Greater Western Sydney Urban Development Health Impact Assessment

FINAL REPORT

Health Impact Assessment of the Sydney Metropolitan Strategy (2005 -) in relation to Greater Western **Sydney**

October 2007

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Acknowledgements

Acronyms

ABS	Australian Bureau of Statistics
AHS	Area Health Service
BMI	Body Mass Index
CCD	Community Cultural Development
DCP	Development Control Plan
GWS	Greater Western Sydney
IRSD	Index of relative socio-economic disadvantage
LEP	Local Environment Plan
PA	Physical activity
POS	Public open space
SEPA	Supportive Environments for Physical Activity
SOE	State of the Environment Report
SSWAHS	Sydney South West Area Health Service
SWAHS	Sydney West Area Health Service
VKT	Vehicle kilometres travelled
WSROC	Western Sydney Regional Organisation of Councils

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EXECUTIVE SUMMARY

This HIA examines potential effects on population health and wellbeing of planned population growth and urban development in Greater Western Sydney (GWS)[1] over the next twenty five years. During this time the population of Sydney is expected to increase by 1.1 million people, 600,000 of whom are anticipated to settle in GWS. This population increase will be accompanied by large scale development of housing, transport, employment and social infrastructure; all changes that can potentially affect the health and wellbeing of new residents and people living across the region.

How this growth is to be managed, in terms of where people live, the transport and other infrastructure that is provided, along with a range of other issues, has a major bearing on the level and type of health impact. Accordingly, this project specifically analyses the Sydney Metropolitan Strategy (2005). Past patterns of growth for Sydney are also reviewed as are other recent comparable metropolitan plans, in order to provide differing perspectives on the planning process and what are reasonable goals and targets to set.

Major Issues Linking Human Health and Wellbeing with Urban Development in GWS
The HIA examines potential health impacts of growth in GWS through an analysis of certain aspects, or "dimensions", of urban development and their impact on known "determinants" of human health. The health determinants and urban dimensions analysed were chosen through a review of research and planning for Sydney and other similar cities, to identify those with the strongest evidence base and relevance to the Sydney context.

The major health determinants, and the urban dimensions that would affect them, for GWS are:

1. **Physical activity** (influenced by public transport services, urban form, social infrastructure and climate amelioration);
2. **Social connectedness** (supported by transport access, social infrastructure and urban form);
3. **Access to Healthy Food** (supported by local retail supply, transport services and local agricultural production[2]).
4. **Air quality** and **local climate** (influenced by transport patterns and urban form);
5. **Accidents and injury** (influenced by transport patterns and urban form);
6. **Employment** (supported by economic development, job creation, transport access, and social infrastructure); and
7. **Access to services** and **mobility** (supported by transport access and social infrastructure).

Priorities for Urban Planning in GWS
Of the above issues, the latter four have long been recognised by urban planners as significant determinants of human health that planning can seek to influence. Not

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[1] Greater Western Sydney is defined as the 14 local government areas in the western region of the Sydney metropolitan area, these being Auburn, Bankstown, Baulkham Hills, Blacktown, Blue Mountains, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith (members of WSROC - Western Sydney Regional Organisation of Councils), Camden, Campbelltown and Wollondilly (members of MACROC – Macarthur Regional Organisation of Councils).

[2] Accepting that "local" production enhances food quality, affordability and supply.

surprisingly, the Metropolitan Strategy recognises and considers these four to some extent (with the exception of local climate). The first three have only more recently received attention in urban research and planning and are less well addressed in the Strategy.

In broad terms, this HIA emphasises the importance of **physical activity, social connectedness** and **access to healthy food** in any planning or development activity for GWS undertaken through the Metropolitan Strategy, or other allied planning processes.

The Sydney Metropolitan Strategy initiatives in respect of new public transport infrastructure and mixed use development patterns can facilitate higher levels of incidental physical activity. Getting to-and-from rail or bus nodes on journeys between home and various destinations provides a regular dose of physical activity. Also, if there are a number of local destinations (shops, recreational and cultural facilities, open space, civic spaces, etc) within a walkable distance in pleasant environments, this also encourages regular physical activity.

However the location of employment for the overall population is a crucial factor. While mixed use developments involve a degree of local employment, it is the *quantum and diversity* of employment that is provided within reasonable commuting time (generally considered to be 30 minutes or less[3]) that can have a significant impact on levels of incidental and recreational physical activity, as well as the amount of time that can be spent with family and friends (ie social connectedness), by the population overall.

In this respect the HIA supports a principal goal of the NSW State Plan which aims to provide a higher proportion of employment in identified "centres" in the region. The HIA also argues for at least the maintenance of the current level of employment "self sufficiency"[4] for the region (70%), and if possible an increase on this figure.

In addition to the impact of availability and accessibility to employment noted above, new infrastructure for public and "active"[5] transport, mixed use development forms and quality civic spaces also can benefit social connectedness. However there are other significant influences on social connectedness that are not addressed in the Metropolitan Strategy. The provision of *social* infrastructure is crucial and this is highlighted by past planning and development experience in North Western Sydney[6]. Social services and facilities not only meet specific needs, but also facilitate social connections. Social infrastructure includes a wide range of services and facilities including neighbourhood centres, early childhood services, youth services, cultural facilities, recreational facilities and activities, etc. Social infrastructure has historically been under provided in the GWS region, in comparison to eastern Sydney.

Early childhood services (which include childcare centres, post natal home visiting, Family Support services, Supported Playgroups, speech pathology, etc), have been shown to be

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3   The generally accepted benchmark for the average amount of time people travel per day is 1 hour, known as the Marchetti constant, which applies across broadly all cultural and economic contexts.

4   Employment self sufficiency refers to the quantum of employment located in the region as a proportion of the numbers of people in the workforce. Therefore a employment self sufficiency of 75% means that for a workforce of 10,000 in the region, there are 7,500 jobs in the region, though not necessarily all held by people from the region.

5   Bicycle ways, footpaths, pedestrian malls, etc.

6   See *"What and When?" Community Services in Rouse Hill Development*, Rouse Hill Community Planning Team 1999

particularly important in that they can identify social and emotional development issues which, when addressed early, reduce the negative health and wellbeing impacts on the individual and the costs to the community[7].

The value for health of an affordable and ready supply of healthy food is self-evident, but this is particularly the case for people on lower incomes, as research indicates that this group suffers from poorer levels of nutrition and overall health. A crucial factor not often adequately considered in urban planning is a mechanism for allocating land for, and otherwise encouraging, local retail supply of healthy foods and ensuring that transport services support these outlets. The complaint that 'big-box' shopping centres are "killing the local shops" is often heard, but there is little done to redress this. The economic imperatives supporting large scale retail outlets have not been challenged by a health and wellbeing analysis, which may favour local, small scale retail outlets in certain circumstances.

Increasing international attention has been paid to the value of agricultural production in urban regions. Up to 40% of the most productive agricultural land in the Sydney basin is within the two Growth Centre areas[8], raising concerns that residential growth will compromise the availability of healthy food. While both the Metropolitan Strategy and the NSW State Plan recognise the economic and environmental significance of agriculture in the region, neither document currently acknowledges the significance of peri-urban agriculture in terms of the health and wellbeing of the population of the whole of the Sydney region.

The anticipated climate changes resulting from global warming are also a factor to consider, highlighted by the recent experience of drought across Australia. For a period during this drought, 80 – 100% of some lines of fresh leafy vegetables in the Sydney market were sourced from the Sydney Basin[9]. Not only are there fertile soils in the region, but GWS also has more reliable rainfalls that other fresh food growing areas supplying Sydney.

This latter point highlights that strategies to address potential health impacts can also assist in meeting other sustainability goals, such as reducing vehicle kilometres travelled (VKT) and/or vehicle greenhouse gas emissions, increasing the self-sufficiency of cities and regions and minimising the city's environmental 'footprint'.

Health and Wellbeing Equity
The HIA identified significant existing health inequities in the region, broadly reflecting socio-economic characteristics of the population. How population growth is managed is crucial to avoid exacerbating these differences and could potentially assist in ameliorating them. Specific recommendations in this respect have been made regarding transport disadvantage, housing affordability, education and employment opportunities, open space and access to healthy food.
At a broader level, the anticipated proportion of new population that is accommodated in new greenfields developments verses infill development, is a crucial consideration in addressing these inequities. New development has the potential to do things better in terms of urban design, amenity and environmental conditions. But if these improvements are made without any benefit to existing communities, then geographic inequities in health will

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7   See the OECD review of Early Childhood Education and Care which includes a benefit/cost analysis of Early Childhood education: Cleveland, G and Krashinsky M: *Financing ECEC Services in OECD Countries*, Uni of Toronto, January 2003.
8   Personal communication – Dr Frances Parker
9   Personal communication – Mr David Mason

be worsened. Some detail is provided in the Metropolitan Strategy and in the planning for the Growth Centres regarding standards of urban design and amenity for greenfield sites, but outside of the three identified regional centres, little is said about design, environments or amenity for infill developments. In analysing the impact of various proportions of greenfields versus infill population distribution, a higher infill population is generally favoured, although this is qualified by recognition that greenfields development has the greater potential, in not being constrained by existing development, to implement better urban form.

In the UK there has been much recent work on social inequities, specifically what is identified as "social exclusion", which has been described as *"a combination of linked problems such as unemployment, low skills, poor housing, family breakdown and high crime rates, which lead people or places to be excluded from the mainstream"*.[10] This linking of various issues – employment, housing, transport, family support, etc – is borne out by this HIA, and highlights the need for coordination, or 'joined up solutions' to address these linked up problems.

Implementation

The range and complexity of the HIA Recommendations raises the question of what would be appropriate and adequate resource levels and coordination structures to implement them. The NSW State Plan outlines a structure for delivery of the State priorities, which relates principally to the responsibilities of State agencies. However, the processes for consultation and partnership development between these agencies and other stakeholders are not specified in the State Plan, but left to the agencies themselves to determine. The Metropolitan Strategy indicates that much of the detail for implementation is to be developed in subsequent or allied planning at the sub-regional level or for centres and transport corridors.

In this context what can be recommended in respect of implementation processes is that they should demonstrate a number of effectiveness parameters, these being that there is:

1.   **An appropriate delineation of responsibility between agencies** (i.e. NSW State Government Executive, State Government agencies, Local Government, ROCs, non-government agencies and business);
2.   **A process to develop priorities and commitment to them;**
3.   **Development of, and commitment to, appropriate timetabling of infrastructure;**
4.   **An appropriate longevity of process;**
5.   **An underwriting of risk in infrastructure funding;**
6.   **Effective community input and transparency; and,**
7.   **A process of ongoing monitoring and reporting at a regional level.**

Planning for health and wellbeing outcomes and implementation of these recommendations will rely upon cooperation between the various levels of government. The Metropolitan Strategy recognises this and identifies a number of consultation, research and planning activities for local government. It is also necessary that objectives and indicators are developed for policy inclusions for planning processes of various NSW Government

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[10]   This description was included in remarks made at the Housing Affordability Conference, Sydney 2005, by Dr Karen Lucas, Transport Studies Group, University of Westminster and advisor to the PM (UK).

agencies. To this end the NSW government should develop greater knowledge and informed policy on the links between health, wellbeing and urban development.

Concluding Remarks

The findings of the HIA to a large extent support what is widely acknowledged as good planning practice, while providing new information and a different rationale for maintaining and refining these practices. Also, as noted above, and in some of the Recommendations, the HIA supports aspects of the Sydney Metropolitan Strategy, the NSW State Plan (which was released subsequent to the preparation of this HIA) and Growth Centres planning.

In the Metropolitan Strategy and the NSW State Plan there are specific targets set for some issues of urban planning relevant to health and wellbeing, including air quality, transport provision, accident prevention, use of open space, engagement in cultural activities. The HIA recommendations generally support and/or seek to apply these targets to the GWS region (see Recommendations).

However, overall there are fewer existing NSW Government commitments with regard to social connectedness and social infrastructure. The importance of social connections and the services provided at a local level for health and wellbeing, would appear to have been relatively overlooked in current Metropolitan and State Planning.

Accordingly, the HIA particularly emphasises research on the significance of these issues for the health and wellbeing of the population and encourages the development of strategies for the delivery of appropriate levels and types of social infrastructure and service delivery.

RECOMMENDATIONS

From the analysis emerging from this HIA a number of recommendations are proposed for the NSW State Government in management of GWS's growth through the Metropolitan Strategy and allied plans (including the Growth Centres Planning, Sub-regional Planning, Regional Centres Planning and Corridors Planning). These recommendations, in the view of the project partners, provide the best opportunities for maximising good health and wellbeing of the region's residents.

These recommendations are grouped according to urban dimensions (transport, urban form, etc) to directly inform urban planning practice. The health determinants that each of the recommendations are intended to affect, are indicated by a code:

physical activity	*~ PA*	*social connectedness*	*~ SC*
access to healthy food	*~ HF*	*air quality*	*~ AQ*
local climate	*~ LC*	*accidents and injury*	*~ AI*
employment	*~ E*	*access to services and mobility*	*~ ASM.*

1. Economic Development and Employment

1.1. Maintain or increase the employment self-sufficiency of the GWS *(currently at 70%, but which has in the past decade been as high as 80%).*   *~ E, SC.*

1.2. Meet the target of 30% of employment being located in the regional centres of GWS, and increase the proportion of GWS residents who can access a major centre in the region within 30 min by public transport to 80% *(the level for Sydney overall in 2005). This is an existing NSW Government target for regional centres (ie outside the Sydney CBD).*   *~ E, SC, PA, AQ.*

In order to achieve this goal it is also recommended that the NSW Government:

1.2.1. Establish areas of higher order employment in proximity to the South West Growth Centre (for example a business or technology park).   *~ E, SC, AQ, ASM.*

1.2.2. Support higher order employment and diversification of the occupational structure in GWS through creating targets for regional growth in banking, finance, business services, health and medical, IT, cultural industries, research and education and other knowledge based employment and strategies to encourage the location of these industries in GWS. *Note this is same commitment as in the State Plan for rural and regional NSW generally.*
~ E, SC, ASM.

1.2.3. Conduct an audit of skill deficits in areas of high unemployment and increase participation in vocational and tertiary education, set a target for tertiary education for the GWS region to address these deficits and provide educational opportunity for disadvantaged areas. *Participation in Vocational Education and Training of 16% by 2016 is a target of the NSW State plan.*
~ E, SC.

1.2.4. Set targets for, and monitor, reductions in unemployment in identified disadvantaged suburbs in GWS.   *~ E, SC.*

2.   Transport Services and Infrastructure

2.1. Set the goal for public transport modal shift to be 30% of trips to work in GWS to be on public transport by 2016. *The NSW State Plan proposes a figure of 25% for journey to work on public transport for the State as a whole, while the 30% target was identified in the NSW Government's Action for Air plan (Action 1.2) as being necessary to achieve the Government's VKT reduction targets for Sydney as a whole*
~ SC, PA, AI, AQ, ASM.

In order to achieve this goal it would be necessary for the NSW Government to:

2.1.1. develop realistic goals at the sub-regional level, acknowledging that different areas will have different capacities to reach this goal;

2.1.2. ensure that public transport to new employment centres is provided in a timely manner;

2.1.3. ensure that public transport links are provided from the Growth Centres to regional centres such as Penrith and to centres of employment outside GWS, including Sydney CBD and Macquarie Park, in a timely manner;

2.1.4. ensure that the NW and SW rail links are constructed within announced timeframes and are extended to Vineyard on the Richmond line and to Bringelly on the Leppington line;

2.1.5. make a commitment to the Parramatta - Epping rail link; and

2.1.6. implement within the announced timeframes the remainder of the Metropolitan Rail expansion program, bus corridors and the rail clearways program, as outlined in the Urban Transport Statement;

2.2   Set a target for active transport only (ie walking and cycling only, not connected to accessing public transport) at 5% for GWS by 2017;   *~ SC, PA, AI, AQ.*

2.3   Set targets and develop a mechanism for, and monitor, yearly reductions in growth of VKT and / or yearly reductions in fuel consumption for GWS;   *~ PA, AI, AQ.*

2.4   Set five year targets for the continuous growth in the proportion of freight transported by rail;   *~ AI, AQ.*

2.5   Provide greater investment in amelioration of environmental impacts of rail enhancements at the local level;   *~ AI, PA, AQ.*

2.6   Set a target for active travel to schools in the Growth Centre Areas to be at least 30% of trips to school, this being equal to 1995 levels. Existing and new schools in both the established areas and greenfield development sites should develop programs for active travel to school;   *~ SC, PA, AI.*

2.7   Implement Action for Bikes 2010, particularly providing increased funding to off-road cycleways and ensure their construction and effectiveness as viable access routes;   *~ SC, PA, AI, AQ, ASM.*

2.8   Develop a cycling strategy that includes all public transport corridors to compliment all new and existing motorways;   *~ PA, AI, AQ.*

2.9   Identify and address transport disadvantage in existing disadvantaged suburbs as a matter of urgency;   *~ SC, ASM.*

2.10   Set targets for reductions in road fatalities in GWS at 0.7 per 100 million vehicle kilometres travelled by 2016. *This is the target set in the NSW State Plan for the state as a whole.*   *~ AI.*

3.   Social Infrastructure

3.1.   Ensure that social infrastructure is provided to the Growth Centres at the time that residents move in. Special attention needs to be paid to the provision of early intervention and early childhood services and cultural facilities, in light of the inattention to these services in past planning and the relative underinvestment in them in the GWS region as a whole;   *~ SC, PA, AQ, ASM.*

3.2.   Develop a funding model for the delivery of social infrastructure that includes a nexus between population growth and service delivery and is underwritten by the NSW government;   *~ SC, ASM.*

3.3.   Ensure that land is identified and allocated/zoned for community use prior to residential and infrastructure development. This would necessitate ensuring that new suburbs are developed sequentially with due attention to links with existing communities and social infrastructure. *This commitment is already given in planning for the Growth Centres with regard to land for schools, but should be extended for other forms of social infrastructure;*   *~ SC, PA, AQ, ASM.*

3.4. Conduct an analysis of existing social infrastructure and service deficits in established areas, the likely services requirements of new residents in these areas, and the best means of increasing service levels to meet these needs;   *~ SC, ASM.*

3.5. Set a target for the visitation and participation in the arts and cultural activities, and recreation and leisure facilities to be increased in GWS by 10 per cent by 2016. *This is the target set in the NSW State Plan for the state as a whole, extended to recreation and leisure facilities;*   *~ SC, ASM.*

4.   **Urban Form and Nature**

4.1. Create shaded and sheltered pedestrian and civic environments within a revegetation policy aimed at ameliorating the impacts of the heat island effect and anticipated climate change, as well as assisting in the prevention of skin cancers;
         ~ SC, PA, LC, AI, AQ, ASM.

4.2. Ensure that development in the Growth Centres and new development in other greenfield and established areas closely follows planning guidelines in existing NSW Government Policy, particularly with regard to walkability, pedestrian safety and mixed use design, as outlined in *Integrating Land Use and Transport – Guidelines for Planning and Transport* and *Guidelines for Walking and Cycling* (both prepared by the Department of Planning) and the National Heart Foundation's *Healthy by Design,* and *Supportive Environments for Physical Activity (SEPA);*   *~ SC, PA, ASM.*

4.3. Conduct an audit of public open space in GWS in terms of quantity, quality, equity of provision and utilization and set a target for increase in use of parks and open space of 20% by 2016 in GWS. *This is the target set in the NSW State Plan for the State as a whole;*   *~ SC, PA, ASM.*

4.4. Set a target of at least 10% of the land in the Growth Centres and other greenfield sites to be allocated to public open space;   *~ SC, PA, ASM.*

4.5. Develop and implement measures to protect and improve existing open space in established areas to compensate for densification pressures likely to occur in these areas, with particular attention to the needs of children living in medium or high density housing;   *~ SC, PA, LC, ASM.*

4.6. Ensure that LEPs and DCPs support a mix of facilities (e.g. cafes, shops, cultural, recreational and community facilities) within precinct centres;   *~ SC, PA, ASM.*

4.7. Provide more public civic spaces and ensure that these spaces are designed, where possible, in collaboration with existing and/or new residents through Community Cultural Development processes;
         ~ SC, PA, ASM.

4.8. Develop strategies to achieve a target of 15% of new housing as affordable to cater for lifecycle housing changes and a demographically mixed community. *This is the current South Australian position addressing the crisis in affordable housing policy in Australia.* In order to achieve this goal it is also recommended that the NSW Government;   *~ SC.*

4.8.1.   Ensure that Community Housing providers are included in large scale housing developments in the Growth Centres either through property purchase by the Department of Housing and /or a "Bonnyrigg Redevelopment style" model which includes a community housing provider and the proportion of affordable housing; *~ SC.*

4.9.   (In recognition that Sydney is reaching the limits of growth) commence planning for the Sydney Basin beyond 2030, particularly investigate opportunities for inter-regional land-based transport infrastructure and decentralisation out of the Sydney Metropolitan Area.

5.   Access to Healthy Food

5.1.   Acknowledge that access to fresh affordable food is a basic human right and identify food insecurity levels for LGAs/suburbs within GWS; *~ HF.*

5.2.   Address the issue of food insecurity with greater support given to the establishment and maintenance of local shops, food co-operatives and improved public transport.
~ HF, E, ASM.

This could involve:

5.2.1.   supporting partnerships with local producers (such as the Hawkesbury Harvest cooperative) and coordination between Local Governments, the Department of Health, Universities, community sector agencies and business; and

5.2.2.   integration of local retail food supply opportunities in LEPs and local transport plans (including the development of new planning instruments if necessary), for both new residential release areas and adjacent established areas.

5.3   Commence a GWS Rural Lands Review, documenting existing agricultural land in the Growth Centres and adjacent areas and the relationship between agricultural land to the sites of planned residential, infrastructure and commercial development. *The Rural Lands Review is a current NSW Government commitment;* *~ HF.*

5.4   Pursuant from above recommendation, develop long term strategies to protect land currently in agricultural production; *~ HF, E, AQ.*

5.5   Set targets for sustainable production of appropriate foodstuffs within the Sydney region at year 2000 levels, annually adjusted to accommodate population increases.
~ HF, E.

6.   Environment and Local Climate

6.1.   Set and periodically review targets for air quality in GWS to comply with or exceed National Air Quality Standards through continued efforts to reduce ozone concentrations and particulate pollution, particularly through measures to control diesel engine emissions and to increase public transport use (see above); *~ AQ.*

6.2.   Ensure that the air quality monitoring network in GWS is an accurate reflection of existing and future population exposure to ambient air pollution, particularly

regarding assessment of the localised impacts of ambient air pollution at existing and proposed centres, sites of major brownfields developments, along arterial roads/transport corridors and for new residential release areas; *~ AQ.*

6.3. Halt and reverse loss of vegetation in the GWS region, with emphasis on sensitive development of greenfield sites, urban environmental amenity in the design of development in the Growth Centres and revitalizing and improving environments in redevelopment of established areas; *~ AQ, PA, LC.*

6.4. Expand and accelerate the revegetation strategies envisaged for the Growth Centres through;

    6.4.1. bringing forward the revegetation of Core Riparian Zones (as described in Growth Centre Development Code); *~ AQ, LC.*

    6.4.2. ensuring there are adequate buffer zones between agricultural lands and residential areas; *~ AQ, LC.*

    6.4.3. ensure that native vegetation is retained in these buffer zones and undertake revegetation where necessary to develop fringe conservation and recreation areas for the new population; and *~ AQ, PA, LC.*

    6.4.4. re-establishing scattered tree cover across all flood prone land. *~ AQ, LC.*

6.5. Expand and accelerate the Greening Western Sydney Program through:

    6.5.1. bringing forward implementation of corridor revegetation works to ensure that benefits are felt sooner; *~ AQ, LC.*

    6.5.2. re-establishing scattered tree cover outside of core corridor areas (ie in agricultural or recreational settings); and *~ AQ, PA, LC.*

    6.5.3. investigate options to broaden Greening Western Sydney to other state government land parcels. *~ AQ, LC.*

7.   Information Needs and Capacity Building in Planning

7.1. Establish a Sydney Metropolitan Health and Urban Development research facility;

7.2. In partnership with academic institutions and the CSIRO, conduct further research in the following areas:

    7.2.1. quantification and monitoring of incidental physical activity levels in conjunction with public transport for GWS; *~ PA, SC, AQ.*

    7.2.2. the Heat Island Effect in Sydney, in conjunction with modelling of Climate Change/Global Warming, including the potential for amelioration through revegetation; *~ AQ, LC.*

    7.2.3. a rural lands review and setting of agricultural production sustainability targets;

~ HF, AQ, LC, E.

    7.2.4. ambient air pollution levels in various parts of the region and urban environments, such as transport corridors, residential areas, etc; *~ PA, SC, AQ, ASM.*

    7.2.5. existing transport disadvantage; *~ PA, SC, E, ASM.*

    7.2.6. benchmarks for visitation and physical activity in parks and open space; *~ PA, SC, ASM.*

    7.2.7.   measures and targets for regional business growth;   *~ E, SC, ASM.*

    7.2.8.   strategies to reach target of 30% of employment being located in regional centres;

                             ~ E, SC, AQ, ASM.

    7.2.9.   quantification of costs of disconnected or "leapfrog" development;

                             ~ PA, E, SC, ASM.

    7.2.10. identification of a realistic target for tertiary and vocational education participation and levels of achievement of GWS residents;   *~ E, SC.*

    7.2.11. new ways of providing new open space to established areas and major infill developments – e.g. rooftops, reclaimed sites;   *~ PA, SC, AQ, ASM.*

    7.2.12. identification of appropriate targets for reductions in unemployment in disadvantaged suburbs in GWS;   *~ E, SC, ASM.*

  7.2   Ensure that existing guidelines and procedures for various urban planning already developed by the NSW Department of Planning (*Integrating Land Use and Transport – Guidelines for Planning and Transport* and *Guidelines for Walking and Cycling),* other NSW government departments and the National Heart Foundation (*Healthy by Design,* and *SEPA: Supportive Environments for Physical Activity)* (see Recommendation 4.2) are widely promoted and practiced;

                             ~ PA, LC, AQ, SC, ASM.

  7.3   Develop new guidelines for;

    7.3.1   encouraging quality food availability and affordability at a local level;

                              ~ HF, ASM.

    7.3.2   encouraging mixed use development;   *~ PA, E, SC, ASM.*

    7.3.3   plantings to provide sheltered pedestrian environments and revegetation; and,

                           ~ PA, AQ, SC, LC, ASM.

    7.3.4   improving public awareness of travel-to-school patterns for physical activity.

                             ~ PA, SC.

8.   Partnerships with other Levels of Government

  8.1. develop partnerships with other levels of government for the implementation of these recommendations, with particular attention to processes of sub-regional planning and local planning processes not otherwise mentioned above.

WSROC October 2007

1   INTRODUCTION

1.1   Health impact assessment, urban environments, society and health

Health Impact Assessment (HIA), whilst a relatively recent phenomenon, has common theoretical foundations with other approaches to the management of the health of populations. Within this framework, health is understood holistically, as a product of environmental, social and economic conditions, not just as a question of the presence or absence of disease, nor as simply being an issue of individual concern. This understanding of health has been evident within the various approaches to health promotion that have arisen over the last three decades, including 'primary health care', 'healthy cities', 'health for all' and 'the new public health'.[1-3].

Public Health as a discipline, was itself founded in a contextual understanding of health, where poor urban environmental conditions (i.e. dirty water, poverty and overcrowding) and war and famine came to be understood as the breeders of disease.[4, 5] Subsequently, recent research into health inequalities has shown clearly that the health gap between rich and poor can only be understood and reduced by addressing wider issues, including wealth distribution, welfare provision and social and economic inclusiveness.[6]

In terms of assessing the impact on health and wellbeing of development in a city such as Sydney, a contextual understanding necessitates drawing on wide ranging and cross-disciplinary research. This research presents clear evidence that aspects of urban development are creating unhealthy environments. For example, increasing reliance upon individually owned cars for journey to work and other daily transport needs, has obvious links with levels of air pollution. In Sydney air pollution is responsible for between 640 and 1440 deaths a year and thousands of hospital admissions.[7] Reliance on car travel also has links to accident rates, stress (related to traffic congestion) and increasing commuting times. In the United States, research into car dependency, urban sprawl and low public transport use, is showing strong links between these trends and health problems of affluent society such as obesity and cardio-vascular disease.[8, 9] These observations seem highly relevant for the sprawling, car dependent region of Greater Western Sydney (GWS). In terms of health equity, there are parts of GWS where people find it hard to access healthy affordable food and basic services.[10, 11] Analysing these types of issues can show ways in which new development and transport infrastructure could reduce existing disadvantage.

HIA is a tool that has been used for the analysis of potential health impacts that may result from physical changes to the environment and/or the provision of services or amenities (such as construction of a road or shopping centre, for example) or from the implementation of a policy (such as criteria for access to material support, for example).

1.2   What this Health Impact Assessment does and its constraints

This HIA estimates the effects on population health and wellbeing of planned population growth and urban development in GWS[11] over the next twenty five years. During this time the

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[11]   Greater Western Sydney is defined by 14 local government areas in the western region of the Sydney metropolitan area, these being Auburn, Bankstown, Baulkham Hills, Blacktown, Blue Mountains, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith (members of WSROC - Western

population of Sydney is expected to increase by 1 million people, 600,000 of whom are expected to settle in GWS, bringing the city's population to 5.5 million. This population increase will be accompanied by large scale development of housing, transport, employment and social infrastructure – all changes that can potentially affect health and wellbeing not just of new residents but people living across the entire region.

In order to manage these changes, the NSW Government, through its Department of Planning, prepared the Sydney Metropolitan Strategy [13] (henceforth referred to as the "Strategy") and initiated a number of planning and management processes for various parts of the city, which may continue for some years[12]. The Strategy is not, nor is it meant to be, a 'plan' for the city's development. There are some geographic elements, principally the determination of the sites for new residential and parklands development and the identification of the most significant centres and transport corridors. The Strategy also has some specific commitments or goals, such as components of transport infrastructure, along with some quantified 'targets', including the population increase cited above. But overall the document presents a strategic vision for the city's development, hence its title, leaving the detailed planning to subsequent, discrete processes, including the Growth Centres[13] planning, sub-regional planning, regional centres planning and transport corridor planning.

The Strategy is the principal document examined through this HIA. The HIA assesses the potential impact on health and wellbeing if residential, employment, transport and social infrastructure developments were to proceed in GWS as proposed in the Strategy. The impact on health and wellbeing of other possible development scenarios are also considered, for instance, if housing development in new release areas (greenfield development) is more or less than predicted. In addition, the HIA assesses the impact on health and wellbeing of delays in new transport infrastructure, that is, if the planned new train lines and bus routes are not delivered in a timely way, or at all.

Finally, this HIA has an equity focus. Metropolitan Sydney exhibits areas of marked difference in socio-economic status of its residents, not just between the east and west of the city, but also within GWS. Inequities in health status largely mirror this pattern. It is important that urban plans acknowledge and ameliorate these differences in seeking to ensure that citizens of the city have equal opportunity for education, employment and engagement in society and culture. An individual's health and wellbeing is strongly impacted by these opportunities[14] and so this HIA is intensely interested in the role of planning in addressing the increasing social polarization that has characterised the growth and development of GWS in recent years.

Consequently, the HIA provides some recommendations for consideration in the review, implementation and monitoring of the Strategy. But more importantly, in focusing on the

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Sydney Regional Organisation of Councils), Camden, Campbelltown and Wollondilly (members of MACROC – Macarthur Regional Organisation of Councils).

[12] The range of planning and management processes established that will influence the development other than the Strategy include, the NSW State Plan, the NSW State Infrastructure Plan, Sub-regional planning, Growth Centres planning, Regional Centres development planning and a proposed Rural Lands Review. The NSW Government has also made specific commitments to Western Sydney outside of formal plans.

[13] The two Growth Centres are the areas of land not currently developed for urban land uses which are identified for major new populations, of the order of 400,000 people in total.

[14] WHO social determinants of health relating health status to social gradient issues, poverty and employment.

Strategy, the HIA has been able to draw the attention of the various stakeholders in the development of the region, to the link between urban form and amenity and health and wellbeing. In so doing the HIA seeks to foster broader understanding, ongoing cooperation and improved planning by these agencies. Urban Development is an emerging agenda with NSW Health, but health and wellbeing issues are not just the responsibility of this Department alone.

