

**Faculty of Built Environment, Art and Design
Department of Urban and Regional Planning**

**Evaluation Criteria for Transport: An Analysis of
Local Policy Implementation Towards
Sustainable Residential Development**

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Master of Arts (Planning)
of
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Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

To the best of my knowledge and belief, this thesis contains no material previously published by any other person except where due acknowledgment has been made.

Signature: _____

Date: 9 June 2004

ABBREVIATIONS

AMCORD:	Australian Model Codes for Residential Development
CBD:	Central Business District
CLG:	Community Leader Group
DPCSD:	Department for Policy Coordination and Sustainable Development
DPI:	Department for Planning and Infrastructure
DPS:	District Planning Scheme
DPUD:	Department of Planning and Urban Development
EMPL:	Ellenbrook Management Proprietary Limited
ESP:	Ellenbrook Structure Plan
GS:	Green Street
ICLEI:	International Council for Local Environmental Initiatives
IUCN:	International Union for Conservation of Nature and Natural Resources
JCDP:	Joondalup Centre Development Plan
JDC:	Joondalup Development Corporation
LG:	Local Government
LGA:	Local Government Association
LNCDC:	Liveable Neighbourhoods Community Design Codes
MRPA:	Metropolitan Region Planning Authority
MTS:	Metropolitan Transport Strategy
NGS:	National Greenhouse Strategy
NSESD:	National Strategy for Ecological Sustainable Development
NSW:	New South Wales
OECD:	Organisation for Economic Co-operation and Development
PMR:	Perth Metropolitan Region
PPP:	Polluter-Pays Principle
RAPI:	Royal Australian Planning Institute
SPS:	State Planning Strategy
SWOT:	Strengths, Weaknesses, Opportunities, and Threats
TPS:	Town Planning Scheme
UDIA:	Urban Development Institute of Australia
UN:	United Nations

UNCED:	United Nations Conference on Economics and Development
UNCHS:	United Nations Conference on Human Settlements
UNDP:	United Nations Development Programme
UNEP:	United Nations Environmental Programme
UNFCCC:	United Nations Framework on Climate Change
UPP:	User-Pays Principle
WA:	Western Australia
WAMA:	Western Australian Municipal Association
WAPC:	Western Australian Planning Commission
WASSS:	Western Australian State Sustainability Strategy
WB:	World Bank
WCED:	World Commission on Environment and Development
WCS:	World Conservation Strategy
WWF:	World Wide Fund for Nature

ABSTRACT

One of the most important issues influencing urban areas is that of sustainable residential development. In this regard, formulation and implementation of policies relating to transport play a major role in decreasing the amount of energy consumed and greenhouse gases released into the atmosphere. This awareness of the major role of transport posed the main research question "Have transport elements in policies for residential development in Western Australia been implemented on the ground in the Perth Metropolitan Region?"

Since this study focuses on and evaluates the implementation of residential planning policy on the ground at local level, it uses case study areas (Joondalup and Woodlake) deemed benchmark of sustainable development within the Perth Metropolitan Region in Western Australia. Policies for residential development and sections on transport (towards sustainable development) were collected and from this, evaluation criteria were drawn to be measured against their implementation. Then, field observation, and household questionnaire surveys were conducted to check and identify the extent of implementation. Subsequently, semi-structured interviews with policy players were undertaken to clarify findings and factors influencing (impeding or supporting) policy implementation.

The findings of this research indicate that Joondalup (planned and developed more than two decades ago) was more sustainable in transport terms than Woodlake (developed nearly a decade ago) when measured against policies at the time of the planning and development phases. But when the case study areas were measured against current policy objectives and new evaluation criteria for transport towards sustainable development, Woodlake performs better. It may not be surprising that in future Woodlake might be considered less sustainable than it is now. It signifies that policies and residential planning standards have improved to a certain degree over time. Improvement is also apparent in the translation of international and national policies to lower-level policies. Recommendations propose what could be performed better in future, based on what has been learnt from past experience.

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1. INTRODUCTION

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1. INTRODUCTION

1.1. CONTEXT OF THIS STUDY

The idea of sustainable development was implicit in the United Nations (UN) Agenda in 1962 (Pugh 1996b). As time went by, people's awareness and understanding of sustainable development and environmental issues increased, marked by the emergence of the UN Commission with its 1987 *Brundtland Report*, known as 'Our Common Future'. The Commission proposed what has become the most popular sustainable development definition. It is "... development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1989, p. 43).

Discussions on sustainable development did not stop at that point in 1987; the UN held conferences at five-year intervals. In 1992, there was a meeting on environment and development in Rio de Janeiro, Brazil to establish an urban settlements policy known as the *Agenda 21* (International Council for Local Environmental Initiatives 1996). The 1997 conference in Kyoto, Japan generated the *Kyoto Protocol*, an international proposal among industrial nations seeking to reduce global greenhouse gas emissions to approximately 5% on average below the 1990's level. More recently, the UN held a World Summit on Sustainable Development in 2002 in Johannesburg, South Africa discussing worsening environmental degradation (The Nature Conservancy 2002).

As sustainable development topics have been raised and discussed at international level, there has been a filtering of ideas through national and local levels. The local level is said to be an influencing agency in making sustainable development successful (Cotter et al. 1999). Currently several nations, including Australia, have committed themselves to apply international agreements through their local actions in residential development (Australian Greenhouse Office 1998; Curtis 1998; Western Australia Department of Transport 1995), in which people have more control in maintaining the environment. This commitment is a positive start.

Apart from the environmental sphere, there is also need to consider the economic and social spheres (such as infrastructure funding, safety, equity, and lifestyle) especially since urban and regional planning ('planning' hereafter) deals with these spheres. Planning principally manages the use of available land resources for humans (and other creatures) by providing a place to live, work, and play. It also plays an important role in attempting to relate policies reflecting the integration of the three spheres. In turn, the spheres will affect spatial, economic, and equity concerns in resource allocation.

Planning has a focus on making the future more predictable and manageable (Hoch 1994). To be manageable, planning should involve land-use and transport management, conflict resolution, as well as balancing environmental, economic, and social needs (Greed 1994; Western Australia Ministry for Planning 2000) within the strictures of a set of policies (Roberts 1980). Not only do Greed and the Ministry for Planning share the same opinion on what planning deals with, but also de Roo (2000) and Wheeler (2000). Planning deals with seeking a long-term balance of economic, environmental, and social goals. Their comments complement each other.

From this point, the relation between planning and sustainable development becomes clear. The nature of sustainable development is concerned with managing available resources sufficiently and, preferably, equally with a long-term perspective for current and future generations. As both planning and sustainable development affect the environment in the long-term, it is vital to integrate them.

Integration can be achieved by planning sustainably, in particular planning for transport towards sustainable development for the purpose of this study. Transport has been chosen as the focus especially because it incorporates the three spheres of sustainable development: environment, economy, and society (The United Nations Department for Policy Coordination and Sustainable Development (DPCSD) n.d.). Transport involves the use of land; "Transport is a major consumer of land" (Organisation for Economic Co-operation and Development (OECD) 1996, p.27) particularly in urban areas. More than a quarter of land is dedicated to roads in modern cities (Organisation for Economic Co-operation and Development (OECD) 1996). Perth, Western Australia (WA) is one of them. Allocation of land to roads has been caused by the arrival of motorised vehicles and low-density development,

which results in urban sprawl. Planning based around private car travel has seen urban areas spread over long areas. Therefore the integration of land-use and transport planning towards sustainable development is indispensable. To achieve it, there should be policies set out by government or by planning agencies as guidance for a decision-making process to satisfy such objectives.

Policies in WA have included land-use and transport planning. Such policies for the Perth Metropolitan Region (PMR) originated approximately five decades ago from the Stephenson and Hepburn Plan (Stephenson & Hepburn 1955). The Perth Central Business District (CBD) was planned to have links to its northern and southern suburbs by a freeway as is currently the case. To date, the Plan is still referred to and over time further strategies such as the *Corridor Plan* (Western Australia Department of Planning and Urban Development 1994; Western Australia Metropolitan Region Planning Authority 1977) and *Metroplan* (Western Australia Department of Planning and Urban Development 1990a) have been developed to address land-use and transport.

The issue of whether transport policies have been implemented on the ground, especially in residential development or at "... local level where most transport volume is generated" (Pohoryles & Giorgi 2001, p. 277) is important. This implementation issue that is related to policy formulation then becomes the main question of this study. Policy formulation that is the first stage after issues identification is about designing a device to address and/ or to anticipate issues and related ones. In this formulation process, internal and external factors play their roles; whether they be conduciveness of surrounding environment (economy, politics, society, or even religion) at the time of formulation or whether they be interests of policy makers or those of (local) communities as recipients.

In considering these factors, this study aims to assess the effectiveness of implementation of residential development policies in enabling households on the fringe or in outer areas of the PMR to gain a better quality of life towards sustainable development, with particular reference to transport. This study will suggest necessary improvements in policy implementation.

1.2. RESEARCH QUESTIONS

The main question addressed in this study is:

Have transport elements in policies for residential development in Western Australia (WA) been implemented on the ground in the Perth Metropolitan Region (PMR)?

This main question posed some subsidiary research questions:

1. To what extent have transport elements been implemented at local level? Why?
2. Why have transport elements not been implemented as planned?

In other words, the researcher intends to evaluate barriers and opportunities emerging between policy formulation and implementation.

These questions then lead to the next subsidiary question:

3. Are transport elements conducive to sustainable transport in residential development? Why?

This question is to evaluate effectiveness of neighbourhood transport policies in achieving transport toward sustainable development.

At local level, the translation of principles on sustainable development will indicate how far such policies have been filtered from the international and national policies. The local level is significant because it has the closest relation with people, particularly in residential development (Yiftachel & Kenworthy 1992). Thus, an assessment in lower order or local policies rather than in higher-level policies is useful for research purposes because lower level policies are more likely to have more practicable objectives, and more detailed actions to be applied. Consequently, an assessment could help local governments (LGs), particularly in the selected case study areas, define and refine their programs.

To answer the research questions, case study areas of residential development in the PMR have been chosen. The extent to which residential development policies aim at sustainable development outcomes has been examined. This has been addressed by measuring policy objectives against their implementation in case study areas through field and observation surveys, as well as household questionnaire surveys. Then interviews with policy players (policy makers and

implementers) provided an insight into factors influencing policy formulation and implementation as parts of a policy lifecycle. This process corroborated what is in the text (policies), people's opinion (household questionnaire surveys), and policy implementers. The detailed research methodology is explained in Chapter 3.

1.3. SIGNIFICANCE OF THIS STUDY

This study attempts to propose improvements in policy implementation, which is closely associated with policy formulation. It does this by evaluating impeding factors influencing implementation of policies on the ground. Once these are identified, preferably, the same mistakes will not be repeated in future policies.

In other words, this study is significant for policy makers and implementers to assist them in improving policy formulation and implementation to attain sustainable development in a better way in the future. Additionally, it is to aid them to avoid duplication of the same mistakes from previous experience, particularly since "...the largest single influence on policy is previous experience ..." (Vigar 2000, p.29); in other words people should learn from the past. This learning process can facilitate the realisation of development, which enables more sustainable transport outcomes in a shorter period of time.

1.4. SCOPE AND LIMITATION

It is essential for this study to have a focus in order to be manageable and give useful meaning to the practice of urban and regional planning. It therefore focuses on the implementation of policies towards sustainable residential development; thereupon, the researcher chose to develop evaluation criteria in transport terms from selected policies rather than to list indicators for transport towards sustainable residential development although indicators are related to evaluation criteria. This focus enables more in-depth analysis as well as being related to the researcher's interest. Moreover, transport encompasses the three spheres of sustainable development: the economic, environmental, and social spheres (Owens & Cowell 2002; The United Nations Department for Policy Coordination and Sustainable Development (DPCSD) n.d.) as exhibited earlier. Consequently, transport represents those spheres and covers the main issues of sustainable development.

It is essential to acknowledge some limitations of the study. Considering its manageability and level, case study areas have been selected within one planning system and not compared with other planning systems in different states. This approach gives this study a deeper insight for WA planning and policy players. The findings, therefore, might not be applicable to other states in Australia or nations. However, it may be applicable after adjustment to local conditions.

The evaluation criteria for transport towards sustainable development (Chapter 6) are left un-categorized into the different spheres of sustainable development. Since issues on transport are related to environmental, economic, and social spheres of sustainable development, overlaps between issues are unavoidable. One issue might be related to two, or even to all the three, spheres. Thus to reduce duplication and to increase outcomes efficiency, the evaluation criteria from selected policies are left un-categorised. This will limit readers who focus on one sphere of sustainable development and want to use findings of this research.

1.5. STRUCTURE OF THE THESIS

This thesis is divided into seven chapters. Chapter 1 is introductory illustrating the general ideas or framework of the study.

Chapter 2 provides a theoretical understanding of sustainable development and public policy. The first part describes the context and content of sustainable development: its history, principles, approaches, significance, indicators, as well as its contribution to transport and urban planning. The second part provides the interpretation and significance of policies, as well as a lifecycle of policy (including policy formulation, implementation, and evaluation).

Chapter 3 presents the research method design giving details of case study areas, policies for residential development, surveys (field as well as questionnaire surveys), and interviews with policy players. The method guided the researcher in collecting and analysing data. This step is crucial since it drives findings that lead to conclusions and recommendations.

Chapter 4 introduces the case study areas (Joondalup and Woodlake) for policy implementation, their location, demography, and planning regime.

Chapter 5 provides an analysis of policy coverage. It covers analyses on transport elements in policies selected in Chapter 3, and on transport elements across the policy hierarchy.

Chapter 6 presents an overview of analyses on evaluation criteria for transport for sustainable development in Joondalup and Woodlake. It offers a comparison of Joondalup and Woodlake in satisfying evaluation criteria from policies present at and after their planning and development phases.

Chapter 7 based on the above analyses, concludes the study by addressing the research questions posed in the introductory chapter. The conclusions are followed by recommendations aimed at improving policy formulation, implementation and transport. The recommendations may be employed and used for further research or study.

2. SUSTAINABLE DEVELOPMENT AND POLICY



2. SUSTAINABLE DEVELOPMENT AND POLICY

Sustainable development has become a discussion topic among urban and regional planning academics and professions at international and national levels. Initially, its main concern was the environment; overtime it has expanded to economy and society. This expansion would then be written in a policy for follow-ups. Thus the expansion was closely related to policy that is indispensable for realisation of (new and widen) objectives at many levels including international and national ones. There are policies formulated internationally and nationally (in Australia). Implementation of these policies will greatly impact on progress of sustainable development. Thus, policies and sustainable development matters go along together. Therefore, an understanding of what they are and how they work is necessary. Consequently, this chapter provides an overview of these two elements: sustainable development and policies.

2.1. SUSTAINABLE DEVELOPMENT

This section provides an understanding of sustainable development. It starts with its history before and after the internationally known 1987 *Brundtland Report* in order to present an illustration of sustainable development, and examines its meaning. It continues to the core of sustainable development, the principles that can be approached from various points of view. Approaches to sustainable development are considered, including its importance to humankind, to the Earth, and to planning in particular. The relationship between planning, and transport indicators towards sustainable development are examined.

2.1.1. History of Sustainable Development

For a clearer understanding of sustainable development, it is useful to know something of its history and progress to see how it has evolved. There was a turning point in the significance of sustainable development in 1987 when the World Commission on Environment and Development (WCED) popularised its definition, published in 'Our Common Future'. Accordingly, the history of sustainable development is differentiated between before and after the 1987 event.

Sustainable development before 1987

The notion of sustainable development, as often related to environmental and ecological issues, was initiated notably in the UN Agenda in 1962 (Pugh 1996b). A decade later in 1972, environmental issues became internationalised as they were discussed in the UN Conference on Human Settlements (UNCHS) in Stockholm (McManus 1996; Pugh 1996b; Mitchell 1999). Unlike the 1962 Agenda, this conference involved not only industrialised nations, but also developing nations. It discussed the route to a solution on global perspectives and agenda that included social, economic, and political relations among nations.

Sustainable development after 1987

There was a big change in sustainable development dialogue in the 1980s. The UN created the WCED. As a follow up, in 1987 the WCED produced the *Brundtland Report* and popularised the term sustainable development in 'Our Common Future' (World Commission on Environment and Development 1989; Pearce, Markadnya & Barbier 1989; Burton, Williams & Jenks 1996; Grove-White 1996). To date, any sustainable development discussions that do not quote the definition seem incomplete. Besides definition, this document recognises issues about vast suburbs causing car dependency and increased transport energy consumption. In 1992, the UN Conference on Economics and Development (UNCED) held an international forum in Rio de Janeiro, Brazil and established an urban settlements policy; known as the *Agenda 21* (International Council for Local Environmental Initiatives 1996). The *Agenda 21* covers transport, favours higher occupancy public transport and non-motorised transport modes, and recognises possible land competition between transport and other essential humans' needs including residential development, health and education facilities and other commercial facilities.

At the same time in the 1990s, the Australian *National Strategy for Ecological Sustainable Development (NSES)* identified key principles in national initiatives (Australian Department of the Environment and Heritage 1992). They aimed at:

1. Integrating economic and environmental goals in policies and activities.
2. Ensuring that environmental assets are properly valued.
3. Providing for equity within and between generations.

4. Recognising the global dimension.

A decade later in 2002, the UN held a World Summit on Sustainable Development in Johannesburg, South Africa (The Nature Conservancy 2002) focusing on fighting poverty and protecting the environment on energy and sanitation issues (The United Nations 2002).

2.1.2. Interpretation of Sustainable Development

Among a myriad of definitions, almost all references include the one coined by the Brundtland Commission in 1987. The Commission defines sustainable development as "... development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Blyth 1999, p.2; Breheny 1992, p. 1; Houghton & Hunter 1994, p.16; World Commission on Environment and Development 1989, p.43). The definition contains two main concepts: the concept of needs, and the concept of limitation (to fulfil present and future needs). These authors assume that the present generation's needs and future generations' needs are the same, if not alike. However in the researcher's opinion, the present generation do not know what the future generations' needs are; their needs might be different from ours.

But why should the present generation consider needs of future generations by saving resources for them whom the present generation do not know? This is addressed in the next section by exploring the core of sustainable development: the principles.

2.1.3. Principles of Sustainable Development

This section only discusses principles having a close relation with policy implementation, sustainable transport, and related to this study. The principles below have been classified into a bigger group; hence they will cover and be applicable to wider aspects of sustainable development. They include equity (intra- and inter-generational equity), polluter- and user-pays principles, and the precautionary principle.

Equity (intra- and inter-generational equity)

Intra-generational equity is known as social justice or social equity. It focuses more on the present generation, especially the less advantaged groups (the poor, women, children, and the elderly). Regarding transport, these groups are considered marginal and are the ones who usually have limited access to a transport system and who have unequal, or less, opportunity to utilise available provision. This principle is similar to Utilitarianism that adopts 'the Greatest Good for the Greatest Number' belief (Diesendorf 1997), and pays attention to the majority group (i.e. a decision is based on greater number of people who will enjoy outcomes).

Inter-generational equity fits very nicely in the sustainable development context especially since sustainable development is a long-term reservation program for future generations. It is known as the principle of futurity or resource conservation where the present generation should bequeath the Earth to the next generation with no less quality than it was bequeathed. Nijkamp and Perrels (1994) define this as continuity in changing situations. If the quality is less from generation to generation, the time will come when the Earth has no quality whatsoever. The decision on whether people care about the future depends on them. This principle is feasible only if intra-generational equity exists.

Polluter-pays and user-pays principles

The polluter-pays principle (PPP) advocates "... the polluters should bear the expenses of preventing and controlling pollution to ensure that the environment is in an acceptable state" (Organisation for Economic Co-operation and Development 1975, p. 15). The more they pollute or damage the environment, the more they should pay the price. Despite the degree of pollution caused, the price mirrors the dearth of resources used. The fewer the resources are, the more people should pay. Usually, costs are contained in the price of polluters' products. An example of this principle includes the increase in petrol price as currently happens. There is a hope that this principle can ease pollution, although it is not a guarantee (Organisation for Economic Co-operation and Development 1975). As this principle is felt insufficient to prevent and control pollution, the user-pays principle (UPP) has been introduced.

UPP is developed from PPP where it applies PPP more broadly (Devuyst 2001). Not only have producers to pay the costs, but also consumers or users who gain advantage from a product pay the costs. In fact, consumers might not realise that they pay the costs through a price charged by producers. In the researcher's opinion, it is fair that both sides share the costs.

In practice, both principles are applied through regulation, such as road pricing.

The precautionary principle

This principle or precautionary behaviour (Cotter et al. 1999) or precaution and risk as Plumwood (2002) states more wholly, has been impliedly included in agreements and meetings internationally (in the United Nations Framework on Climate Change) and nationally (in the Australian Intergovernmental Agreement on the Environment) (Diesendorf & Hamilton 1997). It encourages humans to take action to safeguard against environmental degradation (Cotter et al. 1999) especially because there is possible irreversible damage.

These three principles help in understanding approaches to sustainable development discussed below. They can be approached from different points of view, both positive and negative sides.

2.1.4. Approaches to Sustainable Development

In order to get a more comprehensive view and understand sustainable development better, it is necessary to approach it from different points of view. These approaches provide a better understanding of resource limitation.

It is not the intention of the researcher to elaborate on all approaches (Glasson, Therivel & Chadwick 1999; Jacobs 1991; McManus 1996; Pugh 1996b; Selman 1996; van den Bergh 1996). The researcher briefly describes a selection of the most quoted approaches and those having strong relation to sustainable development principles. They are 'weak sustainability', 'strong sustainability', and 'carrying capacity'.

An understanding of the approaches to sustainable development is useful for the researcher, especially, and readers generally. It acknowledges a diversity of approaches so that people can think more widely. In the researcher's opinion, the most appropriate approach for this study is carrying capacity because it is the root of other approaches and contains the main point of sustainable development: the ability of the Earth to support people's consumption of resources by considering future generations. The strong sustainability is applied where appropriate.

Weak sustainability

Followers of weak sustainability believe that running down any parts of the whole capital stock (human-made, humans, and natural stocks) is acceptable, on condition that capital degradation in one place is balanced and substituted by investment in another (Glasson, Therivel & Chadwick 1999; Selman 1996). It adopts a temporary decrease pattern provided that the environmental resources return to their original stage (van den Bergh 1996) and is based on characteristics of substitution. In the researcher's opinion, this approach is like mathematics, $A + B = C$. 'A' and 'B' may vary in numbers as long as the accumulation or sum of them is equal to 'C', the constant variable. 'A' may decrease, even to minus, given that 'B' is increased. On the other hand, 'B' may increase only if 'A' is decreased. This approach is alarming, as it has no regard to the critical point that might lead to absolute decline of one variable and believes that a loss to biodiversity is acceptable as long as a new one occurs. One may go as another one comes.

Strong sustainability

Strong or maximum sustainability adopts non-decreasing patterns of environmental resources over time where they are kept at their original level before exploitation. It adopts environmentalism as its fundament and does not compromise the use of some resources (Pugh 1996b).

In contrast to 'weak sustainability', 'strong sustainability' is a more logical principle. Its followers believe that running down of total environmental assets is unacceptable for several reasons. In the first place, there is uncertainty. People neither fully understand end results of the decrease for humans do not fully know how environmental systems work. Therefore, people ought to act carefully with the

intention of not distressing the systems. Secondly, changes in the Earth's systems can be irreversibly damaged, which can lead to loss of species. Lastly in terms of life support to humans, ecological assets should be considered. Running down the environment is unacceptable because its elements are vital to support human life (Glasson, Therivel & Chadwick 1999; Selman 1996).

Carrying capacity

People at present think that five sons are not too many and each son has five sons also, and before the death of the grandfather there are already 25 descendants. Therefore people are more and wealth is less; they work hard and receive little.
(Han Fei-Tzu, c. 500 BC)
(Meadows et al. 1998, p. 9)

The '(Appropriate) Carrying Capacity', or 'Environmental Space' or 'Ecological Footprint' (Figure 2-1), is defined as "the ecological impact of regions or large cities on the outside of space" (Mayumi & Gowdy 1999, p. 46) or "... the aggregate land (and water) area required by people in a region to provide continuously all the resources they presently consume and all the waste they presently discharge" (Selman 1996, p. 36).

Figure 2-1: Ecological Footprint – the Carrying Capacity.



Source: Selman 1996, p. 37.

The figure portrays that the real resources exhausted by the built environments are not those on which they stand but those that support them; the footprint is much bigger than the land it stands on. This condition is metaphoric with the tip of an iceberg. The visible part is the tip, the small part of an iceberg. But if we look deeper, the bottom is massive. It is what people do not see that matters.

However, not all people agree with the carrying capacity approach. Some overlook the fact that humans are able to substitute resources using their inventions (Cohen in Carrell n.d.). Another author, McKibben (in Carrell n.d.), criticises carrying capacity from the object's point of view, rather than from the human factor's point of view as Cohen does. McKibben suggests that people do not have to trouble themselves by worrying about carrying capacity for there are many variables influencing it, depending on how people treat resources.

Approaches discussed in this section, together with previous sections, provide a background to why sustainable development is important to humankind. Additionally, this section emphasises that there are different philosophies to choose from. Philosophies applied in this study mainly include carrying capacity (such as road capacity and fossil fuel) to advocate equity (e.g. equity between the disadvantaged/ minority and the advantaged/ majority groups) and precautionary principles. Other principles and approaches are applied when relevant .

2.1.5. The Importance of Sustainable Development

This section presents the importance of sustainable development to the Earth and to planning. Examples of why sustainable development is important to these two fields are offered.

The importance to the Earth

Radioactive and noxious waste, the excessive use of finite resources, the alarming consumption of global energy, and the burning of fossil fuel (from transport and industrial activities) are issues about which people should be concerned and need to be addressed to ameliorate their detrimental impacts. The last issue produces carbon dioxide (CO₂), the prime source of global warming. Global warming that is related to climate change will increase the Earth's temperature up to 0.33°C within

ten years (Webb & Gossop 1994). Recent studies show that “the global average surface temperature has increased over the 20th century by about 0.6°C” (Houghton et al. 2001, p. 7). Consequently, it will cause drought and at the same time will raise the sea level inundating low-level nations.

The consumption of fossil fuel or energy is problematic. It is particularly in transport activities inasmuch as transport consumes more than 25% of world primary energy (Banister 1998). This problem applies to every nation: developing and developed nations. The activities have increased minimum temperatures in changes in extreme climate phenomena (McCarthy et al. 2001). Therefore, there should be a partnership, a governmental coalition to address ecology issues before it is too late. Technologies and energy efficiency in transport industries have potential in reducing gas emission in the 2010-2020 timeframe (Banuri et al. 2001). Thus, a coalition is important since increasing population and industrialisation burdens the Earth's carrying capacity. Above all, some natural resources will not warn people, the consumers, of their irreversible changes (Selman 1996). Once depleted, there will be no more.

The importance to planning

The importance of sustainable development over a broad area has been considered. Its importance to smaller areas or planning should be considered. Planning is primarily concerned with making use of land resources for humankind's well-being. Implicit in the discipline is the acknowledgement of social and economic influences on the use of land and the integration of policies that reflect the influences. These influences affect spatial, economic, and equity concerns in resource allocation and quality of life.

Planning includes land development, conflict reconciliation, economic use of scarce resources, and infrastructure (Greed 1994). It tries to balance (natural and built) environment, social, and economic needs such as employment (Western Australia Ministry for Planning 2000). Also, it addresses resources and space consumption (by urban development) as well as the intensity of activities through policies at national, state, and local levels. Therefore, planning contributes to sustainable development (de Roo & Miller 2000). This is an ideal concept of planning.

At this point, it is clear that planning and sustainable development are inter-related. Sustainable development deals with provision for society and preserving the available resources so that they will be available for future generations. As planning affects the long-term environment and society, it is important to take sustainable development with its long-term process into account (Falk et al. 1993). If we create less sustainable forms of development, resources will eventually dwindle. Hence, people need to consider the Earth's carrying capacity for present and future generations; in other words for intra- and inter-generational equity. Ultimately, there will be nothing left to plan with for commercial, industrial, and especially residential development that is regulated in more detail at local level.

Since residential development includes planning elements (e.g. utilities, open spaces, and transport for sustainable development), these will now be discussed to give people an insight into what can be improved so as to achieve more sustainable transport.

2.1.6. Transport and Planning for Sustainable Development

Planning residential development involves a myriad of considerations to be factored in. One is transport providing facilities for people's daily activities travelling from one point to another. Transport involves accessibility which can be augmented by increasing travel speed, placing urban activities closer together, or using a combination of both (Cervero 2001). Increasing travel speed mainly benefits those with motorised transport and makes roads become less safe for non-motorised groups. One method is to group urban activities closer together and ease disadvantages by having mixed land-uses.

From this point, it is clear that there is a strong relation between transport and land-use planning. Transport creates movement attracted and generated by activities that occupy land. High consumption of (finite and infinite) resources such as land and fossil fuel is therefore inescapable. Unthoughtful transport and land-use planning also contributes to reduced sustainable development especially since currently transport contributes 22% of CO₂ emissions from fossil fuel worldwide and

consumes more than 25% of the world's primary energy. This use will be doubled within three decades if people continue 'business as usual' (Banister 1998).

The next section addresses the dilemmas of transport provision in the context of urban structures and forms for sustainable development or a sustainable city.

Transport for sustainable development

Transport plays an important role in planning sustainable development since "transport is a major consumer of land" (Organisation for Economic Co-operation and Development (OECD) 1996, p. 27). Thus, it is important to discuss what transport for sustainable development is and obstacles to its achievement.

According to the OECD Conference on Environmentally Sustainable Transport (Organisation for Economic Co-operation and Development (OECD) 2000), a sustainable transport system is the one where:

transportation does not endanger public health or ecosystem and meets needs for access consistent with (a) use of renewable resources below their rates of regeneration, and (b) use of non-renewable below the rates of development of renewable substitutes (p. 17).

This definition implies sustainable development principles of intra- and inter-generational equity by using natural resources below their generation velocity rate for future generations use, and implies a sustainable development approach of carrying capacity at the same time.

Another definition of sustainable transport comes from the Western Australian government. It defines it as a balanced transport where public transport and non-motorised transport options are reasonable for many trips (Western Australia Department of Transport 1995) and "private traffic is not excluded but tolerated" (Garbrecht 1990, p. 187). A balanced transport system includes increasing transit, walk, cycle, carpooling and decreasing sole car use (Newman & Kenworthy 1999). It takes into account traffic calming, road network design, and economic sanctions against private transport.

Besides having balanced transport, transport for sustainable development means managing demand rather than supplying demand as tends to happen in Australian

cities (Newman, Kenworthy & Vintila 1992). Since demand management includes land-use management, it is apparent that transport needs to be integrated with land-use especially when the level of car dependence is increasing (Newman & Kenworthy 1999). There is a need for integrating transport and land-use to facilitate sustainable development. Thus, it is necessary to discuss urban forms and structures.

The place of transport in planning for sustainable development

To understand the integration of land-use and transport as well as to understand factors influencing car dependence, it is necessary to examine urban forms and structures. This helps in explaining and understanding the reality of the transport condition in urban development. An urban structure is "... the distribution and the relationship of the dominant land-use and the networks which serve them" (Westerman 1998, p. 47). It is slow to adjust to the changing environment or atmosphere. It defines where urban centres are, dwelling densities, and other major activities. On the other hand, an urban form is "... defined by the way in which these elements are arranged" (Westerman 1998, p. 47). In short, an urban structure is the detail of an urban form.

Often debated and relevant urban forms to current urban issues include the dispersed city and compact city. The dispersed city grows to the fringe outside the central city (Young 1995) with low population density (Young 1995). Thus, centres of activity are spread and dispersed. Consequently, the levels of public transport, walking and cycling usage are low (Curtis 2001; de Roo & Miller 2000), and that of car use is high. It is also because dispersed centres are difficult to serve efficiently by public transport, walking, and cycling because of distance and proximity. Another negative impact of a dispersed city is the need for high financial support in providing infrastructure (Fodor 1999; Real Estate Research Corporation 1974; Young 1995). In contradiction, a dispersed city benefits economically; it increases investment in the infrastructure itself and this increases employment (Troy 1996). Theoretically, another positive impact of a dispersed and low-density development is improved quality of life (Linneman in Young 1995; Planning Commissioners Journal 2000) through open spaces, and freedom enabling people not to limit interaction only within their own areas. They can interact beyond their limited residential territory.

The compact city or contained city is associated with increased density (Steadman 1998). It is where a city has high dwelling-density and mixed-use development. The compact city supports public transport services because it has adequate patrons within close proximity for the services to run (Curtis 2001). It enables residents to fulfil their needs within walking and cycling or short distance. Residents do not need to make long trips or to drive cars. What they need mostly can be fulfilled within one spot through mixed-use development. Thus, a compact city reduces emissions by providing residents choices to travel by walking, and cycling. Consequently, the city is capable in intensifying public transport, walking, and cycling.

It is suggested that in higher-density areas, interaction among residents is restricted. Activities occur indoors as they have limited outdoor areas only balconies (where available), and the ground floor. Hence, it is argued that high density increases seclusion and individualism (Troy 1996). Other shortages include traffic congestion, increase in local noise and air pollution (Jenks, Burton & Williams 1996), and pressure on land since more people in a more compact area are using the same amount of limited resources (Hillier, Yiftachel & Betham 1991) or using the same Earth's carrying capacity at the same time. In other words, on average in total, resources consumption per capita in a compact city is higher than in a dispersed city.

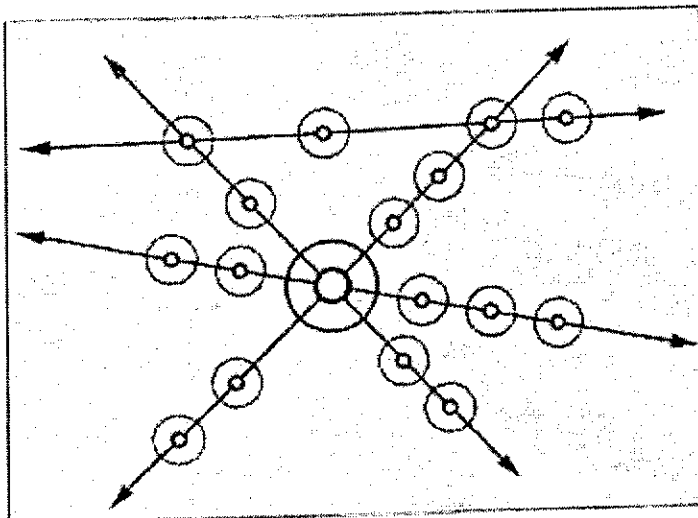
More recently, others have considered an urban form that enables a dispersed city to convert the transport benefits of a compact city (Curtis 2001). It is an integrated activity network city that provides for transport and land development to be coordinated and integrated. Hence, it is moving towards sustainable development (Cervero 2001). Like a compact city, this urban form addresses urban sprawl or dispersal. It embraces intensification along 'activity corridors' with mixed-use development at activity centres. Since a network city provides a myriad of key traffic generators, it can accommodate (low-speed) private cars, public transport, walking and cycling in balance (Curtis 2001). Consequently, it provides for transport choices and may decrease car dependence. This is deemed to be sustainable development (Cervero 2001) and the preferred urban form.

In every urban form discussed above, there are alternatives of urban structure to choose from. They include the core, star, satellite, galaxy of settlements, linear, and

polycentric net or regional cities (Frey 1999). This section only focuses on the urban structure applicable to the case study: the polycentric net city .

The polycentric net or regional city (Figure 2-2) as a configuration of linear cities has a triangular grid pattern. The nodes or intersections of linear cities become the peaks of transport network. Those living within transport circulation network can access centre by public transport; those living around cores by walking, and cycling; while those living between cores and linear cities by cars due to proximity. The city integrates the bus system with rail-based transit and restricts the peripheral spread of urban area (Curtis 2001).

Figure 2-2: The polycentric net city.

