Network City appear to be achievable and relatively non-contentious. An integrated reserve corridor is a well-accepted ecological principle as is the incorporation of environmental issues on an equal level with economic and social issues in decision-making. The State of Western Australia has already endorsed a state-based sustainability strategy which calls for the incorporation of the triple-bottom line in decision-making (State Government of Western Australia, 2003). Equally, few people would object to protecting and managing declining water resources, improving coastal planning and reducing the ecological footprint of the metropolitan area. It could be argued therefore that the environmental strategies identified in Network City

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are not radical enough nor provide a clear enough departure from previous planning practice in order to achieve environmental aims and objectives of Network City.

The final reflection must be about the new processes used to produce the plan. Certainly 'Dialogue with the City' and the plan production that followed enabled the exercise of influence by participants, both formally and informally, (Painter, 1992 cited in Lane, 2005) and this was an important step forward compared to production of regional planning strategies that preceded Network City. The process included a mix of new approaches so ably described by Lane (2005) including transactive planning with its emphasis on mutual learning, dissemination and feedback; advocacy planning where planners took on the role of facilitators; communicative action where there were forums for dialogue, negotiation, and debate. But questions remain as to how far the community's desires were dampened down as a result of the very nature of the new collaborative process. The need to be inclusive meant all stakeholders were included in the process, regardless of the differences in what they had to gain from the planning strategy. This meant the development industry were also players yet they gain much more directly from specific planning outcomes than other community members. Inevitable collaborative process results in compromise. In this case the community's desire to stall urban sprawl by imposing a growth boundary was rejected. The compromise is to manage growth by staging development according to a set of sustainability criteria. These are yet to be established, let alone work their way through the process, meanwhile the spread of development continues.

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