The HIA is largely a desktop analysis of relevant research, planning and policy development with respect to urban management and health issues in contemporary cities elsewhere in the developed world, but applicable to Sydney and GWS. Research in Sydney into the links between urban development and health and wellbeing is relatively undeveloped. The collection of specific evidence and data on Sydney itself with regard to health, wellbeing and urban development, is a task beyond the resources of this project and would take such a considerable time that the opportunity to influence policy would be lost. However, this does mean that the veracity and relevance of the issues and arguments presented in the HIA can be legitimately challenged. Accordingly, the recommendations presented in this Report are qualified, and more research is called for.

There are considerable difficulties in drawing quantitative conclusions regarding health, wellbeing and urban development, given the lack of independent variables in the analysis or any opportunity for comparison with a control. Each city is unique and its development continuous and irreversible. This being said, on an international scale, research into these issues is growing, despite these constraints, in recognition that this work is needed for the planning of sustainable and equitable cities and regions. Some examples of urban development Health Impact Assessment, or other health related analysis of urban environments and planning, are cited in this report.[15]

1.3   The Development of the HIA on the Sydney Metropolitan Strategy

From 2002 a partnership was developed between WSROC and the Area Health Services in the Western Sydney region, these being the Western Sydney AHS the South Western Sydney AHS and the Wentworth AHS. This partnership (known as the GWS Health and Urban Development Group) focussed on the need for improved urban planning and coordination for health and wellbeing outcomes.

While the Sydney Metropolitan Strategy was being prepared, the Group decided, with additional financial support from NSWHealth, to conduct a HIA on the Strategy. This decision was made despite the inherent difficulties in assessing impacts on health and wellbeing of implementation of what is largely a very long term vision, because the subsequent, more detailed planning processes will be informed or constrained by the Strategy. The Strategy 'sets the agenda' as it were, for ongoing planning and this HIA reviews this agenda, while seeking to bring knowledge and a health and wellbeing perspective to subsequent planning processes.

To conduct this HIA, the Group formed a Steering Committee with representatives of each of these parties as well as a representative of the Centre for Health Equity, Training, Research and Evaluation (CHETRE), a unit if the University of NSW, which has expertise in the HIA

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[15]   Specifically the Melbourne 2030 Plan, the London Plan and South East Queensland development studies

process. A Reference Group was also formed, with the participation of a wide range of stakeholders in urban development in Western Sydney, including people from the development industry, state government, local government, academic institutions and the community generally. The purpose of the Reference Group, which met at key stages of the process, was to provide input on the significance of the issues analysed and the relevance of the recommendations made.

The HIA represents a strong desire to prevent negative health impacts of development and the cost involved in retrofitting poor or inappropriate urban form. Accordingly it is hoped that this HIA not only speaks to the Metropolitan Strategy, but also informs the development of Sub-Regional Plans, the Growth Centre Area development, Regional Centres planning, transport corridor planning and any Review of Rural Lands.

1.4   Health and wellbeing

This HIA adopts the World Health Organisation's approach to what is meant by 'health' and largely accepts what the WHO identifies as key social factors that 'determine' an individual's susceptibility to disease or infirmity[146]. Health is defined by the WHO as being "a complete state of physical, mental and social wellbeing and not merely the absence of disease or infirmity". While this definition subsumes the term 'wellbeing', we have retained this word throughout the document. This is done in order to re-iterate a commitment to a broader consideration of a healthy human condition, one that includes such issues as social connections, personal fulfilment in employment, avoidance of stress and cultural engagement. We also wish to avoid the common association of the word 'health' with just a disease condition amenable to an individual medical intervention. As noted in the London Plan:

> "A person's health is ….not only linked to age and gender, but to wider factors such as education, employment, housing, social networks, air quality, access to affordable nutritious food, and access to social and public services in addition to health care."[12]

The social determinants of health identified by the WHO are the social gradient, food, transport, stress, social exclusion, work, unemployment, social support, early life and addiction[147]. Urban environments can clearly influence these determinants and accordingly indirectly influence health and wellbeing. The recognition of the causal connection between elements of the urban environment, determinants of health and ultimately health and wellbeing, is the basic tenant of this HIA, and is described in detail below.

This HIA did not adopt all of the WHO Social Determinants for analysis, and has added others.[16] Factors associated with the physical environment, such as clean air and climate, were added since they have long been understood to have impacts upon health. Other determinants such as physical activity, safety and injury were also added as they have emerged as significant aspects of urban environments and lifestyles that affect health and wellbeing. During the "scoping" stage of the HIA the focus was narrowed to a small number of possible determinants and dimensions. The health determinants that were chosen are outlined in Section 1.7 below.

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[16]   In the process of developing the framework for this project, consultations with urban development stakeholders led to a narrowing of health determinants to those most relevant and for which there is most available evidence.

1.5   Urban planning that responds to the imperative for equity

Cities typically show patterns of differentiation based on affluence, along with inequities in services and amenity resulting from geographical, historical and political influences. This HIA is informed by the view that urban planning should acknowledge these inequities and seek to ameliorate them to achieve the standards of service delivery and amenity that all citizens have an equal right to expect. Planning should therefore identify any issues of equity of outcome within the population directly affected by development, as well as any comparative advantage / disadvantage between existing and new residents that may occur as a result of development.

Given the scale of the Strategy, a particular concern for this HIA is equity at a regional level. Sydney's historical development, in growing outwards from the harbour and port, naturally resulted in investment in the inner city region first. Hence, investment in infrastructure and services in the GWS region has, and continues to be, lower on a per capita basis than that provided for eastern Sydney. Past planning decisions to locate 'dormitory' suburbs in Western Sydney, which were designed to service the Sydney CBD, rather than create viable communities themselves, exacerbated this inequity. Although the region has diversified in recent years, 'Western Sydney' came to be associated with generally lower levels of income, education and cultural sophistication, creating a stigma for its residents. This stigmatisation creates problems in attracting some businesses and professionals to the region, which again exacerbates regional inequities.

In 2007 there are also considerable inequities within the GWS region, particularly resulting from new residential development in some fringe suburbs that offer and promote elite lifestyles, involving large houses, semi-rural settings, landscaping and amenities as part of broad-acre and sometimes exclusive developments. Homes in these developments can only be afforded by people on high incomes. In contrast, the region still has significant areas where the housing is lower in quality, smaller and older, much of which was constructed for public housing or as cheap medium density housing (particularly 3 storey walk up flats built in the 1970s to 1990s). In some of these areas large proportions of the population have very low incomes and/or rely upon social security payments.

Parts of GWS also have been the locality for settlement of new migrants who have come to Australia as refugees. Refugees typically have few resources, lower levels of education and often traumatic personal histories. They may take many years to establish social connections and economic independence, during which time they commonly endure significant poverty, relative to the rest of the population.

Again, it is clear that a number of agencies would need to be involved in urban planning if this range of equity issues is to be addressed in the development of the region, which again has implications for implementation of the Strategy.

1.6   The Sydney Metropolitan Strategy

The Sydney Metropolitan Strategy, *City of Cities: A Plan for Sydney's Future*,[13] was released by the NSW State Government in December 2005. The Strategy focuses on the issue of accommodating the projected population growth of 1.1 million people, addressing issues of housing, employment, transport, environment and some social infrastructure. The Strategy is structured around seven strategies, these being:

- Economy and employment

- Centres and corridors
- Housing
- Transport
- Environment and resources
- Parks and public places
- Implementation and governance.

For the designated Growth Centres in the North West and South West, a SEPP has been developed (*State Environmental Planning Policy - Sydney Region Growth Centres 2006*[14]) along with more detailed planning documents. These plans provide some information about planned local centres, including number of residents, housing densities, public transport and roads, education needs, parks, public places, urban form and open space.[15-17] The process of developing these sites is being managed by the Growth Centres Commission.[18] The Strategy also contains a plan for a large conservation and recreation area between the two Growth Centres (i.e. The Western Sydney Parklands).

Figure 1 below, taken from the Strategy, shows the major components of the strategy for the development of Sydney, including major centres, transport corridors, the North West and South West Growth Centre areas, new transport infrastructure and the Western Sydney parklands.

Figure 1: Major elements of the Sydney Metropolitan Strategy
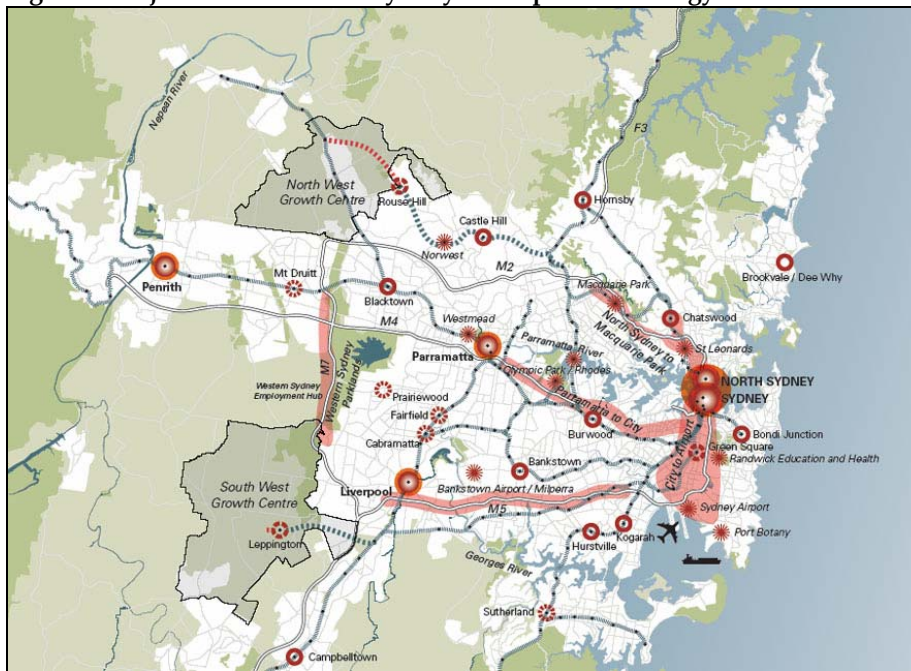
1.7   Analytical framework for the HIA

The HIA analysis has five main structural elements: Health Determinants; Urban Dimensions; Goals; Issues of Concern; and Scenarios.

'Health Determinants', mentioned above, are factors that are acknowledged through considerable research to have an impact on health and wellbeing, such as physical activity, air quality, safety and injury, employment and social connectedness.

'Urban Dimensions' are key aspects of the urban environment including transport, housing, urban form, social infrastructure, which impact on the 'Health Determinants'.

'Goals' (often quantified) are desirable outcomes with respect to 'Urban Dimension' changes that would have an impact on the 'Health Determinants'. Goals identified in this report were adapted and/or justified on the basis of goals adopted in similar planning jurisdictions or were derived from existing NSW government research and policy as outlined in a wide range of documents.

'Issues of Concern' are identified as potential impacts or risks which cannot yet be clearly measured, but need to be highlighted. For example, the social mix in the Growth Centres, or the creation of 'heat island' effects in areas of significantly transformed landscapes (i.e. rural and conservation land converted to high density housing), are considered worthy of highlighting despite a lack of quantification of impact.

The positing of different 'Scenarios' is included to provide a framework for analysis of any potential impact that may occur due to a change to one of the major variables in the Strategy, this being the relative proportions of greenfield and infill development. Details on how these elements of the analytical framework were determined are given below.

1.7.2   Health determinants and urban dimensions

The health determinants chosen for this study are those identified in the Scoping phase of this HIA as the most important determinants, both in the context of the urban environment in GWS and also in that they have been shown in the research literature to have a direct positive or negative influence on health and wellbeing. Accordingly, this HIA does not try to empirically verify the health impacts of these determinants. Such an exercise is beyond the resources of this project, and would take so long that the recommendations would be irrelevant to the planning decisions this project seeks to influence. Rather this study largely accepts that these determinants have health impacts, and identifies potential positive or negative change in the determinants, including, where possible, quantification of the degree of change.

The urban dimensions such as transport patterns, housing, urban form, physical infrastructure (i.e. power and water supplies, roads etc), social infrastructure (i.e. services, such as childcare, family support services, education facilities, health services, cultural facilities, etc) are the direct focus of urban planning, around which the Strategy is structured and its vision expressed. Research indicates, and commonsense dictates, that these factors have impacts upon health and wellbeing, but the relationships are complex, indirect and/or interactive. Health determinants can be affected by these 'urban dimensions', as noted above. Hence the health determinants are intermediaries between urban dimensions and changes in population health risk factors and/or health and wellbeing.

This HIA will assess the potential impacts on health and wellbeing of decisions made with respect to urban dimensions by focussing on the anticipated change in the health determinants which are affected by these urban dimensions. By focussing on the urban dimensions the results will have the greatest relevance for planners and decision-makers.

In the preparation of the brief for this HIA a wide range of urban dimensions and health and wellbeing determinants were considered for inclusion, based on previous research on the health and wellbeing impacts of urban development. A detailed Scoping analysis, in

accordance with HIA standard practice, was made to identify the most important and useful issues to consider [165]. In addition, a range of agencies and stakeholders involved in urban development in the GWS region (i.e. government departments, development interests, local councils, etc) were consulted on their views of appropriate urban dimensions and health determinants for analysis.

The outcome of this analysis and consultation was that few dimensions and determinants were chosen as being:

1) relevant to the GWS region;
2) adequately researched, understood and where possible quantified in some way; and
3) practical to analyse within the resource constraints of this project.

The urban dimensions and health and wellbeing determinants chosen for this HIA are given in Table 1.1 below. The health and wellbeing determinants are clearly influenced by the dimensions and there is substantial evidence for a relationship between the determinants and health and wellbeing (see following chapters).

Table 1.1 Urban dimensions and health and wellbeing determinants

Urban dimensions	Health and wellbeing determinants
• Transport • Urban form and nature • Economic development • Social infrastructure	• Accident and injury • Air quality and climate • Employment • Food access • Social connectedness • Physical activity • Social infrastructure access

1.7.3   Goals and Issues of Concern

The concept of 'goals' was introduced into the analytical framework to give greater structure to the HIA and to provide a basis for giving useful recommendations to planners and policy makers. Many of the planned changes in the Strategy are directional, for example, involving 'improving' or 'increasing' services or behaviours. Other measures are quantified but do not contain detailed information, for example, a statement such as 'there will be X more bus services', but no information about how many people are expected to use the additional services.

It was considered by the HIA steering committee that using a series of goals provided a useful way of measuring some potential health impacts. That is, if a goal is achieved/or not achieved through planned changes, then a specific impact can be expected. For example, if the goal is that 30% of trips to work from GWS are on public transport then it can be quantified how much extra physical activity this will generate across the population (i.e. in walking to and from public transport). Alternatively, in this example, if the goal is not met (e.g. because new public transport is delayed), then it is possible to demonstrate the extent of lost opportunity to increase physical activity.

Goals were selected firstly on the basis that they already existed, either formally or informally, and were judged feasible to achieve. A justification for each goal is included in the relevant chapters. In the first instance the selected goals are ones stated in either:

1) the Metropolitan Strategy;
2) the NSW State Plan (released subsequent to the commencement of this HIA);
3) an Australian or NSW agency; and
4) another comparable Metropolitan Plan.

Where no such goals exist, goals were developed on the basis of existing practice or conditions, with goals set to either maintain the *status quo*, or improve upon it to an achievable degree.

Not all potential impacts of the Strategy are amenable to being assessed through the device of goals. Where this is the case, and a measurable outcome is not appropriate or possible to discern, then the relevant issues or risks are discussed and highlighted. An example of this would be the encouragement of socially mixed communities. There is no detail in the Strategy about mixed communities could be developed, however, there is research to suggest that social mix has benefits for communities. Thus the issue can be raised that social mix should be considered in planning for new communities and population growth.

1.7.4 Scenarios

In addition to analysis of health determinants, urban dimensions, goals and issues of concern, the HIA also considers where new population growth is anticipated to be accommodated, specifically with respect to 'greenfield' (i.e. land previously undeveloped for residential or industrial use) and 'infill' (i.e. previously developed) sites. The reason for focussing on this aspect of the Strategy is that the urban dimensions and goals selected for analysis will be significantly affected by decisions taken to settle new populations in one or other of these settings. For example: greenfield sites require new infrastructure and services, the adequacy and timing of which will affect use patterns and consequently health and wellbeing outcomes. On the other hand, greenfield sites offer the opportunity for development of improved urban environments (with potential benefits for health and wellbeing) that may not otherwise be available in the region. However, quantification (or even estimation) of health and wellbeing outcomes of greenfield or infill development would be difficult if not impossible to determine based upon the very broad strategies for settlement of new populations in these sites, as outlined in the Strategy.

In order to make some assessment of potential impacts of greenfield vs. infill development plans, a 'scenario' analysis was conducted. Various proportions of greenfield vs. infill development were analysed with respect to relevant health and wellbeing determinants. The proportion of greenfield and infill development outlined in the Strategy was compared with two other scenarios with differing proportions.

The three scenarios:
1) As outlined in the Strategy, the proportion of population growth in GWS is anticipated to be 50% in greenfield sites and 50% in infill sites[17].

2) The result of a 'laissez faire' approach to development (i.e. minimal regulation and larger than anticipated release of new residential land) could be expected to result in at least 75% of housing in greenfield sites and 25% in infill sites in GWS.

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[17]   For the Metropolitan area as a whole the anticipated proportions in the Strategy are 35% greenfields and 65% brownfields, but most of the greenfields development is in GWS, producing the proportions for the region cited above.

3) A continuation of recent trends in urban expansion would be expected to result in 25% of housing in greenfield sites and 75% in infill sites in GWS.

It must be emphasised that the alternative scenarios (2 and 3) are not being contemplated by the authors of this report, the NSW Government or any other stakeholders known to the authors. The purpose is to provide a framework for assessment of the potential positive and/or negative impacts of the Strategy's predictions with regard to the relative proportions of greenfields and infill development.

1.8   Approach to the evidence

This HIA draws from a very broad evidence base, spanning the public health and transport and urban planning literatures. A range of sub-literatures are also referred to, including those relating to health inequalities, urban agriculture and social capital. Reference is made to a range of contemporary NSW research concerning the urban dimensions and health and wellbeing determinants. Furthermore, reference is made to three other metropolitan strategies, London, Melbourne and South East Queensland. This section outlines the approach taken to utilising research literature and data.

1.8.1   Health and wellbeing determinant analysis

The health impacts relating to each health and wellbeing determinant are discussed. These impacts relate both to the determinant itself (e.g. how physical activity affects health and wellbeing) and also to the relationship between the determinant and the selected urban dimensions (e.g. how urban form affects physical activity). The literature used in these discussions is selected on the basis of strength of evidence and applicability to the GWS context. Where appropriate, the findings from systematic literature reviews are used. This approach avoids referring to a number of isolated studies, and instead provides a set of well established risks for each health determinant.

Also, wherever possible, NSW data and studies are used to demonstrate the prevalence of particular health risks/issues in NSW or GWS. For example, the health risks associated with Sydney air pollution, or the prevalence of obesity in GWS. This is necessary as "it is important not to uncritically juxtapose overseas urban-health assumptions and policies upon the Australian urban context."[19]

1.8.2   Urban dimensions analysis.

The urban dimensions analysis is in two parts:

1. the current state of GWS development; and
2. proposed changes outlined in the Strategy.

An overview of the current state of development is undertaken for each dimension. This enables a baseline of current development to be established, against which the changes proposed in the Strategy and other scenarios can be assessed. In terms of research, the overview draws substantially from 'FutureWest', (a comprehensive analysis of contemporary urban dimensions in GWS conducted by WSROC)[20] and the associated supporting research documents. In addition, data is used from recent research into urban dimensions and socio-economic disadvantage in GWS.

The changes proposed in the Strategy are discussed, including plans for the new Growth Centres, new public transport provision and the regional parklands. These planned changes are the principal areas where health impacts are assessed.

1.8.3   Other Metropolitan Strategies

Reference is made to three other metropolitan strategies: The London Plan,[12] South East Queensland: Regional Plan 2005-2026 [151] and Melbourne 2030 [152]. These plans and strategies were reviewed to provide a comparison in the way urban dimensions can be managed for health and wellbeing outcomes and, where appropriate, inform the development of goals and recommendations.

1.8.4   Health equity

At a population level, socio-economic disadvantage is associated with health inequities, in terms of average mortality and morbidity rates. [22-24]. Health inequities are caused by a complex array of factors, but can be broadly understood to result from barriers to accessing the conditions that support health and wellbeing.[6, 25] That is, socio-economically disadvantaged people experience barriers to social and economic participation; many also experience barriers in access to transport and to health, social and educational services.

This HIA is particularly concerned with the potential health impacts of urban development on those most socio-economically disadvantaged in the population of GWS. The underlying principle is that health equity involves identifying and eliminating avoidable and unfair risks to health.[26] This means the analysis assesses whether the health and wellbeing of disadvantaged groups will be unfairly disadvantaged or further disadvantaged from proposed urban development, for instance if proposed changes meant disadvantaged locations were likely to lose more public open space than other locations. The issue of 'avoidable risk' is also considered, that is, whether the impacts on socio-economically disadvantaged groups can be changed or reduced in some way. This analysis enables recommendations to be made as to which development patterns and policies should be pursued to obtain the most equitable health outcomes in GWS.

1.9   Major issues

The HIA emphasizes the interrelatedness of various elements of urban planning. For example, a principal finding of the HIA is that the early construction of the rail links to the North West and South West Growth Centre areas is crucial to many aspects of health and wellbeing. Increased rail travel and use of other forms of public transport has a role in improving air quality. The incidental physical activity that public transport users have to-and-from the transport-origin is a significant contribution to their overall activity levels. Train travel can increase the mobility for disadvantaged groups in the population or those without access to a car. Rail and other transport nodes provide a focus for the development of local services, businesses and amenity. Train travel can be less stressful than commuting by car. Hence the construction of major transport infrastructure has impacts on individual health, health and social equity, local amenity, social connectedness, environmental conditions and population distribution.

The major health determinants, and the urban dimensions that affect them are identified as:

1.   Air quality and climate, influenced by transport patterns and urban form;
2.   Accidents and injury, influenced by transport patterns and urban form;

3. Employment supported by economic development, job creation, social infrastructure and transport access;

4. Access to services and mobility, supported by social infrastructure and transport access;

5. Social connectedness supported by social infrastructure, transport access and urban form;

6. Physical activity supported by urban form, social infrastructure, climate amelioration and transport access; and,

7. Quality food access supported by local agricultural production (food quality, affordability and supply) and transport access.

The most significant urban dimensions affecting health and wellbeing would appear to be transport patterns and access and, to a lesser degree, urban form.

It could be argued that economic development, to the extent that this provides employment, should also be considered as important, given the strong association between health and wellbeing and employment and income. However, economic development is uneven in delivering employment to any particular population. Also, these determinants are not independent variables and people who are poor and/or unemployed, may also suffer disadvantage in terms of social connectedness, nutrition, physical activity and live in relatively polluted and harsh environments.

Social infrastructure has historically been under provided in the GWS region, in comparison to eastern Sydney and, accordingly, social infrastructure has been identified as particularly important.

PART A   URBAN DIMENSIONS

The following chapters provide a brief outline of the urban dimensions examined in this assessment with respect to their potential impacts upon human health and wellbeing. This analysis is based upon the key characteristics of these dimensions in Greater Western Sydney and upon the best available and relevant evidence drawn from Western Sydney regional data and research from similar regions elsewhere.

Conclusions and recommendations are not drawn in these chapters. In Part II, Health Determinants are analysed with respect to the dimensions, and issues of concern, appropriate goals and recommendations are developed arising from the potential for urban dimensions to affect health determinants.

2   TRANSPORT

Patterns of transport use have a number of impacts on health and wellbeing, including those relating to air pollution, traffic accidents, access to food and social infrastructure and social connectedness. Active travel (walking and cycling) has clear health promoting value associated with increases in population physical activity. This chapter discusses the current state of transport use and infrastructure in GWS and outlines the changes to transport proposed in the Strategy. The analysis developed in this chapter is used as the basis for the assessment of impacts on the determinants of health and wellbeing (Chapters 7-13).

2.1   Transport in GWS

GWS is a region characterized by reliance on private vehicles for transport and consequent high levels of car use. While some of the inner older suburbs of GWS have reasonable public transport access, most of the region is poorly serviced by public transport. The rail network has not changed greatly from the 1930s and the bus network has poor patronage compared with eastern Sydney.[20, 27] Active transport levels are lower in GWS than in the rest of Sydney, with less people using walking or cycling as a mode of travel.[27, 28]

> "Longstanding concerns in Greater Western Sydney include the lack of adequate expansion in the capacity and extent of the transport networks as the region has grown and the fragmented and poorly utilised private bus networks which exist across the region."[20]

2.1.1   Reliance on Private vehicles and Car Ownership

People in the North West and South West subregions of GWS own more cars and drive more kilometres than people in the rest of Sydney. Car ownership per household is 1.78 in the North West and 1.73 in the South West compared to 1.4 cars per household for all of Sydney. Average VKT per person per day is 26.5km for the North West and 30km for the south West; the average Sydney resident travels 20.3km by vehicle each day.[29]

Across Sydney there has been a trend for increasing car use with growth in annual VKT exceeding population growth each year to 2004.[29] Increases in VKT are comparatively higher in the NW and SW subregions with 1.6% and 2.3% per year compared to 1.4% for all of Sydney, although these figures are close to annual population growth in these regions.[29]

2.1.2   Travel to work

Most work destinations for residents of GWS are within the region, with the destination of journeys to work distributed fairly evenly in thirds, between commuters' own LGA, other GWS LGAs and to other areas in Sydney.[27].

In terms of mode of travel to work there is a higher reliance on private vehicles in GWS (76%) compared to the rest of Sydney (69%). Table 2.1 shows car as mode of travel to work by GWS LGA, either as driver or passenger, with cars use ranging from 62% in Auburn to 84% in Baulkham Hills.

Table 2.1 Mode of travel to work, GWS 2001.

Origin LGA	Car Driver %	Car Passenger %	Total Car %	Train %	Bus %	Total train & bus %	Other mode %
Auburn	54	8	62	30	1	30	7
Bankstown	66	8	74	18	2	19	7
Baulkham Hills	78	6	84	7	5	11	5
Blacktown	67	8	75	17	2	19	6
Blue Mountains	69	7	76	15	1	16	8
Camden	79	6	85	7	1	8	7
Campbelltown	65	8	73	20	1	21	6
Fairfield	68	10	78	14	2	16	6
Hawkesbury	77	7	83	6	1	6	11
Holroyd	64	8	72	19	3	21	7
Liverpool	69	8	77	13	2	15	8
Parramatta	62	7	69	19	4	23	8
Penrith	71	8	79	13	1	14	7
Total GWS	68	8	76	15	2	17	7
Rest of Sydney SD	62	7	69	16	6	22	9

Source: [27]

Train commuting ranges from 6% in Hawkesbury to 30% in Auburn. Work destinations of train commuters are mostly for travelling to workplaces outside the region "particularly to the Sydney CBD and to a lesser extent to key regional centres such as Parramatta, Blacktown, Liverpool and Penrith." [20] Bus and active transport modes are generally minimal as modes of travel to work.

Increased employment self sufficiency in GWS has meant increasing regionally based employment opportunities. At present, for GWS residents 37% of employment is in designated centres, a further 7% is in the Sydney CBD. Other employment locations are dispersed, and hence difficult to serve by public transport: "the established transport networks are not sufficient to cope with the cross-regional and dispersed patterns of commuting which are occurring. This cross-regional transport is dominated by private car use".[20]

Current commuting patterns and employment location in GWS have implications for policies to increase public transport use as a mode of travel to work. This requires:

- more employment needs to be located in the GWS region;
- better cross regional transport links need to be established, and

- employment provision to be focused in designated centres.

2.1.3 Travel within the region

When examining patterns of transport use for trips for all purposes in GWS, car use is very high compared to the rest of Sydney. Around 90% of all trips in GWS are within the region, and most of this travel is by car. On weekdays 71% of trips are by car compared to 53% for the rest of Sydney (Table 2.2). On weekends the proportion of car trips increases with 81% of trips are by car, compared to 68% for the rest of Sydney. For overall travel within the region, public transport, either by trains or buses, is not a significant mode of travel.[20]

Table 2.2 Mode use for all trips purposes on weekdays 2001.

Origin LGA	Car %	Train %	Bus %	Walk %	Other %
Auburn	51	10	2	34	3
Bankstown	74	3	3	19	1
Baulkham Hills	82	0	5	13	0
Blacktown	75	3	3	18	1
Blue Mountains	68	3	4	22	2
Camden	83	0	5	11	1
Campbelltown	73	4	4	18	1
Fairfield	72	2	3	22	0
Hawksbury	82	1	5	11	2
Holroyd	68	4	2	25	1
Liverpool	71	1	5	22	1
Parramatta	58	6	4	31	1
Penrith	76	2	3	18	1
Total GWS	71	3	4	21	1
Rest of Sydney SD	53	5	5	35	2

(Source: [27])

Table 2.3. Mode use for all trip purposes on weekends 2001.

	Car %	Train %	Bus %	Walk %	Other %
Auburn	61	4	3	31	1
Bankstown	81	1	1	15	2
Baulkham Hills	88	0	0	11	1
Blacktown	82	2	2	13	2
Blue Mountains	74	1	0	22	3
Camden	94	0	1	5	0
Campbelltown	88	1	0	9	1
Fairfield	86	1	0	12	1
Hawksbury	92	0	0	6	1
Holroyd	75	3	2	19	1
Liverpool	82	1	3	14	2
Parramatta	72	2	1	24	1
Penrith	83	1	0	15	1
Total GWS	81	1	1	15	1
Rest of Sydney SD	68	2	3	25	2

(Source:[27])

2.1.4 Active transport

The modes of travel used in GWS show that levels of walking vary markedly across LGAs, from very low levels in the mostly outer low density suburbs, to around 20% for other LGAs and over 30% in Auburn. This data alone does not allow conclusions about why some LGAs have higher levels of walking than others. For example the Blue Mountains has similar high levels of walking as is recorded for Parramatta, yet the urban form varies considerably between these LGAs. Factors which influence levels of walking include car ownership levels, aspects of urban form, quality of destinations, public transport provision, and personal preferences.[19] These relationships are discussed in more detail in *Chapter8: Physical Activity*.

What this data does provide is some benchmarks of what could be reasonable levels of walking as mode of travel to be achieved in the new Growth Centres and by the new population in established areas.

2.1.5 Freight transport

Within Sydney freight is increasingly being transported by road vehicles, with currently 85.6% of freight distributed by road. Sydney's freight movements are expected to double by 2020.[13] GWS is the destination for 90% Sydney's container imports, and is the site of many freight generating activities, including warehousing, industrial production and retail.[13] Freight movements are likely to intensify in GWS, given it is the main source of available industrial land in the Sydney basin.

The arterial road network in GWS already accommodates high volumes of freight and commercial vehicle traffic.[20] These vehicles compete with high numbers of cars on highly congested roads. Congestion is likely to further increase and freight movement to increasingly be moved outside business hours to avoid time loss in congested periods.

2.2 The Metropolitan Strategy and transport

Reducing reliance on cars and increasing public and active transport use are prominent objectives of the Strategy, as reflected in these statements:

> "…the Metropolitan Strategy focuses on integrating land use and transport planning to address the increasing number and length of trips taken by individual motor vehicles."

> "The Plan encourages greater emphasis on sustainable transport to meet travel needs, especially walking, cycling and public transport."

> "Sydney's neighbourhoods will have improved local transport with walking and cycling facilities and bus services to major centres. People will be able to carry out more of their trips closer to home, reducing the time taken and cost of longer trips."

The Strategy plans that these objectives will be met through:
- providing new public transport infrastructure and services ;
- improving existing public transport infrastructure and services;
- integrating public transport with support for active travel modes;
- improving cycling and walking infrastructure; and,
- designing urban areas to encourage active travel.

At a spatial level, the main transport initiatives are as follows:

Neighbourhood level
- Walking and cycling infrastructure;
- Integrated public transport/active travel;
- Bus services to link neighbourhoods and town centres to major centres; and,
- Land use planning to encourage people to make more trips closer to home

Subregional level
- Bus corridors with 'fast frequent direct' services connecting centres; and,
- New train services linking Growth Centres to other centres.

Metropolitan
- Cross-city and inter-regional train connections; and,
- Linking suburbs to Sydney City, Port Botany and Sydney airport.

2.2.1   New public transport services

The most substantial new public transport infrastructure will be the construction of two new rail links to service the North West and South West Growth Centres and a new cross Sydney CBD connection. There will also be general capacity and service improvements throughout the Sydney rail system, including GWS lines, which aim to improve public transport access to the main centres and Sydney CBD. In terms of sub-regional linkages between centres, a series of new bus corridors have been planned along with general improvements to the bus system.