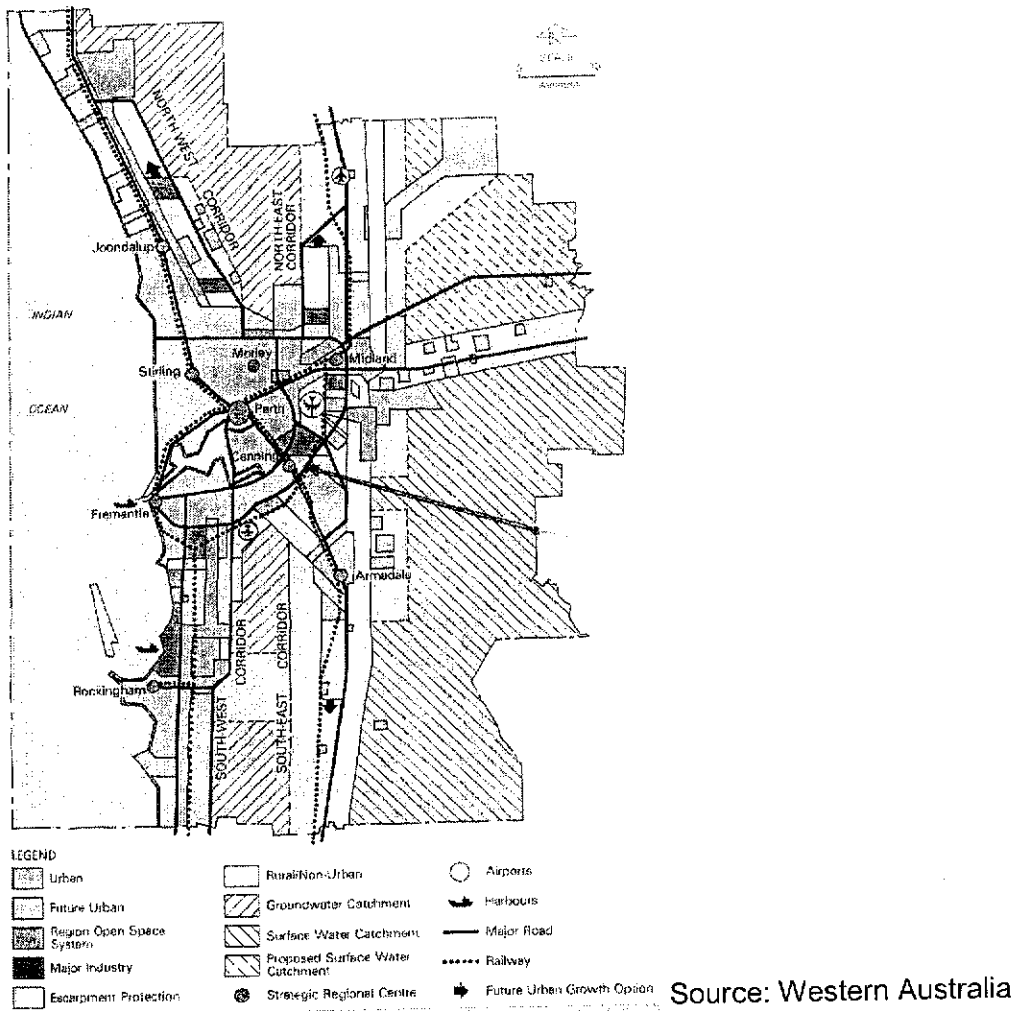


Source: Frey 1999, p. 53.

The PMR falls under this category. It has (four) corridors: North-East, North-West, South-East, and South-West corridors; with their regional centres: Stirling, Morley, Canning, Fremantle, Joondalup, Midland, Armadale, and Rockingham (Figure 2-3). These centres have Perth as the main centre with its high-density population and central business. Resembling the polycentric net city concept, all regional centres, except Morley and Rockingham, are served by a rail system terminating in the Perth CBD. The system is connected with a bus system as the feeder.

These form and structure impact on transport toward sustainable development. Their impacts can be reflected and measured by indicators that will be discussed in the next section.

Figure 2-3: The corridor plan for the PMR.



Department of Planning and Urban Development 1990a, p. 21.

2.1.7. Indicators of Sustainable Development

This section explains meanings, functions, types, and selection of indicators in other Australian states (New South Wales and Tasmania), America, and Europe. Understanding indicators and their process is useful in gauging the progress of programs, whether they are moving forward or leaving desired objectives. Later in this thesis, some transport indicators are linked to evaluation criteria.

Understanding indicators and their functions

Indicators are the yardsticks or measurements with which targets are set. They are quantified parameters to assist in explaining how things change over a period of time. In addition to that, indicators are challenges for people "... to explore how the

way they live affects their community/ world, ... [to] illustrate how each individual can make a difference" (Macnaghten & Urry 1998, p. 216), as well as to assess the effectiveness of policies and their revision (Wheeler 2000).

Supporting Maclaren's point of view, Argyman and Tuxworth (1996) believe that people can use indicators as management kits in policy-making. Indicators also simplify problems, make communication of issues of concern clearer, evaluate progress towards goals, and make people realise where they are so that they can take further actions (Bowerman, 1996; Sustainable Measures, n.d.; Tasmania Together Board, 2000 ; Yencken, 2001). Once goals and indicators are identified, informed decisions can be taken (New Jersey Future 1999). Decisions include policy documents with their objectives and evaluation criteria. Thus, there is a clear link between indicators and evaluation criteria. Linkages between sustainable transport indicators and evaluation criteria are set out in Chapter 6. Since the main focus of this study is the implementation of policy documents rather than measuring indicators, evaluation criteria were chosen as a means of analysing an extent of policy implementation.

Types of indicators

There are kinds of indicator (Macnaghten & Urry 1998; Jacobs 1991). It is beyond the scope of this study to elaborate on all of them. Thus, the researcher will appraise those having roles in this study and are related to the Earth's carrying capacity.

Firstly, environmental indicators are of two kinds: primary and secondary (Jacobs 1991).

1. Primary or stock indicators.

These indicators measure ambient environmental conditions for their qualities and quantities. Included in these main indicators are land use, water resources, non-renewable resource stocks, and coverage and stability of habitats.

2. Secondary or flow indicators.

They measure economic activities affecting the primary indicators. Included in these indicators are emission and discharge rates for pollutants, economic

activities (deforestation and reforestation, non-renewable resource exploitation and discovery, and recycling rates).

These two indicators are intertwined. Only by setting targets for the second set of indicators, can targets for the primary ones be operational (Jacobs 1991)

Secondly, welfare indicators include income, environmental quality, levels of employment and unemployment (which affect people's standard of living), the amount of (voluntary) enjoyable leisure time, public services (including transport), as well as the free goods and services that people consume (Jacobs 1991).

Both types are interrelated; the level of welfare influences how people treat the environment. These typologies were translated into more detailed indicators and broken down from national to local level (Canberra Department of Home Affairs 1983; Higgins, Alexandra & White 1998; New South Wales Planning and Environment Commission 1978; Newton et al. 1998; Western Australia Department of Environmental Protection 1998) and to be used as measures of achievement.

Selection of indicators

As indicators vary, depending on and adjusting to circumstances in which they are operated, some countries set their own criteria for indicators. It is also because indicators reflect what people value and believe.

What follows is a list of transport indicators used in different continents such as America, Australia, and Europe. Their links with evaluation criteria or roles in assessing implementation of transport toward sustainable development are described in Chapter 6. Some indicators that are generally used in these continents are shown below. The researcher combined overlapping ones under a bigger umbrella. They include (Cartwright 2000; Corson 1995; New Jersey Future 1999; Newman & Kenworthy 1999; Newton et al. 1998; Tasmania Together Board 2000; Winograd 1995):

1. Increased transit, cycling, and walking.
2. Reduced car use per capita.
3. Ratio of public to private transport use.
4. Reduced average commute to and from work.
5. Vehicles mile travelled.

6. Areas alienated by transport infrastructure.
7. Jobs per hectare.
8. Meet local needs locally.
9. Equivalent people using fossil fuels.
10. Measures of passengers carried by road.
11. Costs of transport.
12. Community perception of adequacy of transport services.
13. Workplace transport options.
14. Percentage of people feeling safe on public transport.
15. Access, facilities, services, goods and other people in ways which make less use of cars.
16. Access to public transport stops.
17. Kilometres of roads dedicated to cycle routes.
18. The number of pedestrian-friendly streets.
19. Car ownership.

They were chosen due to their close relation to urban passenger transport matters.

On the other hand, included in discarded indicators were:

1. Prevalence of problem gambling.
2. Number of major visitor centres containing Aboriginal cultural interpretation.
3. Consumption of paper and packaging per capita.
4. Proportion of substandard housing.
5. Hospital admissions due to injuries and poisoning.
6. Number of cooperative programs between levels of government.
7. Newspaper circulation.
8. Access to higher education.
9. Total energy use per capita.
10. Agricultural land and natural landscape at the urban fringe.

These indicators are related to criteria considered conducive to transport for sustainable development. They aimed at (Newman & Kenworthy 1999; Newman, Kenworthy & Vintila 1992):

1. Improving the practice of urban development for social justice or intra-generational equity.

Essential ways to improving equity include increase mixtures of services within a safe and easy walk environment, enhance proximity to dwellings and public transport frequency, and situate new residential development within neighbourhoods with established services. These ways are related to average distance to transport and community facilities and services, as well as public transport frequencies.

2. Improving the practice of urban development especially regarding environment criteria.

Residents' journey to work, activities affected by new residential development, car travel demands, and transport infrastructure have roles in transport for sustainable development.

3. Improving the practice of urban development for people's liveability.

This is related to urban design of development including landscaping, street lighting, mixed land-use, as well as quality of and access to public transport stops or shelters.

From the list, it is apparent that car use is much less preferred than public transport, cycling and walking. This preference is co-dependent on land-use as well as the road and transport network. This co-dependency is guided in policy. Policy enables people to expect progress toward betterment since it functions as an instrument to guide policy players to realise such objectives. An example of such progress is with regard to policy's approaches to conventional residential development and that to *Liveable Neighbourhoods Community Design Codes (LNCDC)*, a WAPC publication for developers and local governments, functions as development control to address sustainable development. Table 2-1 shows the comparison.

LNCDC promotes more compact and sustainable designs or spatial structure of new residential development. Neighbourhood centres are located within five minutes walk or 400metre radius from neighbourhoods to encourage residents to walk and cycle and give up their dependency on motorist private vehicle. Unlike conventional street pattern with culs-de-sac and loops, *LNCDC* supports interconnected street pattern including interconnecting vehicular roads with walk and cycle paths. In other words, needs of drivers, pedestrians, and cyclists are accommodated. Furthermore,

to promote community liveability, streets are designed integrated with adjacent land-use to support activities on the land.

Table 2-1: Conventional planning approach versus LNCDC approach.

Conventional Planning Characteristics	LNCDC Planning Characteristics
Neighbourhood centres in cells bounded by arterial roads.	Based on walkable neighbourhoods clustered to form towns along transport routes.
Strong hierarchical curvilinear street pattern with cul-de-sac.	Interconnected street pattern within site-responsive network with high quality public spaces as focal points.
Layout in accordance with subdivision standards for roads and open space.	Layout and performance objectives to provide a variety of lot sizes and housing choice, local retail, employment opportunities within the site and regional context.
Planning is characterised by large areas or zones of single land use and walled estate.	Fine-grained planning framework to ensure that employment and service centres are compatibly integrated with residential areas in neighbourhoods.
Limited planning for an integrated public realm (i.e. roads are designed predominantly for cars).	Streets are designed to comfortably accommodate non-vehicular users and to support adjacent land uses.

Source: Western Australia Department of Transport 2001, p4.

Based on the explanation above, it is wise to discuss policy and its lifecycle in the next part.

2.2. POLICY

Policies are indispensable for the realisation of objectives and equally so for sustainable development. They then will be implemented on the ground. However, sometimes things do not work as planned or formulated due to factors occurring between the stages. To understand influencing factors, it is important to consider a policy's lifecycle. This knowledge is beneficial in appreciating why things happen as they do and in exploring ways of addressing issues when they arise.

The lifecycle involves agenda setting, policy formulation, decision-making, implementation, and evaluation; then the process re-starts from agenda setting. For the thesis to be focused, this section only discusses policy interpretation, significance, and stages closely related to this study: formulation, implementation, and evaluation. These topics were useful in exploring factors influencing policy implementation. This section, with previous sections, gives a more comprehensive picture to enable the researcher to propose recommendations later.

2.2.1. Policy Interpretation and Significance

For many authors (Birkland 2001; Colebatch 1998; Dye 1998; Fenna 1998; Stewart 1999) policy means what government chooses to do or not to do in running governance. Therefore, it is not surprising if a policy changes as a government changes. But, saying a policy is what government does is too broad and indistinct. Like Bracken (1981), Fenna (1998) with a better understanding of policy suggests that policy encloses a purposive component. It is about connecting ends with means to achieve particular outcomes.

Policy concerns how to do things in a preferred way for the sake of stakeholders, including residents or communities to protect desired from non-desired functions (Colebatch 1998) although it is unclear whose desires they are. Because policies include guiding principles, a policy is significant in succeeding goals and objectives as described below.

As many authors (Friedrich 1963; Lasswell & Kaplan n.d.) believe, a policy is made to pursue its makers' goals, values, and practices. Consequently, it is a purposive course of action (Bracken 1981; Fenna 1998). Furthermore, according to Colebatch (1998), policy is significant in advancing the greatest happiness of the greatest number of people (Utilitarianism) which contradicts the-difficult-to-achieve Pareto optimality where the best action is that which makes someone 'better-off' and no one 'worse-off', where possible. Rationally, the better off people are, the better their quality of life. This is in parallel with what sustainable development is trying to achieve: to increase quality of life (Troy 1996).

In line with the opinions of these authors, the connective thread indicates that policy significance is concerned with directions and outputs; how a program would be directed to get desired outputs through challenges during the process. In other words, a policy is essential as it is a "... practical problem solving in a strategic context" (Stewart 1999, p. 65). To solve a problem, there is no doubt that the problem needs to be identified and defined; agenda need to be set. Anchored in agenda, then a policy can be formulated.

2.2.2. Policy Formulation

Although this study mainly explores policy implementation and evaluation, it is necessary to be equipped with knowledge on policy formulation as it has a close relation to policy implementation. Knowledge on policy formulation helped the researcher make informed decisions about factors influencing policy implementation.

This design stage is a real start; get things written. Aims to achieve, how to realise aims, and alternatives to solutions are developed and synthesised. This stage itself offers an opportunity for lessening divergences through a change of devices (Fenna 1998). It is "... changed to fit the needs and standard operating procedures of the agencies and individuals that carry them [it] out" (Palumbo & Harder 1981, p. x).

At this stage, there are influencing factors, for example, internal and external consultation, central agencies, and available options (Stewart 1999). While Stewart sees external factors, Birkland (2001) recognises internal factors that include goals, tools, targets, and implementation of a policy and emerge as a reaction to externalities. Both internalities and externalities elements need to be considered since these elements are inextricably linked to and influence one another. Hence at the formulation stage or process, policies can be approached from different angles. The process involves (Birkland 2001; Colebatch 1998; Dye 1998; Fenna 1998; Hill & Ham 1997):

1. Interest groups

Between the selected two case study areas, Commonwealth Government was incorporated into the Steering Committee for Joondalup Sub-Regional Centre (now Regional Centre), unlike Woodlake. Different interest groups between the two also occurred. The City of Joondalup was managed by Joondalup Development Corporation (JDC) that was a statutory body while Woodlake was by Ellenbrook Management Pty Ltd (EMPL) that is a joint venture between the Western Australian Government (Landstart, an arm of the Ministry for Housing) and the Ellenbrook Joint Venture from private sector.

2. Agenda setting

This stage involves identifying priority given to an issue which might be a result of the first point.

3. Targets of the policy

Targets of different policies that occurred at various time are different. In Joondalup, the target was cars as the City was car-based designed. Decades later, direction or focus was directed to a cycling-and-walking-based design. Also, wider scope of policy environment changes as policy shapes itself as it goes. The changes could be due to “existing policies almost are not enough to achieve ... goals” (Parham & Konvitz 1996, p. 16).

4. Recognised issues

Issues could be arisen from environment; the internalities and externalities elements abovementioned.

These stages in the process are to be decided and managed by policy makers.

Regarding policy makers, Palumbo and Harder (1981), and Colebatch (1998) suggest that policies should be formulated by legislators or by all parts of the hierarchy of administrative agencies and be carried out by administrators. As stages in a lifecycle process interrelate, what happens in the beginning affects what occurs in the end; therefore a formulation stage plays an important role at an implementation stage.

Once a policy is formulated, policy makers will make a decision considering internal and external consultations among themselves and with the public where necessary, depending on the scope of a policy under consideration. After being approved, the policy is implemented in due course.

2.2.3. Policy Implementation

Policy formulation is supervised by policy implementation that is “the directed change that follows a policy mandate, the process of re-arranging patterns of conduct so as to honour the prescriptions set forth in the decision” (Quade 1982, p. 305).

Theoretically, if we follow everything in a policy, everything will run amiably. However, there is no guarantee that if policies are followed, nothing will go wrong (Quade 1982). There are circumstances beyond people's control between

formulation and implementation. They include natures of problems; social, economic, technological, and political conditions (conducive or not); as well as political and economic options of target groups (Howlett & Ramesh 1995). These three circumstances cannot be predicted and are within a vicious circle; circumstance '1' affects circumstance '2', which is caused by circumstance '3' that is rooted in circumstance '1'.

Apart from these factors, successful implementation relies upon policy instruments used by administrators. In Australia, there are four interrelated universal types of policy instruments: advocacy, money, government action, as well as law covering legislation and town planning (Bridgman & Davis 2000). A decision on instrument selection dictates operational method (Bridgman & Davis 2000; Palumbo & Harder 1981) by policy implementers to minimise traps. Lest people forget traps during operation, Lindblom, Woodhouse (1993) and Patton (1993) describe some of the most common ones:

1. Incomplete specifications.
2. Conflicting objectives and directives.
3. Failure in communication, in recording insights, and in reconsidering discharged options.
4. Dependence on past experience that should not be over-emphasised for people and the world change.

They can be mitigated through three perspectives on policy implementation: top-down, bottom-up, and a combination of both (Birkland 2001). In the top-down approach that is applied in Western Australia (Curtis 1998), top government sets and controls goals of its lower levels. This approach has no consensus on what the goals are. It does not recognise diverse ways of implementation. Yet, it assumes that a policy has a single law or authority (Birkland 2001). Hence, conflicts that might occur among different authorities with different objectives can be assuaged. The second approach draws on the perspectives of those implicated by a policy (Howlett & Ramesh 1995). Sometimes this approach overstates the implementers' ability to set a global goal (Birkland 2001). Yet, this approach acknowledges conflicts between the same policies in different norms in different local areas. It recognises the need for bargaining as well as compromising in mitigating conflicts.

The last approach unifies advantages between them. Top decision makers gather data, and consider inputs and the needs of implementers at a lower level.

During its implementation, a policy evolves to its betterment and improvement through testing and refinement. It is called a policy learning process (Bridgman & Davis 2000) where policy implementation alters policies to certain degrees (Lindblom & Woodhouse 1993). From policies' failures and successes, policy players can learn for future policies – learning from the past, people say.

2.2.4. Policy Evaluation

*There are two stages to the public policy process: too early to tell,
and too late to do anything about it.
(Anonymous)
(Fodor 1999, p. 127)*

After being implemented a policy needs to be evaluated to know its effectiveness, efficiency, and appropriateness. It is to acquire a deeper understanding of socio-technical issues and to bring about better solutions (Quade 1982) before issues are (sometimes) too late to handle.

Therefore, it is best to monitor and compare policies (with policies) over time in different situations to ensure whether they have achieved their goals to customers' and stakeholders' satisfaction (Stewart 1999); whether they need to be altered, continued, or terminated. Adding to Stewart, Bridgman (2000) believes that evaluation helps people appreciate costs and benefits (not only in financial terms) of public policy approaches, as well as offers decision makers data and advice.

Because policy process is a cycle, there is time when subsidiary steps overlap one another. It is, therefore, wise not to draw a definite line between policy evaluation and formulation. An evaluation of policy implementation is for formulation of a better policy that will be implemented. The evaluation is approachable from many ways. It is begun with problem definition resembling policy formulation (Quade 1982, Bridgman, 2000).

The steps in that process look simple. Nevertheless, there are limitations, such as internal factors (for example, what we can do rather than what we want), as well as

unpredictable external factors (for example, recalcitrant departments). This unpredictable situation is expressed nicely by Quade (in Bridgman 2000): “in practice, things are seldom tidy” or by Hogwood and Gunn (1988): “In practice, goals are often diffuse, unclear, ... inconsistent” (p. 155). Hogwood and Dunn suggest policy analysts to conduct issues search, filtration, and definition before forecasting through assumptions about the future. The process continues to defining objectives and priorities (the most important step in the process), and to evaluating options. Subsequently, a policy will be implemented to have effect on target groups, and be evaluated. Based on an evaluation, policy analysts gain information on policy problems, future actions, outcomes, and performance (Dunn 1994). They use methods of policy evaluation (Bridgman & Davis 2000):

1. Inputs (efficiency) by comparing financial plan and real production, and benchmarking with analogous programs in other areas.
2. Process (technical efficiency) by measuring production wastage and down time, as well as evaluating gap and reviewing conformity.
3. Outputs (effectiveness) by interviewing participants and clients, as well as forming performance indicators.
4. Outcomes (appropriateness) by testing performance objectives, analysing policy externally, and conducting longitudinal research studies.

Since this study focuses on the extent of implementation of transport elements (the subsidiary research question posed in Chapter 1), the appropriate methods were outputs and outcomes.

2.3. CONCLUSIONS

In the first section the history, meaning, principles, and approaches of sustainable development have been considered. Its importance to human life, its relation to transport, planning, and indicators of transport toward sustainable development have been embraced. The information provides an understanding of the context and content of sustainable development, enabling its policies to be handled more carefully considering the complexities involved.

Based on the section, it is clear that sustainable development has been an international issue long before the 1987 *Brundtland Report*. Concerns about it have

been evolved from the environmental sphere to the economic and social spheres of human life. Consequently, its terms and interpretation have evolved over time and become more complex and comprehensive. Its main principles remain the same although its marginal principles and approaches may be varied and evolve further.

In approaching sustainable development, it is recommended to use more than one approach for each has its weaknesses and strengths, advantages and disadvantages. It is not prudent to use one approach and disregard the rest. Hence in this study, the researcher approached sustainable development from the carrying capacity point of view under the principles of precaution and equity. The researcher believes that these three are the main approach and principles of sustainable development, while others are their further development. The application of the approach and principles in this study is explained as follows.

This study evaluates facilities and services for public transport, walking, and cycling; the three transport modes that are considered energy efficient. It evaluates the road network design in order to assess the relative distances travelled by motorised and non-motorised modes. There is a preference for a road network enabling these transport modes to reduce miles/ kilometres travelled. This allows people to behave cautiously, in case the Earth cannot carry the load people put on it. If the current generation behave within the Earth's carrying capacity, intra- and inter-generational equity is possible to be attained. The attainment progress can be measured against indicators. They indicate whether people are leaving or approaching sustainable development. They also help people making informed decisions on actions to realise liveable neighbourhood.

Sustainable development is worthwhile discussing especially since it is significant to human life continuity in particular in relation to transport and land-use planning for the purposes of this thesis. However, transport and land-use planning are still being debated. There is still no final agreement or unanimity on which urban form and structure are the most sustainable, a dispersed city, a contained city, or a combination of two. Not only are urban forms and structures still being debated, but also their impact on transport choice and travel reduction. However, transport indicators might help determining action to be taken to achieve transport toward sustainable development.

In short, the section defines sustainable development as development to enhance the quality of life of human and nature for intra- and inter-generational equity under consideration of the Earth's carrying capacity. The section helps the researcher understand the big picture of sustainable development, its complexity and increasing significance, as well as the strong relation between land-use and transport for sustainable development. This objective, sustainable development, can be achieved through guidance or instrument that is policy. Hence, an understanding of policy and its lifecycle is necessary to formulate, implement, and evaluate policy.

From what has been described in the second part of this chapter, it is clear that although there are many policy interpretations, the common thread is about connecting ends with means in attaining particular outcomes. In other words, for this thesis, a policy is guidance how to achieve goals and preferred target for the benefits of policy stakeholders. This interpretation applies to policy proposals and policies for sustainable development for the betterment of humankind's quality of life.

Other parts of the second part suggest that the policy lifecycle is a policy process possessing unpredictable and predictable factors. These can be manipulated by policy makers and implementers to achieve either altruism or selfishness. This achievement will be visible when a policy is implemented on the ground and evaluated. Understanding these factors gives recognition to diversity of policy nuances, to complexity of policy lifecycle, to ability in reading what is between the lines, as well as to be wary in policy evaluation and in taking conclusions. Therefore, this part is useful for the researcher in setting the framework for evaluating policies for case study areas and in suggesting recommendations for better policy implementation and transport toward sustainable development.

Founded on this framework and this chapter, it is apparent that, justifiably, urban form and transport for sustainable development are very difficult to realise without political commitment (Blowers 1994) reflected in policies. Hence, transport policies are sometimes associated with conflicts, such as between environment and economic development (Freudensprung & Giorgi 2001). Difficulties also arise from those who are impacted by policy implementation, i.e. residents. Residents will

support government's programs if they can retain the lifestyle that they have enjoyed, and if they do not need to spend more on the introduced programs (Banister 1998; Hall 1998).

3. RESEARCH METHOD

3. RESEARCH METHOD

A case study approach was adopted in order to answer the research question: "Have transport elements in policies for residential development in Western Australia (WA) been implemented on the ground in the Perth Metropolitan Region (PMR)?" Policy objectives applicable to the chosen topic in case study areas were examined. To facilitate the evaluation of whether the objectives had been implemented on the ground, household questionnaire, and observation surveys were carried out. Interviews with policy players in WA were conducted to explore why or why not policy objectives had been implemented.

3.1. SELECTION OF CASE STUDY AREAS

A case study is the primary method used to study policy implementation (Palumbo & Harder 1981). Also, a case study as a medium on which policy objectives are to be implemented is crucial to identify which objectives have been implemented. Moreover, it is to investigate "... a contemporary phenomenon within its real life context" (Yin 2003b, p. 13), and "relies on multiple source of evidence, ... with data needing to converge in a triangulating fashion ..." (Yin 2003b, p. 14).

Two case study areas (Joondalup and Woodlake) were chosen representing examples of the best sustainable development practice in residential development in their time as promoted by experts and professionals in the planning industry. If the best practice of residential development turns out to be a poor example of sustainable residential development, it could be assumed that other developments of that time would be less sustainable.

Other criteria for selecting case study areas included firstly, a subdivision was planned more than five years ago. In evaluating progress of a program, a reasonable period of time of evaluation is needed. Since the Australian Bureau Statistics (ABS) provides data at five yearly intervals, a case study area should have been running for five years to have its data recorded by ABS. Data available from ABS include people's transport modes to work, vehicle ownership, and demography (such as income, and population). They are useful in understanding and considering

consequences of level of available transport services and facilities in the areas, as well as the reasons for people's choice of transport modes.

Secondly, urban areas were preferred rather than rural areas as development was changing towards urban from rural land-use. According to the World Commission on Environment and Development (WCED), "the future will be predominantly urban, and the most immediate environmental concerns of most people will be urban ones" (Houghton & Hunter 1994, p. 9).

Lastly, the researcher chose case study areas located in the outer PMR since generally more 'recent' large-scale residential development occurred in outer fringes due to land release programs. Since the financial value of land in inner areas is relatively high, lands in the outer fringe have been released for greenfield development.

These criteria were used for screening case study candidates before the researcher selected appropriate areas. This selection process occurs before data collection that involves multiple source of evidence. The source comprises (Yin 2003b; Yin 2003a):

1. Documentation, such as community newsletters, and progress report.
2. Archival records, for example maps, data, and survey data.
3. Interviews.
4. Direct observations, for instance a case study visit.
5. Participant observation, by undertaking specific activities within the neighbourhood.
6. Physical artefacts, such as a technological device, and a work of art.

The researcher used the first five of the source for the last one was irrelevant to this study. At this point, once the case study areas had been chosen, it was time to select appropriate policies in residential development to be measured against implementation on the ground.

3.2. SELECTION OF POLICIES FOR RESIDENTIAL DEVELOPMENT

By identifying transport elements in selected policies (relevant to case study areas), it is possible to estimate whether they would likely be conducive to transport towards sustainable development.

As described in Chapter 2, there are three approaches to policy delivery, i.e. the top-down, bottom-up, and a combination of both approaches. The top-down approach was chosen since it is appropriate to evaluate policy implementation (Birkland 2001). The aim was to select documents intended to guide residential development and transport. Since the study has as its focus (the extent of) implementation of policies on the ground, the researcher developed evaluation criteria from policy objectives in the selected policy documents. Thus, indicators for sustainable transport were not evaluated although they are associated with evaluation criteria. Subsequently, policy objectives were compared between policies at the same level, and between policies from different levels. This enabled an evaluation (Chapter 5) of whether there was significant progress towards sustainable development objectives (for example new topic inclusion) over time in policy content as well as whether policy objectives had been cascaded down, as they should have been, especially since a policy has a chain of command (Yanow 1996). Accordingly, the researcher examined international, national, state, and local level policies. Then in Chapter 6, a list of the chosen criteria, as well as an analysis of evaluation criteria for transport are shown.

Appendix 1 describes policy proposals and policies for sustainable development at international, national, state, and local levels that were evaluated in this study. It indicates the limitations and potential of each policy. The limitations include their roles in addressing sustainable development, participation from their audience, and their scope of coverage; whilst the strengths cover policies' roles in meeting Australia's international commitment on sustainable development, support to increase housing affordability, and intention to enhance quality of life.

3.3. FIELD AND OBSERVATION SURVEYS

Data collection was important to answer the question: "To what extent have transport elements been implemented at local level?" Field and observation surveys were conducted to verify whether objectives and requirements in policies had been implemented in the case study areas. This was carried out by using the policy evaluation criteria derived from the preceding policy analysis.

To achieve efficiency of available resources (for instance time and energy) and to reduce duplication, surveys were performed only in sampled areas indicated by numbers and circles (Figure 3-1) within each case study area. Sampled areas were considered representatives of the whole suburb.

In order to measure these sample areas against the evaluation criteria, it was important to ensure representation of a range of features (Table 4-1). These were identified from the evaluation criteria since they include factors to be considered when measuring implementation against criteria. They were useful in selecting sample areas and in providing information needed during analyses of policy implementation. The evaluation criteria are drawn from policy objectives and are listed in detail in Appendices 16 to 18. They were chosen to measure the implementation of policy objectives. They had relationship with the nineteen points listed on page 24. An example is an AMCORD's objective (in Appendix 16): "O11. To establish a street and pedestrian network which provides convenient linkages to activities ..." (The Model Code Taskforce of the Green Street Joint Venture 1990, p. 46). It required information such as cul-de-sac with and without a link to cycle/footpath and facilities (number 3, 4, 8, and 9 in Table 3-1 on page 48) to fulfil the objective. The same information was also required in assessing evaluation criteria (in Appendices 19 and 20) derived or developed from policy objectives. An example is regarding "Bicycle path network (B3)" where Joondalup provides bicycle tracks at its entrances (Figure 3a in Appendix 19). They are continuous along neighbourhood roads and connected to main roads. However, there are thirteen out of 100 (13%) culs-de-sac heads are connected to bicycle path (Photos 15, 16 in Appendix 19). Cyclists need to cycle on roads with motorised vehicles. This low level of connection appears, as at the time this area was designed, discontinuity was not considered an issue. Another example is from Appendix 20: "Connection at culs-de-sac heads (A3)" where there are barely four out of twenty-eight (14%) culs-de-sacs connected

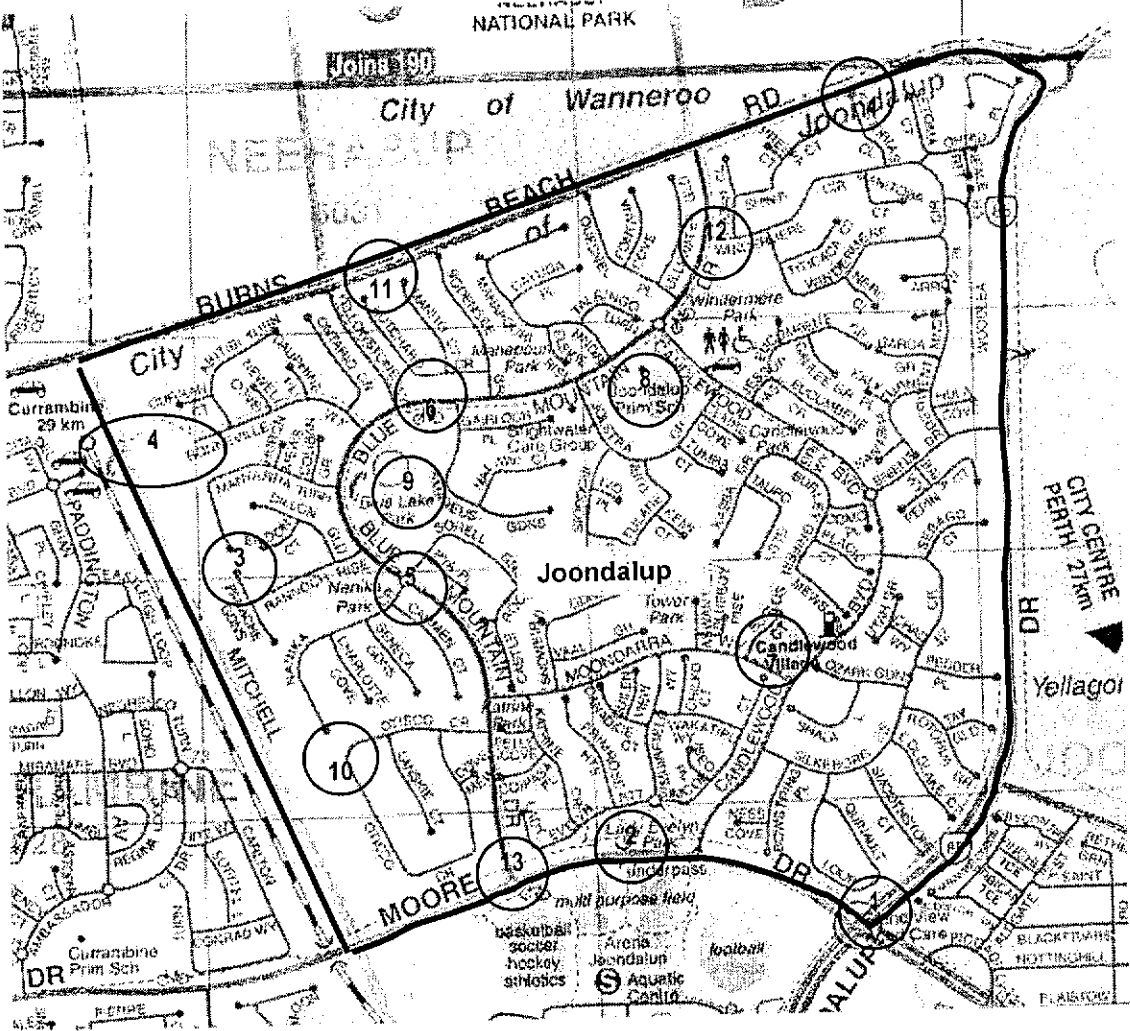
with cycle paths (Figure 3 in Appendix 20). At the time this suburb was designed, there was no such policy for Ellenbrook although interconnection issues existed. The factor may be the policy was still in the process.

Like the objective in AMCORD, other objectives in Appendices 16 to 18 were chosen from the policies identified in Chapter 3 due to their relevancy with matters in passengers urban transport within residential development, the main topic of this study. The objectives in Appendices 16 to 18 are related to sustainable development objectives since one of sustainable development objectives is to improve quality of life, which covers economic, environmental, and social spheres. Cost effective service and lifecycle of costs are parts of economic sphere; impact of traffic on environment, amenities, environment for users, as well as road links and network are elements of environmental sphere; safety, users' convenience, provision of service and community facilities, as well as equal use of all users are components of social sphere.