Table 2.4 Public transport time line (from the November 2006 statement)

Transport	Estimated Completion Date	Details
South West Growth Centre		
Southwest rail link Glenfield to Edmondson Park and Leppington	2011 – Glenfield to Leppington	- 2 New stations at Edmondson Park and Leppington
Bus services		- Building bus lanes - Improving bus lanes - New buses - Interchange upgrades - Subsidies for early operation of service
North West Growth Centre		
North West Rail Link Cheltenham to Castle Hill, Norwest and Rouse Hill	2015 (brought forward from 2017)	- First stage 2015 Epping to Hills Centre - 3 new stations at Franklin Rd, Castle Hill and Hills Centre 4 trains/hour - Extra trains - 6-8/hour in peak periods - Second stage 2017 Hills Centre to Rouse Hill - All day service 4 trains/hour, 6-8 in peak periods

Extending capacity of Richmond line	2010 – stage 1 2012 – stage 2	- Enabling doubling of peak service to 4 trains/hour between Riverstone and the CBD
Bus services		- Building bus lanes - Improving bus lanes - New buses - Interchange upgrades - Subsidies for early operation of service
Subregional		
Bus priority corridors	2008 (9 corridors serving Parramatta, Liverpool, Bankstown, Strathfield, Burwood and Hurstville.) 2012 for all other corridors (improved bus priority on all corridors)	- Dedicated bus lanes in approaches to busy intersections - Bus bypass lanes - Bus priority traffic signals etc
Norwest-Campbelltown Bus corridors		Strategic bus corridors: Blacktown-Castle Hill, Blacktown-Parramatta, Liverpool-Parramatta transitway, Liverpool-Campbelltown, Campbelltown-Camden, Parramatta-Castle Hill, Blacktown-Wetherill Park
Penrith-Blacktown-Parramatta Bus corridors		Strategic bus corridors: Penrith-Blacktown North, Penrith-Blacktown South, Blacktown-Parramatta
Parramatta-Liverpool Bus corridor		Liverpool-Parramatta transitway
Liverpool-Airport/Port Botany Bus corridor		South West Rail Link Strategic bus corridors: Liverpool-Bankstown, Bankstown-Burwood
Metropolitan (as affecting GWS)		
New rail services to City		From: - Campbelltown/Macarthur - 'The west' - Bankstown - Leppington via Revesby
Harbour Rail Link (extending capacity to cope with new rail links)	2017	
New rolling stock, station upgrades, carriages, signal upgrades		Across system
Rail capacity upgrades		Across system

2.2.2 Location of housing near public transport nodes

The intent of the Strategy is to locate housing near public transport, in transit nodes. Transit nodes are defined as areas within 800m of a rail station or 400m of high frequency bus services

in the morning peak. As yet there is not a definitive plan as to the overall proportions of new housing that will be located in transit nodes. Detail is provided about plans for the next 6 years. Table 2.5 gives proportions of new dwellings located in transit nodes to 2013.[13]

Table 2.5 Proportions of housing to be located in transit nodes to 2013

Area	Total dwellings	Number of dwellings near transit nodes	In Nodes %
West Central Sydney	30,608	20,993	69%
North West Sydney	15,813	9,340	59%
South West Sydney	6,841	6,793	99%

2.2.3 Active transport

The Strategy aims to increase the number of trips made by bicycle and walking. As far as specifically encouraging active transport, the following measures are planned:

- improvements to the walkability of local neighbourhood centres (e.g. good pedestrian access, tree lined streets planned for the Growth Centre local areas);
- location of higher density housing within 400 metre radius of service centres;
- improve local and regional cycling and walking infrastructure to include new routes, rail trails and local facilities;
- improvements to subregional access by connecting local networks and providing access across major barriers (roads, rail, waterways);
- provision of support to local government to undertake:
  - small scale projects to improve pedestrian and cycle access; and,
  - providing high quality, safe local facilities for trips to schools, shops and local facilities.
- provision of a network of recreation trails for walking and cycling, linking centres and parks; and
- implement Travelsmart behaviour change program (to encourage active travel), with a focus on primary and secondary school children travel to school.

2.2.4 Freight

The Strategy contains a number of measures which aim to increase the capacity and improve the efficiency of Sydney's freight network. At present most of these measures are related to further development of the Government's existing freight strategy, rather than definitive plans. For example, aims include developing strategies to determine:

- the land requirements for dedicated hubs to focus freight movements in particular locations;
- preferred freight routes on the road network; and
- measures to reduce the impact of freight movements on the community – noise and emissions.

In addition there are a number of actions concerning assessing and evaluating proposals, including those to:

- improve road links between freight generators and Western Sydney;

- widen the F3 and F5 Freeways, connecting the F3 and F2 and linking the F3 to North Western Sydney and the M7; and,
- identifying and refining the route alignment for possible new freight lines to the main distribution and warehousing growth areas in Western Sydney.

In terms of specific plans around freight movement, the most important measures planned by the Strategy with an impact on GWS are:

- upgrading the metropolitan rail freight network through:
  - constructing the Southern Sydney Freight line;
  - extending the dedicated rail freight network to Western Sydney; and
  - improving the capacity of the Botany freight line.
- protecting corridors for possible freight lines to Western Sydney.

3   URBAN FORM AND NATURE

The term 'urban form' has at least two commonly understood meanings. At one level it refers to the general pattern of development in a city that is determined by the density of development, the distribution of land uses (residential, commercial, industrial, agricultural etc), the amount and location of open space and conservation areas and the network of transport infrastructure and associated development corridors. Analysis of these issues has spawned a field of study variously concerned with 'urban sprawl' and the social and environmental sustainability of the 'footprint' of urban areas.

At a local level the term also refers to features of the urban environment at the human scale such as the nature and scale of buildings, the mix of buildings for different purposes, how pedestrians are accommodated, the location and quality of parks and open space and access to and the barriers created by transport infrastructure. Both meanings of the term are analysed.

How urban form is developed in a city has a major impact on health and wellbeing of the population by structuring people's everyday pattern of physical activity, nutrition, social interaction and exposure to hazards.

The presence of natural places within or on the fringes of urban areas is of particular importance given the high value placed on access to natural areas in Australian society. Parks and gardens, natural bushland, rural areas and areas of broad open space are central to our culture's approach to children's play and development, physical activity generally, recreation and socialisation.

This chapter describes the major features of urban form and nature in GWS and outlines the changes to urban form and nature anticipated by the Strategy.

3.1   Urban form in GWS

Urban form in GWS is characterised by a number of features relating to housing density, transport infrastructure, parklands and the rural/bushland fringes. These include:

- major centres in the region, including the centres recognized in the Strategy, Parramatta, Penrith and Liverpool, but also including other currently significant centres or ones anticipated to grow. These centres include, Blacktown, Bankstown, Campbelltown, Castle Hill and Rouse Hill Regional Centre ;
- major transport corridors, including the M2, M4, M5 and M7 motorways, the Hume Highway, the Great Western Highway, and the Cumberland Highway;
- rail lines and other infrastructure, including the western (Parramatta to Penrith), north western (Blacktown to Richmond), south western (Granville to Campbelltown and Bankstown to Glenfield) and the cross regional link (Blacktown to Campbelltown);
- medium density older suburbs with a mix of flats and detached houses;
- low density suburbs with a mix of older detached housing and redevelopment of detached houses, villas and units;
- sprawling newer suburbs containing almost exclusively large detached houses;
- rural areas in close proximity to urban development (e.g. in the LGAs of Liverpool, Fairfield, Camden, Penrith, Baulkham Hills and Hawkesbury);
- Western Sydney Parklands and other conservation zones within the region and,
- bushland fringe development in the Hawkesbury and Blue Mountains.

In common with many developed countries, land use planning of urban areas in GWS over the past 50 years has been shaped by an assumption of universal car ownership and the separation of residential areas from commerce and industry.[20] Low density dwelling patterns produce greater distances between people's homes and their place of employment and other facilities. Small scale 'strip' shopping precincts have been undermined by large retail shopping centres which, for most of the users of these centres, requires travel by vehicle, usually a private car. Road transport and infrastructure dominates the urban environment and cars are needed to access employment, shops, schools, social services, recreation facilities and the natural environment. (see *Chapter 2: Transport*)

The older 'inner' suburbs, which were initially developed prior to this period, are generally more compact and have had substantial infill development in recent decades. Accordingly, these suburbs generally provide better non-car access for residents to transport and facilities, and this is reflected in lower car ownership rates and higher use of public transport. Table 3.1 and Figure 3.1 show the different characteristics and population proportions in the different subregion types, a model proposed by Randolph and Holloway prior to the development of the Strategy.[18]

Table 3.1 GWS Suburban characteristics by subregion

Subregion	Subregion characteristics	Detached dwellings %	Percentage of GWS	No car households %
Sub region 1 Newest	Higher incomes Aspirational Couples and families	93%	2.1	2.4%
Sub regions 1980 and 1996	Somewhat less affluent than subregion 1 Couple and sole parent families	91.5%	13.4	4.3%
Sub region 3 1970-1980	Well established subs Older population	89%	16.3	6.8%
Sub region 4 1945 to 1970	Aging housing stock Approx 20% households lone parents Lower income	80% trend to infill	32.3	12.7%
Sub region 5 Oldest	Located around main transport routes High numbers of private renters Multicultural core of GWS Poorest in the region	63%	26	16%
Rural fringes: Blue Mountains, Rural Cumberland Plain	Detached dwellings Middle socio-demographics	Most	10	7.3%

(Adapted from [31])

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[18] Note that the Subregions identified by Randolph and Holloway differ from the North West, South West and West Central subregions that have been designated by the NSW Government subsequent to the development of the Strategy. These three sub-regions form the basis of Sub-regional Planning, which is the next phase of planning below the level of the Metropolitan Strategy.

Figure 3.1 below shows the distribution of these 5 sub-regional groupings of suburbs according to age. The areas mapped show the suburb boundaries rather than the built up areas. In some parts of the region (particularly the extremities) this map exaggerates to some degree the extent of the earlier development, which was more restricted than is indicated. The temporal pattern of development can be seen to be a combination of accretion to the existing parts of Sydney along with some 'satellite' developments in the far west (Penrith St Marys) and South West (Campbelltown and Camden). Not shown on this map are the areas of Richmond and Windsor which were also initially developed as satellite settlements.

Figure 3.1 Greater Western Sydney Suburbs by Age
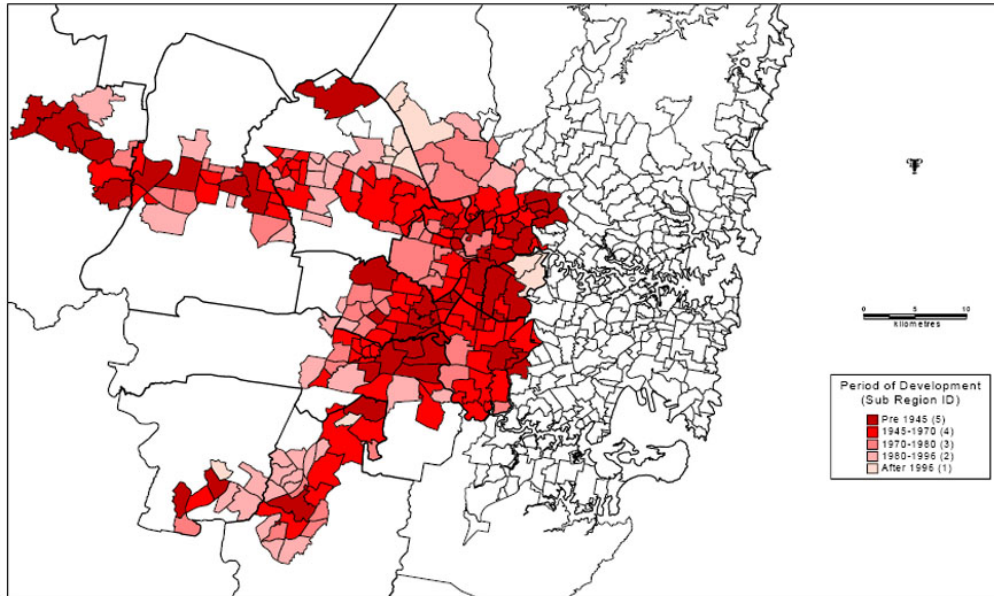
Source [31]

Figure 3.2 below shows the pattern of dwelling type for each of these five sub-regions. While detached housing dominates all sub-regions, the pattern for the older, inner areas (sub-region 5) corresponds closely with the pattern for Sydney as a whole. The trend since the 1950s has generally been for increasingly lower proportions of semi-detached dwellings, flats or units.

Figure 3.2. Dwelling type by subregion
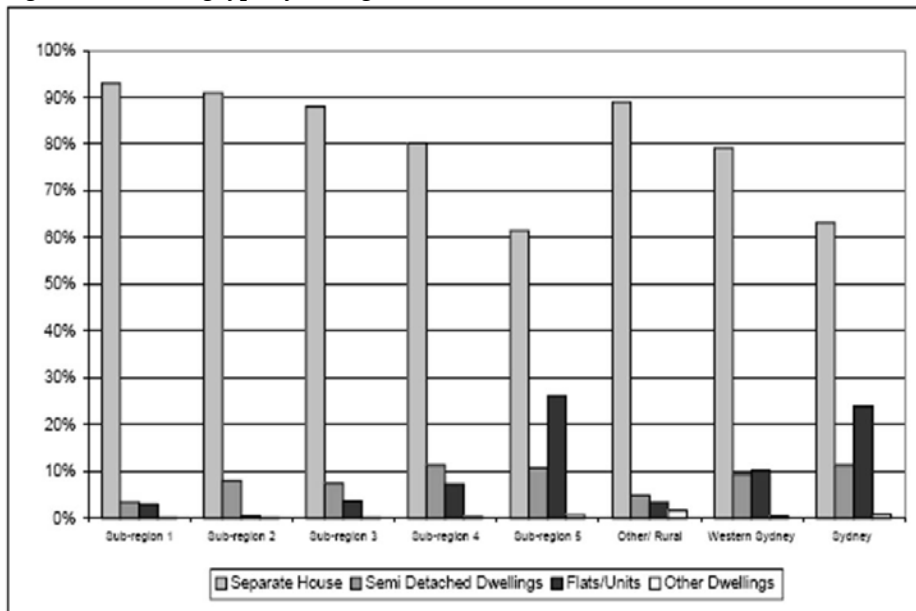
Source [31]

There are higher household occupancy ratios in GWS (3.03 persons per dwelling) as compared to the rest of the NSW (average 2.69), reflecting the predominance in the region of households comprising families with children. Even with a growing trend to lone person households in GWS, which is expected to increase by 15% (compared to 7% for Sydney),[31] it is predicted that families with children will continue to be the dominant household type in GWS over the next 25 years. The 2019 projection for GWS is 46% couples with children, 23% couples without children, 14% one-parent families and 17% lone person households.[20]

3.1.1   Nature

Natural areas, parklands and open space comprise over 60% of the land in GWS, in the form of National Parks, reserves and regional and local parks; with most of this land in the Blue Mountains and Hawkesbury LGAs.[20] The National Parks are effectively on the fringe of the region and hence not readily accessible to people from across GWS. The key issues in regard to open space in GWS are distribution, accessibility and quality, with concern that the region is not equitably provided with quality open space.

Within the region the most substantial allocation of public open space is the Western Sydney Parklands. This constitutes an area 25 times the size of Centennial Park, stretching from Quakers Hill in the north to Leppington in the south. At present, the Parklands is mostly cleared land, in the past largely used for grazing with isolated pockets of native bushland. It is currently the focus of intense 'greening' efforts, with around 700,000 trees being planted since 1992.[32]

The Parklands also contain a number of sporting and recreation facilities, including:
- Nurragingy Reserve;
- Pimelia, Sugarloaf Ridge and Plough & Harrow Picnic Areas (located in the Western Sydney Regional Park);
- Eastern Creek Raceway;
- Western Sydney International Dragway;
- Sydney International Equestrian Centre;

- Sydney International Shooting Centre;
- Blacktown Olympic Park – Softball Centre; and,
- Fairfield City Farm. [32]

3.2 The Metropolitan Strategy and urban form and nature

The Strategy plans for a population increase of 1.1 million for Sydney as a whole, with 600,000 of these people to reside in GWS. Accommodating this population increase is to involve 640,000 new dwellings across Sydney by 2031, with 390,000 of these dwellings in GWS. It is planned that new development will be a mix of infill development and greenfield sites (new release areas), and that the ratio of infill to greenfield to be 70%/ 30% across Sydney. However as GWS is to contain nearly all of the greenfield development, this ratio, under the Strategy is closer to 50%/50% - see discussion in 3.2.2 below). The plans for new development in GWS are very different to existing development patterns. In contrast to car dependent sprawling suburbs of detached houses, the new suburbs are to be focused around public transport, have a mix of dwelling types and to have shops and facilities accessible by walking or cycling. Diverse land use planning also aims to create local jobs and accessible quality open space.

The Strategy states that over three-quarters of new housing will be located in strategic centres, smaller centres and transport corridors within walking distance of shops, jobs and other services concentrated around public transport nodes. Housing density is intended to be greater than for previous residential land releases. Low density housing will primarily be located in greenfield areas in the North West and South West Growth Centres, though there may be scattered small greenfield developments in other parts of Sydney.

There are a number of key trends that have influenced the planning of housing development in the Strategy. These include:
- the existing, and likely continuing, trend towards smaller households (single and two person households), partly as a result of overall population ageing;
- an increased demand for smaller housing and a wider mix of housing types, providing good access to shops, transport, facilities and services etc;
- households with children are expected to remain the largest group of all households, by a small margin, accounting for 32% of all households;
- overall increasing affluence in the community; and
- total demand for housing has been and will continue to be greater than population growth.

3.2.1 Distribution of new dwellings in GWS under the Strategy

The NSW Department of Planning has identified 3 subregions of Western Sydney, being the West Central, the North West and the South West. Table 3.2 shows the planning targets for new dwellings in these three subregions. Greenfield development will include land identified and/or developed for housing under the existing Metropolitan Development Plan as well as new areas designated in the Growth Centre areas (see Figure 3.3).

Table 3.2. Planned new dwellings by GWS subregion:

GWS Subregion	Infill	Greenfield	Total
West Central Sydney	95,500	0	95,000
North West Sydney	60,000	80,000	140,000
South West Sydney	40,000	115,000	155,000
	195,500	**195,000**	**390,000**

These dwellings will be built progressively over the next 25 years. Concurrent with the preparation of the Strategy, the NSW Government consulted and developed 'structure plans' for the North West and South West Growth Centres, and subsequently established the Growth Centres Commission to manage these areas. Figure 3.3 below, provides a basic description of planning for these areas.

Figure 3.3 Structure Plans for the Growth Centres
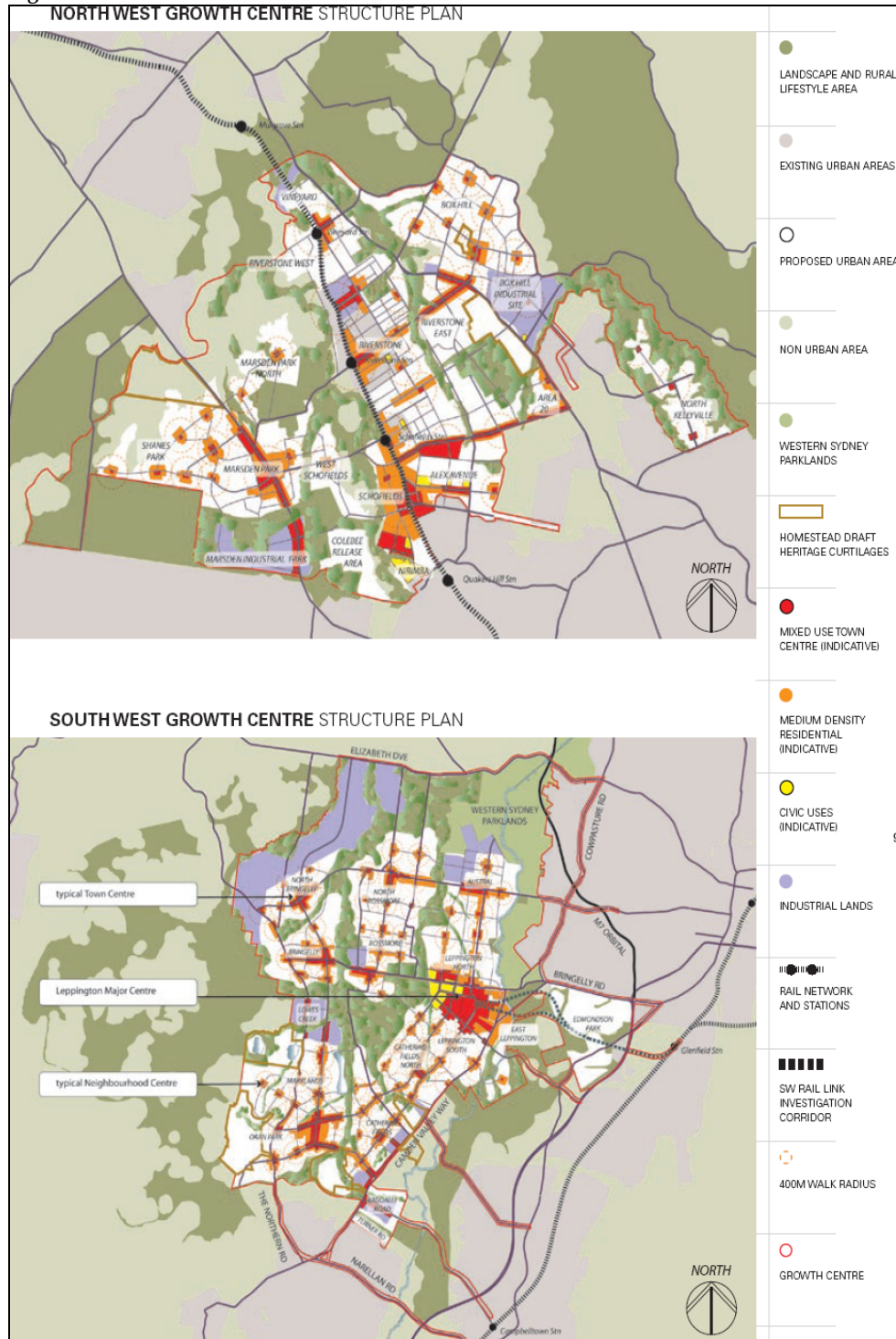
3.2.2   Urban form in the Growth Centres

The North West Growth Centre is located 15km north west of Parramatta and approximately 35 km from Sydney City. The nearest centres are Blacktown, Richmond and Castle Hill, , although a major new centre, the Rouse Hill Regional Centre is being developed immediately adjacent to the area.

The South West Growth Centre is bounded by the Nepean River on the west and the escarpment hills near Camden Valley Way in the south east. The nearest centres are Liverpool, Campbelltown, Camden and Narellan.

The planning documents for the North West and South West Growth Centres give a number of objectives concerning urban form:
- land not to be released all at once, but in staged development (average of 8000 lots per year);
- suburbs to be accessible by public transport;
- easy access to major centres;
- sequencing infrastructure delivery to coincide with housing development; and
- inclusion of conservation land to help protect air quality.

More specifically there will be:
- control on dwelling densities;
- high density development around town centres and railway stations;
- mixed land use patterns, including jobs, services, housing and open space;
- walkable local neighbourhood centres (e.g. good pedestrian access, sheltered and pleasant pedestrian environments in the Growth Centre local neighbourhoods;
- highly connective street networks and land use design;
- streets designed to enable cycle lanes; and
- local shops and services within walking distances.

3.2.3   Local areas and release area precincts

Each of the Growth Centres has been divided into local areas and further divided into release precincts as a mechanism to manage staged development.

Table 3.4: North West Centres and Precincts

Local Area	Population	Dwellings	Multiple unit/ Detached houses	Centres/ Precincts
Riverstone	29,600	10,500	25%/ 75%	1 main 5 smaller
Riverstone East	14,200	5,000	20%/ 80%	4 smaller
Schofields/Nirimba	36,200	13000	31%/ 69%	1 main 5 smaller
Marsden Park	42,000	15,000	25%/ 75%	1 main 12 smaller
Box Hill	31,000	11,000	25%/ 75%	1 main 8 smaller
North Kellyville	9,800	3,500	18%/ 82%	3 small
TOTAL	**162,800**	**58,000**		

Table 3.5 South West Centres and Precincts

Local Area	Population	Dwellings	Multiple units / Detached houses	Centres / Precincts
Edmondson Park	22,950	8500		
Leppington	72,000	26,000	36%/ 64%	1 main 13 small
Catherine Fields North	22,000	8,000	25%/ 75%	1 main 7 small
Catherine Fields	23,700	8,700	24%/ 76%	1 main 6 small
Oran Park	47,000	17,000	25%/ 75%	1 main 13 small
Austral	22,000	8,000	24%/ 76%	1 main 5 small
Rossmore	36,000	13,000	24%/ 76%	2 main 13 small
Bringelly North	14,000	5000	22%/ 78%	1 main 4 small
Bringelly	14,000	5000	22%/ 78%	1 main 5 small
TOTAL	**273,650**	**99,200**		

3.2.4   Urban form in infill development in GWS

In addition to development in the Growth Centres there will be substantial infill development, particularly in the West Central subregion. This will involve increasing housing density in existing centres in the form of multiunit dwellings and increasing occupancy rates. As yet there are no detailed urban form guidelines for these new developments, but in general infill will be:

- focused around centres and corridors;
- located close to public transport; and
- located close to jobs.

3.2.5   Public open space

There are a number of general aims concerning open space. Precinct planning in the Growth Centres will:

- ensure access to open space;
- connect the regional cities of Penrith and Liverpool to riverside open space;
- improve the quality of regional open space, particularly the Western Sydney Parklands;
- place recreation trails in Growth Centre areas such that all residents are within 1.5 km of a trail;
- improve the quality of existing open space (including that in established areas as a part of urban renewal); and
- improve access to waterways and links between bushland, parks and centres.

The Strategy makes particular mention of the Western Sydney Parklands (Figure 3.4) and includes the initiative to consider expanding the role of the Western Sydney Parklands Trust, to provide a single agency for managing regional open space in GWS.

Figure 3.6: Location of the Western Sydney Parklands.

4   ECONOMIC DEVELOPMENT

The aspects of economic development of concern to this HIA include where in the region economic development occurs and strategies to influence the anticipated levels of employment, the allocation and location of employment lands, such as sites for employment, business activity centres, incentives for business and employment to locate in the region and the provision of transport infrastructure for both people and goods. This chapter outlines the current state of economic development in GWS and the changes proposed in the Strategy. This provides the basis for examining the impact on health of economic development in the chapters which follow.

4.1   Economic development in GWS

Within GWS the key concerns relating to economic development include:

- the level of employment self sufficiency, which provides the opportunity for GWS residents to work within the region;
- the limited supply of higher order skills in the labour force;
- the relative lack of diversity in the economic structure;
- the geographically dispersed nature of employment, less than 30% of which is located in the major employment centres; and
- transport and freight infrastructure (both road and rail) that is inadequate to support further economic development in the region.

In recent decades GWS saw a pattern of increasing self sufficiency in jobs, such that in 1996 there were approximately 80 jobs located in GWS for every 100 resident workers, an increase from 73 per 100 workers in 1981 [33]. This measure of self sufficiency includes jobs that are held by people who live outside GWS, but who commute to the region. At present, around 70% of people who live in GWS also work in the region [33] This level of employment has been achieved largely as a result of the movement of manufacturing, industrial and distribution employment from the inner city to GWS.[20]

However, commuting to employment outside the region is still clearly significant at around 30%. Commuting occurs mostly from the 'inner suburbs' of GWS (closer to the CBD) and those employed in knowledge based industries (reflecting the lack of this type employment at the regional level).

Employment diversity is low in GWS compared to the rest of Sydney. The dominant occupations are in manufacturing and retail industries, with also significant proportions of employment in community service and health related occupations, trades and service industries generally. There is an under-representation of managerial and professional employment generally and the region is 'strikingly under-represented' in banking, finance and business services (BFBS) employment, with only 17% of Sydney's BFBS jobs located in the region in 2001.

Health related employment is focused around the medical precincts in the region, particularly in Westmead. BFBS employers are also under-represented in the region and there is also an under-representation of creative and knowledge intensive enterprises undertaking innovation, research and design.

Provision of employment tends to be uneven and dispersed across the region. The dispersal is partially a result of the increasing suburbanisation of service employment and the relative lack of clustering of employment within centres.

High unemployment rates (i.e. above 15%) tend to be localised in particular suburbs, particularly the old public housing estates and the newly emerging pockets of disadvantage in the region's middle suburbs.[34] There are wide differences in unemployment rates across LGAs. Baulkham Hills, for instance, has low unemployment around 3%, compared to Auburn 11.9% and Fairfield 12.7%[33] Some concentrated areas of disadvantage have unemployment rates over 20%.[35] It has been argued that addressing unemployment for these populations is not so much a question of sufficient jobs in the region, but depends crucially on "improvements in access to social infrastructure and an upgrading of skills and qualifications." [33] (For further discussion of the particular issue of unemployment, see Chapter 6: Equity, `Health and Wellbeing).

4.2   The Metropolitan Strategy and economic development

The Strategy has a number of initiatives relating to employment in GWS, these focus around providing actual jobs, employment infrastructure, the location of employment, strategic employment planning and some assistance for unemployed populations.

4.2.1   Numbers of jobs

In terms of actual numbers of jobs, 230,000 new jobs are anticipated to develop in GWS over the period 2005 - 2030. A number of early job capacity targets have been set for the subregions (Table 4.1) and for some strategic employment land precincts (Table 4.2). Substantial employment growth targets have been set for M7 North, Liverpool/Macarthur, M4 and North West employment land precincts.

Table 4.1 Subregional job targets 2031

Subregion	New jobs GWS (rounded)
West Central Sydney	35,000
North West Sydney	99,000
South West Sydney	80,000

Table 4.2 Employment land precinct employment targets 2031

Employment land precinct	2001	2031	% increase 2001-31
West Central Sydney	42,500	51,793	17.9%
West-Central other	16,422	16,800	2.3%
Liverpool/Macarthur	40,942	61,000	48.9%
M4	25,618	32,000	24.9%
M7 North	38,367	80,000	108.5%
North West Other	24,553	30,400	23.8%

4.2.2   Employment infrastructure

The Strategy contains a number of broad initiatives relating to the provision of employment infrastructure including:

- ensuring there are sufficient stocks of employment lands in suitable locations serviced by utilities, public transport and proximate to the labour force;

- providing and enhancing industrial and employment land – e.g. the Western Sydney Employment Hub (M4/M7 intersection);
- concentrating manufacturing, transport and warehousing along major transport corridors;
- encouraging the redevelopment of disused industrial sites;
- planning and developing new greenfield sites to meet employment demand in growth areas;
- preventing or managing conflicts between industrial and other land uses; and
- ensuring new employment lands are accessible and serviced in a timely way.

4.2.3 Employment location principles

There are also broad principles about where employment should be located, including:
- increasing and concentrating jobs in strategic centres in Western Sydney;
- locating employment in centres and enterprise corridors; and
- locating housing and jobs in close proximity.

4.2.4 Employment innovation and investment

A number of sites in GWS are identified by the Strategy as being those for investment to promote knowledge intensive employment. These include:
- Parramatta, as Sydney's second CBD;
- Western Sydney itself (for information and communication technologies, manufacturing);
- biomedical hubs in Westmead and Liverpool;
- educational institutes generally (TAFEs, universities and colleges);
- 'magnet infrastructure' (in addition to universities and hospital associated hubs noted above);
- UWS/ Campbelltown Clinical School; and
- Elizabeth Macarthur Agricultural Institute, Camden.

4.2.5 Unemployment

There are a number of initiatives in the Strategy that could improve access to employment for unemployed people including some plans to provide guidelines for skills training. These initiatives and plans include:
- improved access to jobs through provision of new or improved public transport infrastructure;
- improved access to local jobs, through regional redevelopment and revitalization (for example in Penrith and Liverpool); and
- in association with redevelopment and renewal projects, to set guidelines for local skill development projects, covering factors such as:
    - jobs and skills analysis to determine if skills development is warranted given local labour market conditions;
    - identifying elements of redevelopment and renewal projects are suitable for local skill development; and
    - special tendering for redevelopment projects with skills development as a component.

5 SOCIAL INFRASTRUCTURE

The term 'Social infrastructure' refers to a range of services and facilities that meet local level needs for education, health, culture, recreation, social interaction and community development. This infrastructure has a key role in meeting basic community needs and also in the development of 'social capital'[19] or more recently described 'community capacity'[20], as these services and facilities provide resources and the opportunity for social interaction, cooperation and the development of 'ownership' of place or 'sense of community'. This chapter outlines the key issues in relation to social infrastructure provision in GWS, and summarises the main initiatives proposed in the Strategy in regard to provision of new social infrastructure.

The main issues relating to social infrastructure in GWS of concern in this report are:
- meeting the needs of a rapidly growing population;
- the equity of provision of services and facilities within GWS and between the region to other parts of Sydney;
- the impact on existing services and facilities of growth in demand resulting from population growth; and
- the adequacy of services for population groups with special needs.

These issues are also discussed in greater detail in *Chapter 12: Access to Health, Educational and SocialSservices*.

It has been argued that the GWS region suffers from past, systematic underinvestment in social infrastructure in the region to meet the needs of the current GWS population.[20] Clearly, the growing population of the GWS region will place further demands on existing infrastructure, resulting in the need for additional and expanded services. Given that two thirds of Sydney's

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[19]   Social capital is a term, with origins which can be traced to early 20th Century social science, which gained increasing prominence within several fields of social science from the 1970's to the 1990's. Within public health the conceptualisation of social capital has been heavily influenced by the work of Robert Putnam (see Putnam, R. (1995) Bowling alone: America's declining social capital, *Journal of Democracy*, 6(1): 65-78) and when adopted by the World Bank which defines social capital as "the norms and networks that enable collective action…critical for poverty alleviation and sustainable human and economic development". In Australia the term has been widely used and theorised in terms of and 'trust' and 'reciprocity'. According to Wendy Stone social capital "can be understood as networks of social relations characterised by norms of trust and reciprocity. The essence of social capital is quality social relations. …Thus, social capital can be understood as a resource for collective action, which may lead to a broad range of outcomes, of varying social scale." (Stone, W. *Stronger Families Learning Exchange Bulletin* No.4 Spring/Summer 2003 p.13-16).

[20]   'Community Capacity' is a concept that emphasises the overall capacity of communities to determine what happens to or within them, influenced by social structures, institutions and resources. It has been defined as "a holistic representation of capabilities (those with which the community is endowed and those to which the community has access), plus the facilitators and barriers to realisation of those capabilities in the broader social environment" (Jackson et al. *Half Full or Half Empty? Concepts and research design for a study of indicators of community capacity,* New York Community Health Research Promotion Unit, 1977) and "the degree to which a community can develop, implement and sustain actions which allow it to exert greater control over its physical, social, economic and cultural environments" (Littlejohns and Thompson (2001) Cobwebs: insights into community capacity and its relation to health outcomes, *Community Development Journal* 36(1): 30).

anticipated population growth will be absorbed by the region, this will present challenges in addressing the current inequities between GWS and the rest of Sydney regarding quality educational and cultural facilities. Particular issues include the lack of equitable opportunities for education and training for higher order employment and the lack of 'flagship' cultural facilities in the region.

The problem of transport disadvantage, both across the region generally and in particularly disadvantaged locations, also affects access to social infrastructure. Services and facilities are often difficult to access by public transport. These issues are returned to in the chapters which follow.

5.1   The Metropolitan Strategy and social infrastructure

The Strategy says very little about provision of social infrastructure in areas of infill development. This would appear to be a significant omission, given the existing service and facility deficits noted above. With regard to the Growth Centres, there is reference to planning for the provision of basic social infrastructure (health and education services). Infrastructure is to be largely funded through developer contributions with the State Government suggesting a 25%/75% funding mix, where private contributions pay the bulk of social infrastructure costs.

The Strategy emphasises that social infrastructure will be provided in a timely manner to new developments. The intention is clearly to avoid the planning mistakes of the past, where new housing developments were built without any social infrastructure. "The towns will have main street centres and will include shops and a supermarket, local services such as doctors and dentists, child care centres and a primary school. Corner stores will be at the centre of neighbourhoods."[15] The role of social infrastructure for community development and for the local area identity is not well acknowledged, and the importance of cultural infrastructure is omitted.

Most of the detail concerning actual social infrastructure provision is in the Growth Centre Planning Documents[16, 17] and it is implied that subsequent Subregional planning will address social infrastructure in the Growth Centres, with community centres, recreation services and libraries being cited. At this point there are a number of statements and aims for service provision, including:
- existing health facilities will be expanded, including improvements to existing hospitals;
- new services will be provided including community and primary health centres and associated community based services providing dental, mental health, nursing clinics and family counselling;
- health infrastructure spending of $100 million for the North West Growth Centre and $280 million for the South West Growth Centre;
- sites will be acquired prior to development to ensure the early delivery of schools;
- in the first five years, three primary schools and a high school will be built in the Growth Centres; and
- over the next 25 to 30 years educational services will include:
  - for the South West
    - 45 new primary schools
    - 15 high schools
    - 1 TAFE
  - for the North West
    - 28 new primary schools
    - 9 high schools
    - 1 TAFE

6   EQUITY, HEALTH AND WELLBEING

This chapter discusses the problem of health inequities in relation to GWS, providing the background for the analysis of the equity impacts relating to the determinants of health and wellbeing. In particular, it discusses whether health inequities will be potentially reduced, or further compounded by future urban development in GWS.

6.1   Health equity and socio-economic disadvantage

The link between inequities in health outcomes and socio-economic disadvantage, particularly higher average mortality and morbidity rates, is well established and documented for Sydney and NSW.[22-24] Health inequities are caused by a complex array of factors, but can broadly be understood to result from barriers to accessing the conditions that support health and wellbeing.[6, 25] That is, socio-economically disadvantaged people experience barriers to broad social and economic participation through poor education and employment opportunities, and specifically may also experience barriers in access to health, social and educational services, either through lack of service availability or lack of affordable transport options.

Health equity implies that everyone should have an equal opportunity to attain their full health potential and, in particular, that people should not be unfairly disadvantaged from attaining their best health potential.[36] In this sense a policy which promotes health equity is one which does not disadvantage or advantage some groups unfairly, for example, by exposing poorer populations to more air pollution, or by having better quality health services in wealthier areas.

Every society has differences in health outcomes related to differences in socio-economic status, with people of lower socio economic status suffering more physical disease, mental illness, injury and earlier death. These health inequities are well documented at the LGA level and by household income level for the socio-economically disadvantaged population of Australia, including that of GWS. [23, 24, 40-42]

Socio-economic disadvantage can be assessed in a number of ways. In Australia, studies of health inequalities tend to use the area measure of the Index of Relative Socio-economic Disadvantage (IRSD) developed by the Australian Bureau of Statistics. This index gives a score to a geographic area (e.g. a collector district or Statistical Local Area). It includes measures of disadvantage such as unemployment rate, low income earners, proportions of people with low levels of education, proportion of indigenous people and proportions of people with low English fluency.

People who are socio-economically disadvantaged can expect shorter life expectancy. Table 6.1 shows marked differences in life expectancy between the most disadvantaged and advantaged urban locations.

Table 6.1. Life expectancy at birth in NSW by location

Urban areas	Males	Females
Most disadvantaged	70	79
Most advantaged	80	86

(Source [38])

Socio-economically disadvantaged people also have higher rates of disease and mental and behavioural problems, as shown in Table 6.2.

Table 6.2: Rates of disease and mental/ behavioural problems and disadvantage

Quintile	Arthritis %	Asthma %	Diabetes mellitus %	Heart, stroke and vascular disease %	Malignant neoplasms %	Mental & behavioural problems %
Household income						
1st quintile	32.3	11.6	8.7	10.7	3.7	12.4
5th quintile	8.7	9.8	1.7	1.1	1.2	5.8
Index of disadvantage						
1st quintile	17.8	10.8	5.6	5.2	1.5	11.6
5th quintile	12.9	8.6	2.4	2.6	1.6	6.8

(Source [42])

Health damaging behaviours are at a higher prevalence in socio-economically disadvantaged populations as is being overweight or obese. Table 6.3 shows that if disadvantage is measured by household income, people in lower income households are more likely to be daily smokers and get insufficient exercise. When disadvantage is measured at an area level, people in the most disadvantaged areas are also more likely to have insufficient fruit and vegetable consumption.

Table 6.3: Health damaging behaviours and disadvantage

Quintile	Current daily smoker	Risky high alcohol use	Sedentary/ low exercise level	Overweight/ obese BMI	1 or less serve of fruit	4 or less serves of vegetables
Household income						
1st quintile	21.5	9.6	75.7	50.1	42.7	84.4
5th quintile	16.3	18.2	61.2	49.6	46.3	86.5
Index of disadvantage						
1st quintile	29.9	10.7	76.8	51.1	51.1	87.0
5th quintile	13.5	16.2	63.0	45.1	40.8	85.9

(Source [42])

An equitable health policy should also provide a greater level of resources to disadvantaged groups. This concept is termed 'vertical equity'[37] and refers to the principle that populations with greater health needs should be provided with proportionately more resources which benefit and protect health. An example of vertical equity would be providing more early childhood intervention services to sole parent families.

The NSW Health Department has a clear commitment to health equity.[38] It aims to reduce health inequities in NSW through a series of measures including:
- early childhood intervention programs;
- community participation;
- strengthening primary and preventative care
- regional planning and intersectoral action;
- building organisational capacities; and
- allocating more health resources to disadvantaged populations.

6.2   Limitations of the health equity assessment for GWS

The Strategy is principally concerned with where population growth will be located, transport provision, some elements of urban design (mainly in the Growth Centres) and some details of employment and social infrastructure provision. It contains less information about what and how extra health, social and educational services will be delivered. Also, it contains almost no indication of how infill development will occur, despite its intention to locate 50% of new GWS residents in such areas, this being left to subsequent Sub-regional planning and Centres Planning exercises. Thus, in assessing the likely health equity impacts of the Strategy, it is not possible to make a detailed assessment of whether or not the specific needs of the socio-economically disadvantaged population will be met in future years. What is possible is to predict that extra demand for services and facilities will occur given anticipated population profiles.

6.3   Socio-economic and health inequities in Greater Western Sydney

There are a number of population groups who face socio-economic and health inequities in GWS. These groups include:
- low income households;
- sole parent families;
- unemployed people;
- some CALD populations;
- Indigenous people;
- older people on government pensions; and
- people with disabilities.

6.3.1   Socio-economic disadvantage

Table 6.4 shows the Index of Relative Socio-economic Disadvantage for each of the LGAs in GWS and the quintile in which each is placed in relation to the rest of NSW (with the 1st quintile being the most disadvantaged LGAs). In addition, the table gives selected data from the 2001 census, showing numbers of low income households (with income less than $500/week[21]), sole parent families as a proportion of families, CALD, Indigenous, and unemployment rate.

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[21] Low income households are defined as households earning less than $500 per week. This definition enables data to be used from ABS census income bands. When considering income in deciles, the cut off for the third decile of household incomes is $531 gross per week [39] therefore $500 per week will include approximately the bottom quarter of household incomes.

Table 6.4. Socio-economic disadvantage in Greater Western Sydney by LGA

	IRSD	IRSD quintile (ranking NSW)	Low income (<$500)	Unemploy-ment Rate %	Sole parent families %	Overseas born %	English only at home %	Indigenous people %
Auburn	898.4	1st	29.0	11.9	15.0	52.5	25.0	0.8
Bankstown	954.0	2nd	28.7	7.9	16.0	35.3	48.4	0.8
Baulkham Hills	1109.8	5th	11.4	3.2	9.0	27.8	76.3	0.3
Blacktown	956.1	2nd	22.7	7.7	18.8	32.2	65.5	2.4
Blue Mountains	1060.7	4th	25.8	5.5	15.2	17.2	91.8	1.2
Campbelltown	940.6	2nd	23.1	8.5	21.6	25.1	74.8	2.5
Fairfield	849.2	1st	28.3	12.7	18.4	52.6	29.1	0.6
Hawkesbury	1017.5	4th	20.5	4.7	15.2	13.2	89.5	1.7
Holroyd	974.9	3rd	26.0	7.5	17.0	36.3	54.3	0.8
Liverpool	948.9	2nd	22.4	8.3	15.7	38.1	50.7	1.3
Parramatta	990.4	3rd	26.0	7.2	16.2	36.8	54.7	0.8
Penrith	991.5	3rd	19.9	5.9	17.3	21.2	81.7	2.0

Source [45]

6.3.2   Locational disadvantage

Measuring socio-economic disadvantage at the LGA level tends to obscure 'pockets' of disadvantage at sub-LGA level and the region contains a number of highly disadvantaged suburbs within individual LGAs. These suburbs are characterized by a high concentration of low income households, high unemployment, high rates of sole parent families and/or high numbers of households with no car. There are also proportionately higher numbers of CALD and Indigenous people. These disadvantaged locations have developed from either public housing estates established from the 1950s or more recently older areas where infrastructure is declining and/or not being renewed (see Randolph and Holloway's sub-regional analysis p21). Often, the socio-economic disadvantage of the populations in these locations is compounded by poor transport infrastructure and services, lack of local employment, poor community services and facilities and consequent social problems.

PART B   HEALTH DETERMINANTS

The following chapters in this Part discuss the Health Determinants selected for analysis in this HIA. As discussed in the Introduction, these determinants were chosen on the basis that they are considered to be most relevant to Greater Western Sydney, are most strongly supported by available evidence from GWS and similar regions elsewhere and because they are key concerns of NSW urban planning policy which this HIA seeks to influence.

The issues of concern, appropriate goals and corresponding recommendations are identified in these chapters. The recommendations are written in terms of that could be done with respect to the urban dimensions in order to address the goals or issues identified with respect to the health determinants. The numbering to each of the recommendations refers to the order of listing in the Executive Summary, where the recommendations are collated according to the urban dimension they relate to.

7   AIR QUALITY AND LOCAL CLIMATE

7.1   Ambient air pollution in Sydney

Long term continuous exposure to ambient air pollutants has been linked to increases in mortality, cardio-respiratory diseases and symptoms and hospital admissions.[7, 43, 44] In Sydney between 640 and 1440 premature deaths are estimated to be caused by air pollution each year.[44] Those particularly vulnerable to the health effects of air pollution are the elderly, the very young, and people with existing respiratory conditions.[43] The health costs of air pollution are substantial, particularly when the economic value of loss of life is included. In Sydney, the heath costs of air pollution have been estimated to be between $1.1billion to $8.4 billion per annum.[45]

Within Sydney the main sources of air pollution are industrial emissions, motor vehicle emissions, domestic wood burning, coal burning for electricity generation and burning of native vegetation (either from bushfires or hazard reduction burns). The air pollutants of most concern to health are particulate matter, carbon monoxide, oxides of nitrogen, ozone, and sulphur dioxide, which exacerbate existing respiratory and cardiovascular conditions, and cause infection and general irritation.[45] Of particular concern is fine particulate matter 2.5 microns in diameter or smaller ($PM_{2.5}$), as this pollutant has specifically been shown to lead to increases in deaths from cardio-respiratory disease and lung cancer.[44] Tables 7.1 and 7.2 summarise the health impacts and risks of ambient air pollution to the population.

Table 7.1 Ambient air pollution and health impacts

Air pollutant	Health impacts	Vulnerable population groups
Particulate matter	Deaths brought forward from cardio-respiratory disease. Upper respiratory tract irritation and infection	Older people with respiratory and cardiovascular disease Children with asthma
Oxides of nitrogen	Bronchial irritation Upper respiratory tract infection Exacerbation of asthma	People with respiratory disease (including children with asthma)
Carbon monoxide	Low birthweight	People with ischaemic heart

	Angina Headache, nausea, dizziness, fatigue, shortness of breath	disease
Sulphur dioxide	Throat irritation Exacerbation of cardio-resp. diseases	People with respiratory disease (including children with asthma)
Ozone	Eye and throat irritation Reduced capacity to exercise Exacerbation of respiratory disease	People with respiratory disease (including children with asthma)

(Source: [43])

Table 7.2 Ambient air pollution: mortality and morbidity risks and outcomes for Sydney.

Health impacts	Risk estimate for $10\mu g/m^3$ change in PM_{10}[22]	Current annual outcomes for Sydney
Mortality (long term exposure)	1.026 to 1.061	643 to 1446
Mortality (short term exposure effects)	1.0062 to 1.0086	Unknown
Respiratory hospital admissions	1.005 to 1.011	359 to 784
Cardiovascular hospital admissions	1.006 to 1.013	561 to 1206
Acute bronchitis (children<15)	1.135 to 1.502	7149 to 18,945
Asthma attacks (children <15)	1.027 to 1.062	1184 to 2605
(adults >15)	1.000 to 1.008	0 to 1027
Restricted activities <19	1.079 to 1.109	14,517 to 19,350
Chronic bronchitis (adults)	1.009 to 1.194	237 to 4126

Source: [45]

7.1.1   Ambient air pollution sources and trends

Motor vehicle emissions are the major source of oxides of nitrogen (71%) and significant source of particulate matter (12%).[28] In addition, motor vehicles are the most significant source of the precursor chemicals to ozone. Diesel vehicles contribute a disproportionately high amount of vehicle emission pollutants: for example, diesel vehicles travel 14% of the VKT on major arterial roads, and yet for this road type create more than 50% of the oxides of nitrogen and 80% of the particulate pollution produced by vehicles.[46] Across the Sydney air shed, industrial emissions are the most significant source of particulate matter (37%), followed by the commercial and domestic sectors (35%).[28]

Overall air quality in Sydney has improved in recent years. This is primarily a consequence of stricter vehicle emission controls and the phasing out of leaded petrol. Even so, air pollution is still a major public health issue, as indicated by the health impacts above. In addition, ambient air pollution in Sydney continues to exceed the targets for acceptable concentrations of ozone and particulate matter, with regular episodes of excessively high levels of these two pollutants.[28]

Ozone is a particular issue for Western Sydney. Ozone is created when oxides of nitrogen and volatile organic compounds are exposed to sunlight.[47] As a consequence ozone levels in the North West and South West sub regions are significantly above the national standards on both these areas, in excess of the goal of 1 day per year.[48] In GWS air quality is monitored by the

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[22] PM_{10} is an index pollutant, giving an indication of overall ambient air pollution.

EPA, and morning and afternoon readings are given for the North West and South West regions, of high, medium and low.

7.1.2   The Sydney air shed and patterns of pollutant concentration

When considering air pollution in GWS it is necessary to examine the entire Sydney air shed. Air flow patterns for the metropolitan area result in GWS being affected by air pollution generated both within and outside of the Region.

Prevailing North-easterly sea breezes bring pollutants from eastern and northern Sydney to the Western suburbs. These winds are not sustained very far inland and so do not push this pollution out of the Region. Also, the geography of the Hawkesbury – Nepean river basin includes low lying areas in the north and south of GWS. As a consequence of these two factors, polluted air becomes trapped in these low lying areas. In fact "new [residential] expansion sectors are in the worst parts of Sydney for air pollution – they are in the lowest areas of the Sydney basin and pollution from the rest of Sydney is brought there by north-east winds."[49]

7.1.3   Urban dimensions and air quality

Recent improvements in air quality have derived primarily from government regulatory mechanisms (e.g. enforcing industry emissions standards, phasing out leaded petrol) and technological improvements (e.g. better emission control of vehicles).[28] Transportation patterns and urban form can also have substantial impacts on air quality. Generally, the less reliant a population is on motor vehicles, particularly individual private cars, the less the polluting emissions from this source.

Accordingly, the health and transport literature focuses on measures to increase the modal shares of public transport and active transport as a means of lessening air pollution, as well as to increase incidental physical activity.[43, 50, 51] At a fundamental level this involves providing the necessary transport infrastructure and services, footpaths and cycleways. For people to choose public transport in preference to private vehicle use, public transport services need to be efficient, affordable and link residential areas with appropriate destinations for employment, services and recreation.[51] Another means of reducing car use is to increase the numbers of children walking to school.[50] (see Chapter 8: Physical Activity). Other policy levers to induce changes in transportation patterns include congestion taxes, incentive schemes, and behaviour change programs.[51, 52]

Urban form can also influence Vehicle Kilometres Travelled (VKT) and hence emission levels. The relationship between higher density suburbs, mixed land use and reductions in car use is discussed in detail in the Chapter 8. In summary, higher density developments tend to have fewer cars per household, residents walk more, there are higher levels of public transport use and people travel shorter distances by car.[29, 53-55] Land use mix has been shown to increase the likelihood that people will use public and active transport:[19, 55] "putting homes, shops and business close together makes travelling by foot, bicycle or transit easier."[52]

These observations are reflected in substantial differences in VKT between established areas and greenfield sites, given the higher density and generally greater land use mix associated with infill development. In one US study comparing potential VKT and emissions from established areas as compared to greenfield sites, the per capita daily VKT was between 39% and 52% lower in the former site than that of the proposed greenfield development. (US EPA 1999 in [52]) As would be expected, polluting emissions were also substantially lower. The

finding of lower VKT in infill developments has been supported in other studies, and is clearly evident in Sydney where average VKT per person per day is 19.8 in Sydney City and 43.8 in the North West region.[29]

Measures to increase public and active transport use, as outlined above, are identified in other HIAs as being a necessary part of strategies to improve city and regional air quality.[50, 56]

7.1.4   Equity impacts of air pollution

Exposure to air pollution is not uniform across the population, with people living near busy arterial roads or polluting industries being exposed to higher levels of ambient air pollution. Proximity to roads carrying large numbers of vehicles (10,000 vehicles a day or more) increases exposure to particulate matter, carbon monoxide, oxides of nitrogen and hydrocarbons.[52] Housing located near arterial roads tends to be cheaper, and therefore more likely to be occupied by lower income families[57] and hence poorer households are exposed to higher levels of ambient pollution from this source.

7.2   Local Climate

In recent years, urban development and associated clearing of vegetation has been linked to localised climate changes. 'Heat island' effects, whereby temperatures within a heavily built up city are higher than the immediate surrounding countryside, have been noted and measured for some time.[148] Suggestions have been made in the scientific literature linking removal of vegetation, changes in temperature and decline in rainfall, most particularly with regard to large rainforest areas.

With regard to Sydney, recent analysis by Greening Australia of temperature records for the past 50 years have indicated that the number of high temperature days and the average January temperatures have increased in Western Sydney.[149] The annual number of days with a temperature above 35 degrees Celsius increased from 9.2 to 15.4 from the 1960s to 2000. At Prospect Reservoir in Blacktown, the average maximum January temperature increased by 2.7 degrees over this period. This temperature increase is argued to constitute a heat island effect, resulting from a combination of factors: less evaporative cooling of precipitation (as rain in an urban runs off rather than absorbs and evaporates), heat absorbed and conducted by roads and buildings rather than reflected by vegetation and heat generated by energy released in buildings, vehicles and houses. The fact that this did not occur in eastern Sydney is attributed to the moderating influence of sea breezes.

While the reduction in rainfall effects may have serious implications for sustainability of water supplies, rather than direct health and wellbeing effects, the increase in temperature has clear health impacts. Increased mortality amongst the elderly and other vulnerable people during periods of unusually high temperatures, has been observed and measured in Europe and America. Between 1979 and 1998, it was estimated that 7,421 deaths resulted from exposure to excessive heat in the U.S. In 1995, a single heat wave resulted in the deaths of over 700 people in Chicago.[150] Higher temperatures also exacerbate the effect of air pollution, particularly ozone concentrations, which again impacts on the vulnerable, increasing rates of mortality and morbidity. Finally, high temperatures, and urban environments that give little protection from the sun, are a significant disincentive to undertake physical activity and/or spend time out-of-doors, which also has a negative health and wellbeing impact.[150]

7.3 Impacts, goals and issues

7.3.1 Maintaining and improving air quality

The main concerns in relation to air quality in GWS are:
- maintaining air quality in view of trends of increasing vehicle numbers and VKT (both diesel and private cars);
- high levels of ozone; and
- particulate pollution, from industrial and commercial sources and from diesel engines.

It is evident that given a population increase of 1 million people and a possible additional 690,000 cars (at present ownership levels [29]), maintaining and improving air quality will be a substantial challenge. The currently unacceptably high levels of ozone in GWS (see p40) particularly need to be addressed.

In prior policy development, the NSW Government committed to making the reduction of VKT a planning priority across government, along with specific VKT reduction goals, these being to achieve:
- zero growth in per capita VKT by 2011
- zero growth in total VKT by the year 2021.[154]

The growth in VKT anticipated by the NSW Government, along with population growth for the period from 2001 to 2021 is given in figure 7.1 below. It can be seen that VKT has been growing faster than population growth, indicating that at an individual level, people are travelling more.

7.1 VKT and Population: Projected and Target VKT
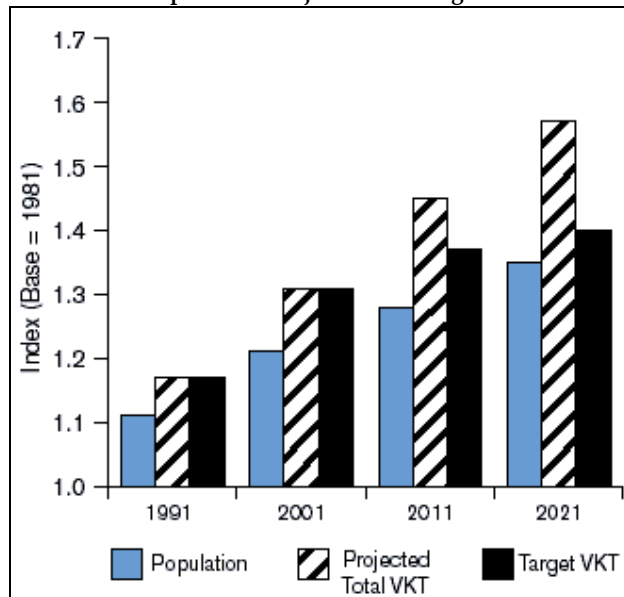
(Source [154]).

However, recent data from the Ministry of Transport's Household Travel Survey suggest that the rate of growth in VKT has slowed in recent years.[155] Figure 7.2 below indicates that growth in VKT fell from 2004 to 2005 and overall did not increase from 2002 to 2005, despite continuing population increase.

Figure 7.2 Travel by Sydney residents on an average weekday 1999 to 2005

(Source [155])

These trends indicate that reductions in VKT are achievable. Development planning for GWS (given the proportion of Sydne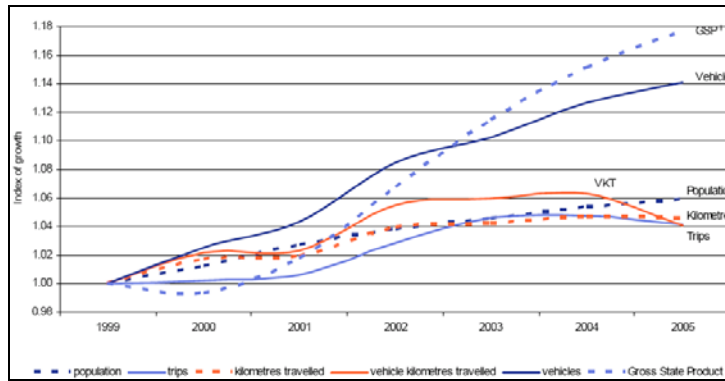y's population living in GWS and the higher average VKT of residents in the region) is a crucial strategy in pursuing these goals.

While the Strategy itself does not refer to goals for VKT reductions (despite the NSW Government's earlier commitment that this be a planning priority across the whole of government), the Strategy does commit to reducing emissions and improved compliance with national air quality standards. These aims are proposed to be achieved through:

- improvements to local and regional walking and cycling networks;
- implementation of a metropolitan parking policy;
- extension of the coverage of TravelSmart (travel behaviour change program);
- new developments and major infill developments to be planned and assessed on the criteria that they reduce emissions and emission exposure;
- separation of sensitive land use from significant emission sources;
- support provided to local governments to develop 'strengthened centres', including provision of walking and cycling infrastructure and access to public transport; and
- encouragement given to local governments to reduce wood heater emissions at a local level.

With regard to GWS, the Strategy argues that no substantial deterioration in current Western and South Western Sydney air quality is expected as a result of development in the North West and South West. It is intended that measures to reduce the use of private motor vehicles and improve public transport will "contribute positively to the management of air quality."

These intentions are echoed in the 2006 NSW State of the Environment Report, which states that "the forecast growth in NSW's population and in private and commercial vehicle travel will require a renewed focus on motor vehicle emissions. A strong emphasis on integrated land use and transport planning, including public transport planning, is needed."[28] The measures in the Metropolitan Strategy are specifically mentioned in the NSW State of Environment Report as part of the NSW approach to improving air quality, including improving access to public transport, increasing walking and cycling, and mixed land use to encourage shorter travel distances and multipurpose trips.

These approaches to improving air quality through reducing car use are widely supported in the research literature (see above), and therefore are recommended and supported by this HIA as a means to maintain and improve air quality in GWS.

Goals:
That air quality in GWS improves and that ozone levels are reduced to meet existing standards.

Recommendation:
Set and periodically review targets for air quality in GWS to comply with or exceed National Air Quality Standards through continued efforts to reduce ozone concentrations and particulate pollution, particularly through measures to control diesel engine emissions and to increase public transport use. (6.1)

7.3.2 Equity impacts of air quality

Low income households in some areas are at increased risk of being exposed to higher levels of air pollution. The Strategy states that most new infill housing development will be located within 800 metres of transport hubs, and that industrial development will be in designated employment centres away from sensitive land use.

Issues of concern:
Exposure of low income households to ambient air pollution from arterial roads and industry.

Recommendation:
Ensure that the air quality monitoring network in GWS is an accurate reflection of existing and future population exposure to ambient air pollution, particularly regarding assessment of the localised impacts of ambient air pollution at existing and proposed centres, sites of major brownfields developments, along arterial roads/transport corridors and for new residential release areas. (6.2)

7.3.3 Ameliorating the 'heat island' effect in GWS

Given the established health and wellbeing impacts of higher temperatures, urban development in GWS should seek to build urban environments that ameliorate heat island effects. While past development practices may have created a heat island effect in the Region, the anticipated acceleration in temperature increase as a result of global warming, is an urgent imperative for long term urban development strategies to seek to reduce this affect and the consequent health impacts.

The selection of pavement and building materials, the provision of shade and urban design that considers the location and the amount of shade in summer, are all elements of built form that can be used to ameliorate urban heat effects. An overall increase in vegetation cover and biomass in existing built up areas could be a priority, as this would have other social benefits, particularly in providing the region's population with greater access to natural areas, revitalizing existing centres and corridors and more opportunity for healthy recreation.

It is inappropriate to set any specific goal for heat island amelioration strategies because of uncertainties in attributing any potential benefits, given current climate volatility. However, increasing vegetation cover by any significant amount would be also in accord with other planning and development goals for the GWS region. In particular, large areas of vegetation (particularly located along water ways) can operate as heat sinks and can cool the surrounding environment. In light of this, large scale riparian revegetation works are an important measure

to combat urban heat island effects. As well as these benefits, these strategies would assist in the retention of bio-diversity, improved livability of built up areas and rehabilitation of degraded landscapes and ecosystems

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Issue of Concern:
Need for amelioration of the Heat Island effect in GWS in the context of climate change and global warming.

Recommendations:
Create shaded and sheltered pedestrian and civic environments within a revegetation policy aimed at ameliorating the impacts of the heat island effect and anticipated climate change, as well as assisting in the prevention of skin cancers. (4.1)

Halt and reverse loss of vegetation in the GWS region, with emphasis on sensitive development of greenfield sites, urban environmental amenity in the design of development in the Growth Centres and revitalizing and improving environments in redevelopment of established areas.(6.3)

Expand and accelerate the revegetation strategies envisaged for the Growth Centres through: (6.4)
~   bringing forward the revegetation of Core Riparian Zones (as described in Growth Centre Development Code;
~   ensuring there are adequate buffer zones between agricultural lands and residential areas;
~   ensuring that native vegetation is retained in these buffer zones and undertake revegetation where necessary to develop fringe conservation and recreation areas for the new population; and
~   re-establishing scattered tree cover across all flood prone land.

Expand and accelerate the Greening Western Sydney Program through: (6.5)
~   bringing forward implementation of corridor revegetation works to ensure that benefits are felt sooner;
~   re-establishing scattered tree cover outside of core corridor areas (i.e. in agricultural or recreational settings); and
~   investigate options to broaden Greening Western Sydney to other NSW Government land parcels.

7.4   Scenario analysis: Air quality and local climate

As outlined in the Introduction, for the purposes of analysis three development scenarios for GWS are proposed which assume that population growth will be accommodated in varying proportions of greenfield and infill growth (see Table 7.3).

Table 7.3 Apportionment of New Residential Development under Three Scenarios to Green- and Brown-field sites

Scenario	Greenfield sites	Infill sites
1. Metropolitan Strategy	50%	50%
2. Laissez Faire	75%	25%
3. Status Quo (based on historical trends)	25%	75%

From the Transport Data Centre data was obtained on the predictive model which they have developed for VKT in Sydney [67]. This model identifies 5 factors as being the most important determinants of VKT by Sydney householders:

- number of Vehicles per household;
- distance to a major centre;
- land use mix and local employment;
- housing density; and
- distance to public transport.