Table 3-1: Representative features surveyed and observed in both case study areas.

Reference number	Features
1	Main road intersection.
2	Underpass.
3	Culs-de-sac without a link to cycle/ footpath.
4	Culs-de-sac with a link to cycle/ footpath.
5	Roundabout.
6	T-junction.
7	Village centre.
8	Educational facility.
9	Recreational facility.
10	Loops and local access road.
11	District distributor road.
12	Local distributor road.
13	Bus stop/ shelter, bus route.
14	Rear access.

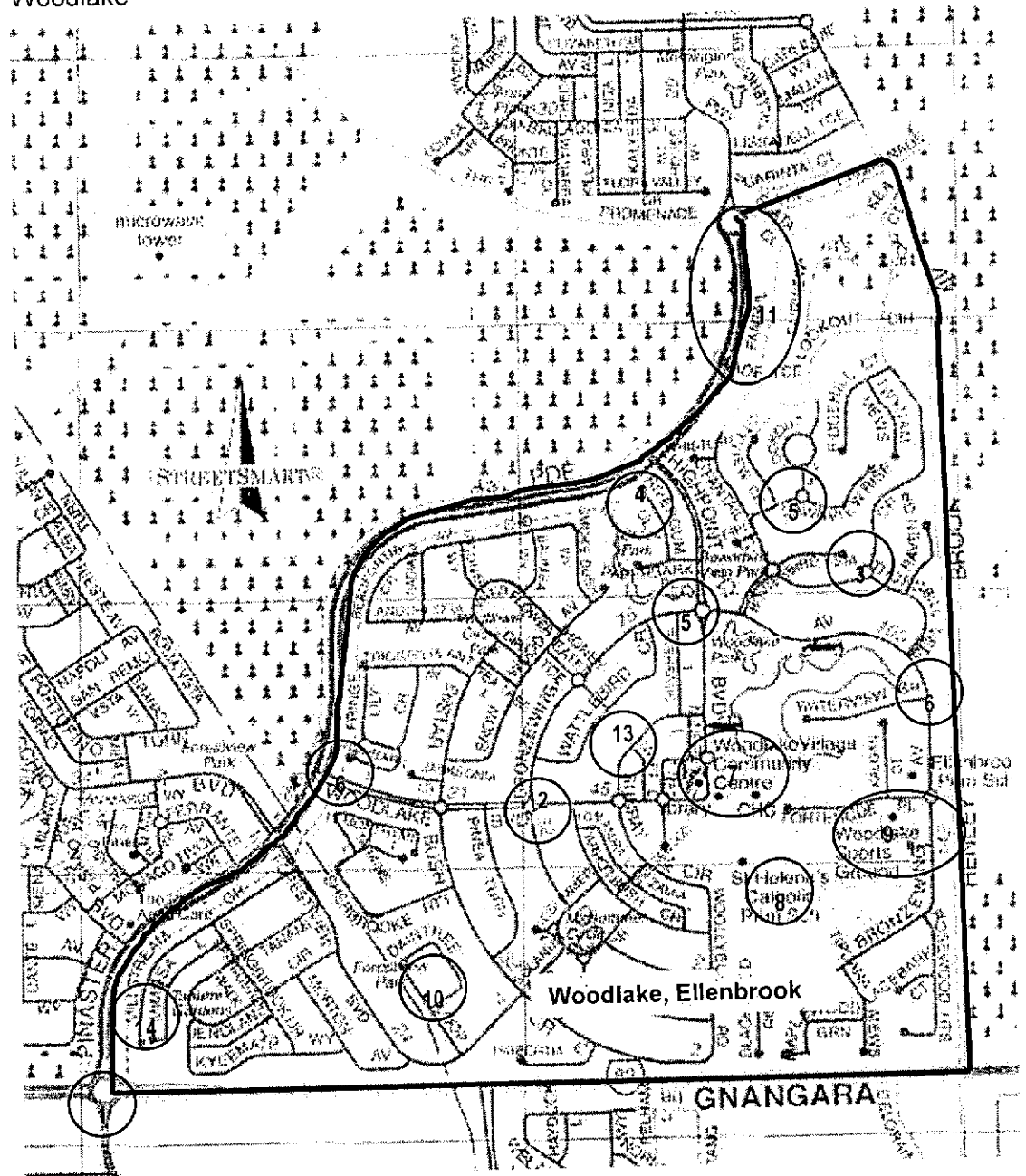
Figure 3-1: Case study areas in Joondalup and Woodlake, Ellenbrook.
Joondalup



Scale: 1 vertical grid line = 500metres

○ 3 : Feature (the number reflects that in Table 3-1 on page 49) and sample area boundary
 — : Case study area boundaries

Woodlake



Scale: 1 vertical grid line = 500metres

3 : Feature (the number reflects that in Table 3-1 on page 49) and sample area boundary

— : Case study area boundaries

3.4. LOCAL HOUSEHOLD QUESTIONNAIRE SURVEYS

Household questionnaire surveys gave the researcher an opportunity to discover situations in the case study areas and to gain an insight of residents' perceptions. These local surveys were conducted to gain information from those directly impacted by the implementation or otherwise of policy objectives. Information from users was important since there might be factors and conditions that could not be noticed by the researcher as an outsider. This information was to confirm observation survey and to assist the researcher answer research question of to what extent transport elements have been implemented at local level.

The questionnaire, in Appendix 2, was guided by evaluation criteria derived from policy objectives. It was designed to gather information on the location of workplaces and transport modes used to work. Workplace location was useful in knowing the distribution of employment that relates to land-use and transport matters; while transport mode used provided a comparison between the two case study areas and the PMR.

3.4.1. Sampling method

A field survey to Joondalup and Woodlake was conducted in November 2001 to ascertain population size and confirm street numbers for questionnaire posting purposes.

This data was used to determine sample size. There were 1,665 residential lots in Joondalup and 860 in Woodlake. From the total population, a sample size for the household survey was determined using a table for determining sample size (Krejcie & Morgan 1970). At a confidence level of 95%, with a sampling error of approximately 10% (Rea & Parker 1992, p. 133), the required sample size for Joondalup was 313 respondents while for Woodlake it was 265. A Random Number Table (Wong 1999) was used to determine which lots would be sampled. The selected numbers then were listed and matched with numbers on the sample frame.

A covering letter (Appendix 3), the questionnaire, and an enclosed reply-paid envelope were sent to each respondent who was asked to reply within two weeks. To increase the level of response, after three weeks (two weeks for reply and one week for posting time), the researcher sent a reminder letter (Appendix 4) and the same questionnaire to those who had not replied within the specified time. Seventeen percent of the questionnaires were completed. At the end of the waiting period, data entry and analysis using the SPSS Statistical Package and Microsoft Excel were performed.

A second household questionnaire survey (Appendix 5) was conducted to follow up the first questionnaire. The methodology, population, and procedures of sample selection were the same but the second questionnaire had as its focus residents' satisfaction with road network, public transport, walking, and cycling facilities and service provision. Primary data needed for analysing compliance of case study areas with selected evaluation criteria were questioned. In other words, evaluation criteria guided the choice of those questions. This information would be very useful for the researcher at the analysis stage. The minimum sample size for Joondalup was ninety-two respondents and for Woodlake eighty-five. From ninety-four questionnaires sent to Joondalup and ninety-one to Woodlake, twenty-eight and thirty-nine questionnaires from Joondalup and Woodlake respectively were returned. The response rate was 30% for Joondalup and 43% for Woodlake, or 36% on average. This level of response is acceptable for a mailed questionnaire survey; the standard is 20%-30% (Moser & Kalton 1975, p. 268). At the end of the waiting period, data entry and analysis using the SPSS Statistical Package and Microsoft Excel were performed.

Responses from the questionnaire surveys were to confirm and clarify the observation survey which had already taken place. Both surveys were useful in analysing the fulfilment of policy objectives and evaluation criteria or measures in Joondalup and Woodlake.

3.5. SEMI-STRUCTURED INTERVIEWS WITH POLICY PLAYERS

The above analyses and comparison needed to be clarified with policy players in Joondalup and Woodlake (for instance their planners, local governments, and Department of Transport). This process is detailed as follows.

The researcher conducted semi-structured interviews with policy players: planning officers from the two local governments, land developers (public and private sectors), planning consultants (private sectors), and the state transport authority. The aim was to clarify and ascertain findings in household questionnaire surveys to gain an understanding on factors influencing policy implementation, and to answer the research questions: "Why have transport elements not been implemented as planned?" and "Are transport elements conducive to sustainable transport in residential development?"

In selecting interviewees or respondents, the researcher used a snowballing technique (Coleman 1970; Denzin 1970b; Denzin & Lincoln 2000). In this technique, a researcher asks respondents, where possible, to recommend other persons having experience relevant to the study. Since the contact persons are recommended by their colleague, they may be more willing to give (more) information to a researcher. Above all, a researcher can identify relevant agencies or contact persons and get information from appropriate persons efficiently in terms of time and finance. But on the downside, the snowballing technique can be bias; not everybody has the same opportunity to participate in. It is possible that there are more knowledgeable persons than the recommended ones but not chosen as respondents. Above all, it is also possible that a recommended person would recommend someone whose opinion is similar to theirs and not recommend someone whose opinion is against theirs.

Local governments and the state transport authority were chosen since they represented policy makers and implementers at the same time. In addition, the transport authority was selected because this study has as its focus transport provision in residential development to reach sustainable development.

Each interviewee (Appendix 6) was contacted; the purpose of the interview, the nature and purposes of this study was explained briefly. All interviewees were notified that interviews would be tape-recorded and no information leading to their personal identification would be revealed. When they agreed, the researcher arranged an appointment. Confirmation was followed up by sending a covering letter (Appendix 7), an information sheet (Appendix 8), and a consent form (Appendix 9) that had to be signed and returned to the researcher at the interview.

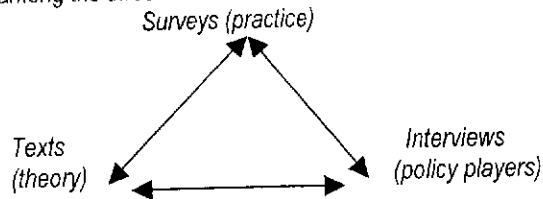
Questions asked (Appendix 10) were broadly the same for each interviewee. The main difference was in terms of location (Joondalup and Woodlake). Generally, the questions were related to clarification of how residents perceived their place of living (based on household questionnaire surveys), and to factors influencing policy implementation. Tape-recorded interviews were transcribed (Appendix 22) and sent to interviewees for confirmation. Afterwards, the researcher identified common themes or views on policy implementation from interview transcripts. Information irrelevant to study analysis was discarded. Some of the information was:

1. Interviewees' personal knowledge of case study areas for example history of and involvement of their organisations in case study areas.
2. Interviewees' professional experience in terms of transport and policy implementation matters in other projects (not in case study areas) that might be useful for the researcher in understanding this study better.
3. The researcher's personal interests in interviewees' organisation's publication or work.
4. Further clarification of topics or issues brought up by the interviewees that were not clearly understood by the researcher.
5. Other topics developed during interviews but irrelevant to the study.

Then the researcher with her knowledge through literature review and interviews assessed whether transport elements were conducive to sustainable development.

At this final stage of analysis, the researcher combined quantitative with qualitative methods since multiple methods give more reliable and convincing results (Denzin 1970a; Denzin 1970b; Denzin & Lincoln 2000). This multiple method, known as triangulation (Figure 3-2), corroborates what is in the text (policies), observation of practice (field and household questionnaire surveys), and policy players who influence the other two.

Figure 3-2: The interrelation among the three tiers.



3.6. SUMMARY

The research methodology was designed to facilitate answers to the research questions. This chapter has explained the methodology used for data collection and analyses. The approach started with selecting case study areas for examination of policy implementation. This was important in identifying from which local governments in the PMR policies for residential development should be chosen. Joondalup and Woodlake were selected due to their reputation as the best practice of sustainable residential development. This step of selecting case study areas was crucial in determining the second approach: selection of policy documents from where policy objectives and evaluation criteria were selected.

The approach continued to selecting appropriate policies guiding residential development in the City of Joondalup and City of Swan. They were analysed to assess how policies evolve over time and to what extent policy evaluation criteria had been implemented to address residents' needs. The selected criteria that were used for the evaluation are listed in Chapter 6, the analysis chapter. They are also available in Appendices 19 and 20 in Table 1 to 4. These two approaches, selecting case study areas and policies, gave the researcher a basis to conduct the third step: field surveys, observation, and household questionnaire surveys.

The surveys were to gain primary data unavailable from secondary data (such as ABS). This third approach provided the researcher with information on what transport features should be measured against. It guided the researcher in determining and deciding which policy evaluation criteria had been implemented.

Subsequently, semi-structured interviews with policy players were conducted to explore factors influencing policy implementation and to clarify findings founded on household questionnaire surveys. This last step, triangulation, corroborated what were in the text (policies), the practice (policy implementation), and policy players.

4. THE TWO CASE STUDY AREAS

4. THE TWO CASE STUDY AREAS

4.1. JOONDALUP AND WOODLAKE

*This is my community and it's my responsibility to make it better
(Governor Tom McCall, Metro Council Organization founder)
(Liberty 1999, no page)*

Within the Perth Metropolitan Region (PMR), the suburbs of Joondalup (in the City of Joondalup) and Woodlake (in Ellenbrook) met the four criteria set in Chapter 3. The City of Joondalup was chosen as it has received recognition and awards since the 1990s. In the mid 1990s, Joondalup was "... the finest example anywhere in the world of the great 'new town' movement of the 20th century" (Stannage 1996, p. xv) and was "... a fitting monument to all who dreamed its making" (Stannage 1996, p. 234). Joondalup was also "... a blueprint to guide the growth of Perth" (Stephenson 1992, p. 11). Later in 1997, it was "regarded as a prime example of regional centre development ..." (LandCorp n.d., p. 4).

Furthermore, Joondalup was visited as a showcase by participants of the 1996 RAPI Congress: 'Implementing the Vision' (Melotte 1996). Participants were shown a realistic appreciation of planning, conservation, development, and an implemented vision of sustainable development in broad terms. Above all, the Joondalup suburb was considered a typical subdivision structure plan and included in the Western Australian Planning Commission *Policy Manual on Residential Road Planning* (Western Australian Planning Commission 1989). This proves that Joondalup was an example of benchmark or blueprint of residential development.

Ellenbrook is considered a benchmark of sustainable residential development in terms of, for example energy efficiency, local employment, and 'sense of community'. In the last six years, Ellenbrook has won fifteen state and national awards, and has been Australia's most awarded new community especially in terms of 'sense of belonging' (LWP Property Group Pty Ltd 2001), which is one of the social sustainable development goals. It also received the UDIA Award for Excellence of the overall residential development, for sense of community, environment, and engineering in 1996 and 1998. Recently in 2001, it was claimed

“... a benchmark in its field for planning, urban design, ... and infrastructure” (Urban Development Institute of Australia (UDIA) 2001). Ellenbrook has been a showcased suburb to the 1996 RAPI Congress participants (Melotte 1996). Woodlake suburb is included in the 1996 *State Planning Strategy* as a residential development providing local facilities and services to residents (Western Australian Planning Commission 1996b).

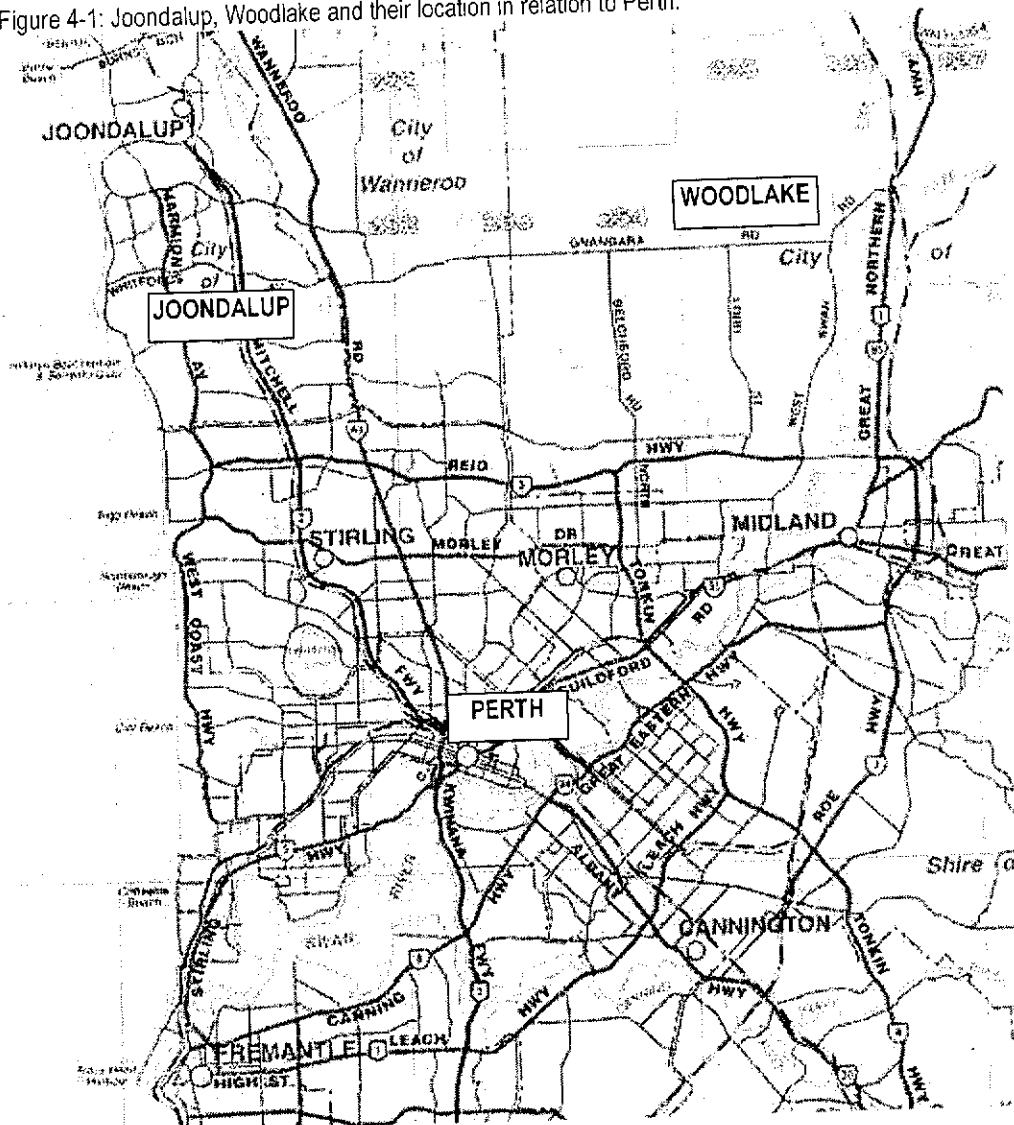
Based on such recognition, there was no doubt that Joondalup and Woodlake fit the criterion as a benchmark of sustainable residential development in its own period.

The following sections describe the location, transport data, and planning regime of both case study areas to give context to analysing evaluation criteria.

4.1.1. Location

Joondalup and Woodlake are both located on the northern part of the PMR, Joondalup in the North-West Corridor and Woodlake in the North-East Corridor (Figure 4-1). Both are approximately 22-27km or 30-35 minute drive North of the City of Perth ('Perth' hereafter).

Figure 4-1: Joondalup, Woodlake and their location in relation to Perth.



Scale: 1 vertical grid line = 10km

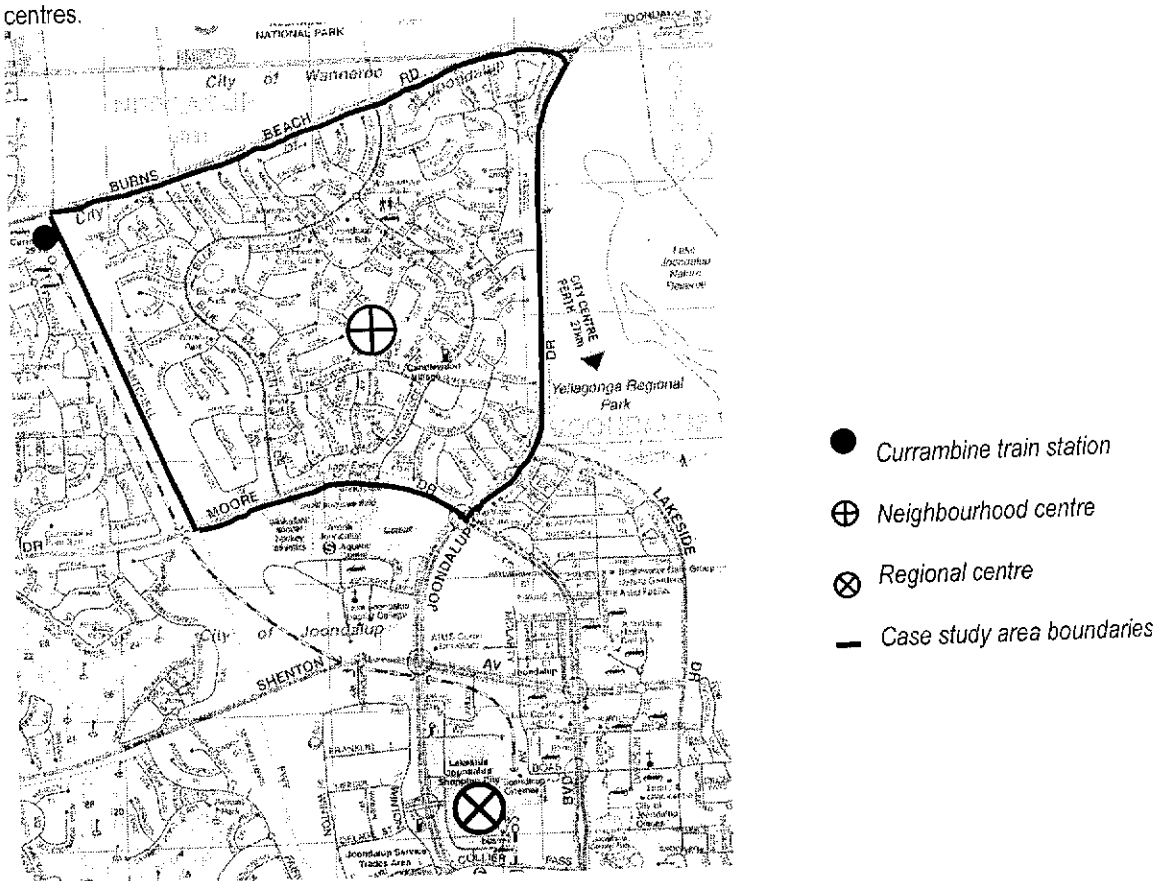
Source: Department of Land Administration & West Australian Newspapers Ltd. 2001.

The suburb of Joondalup

The suburb of Joondalup is 2km from a regional centre (Western Australia Department of Planning and Urban Development 1990a) and bound by four arterial roads: Burns Beach Road (north), Moore Drive (south), Joondalup Drive (east), and Mitchell Freeway (west) as shown in Figure 4-2. Joondalup's street network design is a tributary system where the road network is hierarchical and dominated by cul-de-sac. Local services such as a primary school, lake, park, and local shops are located in the centre of the suburb. Sports, tertiary education, and religious facilities are located south of the suburb in the Joondalup Centre.

4. THE TWO CASE STUDY AREAS

Figure 4-2: The suburb of Joondalup, its boundaries, Currambine train station, neighbourhood and regional centres.



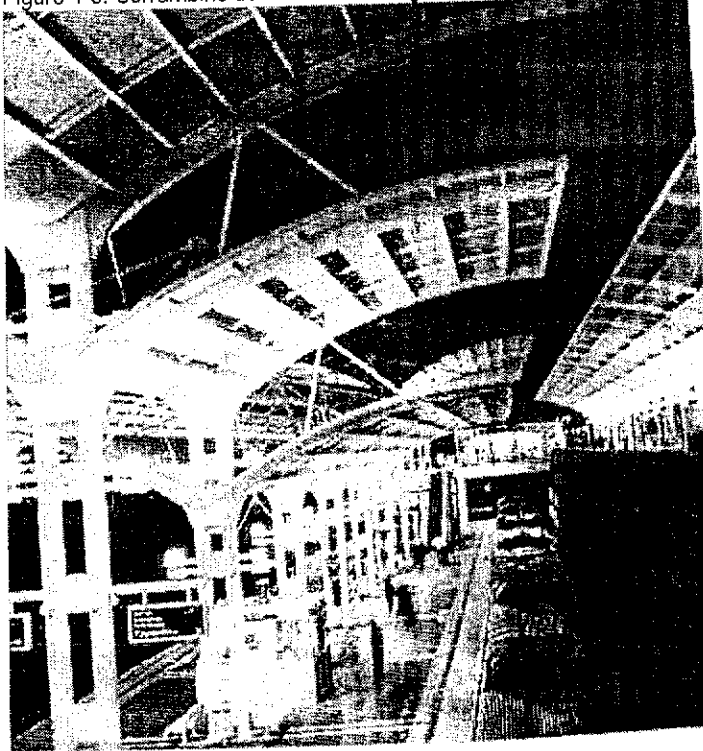
Scale: 1 vertical grid line = 500metres

Source: Department of Land Administration & West Australian Newspapers Ltd.

2001, p. 220.

This suburb is served by two public transport systems: bus and train. The bus services were introduced after the first stages of development in the 1980s. To date, there are eleven bus routes (detailed in Appendix 11). The nearest train station is approximately 1,030metres from centroid of the case study area (Figure 4-3). It was opened in the late 1992 after Joondalup suburb was developed and occupied. Services run every 15 minutes (weekdays) or 30 minutes (weekends). The buses and train are connected and will take passengers to and from surrounding residential development, the regional centre, and Perth train station.

Figure 4-3: Currambine train station serving Joondalup and surroundings.



Source: LandCorp n.d., p. 6.

The suburb of Woodlake

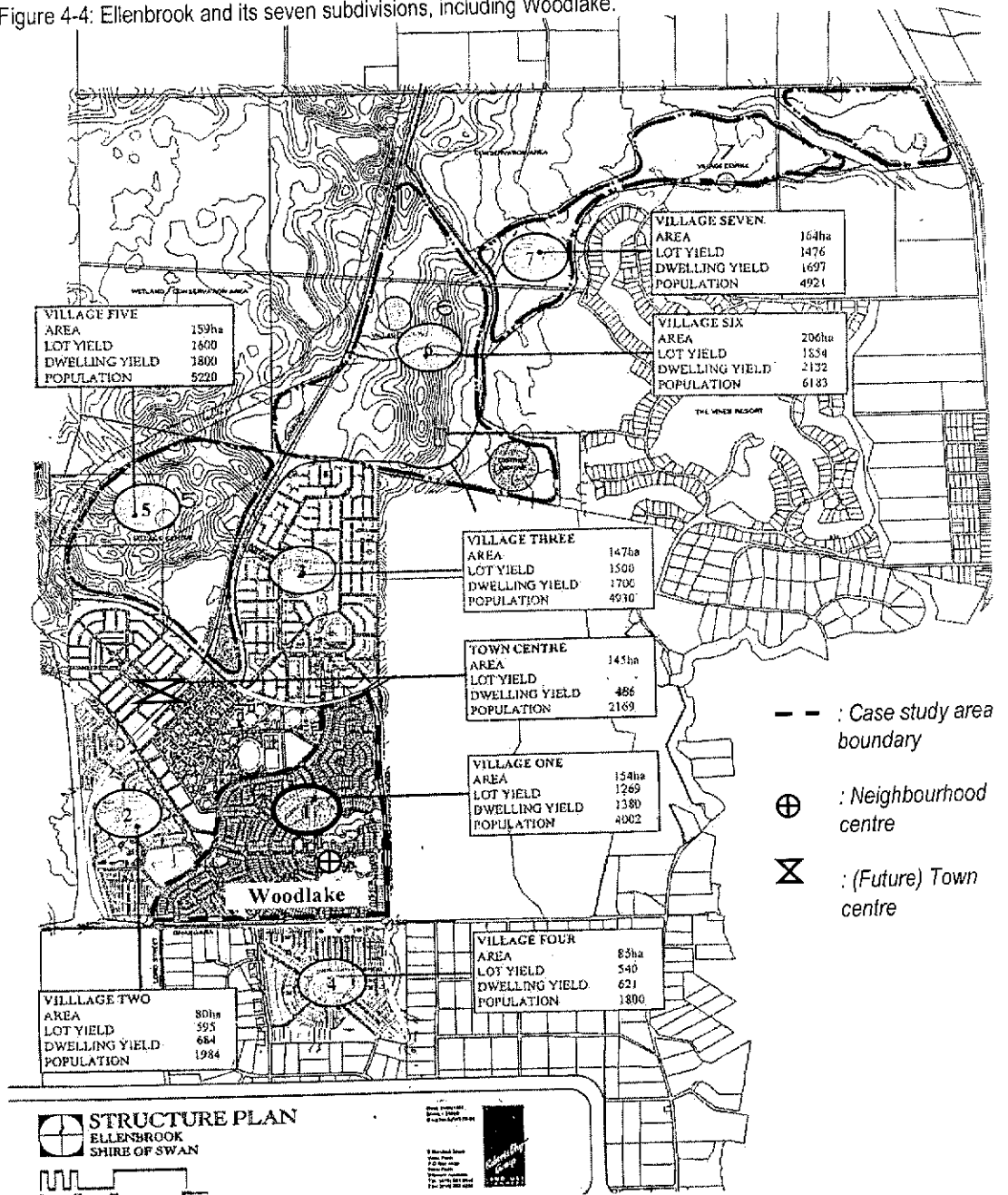
Woodlake, part of Ellenbrook suburb, is one of seven major subdivisions forming Ellenbrook (Figure 4-4). To date, four villages have been developed; they are Woodlake, the Bridges, Coolamon, and Morgan Fields.

Woodlake is bound by four roads: The Promenade (north), Gnangara Road (south), Henley Brook (east), and Pinaster Parade (west). The hierarchical street network design in Woodlake is a mixture of radial, culs-de-sac, loops, and a modified grid. The road system connects houses, which are arranged radially, and oriented to the Centre (Figure 4-5). Similar to Joondalup that has five roads with a connection to its boundary roads, Woodlake has six roads.

Figure 4-5 shows that Woodlake is provided with facilities in the Village Centre including primary schools, a lake, local shops, an amphitheatre for arts events, public open spaces, and tennis courts. The Centre is located on Woodlake's eastern side, designed to be shared with its neighbouring areas (such as Egerton, to be developed to the east) to broaden the Centre's catchment area.

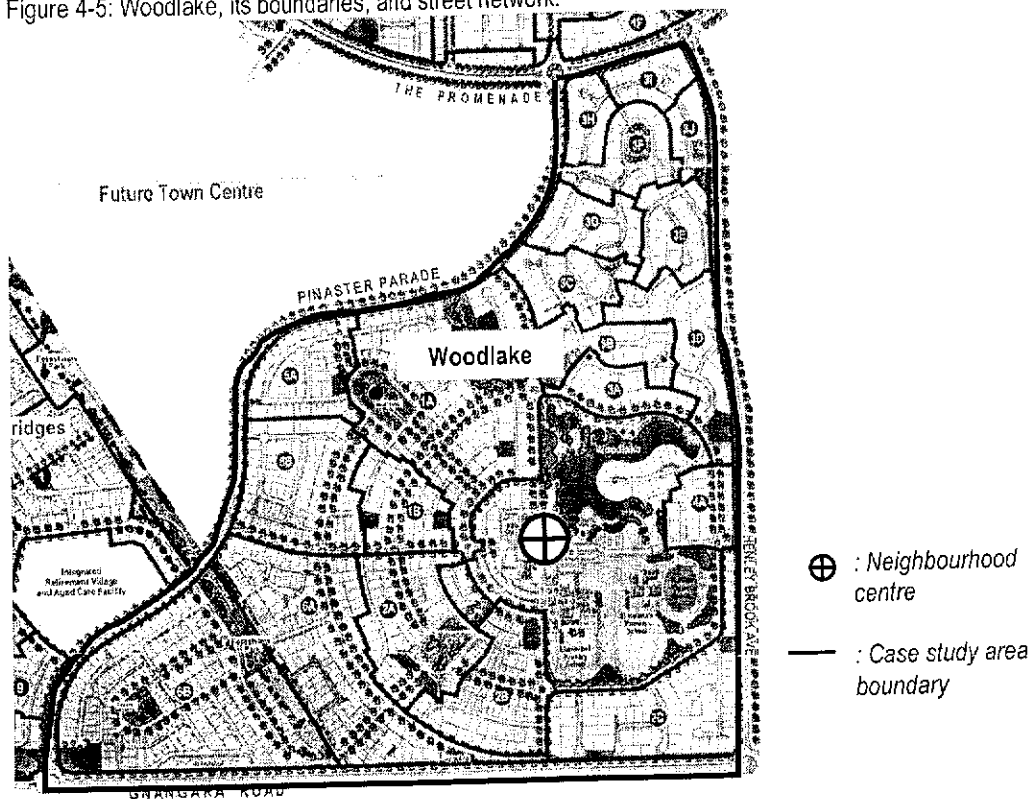
4. THE TWO CASE STUDY AREAS

Figure 4-4: Ellenbrook and its seven subdivisions, including Woodlake.



Source: Roberts Day Group Land Use Planning 1997.

Figure 4-5: Woodlake, its boundaries, and street network.



Source: Whelans 2000.

Scale: Proportional

4.1.2. Demography and Transport

For contextual purposes, transport and demography data of Joondalup and Woodlake are compared with the PMR.

Table 4-1 indicates that Joondalup and Woodlake households have a similar median age (29 and 30 years old respectively). They have the same mean household size (3 persons), but this is higher than that of the PMR (2.6 persons). Woodlake residents have a higher weekly income (A\$900-1,099) than the Joondalup suburb and PMR (A\$800-999). Age and income play their roles in use of transport modes. Income level has a significant influence on vehicle ownership although not automatically; while age influences work force, trip destinations, and a need for travelling. Since generally the demography of the case study areas is alike, differences in travel behaviour arising from demographic influence are likely to be insignificant.

Table 4-1: Demography and transport data in Joondalup and Woodlake.

Category		Location		
		Joondalup	The PMR	Woodlake
Population	Before working age <15 years old	29.7%	20.7%	32.9%
	Working age 15-64 years old	64.0%	68.0%	64.7%
	After working age >64 years old	6.3%	11.3%	2.4%
	Median age (years old)	30	34	29
	Median weekly household income (A\$)	800-999	800-999	900-1099
	Mean household size (persons)	3.0	2.6	3.0
Transport	Method of travel to work (1 method):			
	Public transport	5.2%	8.1%	1.3%
	Car	67.9%	60.3%	74.2%
	Cycling	0.1%	2.0%	0.2%
	Walking	1.3%	5.7%	1.4%
	Others (truck, motorbike)	2.4%	1.3%	2.4%
	Method of travel to work (two methods):			
	Public transport (bus and train)	1.3%	0.7%	1.7%
	Public transport and other	2.0%	1.1%	1.9%
	Others	1.1%	0.9%	0.4%
	Method of travel to work (three methods):			
	Public transport and other two methods	0.1%	0.2%	0.2%
	Other three methods	0.0%	0.1%	0.0%
	Worked at home	2.9%	5.7%	2.5%
	Did not go to work	13.8%	12.5%	13.0%
	Not stated	1.4%	1.4%	0.8%
	Vehicles ownership (with and without motorbikes)			
No car	3.1%	7.8%	1.8%	
1 car	24.3%	36.0%	33.0%	
2 cars	59.4%	35.7%	51.9%	
3 or more cars	10.0%	14.9%	9.2%	
Not stated	3.2%	5.6%	4.1%	

Note: The categorisation 'working age groups' is the same as that of Department of Education, Science and Training (2002).

Source: Australian Bureau of Statistics 2002a; Australian Bureau of Statistics 2002b.