Two of these , distance to public transport and number of vehicle per household, were the strongest predictors.

From the Transport Data Centre data was also obtained on per household car ownership by residents of flats in an established area LGA of Sydney (Bankstown) and residents of a recently developed greenfield LGA (Baulkham Hills). Using these data we assigned an average number of cars per household to greenfield sites (1.95) and established area sites (0.78) in Sydney.

Using this information VKT was calculated for the whole population living in the redevelopment areas under each of the different development scenarios. The extra VKT resulting from reduced population density compared to the current status quo will generate from between 0.03 and 0.05 tonnes of pollution daily, adding 1.65% to particulate pollution in the Sydney basin (Table 7.4).

The health impacts of this additional particulate load in the Sydney Basin can be estimated by applying this increased pollution load (assuming a linear increase in health effects) to previous estimates of mortality and morbidity attributed to health pollution in Sydney. Low and high estimates of these health impacts are shown in Table 7.5. These estimates assume a linear increase in health effects as the suburbs are developed over a 30 year period.

These air pollution impacts over a 30 year period are small in relation to the total morbidity and mortality in Sydney (See table 7.2), reflecting the fact that the marginal increase in car numbers from worst to best development scenario is 1%-2% of the total number of vehicles in Sydney. However there are measurable differences in outcome between the different density scenarios, highlighting that residential density has a bearing on health outcomes of air pollution.

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Table 7.4 Comparison of air pollution outcomes for 3 development scenarios in Greater Western Sydney, summed over 30 years, assuming linear population growth to an additional 600 000 people

Scenarios	Total pop	Proportion of Greenfield development	Proportion of Infill development	Vehicle Kilometres Travelled	Additional VKT compared to Status quo	Tonnes of Pollutants generated by extra VKT	% increase in Sydney's particle pollution
1. Metro Strategy 50% Greenfield 50% Infill	600,000	0.50	0.50	13654934	2805437	0.03	87
2. Laissez Faire 75% Greenfield 25% Infill	600,000	0.75	0.25	16166621	5317124	0.05	165
3. Status Quo 25% Greenfield 75% Infill	600,000	0.25	0.75	10849497	0	0	0

Increases in the differences between scenarios are assumed to rise linearly with population growth over a 30 year period.

Table 7.5 Estimate of excess numbers of health events for 3 development scenarios, summed over 30 years assuming linear population growth

Scenarios	Mortality		Respiratory Admissions		C/vascular Admissions		Acute Bronchitis		Asthma Attacks <15 yrs		Asthma Attacks > 15 years		Restricted Activity Days >19 years		Chronic Bronchitis	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1. Metro Strategy 50% Greenfield 50% Infill	84	189	47	102	73	157	933	2472	155	330	0	134	1894	2525	31	538
2. Laissez Faire 75% Greenfield 25% Infill	160	358	89	194	139	298	1769	4689	293	626	0	254	3593	4789	59	1021
3. Status Quo 25% Greenfield 75% Infill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 7.6 Critical issues in vulnerability to microclimate effects for each scenario

Scenarios	Details
1. Metro Strategy 50% Greenfield 50% Infill	The critical issues in vulnerability to microclimate effects, particularly the 'heat island' effect are: ▪ significant destruction of existing vegetation [149] ▪ potential for improved urban design, building standards, paving materials etc for the moderation of climate effects and livability ▪ potential for improved development practices including retention of vegetation, design and amenity for walking, cycling in residential areas
2. Laissez Faire 75% Greenfield 25% Infill	▪ greater destruction of existing vegetation[23] ▪ greater potential for improved urban design, building standards, paving materials etc for the moderation of climate effects and livability ▪ neglect of investment in established areas currently poorly suited to protection from climate extremes and do not encourage active outdoor activity in built up areas ▪ more land available in infill sites for parklands and revegetation
3. Status Quo 25% Greenfield 75% Infill	▪ lesser destruction of existing vegetation ▪ need for more parklands and vegetation plantings in infill development sites, but there will be more competition for land in these areas. ▪ re-development with improved urban design, building standards, paving materials etc ▪ potential for higher density development delivering improved local environments (i.e. protection from extremes of climate, and re-vegetation) ▪ poorer access to the Regional Parklands for large populations in the established areas.

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[23] This is assumed on the basis of larger land areas required, which may not be the case, as larger populations could be accommodated though higher density. In any case this would have to be checked once it became known which additional land would be used to confirm that significant vegetation would be affected.

8 PHYSICAL ACTIVITY

It is widely acknowledged that regular physical activity has many clear benefits for health. The US Centre for Disease Control summarises the benefits of regular physical activity as follows:

- overall mortality is reduced, not only the very fit but those who are moderately active;
- risk of death from cardiovascular disease, in particular, coronary heart disease, is reduced. The size of the benefit is similar to that gained from not smoking cigarettes;
- high blood pressure can be reduced and prevented;
- colon cancer risk is reduced;
- Type II (non-insulin dependent) diabetes mellitus risk is reduced. For those who have the condition, it can improve blood sugar control;
- optimum skeletal development in children is increased with achievement and maintenance of peak bone mass which may be of benefit in later life;
- falls in the elderly may be prevented;
- obesity risk is reduced;
- mood is improved through reduction in the symptoms of depression and anxiety; and
- health-related quality of life is improved by through better psychological and physical well-being.

(Source [59], cited in [60])

Insufficient physical activity is a global public health problem. In Australia physical inactivity is second only to smoking as the leading cause of death and disability. In NSW, approximately 50% of people undertake insufficient levels of health related physical activity. When considering longer term physical activity levels (regular physical activity sustained over a year) it has been found that almost 70% of NSW adults are insufficiently active.[61]

Lack of physical activity is a concern given the general health effects of sedentary behaviour but more particularly due to the links between physical activity and rates of overweight and obesity. The basic cause of most cases of obesity is that people gain body weight when they consume more energy than they expend. Physical activity increases energy expenditure thereby reducing a person's risk of becoming overweight or obese. Rising rates of obesity and overweight are issues of particular concern in Australia. In 2005 the direct health costs of obesity was AU$3.67 billion.[62]

Given the evidence for the benefits of moderate physical activity, The NSW Chief Health officer recommends that: "Every adult in New South Wales should accumulate 30 minutes of moderate-intensity physical activity on most, preferably all, days of the week."[63]

Even undertaking this physical activity in 10 minute blocks throughout the day is beneficial to health. This is the kind of activity people tend to do when walking to and from public transport or to local shopping centres and is referred to as 'incidental' physical activity. It has been argued that the best way to increase population physical activity levels is to encourage people to incorporate physical activity into simple everyday activities.[19]

8.1 Physical activity in GWS

When compared to other regions in NSW, GWS overall does not have substantially higher rates of obesity/overweight, nor substantially lower rates of physical activity. However, when data for the GWS Area Health Service (AHS) areas is compared to data for the AHSs in the more affluent northern parts of Sydney and the central coast, larger differences can be observed. For

example, a nearly 10% difference in obesity/overweight rates exists between Sydney West AHS (SWAHS) and North Shore and Central Coast AHS (NSCCAHS). There are also substantial variations within age groups. For example, in SWAHS the age group of 35 and 64 had levels of adequate physical activity that are between 7% and 10% less than the state average (see Table 8.1).

Table 8.1 Rates of overweight/obesity and adequate physical exercise by AHS

| AHS	Overweight and obesity	Adequate physical exercise
SWAHS	52.3%	48.9%
SSWAHS	44.4%	50.9%
NSCCAHS	43.3%	54.7%
All of NSW	49.9%	51.9%

(Source: [64])

The predominant urban forms and transport provision in large parts of GWS are not conducive to physical activity. Sprawling suburbs, poor public transport infrastructure, and jobs and service centres at long distances from housing have led to an overwhelming reliance upon private cars for travel. In GWS, walking on weekdays constitutes 21% of trips compared to 35% for the rest of Sydney, while on weekends 15% of trips are by walking compared to 25% for the rest of Sydney.[27] Walking or cycling for transport is particularly low in the South West and North West regions where only 11% of trips are by these modes and 80% of trips are by car.[29]

Although there is an abundance of open space in GWS, many suburbs lack 'quality' open space. Compared to the older areas of Sydney there is a lack of large, attractive parks and gardens of the type that encourage physical activity (see below for discussion of quality open space).

For Australia as a whole, childhood obesity levels are rising and sedentary behaviour amongst children is generally increasing.[62] Part of this problem is a consequence of a dramatic decrease in children walking to school that has been observed over the past 20 years at least. For various reasons, including increasing distances from home to school, changing lifestyles, increasing levels of car ownership and consequent increased traffic and safety concerns, driving has become the major mode of travel to school, as shown by Figure 8.1, below.

Figure 8.1 Modes of travel to school, Sydney 1980-2005
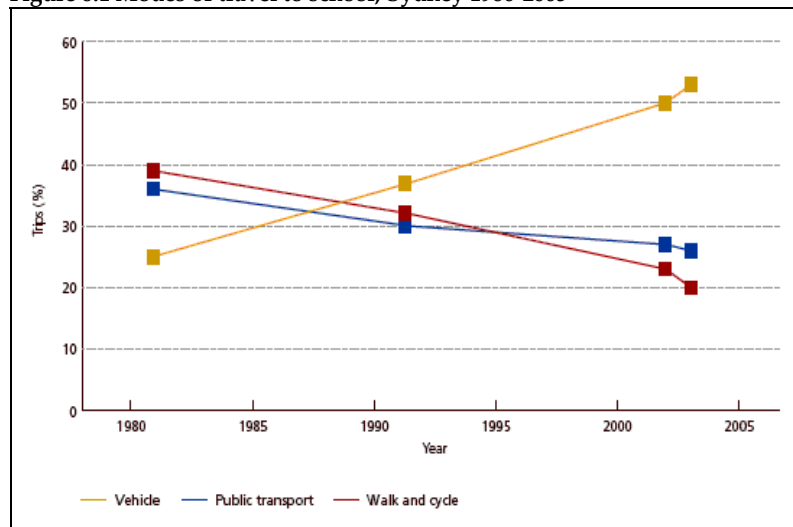
(Source [28])

This change in transportation patterns means that school aged children are increasingly missing out on a source of regular physical activity. Morem and Bauman (2003) found that children in NSW who walk to school (including all those who walk at least once a week) gain, on average, around an hour a week of moderate physical activity.[65] They state that "active commuting like walking or cycling to and from schools has been identified as a source of regular moderate-intensity [physical activity] and an area for intervention."

The inter-generational impacts on physical activity at the population level also bear consideration. It has been argued that the loss from an early age of the habit, or even ability, to walk between local destinations, can lead to life long patterns of mobility whereby walking is avoided and vehicular transport is preferred. [153] Furthermore, the loss by young children of the experience of navigating local environments on foot may affect their overall confidence and feelings of safety in navigating unfamiliar environments in later life, affecting their personal and social development.

In GWS there are differences in children's levels of active transport between the two AHS areas, with Sydney South West AHS recording a 10% lower level (at 43%) than the NSW average, while Sydney West AHS recording a level 5% higher (58%) than the average.[66] While proposing any causes for this would be conjectural, the observation could reasonably be made that there may be some effect of walking environments and distances. The LGAs in the South West generally exhibit lower density development, consequent greater walking distances and the likely perception of less safety, compared to the North West where many areas show medium to high density development.

The scale of the change, and the significance of children's walking to school is highlighted by the fact that the decline between 1991 and 2001 in levels of walking for the overall population is primarily a consequence in decreasing levels of walking in children aged 5 to 14.[67]

8.1.1 Equity and physical activity

There are clear differences between socio-economic groups in the levels of physical activity and overweight in obesity. In NSW, rates of physical inactivity are around 14% higher in the most disadvantaged locations compared to the most advantaged locations, and obesity/overweight rates are 6% higher (Table 8.2). This indicates that poorer people are more likely to be overweight and have lower levels of exercise (NB: poorer people are also less likely to access quality nutritious food, as outlined in Chapter 9). Accordingly, an equity policy position would address ways to increase physical activity for socio-economically disadvantaged people.

Table 8.2 Rates of sedentary behaviour and overweight/obesity by area index of disadvantage (Australia)

Index of disadvantage	Sedentary/low exercise level	Overweight/obese BMI
1st quintile	76.8	51.1
5th quintile	63.0	45.1

(Source [42])

8.2 Urban dimensions and physical activity

There is a large and growing literature exploring the relationships between the urban environment and levels of physical activity and bodyweight. This research has found clear

associations between elements of the urban environment and levels of active transport, physical activity and/or increased risk of being obese or overweight (see below). For example, living in a neighbourhood which is easy to walk around (housing close to shops and services, connected streets, footpaths) is associated with higher levels of walking.[19, 52] Using public transport is also associated with higher levels of walking,[67, 68] and car use is associated with an increased risk of obesity.[69, 70] Children who walk to school have higher overall activity levels than those who are driven to school.[71]

The magnitude of the impact of the urban environment on physical inactivity levels is still being determined, however, a limited consensus has emerged from the research literature that the trends of increasing inactivity and overweight population are partly due to the creation of what are termed 'obesogenic' environments. Such environments discourage physical activity and encourage overeating.[54] Also, researchers generally agree that "changes to the built environment can make walking and bicycling a more attractive option and reduce the barriers to these kinds of trips."[52] They also generally agree that measures which reduce car use, such as taking public transport, or using active transport, will assist in a person meeting their daily physical activity requirements.

8.2.1　Urban form and physical activity

There are number of aspects of urban form which have been found to be consistently associated with levels of physical activity.[8, 9, 19, 54, 69, 72, 73] A key term used to describe the collective elements in the urban environment which encourage or discourage people from walking is 'walkability'. In summary, the research literature shows that an urban environment which encourages walking is one in which locations are close to housing, landuse is mixed (jobs, housing, retail and are located close to one another), there are good quality continuous footpaths and cyclepaths (i.e. well maintained, with crossings at intersections, curb ramps, and continuous pathways of travel), streets are connected with easy direct access to local destinations, there are safe ways to cross barriers such as arterial roads and railway lines, and where streetscapes, parks and gardens are attractive and sheltered.

- Mixed land use

A mixed land use design incorporates a variety of purposes for its buildings and facilities, such as housing, industrial, retail and commercial, education, recreation etc. A greater land use mix is associated with higher number of trips by active transport modes, as the close proximity of various services and destinations facilitates walking or cycling between them. It has also been shown that mixed land use is associated with commuters making fewer car trips in the day and that walking trips tend to be more spread out over the day (rather than being focused around lunch time and commuting times) than in single use areas.

These observations about mixed land use encouraging physical activity are supported by NSW data that finds that a substantial and growing amount of work related walking trips are 'return to work' related.[67]

- Urban density/employment density

A relationship has been observed between more compact residential form, and hence higher dwelling and population densities, and higher levels of walking, public transport use, lower Body Mass Index figures for the population and lower levels of obesity. Higher population densities make viable the operation of services and facilities which in turn, as outlined above, encourage mixed land use and incidental physical activity.

Areas of high employment density also appear to generate physical activity. This is both for the reasons associated with mixed land use (above) in that these employment areas tend to be the site of other services and facilities that are within walkable distance. In addition, employment centres are often more accessible by public transport, the use of which generates walking (see below).

- Quality and proximity of destinations

Clearly if people are going to use walking and cycling for transport, they need destinations within walking or cycling proximity. The distance of 400metRes has been suggested as optimal for locating walkable destinations in relation to housing. It is also important that destinations within this radius be places which people want to use, for instance quality shops, cafes, recreation facilities, parks etc (see also *Chapter 13: Social Connectedness*).

- Street connectivity and continuity

Street connectivity is a "measure of the directness or number of alternative routes available between origins and destinations."[52] Street patterns that are more highly connected provide easier, more direct access to destinations. Grid pattern streets present a highly connected form providing more direct straight line access, assuming that streets and rail lines are provided with crossings and are not barriers to walking. This compares to curving and cul-de-sac street patterns which increase the distance required to be travelled between origins and destinations (see Figure 8.2).

Figure 8.2. Effect of street connectivity on distance needing to be travelled
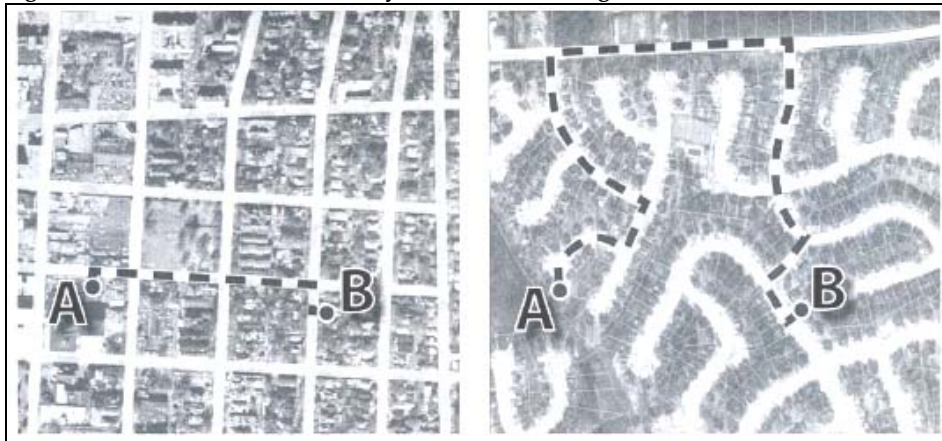
(Reproduced from [19])

- Neighbourhood environment

Factors in the immediate neighbourhood have been found to be associated with physical activity. Busy roads and intersections, which are difficult to cross, unsafe or perceived as unsafe, may affect the willingness of people to walk. In regard to children travelling to school, a safe route of travel has been found to be an important influence on whether active transport is used.[65] The design of walkways, connecting parks and laneways can create zones that present a real or perceived threat as a result of layout, landscaping and inadequate lighting that inhibits passive surveillance.

The aesthetic appeal of the local neighbourhood (e.g. enjoyable scenery), shelter from heat and wet weather, and other factors such as steepness of hills and unattended dogs are important.

- Walking and cycling infrastructure

The provision of walking and cycling paths is associated with levels of physical activity. Specifically this involves infrastructure like neighbourhood walking trails and dedicated cycleways. The NSW government recognised and addressed past neglect of facilities for cyclists in its preparation of its policy Action for Bikes 2010.

8.2.2   Transport

Patterns of transport use have been associated with decreased levels of physical activity and risks of overweight/obesity. In general, the more people use their cars the higher the risks of inactivity and increased BMI.

- Car use

There is a clear relationship between car use and levels of physical activity as the more time people spend driving the less physically active they are. Consequently, There is also a relationship with obesity in that "time spent driving increases the risk of obesity, time spent walking decreases the risk of obesity" [74] The car use/obesity relationship was demonstrated in a recent Sydney study, in which driving to work was shown to increase the risk of overweight/obesity by 13%.[70] Additionally, people who are spending long periods of time sitting in cars on their way to and from work have reduced time in which to participate in informal or organised physical activities.

- Public transport use

Catching public transport generates physical activity as every public transport trip 'starts and ends with a walk'. In Sydney, this relationship has been quantified, and train commuters who walk to the station add an average of 19 minutes each way to their levels of physical activity.[75] The same amount of average physical activity generated by public transport was found in a US study[68]. It is has been found that people who drive to work are less likely to achieve recommended levels of physical activity compared to non-car users.[70] Walking to public transport is precisely the type of incidental, everyday exercise that has been identified as the best way to ensure people are sufficiently active.[19]

8.2.3   Nature and public open space

Public open space is an important site for physical activity, with between 13% and 17% of Australian adults using public open space for this purpose over a two week period.[76] It has also been argued that general levels of provision of public space in an area can influence the amount of physical activity that is undertaken in this environment.[76]

Quantitative and qualitative elements of public open space have also been associated with levels of walking.[54, 76] These elements include quantity of parks, accessibility, size and proximity. Thus, greater numbers of parks, accessible parks (e.g. access which does not require crossing busy roads), larger parks and parks close to where people live, are all factors which influence whether people will use these parks. Quality of open space is also an important influence on whether people will use local parks to walk in. Giles-Corti and colleagues [76] identify the elements of park amenity and design that are conducive to the parks being used, as good park maintenance, aesthetic features (e.g. trees, water, birdlife) and provision of walking paths.

8.3   Goals, issues and impacts

8.3.1   Urban design to encourage physical activity

The research literature shows that making urban environments more conducive to walking and cycling can make the healthier transport choice the easier choice. Social awareness campaigns that aim to improve health behaviours will have limited scope if the urban design is not conducive to healthier choices. Improvements in urban design are complementary to other multi strategic approaches that aim to develop healthier communities.

A clear aim of the Metropolitan Strategy is that development in the Growth Centres will be supportive to physical activity (see *Chapter 2: Transport*). The plans mention most of the elements discussed above, which are known to encourage physical activity. The National Heart Foundation has developed detailed guidelines based on the research evidence concerning best practice in creating 'supportive environments for physical activity' (SEPA). This provides an excellent guide for new development in the Growth Centres and infill sites.

> **Goal:**
> That development in the Growth Centres and new development in infill sites follows guidelines for creating supportive environments for physical activity.
>
> **Issue of Concern:**
> That development in the infill sites will be less conducive to physical activity than that in the Growth Centres
>
> **Recommendations:**
> Implement *Action for Bikes 2010*, particularly providing increased funding to off-road cycleways and ensure their construction and effectiveness as viable access routes. (2.7)
>
> Ensure that development in the Growth Centres and new development in other greenfield and established areas closely follows planning guidelines in existing NSW Government Policy, particularly with regard to walkability, pedestrian safety and mixed use design, as outlined in *Integrating Land Use and Transport – Guidelines for Planning and Transport* and *Guidelines for Walking and Cycling* (both prepared by the Department of Planning) and the National Heart Foundation's *Healthy by Design,* and *Supportive Environments for Physical Activity (SEPA).* (4.2)
>
> Ensure that LEPs and DCPs support a mix of facilities (e.g. cafes, shops, cultural, recreational and community facilities) within precinct centres. (4.6)

8.3.2   Public transport to work

Public transport use generates physical activity when people walk to and from the station or bus stop (see above). Using the Sydney average number of minutes of walking generated per trip to public transport (Table 8.3), and making certain assumptions it is possible to predict the impact on physical activity of differing levels of public transport use.

Table 8.3 Percentages of commuters walking to transport and average walk times.

Origin/ destination	% of commuters who walk to and/or from the station (avg)	Time spent walking (avg)
To station from home	47%	10 minutes
To work from the station.	84%	9 minutes

(Source [75])

Assuming that 46% of the population of GWS travel to work each day (based on current travel to work statistics)[35]; walk to and from station proportions and average times are as above (Table 8.3); people who walk to station from home, do same in the reverse trip; and GWS population is increasing at a steady rate to 2.3 million in 2031, then the following data on the potential influence of public transport to work on levels of physical activity is generated.

Table 8.4 Public transport to work influence on physical activity (PA) levels by year.

Year	17% taking public transport to work (current level)		25% taking public transport to work			45% taking public transport to work		
	+ 38 mins PA	+18 mins PA	+ 38 mins PA	+18 mins PA	Increase	+ 38 mins PA	+18 mins PA	Increase
2011	66892	52660	98371	77441	+47%	177068	139394	165%
2031	84534	66548	124315	97865	+47%	223767	176157	165%

Table 8.4 shows that an increase to 25% of journeys to work in GWS by public transport could result in 31,479 more people (47%) gaining an additional 30 minutes of exercise a day. If public transport journey to work was increased to 45% in 2031 this could result in a 139,233 increase (165%) in people gaining sufficient daily physical activity on the days they travel to work.

Clearly even greater increases in physical activity could be derived if more people walk to the station from their homes than the current 47%. This analysis is illustrative of the kind of leverage that increasing public transport use might have on increasing population levels of physical activity.

As far as influencing public transport use, the Strategy states that it is concerned with increasing public transport use and ensuring the Growth Centres are provided with good transport links. Exactly how much public transport use needs to increase to meet the aims of the Strategy (in relation to reduced car dependency and improved air quality) is not indicated. This compares to the Melbourne Plan where the stated goal is to increase the proportion of public transport trips to 20% of all trips by 2020.

Currently it is apparent that public transport use as a percentage of all trips is very low in GWS, at around 7% of all trips on weekdays (including trips to work) and 3% of all trips on Weekends (see *Chapter 2: Transport*), therefore the Melbourne target of 20% would be very ambitious for Sydney. However, for trips to work by public transport, an increase to 25% for GWS will involve an 8% increase across the region (from 17%). This, in view of the widespread public transport improvements proposed in the Strategy, appears to be a reasonable short term goal (within 5 years). In addition, given the Growth Centres are being designed to promote public transport use, a figure of 30% of trips to work for Growth Centre residents also appears reasonable in the short term.

Goals:
That 25% of trips to work in GWS to be on public transport within 15 years and 30% of trips to work from Growth Centre residents to be on public transport.

Issue of Concern:
To achieve these goals it is important that planned public transport infrastructure and services are delivered in a timely manner, before new residents become habituated to car use and invest in multiple cars per household.

Recommendations:
Set the goal for public transport modal shift to be 30% of trips to work in GWS to be on public transport by 2016. (2.1)
In order to achieve this goal it would be necessary for the NSW Government to:

~ develop realistic goals at sub-regional level, acknowledging that different areas will have different capacities to reach this goal;
~ ensure that public transport to new employment centres is provided in a timely manner;
~ ensure that public transport links are provided from the Growth Centres to centres of employment outside GWS, including Sydney CBD and Macquarie Park, in a timely manner;
~ ensure that the NW and SW rail links are constructed within announced timeframes and are extended to Vineyard on the Richmond line and to Bringelly on the Leppington line;
~ make a commitment to the Parramatta - Epping rail link; and
~ implement within the announced timeframes of the remainder of the Metropolitan Rail expansion program, bus corridors and the rail clearways program, as outlined in the Urban Transport Statement.

Set a target for active transport only (ie walking and cycling only, not connected to accessing public transport) at 5% for GWS by 2017. (2.2)

8.3.3 Active travel to school

At present there is no reference in the Strategy or the Growth Centre Plans to the need for siting schools so as to support pupils walking or cycling to and from school. Currently, the average figure for active travel to school in NSW is 20% of all trips.[28] Given that new schools in the Growth Centres can be located with a view to encouraging active transport, it would appear reasonable that a goal for active travel to schools in the Growth Centres be a minimum of 30%, which was the NSW average in 1995. [28] A number of schools in the GWS region are initiating 'walking school buses', which entail organized and escorted walking groups of school children to and from school. These initiatives should be widely adopted by all schools in the region.

Goals:
That active transport to schools in the Growth Centres be at least 30% of all trips to school and that schools in established areas develop active transport strategies.

Recommendations
Set a target for active travel to schools in the Growth Centre Areas to be at least 30% of trips to school, this being equal to 1995 levels. Existing and new schools in both the established areas and greenfield development sites should develop active travel to school projects. (2.6)

8.3.4   Public open space

The quantity, location/accessibility and quality of public open space have been shown to influence levels of physical activity in a community. While public open space can be allocated during the development stages of the Growth Centres, which is a stated intention of the Strategy, it is more problematic to provide adequate and quality open space to accommodate infill development in established areas. Substantial increases in population in these sites will put pressure on existing open space, both in terms of potential conversion to housing development and in greater use by a larger population. A particular concern is for play areas for children resident in medium and high density housing, as this housing form and associated neighbourhood development has been shown to be associated with lower levels of children's outdoor play.[153]

As for major regional parks in GWS, Western Sydney Parklands is currently being redeveloped. It is to be expected that this regional parklands will eventually become quality open space, containing areas of high aesthetic value (i.e. containing mature trees, water and public facilities).

Issues of Concern:
The quantity and quality of public open space in established areas in light of infill development pressures and that sufficient land is allocated for public open space in the Growth Centres.

Recommendations:
Conduct an audit of public open space in GWS in terms of quantity, quality, equity of provision and utilization and set a target for increase in use of parks and open space of 20% by 2016 in GWS. (4.3)

Set a target of at least 10% of the land in the Growth Centres and other greenfield sites to be allocated to public open space. (4.4)

Develop and implement measures to protect and improve existing open space in established areas to compensate for densification pressures likely to occur in these areas, with particular attention to the needs of children living in medium or high density housing. (4.5)

8.4   Scenario analysis: variations in physical activity for each scenario

The three scenarios used in this HIA (see above) have been the basis for the contrasts drawn with respect to impacts on physical activity and health.

Pooled walking data were obtained from the Department of Planning Transport Data Centre Travel Surveys 1997-2001. These surveys provide average minutes walked per day by local government area. The standard error of these average minutes walked was used to calculate the proportion of people in established areas and greenfield sites likely to obtain their average daily exercise requirement from "everyday" walking, rather than purposeful exercise. To do this we assumed that the average walking time in the Auburn local government area was representative of the established area average, and that from Baulkham Hills a greenfield average.

Table 8.5 Adequate weekly exercise from 'everyday walking' by development scenario 2000-2030

	Total Population	Greenfields development proportion dwellings	Infill development proportion dwellings	Exercise adequate	Exercise Inadequate
1. Metro strategy 50% Greenfield 50% Infill	600,000	0.50	0.50	155,625	444,375
2. Laissez Faire 75% Greenfield 25% Infill	600,000	0.75	0.25	195,000	405,000
3. Status quo 25% Greenfield 75% Infill	600,000	0.25	0.75	120,875	479,125

Although not adjusted for complicating factors such as socio-economic status, these calculations indicate that over a 30 year period there may be up to 75,000 people who would be doing less than the recommended level of physical activity because of where they

Table8.6 Comments on the physical activity impact of each scenario

Scenario	Details
1. Metro Strategy 50% Greenfield 50% Infill	Under the Strategy there are clear plans in the Growth Centres to locate housing around service centres. The 400m radius is being used as a guide to locate higher density housing. However, it should be noted that there is no clear indication as to what will be located in these 'focal centres' – they could include 'quality destinations' of the type which encourages people to walk in their community, but there is no guarantee of this. The effectiveness of these strategies will be dependent upon the detailed design (not yet developed) providing safe and practical routes, as discussed above. In terms of physical activity, infill development generally has the advantage of higher density housing, mixed land use, closer proximity of housing to destinations and workplaces, closer proximity to public transport, and better public transport services. The issues of concern include the provision of adequate public open space for the increased population and particularly the protection of existing public open space which may come under pressure for redevelopment. There is reason to argue that the high standards of urban design being planned for the Growth Centres should also apply, where possible, to infill development.
2. Laissez Faire 75% Greenfield 25% Infill	As above for the Growth Centres. The additional issues of concern are whether greenfield development outside the Growth Centres will follow best practice in developing environments which support physical activity, and also the level of public transport that will be provided to these locations.
3. Status Quo 75% Infill 25% Greenfield	Both the advantages and disadvantages of high density development are likely to be increased under this scenario. For example, more people will be in close proximity to transport and mixed land use destinations, however, the pressure on public open space will be greater. A large increase in established area populations may compromise pedestrian and cyclist safety if measures are not also taken to curb car use in these locations. Alternatively, greater densities in established areas could provide the funding stream and the political imperative to improve infrastructure, particularly public transport infrastructure, and service levels – the result of such measures would be to increase physical activity (as shown above).

9   FOOD ACCESS

Access to fresh affordable nutritious food is both a basic requirement and a human right. In GWS there are two main issues of concern relating to food access:

- sustainability of agricultural production in the Sydney basin; and
- food insecurity for socio-economically disadvantaged groups.