For method of travel to work, the ABS data do not differentiate types of mode for two or three methods. Data users cannot differentiate public transport and walk from public transport and car. Since they cannot be identified, the researcher only used 'method of travel to work (one method)'. The 2001 ABS data indicate that regarding motorised transport, Woodlake has the lowest rate of public transport use (1.3%) while Joondalup is higher (5.2%). This significant rate difference may be caused by different kinds of public transport available in these two case study areas and their proximity to public transport stations. It may also be due to urban and structure of the PMR. Inasmuch as the PMR is a polycentric net city as described in Chapter 2, the Joondalup suburb has higher public transport usage. Joondalup is closely located within approximately 1,300metres from public transport (bus and train) stations and a regional centre; thus it is within transport circulation network. Its

location and close urban activities around the suburb explain why the Joondalup suburb has a higher level of public transport usage (Cervero 2001) than Woodlake which is located distant from its regional centre. In addition, Joondalup suburb also has more frequent and varied bus routes (Appendix 11) than Woodlake (Appendix 12).

Because of its location and transport provision, Woodlake residents need to use a private car for the journey to work. Hence, Woodlake has the highest car use (74.2%), followed by Joondalup (67.9%) and PMR (60.3%). This higher car use rate in Woodlake, as shown in Table 4-1, may be related to the data on motorised vehicles ownership. As shown in Newman's Table (Newman & Kenworthy 1999, p. 80) on transport data around the world (America, Asia, Australia, and Europe), increase of car ownership is concomitant with car usage and total kilometres travelled. The kilometres travelled is also related to location of the suburbs which are explained later in this chapter.

High car use/ dependency is also affected by land-use around an area (Newman & Kenworthy 1999). Joondalup is surrounded by residential development and a regional centre while Woodlake is by vacant land. Newman (1998) also believes that there is a close link between car-usage and people's wealth. Wealthier people tend to use cars more. Since car ownership is concomitant with car-usage which has a close link with people's wealth, there is a link between car ownership and people's wealth. The Table on car ownership, usage, and their relation to transit and income (Newman & Kenworthy 1999, p. 80) also implicitly explains why transit use is the reverse from car use. This tendency is also recorded in the 'State of Environmental Report' (Newton et al. 1998). The researcher believes that the reverse level of transit from car use is also the case for low non-motorised transport modes (cycling and walking) use.

In terms of non-motorised transport modes, the PMR has the highest rate of walking (5.7%), followed by Woodlake (1.4%) and Joondalup (1.3%). In terms of cycling, the condition is the same; the PMR has the highest rate of cycling (2%), followed by Woodlake (0.2%) and Joondalup (0.1%). Data on cycling and walking usage for formal use (such as for business or work purposes) are low because residents' workplace is far, as shown in Figures 6-4 and 6-9 (on pages 94 and 108), and beyond walking and cycling comfortable distance (no more than 1km and 5kms

respectively). Thus, the levels of cycling and walking use for both suburbs are very low. Residents use them for other purposes (such as recreation and health purposes) which are not the focus of this study and therefore not discussed. The significances of these transport modes use levels are high fossil fuel consumption, high pollution, and dependence on motorised transport modes. They are significant for an urban area will expand farther to its perimeter forming a conurbation.

In short, Woodlake is a dispersed suburb from the main metropolitan region. Accordingly, public transport (1.3%), cycling (0.1%) and walking (1.4%) usage are low and car use (74.2%) is high. Besides being explained by its dispersed location, high car use can be explained as follows. Since public transport service is insufficient, residents are only faced by two choices of transport modes to the workplace and major retail facilities (for example at Morley and Midland): non-motorised modes and private vehicles. Since residents' workplaces are beyond walking and cycling comfortable distance, they are left with the last alternative that is the car.

4.1.3. Planning Regimes

Given that this study has as its focus policy implementation, awareness of the planning regimes in both case study areas helps understanding why certain policy evaluation criteria have not been implemented or why case study areas do not fulfil current policy objectives.

The suburb of Joondalup

Joondalup suburb is under the local government of the City of Joondalup (the City of Wanneroo before 1998). Based on the 1970 *Corridor Plan for Perth*, the City of Wanneroo was planned to be the centre of the North-West Corridor (Western Australia Department of Planning and Urban Development 1992). Later in 1977, the *Planning Strategy for the North-West Corridor* designated the whole Joondalup City Centre (not the Joondalup case study area) as the subregional centre for the corridor. The corridor was planned to be an employment centre, a counter magnet to encourage people to work closer to their homes and to offer them an opportunity to avoid commuting to Perth. It was also to avoid high transport costs (economic, environmental, and social costs) of travelling 27kms to Perth. Currently, the Joondalup City Centre (approximately 1,300 metres from Joondalup suburb) is

classified as a regional centre. The strategic planning policy (Western Australia Department of Planning and Urban Development 1991) suggests that a regional centre as a multi-purpose centre for a city's self-fulfilment is best located on a primary road within a rapid transit route and major public transport network to support growth of an urban transport corridor. It provides people with employment opportunities to reduce commuting and support local employment especially since the centre is close to a high-density housing. With a spacing of 5-10kms, the centre is accessible by public transport and car (Western Australia Department of Planning and Urban Development 1991) with a wider catchment area and population.

Unlike other local governments, the City was planned and developed outside conventional local government structure. It has its own Act, the *Joondalup Centre Act 1976*, to support the development of the 1,425ha of land and to set up a statutory body, the Joondalup Development Corporation (JDC). The JDC (the then Landcorp) was established to "... promote, coordinate and secure as soon as practicable the laying out and development of the Joondalup Centre" (Stephenson 1992, p. 219). The survey and design for the Joondalup Centre were outlined in an interim report and the final report was published in 1977 (Stephenson 1992).

The City comprises five precincts (Currambine, Hillarys, Joondalup (where the case study area is located), Warwick, and Whitfords), and 25 villages within these precincts. The Joondalup suburb was planned in the mid 1970s (Stannage 1996). In 1987, 288 new lots were developed; while in 1988, the first serviced residential lots were released in Joondalup suburb (Joondalup Development Corporation 1989). The complete timeline of Joondalup development is in Appendix 13.

The suburb of Woodlake

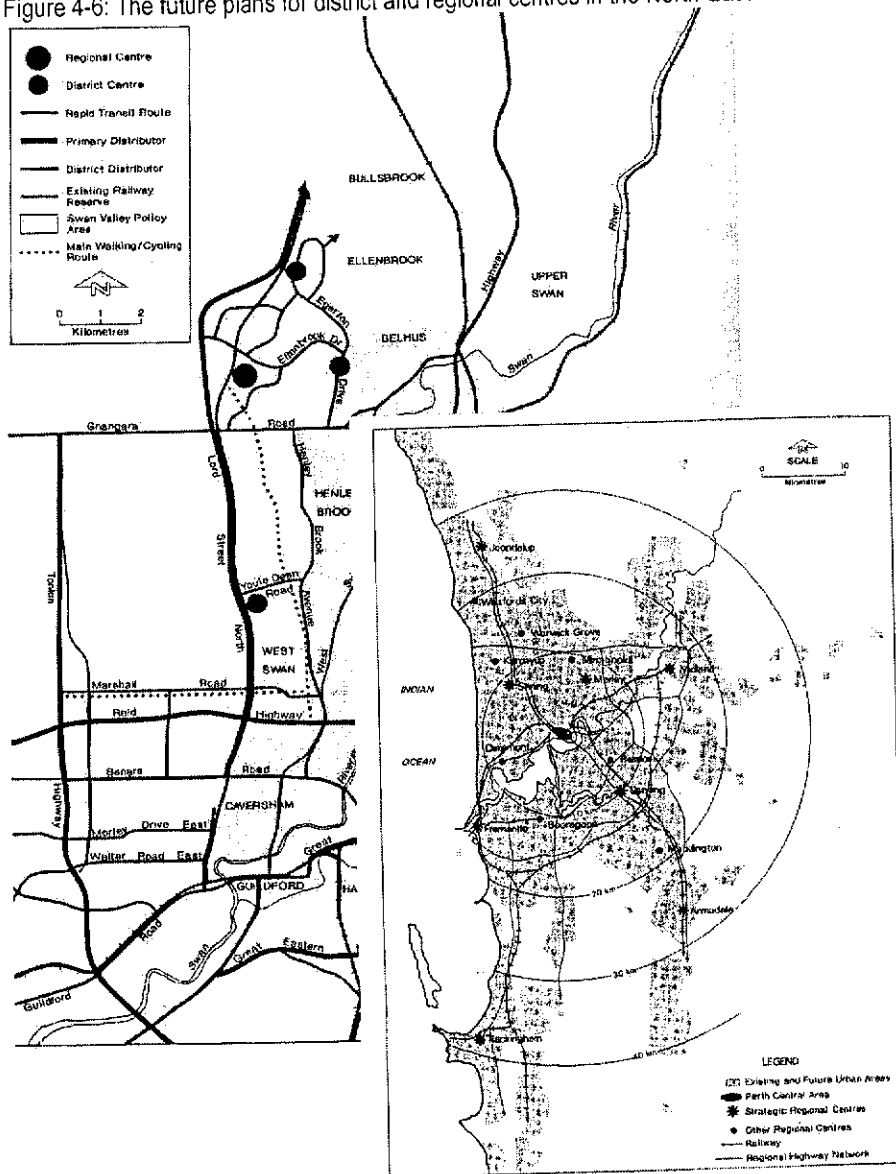
Woodlake, as part of Ellenbrook, is under the *City of Swan Town Planning Scheme No. 9* (gazetted in 1985 and amended in 1997). This development was triggered by the need for dwellings in peripheral areas to ease the pressure (of the need for housing) in the PMR as identified in the 1990 *Urban Expansion Policy* (Feilman Planning Consultants 1992; Western Australia Department of Planning and Urban Development 1990b).

4. THE TWO CASE STUDY AREAS

Woodlake was rezoned from rural to urban deferred in December 1992, nearly twenty years since Joondalup suburb was planned. The development plan for Ellenbrook, covering an area of 1,540ha, was promoted in 1994. In the same year, construction was commenced and a year later the first residents were arriving. Appendix 14 exhibits the full timeline of Woodlake development.

Unlike the Joondalup regional centre, Ellenbrook was planned as one of the district centres in the North-East Corridor (Figure 4-6). There are two regional centres in

Figure 4-6: The future plans for district and regional centres in the North-East Corridor.



Source: Western Australia Department of Planning and Urban Development 1991, p. 10; Western Australia Department of Planning and Urban Development 1994, p. 72.

Midland and Morley serving Ellenbrook. This hierarchy of metropolitan centres impacts on travel patterns and sustainability discussed earlier. The centres provide a wider range of goods and services. This is why the Woodlake residents travel so far to use them. Since the centres are beyond cycling and walking distance, residents do not use the modes; instead, they use motorised modes. Since public transport service between Woodlake and Midland or Morley is limited (detailed in Appendix 12), local residents use their own vehicles. Thus, high car-use and non-renewable natural resource consumption are unavoidable at present.

In terms of the development process, there is a big difference between Joondalup and Woodlake. Joondalup has been developed by a statutory body: the Joondalup Development Corporation (the then Landcorp); while Woodlake has been developed by the Ellenbrook Management Pty Ltd (EMPL), a joint venture between the Western Australian Government (Landstart, an arm of the Ministry for Housing) and the Ellenbrook Joint Venture from private sector. The EMPL assists the City of Swan in filtering building plan proposals. The proposals must be approved by the Management before the Management sends advice to the City for building licences issuance. The Management acts as the mediator between its customers (or the City's residents) and the City.

4.2. COMPARISON BETWEEN JOONDALUP AND WOODLAKE

Besides the development process, the two case study areas have differences in their own ways. Joondalup was planned two decades earlier than Ellenbrook. It is more connected to neighbouring suburbs, more developed and was being developed to be part of a new city on the north, the City of Joondalup. Ellenbrook has 'leap-frogged' the urban front; thus it does not adjoin other residential development.

Since generally the demography of the case study areas is alike, differences in travel behaviour could be insignificant in terms of those factors. In contrast, different metropolitan centres in the hierarchy have significant functions. The Joondalup City Centre (south of the Joondalup suburb) as a regional centre is dominated by a multi-purpose centre with a major employment centre. Due to its high level in the hierarchy, a centre plan is required and the Centre is best located on major public

transport service and primary roads. Ellenbrook as a future district centre will be dominated by service and community facilities, as well as offices. Joondalup and Woodlake suburbs as neighbourhood centres predominantly provide local shops and business services. As a consequence of their functions, these centres with a different hierarchy have different spacing and population catchments. Their spacing location also influences transport modes used by residents.

Regarding the provision of public transport and its type, Joondalup suburb has more advantages than Woodlake since it is located close to two train stations and near a bus station (approximately 1,030metres to Currambine train station, approximately 1,300metres to Joondalup bus and train stations as well as a regional centre, measured from centroid of the suburb). On the other hand, Woodlake is located far from public transport stations (approximately 11,575metres to Midland train station and approximately 14,045metres to Morley bus station). In addition, Joondalup suburb has been developing much longer than the Woodlake so it has more patrons and more service, such as the numbers of bus routes, and their frequencies. However, the land developer of Woodlake has tried to provide an adequate bus service by subsidising the service to overcome the problem of low patronage.

5. ANALYSING POLICY COVERAGE

5. ANALYSING POLICY COVERAGE

This chapter presents an analysis of the coverage of policies for residential development towards sustainable development at the international, national, state, and local levels. This will enable an examination of the reasons why transport objectives in these policies have not been implemented on the ground, and of whether the objectives are conducive to sustainable development. It does this by identifying topics included in each policy and the evolution of policy (towards sustainable development) over time.

In approaching this analysis, this study applied a top-down approach where a policy is filtered from higher to lower level agencies and preferably improved over time (Birkland 2001). Since policies at the international level were formulated to pursue sustainable development, theoretically, policies at local level would show the same trend and have more detailed actions to be implemented on the ground. This deduction is based on a belief where higher-level policies should have been cascaded down to lower-level policies (Brown & Duhr 2002). For the purposes of this study, only policies and policy objectives related to and significant for transport towards sustainable development were selected.

5.1. ANALYSING TRANSPORT OBJECTIVES IN POLICIES

The selection of policy documents had guidance on transport and residential development as its focus. At the international level, the *Kyoto Protocol*, and *Agenda 21 (Rio Declaration)* were selected since they aim to reduce the level of greenhouse gas emissions and include aspects on transport. The 1985 *Vienna Convention*, 1989 *Montreal Protocol*, and 2002 *Bush Plan* (released by the President of USA) were left out for they do not touch on transport matters. The *Vienna Convention* focuses on protection of the ozone layer; the *Montreal Protocol* has as its focus substances (such as CFCs and Halons) that deplete ozone layer; while the *Bush Plan* is principally for USA domestic environment (Eccleston 2002; The White House 2003).

At the national level, the *Green Street (GS)*, *Australian Model Codes for Residential Development (AMCORD)*, *National Strategy for Ecologically Sustainable Development (NSES)*, and *National Greenhouse Strategy (NGS)* were chosen because they include discussion on transport.

At the state level (Western Australia), the *Corridor Structure Plan*, *Western Australian Planning Commission (WAPC) Policy Manual*, *Perth Metropolitan Transport Strategy (MTS)*, *State Planning Strategy (SPS)*, and the *Liveable Neighbourhoods Community Design Code (LNCDC)* were evaluated because of the same reasons as national policies. Policies left out consist of the *WA Bush Plan* concentrating on bush management in any development, the *Residential Codes* detailing for example development requirements, and building setbacks (these two aspects are too detailed to be analysed in a large scale residential development), as well as *Metropolitan Centres* focusing on the policy for metropolitan centres, retailing, offices, and other associated development.

Finally at the local level, the *Town Planning Scheme (TPS)* and *District Planning Schemes (DPS)*, *Joondalup Centre Development Plan (JCDP)*, and *Ellenbrook Structure Plan (ESP)* were analysed inasmuch as they are the main documents in guiding residential development in both case study areas. The documents excluded include the *Joondalup Policy Manual* focuses on matters at the city council (such as human resources, governance, and financial planning) rather than matters of residential development planning.

Once these related policies had been identified and compiled, objectives and evaluation criteria or requirements related to transport were identified. The analysis of fulfilment was divided into four factors: the road network, public transport, walking, and cycling (the last three are choices of transport modes). These factors were drawn from common policy objectives and evaluation criteria. At the end, a comparison of fulfilment in Joondalup and Woodlake was presented.

Objectives and requirements were selected since both of them are guidelines to realise vision (Tasmania Together Board 2000). It should be noted that some objectives and evaluation criteria were left out because they are un-related to transport, for example administrative requirements, utilities, landscapes, and

education. Owing to cost, lack of equipment, and experience, measurements concerning speed and slopes (factors identified as transport evaluation criteria) were not managed. Some evaluation criteria that overlap or are irrelevant to a case study (such as railway, bushfire) were excluded either.

5.1.1. International Level Policies

Principally, international level policies address ways to handle climate change arising from greenhouse gas emissions. Table 5-1 shows topics and policy objectives contained in the selected policy documents. Each objective has been given a unique reference number in order to enable comparison between policy documents. In total, the analysis categorised fifty-three objectives shown in Table 5-5 on page 79. The complete policy objectives are shown in Appendix 15.

Table 5-1: Policy objectives included in international policies.

Reference number	Policy objectives	Agenda 21 (1992)	Kyoto Protocol (1997)
1	Sustainable energy (consumption patterns change).	Y	Y
4	Fossil fuels use limitation.	Y	Y
8	Land-use and urban transport.	Y	
9	Land-use management.	Y	
17	Efficient transportation system.	Y	
18	Effective transportation system.	Y	
29	Encouragement of use of non-motorised modes.	Y	
33	Pedestrian safety.	Y	
39	Cyclist safety.	Y	
42	Public transport usage promotion.	Y	

Y: Objective is in the policy

Both documents have as their focus limiting fossil fuels use (reference number 4) through sustainable consumption patterns (1) to protect the atmosphere from greenhouse gas emissions to achieve sustainable development. Then *Agenda 21* provides detailed actions, such as encouraging the use of non-motorised transport modes (29) as well as land-use and transport management (9). The *Kyoto Protocol* does not cover the range of topics. This suggests that the 1992 policy has not been superseded by the 1997 policy; instead they have different objectives. *Agenda 21* tends to be an action plan (with its more detailed-actions) generated from the 1992 *Rio Declaration* whose focus is environment and development, while the *Kyoto Protocol* has as its focus climate change. Although they have different focus, there are overlapping or similar parts as analysed in this section.

5.1.2. National Level Policies

It is the nature of policies that higher level policy is expressed in general terms rather than on precise or detailed terms. Hence, policy objectives at the national level should be less general than those at international level.

Table 5-2 shows the evolution of transport elements included in the selected national policies over nearly a decade. A complete list of policy objectives is shown in Appendix 16. Based on the table, the *AMCORD* includes a large range of objectives. It is the only document that recognises the need for access for the

Table 5-2: Policy objectives included in national policies.

Reference number	Policy objectives	GS (1989)	AMCORD (1990)	NSESD (1992)	NGS (1998)
1	Sustainable energy (consumption patterns change).			Y	
2	Atmosphere protection from greenhouse gas emissions.			Y	Y
3	Energy efficient.			Y	Y
4	Fossil fuels use limitation.			Y	Y
6	Land-use optimisation near centres.			Y	Y
7	Land-use optimisation near public transport station.			Y	Y
8	Land-use and urban transport.		Y		Y
9	Land-use management.			Y	Y
10	Locally based business and employment.			Y	
15	Transportation safety/ safe transportation system.		Y		
16	Transport convenience.		Y		
17	Efficient transportation system.		Y	Y	
19	Movement/ road network.			Y	
20	Ensure close linkages are maintained.				
21	Physical/ clear distinction of road hierarchy.		Y		
22	Travel time limitation.		Y		
23	Public transport to the main centres of employment.		Y	Y	Y
25	Car dependency reduction.			Y	Y
26	Accessible activities by non-car users.			Y	
27	Access for the disabled.		Y		
28	Access for the aged.		Y		
29	Non-motorised modes of transport encouragement.			Y	Y
31	Pedestrian access/ network.	Y	Y		Y
32	Pleasant/ convenient walking.	Y	Y		Y
33	Pedestrian safety.	Y	Y		Y
34	Pedestrian visual supervision.		Y		Y
37	Cyclist access/ network.		Y		Y
39	Cyclist safety.		Y		Y
40	Cyclist visual supervision.			Y	Y
42	Public transport usage promotion.				Y
43	Public transport system improvement.		Y		
44	Public transport network.		Y		
46	Acceptable walking distance bus route.	Y	Y		
47	Direct bus route.	Y			
48	Accessible bus route/ public transport services.	Y	Y		Y
49	Pleasant/ convenient driving.		Y		
52	Safe driving.	Y	Y		

Y: Objective is in the policy; GS: Green Street; AMCORD: Australian Codes for Residential Development; NSESD: National Strategy for Ecologically Sustainable Development; NGS: National Greenhouse Strategy

disabled (27) and the aged (28). But *AMCORD*, like *GS*, does not state directly the need for a reduction in car dependence. Besides this similarity, *AMCORD* and *GS* differ; *GS* focuses more on roads, while *AMCORD* on residential development. Unlike *AMCORD*, *GS* does not incorporate cycling. The reason may be that cycling is seen by some as a mostly on-road activity (Western Australian Planning Commission 1989). Hence, *GS* only incorporates walking.

While the *GS* and *AMCORD* have as their focus roads and residential development, the 1992 *NSESD* and 1998 *NGS* have sustainable development as a whole. This includes non-human elements (for instance mining and agriculture). Therefore, these documents are general and not as detailed as *GS* and *AMCORD* regarding residential development. This arises because the *NSESD* stemmed from the 1980 *World Conservation Strategy (WCS)* (Australian Department of the Environment and Heritage 1992). It is not surprising that *NGS* covers more policy objectives than *NSESD* because *NGS* was published six years later when it is possible that people's awareness and understanding of the significance of sustainable development could be enhanced. These last two documents acknowledge ideas of land-use management (9) and mixed land-use optimisation around city centres (6) and/ or public transport stations (7). Similarities between the two occur because they have *NGS* as their companion strategy (Australian Ecologically Sustainable Development Steering Committee 1992; Australian Greenhouse Office 1998).

In assessing the evolution of policy in the four documents, it can be seen new objectives have been adopted over time. For instance the need for car dependence reduction (25) which is compatible with encouraging non-motorised transport modes usage (29) and promoting public transport usage (42). There is an indication that these documents complement each other since they were formulated for different audiences. The *GS* and *AMCORD* were formulated for government, and housing industry. *NSESD* and *NGS* were for government, industry, consumer groups, stakeholders, and wider community. These last two documents then are for wider audiences (such as education, tourism, indigenous people, and vegetation); while the first two are for 'dwelling related' audiences (for example the developer and planner).

5.1.3. State Level Policies

Table 5-3 shows the policy objectives for transport elements discussed in the selected state level policies. These policies were produced by different agencies as indicated earlier. Appendix 17 displays the full policy objectives.

Table 5-3: Policy objectives included in state policies.

Reference number	Policy objectives	NWC ¹ (1977)	Metroplan (1990)	WAPC ² PM(1992)	NEC ³ (1994)	MTS ⁴ (1995)	SPS (1996)	LNDC (2000)
3	Energy efficient.					Y		Y
4	Fossil fuels use limitation.						Y	
5	Emissions control for motor vehicles.				Y		Y	Y
6	Land-use optimisation near centres.	Y		Y	Y		Y	
7	Land-use optimisation near public transport station.		Y	Y			Y	Y
8	Land-use and urban transport.						Y	Y
9	Land-use management.				Y			Y
10	Locally based business, employment.	Y						Y
11	Provision of recreation facilities.							Y
13	Provision of commercial facilities.		Y	Y				Y
15	Safe transportation system.				Y	Y		Y
17	Efficient transportation system.	Y			Y	Y	Y	Y
19	Movement/ road network.			Y	Y			Y
21	Physical distinction of road hierarchy.		Y				Y	Y
22	Travel time and length limitation.	Y	Y				Y	
23	Travel demand limitation.				Y			
24	Public transport to main centres of employment	Y			Y			Y
25	Car dependency reduction.	Y	Y			Y	Y	
27	Access for the disabled.		Y	Y		Y	Y	
28	Access for the aged.					Y	Y	Y
29	Non-motorised modes of transport encouragement.						Y	Y
30	Efficient walking.				Y	Y	Y	Y
31	Pedestrian access/ network.	Y	Y	Y	Y			Y
32	Pleasant/ convenient walking.	Y	Y	Y	Y			Y
33	Pedestrian safety.	Y	Y	Y	Y			Y
34	Pedestrian visual supervision.				Y		Y	
35	Pedestrian facilities.	Y	Y				Y	Y
36	Efficient cycling.			Y	Y	Y	Y	Y
37	Cyclist access/ network.	Y	Y	Y	Y			Y
38	Pleasant/ convenient cycling.	Y	Y	Y	Y			Y
39	Cyclist safety.	Y	Y	Y	Y			Y
40	Cyclist visual supervision.				Y		Y	
41	Cyclist facilities.	Y	Y	Y			Y	Y
42	Public transport usage promotion.				Y			
43	Public transport system improvement.	Y	Y				Y	
44	Public transport network.		Y					Y
45	Safe public transport system.							Y
46	Acceptable walking distance bus route.				Y			Y
47	Direct bus route.	Y				Y		
48	Accessible public transport services.			Y				Y
49	Pleasant/ convenient driving.							Y
50	Efficient driving.							Y
51	Driving access.							Y
52	Safe driving.			Y			Y	
53	Efficient public transport.							

Y: Objective is in the policy; NWC: North-West Corridor Structure Plan; PM: Policy Manual; NEC: North-East Corridor Structure Plan; MTS: Metropolitan Transport Strategy; SPS: State Planning Strategy; LNDC: Liveable Neighbourhood Community Design Code; 1: 1970s-Joondalup was planned; 1987-lots were developed; 1988-lots were occupied; 2: 1992-Woodlake was rezoned; 3: 1994-Woodlake was constructed; 4: 1995-residents were arriving in Woodlake

Across these documents, all acknowledge a need for non-motorised network (31, 37). Most acknowledge the need for land-use optimisation near public transport stations (7).

Comparing the *NWC* with the *NEC*, it was evident that they were formulated two decades apart. Ideally, there should be noteworthy changes over that period. Unfortunately, the policy objectives within the two are the same. Both Plans consider land-use optimisation (6), local employment (10), and effective transport systems (17). It signifies that the policy framework in transport terms has not evolved far over more than two decades. The state government may think that the objectives are still relevant, or the *NWC* (the earlier Plan) had been formulated far ahead of its time.

A glance across the state level documents shows that more policy objectives have been added gradually, providing depth. This indicates that people's concern and understanding to take action to address sustainable development issues has become more urgent. Examples include access for the disabled (27); this had not been included until *Metroplan* (1990) despite Acts regarding the disabled, i.e. the *Disability Services Act 1986* and *Disability Discrimination Act 1992*. Updating policy was slow. Public transport network objective (44) was not included before 1990. Actually, the researcher believes that these two, together with land-use and transport (8), are the primary means of or the first step towards urban passenger transport for sustainable development. They are now considered and promoted as ways to attain sustainable development. These examples suggest that policy objectives have evolved to include greater clarity and show increasing awareness and understanding of the issues.

The *Liveable Neighbourhoods Community Design Code (LNCDC)* is the most recent policy document. It went through a revision within three years: 1997 and 2000. Both versions consider not only public transport and non-motorised transport modes, but also private cars (49-52). The only differences in terms of transport between the *LNCDC 1997* and *2000* are clarifications on footpath requirements to ensure access streets, neighbourhood connectors, and arterial routes to have footpaths provided on both sides of a road. This requirement is to ensure pedestrians' safety and equity. Including more detail in the revised *LNCDC* signals

that policy objectives have evolved. Unfortunately, *LNCD* omits consideration of the aged (28) although *LNCD* encourages smaller lot sizes raised due to an increasingly aging population, and smaller families in the Perth Metropolitan Region (Western Australian Planning Commission 2001).

In the policy documents, different terms are used for similar matters, for example regarding road hierarchy classification, *LNCD* uses neighbourhood connectors and laneways while the *WAPC Policy Manual* uses local distributor and access places for the same type of road. It would be preferable to use the same term across the various documents to avoid or to minimise confusion to laypersons. Yet, the whole point is that the new language of *LNCD* signifies a different approach to the issue. A 'neighbourhood connector' connects neighbourhoods; this is a clear statement of the integration of the road network with land-use activity rather than the term 'local distributor' which focuses only on traffic function.

5.1.4. Local Level Policies

In this section, policies in Joondalup are differentiated from those in Woodlake. Appendix 18 exhibits all policy objectives in policies analysed in this section.

As shown in Table 5-4, the Joondalup *DPS* incorporates a wider range of policy objectives than the *TPS* produced nearly three decades earlier. Inclusion of land-use management (9), and provision of locally based business/ employment (10), and transport safety (15) are a significant progression in policy objectives. Although the *JCDP* was produced before *DPS*, it covers a much wider range of objectives than the *DPS* since *JCDP* was produced specifically for one particular location rather than for the whole local government area, unlike *TPS* and *DPS*. Above all, it is the nature of a Development Plan to be detailed (The Shire of Swan Council 1997) and this is reflected in the *JCDP* that includes more action-oriented objectives.

Although the City of Joondalup supports land-use management (9), it "... does not believe that higher residential density should necessarily be imposed over existing residential areas that surround a railway station" (City of Joondalup 2000, p. 36).

Table 5-4: Policy objectives included in local policies.

Reference number*	Policy objectives	J-TPS ¹ (1972)	J-JCDP ² (1982/1996)	W-TPS (1985)	W-ESP ³ (1995)	J-DPS (2000)
3	Energy efficient.		Y			
8	Land-use and urban transport.		Y	Y		
9	Land-use management.		Y			Y
10	Locally based business and employment.			Y		Y
11	Provision of recreation facilities.	Y	Y	Y		Y
12	Provision of educational facilities.		Y	Y		
13	Provision of commercial facilities.		Y	Y		Y
14	Provision of business facilities.		Y	Y		Y
15	Transportation safety/ safe transportation system.		Y			
17	Efficient transportation system.		Y			
18	Effective transportation system.		Y			
19	Movement/ road network.			Y		
24	Public transport to the main centres of employment.				Y	
25	Car dependency reduction.				Y	
31	Pedestrian access/ network.			Y	Y	
32	Pleasant/ convenient walking.		Y		Y	
33	Pedestrian safety.		Y		Y	
37	Cyclist access/ network.				Y	
38	Pleasant/ convenient cycling.				Y	
39	Cyclist safety.		Y		Y	
40	Cyclist visual supervision.				Y	
44	Public transport network.		Y	Y		

Y: Objective is in the policy; J: Joondalup; W: Woodlake; TPS: Town Planning Scheme; DPS: District Planning Scheme; JCDP: Joondalup Central Development Plan; ESP: Ellenbrook Structure Plan; 1: Mid 1970s-Joondalup was planned; 2: 1987-lots were developed; after 1988-lots were occupied; 3: 1992-Woodlake was rezoned; 1994- was constructed; 1995-residents were arriving

When the Woodlake policy documents were examined, the *ESP* includes more action-oriented policy objectives than the *TPS*. The *ESP* was required for this development proposal since Ellenbrook was zoned 'Special Purpose' under the *TPS* No. 9 (1985). Unlike the *Structure Plan*, the *TPS* covers a wider range of topics as it concerns the whole of the City of Swan, not just one subdivision. Therefore provision on public facilities (11-14), public transport and road network (19, 44) are excluded from *ESP* since they are included in the *TPS* which also applies to Woodlake.

When policies in Joondalup and Woodlake were compared to each other, car dependency (25) was only recognised in the later Woodlake policies. The researcher believes that it occurs since car ownership and dependency are increasing nowadays (Western Australia Department of Transport et al. 1995). Likewise pedestrian access (31) was recognised in a later period, and interestingly only by the City of Swan. Other important progressions in policies in both case study

areas are locally based employment (10), road network (19), and public transport to the main employment centre (24). These objectives contribute to transport for sustainable development.

Overall, Joondalup's policy objectives were more general, while Ellenbrook's tended to have greater depth. Joondalup had as its focus general transportation, for instance transport safety and system (15), efficient (17) and effective (18) transport system, as well as land-use management (9). On the other hand, Ellenbrook includes more detail on pedestrian (31) and cyclist access (37) and convenience (38).

In considering the range of policy objectives (Table 5-4), most objectives lead to the 'car dependency reduction' (25). By achieving objectives on 'transport safety' (15), 'convenient walking' (32) as well as 'cycling' (38), and the rest, optimistically car dependency reduction may be achieved. If the quality of public transport, walking, and cycling facilities and services are improved to a level of convenience that people perceive from private cars; theoretically more people will relinquish their cars and take public transport, walk, or cycle. Car dependency reduction also can be eased if provision of local public facilities (11-14) is realised within cycling or walking distance. It is inappropriate encouraging people to walk if there is nothing within walking distance. However, there is no guarantee that people will change to a more sustainable mode after such improvements (Curtis & James 1998; Siahaan 1988; Thomson 1978).

5.1.5. Overview

Based on the four tables above, it is apparent that new topics have been incorporated in later policies at different levels to augment sustainability. New topics include:

1. At the national level.

Land-use optimisation (6, 7) is not incorporated in the *1989 Green Street* and the *1990 AMCORD*, but is included in the *1992 NSESD* and *1998 NGS*. This recognition will enhance sustainable development in the environmental sphere leading to the economic sphere. Inclusion of access for the disabled (27) and aged (28) as well as the need for pedestrian (34) and cyclist (40) visual supervision or surveillance is apparent in the *1990 AMCORD*. These two matters

are related to equity and safety; the social sphere of sustainability under the principle of intra-generational equity from the strong sustainability approach.

2. At the state level.

The need for access for the disabled (27) is associated with the social sphere of sustainability but had not been discussed until 1990. The need for travel demand limitation (23) had not been included either before 1996. The latter issue interacts with the environmental sphere leading to the economic sphere of sustainable development.

3. At the local level.

The need for car dependency reduction (25) was not realised until 1995. This reduction leads to the achievement of the triple bottom line of sustainable development: the economic, environmental, and social spheres. Car dependency as a result of urban dispersal relates to the economic sphere as more funds are needed for constructing new roads; it relates to the environmental sphere as it will increase air pollution; and it relates to the social sphere as isolated developments do not promote a sense of place (New Jersey Future 1999).

This suggests that there was an increasing awareness of the complexity of sustainable development at every policy level. What were not considered as issues, now are regarded as issues; for example increasing use of and dependency on cars, road users' safety, and equal opportunity for using facilities. These new issues follow the domino effects. Increasing car dependency results in higher use of fossil fuels and air pollution. They affect global warming and climate change leading to less-sustainability.

It is a positive sign that different policies at different levels evolve to include new objectives to support attainment of sustainable development. Contrary to the principle of top-down approach, it is evident that the state government provides more detailed guidelines to lower order government. In WA, since residential subdivision approval is decided at the state level, the state government has more detailed policies than local government; whereas local governments provide recommendations on application, planning controls in their territories, and general administration for local governments' scheme (Western Australian Planning

Commission 1996a). This may be the case why some policy objectives have not been implemented at local level. Different local governments have different more-action-oriented objectives but have limited resources for implementation. This limitation may affect the evolution of policy objectives.

When these policy documents were investigated in detail, it was found that some objectives were contradictory within the same level and also between different levels. In some cases there are conflicting objectives and directives (Lindblom & Woodhouse 1993; Patton & Sawicki 1993). One of the examples is a conflict between energy efficiency and safety objectives. In policies at the state and local levels, energy efficiency (3) is encouraged; while in national policy (*AMCORD 1990*), state and local policies, convenient and safe walking (32, 33) are promoted. The researcher believes that streetlights play a noteworthy role in realising a safe and convenient walking and cycling network. Streetlights should be on during the dark although they will increase energy consumption and reduce energy efficiency. Conversely, streetlights bring safety to road users. Nevertheless, the researcher believes that it is worth sacrificing energy efficiency for the sake of road users' safety that in turn may increase cycling and walking. In the end, increased cycling and walking reduce energy consumption.