9.1   Local food production

Around $1 billion worth of agricultural and horticultural production comes from the Sydney basin, including $235 million worth of fresh vegetables. This production is derived from 77,000 hectares of agricultural land amounting to over 2000 farms.[77] Agricultural lands are mostly located in the peri-urban fringes of GWS, including suburbs in the North West and South West Growth Centre areas.[78]

Sydney basin agricultural farming is highly productive, with an average return of $5,433 per hectare, as compared to $136 per hectare for the rest of NSW([79] cited in [80]) This production includes substantial quantities of perishable vegetables amounting to:

- most of the vegetables sold in Sydney Markets;
- 20% of the tonnage of fresh vegetables;
- 80% of fresh mushrooms (worth $71 million a year);
- 100% of the State's Chinese cabbages and sprouts; and
- 91% of spring onions and shallots.[77, 78]

The Sydney region also accounts for between a third and half of the state's poultry production[77, 80], 40% of the NSW total area devoted to nurseries, about two thirds of the area of cultivated turf,[77] and most of the flower production.[81]

9.1.1   Health and wellbeing benefits of locally produced food

In 1996 the health and wellbeing benefits of urban agriculture were formally recognised by the United Nations International Conference on Human Habitats in Istanbul.[82] It is evident from the urban agriculture literature that there are a wide range of benefits in retaining rural lands and local food production.[77, 78, 80, 82-87] These include:

- provision of locally produced fresh food to the major markets. Food that is produced closer to where it is sold reduces time spent on transportation and so retaining freshness and taste. Increases in average 'food miles'[24] can reduce the nutritional value of food. It has been found that a 5-10 day lag can lead to 30-50% reduction in some nutritional constituents.([89]cited in [82]);
- agricultural production can be a significant employer and contributor to regional economies. In Sydney the value of production is commonly cited at $1 billion and the industry employs approximately 12 000 people;
- lower overall food costs resulting from lower transport costs. When urban agricultural lands are lost, the costs are passed on to the consumer, reducing food affordability;

Food miles are "a measure of the distance food travels from where it is grown or raised to where it is purchased by the consumer."[88]

- reduced impact of freight transport. Food produced outside the region adds to the volumes transported through large scale freight distribution networks, involving large, long haul vehicles, thus increasing traffic congestion, ambient air pollution and noise;
- reduction in impacts of air pollution and heat islands. Areas of land devoted to agricultural production provide green zones within or adjacent to urban environments. These areas 'break up' a landscape dominated by housing, roads and industry. Possible benefits include buffering housing from ambient air pollution and a mitigating effect on the creation of 'heat islands' in densely built up areas (see *Chapter 7: Air Quality and Climate*);
- rural/scenic amenity. Agricultural lands within the metropolitan area and its hinterland provide opportunities for recreation, education and appreciation of the natural world's sustenance of human life and society. This has positive effects on human spiritual life and understanding of sustainability principles, as well as the well recognised aesthetic values of rural environments; and
- sustainable urban development. Retaining and protecting productive urban lands makes for a more sustainable city, as people eat food which is produced in their own region. In regions where productive land is limited or threatened by drought (such as NSW), protecting urban agricultural lands also protects the local food source.

9.1.2   Urban dimensions and food production

The most substantial threat to urban agricultural production is the expansion of urban development and the subsuming of farm lands for housing, industry and infrastructure.[80, 86] The loss of urban productive land has occurred in cities across the world.[86] In London, for example, much of the "horticultural land has been lost to urban development, in particular the market gardens of West London, which were swallowed up by the runways of Heathrow."[85] In GWS there has been substantial loss of farmland due to the encroachment of urban development.[78]

Urban lands are a finite resource. This is particularly the case in Sydney where the geography of the Sydney basin and existing development, limits agriculture to areas in the far west, south-west and north west.[80] Loss of these agricultural lands cannot be replaced within the Sydney region.

International experience demonstrates that unless agricultural lands are protected through planning legislation,[85] (e.g. urban green belts), then these lands will tend to be sold off for development as the immediate return on land sale is very high when land is zoned for housing. Alternatively such lands can suffer from lack of investment on the assumption that they will eventually be sold for residential development.

Land use conflicts can also be an issue when housing encroaches into agricultural areas without sufficient land buffers. Complaints about noise, drainage, contamination and odour can often result.[77] The HIA on the South East Queensland Plan observes that one of the impacts of urban development on peri-urban agricultural land is the creation of potential land use conflicts.

9.1.3   Equity impacts of local food production

The Sydney agricultural industry provides up to 12,000 jobs, including opportunities for self employment and particularly employment to people from CALD backgrounds who otherwise may have little employable skills in Australia, such as people with refugee backgrounds from

developing countries.[80 and 81] Sydney has and will continue to accept a large proportion of NSW's refugee settlers, and agricultural employment has been a significant opportunity for many of them. Approximately 30% of people working in agriculture in the Sydney basin are from CALD backgrounds, increasing to 80 to 90% in cut flower and market gardening.[81]

As noted above, locally produced food can be cheaper, and hence more affordable for socio-economically disadvantaged populations. Locally produced food can be used in food projects to improve the access of socio-economically disadvantaged people to fresh nutritious food. For example, locally produced food is an important part of two GWS projects to improve the access of local people to a healthy food supply: Penrith Food Project and the Hawkesbury Food Program.[86]

9.2   Food insecurity

Food insecurity refers to a state where people are not always able to access appropriate and adequate supplies of nutritious food.[83] It is defined as "the limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways." ([90] cited in [10]) The main cause of food insecurity is poverty, where people run out of money and temporarily cannot afford to buy available food. However, food insecurity can be a consequence of a lack of available local outlets and poor transport.[83 and 10]

9.2.1   Food insecurity in GWS

Food insecurity is a significant problem in GWS. In a survey of the problem by the Area Health Services in the region, the proportions of the population who experience food insecurity as defined above, were 6.4% (SSWAHS) and 5.4% (SWAHS).[64] These figures compare with 4.3% for Northern Sydney and Central Coast AHS.[64] There is evidence to indicate that in particular suburbs in GWS that food insecurity is a much more serious problem than these aggregated statistics indicate. One study of three suburbs in South West Sydney found an average of 15.8% of people experience food insecurity.[10]

9.2.2   Urban dimensions and food security

The distribution of food outlets, particularly fresh fruit and vegetables, is the main aspect of the urban environment which affects food security.[10, 91] Some socio-economically disadvantaged suburbs in GWS are effective 'food deserts' with no local food outlets, such as supermarkets, food co-operatives or fruit and vegetable shops.[10, 91] In other areas the only food outlets are 'fast food' shops selling nutritionally poorer quality food and/or food that contributes to overweight and obesity.

The issue of transport disadvantage in GWS is discussed in *Chapter 12: Access to social and health services*. Parts of Western Sydney suffer a substantial transport disadvantage, with the only public transport being an inadequate and often inaccessible (e.g. to parents with small children, people with disabilities) private bus service. In the food security study in South West Sydney cited above, people who were food insecure strongly indicated that transport to food outlets and better public transport overall would both be useful strategies to improve food access.[10]

Although it is perhaps unexpected, the problem of food security occurs in many affluent nations.[91, 92] As part of the HIA on the London Plan, it was recommended that the issue of unequal access to affordable, nutritious food be addressed.[91] It was observed that, as in

Australia, the growth in 'big box' shopping centres has undermined the viability of local shops to the detriment of poorer people and/or people with limited mobility or transport options who otherwise could access quality food in their immediate area.

9.3   Goals, issues and impacts

9.3.1   Food production

Agricultural food production in the Sydney basin is clearly under threat by new urban development. The Strategy recognises the contribution of agricultural land in the region to food supply and the economy of GWS, and acknowledges the need for this contribution to be protected. The Strategy states that "much of the interest in agriculture by cities internationally is in relation to improving the health and wellbeing of the community. This is achieved by strengthening links to local food production, improving access to, and consumption of safe, nutritious, affordable food." The Strategy also recognises the employment value of agriculture, particularly in regard to providing employment to CALD populations. There are clear aims to protect agricultural production in GWS, including:

- the focus of land release in the Growth Centres;
- the completion of sub-regional planning to ensure Local Environmental Plans (LEPs) maintain viable rural industries;
- the completion of mapping of regionally significant activities including agriculture, mining and petroleum uses, extractive industry and special uses, in partnership with the Department of Primary Industries; and
- the implementation of sustainability criteria for new land releases.

However, there is reason to believe that these measures may not be adequate to protect agricultural production in GWS. The Growth Centres coincide with the most important areas in the region for intensive plant and animal production, with 40% of Sydney's market gardens located within the Growth Centre boundaries.[93, 94]

If all or part of this land is lost to agricultural production then the impacts include:

- loss of a major source of locally produced fresh food to the Sydney markets;
- the need to source food from outside the Sydney basin, so increasing 'food miles', with the associated loss in food nutritional value and increases in freight costs and movements, air pollution and congestion;
- loss of hundreds, possibly thousands, of jobs, particularly for CALD workers; and
- loss of rural amenity and green space within the metropolitan area.

> **Goal:**
> That agricultural land in GWS and in particular within the Growth Centres is adequately protected.
>
> **Recommendations:**
> Commence a GWS Rural Lands Review, documenting existing agricultural land in the Growth Centres and adjacent areas and the relationship between agricultural land to the sites of planned residential, infrastructure and commercial development; (5.3)
>
> Pursuant from above recommendation, develop long term strategies to protect land currently in agricultural production. (5.4)
>
> Set targets for sustainable production of appropriate foodstuffs within the Sydney region at year 2000 levels, annually adjusted to accommodate population increases. (5.5)

9.3.2 Buffers for agricultural land

Agricultural production in the Sydney basin is mostly the output of intensive farms, with lot sizes in the 0.8 to 3 hectare range.[77] This type of small acreage farming in close proximity to urban areas means that each farm cannot afford to have a buffer zone with neighbouring properties. Currently, productive farms often border with large lots zoned 'rural-residential' or with creek/drainage lines and conservation areas. Were these small farms to border higher density residential areas, conflicts would almost certainly arise with respect to drainage, noise, odour, etc. In order for large scale medium (or even low) density residential development to occur in the Growth Centre areas, while still retaining some agricultural production, adequate buffer zones need to be created between farms and residential development. These buffer zones would effectively be valuable agricultural land that is forgone for production, emphasizing the difficulty of preserving agricultural lands in the context of development of the Growth Centres.

However, buffer zones are necessary and they could serve another purpose, being prime sites for revegetation. Revegetation of these zones would provide visual screening between agriculture and residential areas, to both parties benefit, as well as contribute to the other values of revegetation noted above: biodiversity retention, heat island amelioration, rehabilitation of degraded landscapes and in providing areas for recreation and access to nature for the residents of the Growth Centre areas.

> **Issues of Concern:**
> The need for buffer zones between agricultural land and residential land and the impact buffer zones will have on the amount of remaining agricultural land on local environments.
>
> **Recommendation:**
> Expand and accelerate the revegetation strategies envisaged for the Growth Centres through (6.4);
> ~   bringing forward the revegetation of Core Riparian Zones (as described in Growth Centre Development Code);
> ~   ensuring there are adequate buffer zones between agricultural lands and residential areas through either native vegetation retention or revegetation; and
> ~   re-establishing scattered tree cover across all flood prone land.

9.3.3   Food security

Food security in the Growth Centres is not likely to be an issue, given the commitments to design and infrastructure that have been made for these areas and that residents are unlikely to be of lower socio-economic status. (see *Chapter 6: Equity, Health and Wellbeing in GWS*).

However, the Strategy does not acknowledge or address existing food insecurity or any worsening of this issue that may arise as a result of changes in the pattern of retail development that may occur as a result of infill development in established areas or adjacent large scale greenfields development.

If it is accepted that local retail outlets and local access to food are affected by the development of large 'big box' shopping centres, so planning for growth in GWS should include measures to encourage local outlets and ensure transport access to local outlets. These measures may include planning instruments for use at a local level. Alternatively, or in conjunction with these measures, other measures could be taken to ensure that new food retail outlets provide affordable quality food, and that people vulnerable to food insecurity have access to these outlets.

Issues of Concern:
There are existing and unacceptably high levels of food insecurity in parts of GWS and there is a potential for worsening of this situation, as a result of new or redevelopment in or near to disadvantaged areas and populations.

Recommendations:
Acknowledge that access to fresh affordable food is a basic human right and identify food insecurity levels for LGAs/suburbs within GWS; (5.1)

Address the issue of food insecurity with greater support given to the establishment and maintenance of local shops, food co-operatives and improved public transport. (5.2)

This could involve:

Supporting partnerships with local producers (such as the Hawkesbury Harvest cooperative) and coordination between Local Governments, the Department of Health, Universities, community sector agencies and business; and

Integration of local retail food supply opportunities in LEPs and local transport plans (including the development of new planning instruments if necessary), for both new residential release areas and adjacent established areas.

9.4   Scenario Analysis: Food production and agricultural land retention

The following table gives details of the potential impact on food production and agricultural land retention of carrying out the various scenarios based on proportions of Greenfield and Infill housing development in GWS.

Table 9.1 The impact of various scenarios on food production and agricultural land retention

Scenarios	Impact on food access	Details
1. Metro Strategy 50% Greenfield 50% Infill	Growth centre development will reduce agricultural lands.	Part of the Strategy planning to protect agricultural lands involves placing development in the Growth Centres (South West and North West). However, some significant areas of agricultural land are located within these Growth Centres. For example, there are a number of farms in Austral and Leppington in the South West Growth Centre area. "About 115,000 new homes will be built in an area that also happens to be the site of about 40 per cent of the city's market gardens."[93, 94] Under the Strategy and allied Growth Centres planning it can be expected that agricultural lands will be lost to new housing development and new transport links. Necessary buffer zones between agriculture and housing will also remove land from agricultural production. There will be a consequent reduction in the supply of fresh locally produced food. There will also be a loss of green agricultural space and urban amenity. Job losses are also to be expected, in particular work opportunities for people who do not speak English, and who may find it difficult to obtain other employment.
2. Laissez Faire 75% Greenfield 25% Infill	Large scale greenfield development is likely to reduce agricultural land in the Sydney basin.	If a larger proportion of housing is in greenfield sites and this consumes more land (depending upon dwelling density and where new development is located) there will likely be a greater loss of agricultural land. The prospect of this scenario coming to pass highlights the importance of mapping productive agricultural land, particularly within or in the vicinity of the Growth Centre areas, and clearly delineating those areas to be retained for agriculture, buffer zones, revegetation areas and residential development areas.
3. Status Quo 25% Greenfield 75% Infill	Greenfield development may reduce agricultural land in Sydney basin.	A reduction in the proportion of housing in greenfield areas can be expected to have a lesser impact on the retention of agricultural lands, (depending upon dwelling density) than the other scenarios and would be preferred from the perspective of agricultural land retention.

10 EMPLOYMENT

Employment is an important determinant of individual and population health and wellbeing. For individuals, employment associated impacts relate to having a job or not, the quality and hazardousness of the work, employment security and income. At a population level, employment is a strong determinant of health inequities.

The nature of employment can have a negative impact on health, most obviously with employment in risky and hazardous occupations. Also, work in occupations which create a burden of psychosocial stress have been shown to increase risk of cardiovascular disease[95] and poor mental health. These are jobs which have high 'job strain', where the effort required from a person to do a job is greater than the reward they receive.[96] For example, jobs with high effort/reward imbalance are usually poorly paid, boring and with few career opportunities.

10.1   Unemployment, health and wellbeing

The most substantial employment related health impact relates to unemployment. Job loss results in income loss, and very low income is a clear cause of poorer health.[6] Long term unemployment, has been linked with worse outcomes for physical health,[97] mortality,[98, 99] mental health[100] including suicide and risky health behaviours.[101] Unemployment is also linked to increased use of health services. [97]

There is a risk to health even when relatively high levels of income support are provided. This is demonstrated by the fact that negative psychological effects for the unemployed are similar in countries such as Sweden as they are in other countries with less generous unemployment benefits.[102] In addition to the loss of independent income, experiencing unemployment carries a risk for health, that may last for many years, even after a person is employed again.[103, 104]

10.2   Employment health and wellbeing

Employment is an important factor for the wellbeing of most people. Having a job gives a person a sense of identity, and enables them to feel that they are able to support themselves and their families and to make a contribution to their society.[105] The World Health Organisation identifies a number of ways in which employment benefits mental health and wellbeing. These include:

- structuring time – the absence of such a structure can be a major psychological burden;
- social contact – work provides a linkage for the person to work colleagues, friends, family and society in general; and
- involvement in a collective effort or an activity associated with certain contributions to society, regular activity. (List reproduced from [106])

Work life balance is also an important element in peoples' wellbeing. This issue is emerging as one of critical importance in Australian society. Long work hours and commuting times reduce the amount of time people have to spend with their families and within their communities. Two key factors which can positively influence work life balance are the location of employment

close to where people live, and the availability of quality part time work for those who would prefer to work part time.[106]

10.3   Employment in GWS

The key employment issues for GWS were outlined in *Chapter 4: Economic Development*, including:

- access to employment and employment self-sufficiency in the region;
- low diversity of employment, particularly a deficiency in higher order, better paying jobs in GWS;
- the dispersal of employment throughout the region rather than being focused in particular centres. This leads to higher levels of car commuting and longer commute times; and
- highly localised unemployment, with some locations have far in excess of the state level of unemployment.

Figure 10.1: Jobs taken by the subregions residents.
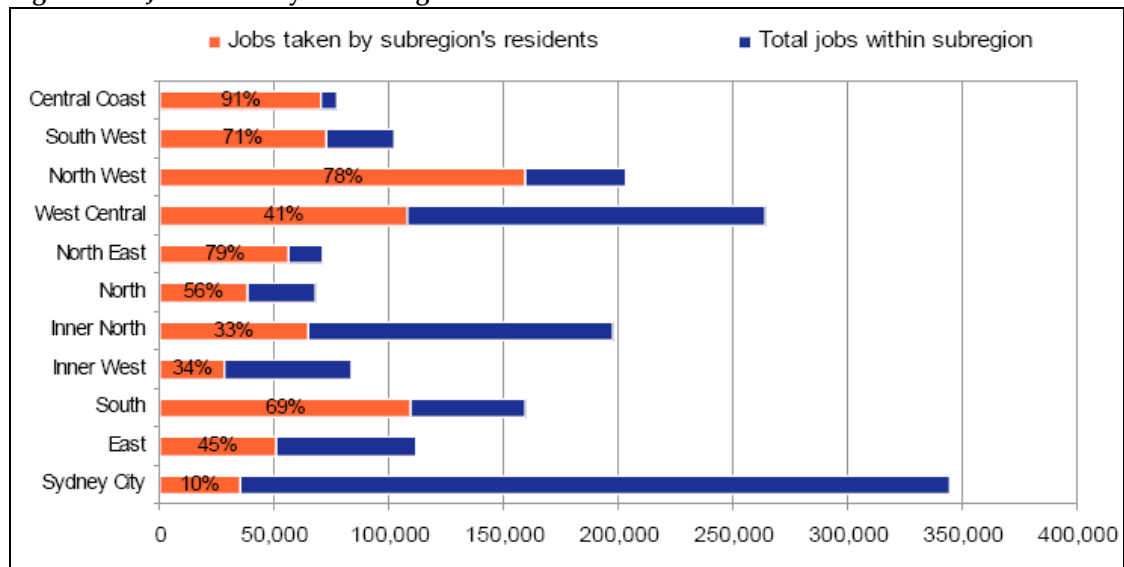
Source [166]

10.4   Employment and equity

In *Chapter 6: Equity, Health and Wellbeing* it was shown that people at the lower levels of the social gradient generally experience poorer health and wellbeing. Employment related factors contribute substantially to these poorer outcomes, particularly unemployment, low levels of job security and demanding but low paid work.

Unemployment does not affect the region uniformly as evidenced by unemployment rates varying significantly across GWS. Baulkham Hills LGA has an unemployment rate of approximately 3%, compared to Auburn LGA (12%) and Fairfield LGA (13%)[33] There are also locations within LGAs of concentrated unemployment, including public housing estates and the more recently emerging disadvantaged suburbs often with high rates of private rental.[34] Some concentrated areas of disadvantage have unemployment rates over 20%.[35]

There are a number of groups who are particularly vulnerable to unemployment, even during periods of very low unemployment, including:
- unskilled workers;
- CALD populations with low English skills;
- early school leavers;
- indigenous people;
- sole parents/ single mothers;
- older people;
- long term unemployed; and
- people with disabilities.[33, 107]

The types of barriers to employment that these groups can encounter, include:

- insufficient availability of unskilled employment;
- lack of demand for their work skills;
- lack of viable or affordable transport to employment;
- family and / or carer responsibilities
- unavailability of affordable child care
- low levels of English skill; and
- lack of provision by employers for disability.[33, 107]

In GWS, unemployment tends to be highly localised in particular suburbs, many of which enclose public housing estates. However, high unemployment and low socio-economic status is not limited to public housing areas, with concentrations of poverty and disadvantage occurring in areas of high private rental.[34] It has been argued that addressing unemployment for these populations is not so much a question of sufficient jobs in the region, but depends crucially on "improvements in access to social infrastructure and an upgrading of skills and qualifications." [33]

10.5 Urban dimensions and employment

The geography of the location of 'new economy' employment (e.g. IT, banking and finance, medical technology, research and training) is a strong determinant of differential social and economic outcomes for a contemporary society.[108, 109] In Sydney, banking and finance employment is solidly centred in the Sydney CBD while manufacturing and warehousing employment are more strongly represented in GWS.[20]

The concentration of employment in mixed use centres well serviced by transport infrastructure and services rather than an even dispersal throughout the region, generally improves access to employment and reduces travel times and VKT. For residents in these centres, the benefits are maximised.

Existing regional inequities in educational qualifications are also a major factor in high levels of unemployment in parts of GWS. The strengthening of GWS's education and training facilities and support services and adequate public transport services can therefore provide both regional employment for workers in these institutions and improve educational outcomes for disadvantaged residents.

The large population growth anticipated for GWS, and the development of major new urban centres in the north and south of the region should be accompanied by a vision of major new or expanded educational precincts. The increased population will provide the economy of scale necessary for major educational expansion, which can deliver both the skilled workforce for the new economy opportunities that will arise over this period and address the current inequities in educational outcomes.

10.6   Goals, issues and impacts

10.6.1 Sufficiency of access to employment

Currently employment self sufficiency in GWS is 70% [and see *Chapter 4: Economic Development*]. The significant population growth and the development of new large residential areas raises the concern that this level of regional employment is maintained or increased in coming decades. The Strategy indicates a target of 230,000 new jobs for GWS by 2031, but this is not related to a jobs sufficiency level, or other equity parameter, for the region. In contrast, Fagan, Dowling and Langdale, in their employment profile and projections analysis for GWS estimate that 290,000 new jobs will be required by 2019 to match regional population and workforce growth, and give a regional employment containment of 75%.[33]

Goal:
Maintain or increase employment self-sufficiency in GWS.

Recommendation:
Maintain or increase the employment self-sufficiency of the GWS, currently at 70%, but which has in the past decade been as high as 80%. (1.1)

10.6.2 Employment focused in centres

While growth in employment provided within the region would assist in improving regional employment, alone it is not sufficient to deliver benefits in reducing commuting and so increasing social connectedness (particularly with family), physical activity and recreation. The region is very large and current data indicate that travel times within the region are still considerable. A greater concentration of employment in centres would assist in these ways, particularly if accompanied by improved public transport links. The Strategy acknowledges the value of concentrating more employment in centres but does not set a target. Subsequently, the NSW State Plan has set a target of 30% of regional employment to be in centres,which is also an appropriate target for GWS. Currently only 18% of employment is in GWS regional centres. [33]

Goals:
Achieve 30% of employment to be located in regional centres, supported by adequate public transport links.

Recommendation:
Meet the target of 30% of employment being located in the regional centres of GWS, and increase the proportion of GWS residents who can access a major centre in the region within 30 min by public transport to 80% (the level for Sydney overall in 2005). (1.2)

10.6.3 Employment for the South West Growth Centre

The Strategy anticipates 100,000 households for the South West Growth Centre by 2031, accommodating approximately 290,000 people (on current occupancy rates), approximately 150,000 of whom would be in the workforce. This workforce will likely comprise higher proportions of middle to higher paying occupations than currently exists in this part of the region, given the income necessary to afford to purchase or rent new housing in the Growth Centres (see *Chapter 13: Social connectedness* for a discussion of affordable housing)

In order to avoid significant increases in commuting times and VKT and further exacerbation of existing inequity of employment opportunity, both employment and public transport links need to be provided to the South West. The Strategy recognizes these needs and indicates that the NSW Government will "plan and develop new greenfield sites to meet employment demand in growth areas", while committing to a new South West rail link to the Sydney CBD and intra-regional busways.

However, most of the new employment in proximity to the South West Growth Centre is envisaged to be in warehousing and retail and so may not match the profile of the workforce. Unless this issue is addressed, a substantial proportion of the resident workforce of the South West Growth Centre will need to travel (mostly by car) either to the 'global arc' (from Sydney CBD through North Sydney to Macquarie Park and Ryde), or other centres for employment.

Significant amounts of economic and employment growth would need to occur in the South West, and this growth would ideally be in the 'higher order' jobs associated with technology, financial and business services.

> **Goal:**
> Develop new centres of business growth and employment in the South West, particularly 'higher order' jobs in technology, finance, business and associated services.
>
> **Recommendation:**
> Establish areas of higher order employment in proximity to the South West Growth Centre (for example a business or technology park). (1.2.1)

10.6.4 Employment diversity

GWS lacks employment diversity and higher order occupations and industries are substantially under represented in the region (see *Chapter 4: Economic Development*). Increasing employment diversity can have a beneficial impact on the social mix of the region and reduce the need for managers and professionals to commute out of GWS. The Strategy provides little detail about encouraging innovation and investment to create higher order employment in GWS, with its aims relating to this area being largely a simple list of existing or desirable facilities and locations.

Issue of concern:
Low levels of higher order employment in GWS.

Recommendation:
Support higher order employment and diversification of the occupational structure in GWS through creating targets for regional growth in banking, finance, business services, health and medical, IT, cultural industries, research and education and other knowledge based employment and strategies to encourage the location of these industries in GWS. (1.2.2)

10.6.5 Public transport access to employment

As noted above, the dispersal of employment makes it difficult for people to access employment by public transport. While the new M7 tollway provides a road connection to the 'global arc', for those who can afford to pay, the rail and bus links will be ineffective in linking residents to this area, other than the Sydney CBD and even this would involve a very long commute.

The specific issues of concern are that new employment centres will not be accessible by public transport, and that planned public transport will not be provided in a timely manner. In the latter case, the Strategy states that employment centres will have public transport provided in a timely way. However, if public transport is not provided or is delayed, then the Strategy's aims concerning public transport provision and reducing car emissions will be more difficult to achieve. If public transport services are not in place as the population develops in the Growth Centres, people will become habituated to car use and subsequently reluctant to change their commuting mode.

The construction of the Parramatta to Epping rail link, originally a part of NSW policy outlined in "Transport 2010", would make a significant impact on addressing this inequity.

Issue of concern:
The adequacy of public transport provision to new employment centres and for commuters travelling out of the region, and specifically access to the Sydney global arc.

Recommendations:
Ensure that public transport to new employment centres is provided in a timely manner; (2.1.2)

Ensure that public transport links are provided from the Growth Centres to regional centres such as Penrith and to centres of employment outside GWS, including Sydney CBD and Macquarie Park, in a timely manner; (2.1.3)

Ensure that the North West and South West rail links are constructed within announced timeframes and are extended to Vineyard on the Richmond line and to Bringelly on the Leppington line; (2.1.4)

Make a commitment to the Parramatta - Epping rail link; (2.1.5) and

Implement within the announced timeframes the remainder of the Metropolitan Rail expansion program, bus corridors and the rail clearways program, as outlined in the Urban Transport Statement. (2.1.6)

10.6.6 Addressing unemployment in GWS

Unemployment in GWS is highly localised and effects some sub-populations to a far greater degree than others. This problem is largely a consequence of skill mismatches to the available employment and insufficient skill levels in the unemployed population.[33] Transport disadvantage and lack of English skills add further barriers to employment. The Strategy states that it will improve opportunities and access to jobs for disadvantaged populations. These strategies include providing guidelines for the involvement of local people in redevelopment and renewal projects, including a re-skilling element – if appropriate. However, there is no real commitment to substantial retraining and reduction of unemployment within disadvantaged populations.

Issue of concern:
The continuing levels of high unemployment amongst sub-populations and in some geographic areas of GWS.

Recommendations:
Conduct an audit of skill deficits in areas of high unemployment and increase participation in vocational and tertiary education, set a target for tertiary education for the GWS region to address these deficits and provide educational opportunity for disadvantaged areas. 1.2.3)

Set targets for, and monitor, reductions in unemployment in identified disadvantaged suburbs in GWS. (1.2.4)

10.7 Scenario analysis

Scenarios	Details
1. Metro Strategy 50% Greenfield 50% Infill	Achieving a match in employment growth with residential growth has proved difficult in Australian experience. The sort of industry needed in new growth areas and GWS generally ('higher order' jobs in technology, finance, business etc) requires special measures to attract them.

Employment centre development may be more difficult in existing centres than in greenfield sites (where the model of a "business or technology park" could be viable), and may require significant investment in urban renewal and revitalisation of the CBDs. This is understood to be the intention of the Regional Centres Planning, details of which were not analysed in this report. In the Strategy there is no clear planning concerning employment in infill areas. Councils have already expressed concerns with how to provide jobs for the new residents they are expected to house in established residential areas.[110] |
| **2. Laissez Faire** 75% Greenfield 25% Infill | A lower proportion of new residents in infill sites will lessen the incentive and may diminish the capacity of these centres to attract employment providing industry, which would be to the detriment of both existing and new residents.

A larger proportion of residents in greenfield sites would provide a larger worker supply to stimulate / support employment centre development, which would have a positive effect on wellbeing of the resident population. However whether such an outcome could be achieved would be reliant on a wide range of complex factors, difficult to predict or manage and so would represent a more ambitious goal than the already daunting task associated with Scenario 1.

A higher proportion in greenfield sites may also lead to a more dispersed development pattern (based on past experience), making the provision of public transport services difficult and resulting in higher rates of private vehicle commuting and travel times. Without more region-based employment and adequate public transport provision, commuting times and traffic congestion would likely be greater than that under the Scenario 1, as people travel to the existing employment centres in the Sydney CBD, North West etc. |
| **3. Status Quo** 25% Greenfield 75% Infill | With a larger infill population proportion it would be easier to meet the Regional Centres employment targets, transport infrastructure needs and CBD revitalisation goals. However, this has the risk of greater gentrification and exclusion of existing disadvantaged residents as more higher-income people move into established centres. This scenario would therefore require initiatives to ensure housing affordability for lower income people along with employment and skills programs to address existing employment inequities and ensure that those disadvantaged in education and employment also benefit from development.

A smaller proportion of the population in Growth Centre areas may make it difficult to develop viable business or technology parks, |

	or other zones for employment, given the smaller labour pool. Employment in these areas may be limited to service industries. To minimise the commuting times and high journey to work VKT, the early development of public transport services and employment growth in regional centres would be crucial. However this may be complicated by a lesser capacity to raise funds through development levies, under current (2007) financial models. This would have significant budgetary implications if facilities and services were to be provided from consolidated revenue.

11 ACCIDENT AND INJURY`

In this HIA the accidents and injury determinant is analysed only with respect to death and injury due to traffic accidents. Although there are clearly risks to personal safety related to design, material and amenities in the built environment, particularly for the elderly and the very young (for example pedestrian slips and falls, household accidents and interpersonal violence), traffic accidents are a focus because they are most influenced by transport infrastructure and urban form. Other hazards encountered in the built environment are most affected by the standards and regulations administered by local governments on new development and in public areas within their responsibility, rather than as a result of broader urban development.

11.1 Traffic accidents and injury

Traffic accidents are one of the most obvious impacts of the urban environment on health, and the second leading cause of injury in NSW. There are many factors which influence the number of traffic accidents, including the speed at which people drive, the use of alcohol, the number of cars on the road (or VKT), the road conditions and car safety. In NSW numbers of car accident deaths have steadily declined over the past 20 years. In 2005 the death rate per 100,000 people was 7.5, the lowest since 1908.[111] Car accident injury rates have also been declining, with actual numbers remaining fairly steady since the early 1990s, despite an increasing population.

Reductions in road accidents and death and injury are the result of improvements in car safety, protective and preventative measures, such as seat belt wearing, reductions in drink driving, reduced urban speed limits and improvement to the safety of roads and crossings.[112, 113]

Pedestrians and cyclists are particularly vulnerable to the impact of traffic collisions which is reflected in mortality rates disproportionate to the modal share of active transport. Approximately 18% of road deaths are pedestrians and 3% are cyclists, yet pedestrians and cyclists make up 6% and 1% of modal share respectively.(cited in [113])

11.2 Traffic accident and injury in GWS

Country areas account for a disproportionate number of road deaths with 62% of fatal accidents occurring on non-metropolitan roads.[111] GWS is also disproportionately represented in rates of road fatalities , with 61% of Sydney's fatal accidents occurring in GWS. This has led the RTA, the MAA and NSW Police to establish special measures to address road safety in the region (Operation Westsafe), which has led to a decline in the proportion of fatal accidents in GWS.[114] Table 11.1 shows the road accidents across NSW, and Table 11.2 provides accident statistics for the LGAs in GWS.

Table 11.1 NSW Road accident statistics, 2005

Variable	Number
Killed	508
Injured	25209
Vehicles in state	4,124,000
Population of state	6,774,000

Table 11.2 Total persons killed or injured, GWS LGA (where accident occurred), 2005

| LGA	Total casualties(deaths and injuries)
Auburn	359
Bankstown	719
Baulkham Hills	459
Blacktown	1006
Blue Mountains	256
Camden	164
Campbelltown	493
Fairfield	812
Hawkesbury	289
Holroyd	471
Liverpool	847
Parramatta	746
Penrith	669
Wollondilly	178

(source[111])

11.3 Equity and accident and injury

Deaths due to vehicle accidents are the fourth leading cause of avoidable mortality (deaths that could potentially be avoided by individual behaviour change or preventative measures) in NSW.[115] Motor vehicle accidents are one of the contributing factors to higher mortality and morbidity rates in socio-economically disadvantaged populations.[24] Although motor vehicles deaths have been declining generally, there is a significant gap between the avoidable mortality due to traffic accidents between the highest and lowest socio-economic groups.[115]

There are very marked differences in motor vehicle death and injury by gender and age, with younger males substantially over-represented for both deaths and hospitalizations due to motor vehicle accidents (see Figure 11.1)

Figure 11.1 Motor vehicle crash deaths 1985 to 2004 and hospital separations 1989-90 to 2004-05, by sex, persons of all ages and persons 15 – 24 years old: NSW

(Source: [24])

AGA Consulting P/L
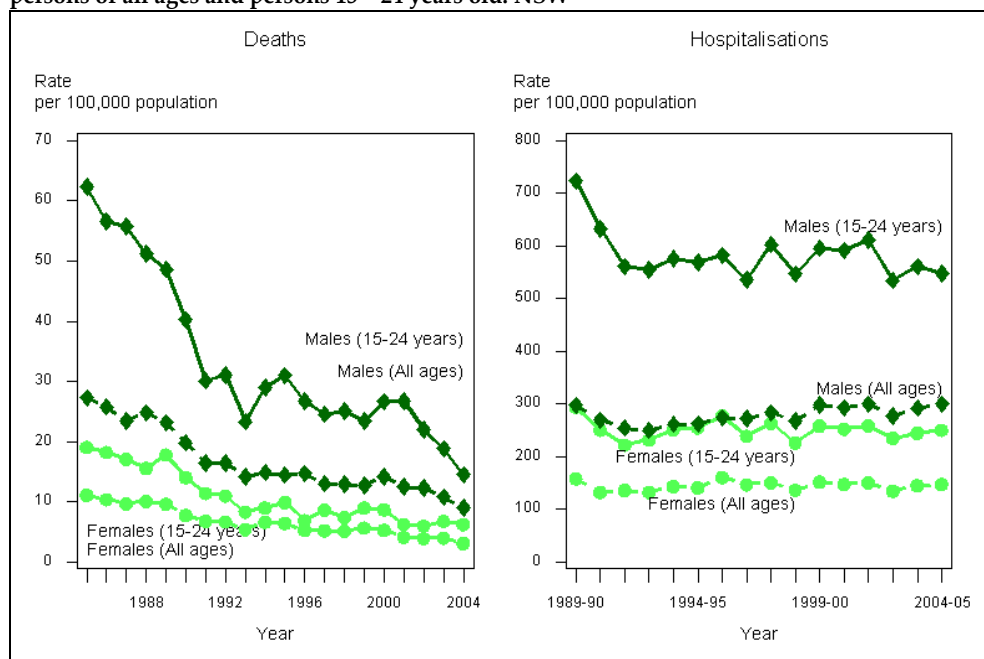
11.4 Urban dimensions and accidents and injury

The transport and public health literature indicates that there are evidence based strategies relating to urban form and transport which can reduce traffic deaths and injuries.[52, 60, 112, 113, 116]

- Measures to reduce vehicle kilometres travelled (VKT)

Even with ongoing improvements to car design and road safety, numbers of accidents are still a function of how many cars are on the road, or more particularly, levels of VKT. That is, given a particular accident rate for a city (e.g. per million VKT), the greater the total kilometres driven, the greater the number of total accidents that occur. Thus measures to reduce VKT, such as changes to urban form which reduce the need for car use and ownership (see *Chapter 8: Physical Activity*), and increases in the modal share of public transport and active transport, will also reduce total numbers of motor vehicle accidents. Increased public transport use is a measure identified by the NSW RTA which can contribute to road safety and reduced road toll.[112]

- Speed limits

Lower speed limits are one of the most effective road safety measures that can be taken. Systematic reviews of the effect of urban speed limit reductions (from 60kph to 50kph and from 50kph to 40kph) have found up to a two thirds reduction in personal accidents.[60] Speed limit reductions also reduce the impact of accidents on pedestrians. For example, it was estimated that only 5% of pedestrians would die if struck by a car travelling at 32 kilometres per hour or less; this compares with fatality rates of 40, 80, and nearly 100 percent for collision speeds of 48, 64 and 80 kilometres per hour respectively.[25][116]

- Traffic calming

Traffic calming is defined as "the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behaviour, and improve conditions for non-motorized street users." It includes such devices as speed humps, roundabouts, chicanes (s-shaped curves) and road narrowing. These types of devices have been shown to consistently reduce collisions over the area in which they are used. They have a particularly strong effect on reducing accidents on local roads. The positive impact of traffic calming on reducing accidents has also been consistently observed across countries. This suggests that traffic calming is a highly useful measure to implement in suburban streets.

- Separating pedestrians and cyclists from vehicle traffic

Separating pedestrians and cyclists from cars, improves safety. Footpaths are particularly important for pedestrian safety with one study finding that pedestrian accidents were two and a half times more likely in areas of road with no footpaths as those with footpaths.

- Providing safe pedestrian crossings

The safest crossings are those which completely separate pedestrians from the road, such as pedestrian bridges or underpasses. Intersections which are controlled by traffic lights also tend to be fairly safe for pedestrians. Marked crosswalks on roadways can be effective in slowing cars, particularly on roads where cars tend to be at low volume and travel at low speeds. However, the effectiveness of marked crosswalks is less on higher traffic volume roads.

- Roadside objects

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[25] Note that speeds have been converted to kilometres per hour from the miles per hour in original study.

The evidence concerning the influence on accidents on road side objects (such as trees and rubbish bins) is mixed. On the one hand, these elements are seen as more clearly marking the road side for drivers and may deter high speed driving.[52] Tree and shrub plantings in appropriate locations can also act as an effective traffic calming device by reducing the apparent width of the street as wide streets encourage higher traffic speeds. However, roadside objects have also been shown to increase the risk of child pedestrian injury, as a child may be concealed by these objects when walking along the roadside.[117]

- Play areas for children

Parks and play areas away from roadways contribute to reducing accidents and injury to children. An Australian study found that 78% of child pedestrian injuries happened to children who lived in streets with no parks or other appropriate recreational facilities.[118](cited in [117])

11.5 Goals, issues and impacts

11.5.1 Reducing VKT

Traffic accidents and injury, including those involving pedestrians and cyclists are partially a consequence of the number of vehicles on the road (see above). Thus, measures that reduce car VKT can be expected to have a positive impact on road safety. The reduction of car use is a clear theme within the Strategy, and goals have been set by the NSW Government for reductions in rates of growth of VKT in prior policy (see earlier discussion on Air Quality and Climate: 7.3 above). The Strategy includes measures to increase public transport, increase active transport and increase development in established areas, where higher density living will reduce the need for car ownership and use.

Issues of Concern:
The sufficiency of measures in the Strategy to result in decreases in VKT.

Recommendations:
Set targets and develop a mechanism for, and monitor, yearly reductions in growth of VKT and / or yearly reductions in fuel consumption for GWS; (2.3)

Set targets for reductions in road fatalities in GWS at 0.7 per 100 million vehicle kilometres travelled by 2016. (2.10)

11.5.2 Pedestrian and cyclist safety

The development of greenfield sites, such as the Growth Centre areas, can easily facilitate separation between motor vehicle traffic from pedestrians and cyclists. While the provision of footpaths and off road cycleways, as cited in the Strategy, will assist in improving safety, the safety of pedestrians and cyclists using existing road infrastructure could be further improved with construction of new pedestrian infrastructure, cycleways and retrofitting of existing facilities. These benefits have been recognised in previous policy development of the NSW Government, through *Action for Bikes 2010*.

Issues of Concern:
Safety of pedestrians and cyclists, particularly those using existing road infrastructure.

Recommendations:
Implement *Action for Bikes 2010*, particularly providing increased funding to off-road cycleways and ensure their construction and effectiveness as viable access routes. (2.7)

Develop a cycling strategy that includes all public transport corridors to compliment all new and existing motorways. (2.8)

Ensure that development in the Growth Centres and new development in other greenfield and established areas closely follows planning guidelines in existing NSW Government Policy, particularly with regard to walkability, pedestrian safety and mixed use design, as outlined in *Integrating Land Use and Transport – Guidelines for Planning and Transport* and *Guidelines for Walking and Cycling* (both prepared by the Department of Planning) and the National Heart Foundation's *Healthy by Design*, and *Supportive Environments for Physical Activity (SEPA.* (4.2)

11.5.3 Off road play areas for children

It is evident that availability of play areas is a factor influencing child accident rates. Adequate provision of parks and play areas for children is at risk of compromise in the infill sites due to the pressure on available land created by new development.

Issue of Concern:
Adequacy of public open space in infill development, particularly to give children sufficient areas to play away from roads

Recommendation:
Develop and implement measures to protect and improve existing open space in established areas to compensate for densification pressures likely to occur in these areas, with particular attention to the needs of children living in medium or high density housing. (4.5)

11.6 Scenario analysis

The scenario analysis of accidents and injury involves a simple extrapolation of figures derived from existing representative LGAs, one recently developed from greenfield and the other an established area, to the proposed population levels for 2031. Figures from NSW Ministry of Transport's Transport Data Centre for Bankstown, representing an established area and Baulkham Hills, representing a recently developed greenfield area. Given that not all of Baulkham Hills was recently developed from a greenfield site this analysis would likely underestimate the differences between greenfields and infill development.

Using the average number of cars per household in greenfield and infill sites, calculated to be 1.95 and 0.78 respectively, coupled with the estimates of population in the greenfield and infill sites in each scenario, the total number of cars can be estimated. As car accident fatalities and injuries are directly proportional to the number of vehicles on the road, this in turn yields an estimate of the differences in the fatality and injury rates for each development scenario, as shown in Table 11.3. Table 11.4 sums these differences over 30 years assuming that population growth and differences in fatalities and accidents would increase linearly over this time. This table also quantifies the additional road fatalities and injuries that could be reasonably

anticipated to result from both of the increased greenfield development scenarios, given that Scenario 3 represents recent past trends.

The analysis shows that over a 30 year period there will likely to be 195 more road fatalities and 9674 more road injuries through a scenario involving maximum development of greenfield sites compared to a continuation of recent past trends. The planned level of greenfield development in the Strategy would produce approximately half these increases in fatalities and injuries.

Table 11.3 Comparison of Fatalities and Injuries per annum for 3 Development scenarios in Greater Western Sydney after population growth reaches an additional 600 000 people

	Total Pop	Proportion Greenfield	Proportion Infill	Total Cars	Annual fatalities per 10 000 vehicles	Annual Injuries per 10 000 vehicles	Fatalities per annum	Injuries per annum
1. Metro Strategy 50% Greenfield 50% Infill	600,000	0.50	0.50	278,125	1.2	61.1	42	2 081
2. Laissez Faire 75% Greenfield 25% Infill	600,000	0.75	0.25	302,425	1.2	61.1	48	2 387
3. Status Quo 25% Greenfield 75% Infill	600,000	0.25	0.75	251,715	1.2	61.1	35	1 742

Table 11.4 Comparison of Additional Fatalities and Injuries for 3 Development Scenarios in Greater Western Sydney, summed over 30 years, assuming linear population growth to an additional 600 000 people

	Total Pop	Proportion Greenfield	Proportion Infill	Total cars	Additional Fatalities/ yr compared to Status quo	Additional Injuries/ yr compared to Status quo	Additional Fatalities/ 30 yrs compared to Status quo *	Additional Injuries / 30 yrs compared to Status quo*
1. Metro Strategy 50% Greenfield 50% Infill	600 000	0.50	0.50	278 125	7	339	105	5 085
2. Laissez Faire 75% Greenfield 25% Infill	600 000	0.75	0.25	302 425	13	645	195	9 674
3. Status Quo 25% Greenfield 75% Infill	600 000	0.25	0.75	251 715	0 (35)	0 (1 742)	0	0

* Increases in the differences between scenarios are assumed to rise linearly with population growth over a 30 year period.

12 ACCESS TO HEALTH, SOCIAL AND EDUCATIONAL SERVICES

Health, social and educational services are essential components of the locally provided social infrastructure necessary for community functioning and individual wellbeing. As discussed above, viable local communities which encourage active transport and social connectedness, imply that there are local destinations and sites for social engagement. The Strategy recognises this, describing new communities to be developed in terms of local amenity and service availability, along with attractive environmental conditions. However, with the exception of reference to some educational facilities, the details of necessary service provision, and their value for health and wellbeing, are not provided in the Strategy. This level of more detailed planning has been left to the planning processes of the relevant State Government agencies and local government.

This HIA argues that planning for social infrastructure provision should be a standard part of planning processes for urban development, along with physical infrastructure, housing, employment, economic activity and environment. Past experience of urban development in GWS has been that where social infrastructure is considered after residential development occurs, significant inequities in access to services result.[156] Accordingly, this section outlines the significance of health, social and educational services for the health and wellbeing of the population, and some of the issues that arise in ensuring adequate and equitable access to these services.

The issues of concern with regard to adequate access to health, educational and social services include:

- the presence of an appropriate range of services and facilities in a location for resident population needs;
- adequate levels of service provision (i.e. enough staff to meet demand, acceptable waiting times/lists, etc);
- quality of services, and that they are equitable to those provided in other places;
- transport access; and
- availability of specialist or intensive services and interventions for those who need them.

Included in the Sydney Metropolitan Strategy is the aim to 'ensure fairness' in access to services, measured in terms of the proportion of the population living within 30 minutes by public transport from a city or a major centre. However this measure does not consider other dimensions of accessibility, such as affordability, and assumes that appropriate services are available in all the major centres. The simple measure of travel time does not consider the efficacy of transport systems for peoples' well-being, which would include such issues as enabling frequent access, ease of access for people with young children.

12.1 Access to educational and social services

Based on input from agencies consulted for this HIA and the recent development history in GWS, the social infrastructure considered most important to address both the existing service and support deficits and to ensure that residents in new land release areas have equitable access to services, are:

- schools and preschools (including programs for successful integration into school such as Families First, Parents as Teachers, Schools as Community Centres and Primary Connect);[26]
- child and family services (including childcare, specialist early childhood intervention support services and general family support services); and,
- cultural services and facilities.

These services are highlighted because of the impact of early intervention on long term life outcomes, particularly for disadvantaged people, and the overall lack of cultural services and facilities in GWS.

12.1.1 Schools and pre-schools

The issues that have arisen in recent decades of urban growth in GWS regarding schools, preschools and allied services/programs, have been the timing of primary school development in new residential release areas, and the access and affordability of preschools and the development of school integration services, particularly the widespread Schools as Community Centres (SaCC) Program. [157] This Program engages families of school pupils, government service agencies and community projects in a partnership to maximise the outcomes of the primary school students.   Schools are also important places for new residents to meet.

Although this program has been developed particularly for disadvantaged areas, the principles and processes are valid for the general population, particularly given that there is usually a range of socio-economic backgrounds represented in state public schools. It could be argued that new residents to a greenfield development area would not just benefit from the early development of a local primary school, but also the development of social connections, service supports and community capacity that are the focus of the SaCC program.

Access to pre-schools has been demonstrated to make a significant difference to subsequent educational outcomes, particularly for educationally disadvantaged people[27] [158]. This has recently been acknowledged in NSW Government policy and programs supporting pre-schools in disadvantaged areas, and is reflected in contracts let by the NSW Government for the development of new residential areas which involve a component of construction of pre-schools as a part of primary school development.

12.1.2 Early childhood intervention and childcare

Early childhood intervention services include childcare/ early education (which has a crucial role in identifying and addressing developmental issues), family support services (which can provide support in such areas as parenting skills, nutrition, social engagement, health, etc), playgroups and other parent support groups.

The value to the individual and the family of early rather than late identification of child developmental delay and/or disability issues is obvious. However, well respected academic research has also shown that investment in early intervention yields greater returns than later investment, and the financial cost to the community of providing support in the early years of life, is repaid many times over in avoiding more costly and less effective interventions later in

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[26]   An outline of these various programs is provided by the NSW Department of Education, through their website: www.det.nsw.edu.au/reviews/futuresproject/issuespapers/schoolcommunity.htm

[27]   See National Institute for Early Education Research www.nieer.org for research on early education.

life[28]. US studies indicate a 7 to 13 fold return on financial investment that is made in the early years of life, along with improved outcomes for individuals in employment, income and reduction in crime and imprisonment [119, 159].

12.1.3 Cultural programs and facilities

Attention to cultural needs is broader than a focus on artistic practices, but includes such issues as values, language and communication, social practices or conventions and cultural sensitivity in service delivery and engagement with government, business and services. This broad view of culture and its importance for communities is acknowledged by both State and local Governments:

> *"Culture in its widest sense is about what matters to people and communities. It is about relationships, shared memories and experiences. It is about identity, history and a sense of place and belonging. It is about the different cultural and religious backgrounds found in most communities. It is about the things we consider valuable for passing on to future generations. It is our way of connecting the present with the past and the future".* [160]

As can be seen from this definition, culture is a central issue in an individual's and a family's establishment of a home and belonging to a particular place and, consequently, for the development of social capital and community capacity. People want to participate in creating meaningful places to enhance local identity, health and wellbeing. The very diverse cultural communities that currently reside, and will continue to settle in GWS, require a comprehensive strategy and investment to ensure that culture is a resource, an opportunity for personal growth and contribution, rather than a barrier.[161] Investment in cultural programs and facilities that are inclusive and responsive to the diverse cultural backgrounds represented by the population in GWS also increase the capacity of the community to manage and resolve conflicts that may arise revolving around, or focusing on, cultural differences.

Consideration and consultation with regard to culture, and access to the arts, should be a part of all stages of the development process. For example, public art projects instigated as part of the development process can engage the new residents and the design and amenity of cultural facilities should be able to accommodate their various cultural backgrounds and aspirations. Access to existing regional arts facilities should be ensured and the intra-regional transport network should cater for this. Planning for new release areas should also recognise the employment opportunities provided by the arts, since the cultural industries are one of the fastest growing areas for employment and are a catalysing force in urban development.

12.1.4 Access to Health services

While good population health is far more than a question of accessible health service provision,[6] health services are still an essential part of maintaining population health, treating disease, illness and injury, and promoting health and wellbeing generally. It is generally expected that urban Australian populations will have access to health care services which cover the following:

- primary health care (general practitioners, community health services etc);

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[28]   See Heckman, J (2000) *Invest in the Very Young,* University of Chigago. The author concludes that "learning begets learning and skills acquired early on make later learning easier…efficiency would be enhanced if human capital investment were reallocated to the young" (p. 4).

- emergency medical care;
- hospital and clinic based medical care;
- specialist treatment;
- preventative health (screening, health promotion, health education);
- mental health care;
- dental health care;
- allied health care; and
- palliative care.

The provision of all of these services to a new residential area developed in a greenfield site is a significant challenge. Inevitably priorities need to be set, and for those services that cannot be quickly provided to a new development area, access plans to regionally delivered services need to be considered.

Table 12.1 provides selected survey data on access to and rating of health care services in the GWS region's AHSs and for the State as a whole. Overall, while difficulty in accessing general health services is less of a cause for complaint amongst GWS residents, and rating of hospital care is on par with the NSW average, emergency care rates significantly poorer for GWS than for NSW in this user survey.[64] The location and delivery of emergency health care is a long standing issue in GWS and, unless addressed through long term planning, this problem will only be exacerbated by continuing population increases.

Table 12.1 Health care access and rating, GWS Area Health Services 2005

AHS	Difficulties getting health care when needed	Hospital care Excellent, very good or good.	Emergency care Excellent, very good or good.
SWAHS	9.1%	89.2%	73.5%
SSWAHS	10.3%	91.0%	74.1%
All of NSW	13.1%	91.8%	80.7%

Source [64]

12.2 Equity and access to educational, social and health services

In GWS the major equity issues with respect to delivery of educational, social and health services are quality of service, transport access and adequate service levels that are appropriate for socio-economically disadvantaged populations.

The issues concerning equity of access to early childhood education were discussed above. Clearly, children who are socio-economically disadvantaged can particularly benefit from intensive early education and intervention services, and so need to have adequate access to these services.

In *Chapter 6: Equity, Health and Wellbeing* it was demonstrated that the socio-economically disadvantaged population of GWS experience more disease and illness and have higher levels of health risk behaviours. Consequently, and at a minimum, socio-economically disadvantaged populations require proportionately more health services than more advantaged populations.[41] There is also evidence to show that access to quality health services can improve health outcomes for disadvantaged populations.[120] This suggests that provision of high quality primary care services would be a priority for socio-economically disadvantaged populations.

12.2.1 Transport disadvantage and access to services

Lack of access to transport can also impede access to services. Hurni's study of transport disadvantage in GWS identifies some groups at particular disadvantage.[11] These include older women, sole parents and young unemployed people. Some of the barriers they face to using public transport include:

- cost of transport;
- timing of services;
- cross regional access;
- difficulties physically accessing public transport;
- limited space on buses for prams and shopping;
- winding bus routes and poorly connected services; and
- poor public transport access to health services not located in central business districts.

Transport difficulties were found to reduce access to work, education and training, health services, sport and recreation and opportunities for social interaction.[11] As a consequence, disadvantaged groups are finding that difficulties accessing transport create a barrier to full social and economic participation. Using public transport, particularly bus services, is often experienced as difficult, time consuming and costly. Thus, an additional burden of stress and inconvenience is added to the lives of people who are reliant on public transport.

The major commitments to transport services and infrastructure are the heavy rail links for the North and South West Growth Centres and new bus corridors between Blacktown and Parramatta and between Liverpool and Campbelltown. These commitments are intended to provide for new residents, and seem primarily aimed at addressing commuting needs to major employment centres. Accordingly they will have limited value to existing transport disadvantaged people, although inter-regional connectivity may be improved to some extent by the bus corridors.

Issues of cost, timeliness and frequency of service, physical access and capacity of buses, will not be addressed solely by developing new corridors. It is also uncertain whether there will be new services to meet the local travel needs of residents for shopping and service access.

12.3   Goals, issues and impacts

12.3.1 Provision of social infrastructure in the Growth Centres

A range of basic social infrastructure is planned for the Growth Centres, including shopping facilities, schools, preschools and health services (see *Chapter 5: Social Infrastructure*). This infrastructure is to be provided through a financing model which sees developers paying a large proportion of social infrastructure costs. There is a clear intent to provide basic social infrastructure in a timely manner, as development proceeds. However, there is no overall commitment or guarantee by the NSW Government that the full social infrastructure needs of new residents will be met, as there is in other areas of infrastructure provision, such as roads, railways, water reticulation, sewerage, etc.

Clearly the demands of a rapidly developing new community are different, both in terms of type and timing, than in more established areas. It is important to identify the priority services and facilities required. This is particularly important for the initial residents, who are likely to suffer specific disadvantages associated with the long lead times for provision of major facilities

or services, often compounded by the relative isolation from any existing social infrastructure. It is also important to cater for a mixed population including younger and older people and people with disabilities. The fact that the younger population will at some later point require aged services, should also be factored into planning (for example, with multi use facilities). The integration of new and established residents in order to either avoid, or reasonably resolve, any conflicts arising from the settlement of newcomers, is also an important consideration.

Issue of Concern:
The sufficient and timely provision of social infrastructure in the Growth Centres.

Recommendations:
Ensure that social infrastructure is provided to the Growth Centres at the time that residents move in. Special attention needs to be paid to the provision of early intervention and early childhood services and cultural facilities, in light of the inattention to these services in past planning and the relative underinvestment in them in the GWS region as a whole.(3.1)

Develop a funding model for the delivery of social infrastructure that includes a nexus between population growth and service delivery and is underwritten by the NSW government. (3.2)

12.3.2 Social infrastructure for increased populations in established areas

At present there is little detail about how and what social infrastructure is going to be provided for the new population established areas. This population could range between 123,000 to 420,000 people, depending on the eventual split between greenfield and infill development. Clearly this new population will be making substantial demands on existing services, and will require the funding and provision of new services, in particular primary health services and schools.

Issues of Concern:
Social infrastructure provision for new populations in infill sites in established areas and the existence of significant transport disadvantage in some locations in GWS.

Recommendations:
Conduct an analysis of existing social infrastructure and service deficits in established areas, the likely services requirements of new residents in these areas, and the best means of increasing service levels to meet these needs. (3.4)

Identify and address transport disadvantage in existing disadvantaged suburbs in GWS as a matter of urgency. (2.9)

12.4   Scenario Analysis

Table 12.2 Impact on social infrastructure by scenario

Scenarios	Details
1. Metro Strategy 50% Greenfield 50% Infill	The development of the full range of new educational, social and health services for a large population in greenfield sites is a major challenge. Commitments made in the Strategy in this regard are general rather than specific and comprehensive as they are with respect to transport and utilities, for example. The large greenfield developments carry the risk of undersupply of social infrastructure and consequent inequitable outcomes for residents in these areas. While the majority of residents of the Growth Centres are not likely to be of low socio-economic status, the difficulties encountered in settling in new developments, in making social connections, accessing service support and developing a sense of local community, warrant attention to adequate social infrastructure provision. The Strategy does not address the need for a new or expanded social infrastructure that would be required for the significant increase in population in established areas. Development levies administered by local government may or may not be able to contribute to social infrastructure provision in these areas, depending upon other demands upon these funds and the outcome of current review of these levies.[29] The relevant State agencies would seek augmentation to their core funding to cater for population growth through the usual budgetary processes. This process offers no guarantees and highlights that the Strategy does not fully embrace planning for social services and facilities.
2. Laissez Faire 75% Greenfield 25% Infill	Any greater proportion of the population accommodated in greenfield development sites would magnify the issues identified for Scenario 1. There is an additional concern that should greenfield development occurred beyond the capacity of the two Growth Centres, there is even more uncertainty with regard to funding of necessary service provision, as there would not be the special development levies to fund them that apply within the Growth Centres. A smaller population increase in established areas, combined with a large demand for service delivery development in greenfield

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[29]   At the time of preparation of this report the NSW Government is reviewing provisions of Section 94 Developer Contributions that are a source of funds for infrastructure required to meet the demands generated by new development.

	sites, could limit the capacity of State funding agencies to secure funds for service delivery enhancement in established areas. A comprehensive approach to population growth would include a funding enhancement model for social service and facility provision that was linked to population levels. As many of these areas already support disadvantaged populations and have existing deficits in service delivery, a scenario of with dominant greenfield growth (predominantly accommodating middle and higher income people) could result in deepening inequities in GWS. Existing disadvantaged areas could be starved of funds while new greenfield developments would benefit from improvements in design, transport, amenity and services.
3. Status Quo 75% Infill 25% Greenfield	Under this scenario there could be up to 420,000 new residents in established areas in GWS. To manage this level of growth significant funding would be needed to re-develop degraded and/or poorly designed urban landscapes and develop and/or enhance services and facilities in order for these areas to be attractive to new residents. Planning for the Regional Centres has already recognised the former point and urban renewal plans are being drafted. Gentrification of established areas that would (to some degree) be inevitable under this scenario, carries with it the risk not only of displacement of poorer people who can not afford housing in these centres, but also that service development could favour the new residents rather than support for disadvantaged people.

13   SOCIAL CONNECTEDNESS

In this report, the term social connectedness is broadly understood as describing the wide range of relationships that exist between family members, friends, neighbours, acquaintances, work colleagues and people within local communities. These connections fulfil a human need for interpersonal attachments and engagement with a wider world as well as contributing to a sense of belonging, trust, support and reciprocity. There is no standard definition of social connectedness, however most uses of the term, or the related term of social capital, include these elements.[56, 121]

According to Robert Putnam, one of the most prominent researchers in the field: "the more integrated we are in our community, the less likely we are to experience heart attacks, strokes, cancer, depression, and premature death of all sorts."[122] Social connections also make it more likely that we will feel happier: "the single most common finding from a half century's research on the correlates of life satisfaction, [from] around the world, is that happiness is best predicted by the breadth of one's social connections."[122]

There is substantial evidence to support Putnam's conclusions of a beneficial impact of social connections, with a wide research base into social connectedness and the related concepts of social capital and social inclusion. Although social connectedness is not uniformly beneficial (for example criminal associations, abusive families, cults, etc) the research evidence shows that individual social connectedness is related to lower mortality rates, lower rates of disease, better mental health and better self rated health. [123-128]

Some of the more specific associations between social connectedness and health and wellbeing reported in the literature[52, 129] include:

- faster recovery from illness;
- better recovery from serious illness such as stroke, heart disease and cancer;
- lower suicide rates;
- lower rates of depression;
- less binge drinking; and
- less violent crime.

The mechanisms by which human contact and connection benefit individual health and wellbeing are the subject of current research, but clearly, contact with other people avoids the damaging impacts on human mental and physical health of isolation and loneliness.[130] It has also been argued that social connections benefit health by ensuring help in a crisis, general social support and practical assistance with employment networks, supporting healthy behaviours and providing a sense of belonging.[129, 130]

Collective social connectedness is also an area which has generated considerable research interest in the question of whether community levels of trust and social ties have an impact on population health.[131-135] While conclusions from this research are complicated by extraneous factors,[136, 137] clearly a community in which there are high levels of trust, reciprocity and connections between social groups and individuals is more desirable to live in than one in which people fear and distrust their neighbours other sections of their local community. It has been suggested that highly connected communities deal better with conflict, problems or change, with existing connections and networks enabling collective action.[138]

13.1 Social connectedness in GWS

Differences in degrees of social connectedness in GWS compared to other parts of the State have been identified in survey data collected by NSW Area Health Services. For example, on the question of whether people believed that 'most peopled can be trusted', 65% of residents in SSWAHS responded positively compared to the state average of 73%. 62% indicated that they visit their neighbours, compared to the state average of 67%.[64] By contrast, SWAHS residents did not vary markedly from the state average on either of these or other social connectedness indicators.

For residents of disadvantaged locations (as outlined in *Chapter 6: Equity, Health and Wellbeing)*, low levels of involvement in the labour market, socio-economic disadvantage, associated stigmatisation of their place of residence, poor transport and services, can limit an individual's engagement with the wider community.

There is concern that GWS is developing further spatial polarisation by income,[34] with an increasing tendency for some locations to be highly disadvantaged while others are becoming exclusive enclaves for the well off. This type of polarisation has long been evident with respect to public housing estates, but there are also recently formed pockets of disadvantage associated with larger CALD populations predominantly in private rental in some of the older suburbs of GWS.[34]

A socio-economically divided urban landscape is undesirable in many respects. Existing disadvantage is entrenched, as people's opportunities are limited, which creates an unfair burden on particular schools, health and social services.[34, 52, 139, 140] Planning new development provides an opportunity to create communities where people have a range of incomes, backgrounds and demography generally. However, this of course does nothing for existing areas of disadvantage, which the Strategy should also address.

13.2 Urban dimensions and social connectedness

There are a number of features of the GWS urban environment and transport patterns which have been shown to be associated with lower levels of social connectedness. As with physical activity, determining causal relationships between the urban environment and social connectedness is challenging. A number of key associations have been found in the literature. [19, 52, 56, 69] These include:

- Long commute times

Time spent in a car is time that cannot be spent connecting with other people or contributing to the civic affairs of a person's community. "Time spent alone in cars translated directly into a loss of social capital"[52] Putnam argues that each additional ten minutes spent in daily commuting time cuts involvement in community affairs by 10%.[52]

- Walkable neighbourhoods

In *Chapter 8: Physical Activity* outlined how walkable neighbourhoods support higher levels of physical activity, with walkability being a function of ease of access to local destinations and safe, aesthetically appealing pathways of travel. There is evidence to suggest that walking to and from local destinations creates opportunities for informal contact.