Some objectives were covered at different levels with the same degree of detail as described below. Although theoretically policies have been through an iterative process, sometimes traps are inevitable. It can happen for several reasons. To begin with, policies have flexible broad goals (Birkland 2001). MacLennan (1981) and Quade (1982) indicate that flexibility can lead to ambiguity or vagueness leading to misinterpretation. Misinterpretation occurs since interpretation varies among agencies as they have different values and beliefs (meanings) in interpreting policy languages (Yanow 1996). The ambiguity creates a hiatus between policy purposes (as input) and its output (Yanow 1996).

As a policy progresses toward administrator level or street-level agencies, it becomes more action-oriented. Implementing agencies need to formulate more detailed guidance (State Policy Officer 2002) for they have greater knowledge for managing the practice (Birkland 2001). Hence, a higher-level policy will be impractical if it has to give very detailed guidelines to lower-level policies. But,

AMCORD (at the national level) and *LNCD* (at the state level) have more detailed guidelines when compared to local-level policies. The strong role of the state in subdivision assessment and structure planning may explain why these two policy documents are more detailed than those at local level.

In *AMCORD*, some objectives in Element B6 'Transport Network': "O2. To provide a safe, convenient and legible network of all-weather paths for pedestrian and cyclist movement" and "O9. To control the maximum length of time travelled in a low speed environment" (Canberra Department of Housing and Regional Development 1995, p.46) are vague. The words 'safe', 'convenient', and 'low speed' are ambiguous and subjective. Subjectivity also occurs in *Liveable Neighbourhoods* (Western Australian Planning Commission 1997; Western Australian Planning Commission 2000). However, there is no black or white, right or wrong in flexibility. It allows for trade-offs benefits for equity distribution (Canberra Department of Housing and Regional Development 1992). Yet, if an issue is significant, it is better to have more guidance so that the issue could be addressed properly.

Secondly, Dunn (1994) and Stewart (1999) suggest that policies need to be appropriate in delivering action. There are inappropriate words in policies that may mislead implementation. A case in point is Element B6 'Transport Network' in the *AMCORD 1990*, which has an objective of "O4. To provide for bus routes which are both accessible from all dwellings and activity centres, and effective to operate" (Canberra Department of Housing and Regional Development 1992, p. 46). 'Accessible bus routes promotion' should be replaced by 'Accessible bus stops promotion'. If only the 'routes' are accessible, bus users will not be able to take the bus. But if the 'stops' are accessible, bus users can hail the bus at a bus stop and utilise the service.

Next, the Australian Broadcasting Corporation (2002) comments on how policies at different levels can contradict one another. A contradiction in the policy on footpath provision occurs between national, state and local level policies. The national policy prefers developers to provide a footpath on one side of a road whereas the state and local policies prefer two footpaths on both sides of a road in some circumstances.

Contradiction can occur because of ignorance, conflict over goals, and lack of coordination (Pressman & Wildavsky 1973). This contradiction creates a problem if a residential development proposal is refused because of one-side footpath provision.

Traps can also occur where there are too many policy players with overlapping authorities causing policies overlap each other (Sharp 1981). Overlaps may signify that a policy is either too broad or alternatively too comprehensive. At the international level, integration between land-use and transportation planning is discussed. The same matter is discussed in policies at the national level too. It can be considered as either overlapping or supporting the statement at different levels. The local level encourages mixed-used development at the Centre (City of Joondalup 2000) which is basically the same as the state level "Promote mixed use development in neighbourhood and district centres" in *SPS* (Western Australian Planning Commission 1996b, p. 80) and "To facilitate mixed use urban development ..." in *LNCD* (Western Australian Planning Commission 1997, p. 2; Western Australian Planning Commission 2000, p. 2).

5.2. ANALYSING TRANSPORT OBJECTIVES

ACROSS POLICY HIERARCHY

As this study focuses on gaps between planned goals and actual implementation, the appropriate perspective of policy implementation is the top-down approach (Birkland 2001) where people at the top give directions (Colebatch 1998; Healey et al. 1988). Furthermore, WA theoretically adopts this approach (Curtis 1998). Through an analysis of a 'translation' of policy objectives in transport terms across international, national, state, and local levels, it was possible to determine whether policy objectives at the international level have been translated through the national and state levels to the local level. Table 5-5 compares these transport objectives.

The objectives become more action-oriented as they are 'cascaded-down' towards lower levels. The sum of policy objectives shows that the number of and detail of topics mostly increase through the international, and national levels to state level. It indicates that implementers or street-level agencies (a term used by Yanow (1996)) include more detailed guidelines (Birkland 2001; State Policy Officer 2002) or

5. ANALYSING POLICY COVERAGE

actions since implementers have greater expertise for managing the implementation process (Birkland 2001). However, fewer policy objectives are covered at local level. It is inasmuch as certain matters (such as public transport, and road network) are

Table 5-5: Policy objectives included across international, national, state, and local levels policies.

No.	Policy objectives	International	National	State	Local
1	Sustainable energy (consumption patterns change).	Y	Y		
2	Atmosphere protection from greenhouse gas emissions.		Y	Y	Y
3	Energy efficient.		Y	Y	
4	Fossil fuels use limitation.	Y	Y	Y	
5	Emissions control for motor vehicles.			Y	
6	Land-use optimisation near centres.		Y	Y	
7	Land-use optimisation near public transport station.		Y	Y	Y
8	Land-use and urban transport.	Y	Y	Y	Y
9	Land-use management.	Y	Y	Y	Y
10	Locally based business and employment.			Y	Y
11	Provision of recreation facilities.				Y
12	Provision of educational facilities.			Y	Y
13	Provision of commercial facilities.				Y
14	Provision of business facilities.		Y	Y	Y
15	Transportation safety/ safe transportation system.		Y		
16	Transport convenience.			Y	Y
17	Efficient transportation system.	Y	Y	Y	Y
18	Effective transportation system.	Y	Y	Y	Y
19	Movement/ road network.		Y		
20	Ensure close linkages are maintained.		Y	Y	
21	Physical/ clear distinction of road hierarchy.		Y	Y	
22	Travel time limitation.			Y	
23	Travel demand limitation.			Y	
24	Public transport to the main centres of employment.		Y	Y	Y
25	Car dependency reduction.		Y	Y	Y
26	Accessible activities by non-car users.		Y		
27	Access for the disabled.		Y	Y	
28	Access for the aged.		Y	Y	
29	Non-motorised modes of transport encouragement.	Y	Y	Y	
30	Efficient walking.			Y	Y
31	Pedestrian access.		Y	Y	Y
32	Pleasant/ convenient walking.		Y	Y	Y
33	Pedestrian safety.		Y	Y	
34	Pedestrian visual supervision.			Y	
35	Pedestrian facilities.			Y	
36	Efficient cycling.		Y	Y	Y
37	Cyclist access/ network.			Y	Y
38	Pleasant/ convenient cycling.		Y	Y	Y
39	Cyclist safety.	Y	Y	Y	Y
40	Cyclist visual supervision.			Y	
41	Cyclist facilities.		Y	Y	
42	Public transport usage promotion.	Y	Y	Y	
43	Public transport system improvement.		Y	Y	Y
44	Public transport network.			Y	
45	Safe public transport system.		Y	Y	
46	Acceptable walking distance bus route.		Y	Y	
47	Direct bus route.		Y	Y	
48	Accessible bus route/ public transport services.		Y	Y	
49	Pleasant/ convenient driving.			Y	
50	Efficient driving.			Y	
51	Driving access.		Y	Y	
52	Safe driving.			Y	
53	Efficient public transport.			Y	
	TOTAL (inclusion of policy objectives)	9	37	45	22

Y: Objective is in the policy

dealt with by the state level in WA. It may also because of a strong role rest with the state government in assessing subdivision application. Then local governments must make reference to state policies in their *TPS* and development assessment. Public transport and the road network are not isolated within one locality. They connect one local government to other local governments within and between states. Hence, public transport and road network are not dealt with at the local level but dealt with at the state and national levels. Local governments have the responsibilities for details such as required parking bays or provision, width of road reserve, and fence height. The details are excluded from this study since they differ from one local government to another.

The 'cascading-down' of policy objectives towards lower levels also takes place in road infrastructure and facilities. Policy objectives detailed at lower levels include 'movement or road network' (19), and 'provision of public facilities (recreational, educational, commercial, and business facilities)' (11 to 14). These public facilities provisions (11 to 14) are compatible with 'locally based business and employment' (10) which is part of public facilities and is incorporated in national, state, and local levels policy documents. Providing business facilities such as offices and banks nearby residential areas certainly realises the approach of having business and employment locally for compact cities. In this way, local governments are given flexibility to translate what locally based business and employment mean or how to address it.

Since policies at the international (top) level give global direction to policies at the national (lower) level, the national policies take over international policies' position as guidance to the state then local levels. The translation of general direction to an oriented program is explained as follows. International policies aim at a global objective: fossil fuels use limitation (4). It is then translated in national policies according to 'local' circumstances aiming at land-use-transport management (9), an efficient transport system (17), and public transport usage promotion (42). Subsequently, state policies aim at providing access for the disabled and the aged (27, 28), as well as providing public transport, cyclists, and pedestrians network (44, 31, 37). These aims are unquestionably much more focused in their achievement of fossil fuels use limitation. Finally, local government with its policies ideally implements this guidance by using more detailed standards and measurements.

Theoretically, local governments as street-level agencies include more detailed guidelines to a certain degree as they have more control over residential matters than the state (Yiftachel & Kenworthy 1992), except in terms of an assessment of residential subdivision application in WA. Therefore, logically a policy is getting more action-oriented towards the bottom of the hierarchy. Not all themes were cascaded down from a higher-level policy. A case in point is the provision of 'pedestrian visual supervision' (34). It was excluded from international policies. It was included in lower level policies at national and state levels. It seems that the national and state governments either have more initiatives than the international or have more capabilities in handling the matter. In the researcher's opinion, this exclusion may happen as the scope 'pedestrians visual supervision' is too detailed to be discussed at international level.

5.3. CONCLUSIONS

This conclusion addresses the two research questions posed earlier in the chapter: "Why have transport elements not been implemented as planned" and "Are transport elements conducive to sustainable transport in residential development? Why?".

In addressing the first question, there are factors influencing policy implementation. Firstly, some policy objectives are expressed in general or broad terms which gives too much flexibility; or they are contradictory or conflicting, inconsistent across policy hierarchy, and do not have the right choice of wording.

Secondly, policy implementers have insufficient resources to support policy implementation. The resources are not limited to funding but also human resources in terms of the number of personnel and skills. In other words, the resource is related to inadequate administrative resources (Bridgman & Davis 2000). Apart from transport, there are other policy objectives (for instance revitalisation, historical building preservation, indigenous issues, crime and safety) that each demands a certain amount of financial support. It is hard to distribute limited financial support to satisfy all the needs of all objectives. Hence, funding is distributed based on a level of priority or importance, and on available staff and skills at that time. This is where

social, economic, and political conditions or resources of target groups play their role in influencing policy implementation (Howlett & Ramesh 1995). The groups affected by a policy can support or oppose the implementation. Their stance is reflected on a level of public support.

Thirdly, current policies are not always developed from previous ones for audiences affect the scope of objectives. Yet, in newer policies, more topics and/ or more multifaceted issues are incorporated. Therefore, policies within the same level have a broader spectrum than others. Rationally, local level policies should be more action-oriented than international policies, since they coordinate smaller developments, for example suburbs or allotments development rather than regional developments. The main objectives of international policies are greenhouse gas emissions control and reduction. They are translated into action by the Australian government, including car dependency reduction by promoting public transport, walking, cycling, and mixed-use development. Street level administrators or local government is responsible for providing public facilities. Policies at the higher level are more flexible and non-specific than those at the lower levels. However, non-specificity does not apply to all policies. A certain policy is either too detailed or too generic to be at its level of hierarchy. A case in point is the *Green Street* detailing for example allotments, setbacks, and road dimensions. In the researcher's opinion, the dimensions are too detailed for a national level policy as *LNCD* at the state level also includes these considerations.

Fourthly, there are unfortunately trade-offs in policy implementation in Joondalup and Woodlake. The decision on trade-offs could depend upon the priority of objectives, significance, and whether the benefits will be greater than the costs.

Next, a level of policy efficiency influences policy implementation. Although policies have a structural hierarchy, they also support or overlap other policies. The progression and evolution of ideas in the policy hierarchy are not constant. Not all policies were cascaded-down but there were improvements and inclusions in revised policies. This new inclusion can be within the same level or different levels. This suggests that lower level government better understands the complexity of sustainable development or shows more initiative to include aspects that have not been identified by a higher one.

Finally, overlapping authorities is one of factors influencing policy implementation. This overlap may be a sign of an ineffective policy system (several authorities handling the same issue), of support from other authorities (several authorities giving input to the issue), and of breadth of a policy issue (several authorities are needed to handle the issue). Therefore, overlapping authorities might create contradiction or support on the other hand.

Regarding the second research question whether some objectives are conducive to sustainable development, some transport objectives are as defined in Chapter 2 owing to several factors. To begin with there are requirements for provision of transport facilities and services as well as the increasing quantity and quality of topics. These supportive factors should be augmented by re-evaluating policy implementation to explore any issues (related to sustainable development) which were not covered in policy documents. In contrast, some policies conflict with each other (for example footpath provision) and need to be reconciled.

Second, some policy objectives are contradictory, and inconsistent since "... often one level will act against the interest of another ..." (Roberts 1990, p. 300). The conducive objectives to transport for sustainable development are certainly sustainable energy by, or compatible with, limiting fossil fuel consumption in order to protect atmosphere from greenhouse gas emissions. The main objectives lie at the high level (international and national levels) with its wide-range of responsibility and scope. Then the national government, followed by local government, will translate this objective into more action-oriented programs. A case in point is land-use and transport management which can be addressed through land-use optimisation near centres and public transport station, as well as locally based facilities (employment, educational, recreational, and others). Land-use optimisation near centres and provision for locally based facilities are strongly conducive to transport for sustainable development. People can address their needs locally within 'one-stop shopping' in a short distance, time, and use up less natural resources. These conditions (short distance, time, and consumption) are congenial with non-motorised transport modes: cycling as well as walking and do not require any natural resources. Yet, not everything can be provided locally due to restricted space and economics of scale of retailers, which define catchment areas on the

basis of a population threshold. This is when motorised transport modes may take over the function of non-motorised ones. The motorised modes (private and public) can take more people to a farther destination within a shorter time than non-motorised ones. Public transport (bus and train) is much more conducive to transport for sustainable development than private transport (car).

Lastly, it is not easy to determine which policy objectives are more conducive to transport for sustainable development because it is dependent upon the purpose and complexity of a trip. Although non-motorised ones require no natural resources to operate and therefore may be considered more conducive to sustainable development, they are less suitable for long-distance, unlike motorised ones. Determining which policy objectives are conducive to transport for sustainable development at different levels is not simple either; objectives are co-dependent. An objective is conducive only if it is supported by other objectives. Encouraging cycling and walking may be successful if there are paths. However, a path alone is inadequate unless it is safe and of good quality. Yet, a good quality path may not be utilised if there are no trip attractors (such as open spaces and retail shops) for cyclists and pedestrians.

In short, this chapter has shown that developing strong sustainability policies from 1987 at the inception of Brundtland's definition to the 1990's when policy objectives became more detailed and action-oriented takes time. Awareness of more complex sustainable development issues and the inclusion of conducive objectives requires time; let alone the actual implementation. Thus, time has a role in a learning process for betterment.

6. IMPLEMENTING TRANSPORT POLICIES: JOONDALUP AND WOODLAKE



6. IMPLEMENTING TRANSPORT POLICIES: JOONDALUP AND WOODLAKE

This chapter starts with the relationship between transport indicators and evaluation criteria for transport in policies to clarify why the researcher chose transport evaluation criteria instead of transport indicators. It then provides the analyses of the fulfilment of policy evaluation criteria for and their conduciveness to transport towards sustainable development. These analyses are performed to address the research questions “To what extent have transport elements [in policies for residential development] been implemented at the local level?” and “Are transport elements conducive to sustainable transport in residential development?” The analyses answer the questions through field and observation surveys to confirm physical implementation on the ground, and through household questionnaire surveys to clarify users’ satisfaction with the implementation. The implementation is assessed by examining transport infrastructure (road network), and transport modes (public transport, cycling, and walking). This categorisation is based on the chosen policies.

The full range of issues in the selected policies includes education, utilities, landscape, freight transport, public transport, cycling and walking. Since some of the transport issues in policies analysed in Chapter 5 are irrelevant to this study, they have been excluded because they are not closely related to urban passenger transport. The exclusion was also because some matters are requirements for administrative documents, geometric criteria, irrelevant to the case study areas (such as criteria for railways, bushfires). In some cases, exclusion is also due to unavailable and costly measuring equipment such as stop-sight distance, and road pavement strength.

As a result of the policy analysis in Chapter 6, sixty-six evaluation criteria were identified for Joondalup (twenty-two were drawn from policies extant before its time of the planning and development phases and new forty-four evaluation criteria from policies extant post planning and development phase) and sixty-two evaluation criteria were for Woodlake (forty-four from policies extant at the planning and

development phases and new eighteen from policies published after the planning and development phases). They have been categorised into similar headings in the selected policies. The categories are transport infrastructure (the road network) and transport modes (the public transport, cycling and walking). Evaluation criteria analysed in Joondalup were slightly different from those in Woodlake because they have different policy documents at local level; the *Joondalup Centre Development Plan* (Shrapnel Urban Planning 1982) is only applicable to Joondalup, while the *Ellenbrook Structure Plan* (Roberts Day Group 1995) is to Woodlake.

Field observation, household questionnaire surveys, and interviews with policy players were conducted to provide data for analyses. Analyses of the fulfilment of implementation of policies present at the time of the planning and development phases have been differentiated from those after the phase. It is unfair to measure a performance against future objectives which were not available at the time of the planning and development phases. The performance analysis of new criteria may indicate that standards have been changed and augmented. What were once not considered issues, now become issues; what was thought did not need to be regulated, now is thought needs to be regulated.

6.1. THE RELATIONSHIP BETWEEN INDICATORS AND EVALUATION CRITERIA FOR TRANSPORT

As listed on page 24, there are nineteen transport indicators, some of which are used in America, Australia, and Europe. They are related to the selected evaluation criteria and policy objectives as shown in Table 6-1. The policies objectives were drawn from Table 5-5; while the evaluation criteria were from Table 1 to Table 4 (Appendices 19 and 20). Before reading further, it is necessary to differentiate (policy) objectives, (evaluation) criteria, and indicators to avoid confusion.

1. Objectives are broader policy goals to achieve or "something that one's efforts or actions are intended to attain or accomplish" (Pearson Education 2003).
2. Criteria are "standard[s] on which a judgment or decision may be based" (Merriam-Webster Incorporated 2004).
3. Indicators tend to be quantitative; they are measured periodically. They are measured instruments to audit progress of achievement of policy objectives.

6. IMPLEMENTING TRANSPORT POLICIES

Table 6-1: The relationship between transport indicators and case study evaluation criteria/ policy objectives.

No.	Indicators	Related evaluation criteria or policy objectives (examples)	Note
1	Increase transit, cycling and walking.	Regular and direct bus route; appropriate service to employment centre; provision of public facilities.	Adequate provision of facilities for public transport, cycling and walking widens the chance for increased use of these three modes.
2	Reduce car use per capita.	As above; car dependency reduction; non-motorised modes encouragement; energy efficiency; fossil fuels use limitation.	The reduction is concomitant with indicator number '1' and reflected on the first household questionnaire survey.
3	Ratio of public to private transport use.	Regular and direct bus route; access to public transport; public transport use promotion; potential population catchment of public transport; safe public transport system.	The ratio is related to number '2', mirrored on the first household questionnaire survey and dependent on public transport service and network adequacy. The ratio may be enhanced by bus-stop safe condition.
4	Reduce average commute to and from work.	Locally based business and employment; distance between neighbourhood centre and its perimeter; provision of public facilities.	Provision of local employment and business as well as land-use management are ways of addressing this indicator.
5	Vehicles mile travelled.	Interconnected street network; a movement network which minimise travel time; length of cul-de-sac; lots served by a cul-de-sac.	Interconnected street network and sufficient local facilities will certainly reduce vehicles mile travelled. This indicator is related to number '4'.
6	Areas alienated by transport infrastructure.	Potential population or public transport catchment; cycle and walk paths along the roads; access to public transport by pedestrians, cyclists, people with disabilities.	Such areas include those without cycling and walking paths or facilities as well as beyond walking distance from bus stops and routes.
7	Jobs per hectare.	Provision of public facilities; land-use optimisation near centres; land-use management.	This indicator may be increased by providing local business facilities and distance of residential areas from commercial centres. This indicator is related to number '4' and plays roles in a compact city.
8	Meet local needs locally.	Distance between neighbourhood centre and its perimeter; locally based business; land-use management; land-use and urban transport.	These criteria provide data to gauge this indicator, which is related to number '4' and '5'. Mixed-use and land-use management sustain this indicator.
9	Equivalent people using fossil fuels.	Car dependency reduction; public transport network; sustainable energy; energy efficient; fossil fuels limitation.	The limitation use of fossil fuels is compatible with addressing or enhancing facilities and service for mass transit and environment friendly transport modes.
10	Measures of passengers carried by a road.	Public transport network; dwellings within 400metres from bus stops and routes.	The measures are mirrored on public transport catchment. The wider public transport catchment on residential development, the more passengers can be carried. It is affected by indicator number '4'.
11	Costs of transport (economic costs).	Regular public transport; public transport network; public transport service to employment centres; efficient public transport.	Un-interconnected roads will increase cost of petrol. Another cost is when patrons need to change public transport or have a long trip as transport ticket will be higher.
12	Community perception of transport service adequacy.	Proximity of bus routes; cycling and walking paths provisions; tram crossings; safe and convenient movement for the disabled, aged, and very young.	The perception is reflected on the second household questionnaire survey. The service can be crosschecked with public transport timetables.
13	Percentage of people feeling safe on public transport.	Safe public transport system; bus stops surveillance.	Evaluation criteria on safety of public transport, cycling and walking as well as the second household questionnaire survey are useful data to gauge this indicator. This indicator influences indicators number '1' to '3'.
14	Workplace transport options.	Regular and direct public transport network; service to employment centres; land-use optimisation near public transport stations.	Many options will be available concomitantly with improved public transport service. This indicator may affect indicators number '1' to '3'.
15	Access, facilities, service, goods, other people for, less cars use.	Safe and convenient access for bus stops; public transport network; efficient public transport; accessible activities by non-car users.	This includes access for the aged, disabled, very young by public transport, cycling and walking. This is supported by interconnected road network.
16	Access to public transport stops.	Cycle paths on roads; pleasant cycling; cul-de-sac heads interconnected with a path.	The access depends on provision of service (comfort and safety), accessibility by potential population/ public transport catchment, and road network.
17	Kilometres of dedicated cycle routes.	Cycling and walking are safely integrated with other road users; cul-de-sac heads interconnected with cycle path.	Provision of cycle path and trip attractors provide data on length of cycle route.
18	The number of pedestrian-friendly streets.	Access to public transport by pedestrians, cyclists, and people with disabilities; traffic calming to achieve the target speeds;	Pedestrian-friendly streets can be achieved by calming the traffic.
19	Car ownership.	Car dependency reduction; public transport usage promotion.	The data are inter-related to public transport use and reflected on first household questionnaire survey, and Australian Bureau of Statistics. This indicator may impact on indicators number '2', '3', '9', and '11'.

In other words, an indicator is “any sign, condition, situation, etc which shows ... something” (Crystal Reference 2003).

Besides as shown in Table 6-1, their relationships are shown through examples as follows.

1. Objective (from Policy Manual 1989 DC 2.6 Residential Road Planning in Appendix 17): to provide for bus routes (and bus stops) which are both accessible from all dwellings and activity centres and appropriate to the road function.
2. Criterion (from number 8 of Table 2 in Appendix 19): safe and convenient access for bus stops.
3. Indicator (from number 16 on page 24): access to public transport stops.

The (minimum) standard to attain accessible bus stops provision (the objective) is to have safe and convenient bus stops (the criterion). Then how many bus stops are accessible safely (the indicator) needs to be checked. This information on quality can be obtained through questionnaire survey. The objective will not be able to be attained if bus stops are provided but inaccessible because they are unsafe.

Because this study has as its focus an analysis of implementation of policies for residential development in transport terms, again, evaluation criteria for sustainable transport instead of transport indicators were used for such analysis. It was also because this study does not assess any progress of actions for sustainable transport, which can be identified by comparing indicators over time.

What follows is an overview of the analysis, whereas the full details of this analysis are found in Appendix 19 for Joondalup and in Appendix 20 for Woodlake. Analyses are presented in tabular form, maps, and photos (at the end of each appendix). An assessment of implementation in relation to policy availability is made for each case study area before an assessment of both suburbs against the ‘state-of-the-art’ policy regime of today. The extent of fulfilment of each evaluation criterion was classified using three categories: ‘N’ where the criterion is implemented in no more than half the suburb, ‘M’ where the criterion is implemented in most areas of or more than half the suburb, while ‘Y’ or fully (yes) if the criterion is fully fulfilled or implemented across the whole suburb. The performance of each case study area is also compared in order to examine any progression in implementation of transport

planning over time. In the tables in this chapter, each evaluation criterion has been given a unique reference number in order to identify the presence of policy documents: before or after the planning and development phases of each case study area.

6.2. JOONDALUP

6.2.1. Implementation in Policy Extant at the planning and development phases

In total, twenty-two evaluation criteria were identified from policy documents at the time Joondalup was planned. Table 6-2 lists these criteria and their sources.

Table 6-2: The twenty-two evaluation criteria identified from policy documents at the time Joondalup was planned.

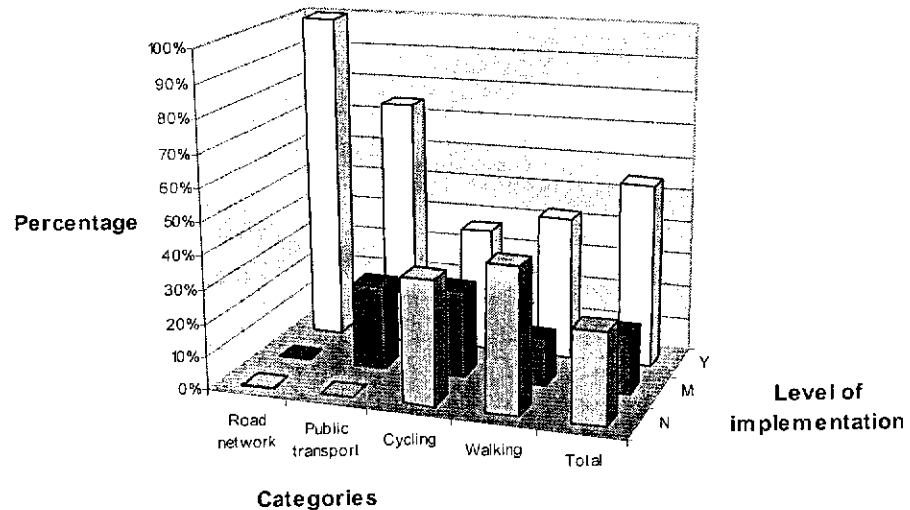
Categories	No.	Evaluation criteria	I	Policy source
Road network	1	Connections between residential streets should be T-junctions or roundabouts.	Y	JCDP
	2	Lots with road access to both front and rear boundaries are not generally favoured.	Y	PM (1988)
Public transport	3	Direct short cuts across the cell are not allowed.	Y	PM (1988), JCDP
	4	Bus routes to be as direct as possible.	Y	JCD, NWC
	5	Average spacing between stops is 300-400metres.	Y	JCDP
	6	Bus routes to provide good access to local facilities.	Y	JCDP
	7	Appropriate services to employment centres.	M	NWC
Cycling	8	Pleasant, efficient, and safe cycling.	N	JCDP, NWC
	9	Safe crossing of major roads (overpass and underpass).	N	LNCDC, NWC
	10	Cycling is safely integrated with other road users.	N	JCDP
	11	Bike linkages between trips attractors (schools, local centres, other community activities, bus stops).	Y	JCDP, NWC
	12	Provide end-of-trip facilities.	M	JCDP, NWC
	13	Paths to open space.	Y	AMCORD
	14	Intersect bus route with cycling routes.	Y	JCDP
Walking	15	Cycling systems separate from the road systems.	M	JCDP
	16	Pedestrian paths through parks for recreation purposes.	Y	AMCORD
	17	Safe and convenient pedestrian movement.	N	JCDP, NWC
	18	Safe crossing of major roads (overpass and underpass).	N	NWC
	19	Walking is safely integrated with other road users.	N	JCDP
	20	Linkages between trip attractors (schools, local centres, bus stops, other community activities).	Y	JCDP, NWC
	21	Intersect bus routes with walking.	Y	JCDP
	22	Separate pedestrians systems from road systems.	M	JCDP

NWC: 1977 North-West Corridor Structure Plan; JCDP: 1982 Joondalup Centre Development Plan; PM: Policy Manual (year); I: Implementation; N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb

Figure 6-1 illustrates the extent of implementation of these twenty-two policy evaluation criteria in Joondalup. In total, 55% are implemented across the

Joondalup suburb, 18% are implemented in most of Joondalup, while 27% are implemented in no more than half the suburb.

Figure 6-1: Implementation of evaluation criteria drawn from policies existing at Joondalup's planning and development phase.



N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb

By category, the 55% of fully implemented policies include 100% of the evaluation criteria for the road network, 75% of the public transport criteria, 37% of the cycling criteria, and 43% of the walking criteria. It means that Joondalup satisfies road network and public transport evaluation criteria at its time of the planning and development phases since it has implemented most evaluation criteria. But its implementation is weaker for the walking and cycling criteria.

In the interview with the private planning consultant 1 (refer to Appendix 6), it was indicated that evaluation criteria for the road network have been satisfactorily implemented since Joondalup was planned in accordance with policies applied at that time: "We deliberately set out a plan that neighbourhood completely in accordance with the current policy that was applied at that time" and was designed for cars as revealed by the state transport authority at an interview: "Joondalup network is very much based on cars in a way it's designed". In addition, although public transport facilities and services have been provided residents do not utilise them: "It is disappointing that it's not utilised" (public land developer 1 supported by public land developer 2 and private planning consultant 1). People find private cars

too convenient; “They’re too comfortable with the cars ... Very few of them use public transport” (public planning officer 1). On the other hand, evaluation criteria for the cycling and walking have not been satisfactorily implemented because Joondalup was not designed to encourage cycling and walking as formal transport, revealed by the private planning consultant 1.

6.2.2. Assessing Joondalup against Current Policies

Table 6-3 sets out the forty-four new evaluation criteria from policies published after the planning and development phases. Based on the detailed analysis in Appendix 19, the performance of the suburb is poor.

By category, no one category is entirely satisfactory. In total, Joondalup meets seventeen criteria across the whole suburb, nine in most of it, and eighteen in less than half Joondalup (Figure 6-2). Joondalup performs best against the public transport criteria; 50% or five out of ten new criteria can be said to have been achieved across the whole of Joondalup. It performs least well on the new criteria for the non-motorised transport modes, especially cycling, with only two of the six new criteria for the cycling are met across the suburb. On average, Joondalup measures poorly against current policies considered conducive to transport for sustainable development. This performance may impact local travel behaviour and may lead to low use of non-motorised transport modes and a high level of car-dependency. Because satisfactory infrastructure and facilities for cycling and walking have not been well provided, residents might be deterred from these modes. Also since the public transport and road networks are better provided than cycling and walking, the use levels of these two modes are higher. This is confirmed by the low use of non-motorised transport modes and high level of car use as shown in Table 4-1 on page 58. Joondalup suburb was designed for car-based travel as identified at an interview in 2002 with the private planning consultant 1 and public planning officer 1: “It’s designed to support private rather than public transport”.

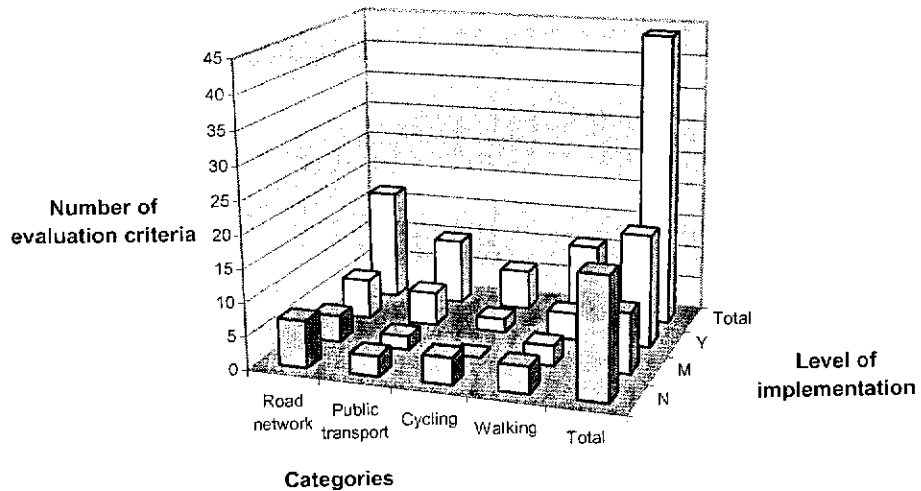
6. IMPLEMENTING TRANSPORT POLICIES

Table 6-3: Evaluation criteria from policies extant after planning and development phase in Joondalup.

Categories	No.	Evaluation criteria	I	Policy source
Road network	1	Residential areas are not passed by through routes un-associated with the area.	Y	GS
	2	Culs-de-sac to serve no more than twenty lots.	M	LNCDC, PM
	3	Streets links are not more than two levels different in the hierarchy.	Y	AMCORD
	4	No more than three turns are required to travel from any address to collector street.	Y	AMCORD
	5	Interconnected street network.	N	LNCDC, SPS
	6	The street network should have no more than 15 percent of lots fronting culs-de-sac.	N	LNCDC
	7	A movement network; maximum driving time from collector street to any allotment.	N	LNCDC
	8	Clear physical distinctions of road hierarchy.	Y	LNCDC, Metroplan
	9	Street blocks of no more than 240metres.	Y	LNCDC
	10	Maximum culs-de-sac length should be 120 metres.	M	LNCDC
	11	Speed control/ traffic calming devices to achieve the target speeds.	Y	LNCDC, Metroplan
	12	Traffic signal control rather than roundabout.	N	LNCDC
	13	Street design to enable development to front all streets.	N	LNCDC
	14	Local street should be provided parallel to arterials.	M	LNCDC
	15	Average spacing of junctions (the standard is contained in Appendix 21).	N	LNCDC
	Public transport	16	Distance between neighbourhood centres and perimeter is 400-450metres on average.	N
17		Access ways should serve no more than 80 dwellings (culs-de-sac) or 120 dwellings (loops).	M	PM
18		At least 90 percent of dwellings are within 400metres straight-line distance from bus route.	Y	GS, AMCORD, PM, SPS
19		Bus routes are as regular as possible.	Y	PM
20		Bus routes are approximately 800metres apart.	Y	PM
21		At least 60 percent of dwellings are within 400metres straight-line distance from bus stop.	Y	LNCDC, PM, GS, AMCORD
22		Locate bus stops at potential destinations.	Y	LNCDC
23		Bus stops have surveillance from surrounding development.	N	LNCDC, PM
24		Locate bus stops adjacent to traffic light or median islands.	N	LNCDC
25		Safe and convenient access for bus stops.	N	PM
26		Access to public transport by pedestrians, cyclists, and people with disabilities.	N	PM, Metroplan
27		Provision with public transport network.	M	LNCDC, PM
Cycling	28	Cycle paths near cycle routes are 2.0metres width.	N	AMCORD
	29	Dual-use paths to school, on neighbourhood connectors, and arterial routes is 2.5metres wide.	N	LNCDC, SPS
	30	Cul-de-sac heads should have a bike path connection.	N	LNCDC, PM
	31	Dual-use path must have a durable, non-skid surface.	Y	AMCORD, LNCDC
	32	Segregated dual-use or cycle paths along one side of district and local distributor roads.	Y	PM, Metroplan
	33	Safe and convenient movement for the disabled, the aged, and the very young.	N	AMCORD, LNCDC, PM, Metroplan
Walking	34	No footpath in low-traffic volume.	Y	GS, PM
	35	Footpaths should be 1.5metres minimum width (2.0metres at activity centres).	M	LNCDC
	36	Footpaths are on both sides on arterial routes, access and neighbourhood connector streets.	N	LNCDC
	37	Cul-de-sac heads should have a footpath connection.	N	LNCDC, PM
	38	Safe, convenient movement network for the disabled, the aged, and the very young.	N	LNCDC, AMCORD, PM, Metroplan
	39	Pram crossings are available at all intersections.	M	LNCDC
	40	Dual-use paths must have a durable, non-skid surface.	Y	AMCORD, LNCDC
	41	Segregated dual-use paths along one side of district and local distributor roads from vehicles.	Y	PM, Metroplan
	42	Dual-use path to school on neighbourhood connectors, arterial routes is 2.5metres width.	N	LNCDC, SPS
	43	Footpaths are along one side of local distributor roads and access way.	M	PM, GS
	44	Footpath, where required, of 1.2metres width.	Y	AMCORD

PM: Policy Manual; GS: 1989 Green Street; AMCORD: 1990 Australian Model Code for Residential Development; SPS: 1996 State Planning Strategy; LNCDC: Liveable Neighbourhoods Community Design Code; I: Implementation. N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb

Figure 6-2: Implementation of evaluation criteria drawn from policies extant after the planning and development phases in Joondalup.



N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb; Total: Total number of evaluation criteria

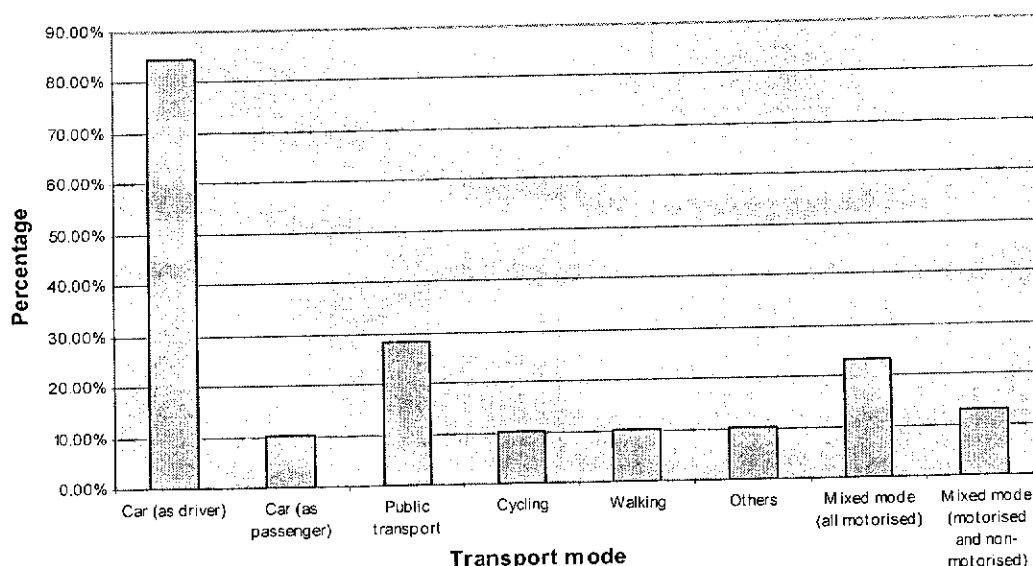
Travel behaviour

Table 5-5 demonstrates that most policy makers intended to reduce car dependency (reference number 25). Since this policy objective came after the planning and development phases in Joondalup, it is not surprising if car dependency reduction was not considered at Joondalup's planning stage.

The need for the reduction can be seen in Figure 6-3 where the survey results from the first household questionnaire survey show that 94.8% of respondents used cars for the journey to work (84.6% were drivers and 10.2% were passengers). Nearly a third (28.2%) took public transport to work. This rate was different from the ABS data in Chapter 4 which was 5.2% since the chapter only uses the ABS data on travel with 'one-method' while data in this section includes 'more-than-one-method'. The ABS data on 'more-than-one-method' were included but not used. They were included to give a more comprehensive picture of variation of transport modes. They were not used inasmuch as the kind of transport modes used cannot be identified. Residents who take the train and a car are not differentiated from those taking the train and a bicycle; residents taking a car and walk are not differentiated from those who take a taxi and walk. The rest of respondents chose cycling (10.2%), walking (10.2%), or others (10.2%) to the workplace. From the second household questionnaire survey, it was revealed that cycling and walking were less popular in the suburb of Joondalup due to safety issues (50%), personal reasons (43%), and

topography (17%). The last reason was confirmed by the private planning consultant 1. The public land developer 1 indicates that this dissatisfaction may also be due to inconsistent support from local government by converting a cycle path into a car park after a pressure from certain groups. Yet, there is no guarantee that the rate increases in a flatter suburb; the factors may be the first two. In contrast to journey to work, respondents took cycling (63%) and walking (92%) for leisure purposes enhanced by attractive surroundings as identified by the private planning consultant 1.

Figure 6-3: Ratio of motorised and non-motorised transport modes to work.



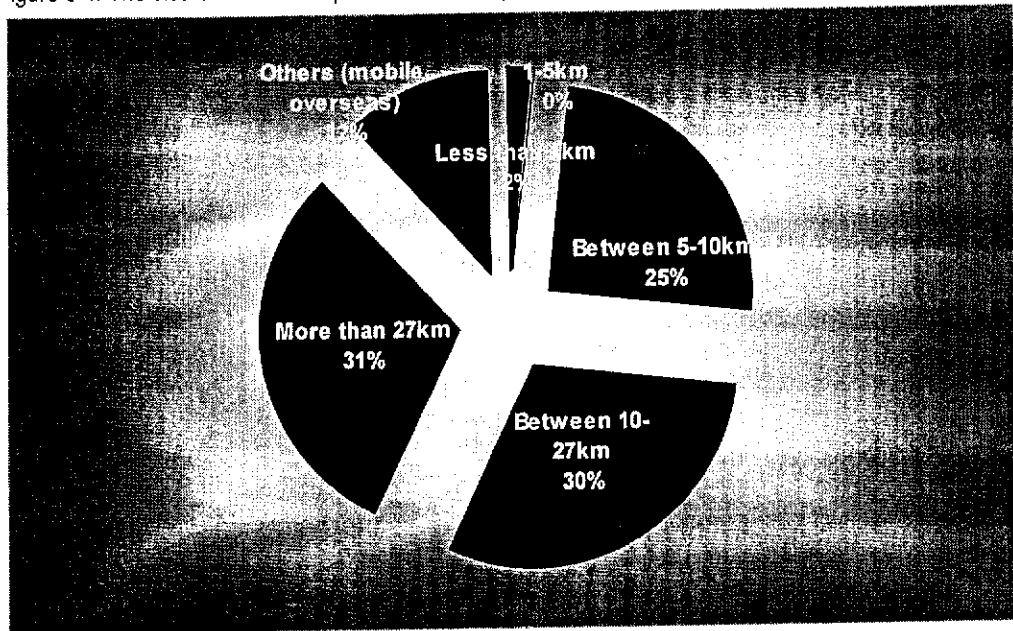
n= 42 respondents

Note: Total percentage is not 100% since some respondents took more than one transport mode.

Source: First household questionnaire survey conducted in 2001.

When respondents were asked the location of their workplace, it was revealed that nearly a third (31%) of them travelled 27km to Perth or more than 35km to Northam and Welshpool (Figure 6-4). The rest travelled less than 27km or were mobile workers. The categories were based on transport modes catchment and distance to Perth CBD as the main employment centre: less than 1km (within walking distance), 1-5km (within cycling distance), 5-10km (local and the nearest neighbouring suburb), 10-27km (Perth), and beyond Perth.

Figure 6-4: The distribution of workplace of Joondalup's respondents.



n = 52 respondents

Source: First household questionnaire survey conducted in 2001.

6.2.3. Assessing Joondalup against Evaluation Criteria in a Strategic Context

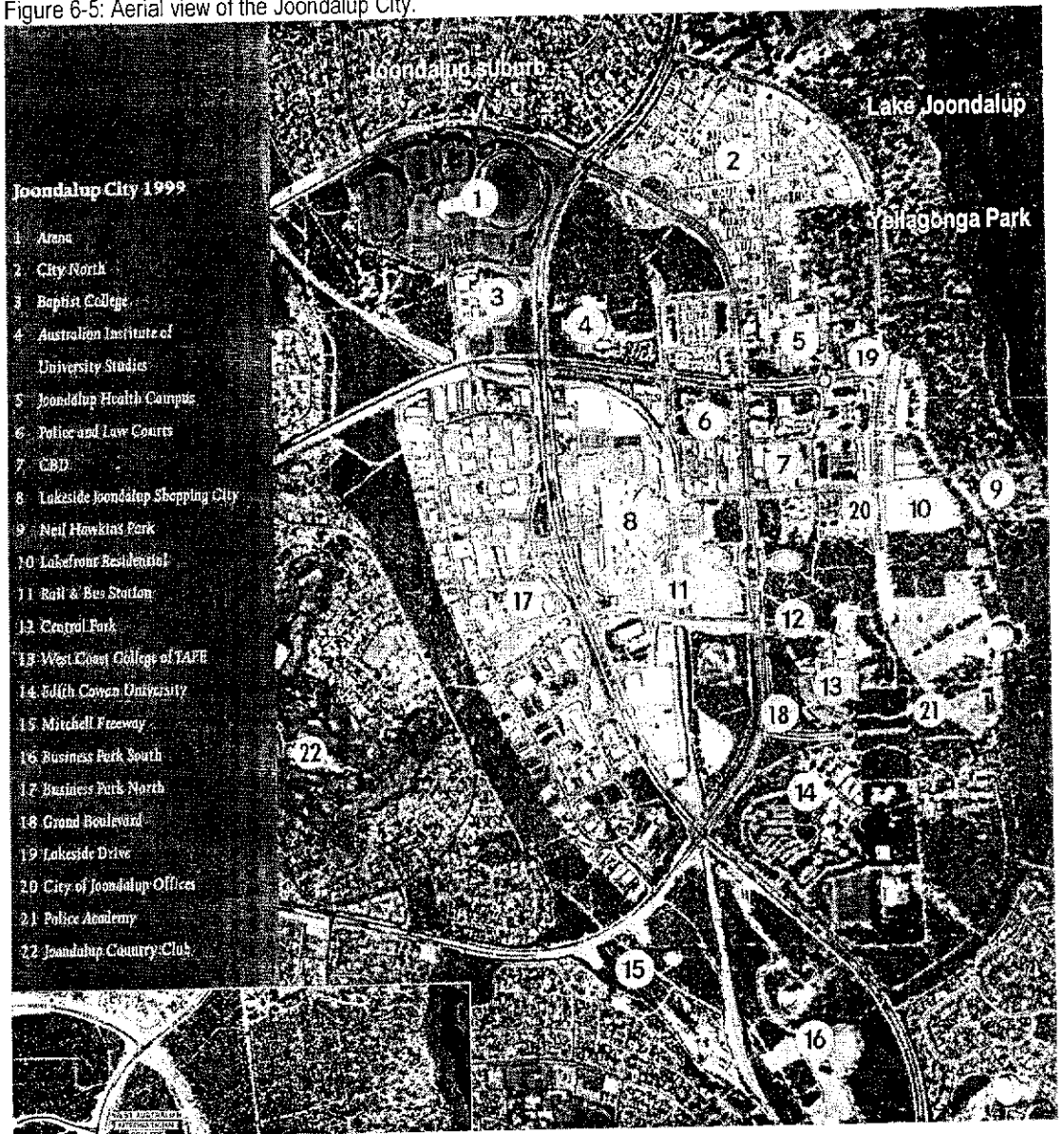
When the Joondalup suburb was viewed within its contextual location in the PMR, it was apparent that it is related to other suburbs, land-uses, and transport system. The relationship of land-use and transport is affected by urban structure (Westerman 1998) which is best discussed at regional level rather than at local like this study. However, the researcher will discuss it briefly to put transport in context of land-use in the PMR and people's activity patterns in addition to evaluation criteria suitable to local level in the previous section.

Higher density housing near centres

Figure 6-5 shows that the zoned density of residential areas around the Joondalup Regional City Centre (R-60 and grouped-dwellings) is higher than those in the case study area (R-20). However, the density could not be optimised due to the nature of surrounding land-use of the City Centre. The City Centre is surrounded by open spaces such as the Yellagonga Regional Park, Lake Joondalup, Joondalup Golf Course (22), and the arena (1). These open spaces reduce the population catchment of the centre. In the centre, public transport facilities are also provided. Besides taking passengers from and to areas such as Perth and Joondalup, the

public transport service takes passengers from Joondalup to other areas. The existence of higher density around the station may sustain the service and facilities by providing them enough patrons to be carried. It also sustains activity centres by providing more customers.

Figure 6-5: Aerial view of the Joondalup City.



Source: LandCorp n.d., p. 3.

Employment opportunities close to living places

There are employment opportunities in the Joondalup City Centre close to residential areas such as the Joondalup suburb, Currambine, Connolly, and Heathridge within approximately 2kms from the City Centre. They are within

comfortable cycling distance (no more than 5kms). The employment opportunities include the Business Park (South and North), a hospital, Central Park, the Police Academy, and entertainment facilities. However, there is no guarantee that they suit the needs of surrounding residents. The usefulness of the opportunities depends on factors like employment varieties, and residents' skills. But at least the opportunities have been provided for (wider) communities to choose.

Encouraging the regional centre to develop a diversity of functions and to serve a large suburban population catchment

Indeed, the Joondalup Centre provides a diversity of functions in the economic, environmental, and social spheres (the sustainable development triple-bottom-line). To mention a few, they include businesses, banks, the Lakeside Joondalup Shopping City, major and small retail shops, offices (economic sphere); open spaces, the Central Park, the arena (environmental sphere); and a sports arena, Country Club, a hospital, a university, colleges, places to eat and worships (social sphere). With its extensive diversity, the regional centre has been planned to serve communities from within 5kms "... for personal services, health care, groceries, and household items" (LandCorp n.d., p. 6) to within 10kms for social activities such as cinema, and eating out (LandCorp n.d.). So with its diversity of functions serving a large population catchment, it is not surprising that "... Joondalup City will be the second major business and employment centre of the PMR" (LandCorp n.d., p. 4).

In summary, the Joondalup City Centre can meet the needs of communities up to 10kms away by providing public transport services (bus and train networks), administrative and civic centres, business parks, a shopping centre (the economic sphere); parks and lake (the environmental sphere); and entertainment venues, places of worships and restaurants (the social sphere). This wide range of functions makes the whole City of Joondalup more compact. Neighbourhood communities may see their needs met in the City Centre, thus obviating the need to commute, to use private vehicles, and increasing the public transport use, cycling and walking. Although the Centre has a wide variety of functions, land-use management would be optimised if there were more higher density housing around it. At present, there is only a small residential area zoned R-60 in Joondalup North (2). Other surroundings, including the Joondalup suburb case study area, are only zoned R-20.

6.2.4. The Quality of the Evaluation Criteria in Achieving Transport for Sustainable Development

Judging performance only by calculating numbers of evaluation criteria performed in Joondalup is incomplete because quality of performance is more important than quantity. For example, suburb 'B' fulfils ten out of fifteen evaluation criteria while suburb 'C' fulfils seven. This does not necessarily mean that 'B' is better than 'C'. It is possible that 'C' is better than 'B' since 'C' fulfils the first seven most significant criteria while 'B' fulfils the ten least significant criteria. Thus, evaluation criteria from policies extant (Table 6-2 on page 89) and after the planning and development phases (Table 6-3 on page 91) were weighted qualitatively. Mostly, selected conducive criteria were also covered in the guidelines created by Newman, Kenworthy and Vintila (1992) for improved urban transport development toward sustainable development in transport terms. At the same time, they are major issues of land-use and transport integration in auto-cities (Newman & Kenworthy 1999). Also, the selected criteria are felt important to realise environmental friendly urban transport (Garbrecht 1990).

Table 6-4 lists evaluation criteria considered conducive to transport toward sustainable development drawn from policies extant at the planning and development phases and ranked according to their conduciveness. Note that it seems that the number of evaluation criteria is fewer than those in Table 6-2. In fact, some were merged when they were inter-related.

The top seven or more than half of the evaluation criteria in Table 6-4 have been fully implemented in Joondalup suburb; 42% across the suburb, 29% in more than half the suburb, and 29% in no more than half the suburb. It may signify that LandCorp as Joondalup's developer has followed guidance on sustainable development by emphasizing transport. Condition would be better if more conducive criteria were implemented all across the suburb.

6. IMPLEMENTING TRANSPORT POLICIES

Table 6-4: Qualitative assessment of policy implementation (policies extant at the planning and development phases) in Joodalup.

Rank order	Criterion/ criteria	Rationale for ranking	Extent of implementation
1	Bus routes to be as direct as possible.	Direct routes reduce miles travelled and time spent on roads, as well as fossil fuels use. This may encourage non-patrons to become patrons. Yet, directness is impacted by the road network design.	Y
2	Appropriate services to employment centres.	This service is beneficial for those with no access to motorised vehicles and longer trips (beyond walking and cycling distance, i.e. 1-5kms).	M
3	Bus routes to provide good access to local facilities.	This access is good for the local level. It gives intra-generational equity to those without private vehicles.	Y
4	Cycling and walking linkages between trips attractors (school, community activities, bus stops).	Trip attractors and community activities, especially when they are within walking distance, function as magnets to 'pull' people to start cycling and walking. Hopefully cycling and walking levels will be increased.	Y
5	Cycling and walking are safely integrated with other road users.	A safe integration of road users means that everybody has the same chance to use a road together. In other words, it is for equity.	N
6	Pleasant, efficient, and safe cycling and walking by having safe crossing of major roads (overpass and underpass) as well as by separating cycling and walking systems from the road systems.	This can be achieved using traffic calming to "...give equal rights to [pedestrians and] cyclists to using road space and associated service" (Strategic Scan Western Australia, 1988, p.14). They are for safety of both non-motorised modes users (pedestrians and cyclists) and motorised modes users (cars, train, buses, and motorbikes).	N
7	Provide end-of-trip facilities.	Ideally, adequate end-of-trip facilities, such as bicycle parking, shower, and drinking fountain should be provided since these facilities are useful for cyclists, especially commuting cyclists.	M
8	Connections between residential streets should be T-junctions or roundabouts.	They are means of controlling traffic flow for road users' safety and for preventing congestion. They can be explained within the principles of sustainable development. Road users' safety is concerned with intra-generational equity. Road safety gives equal opportunities for groups considered strong (motorised transport users) and for groups considered weak (non-motorised transport users); it gives social justice. Preventing congestions is concerned with the polluter-pays principle (PPP) and user-pays principle (UPP). Congestion means more fossil fuels is consumed (UPP) and more air and noise pollution is created (PPP). Also, since congestion increases the use of the non-renewable natural resources, congestion endangers the Earth's carrying capacity and overlooks the precautionary principle which is related to the inter-generational equity.	Y
9	Average spacing between stops is 300-400metres.	The spacing is aimed at making bus stops within the short walking distance. But, if there is no development around the stops, it is unnecessary to meet this criterion. There will be hardly any patrons at the stops.	Y
10	Direct short cuts across the cell are not allowed.	This will result in dividing a neighbourhood. The neighbourhood will not be as compact as it would be.	Y
11	Cyclists and pedestrians paths through parks.	This provision is for recreation purposes and good for social and leisure activities but not as a main activity.	Y
12	Intersect bus route with cycling and walking routes.	It is ineffective if bicycles are forbidden on a bus and if there is no bus stop to 'enter' the services.	Y
13	Lots with road access to both front and rear boundaries are not generally favoured.	It is not favoured since two vehicular accesses for a dwelling are excessive; the additional access expands road surface which can increase temperature. The space is better off used for open space or other land-uses.	Y

N: The evaluation criterion is met by less than half the suburb; Y: The evaluation criterion is met across the suburb

When evaluation criteria drawn from policies published after the planning and development phases were evaluated qualitatively, the level of conduciveness was dissimilar to those extant before these phases. Table 6-5 sets out the evaluation criteria considered conducive to transport toward sustainable development ranked according to their conduciveness. It seems the number of evaluation criteria is less than in Table 6-3. Actually, some were amalgamated as they are related or compatible with others. It should be noted that there were more criteria drawn from policies published after Joondalup's planning and development phase as there were more policies than before the phase.

From the top eleven or more than half conducive criteria drawn from policies published after Joondalup's planning and development phase as listed above, Joondalup has met 46% of criteria across the whole suburb, 18% in more than half the suburb, and 36% in no more than half the suburb. The level of implementation has dropped compared to when Joondalup was evaluated earlier in section 6.2.3 with the same rationales. It means that according to new current standards, the path to transport toward sustainable development is still distant for Joondalup.

It is not very easy to rank a wide range of evaluation criteria as they are co-dependent; one may become a success only if sustained by others. The most important is the road network since it is the infrastructure for vehicles (cars, public transport, cycling and walking). This network is followed by the public transport to transport more people on either short or long trips. Although the cycling and walking are the most environmentally friendly since they require no fossil fuels to operate, they are only ideal for short trips (de Roo 2000) or 1-5kms. Effectiveness of cycling and walking in realising transport toward sustainable development depends on land-use management. If most local needs and employment are within cycling and walking distance, cycling and walking might overtake public transport to a certain degree. These two types of non-motorised transport modes, together with public transport, are unquestionably compatible with car dependency reduction and support natural resources conservation for intra- and inter-generational equity to maintain the Earth's carrying capacity.

6. IMPLEMENTING TRANSPORT POLICIES

Table 6-5: Qualitative assessment of policy implementation (policies published after the planning and development phases) in Joondalup.

Rank order	Criterion/ criteria	Rationale for ranking	Extent of implementation
1	Interconnected street network by controlling street network should have no more than 15% of lots fronting culs-de-sac, maximum driving time from collector street to any allotment, cycling and walking connection at cul-de-sac heads, maximum culs-de-sac length and dwellings served by access ways.	The network is addressed by interconnecting residential development network including culs-de-sac with walk and cycle paths. Urban activities will be efficiently accessible. If roads are interconnected or permeable, road users will reduce travel time from one location to another. If everything is within easy reach, there is a confidence that more activities will be carried out by walking. They will also affect natural resource use.	N
2	Provision with public transport network including regular and approximately 800metres apart bus routes.	This kind of service gives more equity to those having no access to a car or motorbike. The latter offers a wider range of choice of route to patrons on which route they prefer.	Y
3	Distance between neighbourhood centres and perimeter is 400-450metres on average.	The preferred distance (approximately 400metres) discourages dispersed centres which are difficult to be served effectively by public transport, cycling and walking as discussed in Chapter 2.	N
4	Locate bus stops at potential destinations.	Adequate provision for bus stops is a way of demand management (Curtis 2001). It is also to sustain the service with passengers.	Y
5	At least 60% of dwellings are within 400metres straight-line distance from a bus stop.	This can be classified as an access to public transport stops and provides more patrons to the service.	Y
6	Access to public transport by pedestrians, cyclists, and people with disabilities.	Besides for giving equity to every group in a community, the access is for managing travel demand (Curtis 2001). It is for sustainable development in social sphere (Newman & Kenworthy 1999). These minority groups do exist and it is unjust to ignore them. They have same needs as the so-called majority groups and have equal opportunity to live on this Earth.	M
7	Safe and convenient access for bus stops by having street design to enable development to front all streets, bus stops surveillance from surrounding development, segregation of dual-use paths along one side of district and local distributor roads.	Bus stops located with a lack of surveillance may make people feel insecure. This condition could hinder them using public transport services. Any facilities and services will be ineffective if there are no patrons at the stops owing to insecurity. Above all, a bus stop is the starting point for people to use public transport services.	N
8	Dual-use path must have a durable, non-skid surface.	This is also for cyclists and pedestrians safety.	Y
9	Speed control/ traffic calming devices to achieve the target speeds through maximum length of street blocks (no more than 240metres) and average spacing of junctions (the standard is contained in Appendix 21).	As discussed before, traffic calming gives pedestrians and cyclists equal rights to using roads (Strategic Scan Western Australia 1998). But traffic-calming devices put buses and emergency vehicles in hazard (Goodwin in Banister, 1998).	M

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10	Traffic signal control rather than roundabout.	Signalised cross-intersections are preferred than roundabout (Brindle 1984). This is useful for pedestrians and cyclists and for heavy-volume traffic roads. The control avoids accidents and congestion. The latter, as discussed earlier, saves time and environmental cost (Newton et al. 1998).	N
11	Streets links are not more than two levels different in the hierarchy.	This is aimed at making road users more comfortable. Too-high difference will surprise motorised vehicles drivers due to sudden or severe change of traffic environment.	Y
12	Residential areas are not passed by through routes un-associated with the residential area.	Non-residential purpose vehicles which are usually heavy and create noise may disturb residents' peace. Residents may not feel at ease with this consequence.	Y
13	Clear physical distinctions of road hierarchy.	This distinction is to control traffic speed.	Y
14	Pram crossings are available at all intersections.	Pram crossings are also useful for people with disabilities.	M
15	No footpath in low-traffic volume.	But bear in mind that a low-traffic road may become high-traffic as a location develops.	Y
16	No more than three turns are required to travel from any address to collector street.	More turns will make driving uncomfortable. Simpler road network makes roads more users friendly.	Y
17	Width of cycling and walking paths.	Width issues can be handled by dedicating right of way to bus and bicycles (Cervero 1998 in Cervero, 2001), adjusting road verge, road width (this is depending on vehicle's size since the size sometimes is different in different nations).	N
18	At least 90 percent of dwellings are within 400metres straight-line distance from bus route.	This criterion is meaningless since in WA, patrons can get on or off a bus only from a bus stop, not at any place within a bus route. Although there may be high-rise dwellings around a freeway on which buses may pass frequently, no patrons can hail to stop a bus, since there are no bus stops. If the criterion measures the minimum number of dwellings with certain distance from bus stops instead of bus routes, the criterion would make cities more sustainable.	Y
19	Local street should be provided parallel to arterials.	In the researcher's opinion, as long as roads are interconnected, the relations between local streets and arterials becomes less important especially since the geometry is highly dependant upon topography of a local area and consequently cannot be applied to every area prior to further consideration.	M
20	Locate bus stops adjacent to traffic light or median islands.	In fact, the researcher believes that it makes road users uncomfortable since they will be distracted by bus stopping at certain bus stops. Taking and getting off passengers at traffic light will slow down the traffic flow.	N

N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb

6.3. WOODLAKE

6.3.1. Implementation in Policy Extant at the planning and development phases

Overall, forty-four evaluation criteria were identified from policy documents existing at the time of the planning and development phases. Table 6-6 displays these criteria and their sources; a complete explanation of this can be found in Appendix 20.

Table 6-6: The forty-four evaluation criteria identified from policy documents present at the time of Woodlake was planned.

Categories	No.	Evaluation criteria	I	Policy source
Road network	1	Residential areas are not passed by through routes un-associated with the residential area.	Y	GS
	2	Culs-de-sac to serve no more than twenty lots.	Y	PM (1989)
	3	Streets links are not more than two levels different in the hierarchy.	Y	AMCORD
	4	Connections between residential streets should be T-junctions or roundabouts.	Y	AMCORD
	5	No more than three turns are required to travel from any address to collector street.	Y	AMCORD
	6	Lots with road access to both front and rear boundaries are not generally favoured.	M	PM (1988)
	7	Direct short cuts across the cell are not allowed.	Y	PM (1988)
Public transport	8	Bus routes to be as direct as possible.	M	AMCORD, PM (1990), NEC
	9	At least 90 percent of dwellings are within 400metres straight-line distance from bus route.	Y	GS, AMCORD, PM (1990), SPS
	10	Bus routes are as regular as possible.	N	PM (1990)
	11	Bus routes are approximately 800metres apart.	N	PM (1990)
	12	At least 60 percent of dwellings are within 400metres straight-line distance from bus stop.	Y	PM (1989), GS, AMCORD
	13	Average spacing between stops is 300-400metres.	N	PM (1989)
	14	Bus stops have surveillance from surrounding development.	M	PM (1989)
	15	Safe and convenient access for bus stops.	M	PM (1989)
	16	Access to public transport by pedestrians, cyclists, and people with disabilities.	Y	PM (1990)
	17	Provision with public transport network.	N	PM (1990)
Cycling	18	Appropriate services to employment centres.	N	ESP, NEC
	19	Cycle paths near cycle routes are 2.0metres width.	Y	AMCORD, ESP
	20	Paths on district distributor roads should be on both sides.	N	ESP
	21	Cul-de-sac heads should have a bicycle path connection.	N	PM (1990)
	22	Pleasant, efficient, and safe cycling.	M	ESP, AMCORD, NEC
	23	Safe crossing of major roads (overpass and underpass).	M	NEC, ESP
	24	Dual-use path must have a durable, non-skid surface.	Y	AMCORD
	25	Cycling is safely integrated with other road users.	Y	PM (1990)
	26	Segregated dual-use paths or cycle paths along one side of district, local distributor roads.	Y	PM (1989)
	27	Bicycle linkages between trips attractors (schools, other community activities).	Y	PM (1990), NEC
	28	Provide end-of-trip facilities.	Y	PM (1990), NEC,
Walking	29	Paths to open space.	Y	AMCORD
	30	Safe and convenient movement for the disabled, the aged, and the very young.	M	AMCORD, PM (1990)
	31	Cycling systems separate from the road systems.	M	AMCORD
	32	No footpath in low traffic volume.	Y	GS, PM (1989)
	33	Footpaths should be 1.5metres minimum width (2.0metres at schools, shop, other activity centres).	Y	ESP
	34	Footpaths are on both sides on arterial routes, access streets, neighbourhood connector.	M	ESP

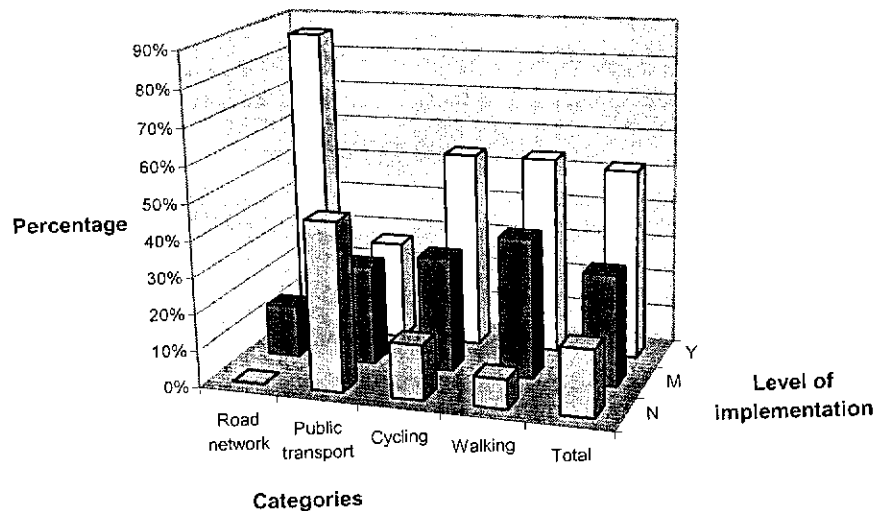
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		N	PM (1990)
35	Cul-de-sac heads should have a footpath connection.	Y	AMCORD
36	Pedestrian paths through parks for recreation purposes.	M	GS, AMCORD, ESP, NEC
37	Safe and convenient pedestrian movement.	M	ESP, AMCORD, PM (1990)
38	Safe, convenient movement network for the disabled, aged, and very young.	M	NEC, ESP
39	Safe crossing of major roads (overpass and underpass).	Y	AMCORD
40	Dual-use paths must have a durable, non-skid surface.	Y	
41	Segregated dual-use paths along one side of district and local distributor roads from vehicular traffic.	Y	PM (1989)
42	Linkages between trip attractors (local centres, bus stops, community activities).	Y	PM (1989), NEC
43	Footpaths are along one side of local distributor roads and access way.	Y	PM (1989), ESP, GS
44	Footpath, where required, of 1.2metres width.	M	AMCORD

PM: Policy Manual (year); GS: 1989 Green Street; AMCORD: 1990 Australian Model Code for Residential Development; NEC: 1994 North-East Corridor Structure Plan; ESP: 1995 Ellenbrook Structure Plan; I: Implementation; N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb

Figure 6-6 displays the degree of implementation of the forty-four policy evaluation criteria for the road network, public transport, cycling, and walking in Woodlake. These evaluation criteria were derived from policies present at the planning and development phases. Altogether, 52% have been fully implemented across Woodlake, 31% in most parts, while 17% in no more than half of Woodlake.

Figure 6-6: Implementation of evaluation criteria drawn from policies present at the planning and development phases in Woodlake.



N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb

By classification, 52% of implemented criteria comprises the majority (86%) from evaluation criteria for the road network, just over a quarter (27%) from the public transport, and over a half (54%) of the cycling and the walking (54%). It indicates

that Woodlake has achieved more in relation to evaluation criteria for the road network, cycling and walking than those for the public transport.

Evaluation criteria for the road network have been implemented well because an interconnected road system, especially to a neighbourhood centre, was considered at Woodlake's planning phase. Woodlake's road system was also noted by the public planning officer 3 and private planning consultant 2: "... based upon interconnected road system". Low satisfaction of the public transport criteria is due to Woodlake's isolated or fringe location resulting in few patrons as revealed by the state transport authority and public planning officer 3: "... because the location of Woodlake (on the urban fringe) is quite some distance in major transport infrastructure, there are a number of problems in regional transport, public transport". Service inadequacy is also a factor influencing the low implementation. Evaluation criteria for the cycling and walking have been satisfactorily implemented because Woodlake was designed with a walk-ability concept and cyclist and pedestrian accesses are provided as confirmed by the public planning officer 3, private planning consultant 2, and private land developer 1: "... the design or layout also looks at bicycle and walking trails".

6.3.2. Assessing Woodlake against Current Policies

Table 6-7 lays out seventeen new evaluation criteria drawn from policies available after the planning and development phases. Based on the detailed analysis in Appendix 20, the performance of the suburb is poor compared with its performance of evaluation criteria drawn from policies extant at its planning and development phase. Only half the criteria could be performed across Woodlake.