- 'Leapfrog'[30] development

Sequential development patterns provide a means for new residents to link with existing communities, through using established facilities and services such as shops, cafes, neighbourhood centres, schools, libraries, sporting facilities and clubs. By contrast, 'leapfrog' development creates physical and social barriers with existing communities and is strongly associated with a weakened sense of community.[156]

- Community facilities and public space

The existence of community amenities and facilities such as cafes, shops, clubs, footpaths, plazas and parks provide opportunities for people in a community to meet and connect with one another or 'hang out' informally. "The coffee shop, the local grocery store and other informal gathering sites have been zoned out of residential areas. An…arguably dangerous amount of attention has been paid to the individual and family unit, resulting in aesthetically well designed individual homes but no sense of community"([141]cited in [56])

The role of schools is noteworthy, with primary schools of particular importance in fostering social connectedness in new development areas, where friendship, neighbour and acquaintance networks are yet to be established (see *Chapter 12: Access to health, social and educational services*)

- Community severance

When communities are dissected by busy arterial roads, railway lines or other substantial barriers, without adequate and easily accessible pedestrian and vehicular crossings, a typical pattern can emerge whereby one side of the barrier (for example a railway line) suffers from underdevelopment and even stigmatisation compared to the other. Numerous examples of this can be found in GWS (i.e. Cabramatta, Blacktown, Bankstown) that may persist even after cross barrier access issues are addressed.

To summarise, an urban environment associated with higher levels of social connectedness is on a scale small enough for social interaction, connected to existing communities, mixed income, in close proximity to employment, walkable, and features quality destinations and public space.

A number of other HIAs have specifically highlighted issues of social connectedness in relation to aspects of the urban environment, including:

- the importance of providing social services and facilities;[142]
- the risk that the planning process will not be able to establish new communities with high levels of social capital and commensurate social infrastructure. The observation is made that high level planning, integration and commitment are required for this outcome;[143]
- the need for community involvement in the delivery of the strategy (The London Plan;)[50]
- the need for an efficient transport system that minimises travel times and connects people to their neighbourhoods and wider city (especially important for low income areas);[56] and
- design for active transport and plan for active centres which are close to employment and community facilities.[56]

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30   The term 'leapfrog' development refers to a pattern of development whereby new suburbs are created further out and disconnected from existing residential areas.

13.3 Goals, issues and impacts

13.3.1 Equity and housing affordability

The Strategy recognises that housing affordability is an important issue affecting "our ability to maintain social diversity in our communities and the opportunity for essential service workers to live close to work." However, the Strategy contains no strategies or targets aimed at increasing the stock of affordable housing or ensuring that communities exhibit a mix of socio-economic background.

Plans for greenfield development in the Growth Centres do include anticipated housing diversity in terms of size, style and cost. However, there is no assurance that amongst this diversity there will be adequate (or any) supply of low cost housing that can be afforded by low income earners either purchased or rented. Nor is there any allocation of social housing. Recent housing development negotiations in other parts of the region have involved inclusion of a small percentage (usually in the order of 3%) of total residential development for affordable housing. In this sense it can be expected that low income households will largely be excluded from the Growth Centres, and will be concentrated in the infill developments in existing suburbs thus exacerbating the socio-economic divide.

The Strategy proposes that approximately half of the new housing in GWS over the next 25 years will be in established areas, a proportion of which is anticipated to be multi-unit developments. Planning for this housing growth is delegated to a subsequent subregional planning, which at the time of this report has not progressed to the release of draft housing allocation figures for all the LGAs in GWS. Consequently this report cannot assess the impact of housing development plans for GWS other than a broad analysis of the potential impacts of the proportion of greenfield and infill development informed by trends (in affordability, housing form and supply, etc) evident in recent housing developments and the current housing market.

Currently, demand for apartments in the middle and outer areas of Sydney is largely generated by lone person households and lower income two parent and sole parent families who are predominantly renting.[144] As discussed above, in GWS many established areas exhibit low socio-economic characteristics (i.e. higher than average unemployment rates, lower than average incomes, lower than average overall IRSD scores, etc). Also, five of the seven locations indicated for infill development in the Metropolitan Strategy contain a strong housing submarket of 'migrant low income communities renting largely from the private sector' for whom 'common features of this population are high unemployment, low skills, and lack of fluency in English."[31]

If a proportion of infill development is provided by the re-development of older (usually less expensive) housing stock, this gentrification is likely to displace many lower income and other disadvantaged people unless appropriate levels of affordable housing are a part of re-development. Past experience indicates that people are likely to be displaced to areas further from Sydney city and Regional Centres, therefore diminishing their access and connections to amenities, services, employment and possibly their family support structures.

Accordingly, if housing affordability is not addressed in population growth for established areas of GWS, current patterns of social polarisation and inequity are likely to be entrenched and intensified. Alternatively, if disadvantaged people can be retained in redeveloped areas, the new investment and economic activity can provide greater local opportunity that can assist in addressing underlying disadvantage, particularly intergenerational disadvantage. Hence,

development, rather than being detrimental to lower socio-economic groups could, when accompanied by appropriate social policy, be a factor that increases social connectedness and improves individual circumstances. The value of retaining or creating a social mix in re-development has been recognised in other planning jurisdictions. For example the South Australian government recently adopted legislation which sets a target for affordable homes to be 15 percent of significant new developments.[145] A similar goal could be adopted in NSW.

Diversity in housing form and cost is also desirable to accommodate differing housing needs during a family's lifecycle. Family changes, such children leaving home, students requiring inexpensive housing for the duration of their studies, couples separating, the death of a spouse, etc, may entail a different need for housing in terms of size, cost, closeness or access to amenities. Without such housing diversity being available, such changes can mean that people have to move out of the area or adopt unsatisfactory accommodation arrangements, which can have significant impact of the health and well being of individuals and families as their relationships and social support are affected.

Goal:
That there is 15% affordable housing in the Growth Centres.

Recommendations:
Develop strategies to achieve a target of 15% of new housing as affordable to cater for lifecycle housing changes and a demographically mixed community. (4.8)

Ensure that Community Housing providers are included in large scale housing developments in the Growth Centres either through property purchase by the Department of Housing and /or a "Bonnyrigg Redevelopment style" model which includes a community housing provider and the proportion of affordable housing. (4.8.1)

13.3.2 Land allocation and Sequential development

The planning of the Growth Centres provides an opportunity to develop new suburbs sequentially, enabling easy connectivity for new residents to existing, nearby services and amenities. The Strategy has stated that development will be sequential, with gradual release of land in combination with the timely delivery of social infrastructure (see *Chapter 5: Social infrastructure*). The Strategy also indicated that allocation of land for community purposes and service delivery would be done at the initial planning stage, and the Growth Centre Structure Plans (see Figure 3.3) and subsequent planning included civic uses as a part of land use mix.

However, there is concern that difficulties in negotiating land for release may undermine these intentions, and that new suburbs will be developed at some distance from existing communities and social infrastructure. For the South West Growth Centre, the first tract of land identified for development (June 2007) is Oran Park, which is at the furthest extremity of the Growth Centre Area. Although it could be argued that this area is in reasonable proximity to Camden, existing transport links are minimal, with just one major road connecting Oran Park with Camden, and there are no plans for a rail link or other substantive public transport infrastructure.

Issues of Concern:
That adequate and appropriate land is secured for social infrastructure to allow the development of facilities in a timely manner.

Recommendation:
Ensure that land is identified and allocated/zoned for community use prior to residential and infrastructure development. This would necessitate ensuring that new suburbs are developed sequentially with due attention to links with existing communities and social infrastructure. (3.3)

13.3.3 Timeliness of social infrastructure provision

Schools and community services are important sites where people develop social connections. There is an intent in the Strategy to provide these services in a timely manner, that is, before the residents move into the new communities. It is an issue of concern that infrastructure financing methods could result in these services being delayed, and that this would have a possible negative impact on the development of social connectedness and sense of community in the Growth Centre suburbs.

Issue of Concern:
The timeliness of school and community service provision

Recommendations:
Ensure that schools and community services are provided in a timely fashion, i.e. at the time new residents move in. (4.2)

Ensure that land is identified and allocated/zoned for community use prior to residential and infrastructure development. (4.4)

Ensure that social infrastructure is provided to the Growth Centres at the time that residents move in. Special attention needs to be paid to the provision of early intervention and early childhood services and cultural facilities, in light of the inattention to these services in past planning and the relative underinvestment in them in the GWS region as a whole. (3.1)

13.3.4 Commuting and work/family balance

The impact of long working hours and long commuting times on the health and wellbeing of workers and their families has since the year 2000 come to greater prominence in social research in Australia.[162] Impacts on health and wellbeing derive from a range of issues including the time spent away from family and the local community, work stress and the stress and accident risk associated commuting by private vehicle. While the emphasis in research on theses issues has been on working hours, commuting time clearly adds to these hours and also, when spent travelling by private vehicle, limits the opportunity for incidental physical activity associated with commuting by public transport, as discussed in previous chapters. Commuting is one aspect of the separation of residential areas and employment that is a legacy of old planning imperatives that no longer apply.

In addressing this issue the major impact that urban planning can have is to facilitate the dispersal of employment through mixed use development and, at a metropolitan and/or regional scale, through multiple centre development supported by effective public transport.

The Strategy and the allied processes of Growth Centres Planning and Regional Centres planning acknowledges this, as discussed in *Chapter 10*. The issue of concern is the capacity to deliver this outcome for new residential development, particularly in the South West Growth Centre, and a commitment to address this issue for existing areas in GWS.

It was shown in *Chapter 10: Employment* that residents in the South West region will have poor access to mid level and higher paying jobs. However, they will require at least an average level of household income in order to afford to purchase housing in the new development. This means residents of the South West can expect to commute either to the North West region or other centres for employment. The result will be long commute times and higher than average absences from their families and communities.

Issue of Concern:
The location and quality of employment provision in GWS.

Recommendations:
Maintain or increase the employment self-sufficiency of the GWS (currently at 70%), but which has in the past decade been as high as 80%. (1.1)

Meet the target of 30% of employment being located in the regional centres of GWS, and increase the proportion of GWS residents who can access a major centre in the region within 30 min by public transport to 80% (the level for Sydney overall in 2005). (1.2)

Establish areas of higher order employment in proximity to the South West Growth Centre (such as a business or technology park). (1.2.1)

Support higher order employment and diversification of the occupational structure in GWS through creating targets for regional growth in banking, finance, business services, health and medical, IT, cultural industries, research and education and other knowledge based employment and strategies to encourage the location of these industries in GWS. (1.2.2)

Ensure that public transport to new employment centres is provided in a timely manner. (2.1.2)

Ensure that public transport links are provided from the Growth Centres to regional centres such as Penrith and to centres of employment outside GWS, including Sydney CBD and Macquarie Park, in a timely manner. (2.1.3)

13.3.5 Quality of local environments

As discussed in Chapter 8, quality local environments with appropriate destinations encourage people to be physically active in their local community. This also facilitates greater social connectedness through casual meetings in public spaces, shopping precincts, at civic place events (i.e. festivals, exhibitions, etc) and active and passive recreation areas. The Strategy and Growth Centres planning recognize this issue and indicate an intention that local communities are designed accordingly and have the requisite amenities. To ensure that local environments are developed with these goals in mind, this commitment should be extended to require that appropriate provisions are included in Local Environment Plans (LEPs) and Development Control Plans (DCPs).

Civic facilities and public spaces are particularly important in expressing local identity and encouraging identification by local residents as being "their place". This identification is important for developing engagement by residents in local activities and use of local amenities.

The design and amenity of local public spaces should therefore not just be of a high quality, but should be reflective of local cultural differences and community aspirations. GWS is very culturally diverse, and local governments and other agencies in the region have developed strategies and processes to engage their diverse communities in urban design and development activities.[161] These processes are generally known as "Community Cultural Development" or CCD, and this report recommends that CCD approaches be used wherever possible. CCD is not a culturally specific process or only for people of CALD background, but basically seeks to ensure that the particular cultural perspectives of the local community are identified and integrated, wherever possible.

In addition to the design of urban spaces themselves, the deployment of public art in new communities can develop the talents of Western Sydney artists through their employment to create exemplar works of excellence and benchmarks for young artists to aspire to. This is particularly the case where local artists are supported through mentorships with the nation's leading artistic practitioners.

For new developments, where there is not an extant community to engage in this process, public spaces could be designed to allow final development once residents have become established. Artists and urban designers should be engaged early in planning and development processes taking into consideration stakeholder concerns, employment of professional artists, public consultation and possible community collaboration. This would assist in designing spaces and elements for sculptural and horticultural opportunities and provide open-ended possibilities.

Of particular concern for the population of GWS is access to arts and cultural facilities, in view of the existing deficit in this area,[161] as discussed in Chapter 12. However the provision of facilities alone is not enough, as visitation and patronage needs to be cultivated. Cultural centres and other facilities need to develop a profile in order to both create and secure high standard events and programs and to educate and develop new audiences and audiences who currently patronise other centres in other parts of Sydney. This requires a long term commitment to facilities and product development that extends beyond the construction and establishment phases. This commitment has been acknowledged in NSW Government policy, particularly the Western Sydney Arts Strategy.[162] Achieving visitation and use targets is also identified as an appropriate Strategy in the NSW State Plan. Expansion and fulfilment of the Western Sydney Arts Strategy and commitment to targets for visitation of facilities and participation in arts and cultural activities for the GWS region are appropriate goals.

From the perspective of social connectedness, visiting and use of other public recreation and leisure facilities also has benefits, as incidental social contacts are encouraged. While the imperative for more recreation and leisure facilities in GWS is not as great as those for art and culture, the goal of greater visitation and use is just as valid.

Issue of Concern:
The Quality and nature of civic/ public spaces and community amenities.

Goal:
Increase visitation and use of arts and cultural facilities and recreation and leisure activities in GWS.

Recommendations:
Ensure that LEPs and DCPs support a mix of facilities (e.g. cafes, shops, cultural, recreational and community facilities) within precinct centres). (4.6)

Provide more public civic spaces and ensure that these spaces are designed, where possible, in collaboration with existing and/or new residents through Community Cultural Development processes. (4.7)

Set a target for the visitation and participation in the arts and cultural activities, and recreation and leisure facilities to be increased in GWS by 10 per cent by 2016. (3.5)

13.4 Scenario analysis

Scenarios	Details
1. Metro Strategy 50% Greenfield 50% Infill	▪ The population in greenfield development sites in the Growth Centre areas is likely to be characterised by mid to upper income groups. Active intervention is required if these communities are to exhibit a diverse socio-economic mix, which could include policies for stimulating housing diversity and affordable housing, as well as design and amenity provisions in LEPs and DCP. ▪ While an equal proportion of population growth is anticipated to occur in established areas under this scenario, past experience in GWS suggests that, without policy and investment supporting the widening of opportunity and material circumstances of low socio-economic groups who live in many older suburbs of GWS, then socio-economic disadvantage could become further concentrated in these suburbs. ▪ Given the challenge that this scenario presents in developing new social infrastructure facilities (discussed above), it is a concern whether schools, arts and cultural facilities and other social services will be provided in a timely manner, such as to facilitate social connectedness for new residents. (See also Scenario 1 in Employment Chapter).
2. Laissez Faire 75% Greenfield 25% Infill	▪ This scenario would entail even grater risk of spatial income polarisation between some disadvantaged established areas and greenfield developments, as little investment would be forthcoming to alleviate disadvantage in established areas, or provide opportunity for low income or otherwise disadvantaged people to connect with new employment, services and facilities (except perhaps as low skilled workers in residential service industries). ▪ A higher percentage of greenfield development could also be more difficult to manage without creating isolated suburbs or 'leapfrog' development, due to greater difficulties in negotiating greater levels of land release. (See also Scenario 2 in Employment Chapter). ▪ The difficulty in providing adequate social infrastructure with regard to Scenario 1 would likely be accentuated in this Scenario. In contrast to the issue of employment development, a larger population driving demand for services would not be expected to be more viable, as this infrastructure is largely not provided through a 'user pays' model, but from government revenues. While development levies are a potential source of funds for social infrastructure, the impact of levies on housing affordability creates pressure to reduce them, and allocate moneys available to physical infrastructure (i.e. roads, bridges, utilities, parks and open space, etc).
3. Status Quo	▪ A higher proportion of Infill development could entail greater investment in facilities, civic spaces and arts and cultural

75% Greenfield 25% Infill	activities, both to attract the potential residents and as a result of investment by the NSW State government and local councils, funded from development levies and general revenue. If this investment was accompanied by policies of inclusion and support for disadvantaged groups, then this scenario could assist in addressing socio-economic polarisation that characterises some of the established areas. ▪ However, the lower proportion of Greenfield development would still represent a substantial residential population increase (275,000), but with less potential to support significant employment centres in proximity to the Growth Centre Areas. (See Scenario 3 in the Employment Chapter). ▪ Larger population growth in infill compared to greenfield developments could better facilitate social connectedness for new residents, given the established networks and activities in these areas. However this outcome could be compromised by regulation, marketing and urban planning that promotes "elite" developments designed to be set apart from the surrounding communities. This concern is not just related to so-called "gated communities", of which there are few in GWS, but also with respect to more subtle strategies whereby landscaping, layout and road/ other access infrastructure isolate new developments from existing residential areas. The motivation of these elite developments is to secure premium land and property values through disassociation from perceived (or real) socially and economically disadvantaged areas. This tendency clearly entrenches social polarisation, and highlights that measures need to be taken to address disadvantage, not just on the basis of equity, but for broader community wellbeing outcomes.

PART C IMPLEMENTATION

14 IMPLEMENTATION OF THE RECOMMENDATIONS OF THE HIA

14.1 Implementation of the Metropolitan Strategy

The Sydney Metropolitan Strategy is a broad strategic document which proposes a vision for the development of Sydney in response to the anticipated population growth and a number of major challenges to the year 2030. The Strategy is structured around seven smaller strategies: economy and employment; centres and corridors; housing; transport; environment and resources; parks and public places; and implementation and governance. Issues relating to the first six strategies have been examined in this HIA. This chapter discusses issues relating to the last strategy: how the Strategy can be implemented effectively in order to contribute positively to the health and wellbeing of the population of GWS.

The Strategy is not meant to be a detailed urban development plan, and other planning processes have been established to develop this detail, including Sub-regional Plans[31] Growth Centres[32] planning, regional centres[33] planning and transport corridor planning. Implementation of the Strategy is therefore largely devolved to these subsequent planning and management processes. Reporting on the implementation of the Strategy is to be done annually by the Minister for Planning on advice from the executive of metropolitan state agencies. An overall review by the NSW Government of the Strategy will take place at 5 yearly intervals, coinciding with census data availability.[13]

Overarching these land use planning processes is the NSW State Plan, released in 2006. This plan outlines the priorities of the NSW Government in improving service delivery, addressing rights and responsibilities, fairness and opportunity, environments for living and growing prosperity. Annual reports are to be made on the Plan with community consultation to revise and refine priorities.

Significant for this HIA, the State Plan identifies some specific goals that are relevant to health and wellbeing. It also includes an implementation and governance structure to guide strategy development and resource allocation in delivering goals. The Cabinet Standing Committee on State Plan Performance has review powers over state agencies activities and will advise Cabinet on new policy, legislation or funding proposals. It can be anticipated that this Committee will have a significant influence on government support for any new health and wellbeing initiatives.

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[31] There a three sub-regions making up GWS: the NW Sub-region, comprising the LGAs of Blacktown, Baulkham Hills, Hawkesbury, Penrith and the Blue Mountains, the West Central Region, comprising the LGAs of Parramatta, Auburn, Holroyd, Bankstown and Fairfield, and the South West Sub-region, comprising the LGAs of Liverpool, Camden, Campbelltown and Wollondilly.

[32] The two Growth Centres are greenfield areas identified for major urban development in the North and South of the GWS Region. The Southern Growth Centre straddles the LGAs of Liverpool and Camden while the Northern Growth Centre straddles the LGAs of Blacktown, Hawkesbury and Baulkham Hills.

[33] The major centres identified in the Strategy are Parramatta (a regional centre) and Penrith and Liverpool (Major Centres).

14.2   Strengths of Metropolitan, Regional and State Planning and Implementation Processes

The planning and implementation processes noted above have a number of strengths and demonstrate improvements over previous urban development planning processes. These include:

1. The establishment of the Growth Centres Commission gives a single authority responsibility for the coordination of all aspects of urban development within the areas of its concern. Such an approach has precedents in other urban cities and regions in Europe and America and is viewed as an effective model. The Commission has been active in involving Councils and other stakeholders in ongoing planning processes;

2. The State Plan establishes clear governance and implementation processes between the executive management of NSW Government agencies and government decision-making. It also commits to reporting and community review of the Plan;

3. The Sub-regional planning processes have to date involved considerable consultation with local government and other stakeholders, (although plans have not been released and so review of feedback is yet to occur); and

4. The Regional Centres Taskforce has been effective in quickly developing architectural and design solutions to centres' development.

14.3   Concerns for Implementation

While the Sydney Metropolitan Strategy was released in 2005, the other planning processes are more recent. In the case of the Sub-regional plans, the NSW Government has yet to release draft plans for any sub-region in GWS, as noted above. It is therefore not possible to make an assessment of the implementation of these planning processes. However, there are some initial concerns regarding these various processes:

1. The geographic areas of responsibility of the Growth Centres Commission are the boundaries of the land specifically identified for new residential and commercial development. Given the very large populations envisaged for these areas, it could be expected that there will be a major impact on the entire region as a result of decisions made on the development of the Growth Centres for which the Commission would not bear responsibility;

2. Given that the implementation of the Strategy is largely devolved to a number subsequent planning processes, the question arises as to how these various planning processes are to be coordinated to ensure delivery of the Strategy goals;

3. It is unclear at this stage who will take responsibility for various commitments made in Sub-regional Plans;

4. The State Plan identifies some specific health and health service delivery issues, but does not take the broad view of health and wellbeing that would be necessary to respond to the issues and recommendations developed in this HIA. There is also no detail on consultation and partnership processes between departments and other stakeholders, this being left to the agencies themselves; and

5. The scale of planning, in terms of population increase, infrastructure development, employment generation, land use changes along with the numerous processes established to manage these, raises the question of the adequacy of resources to effect implementation of the Strategy and the other subsequent plans.

14.4   Previous Experiences in Urban Planning and Development in GWS

Apart from the structural concerns relating to the Strategy and other management processes, the experience of previous urban growth phases is also relevant in considering the likely issues that may arise in implementation of planning for Sydney's growth, particularly the development of new residential areas in Rouse Hill in the NW of Sydney, which was the most recent large scale residential growth area in Sydney. This experience of growth had major planning inadequacies resulting in significant problems in the development of communities, services and infrastructure[156] and suggests that there are a number of key issues for governance and implementation of plans for growth in population in both greenfield and infill sites in GWS, these being:

1. Planning for the new greenfield sites themselves (in this case the two Growth Centres);
2. Community Development;
3. The Role of Social and Community Planning; and
4. Urban Consolidation, or greater densities in existing developed areas.

14.1.1 Planning for the Growth Centres

Successful development of a new community requires control of a significant area of the land required for the scheme. If land acquisition is delayed or fragmented, there are risks of an escalation in land costs, as landowners either 'hold out' on initial land parcel, or take advantage of the 'betterment' of their property following adjacent development. Not only is this inequitable in that benefits flow to a few individuals rather than to the development as a whole, but past experience of new release areas has shown that the failure to capture at least a substantial part of this value increase seriously compromises the development. Financing of infrastructure provision is in part reliant upon levies on development. If the capacity of the development to pay these levies is compromised by the high cost of land acquisitions, available funds for infrastructure will be reduced. It is then difficult to provide the many non-profitable components of the scheme, which distinguish a new community development from a mere sub-division.

Another issue is the timing of funds for infrastructure. Reliance on development levies (as against a land betterment tax) means that developers of large-scale projects delay the provision of community services and facilities until sufficient residents are in place to provide the required level of revenue.

14.1.2 Sequential Phasing of Development

The rapid growth of an area can cause problems for the early residents. This stress can be alleviated to some extent by the carefully planned sequential phasing of development. Not only must the new development areas function as a complete unit at the end of the development phase, but each increment of growth should function as a unit in its own right. Phasing of development is an integral component and should be based on a number of factors including:

- Servicing availability;
- Time required to get development under way;

- Capacity of the construction industry; and
- The ability of the range of authorities involved to organise the volume of development.

Continuity is an important principle in relation to existing urban areas, and sequential development enables access to existing developments and services from the new areas.

The completed sequential development should contain or have access to a full cross section of facilities and employment opportunities. This means new developments may utilise spare capacity of existing facilities in adjacent areas, or there may be a need to supplement, or provide extra facilities to underserved existing areas.

14.1.3 Community Development

In the case of Growth Centres, the processes of community development are complicated by the arrival of relatively large numbers of newcomers over a relatively short period. These can give rise to two sets of problems**:**

Firstly the newcomers may be different in experience, expectations and lifestyle from existing residents, potentially causing conflicts of various kinds. There can also be resentments about the changes taking place in an area, or if newcomers appear to be obtaining greater benefit than established residents.

Secondly, newcomers may experience settlement problems in adjusting to the new environment, including practical and emotional difficulties which may be short or long term depending on their nature and the individuals involved.

The integration of new and established residents in and the smooth settlement of newcomers will be critical to the success of the Growth Centre program.

While it is unclear as to whose prime responsibility it will be to cater for the activities that are called for in this area, the Growth Centres Commission must be a contributor. To this extent the staff resources may need to be increased to include an officer with responsibility for the area of community development with a special focus on the two facets described above.

14.1.4 New Residential Release areas and needs of new residents

The service demands of a rapidly developing new community are different to those in an established areas, both in terms of service type and timing,. Initial residents are likely to suffer specific disadvantages associated with the long lead times for provision of major facilities or services, often compounded by the relative isolation from any existing social infrastructure.

To some extent facilities are the easiest component of the social program to assess. They have an obvious and direct relationship to the physical planning program, institutional structures already exist for their provision and current practices allow direct estimates of need to be made simply on the basis of assumed population size and distribution patterns.

The need for social processes is harder to assess because of the practical issues of resource allocation and organisation that are subject to current policy priorities. For example, there is generally no dispute about the need for a school, yet there is likely to be some debate about the extent of settlement services that should be made available for new residents (e.g. neighbourhood centres, family support services, new resident welcome packs and

events), or to the extent that incoming residents should be able to influence the direction of development policy.

Lack of investment in social infrastructure in Western Sydney has been identified as a major issue in developing social polarization and disadvantage that has characterised the development of the region:

> *"Decades of under-investment of policy and fiscal resources in Western Sydney by successive State and Federal Governments have left many of the region's cultural, social and environmental needs unmet. The legacy of this 'undernourished' development includes mounting social and environmental problems, including hardening pockets of poverty and social exclusion, a dwindling and fraying public sphere and ever-increasing ecological stress".[164]*

The report also pointed to '*newly forming pockets of disadvantage in older suburbs outside public housing estates'.* The authors noted that a lack of access to life enhancing opportunities (hospitals, parks, good schools and public transport) was resulting in Locational disadvantage that *'may severely diminish the ability of relatively affluent households to make use of and enjoy their income'.*

14.1.5 The Role of Social and Community Planning

Greater emphasis is now being given to social/community planning due to:

- Increasing demand for local community services coupled with scarce resources resulting in needs based planning to ensure the fair and efficient allocation of resources;

- Requirements to prepare management plans, making the preparation of corporate plans incorporating social planning activities an essential pre-requisite;

- Awareness of the social isolation suffered by some communities which requires community support and community cultural development as techniques for improving the quality of life;

- Councils' statutory responsibilities in environmental planning which require the social as well as the physical effects of planning to be taken into account; and,

- Realisation that separate planning by a multitude of government agencies has often resulted in local communities being poorly served, has encouraged a move towards social/community planning involving many agencies and all sections of councils.

A central theme running through the consideration of health, education and welfare issues is the need for co-ordination of efforts and co-operation between the Growth Centres Commission with its planning activities and the various funding and providing agencies. For many of the latter this involves the expenditure of considerable sums of public money and the development of investment programs with lead times of several years. The Growth Centres Commission by virtue of its planning responsibilities will largely determine where and when those needs will arise.

14.1.6 Urban Consolidation – greater densities in existing developed areas

Urban consolidation has been a policy of the NSW government for many years, and this is reflected in the expectations for urban renewal and public through more development and higher residential densities in established centres/ areas. However, urban consolidation policies have had a mixed reception. There is considerable confusion about the application of an urban consolidation policy, partly because of the complex relationship between the urban structural issues affecting consolidation, but more particularly because of conflicting opinion about what urban consolidation can actually achieve, how it should be understood and what its priorities really are.

Well known Australian urban academic Patrick Troy argues that the origin of the consolidation policy lies in the fiscal crisis of State and Federal Governments and that one of the main drivers for the consolidation trend is relieving the cost burden of services infrastructure imposed on governments.[163] This context led to a policy formulated on the following propositions:

- If we live at higher densities we will achieve great economies in the use of land which will in turn lead to economies in infrastructure;
- There is a large amount of un-utilised, or under-utilised, social capital in the inner areas of Australian cities and it is therefore inefficient to invest in new social capital 'on the fringe' while this situation occurs;
- The present form of development results in subsidies from inner city residents to those on the fringe;
- The present form of development results in a housing mix that is out of kilter with basic demand; and
- Consolidation reduces environmental stress.

Although there are elements of truth to all aspects of the policy, the above propositions can be questioned on a number of grounds:

I.   Is there really a reduction in urban sprawl?
Analysis of the relationship between densities and total land demand shows that higher net residential densities contribute very little to the restraint of sprawl. This is because increased residential densities are not necessarily accompanied by increased densities for other urban land uses and public facilities such local schools, shops and open space; and

II.   Is there really a reduction in infrastructure costs? Total producer costs at the fringe vary between cities. The differences between Melbourne and Sydney are mainly due to variances in broad hectare land costs and the number and level of development requirements imposed by local authorities and infrastructure providers.

There is little difference in the costs of major works and headworks infrastructure for development of different density, as most public infrastructure is typically designed nowadays to handle densities many times greater than is usual in new areas. Lot shape and size are the key determinants of the infrastructure cost of land development, with cost reductions best achieved by reducing lot frontage, since the quantity of infrastructure is generally proportional to the length of road.

Therefore urban consolidation will produce large savings only if it permits a substantial reduction in the major works program. The greatest efficiency gains are considered to lie in the reform of pricing policies for infrastructure, although this raises questions of equity given that

existing infrastructure enjoyed by current residents was not paid by them in property costs, yet they benefit from this infrastructure in their property values.

III. Is the housing mix really out of kilter with consumer demand?
It does not necessarily follow that falling household size means there is a general increase in the demand for smaller dwellings. There are many reasons why individual households may wish remain in their dwelling even after the size of the household has fallen. These include security, familiarity, stability, freedom of expression, choice of lifestyle and increasing living standards. Moving may also involve costs relating to relocation, transaction fees and taxes.

However, it can be argued that the housing needs of different family types and different stages in the lifecycle are not adequately recognised by the existing housing stock or current planning policy.

14.1.7 A Reformulated Policy

A more valuable approach to these issues is to reformulate the policy from the following set of basic premises[163]:

- Cities should offer equal access to public facilities;
- There is a strong preference for a traditional, house and garden, but a full range of dwellings should be available for different household types, at different stages in the household lifecycle, meeting basic health, safety, space and amenity standards;
- There is a strong attraction for individual freedom of movement; and
- Urban design, development and operating strategies should be developed to both minimise environmental stress and should be open, democratic and decentralised.

Troy also suggested that urban consolidation could be met by re-specifying the problem:

- A reaffirmation of a commitment to planning and development of cities which need less travel to make them work;
- Reform of the regulation and pricing policies for infrastructure systems;
- Reform of the institutions of the city; and
- The adoption of a cultural development policy which led to more people being given more opportunity for cultural growth, expression and engagement.

14.5   Parameters for effective implementation

In light of the above discussion concerning existing implementation mechanisms and some of the issues in developing new residential areas that arose from recent experience in Sydney, the following points are suggested as parameters for effective implementation of the Metropolitan Strategy and allied planning processes.

Implementation should ensure that there is:

8.   **An appropriate delineation of responsibility between agencies** (i.e. NSW State Government Executive, State Government agencies, Local Government, ROCs, non-government agencies and business);
9.   **A process to develop priorities and commitment to them;**
10.   **Development of, and commitment to, appropriate timetabling of infrastructure;**
11.   **An appropriate longevity of process;**

12.   **An underwriting of risk in infrastructure funding;**
13.   **Effective community input and transparency; and**
14.   **A process of ongoing monitoring and reporting at a regional level.**

14.1.8 Commitment to Triple bottom Line Sustainability and Effective "whole of government" responses

Governments nowadays are charged with responsibilities for sustainable management of social, environmental and economic resources ("triple bottom line" accountability). Communities are concerned about sustainability because the human impact upon the environment is leading to an increasingly unsustainable pressure on the global environment. Through reducing the quality of air, water, soil, food and available space, pressures are being increased at the local scale.

While ESD is seen to have a strong focus on the natural environment it should be acknowledged that ESD is about improving the total health of our society. This requires genuine and sustainable improvements to our environmental, economic and social capital – the full "triple bottom line".

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