By category, evaluation criteria for the public transport have been fully performed. But it is unfair to say this because there are merely two new evaluation criteria for this category. Woodlake performs best on the road network since six out of twelve new criteria are met across Woodlake (Figure 6-7). It performs one new evaluation criterion for the cycling in no more than half of Woodlake. Like those for the public transport, it would not be fair to say that Woodlake performs least well as regards the cycling because there is only one new criterion extant after Woodlake's planning and development phases. This performance may influence the travel behaviour of Woodlake residents. Since more criteria for the road network (six) are implemented

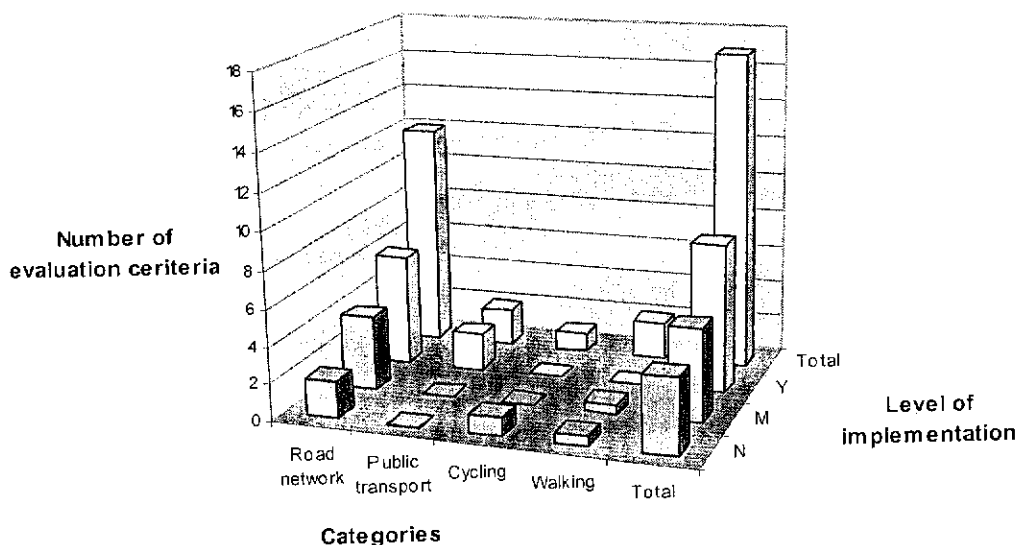
well across Woodlake, the use of motorised vehicles especially private ones could increase car dependency. This dependency is enhanced since there are two new criteria for the public transport are implemented across the suburb and the new criterion for the cycling is performed in no more than half of the suburb. This could lead to low level of cycling and walking use as formal transport modes (such as journey to work). This low level then could lead to high car dependency as discussed below.

Table 6-7: The seventeen evaluation criteria identified from policy documents present after the planning and development phases in Woodlake.

Categories	No.	Evaluation criteria	I	Policy source
Road network	1	Interconnected street network.	M	LNDC, SPS
	2	The street network should have no more than 15 percent of lots fronting culs-de-sac.	Y	LNDC
	3	A movement network which minimises travel time. Maximum driving time from collector street to any allotment is one minute.	Y	LNDC
	4	Clear physical distinctions of road hierarchy.	Y	LNDC
	5	Street blocks of no more than 240metres.	Y	LNDC
	6	Maximum culs-de-sac length should be 120metres.	M	LNDC
	7	Speed control devices to achieve the target speeds.	Y	LNDC
	8	Traffic signal control rather than roundabout.	M	LNDC
	9	Street design to enable development to front all streets.	M	LNDC
	10	Local street should be provided parallel to arterials.	Y	LNDC
	11	Average spacing of junctions (the standard is contained in Appendix 21).	N	LNDC
Public transport	12	Distance between neighbourhood centres and neighbourhood perimeter is 400-450metres on average.	N	LNDC
	13	Locate bus stop at potential destinations (schools, neighbourhood and town centres, stations, and recreational areas, industrial areas).	Y	LNDC
Cycling	14	Locate bus tops adjacent to traffic light or median islands.	Y	LNDC
	15	Dual-use paths to school should be 2.5metres wide.	N	LNDC, SPS
Walking	16	Pram crossings are available at all intersections.	M	LNDC
	17	Dual-use path to school on neighbourhood connectors and arterial routes is 2.5metres width.	N	LNDC, SPS

SPS: 1996 State Planning Strategy; LNDC: 2001 Liveable Neighbourhoods Community Design Code; I: Implementation; N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb

Figure 6-7: Implementation of evaluation criteria drawn from policies after the planning phase in Woodlake.

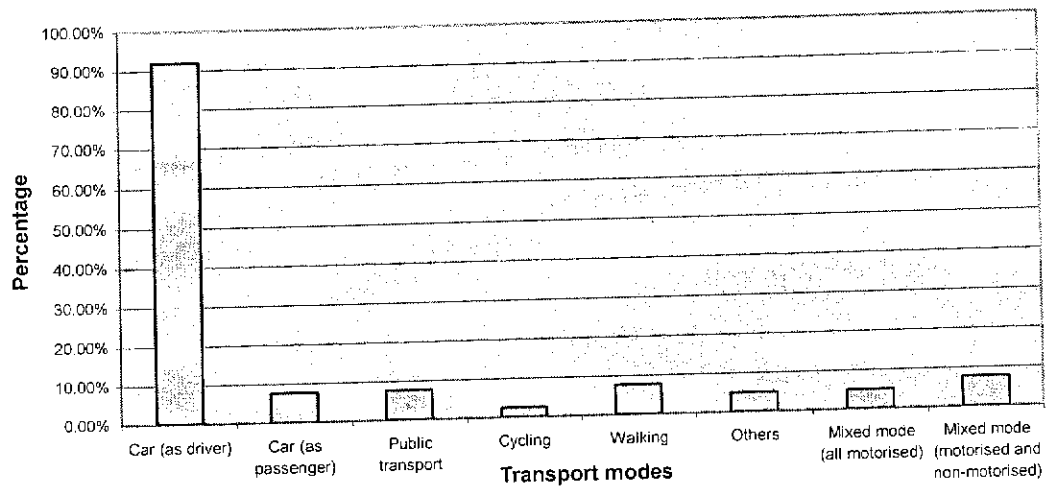


N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb

Travel Behaviour

Number 25 in Table 5-5 on page 79 demonstrates that policy makers at all levels aimed at 'car dependency reduction' at the time of the planning and development phases in Woodlake. Hence, the suburb was designed in attempt to reduce this dependence. The first household questionnaire survey provided the researcher with information on household's transport modes to workplaces. Figure 6-8 shows that 92% of the respondents used the car drivers and 7.7% as passengers. The rate is slightly lower than the ABS data on Woodlake and much higher than those in Joondalup and the PMR. The reasons may be because of an inadequate public transport network as follows.

Figure 6-8: Motorised and non-motorised modes usage in Woodlake.



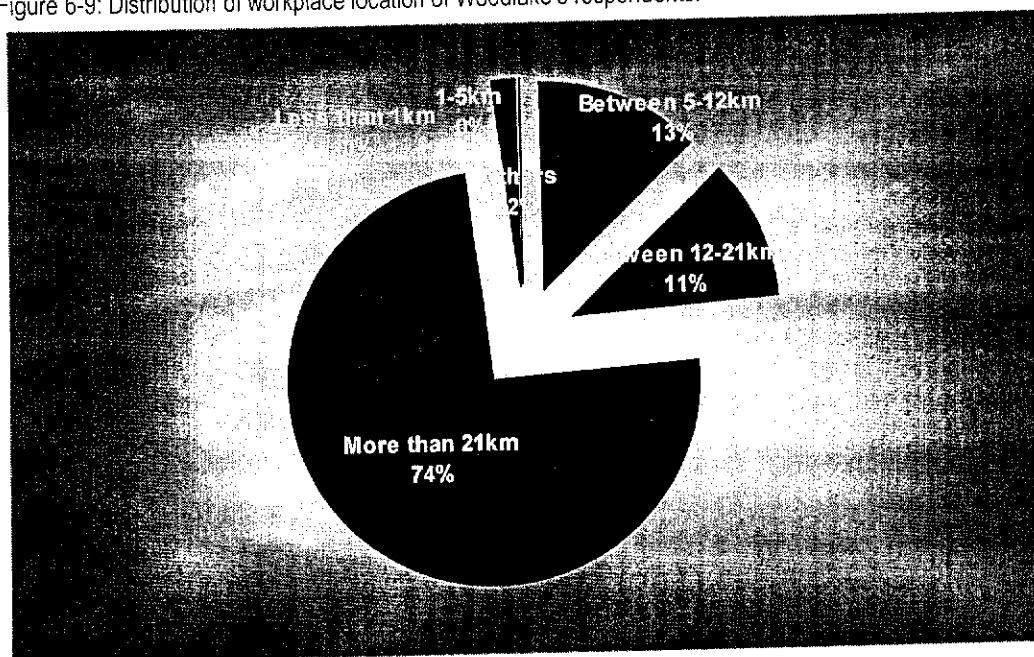
n= 39 respondents

Note: Total percentage is not 100% since some respondents took more than one transport mode.

Source: First household questionnaire survey conducted in 2001.

The rate of public transport usage was 7.7%, lower than the PMR (8.1%). This level is due to Woodlake's fringe location and functional land-use separation. Unlike Joondalup, there is much less residential development towards Woodlake from the Perth inner city area. Woodlake residential development is secluded from other residential development by rural development with its low (humankind) population. Public transport was less popular owing to an unsatisfactory public transport network (inappropriate routes, time, and bus connections as well as being time consuming) as revealed by 84% of respondents of second questionnaire survey. The rest took cycling (2.6%) and walking (7.7%), or others (5%). Cycling and walking were less in favour in Woodlake for residents' workplaces were distant. It is reasonable to have low rate of cycling and walking uses to work in this suburb especially as all residents' workplaces are between 5-35km and beyond walking and cycling distance (within 1km and 5kms). Cycling and walking were more favoured for leisure purposes. Forty-seven percent of respondents travelled 21kms to Perth; 27% travelled up to 33kms (to Fremantle and Canning Vale); only 13% work locally at home or in Woodlake's neighbouring suburbs (Midland and Middle Swan) as shown in Figure 6-9.

Figure 6-9: Distribution of workplace location of Woodlake's respondents.



n = 45 respondents

Source: First household questionnaire survey conducted in 2001.

6.3.3. Assessing Woodlake against Evaluation Criteria in a Strategic Context

When the Woodlake suburb was considered in its contextual location in the PMR, it is clear that it is related to land-uses and transport systems in other suburbs. This connection between land-use and transport systems, urban form and structure should not be discussed at local level since the level is too low for an urban form and does not capture the extent of people's activity patterns. Nevertheless, the researcher will discuss the urban form, Woodlake's relation with other areas regarding location, proximity, land-use and their impact on travel. The evaluation criteria discussed are different from those for Joondalup suburb as Joondalup and Woodlake have different policies and Woodlake is a relatively new residential development.

Higher density housing near centres

Promoting high-density housing near regional and district centres is aimed at creating a compact city to fulfil local needs locally and to sustain centres with customers. Currently, the Midland and Morley regional centres serve Woodlake residents. Thus, the residents travel far to use them. Areas near the Morley regional

centre have a higher zoned density (R-40) than the Midland centre (R-5 and R-20) especially since there are wine estate, parks, riverbanks, and railways around Midland.

Promote mixed-use development in district centres

The district centre has not yet been built in Ellenbrook. It is planned for construction in 2004 and will provide commercial, educational, health, and sports facilities, places of worships, and open spaces to provide residents' variety needs. They are also for a wider population catchment of 3-5kms. In this way, residents and the centre compliment each other; residents sustain the centre that fulfils their needs.

Encouraging the regional centre to develop a diversity of functions and to serve a large suburban population catchment

Although theoretically, a regional centre serves development within 5-10kms, both regional centres serving Woodlake are beyond that; Midland is nearly 12kms and Morley is just over 14kms away. It means that Woodlake is not well served and therefore a regional centre will be built in Ellenbrook when there is enough population to support it. The regional centres serving Woodlake offer cinema, primary and tertiary educational, commercial facilities, commercial accommodation, sports arenas, parks, places of worship, a hospital, and public transport stations.

Ensuring a high level of public transport service to new areas

Promoting public transport generally and ensuring high level of public transport service to new urban areas are difficult since there are insufficient numbers of patrons to be served. There is only one bus serving Woodlake, Ellenbrook to Midland and to Morley. Details of the service are given in Appendix 12 and discussed in Appendix 20. The service is possible especially since EPML subsidised it during the first year of development.

Early provision of community facilities in new areas

Initially, "... stages of any development have been characterised by a lack of facilities and amenities with a consequent social cost" (Ellenbrook Community Planning Team 1997, p. 5) due to insufficient population. Developer subsidies and community account (between developer and the local government) made early

communities facilities possible. The first Community Centre was opened in 1997. Also, rental agreements were arranged so that health and general stores (such as a bakery and a news agency) were available.

Briefly, the Woodlake suburb has not met the needs of its residents within a reasonable distance. It takes approximately 12-14kms to reach major public transport (bus and train) stations, to tertiary education, major health facilities available in regional centres. This happens as a result of a 'leap-frogged' development. Also, the long distance between suburb and regional centres causes residents to travel a long way to use them. The condition is worsened by an infrequent public transport service and an inadequate public transport network. Consequently, residents cannot cycle and walk or use public transport so travel by private car.

6.3.4. The Quality of the Evaluation Criteria in Achieving Transport for Sustainable Development

Giving the same weight to each evaluation criterion is unjust. It is inadequate to determine the level of transport for sustainable development in Woodlake only based upon the number of criteria fulfilled. Thus, it was necessary to evaluate and determine the quality of the criteria from policies present at the time of planning and development phase (Table 6-6) and after the development phase (Table.6-7) to identify whether there are any improved standards extant after the planning and development phases.

The selected conducive criteria are very similar to Joondalup since both case study areas used the same policy documents except that the Corridor Structure Plan (the *North-West Corridor Plan* is for Joondalup and the *North-East Corridor Plan* is for Woodlake) in addition to local policies (such as the *Joondalup Development Centre Plan* and *Ellenbrook Structure Plan*). Like Joondalup, the criteria are significant in improving urban development and sustainable transport (Newman & Kenworthy 1999) as well as in creating environmental friendly urban transport (Garbrecht 1990).

Table 6-8 sets out the evaluation criteria drawn from policies extant before Woodlake's planning and development phase. They are ranked in order of

importance. Bear in mind that some criteria as listed in Table 6-6 were merged with related criteria; thus there are fewer than those in the Table.

From the top eleven or most of conducive criteria listed above, Woodlake suburb has fully implemented 36% across the suburb, 36% in more than half, and 28% in no more than half the suburb. It is sad that the suburb has not implemented some of the high ranked conducive criteria for it signifies that according to policies at the time of planning, transport toward sustainable development in Woodlake is far from satisfactory.

When evaluation criteria drawn from policies published after the planning and development phases were evaluated qualitatively, the level of conduciveness was dissimilar to those extant before the planning and development phases. Table 6-9 shows the evaluation criteria considered conducive to transport toward sustainable development ranked according to their conduciveness. Note that it appears that there are fewer criteria than in Table 6-7. Actually, some were combined as they are inter-related. Also, note that there were more criteria drawn from policies published after Woodlake's planning and development phases as there were more policies.

6. IMPLEMENTING TRANSPORT POLICIES

Table 6-8: Qualitative assessment of policy implementation (policies extant at the planning and development phases) in Woodlake.

Rank order	Criterion	Rationale for ranking	Extent of implementation
1	Provision with public transport network by having bus routes approximately 800metres apart.	As in Joondalup, this provision gives equity to those with no access to a car or motorbike. Therefore, this criterion is suitable to addressing intra-generational equity or social justice.	N
2	Bus routes to be as direct as possible.	Good services gives more chance to increased patrons, although there is no guarantee (Curtis & James 1998; Siahhaan 1988; Thomson 1978).	M
3	Bus routes are as regular as possible.	This criterion is compatible with number '1' and '2' with the same aims. These criteria are for social justice and for car-dependency reduction resulting in reduced non-renewable natural resource consumption.	N
4	Appropriate services to employment centres.	Since most population is within the working group, appropriate public transport service to employment centres will likely increase public transport patrons. Increased public transport patrons is followed by decreased car dependency (Newman & Kenworthy 1999).	N
5	At least 60% of dwellings are within 400metres straight-line distance from bus stop for access to public transport by pedestrians, cyclists, and people with disabilities.	These groups should not be overlooked as they are the same as other (majority) groups. This criterion also gives equity to other groups of a community. Thus it supports sustainable development in the social sphere. This criterion can be classified as an access to public transport stops and helps providing public transport patrons.	Y
6	Cycling and walking linkages between trips attractors (schools, local centres, and other community activities).	Trip attractors have their roles as a magnet to cyclists and pedestrians or the users of environmental friendly transport modes.	Y
7	Cul-de-sac heads should have cycling and walking paths connection and paths on district distributor roads should be on both sides.	Connected cul-de-sac heads with cycling and walking paths will certainly enhance movement network and accessibility which are small parts of ways of realising transport toward sustainable development.	M
8	Cycling and walking are safely integrated with other road users.	Providing safe pathways may encouraged more people to start cycling and walking although may not be for long trips.	Y
9	Safe and convenient access for bus stops by controlling the average spacing between stops (300-400metres), having bus stops surveillance from surrounding development, segregating dual-	A bus stop is the starting point or 'entrance' to public transport services. Thus, it should be made safe and convenient. These last two criteria are categorised as "operational and services delivery issues" (Newman & Kenworthy 1999, p. 388) in auto cities. Such access is a means of managing travel demand (Curtis 2001).	M

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	use paths along one side of district, local distributor roads, as well as having safe and convenient movement for the disabled, the aged, and the very young.		
10	Safe and convenient pedestrians and cyclists movement by providing pleasant, efficient, and safe cycling and walking, safe crossing of major roads (overpass and underpass), as well as dual-use paths with a durable, non-skid surface.	Bus stops lacking surveillance may hinder people using the public transport service. This hindrance could reduce patrons at the bus stops which are the gates for people to take a bus.	M
11	Provide end-of-trip facilities.	Once pedestrians and cyclists are attracted, it is rational that facilities should be provided at their end-of-trips.	Y
12	Connections between residential streets should be T-junctions or roundabouts.	These connections are means of controlling traffic flow for the safety of road users and for congestion prevention. They are related to the principles of polluter-pays and user-pays (PPP and UPP) as explained in Table 6-4.	Y
13	Direct short cuts across the cell are not allowed.	Direct short cuts might divide neighbourhood cells. Subsequently, the neighbourhood cells are not integrated.	Y
14	Paths to open space.	Paths to open space contribute to sustainable development in social terms.	Y
15	Streets links are not more than two levels different in the hierarchy.	The links are to avoid a junction with a too-distinct difference which could surprise road users due to severe change of traffic environment.	Y
16	Residential areas are not passed by through routes un-associated with the residential area.	It may make residential roads hazardous. Fast and heavy trucks passing residential roads will not only damage residential road infrastructure near non-residential roads due to vibration, but also put the disabled, aged, very young, and other road users in hazard.	Y
17	No footpath in low traffic volume.	Although a path may not be necessary, it would be needed in future when traffic becomes more hectic.	Y
18	No more than three turns are required to travel from any address to collector street.	Less turns is more comfortable for driving. It also reduces road users confusion in location orientation.	Y
19	Width of cycling and walking paths.	Width matters can be handled by several ways as indicated in Table 6-5.	M

6. IMPLEMENTING TRANSPORT POLICIES

20	Lots with road access to both front and rear boundaries are not generally favoured.	Excess road access expands road surface that can increase temperature. The access can be used for open space or other features.	M
21	At least 90% of dwellings are within 400metres straight-line distance from bus route.	In WA, this criterion is less useful because patrons can take on a bus only from a bus stop or station. The criterion will be more useful if dwellings are measured from a bus stop as discussed in Table 6-5.	Y

N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb

6. IMPLEMENTING TRANSPORT POLICIES

Table 6-9: Qualitative assessment of policy implementation (policies published after the planning and development phases) in Woodlake.

Rank order	Criterion	Rationale for ranking	Extent of implementation
1	Interconnected street network that should have no more than 15% of lots fronting culs-de-sac and maximum culs-de-sac length of 120metres to minimise travel time.	Cars, public transport, cycling and walking network influences mobility and accessibility to roads and facilities, time spent on roads, and distance travelled. For motorised transport modes, reduced time and distance travelled mean reduced cost for petrol. Hence, this network helps sustaining the Earth's carrying capacity.	M
2	Distance between neighbourhood centre and its perimeter is 400-450metres.	This requirement is aimed at placing urban activities closer together which will result in increased travel speed (Cervero 2001) and reduced time spent on roads.	N
3	Locate bus stop at potential destinations.	Potential bus stop location might stimulate public transport operator to run its services in that area due to more patrons available. Potential bus stops location is often a major transit and land-use integration issue in urban cities (Newman & Kenworthy 1999).	Y
4	Street design to enable development to front all streets.	Besides aimed at safety of road users, this design is aimed at enhancing quality of streetscape. Good streetscape is for residents' social needs or sphere too.	M
5	Speed control devices to achieve the target speeds by controlling street blocks of no more than 240metres and average spacing of junctions.	Traffic calming may induce safety and to road users and residents. As a result, traffic calming could indirectly enhance quality of life. This can control speed, so that roads will be more pedestrians and cyclist friendly.	Y
6	Traffic signal control rather than roundabout and clear physical distinctions of road hierarchy.	This control gives cyclists and pedestrians a chance to cross roads safer and mitigates accidents at a roundabout.	M
7	Pram crossings are available at all intersections.	Pram crossings can be merged into crossings for people with physical disabilities.	M
8	Local street should be provided parallel to arterials.	The researcher believes that arterials and local streets are unnecessary parallel since the geometry is dependent on local topography. Road interconnection is more important and does not have to be parallel.	Y
9	Width of cycling and walking paths.	Widening paths can be performed by several ways as explained in Table 6-5.	N
10	Locate bus tops adjacent to traffic light or median islands.	In the researcher's opinion, having bus stops adjacent to traffic light or median islands will slow down traffic flow. Consequently, it may cause traffic congestion and discomfort.	Y

N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb

From the top five or most of the conducive criteria listed above drawn from policies published before Woodlake's planning and development phase, 40% have been performed across the whole suburb, 40% in more than half, and 20% in no more than half the suburb. The level of implementation is slightly higher than before (36%). This may be as there were fewer new evaluation criteria drawn from policies published after the phase. Nevertheless, the journey to transport toward sustainable development in Woodlake is still long.

6.4. OVERVIEW: JOONDALUP AND WOODLAKE

This section addresses the two research questions posed in the beginning of this chapter. They are the extent to which policy evaluation criteria have been implemented in Joondalup and Woodlake, as well as whether transport elements are conducive to sustainable development. The criteria were mainly adapted from Newman's works (1992; 1999) while considering that of McClintock (1992b; 1992a).

6.4.1. Joondalup

For Joondalup, the extent to which policy evaluation criteria have been implemented depends on which evaluation criteria are assessed: road network, public transport, cycling, or walking. Joondalup measures up well on policies regarding the road network. This is also the case for the public transport because the suburb is located approximately 1,030metres from Currambine train station and approximately 1,300metres from the Joondalup train and bus stations. Joondalup was developed more than twenty years ago; it now sits within a wide catchment for public transport patronage. However, it does not measure up well against cycling and walking evaluation criteria since its designers did not cater for either. This signifies that Joondalup does not have a balanced transport system because non-motorised transport options are not catered for. The undulating topography also acts as a deterrent, as claimed at the interview with the private planning consultant 1.

The extent too depends on the period of policies Joondalup was measured against: at the time of planning and development phase or after the development phase. Sensibly, Joondalup measures up well on policies existent at the first phase. On the other hand, it performs poorly when it was measured against policies published after its development phase. This indicates that policy evaluation criteria for transport towards sustainable development have been increased in quantity within the twenty

years since Joondalup was developed. This factor may show that more matters on transport toward sustainable development arose, awareness of those matters increased, or more attention to detailed components of some matters arose. Nevertheless, an increase in quantity does not necessarily mean that there is an increase in quality. There may be latent issues not identified yet at present.

In relation to the second research question of whether transport elements are conducive to sustainable residential development, the answer too relies upon the period of policies Joondalup was evaluated against. In the researcher's opinion, the top five conducive criteria for transport toward sustainable development from policies present at Joondalup's planning and development phase include direct bus routes, appropriate service to employment centres, bus routes to local facilities, cycling and walking linkages to trip attractors, and safe integration of cycling and walking with other road users. Direct bus routes may stimulate public transport use as well as save time, costs, and energy consumption especially if the workplace is far. Thus, appropriate service to employment centres is important. By not forgetting local needs, bus routes to local facilities give equity to those who have no access to private transport, cannot cycle or walk far. For those who can cycle and walk, linkages to trip attractors with safely integrated with other road users may increase cycling and walking usage.

When new evaluation criteria drawn from policies published after the planning and development phases (Table 6-3) were weighted qualitatively, the researcher believes that some of the top evaluation criteria conducive for transport toward sustainable development comprise interconnected road network, public transport network provision, regular bus routes, preferred distance between the neighbourhood centre and its perimeter, as well as potential location for bus stops. Road interconnection enhances road permeability, reduces travel distance and resource consumption, and eases road users to reach their destination, including bus stops. Conduciveness of provision with public transport network and regular bus routes are in line with residents' needs of mobility. Good service may increase public transport use and decrease private transport use to save non-renewable natural resource. In this era, the 400metre-5-minute walking distance has been identified so that local residents can meet their needs locally and reduce time spent on road travel. Potential bus stop locations across the suburb increase bus catchment and patrons, and visual surveillance from surrounding development.

These criteria cover the triple bottom line of sustainable development: environmental, economic, and social spheres (Munasinghe in Pugh 1996a). In the environmental sphere, the interconnected road network which reduces travel distance consumes less non-renewable resource and produces less greenhouse gas emissions effects. In the economic sphere, potential bus stop locations sustain bus services since there will be more patrons at the potential stops. More patrons to be served supports and sustains the company's wheel of economy. In response to the social sphere, provision of public transport services, cycling and walking facilities gives equity to those having no access to private transport or disadvantaged groups. These are some intra-generational equity examples.

6.4.2. Woodlake

For Woodlake, the answer to the research question of the extent policy evaluation criteria has been implemented is not clear-cut for it depends on which evaluation criteria are analysed against. Woodlake measures up well on the road network, cycling, and walking because it was planned using a different street system to Joondalup. Yet, Woodlake is not strong in the public transport owing to its fringe location and because its development is not contiguous with the existing urban area. It is also located approximately 11,575metres from Midland train station and approximately 14,045metres from Morley bus station. This makes it difficult to have a balanced transport system where options of public transport, cycling and walking are catered for travel (Western Australia Department of Transport 1995).

Likewise, the extent depends on the period of policies Woodlake is measured against: at the time of planning and development phase or after the development phase. Rationally, Woodlake measures up well on policies existent at its planning and development phase except in the case of public transport. On the other hand, the level dropped slightly five-percentage point when it was measured against policies published after the development phase according to evaluation criteria for transport towards sustainable development. The slight drop signifies that there are few new criteria and that the criteria have been improved slightly quantitatively within almost a decade since the planning stage of Woodlake. The existence of new evaluation criteria shows that some new and or detailed matters on transport have been identified although there is no guarantee that an increase in quantity increases

quality. New identified issues might be within the same issue frame, such as revised width of paths and criteria on acceptable condition for omitting footpaths.

In addressing the second research question of whether transport elements conducive to sustainable residential development, the answer is not clear-cut either. Like the first research question, the answer rests on which period of development phase it was measured against: before or after the development phase. Because Woodlake was planned more than a decade later after Joondalup, Woodlake has more evaluation criteria present at its time of planning. Thus, there is a wider range of evaluation criteria for transport toward sustainable development than Joondalup.

From evaluation criteria from policies at the time of planning, some of the top conducive criteria for transport toward sustainable development include the provision of public transport networks, direct bus routes, regular bus routes, an appropriate public transport service to employment centres, as well as population catchment within 400metres from a bus stop with easy access by cyclists, pedestrians, and people with disabilities. All are related to the public transport service and consider the disabled as well as non-motorised groups. Adequate provision of these may save patrons' time and financial costs. They also save energy consumption and can stimulate public transport use. The era before Woodlake's planning and development phase has identified the walking-distance catchment which is one of prominent strategies for transport toward sustainable development. Direct bus routes might stimulate public transport use as well as save time, costs, and energy.

From new evaluation criteria drawn from policies published after the development phase, the researcher suggests that some of the top conducive criteria cover the interconnected street network by limiting maximum culs-de-sac length to minimise travel time, preferred distance between a neighbourhood centre and its perimeter, potential location of bus stops, street design enabling development fronting all streets, and speed control devices. Road interconnection augments road accessibility, reduces travel distance and time, decreases energy consumption, and facilitates residents reaching their destination. The latter is also addressed by allocating a neighbourhood centre within a 400-metre walking-distance. Bus stop potential locations sustain the service by providing patrons. This location can be safe by enabling development fronting all streets for road users (cyclists and

pedestrians) surveillance. Cyclists and pedestrians safety is addressed through calming traffic as well.

These top conducive criteria cover the sustainable development triple-bottom-line as discussed earlier in the Joondalup section.

6.5. A COMPARISON OF JOONDALUP AND WOODLAKE

This section describes the evolution of policy evaluation criteria in the selected policies in Joondalup and Woodlake, discusses the extent of the criteria and ends by considering the conduciveness of the criteria for transport towards sustainable development. The context of the criteria in a wider scope of urban planning is also acknowledged.

6.5.1. Evolution of Policy Evaluation Criteria

The analysis on evolution of policy criteria helped the researcher to address the research question why transport elements have not been implemented as planned. Evolution may be one of factors causing the non-implementation. Since Joondalup and Woodlake were planned and developed nearly two decades apart, it is right to acknowledge the difference between these two case study areas to identify any evolution of policy evaluation criteria. Woodlake had a greater number of policy evaluation criteria at its planning and development phase than Joondalup. Consequently, Woodlake had fewer new criteria after its planning and development phase.

The policy evaluation criteria for the road network shows that matters such as through routes within residential areas, maximum lots served by a cul-de-sac, maximum hierarchy level for street links, and maximum turns between addresses were published after Joondalup's planning and development phase but before Woodlake's. It signifies that, in quantity, new evaluation criteria have been incorporated in sustainable transport and that a new approach to the road network design is apparent.

In relation to the public transport criteria, the regularity of bus services and safety at bus stops appeared in later policies after Joondalup's planning and development phase. This is also the case for the cycling (regarding the width of cycle path near cycle routes and end-of-trip facilities provision). Regarding the walking criteria, a new policy evaluation criterion comprises of segregation of dual-use paths and vehicular traffic. This criteria evolution signifies that evaluation criteria have been modified to augment efforts towards sustainable development, especially in the transport sense. The modification is predominantly in the road network design, principally by creating a more permeable network in order to allow a choice of routes and so help to reduce travel distance by non-motorised modes. The modification is also to enhance road users' comfort and safety in a physical or technical way, for example provision of facilities and segregation of non-motorised from motorised transport modes.

Some evaluation criteria were drawn from policies applicable to either Joondalup or Woodlake only. Thus, evaluation criteria for Joondalup and Woodlake are slightly different. The criterion on the number of paths on distributor roads is derived from the *Ellenbrook Structure Plan* (Roberts Day Group 1995); thus it is only applicable to Woodlake. The criteria applicable only to Joondalup include having bus access to local facilities, intersecting bus routes with cycling and walking, as well as incorporating a pedestrian system and a road system. They are included in the *Joondalup Centre Development Plan* (Shrapnel Urban Planning 1982). This difference in criteria is attached to the planning regimes at the planning and development phases. The regimes will determine programs to address sustainable transport, their priority, how to address them, as well as their timeframe. Needless to say, these factors influence the concerns about connecting ends with means in attaining desired outcomes (Fenna 1998). This is where a policy plays its role as a guide how to achieve goals and preferred targets for the benefit of stakeholders.

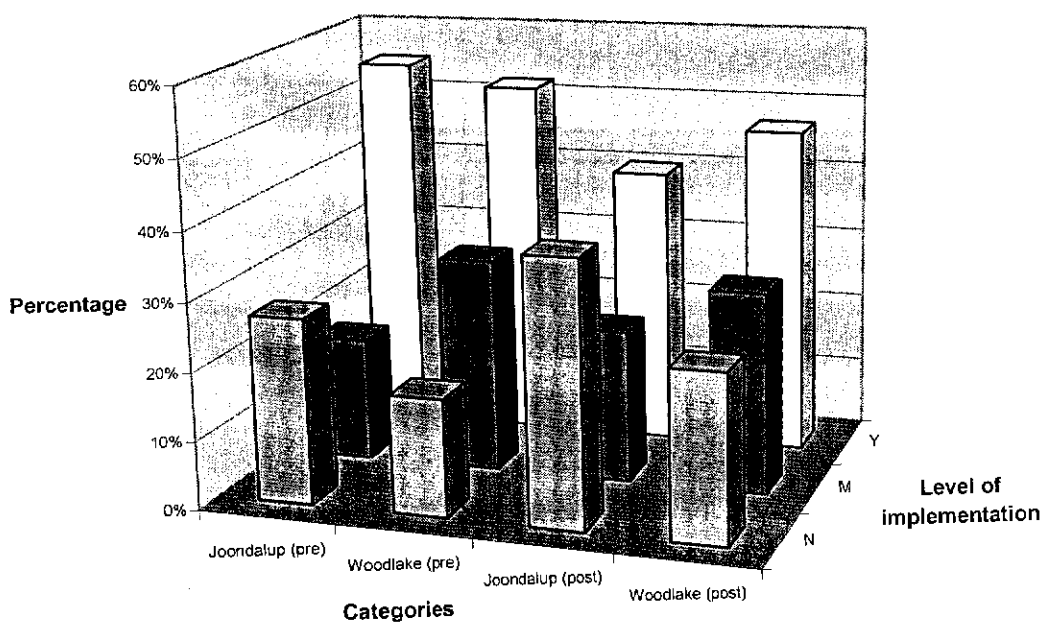
So, the key findings of this section are firstly, policy evaluation is continuous. It does not stop at Woodlake as benchmark of sustainable residential development. It is to provide information and direction to change the policy, if need be, so that it comes closer to the set goals. Secondly, subsequently, evaluation criteria have been modified and added to augment effort towards attaining sustainable development in transport sense by giving clearer guidance and more action-orientation. Lastly, the

planning regimes have roles in formulating policies for sustainable development as discussed above.

6.5.2. The Extent of Implementation of Evaluation Criteria

Joondalup and Woodlake have satisfied evaluation criteria from policies existing at the time of planning and after the development phase to a certain extent. Overall, both case study areas measure up well with policies present at the time of their planning and development phase (Figure 6-10). Joondalup performs slightly better than Woodlake (55% of the criteria fully fulfilled compared to 52% for Woodlake). Joondalup performs more strongly than Woodlake in relation to the road network and public transport criteria, while Woodlake performs better in relation to the cycling and walking. Joondalup and Woodlake have satisfied most of these evaluation criteria.

Figure 6-10: Comparison of implementation of evaluation criteria drawn from policies extant at the time of planning and after the development phase in Joondalup and Woodlake.



(pre): Evaluation criteria drawn from policies present at the time of planning and development phase; (post): Evaluation criteria drawn from policies present after the development phase; N: The evaluation criterion is met by less than half the suburb; M: The evaluation criterion is met by most parts of the suburb; Y: The evaluation criterion is met across the suburb

When suburbs were measured against new criteria from policies post planning and development phase, as expected, their level of fulfilment drops (Figure 6-10). However, Woodlake measures up better than Joondalup (47% of the criteria fully fulfilled compared to 40% for Joondalup).

Given the relatively recent development of Woodlake, it is not surprising that it performs well against the given local criterion. Since the case study areas are at local level, the level of measurement of policy implementation is local too. Hence, urban structure and self-containment (which require a higher scale of metropolitan centres such as at a regional level) as discussed in Chapter 2 were discussed briefly although these two factors are strategies to attain sustainable development (Cervero 2001; Newman & Kenworthy 1999; Newman, Kenworthy & Vintila 1992).

However, it is useful to assess the suburbs against current policies because the level of performance can be enhanced to satisfy current new standards or public expectations using each case study's own opportunities and strengths to improve their transport condition towards sustainable development. Improvement can be achieved by promoting public transport and non-motorised modes and by improving facilities and services, both in quantity and, especially, in quality. Joondalup and Woodlake both have the potential to improve cycling and walking access, at least for leisure and health if not for transport modes to work considering there is inadequate local employment, especially in Woodlake. In Joondalup, although the regional centre is only approximately 1,300metres away, most residents (86% based on Figure 6-4) work outside the centre. Some local residents perceived that both Joondalup and Woodlake have attractive streetscapes (25% and 36% respectively); both suburbs have paths providing access to open spaces. The interview with the private planning consultant 2 indicates that these strengths encourage people to walk or cycle to enjoy the scenery. At the same time, it is very difficult to encourage walking and cycling as transport modes for journeys to work if there are no employment opportunities within the walking and cycling distance (no more than 1km and 5kms respectively).

6.5.3. Conduciveness of Transport Elements to Sustainable Development

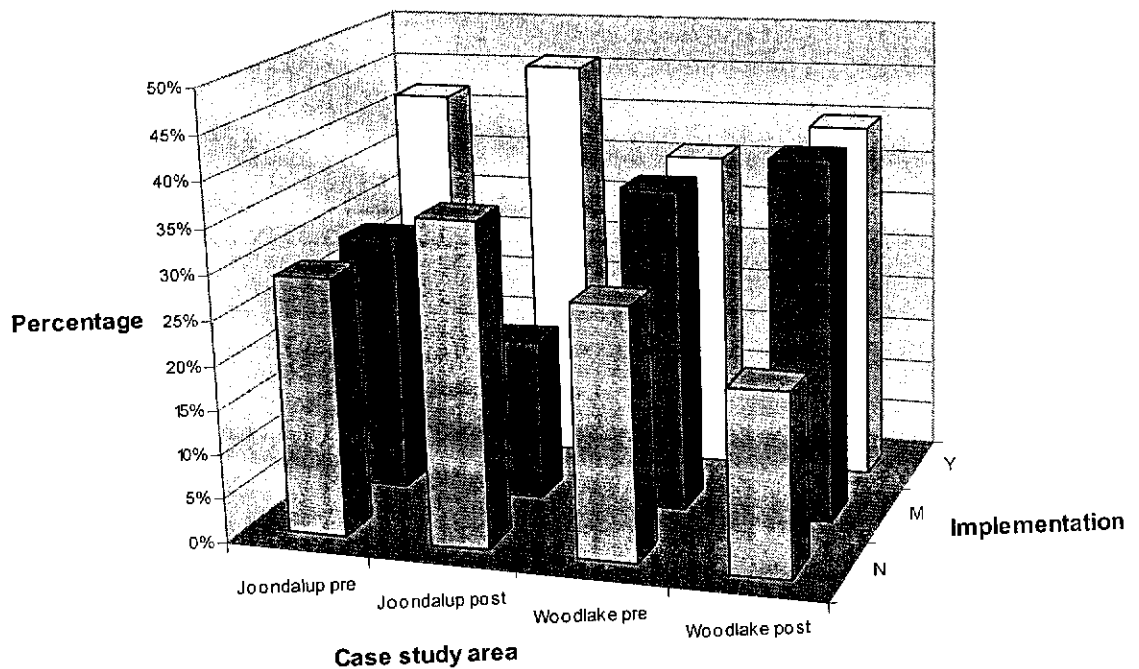
Among all evaluation criteria in the selected policies for Joondalup and Woodlake extant at the time of the planning and development phases and policies published after the development phase, some are more conducive to transport for sustainable development than others.

From policies extant at the time of Joondalup and Woodlake's planning and development phase, the top conducive criteria for transport toward sustainable development comprise public transport provision network, direct and regular bus routes to local facilities as well as to employment centres. These criteria are met better by the Joondalup suburb. Thus, it is not surprising that the ABS data in Chapter 4 shows that public transport use in Joondalup (5.2%) is much higher than in Woodlake (1.3%). Consequently, car use is higher in Woodlake (74.2%) than in Joondalup (67.9%). In fact, using the car costs more than taking public transport. This high-cost car use in Woodlake is supported by its residents' income (median weekly income is \$900-1099) which is higher than Joondalup (\$800-999). From policies present at post Joondalup and Woodlake's planning and development phase, the top conducive criteria cover interconnected street networks, preferred walking distance between a neighbourhood centre and its perimeter, potential bus stop locations and access. This time, Woodlake performs better than Joondalup. The street network for motorised and non-motorised transport modes is much better interconnected in Woodlake; its neighbourhood centre is more accessible to local residents; public transport access is easier especially near the centre. This may be why usage levels of cycling and walking in Woodlake are slightly higher than Joondalup (cycling is 0.2% and 0.1%, walking is 1.4% and 1.3% respectively).

Figure 6-11 sets out the implementation level of conducive criteria in Joondalup and Woodlake before their planning and development phase. It shows that from this 'qualitative' analysis, Joondalup suburb performs much better than Woodlake. The transport elements in Woodlake have not been well developed although they have been subsidised to a certain degree since it is a much newer residential development than Joondalup. Also, it is a result of Woodlake's 'leap-frogged' development, its location/ proximity to regional centres serving it at the moment, and its surrounding land-uses.

After the planning and development phases, implementation is slightly higher for Joondalup (Figure 6-11) since the 'Y' value is high. However, the researcher thinks that Woodlake is better since its 'M' value is much higher than Joondalup's. For Woodlake, the implementation level after the phases is slightly higher than before it. This trend is different from when evaluation criteria were analysed 'quantitatively' with no ranks. This may be because Woodlake was designed ahead before ideas in the criteria were included in legal documents. In other words, its planning was beyond policy framework and its planner and developer had long-term programs. In short, the graph indicates that there is still much to be done in Joondalup and Woodlake (especially) for transport toward sustainable development.

Figure 6-11: The comparison of implementation of top conducive criteria drawn from policies extant before and after the planning and development phases in Joondalup and Woodlake.



pre: Before the planning and development phases; post: After the planning and development phases; N: The evaluation criterion is implemented in no more than half the suburb; M: The evaluation criterion is implemented in most of the suburb; Y: The evaluation criterion is implemented across the suburb

By comparing Joondalup's performance to that of Woodlake, the evolution of policies applied to the suburbs which were planned nearly two decades apart could be identified. It signifies that there is an effort to improve policy documents by taking on board new ideas on transport for sustainable development to enhance people's quality of life over time. Also, past experience can be used or analysed at the present to be used for future policies or further reference.

If the transport evaluation criteria included a consideration of a strategic context rather than within the Joondalup and Woodlake alone, the outcome in terms of analysis would be different. Within the context of urban planning in the Perth Metropolitan region (PMR), Joondalup and Woodlake become parts of a polycentric net city; the Perth CBD as the main centre, while Joondalup and Woodlake are the linear cities within the North-West Corridor (NWC) and North-East Corridor (NEC) respectively. Including criteria for urban form and urban structure as discussed in Chapter 2 may result in the Joondalup suburb being more sustainable than Woodlake although Woodlake has a neighbourhood centre with more varied functions.

The Joondalup suburb would be more sustainable since within the NWC, the Joondalup Regional Centre is more developed than Ellenbrook as a district centre in the NEC. This condition benefits the Joondalup suburb since it is located approximately 1,300metres north of the centroid of the City Centre. This City Centre is surrounded by residential development such as Currambine, Connolly, and the Lakeside. It provides a variety of facilities (such as tertiary education, a hospital, a library, and business centre) to facilitate employment growth, and has public transport stations (train and bus). The City of Joondalup as the local government and Joondalup Development Corporation (the then LandCorp) as the developer have planned the Centre with improved public transport service to attract people to get to this major centre (Western Australia Department of Planning and Urban Development 1990a).

Unlike the Joondalup suburb, Woodlake is a result of a 'leap-frogged' development which does not benefit Woodlake for employment and community activities are not located nearby (such as tertiary education, business headquarters, and public transport stations). Rather than being surrounded by residential development unlike Joondalup, Woodlake has the state forest and rural areas where population is

relatively low. This low population inhibits the creation of employment nodes within the Corridor (Western Australia Department of Planning and Urban Development 1994). Therefore, Woodlake or Ellenbrook as a whole is not self-sufficient as the Joondalup Centre. However, Woodlake has a neighbourhood centre. At the centre, there are places of worship, a community centre, an amphitheatre (for social purposes); a shopping centre, convenience shops, delis (for economic purposes), as well as parks and a lake (for environmental purposes). The future town centre located north-west of Woodlake which will be the major commercial centre for the NEC (Western Australia Department of Planning and Urban Development 1994) may help Ellenbrook become more self-sufficient regarding employment. Hopefully, this future centre, amplified by the future extension of the rail network and national highway, will increase regional accessibility and reduce car dependency.

The provision of facilities and service, land-use intensification, and the planning of urban form and structure make an area more self-contained. This self-containment reduces the need for travel for unnecessary activities, reduces travel distance, increases the sense of community, reduces consumption of non-renewable resources, puts less pressure on the Earth, and sustains economy viability of public transport enterprises. These cover the triple-bottom-line of sustainable development: the economic, environmental, and social spheres. Thus, urban form, land-use intensification, as well as land-use and transport integration are conducive to transport for sustainable development within a wider context of urban planning. It should be noted that it takes a long time (four decades in Curitiba, Brazil) to the integration of land-use and transport (Cervero 2001).

6.6. CONCLUSIONS

The first section sets out the relationship of indicators and evaluation criteria for transport toward sustainable development used in this study. Evaluation criteria are a means of addressing and facilitating indicators. The implementation of criteria impacts on indicator results; results can be monitored overtime to gauge the progress of implementation. Nevertheless, since this study focuses on implementation of policies for residential development for transport toward sustainable development, evaluation criteria, rather than indicators, drawn from selected policies were chosen.

The next section continues with the implementation of the selected evaluation criteria derived from policies in Joondalup and Woodlake before and after the planning and development phases. Based on the former period, across the suburb, Joondalup performs much better (especially in public transport terms) than Woodlake. On the other hand, based on the latter period, across the whole suburb, Woodlake performs better. The road network is much more interconnected by having fewer culs-de-sac and connecting some cul-de-sac heads with cycling and walking paths. Both suburbs rationally perform better evaluation criteria drawn from policies extant before than those drawn after since it is very difficult to satisfy non-existing factors.

Then the evaluation criteria were ranked 'qualitatively' based on their conduciveness. It was not very easy to rank a wide range of evaluation criteria as they are co-dependent; one may become a success only if sustained by others. For example safe cycling and walking networks are dependent on traffic calming and development fronting all streets. From the analyses, both suburbs especially Woodlake are still a long way from transport toward sustainable development. Before the planning and development phases, Joondalup's fulfilment of conducive criteria for transport toward sustainable development squares with transport patterns. According to the first household questionnaire survey, fewer people took cars and more took public transport, cycled and walked. After the planning and development phases, Woodlake is slightly better in fulfilling its conducive criteria. It is especially since roads are interconnected, and cycling and walking paths are available. This interconnection squares with the findings when evaluation criteria were evaluated 'quantitatively'.

The road interconnection, a suburb's proximity to centres (such as commercial, employment, and entertainment), land-use in surrounding areas, as well as provision of public facilities and service in an area impact on people's travel behaviour and the type of transport mode used by them. In other words, behaviour is affected by how the suburb was planned and designed.

When these case study areas are evaluated at a strategic level (the regional level) in the context of urban form, Joondalup suburb performs much better. It is located approximately 2kms away from the Joondalup Regional Centre, unlike Woodlake approximately 12-14kms away from Midland and Morley regional centres. Land-use

around Joondalup suburb (residential, open space, business and commercial uses) is more mixed than Woodlake (forest, and low-density housing). Woodlake's unsatisfactory performance is also due to its 'leap-frogged' development, its proximity to commercial centres, land-uses around its area, and being a new residential development. Rather than due to a demographic profile, residents' travel behaviour is more due to an insufficient network or local infrastructure and services. Proper land-use and transport management in residential development will reduce the need to travel far or to commute and make this suburb more sustainable in transport terms.

7. CONCLUSIONS AND RECOMMENDATIONS



7. CONCLUSIONS AND RECOMMENDATIONS

This chapter closes this thesis focusing on policy evaluation leading to transport for sustainable development in residential developments in the suburbs of Joondalup and Woodlake by using policy evaluation criteria. It answers the research questions posed in Chapter 1 and proposes some recommendations for improving policy implementation as well as for improving transport towards sustainable development. These recommendations can be used for further study or research in evaluating the implementation of the recommendations.

The recommendations are addressed to the City of Joondalup and the City of Swan particularly and to other local governments generally. Also as later shown in conclusions, since some evaluation criteria have been implemented to a certain extent, recommendations are applicable to objectives that have not been implemented. They depend on emphasis and consideration taken into account by policy evaluators and factors influencing decision-making. The breadth of the scope is mainly on transport but its related issues are acknowledged. Nonetheless, it is recognised that sustainability issues are far more than transport. Thus, agencies included in recommendations are not merely from pure transport areas.

Finally, this chapter is to address the research questions:

1. Have transport elements in policies for residential development in Western Australia (WA) been implemented on the ground in the Perth Metropolitan Region (PMR)?
2. To what extent have transport elements been implemented at local level?
Why?
3. Why have transport elements not been implemented as they are planned?
4. Are transport elements conducive to sustainable residential development?
Why?

These are now addressed in the following sections.

7.1. HAVE TRANSPORT ELEMENTS IN POLICIES FOR RESIDENTIAL DEVELOPMENT IN WESTERN AUSTRALIA (WA) BEEN IMPLEMENTED ON THE GROUND IN THE PERTH METROPOLITAN REGION (PMR)?

With a range of policy documents analysed in Chapter 5, it is necessary to analyse whether they have been implemented on the ground in the PMR in order to measure the effectiveness and potentials in moving WA to sustainable development in transport terms. The implementation of the transport elements or evaluation criteria is dependant on the period of policy documents publication: before or after the planning and development phases of case study areas and on which category case study areas are measured against: the road network, public transport, cycling or walking.

Thus in brief, the answer to this research question is that transport elements in policies aiming at sustainable residential development in WA have been implemented in Joondalup and Woodlake to a certain degree; some elements have been implemented fully, some have not. The details are elaborated in the following sections.

7.2. TO WHAT EXTENT HAVE TRANSPORT ELEMENTS BEEN IMPLEMENTED AT LOCAL LEVEL? WHY?

In relation to policies in place at the planning phase, Joondalup measures up well on criteria for the road network and public transport while Woodlake on criteria for the road network, cycling and walking. At that phase there were only four evaluation criteria on bus facilities and services (for example preferred space between bus stops, and services to employment centres) for Joondalup. Nearly all of them were implemented across the suburb. Also, there were three evaluation criteria on preferences over T-junctions and roundabouts, one-road-access lots, and no short

cuts across the suburb. These three are categorised as the road network and implemented across the suburb.

The differences in their performance occur due to different emphasis and consideration taken into account by planners of each suburb based on available policies. In other words, it depends on social, political, and economic options of target groups (Howlett & Ramesh 1995). In the case of Joondalup, the interview with the private planning consultant 1 in 2002 indicated that planners had followed guidance on the road network and public transport in available policies; while for Woodlake, its planner had translated guidance on the road network, cycling and walking into Woodlake. Unfortunately, the translation of the public transport criteria did not work very well due to Woodlake's distant and secluded location from other residential development and public transport stations in the PMR.

Unlike Woodlake, Joondalup does not meet criteria for the cycling and walking well since more detailed policies on the non-motorised transport modes were published after its planning and development phase. The arrival of new detailed policy evaluation criteria gave Woodlake an advantage or more guidance in addressing walkability within the suburb to local facilities. Walkability is one strategy to overcome automobile dependency towards a more sustainable development (Newman & Kenworthy 1999; Newman, Kenworthy & Vintila 1992) and is a way to greening urban transport (Garbrecht 1990).

At this point, it can be concluded that overall, based on transport elements drawn from policies in place at the planning phase, Joondalup and Woodlake have implemented the evaluation criteria across the suburbs to a certain extent. But Joondalup measures up better than Woodlake in terms of transport for sustainable development. Joondalup has implemented slightly more evaluation criteria (55%) than Woodlake (52%).

In relation to policies in place after the planning phase, it also can be seen that Joondalup performs better on the public transport, whilst Woodlake performs better on the road network and on the public transport. The shift of categories met by Joondalup (from the road network and public transport at its planning phase to the public transport after the phase) may have taken place on account of more new criteria for the road network (twenty-seven items) and public transport (ten). On the

other hand, the shift of categories performed well by Woodlake (from the road network, cycling and walking at its time of planning to the road network and public transport after the phase) is possible since there are only a few new evaluation criteria for the public transport (two items), cycling (one) and walking (two). Hence, it seems unjust to judge that Woodlake has performed well on these three categories. It also seems unjust to judge that Joondalup has performed well on the public transport with a wider range of new criteria. Nonetheless, if the level of performance is determined only by using the percentage approach, it is clear that Woodlake is considered more sustainable transport than Joondalup after their planning and development phases (39% for Joondalup and 47% for Woodlake). On the other hand, if the level of performance is judged taking into consideration the number of criteria performed, Joondalup can be considered more sustainable than Woodlake after the development phase because it has more new evaluation criteria.

In brief, it can be said that according to total transport evaluation criteria derived from policy documents published after the planning and development phases of these suburbs, the criteria have been met by each suburb to a certain degree. Woodlake performs slightly better than Joondalup (47% and 39% respectively). But the difference is greater than the implementation of evaluation criteria drawn from policies extant at their planning and development phase. The difference indicates that within nearly two decades (from the planning of Joondalup to the planning of Woodlake), policy evaluation criteria have increased in quantity as indicated by the presence of some new criteria. This evolution is addressed in the next section.

When the collection evaluation criteria were ranked based on their conduciveness to transport toward sustainable development, the tendency of implementation in the Joondalup and Woodlake suburbs is similar. From policies extant at their planning and development phase, Joondalup (42%) performs the top few conducive criteria better than Woodlake (36%), but based on new evaluation criteria drawn from policies published after their planning and development phase, the positions were reversed; Woodlake performs better. Although Joondalup achieved 46% and Woodlake 40% of the conducive criteria across the suburb, the researcher believes that Woodlake is better in this case since Woodlake performs 40% of the criteria in more than half the suburb (the 'M' category) while Joondalup only performs 18%.

In Woodlake based on evaluation criteria drawn from policies after the planning and development phases, its level of 'qualitative' analysis (40%) is lower than its level of 'quantitative' analysis (47%). These different levels of implementation manifested themselves since in the 'quantitative' analysis, the evaluation criteria were not ranked unlike in the 'qualitative' one. In the 'qualitative' analysis, the top few conducive criteria are concerned about the public transport, the public service which Woodlake lacks of.

Woodlake's performance is also related to its location. When Woodlake was evaluated using a strategic context or an urban form, its location, proximity to commercial and employment centres, the extent of mixed-use in surrounding areas, as well as transport facilities and service were not as good as Joondalup suburb. Joondalup is better for it is located approximately 1,300metres from a state project, the Joondalup City which will be the second city after Perth, thus the researcher believes that more resources (human resources, funding, and time) have been dedicated for its success. Resources availability is crucial in succeeding projects as (Blowers 1994) believes: " policies for sustainable development can only be achieved if there are resources to back the commitments ..." (p. 17). Public facilities and service are likely to be more varied with land-use and transport more integrated. Furthermore, the researcher also believes that public transport is better in Joondalup as there are many suburbs on the northern side. Unlike Woodlake, there are only a few suburbs on its eastern side so transport has to link those suburbs to Perth as the centre of a polycentric net city.

In short, sustainable development as regards to transport is still a long way off for Joondalup and particularly for Woodlake.

For these conclusions, some proposed recommendations are:

1. Policy objectives should be ranked in terms of their significance or importance.

As shown in conclusions abovementioned, judging a level of implementation based on quality performance is more rationale than that of quantity. Thus, ranking significance of policy objectives is necessary. The ranking would help land developers and planners facilitate creation of vibrant communities. They will know which objectives are more significant to community's quality of life. Where situation

at that time does not favour, lower-priority objectives can be postponed or withheld. However, there should be ways of trading offs or alternatives. Values of trade offs should be at least the same as, if not greater than, values of the objectives that cannot be fulfilled.

2. Development should be continuous rather than leap-frogged in order to have a continuous transport flow and non-solitary communities.

As we can see from Woodlake and Joondalup examples, leap-frogged development provides inadequate and unsatisfactory public transport service to local residents. Thus, residential development should be linked with other residential development. One possible link is commercial development in between. By having continuous development, service providers have adequate patrons to be served; thus they can survive in running their business. In this way, both parties (users and providers) are satisfied; demand and supply match. Where it is impossible to have a link, a self-supported community would be preferable. They still need to interact with other communities, though.

7.3. WHY HAVE TRANSPORT ELEMENTS NOT BEEN IMPLEMENTED AS PLANNED?

Certainly, answers to this question are interrelated to other stages in the policy lifecycle process besides the policy implementation stage. What happens at that stage is attached to the policy formulation stage and conditions on the ground.

To begin with, some policy objectives are contradictory or conflicting (Roberts 1990), inconsistent across policy hierarchy, and do not have the right choice of wording in particular that policies such as *AMCORD* have inappropriate wording. A contradiction between policy documents at different levels (Australian Broadcasting Corporation 2002) occurs between *Green Street* (at the national level) and *LNCDC* and *Policy Manual* (at the state level). The former allows a cul-de-sac to serve more than twenty lots; on the contrary, the latter two suggest that a cul-de-sac should serve no more than twenty lots. Since in WA the decision on residential development application is dealt with at the state level instead of at the national level, this contradiction is insignificant at this time. Conflict between policy objectives

(Lindblom & Woodhouse 1993; Patton & Sawicki 1993) may also explain why some policy objectives have not been implemented.

Secondly, policies have flexible broad goals (Birkland 2001) that can lead to ambiguity and misinterpretation (MacLennan 1981; Quade 1982). Some objectives in *AMCORD* and *LNCDC* are ambiguous by including subjective words such as 'safe' and 'convenient'. Different people perceive and address safety and convenience in different ways.

Thirdly, the existence of different policy evaluation criteria at the time of the planning from those after the development phase could explain why some transport elements have not been implemented. On this basis it is possible that Joondalup and Woodlake are unable to meet new criteria extant after their planning and development phase.

Since Joondalup and Woodlake were planned and developed nearly two decades apart, the differences between evaluation criteria extant within these periods are apparent. Woodlake had a wider range of evaluation criteria at its planning and development phase than Joondalup. This demonstrates that policies have been evolving and are being updated over time even after development has been completed. New policy evaluation criteria need to be challenged regarding their potential in moving new development towards the desired development: sustainable development. Inevitably, assessing the Joondalup suburb today means taking into account new policy criteria published after its planning and development phase since it was planned and developed nearly twenty years earlier than Woodlake.

Then there is the difference in the increased number of new evaluation criteria present after the development phase in both suburbs. This increased complexity of issues in the arena of sustainable development. Nonetheless, the increased number in quantity does not automatically mean that quality is increased. It takes longer to enhance quality than quantity. Although the number (quantity) and value (quality) of evaluation criteria have been improved over time, it was found that they were within the same framework and showed only a slight change. It may indicate that the evaluation criteria were planned ahead, too general, or did not go far enough. It may be proof that it takes time to improve the quality of evaluation criteria.

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Next, policy implementers have inadequate resources to implement policy objectives. The resources that policy implementers lack of are not limited to funding, but also include human resources (quantity and quality) as identified by a public planning officer 1 in a semi-structured interview conducted in 2002. Besides transport, there are other policy objectives to fulfil (for example revitalisation, historical building preservation, indigenous issues, crime and safety); each requires certain amount of funding. It is not a simple matter to dispense limited financial support to appease the needs of all objectives. For this reason, funding is dispensed on a basis of the level of priority and/or importance, and of available human resources at the time of implementation (Blowers 1994).

Lastly, there are times when trade-offs in policy implementation in Joondalup cannot be overlooked. A case in point is a trade-off between public transport and car use. Although public transport is considered low-cost, environmentally friendly, it is not a flexible service (in terms of time and routes), and is time consuming due to waiting time for interconnection. On the other hand, people have an alternative choice, driving a car. This has the opposite nature of public transport services.

The decision on trading-off relies on the situation on the ground; whether the situation supports or opposes the trade-off. There are also priorities of policy objectives, and on whether benefits will compensate costs. Not all trade-offs can be considered good or bad. In actual fact, there is no right or wrong in discussing policies because they are between right and wrong in a grey field.

Several recommendations for the conclusions include:

1. Different policies at state level should be based on common and unanimous principles, as well as involve community representatives, local governments, consultants, and WA Municipal Association (WAMA); depending on the topic discussed. Thus, (often conflicting) agencies may go in the same direction in realising transport for sustainable development.

This recommendation will be more effective if carried out at the state level with an umbrella agency, such as Department for Planning and Infrastructure. The state level is recommended because policies for residential development are formulated at this level. Recently, common or general principles have been incorporated in the *Western Australian State Sustainability Strategy (WASSS) 2002* under sustainability

framework section (Sustainability Policy Unit 2002). All policies should be within the framework to mitigate conflicts or contradictions.

Besides possible contradictions, another difficulty in adopting common principles is lack of skills and knowledge in interpreting them. This shortage leads to individual interpretation; one person could interpret them differently, as pointed out by the public land developer 1 and 2: "... relatively inexperienced people applying policies but not having ... the ability"; this would lead to uncertainties. Hence, guidance or standardised guidelines for interpretation should be made available. Interpreting principles differently also happens because common principles are flexible. Flexibility in interpreting principles is essential to adapt policies to real conditions since different areas have different circumstances with uncertainties. The greater the uncertainty is, the higher the flexibility will be. Flexibility allows different areas for having their own ways to satisfy policy objectives; bear in mind that there are many ways to address one objective. It is the same as translating sustainability principles into action. Flexibility allows for creativities to emerge but should be within unanimous principles. It also welcomes uniqueness as each area has its own strengths, weaknesses, opportunities, and threats (SWOT).

2. Policy documents should use appropriate words to mitigate misinterpretation and non-implementation.

The use of appropriate wording may avoid misinterpretation of policy objectives and their evaluation criteria. Although criteria are implemented, they may lead to undesired outputs. A case in point is the use of words 'bus routes' and 'bus stops' in *AMCORD*, as pointed out in the conclusions. In that policy document, it is desired to have accessible bus routes and dwellings with potential catchment from bus routes. In fact, an accessible bus stop is more meaningful than an accessible bus route since a bus stop, instead of a bus route, is a gate to bus services. Thus, if these two criteria are implemented across the suburbs, they will not meet desired outputs compatible with the public transport use promotion to reduce car dependency.

It is also wise to minimise subjective words such as 'safe', and 'convenient'. They could lead to uncertainties as identified in the analysis and conclusions chapters. This situation could be mitigated by providing more guidelines or criteria for

achieving such a condition. More guidelines are needed where there are more uncertainties (qualitative or quantitative ones).

3. Policy objectives should be translated by a lower-level agency to minimise conflicts.

As identified in the analysis and conclusions chapters, conflict appears in different policies between a same level and at different levels (between *Greet Street* and *LNDCD* as well as *Policy Manual*). One level allows a cul-de-sac to serve more than twenty lots while the other disallows. One way to mitigate a conflict or contradiction between objectives is by translating policy objectives set by a higher-level agency to a lower-level one. However, the opportunity of a lower-level agency to express its voice should always be made available. Lower-level agencies should be able to voice their needs and conditions, and then give inputs regarding policy making to a higher agency. Inputs are important for policy makers in reviewing policy documents and hopefully conflicts will erode. In this way, communication occurs both ways.

4. Policy players to organise trainings to minimise conflicts between interpretations of policy objectives and to enhance quality of human resources.

As has been identified at interviews and in conclusion chapter why some transport elements have not been implemented, there are lacks of qualified human resources interpreting policies. Thus, trainings for local governments are needed especially since they are the ones who assess development applications. Trainings can be organised with other local governments (LGs), Local Government Association (LGA), WAMA, DPI, and other related organisations at local, state, or higher levels. In so doing, they can share knowledge, experience, and ideas. Indirectly, organised trainings will develop constructive environment; thus realisation of better policies (in the making and implementation) is possible.

7.4. ARE TRANSPORT ELEMENTS CONDUCTIVE TO SUSTAINABLE RESIDENTIAL DEVELOPMENT?

WHY?

Transport elements in the selected policy objectives are conducive to sustainable development to a certain degree, even though some policy objectives are overlapping, contradictory, and inconsistent.

Based on analyses in Chapter 6, there are evaluation criteria conducive for the transport towards sustainable development. The top criteria include the interconnected street networks, potential bus stop locations, good services of public transport network, and integration between road users. These criteria are some of the major issues in cities, including Australian cities, where the use of an automobile is a necessity (Newman & Kenworthy 1999; Newman, Kenworthy & Vintila 1992). These criteria are considered conducive to transport for sustainable development. They aimed at:

1. Improving the practice of urban development for social justice or intra-generational equity (Newman & Kenworthy 1999; Newman, Kenworthy & Vintila 1992) or sustainable development principles.

Bus stops, local community activities, trip attractors should be safe and within cycling and walking distance from dwellings to embrace those who are transport disadvantaged. Safety could be addressed by putting traffic calming devices in place, limiting culs-de-sac, designing development to face streets, and segregating non-motorised from motorised vehicular traffic. Enhancing the public transport network with its route diversities and regular service is aimed at a better connection with activities that are not local in nature. Another example of improving social justice is taking into account transport network distance from a neighbourhood centre.

2. Improving the practice of urban development especially regarding environment criteria (Newman & Kenworthy 1999; Newman, Kenworthy & Vintila 1992).

Due to Woodlake's fringe and detached location from other residential development, residents are heavily dependent on cars (based on the first household questionnaire survey). Thus, a car is driven to other parts mainly within the PMR. It contributes noise in another place and puts pressure on the authorities to provide more roads especially freeways and parking facilities (Newman, Kenworthy & Vintila 1992). It causes loss of open space. Hence, the location of community activities is conducive to transport for sustainable development.

3. Improving the practice of urban development for people's liveability (Newman & Kenworthy 1999; Newman, Kenworthy & Vintila 1992).

This liveability is related to inter-generational equity as long as people live. The liveability includes traffic-calmed streets, public safety including visual surveillance from surrounding development, street lighting, potential threats (such as at the underpass in Joondalup and dense landscape in Woodlake), frequency and distance of bus service, as well as access to bus stops and public transport stations.

These criteria address a main objective of sustainable development: controlled consumption of limited natural resources to support the Earth's carrying capacity as a precaution for intra- and inter-generational equity to achieve a strong sustainability.

Improved public transport services in addition to the interconnected road network is significant because its service carries more people at the same time on a longer journey in a relatively shorter period than any other transport mode except the car in terms of speed and distance. Besides, public transport provides a service to people with disabilities, the aged, and the very young. Accordingly, it is apparent that public transport supports sustainable development, especially inasmuch as a full-occupied public vehicle consumes less fossil fuels than private motorised modes. In this way, the Earth's carrying capacity and equity or sustainable development approach and principles are integrated. But public transport efficiency needs to be supported by road network system and design. An indirect and poorly interconnected road network will result in public transport services being time consuming and uncomfortable for passengers.

Based on analyses of Joondalup's and Woodlake's evaluation criteria within a wider context of urban planning in Chapter 6, it is apparent that urban form, urban structure, mixed land-use, as well as land-use and transport management play significant roles in moving residential development to sustainable development, especially in transport terms. They offer a range of employment opportunities that are beneficial for employment security (the economic and social spheres). They also impact on travel patterns that reduce the pressure on the Earth's carrying capacity (the environmental sphere). These two offer an opportunity to build a sense of community (the social sphere).

Some recommendations for the situation incorporate:

1. Coordination between related policy players and affected groups in terms of the timing and location of facilities provision is important.

This coordination issue was revealed at an interview with the private planning consultant 2: "... there is a very little coordination between government agencies and levels of government in terms of policies". Yet, the coordination process increases interdependency among implementing agencies. This coordination process may lead to efficient work rather than 'band-aid' (Gilman & Fedale 1996) or 'cosmetics' (Hillier 2002) works. In the future, agencies will consider more factors such as in terms of safety in the planning phase. A successful coordination could mitigate a domino effect or a chain reaction. Lacks of safety may deter people from using public transport facilities and services. In return, people would prefer driving cars; thus car dependency remains high and fossil fuels usage keeps soaring. Consequently, in this example, sustainability stays in a distance.

2. Future residential development needs to improve the practice of urban development for social justice or intra-generational equity for people's liveability by not neglecting environment, particularly natural one.

This improvement, as explained in the first part of this chapter, is parallel with values in sustainable development and complies with its objective: managed consumption of limited natural resources to uphold the Earth's carrying capacity as a precaution for intra- and inter-generational equity to enhance humans' quality of life. Some solutions are by improving public transport service and facilities for all

users like Joondalup especially in fringe areas like Woodlake, and by integrating needs of road users. Another one is interconnecting road network in a preferred urban form and structure. This combination is conducive to transport toward sustainable development and parallel with land-use and transport integration. In other words it is about mixed-use development like the City of Joondalup.

3. Local governments should improve conditions of public transport services and facilities, roads, as well as pedestrians and cyclists facilities.

1. Improve public transport services and facilities.

Bus stops should be provided within walking distance from dwellings; bus frequencies and the provision of shelters need attention. As Woodlake has its infrastructures and road network ready, there is an opportunity to increase public transport usage once bus frequencies have been enhanced. Currently, there is inadequate population to utilise the services in Woodlake. Consequently, service providers may be reluctant to run their business with no profit unless they adopt deficit financing in the beginning of the service. Hence, it is recommended that the public sector could (cross-) subsidise the service. Alternatively, financial support could be from advertisements at bus shelters.

In Woodlake, bus stops are supported by Woodlake's interconnected road network. Unfortunately, their distribution is imbalanced, particularly in the northern and south-eastern parts of Woodlake. Another enhancement needed in Woodlake is increased bus frequencies and shelters. With its current inadequate population, additional bus frequencies are unlikely in the near future but an increase in the number of shelters instead of bus stops (orange poles) is necessary for patrons' comfort. Bus shelters should be provided from Woodlake towards Coolamon (another village next to Woodlake) as the distance between two shelters between these two villages is more than 800 metres.

2. Interconnect roads.

This interconnection will reduce trip length and petrol consumption, minimise turnings, and driving time. In the City of Joondalup, roads and paths interconnection will occur after culs-de-sac are interconnected. Although LGs have the authority to

buy houses at the end of culs-de-sac, buying houses to enhance road interconnection need financial support. Moreover, residents will likely reject it as it is related to compromising their values. It is in line with a governmental developer's opinion as mentioned by the public land developer 2. Residents have chosen where they have lived for a long time inasmuch as they have found values that they want. This happened in the City of Joondalup, in neighbouring suburbs close to Joondalup the case study area. Residents strongly opposed an LG's plan whose aims were to improve road interconnection, road extension, pedestrians and road laneways, as revealed by the public planning officer. Thus, it is preferred to upgrade the suburbs gradually where possible and to learn from what we have done to the suburbs.

3. Interconnect cycling and walking paths.

In Joondalup and Woodlake, a pedestrian ramp rather than stairs is preferable to interconnect some culs-de-sac to main roads. Unlike stairs, a ramp can be used by both the disadvantaged and advantaged groups. Currently, some main roads and access ways are disconnected due to topographical constraints. After they are interconnected, people (including the disabled) can reach a bus stop within a shorter distance and period of time than before. This condition can increase bus usage, walking and cycling frequency; and at the same time maintain the Earth's carrying capacity and augment equity.

4. Enhance cycling and walking safety.

Safety of road users especially pedestrians and cyclists should be enhanced to create a convenient movement. As currently some dwellings in Woodlake and more in Joondalup have high and solid fences, surveillance of road users is difficult. There are several ways to enhance surveillance; they include:

- Lowering fences which will compromise people's privacy.

This is unlikely as people value privacy highly, as disclosed by the private planning consultant 1.

- Creating non-solid fences.

Openings can be made in parts within people's eye level. This allows residents to see what is happening in the streets and as a result, road users would feel

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safer since they know that they are 'protected'. A non-solid fence for visual surveillance is more likely especially since it has been illustrated in Western Australian Residential Design Codes (Residential Codes Advisory Committee n.d.).

- Constructing more dwellings facing the streets.

This will be difficult in the Joondalup suburb since the researcher believes that it is unacceptable to 'force' residents to change their dwelling's façade. It is possible may be in corner lots in new development. The creation of lots facing the street has the same function as creating non-solid fence.

- Paths should be well lit.

LGs, the City of Joondalup and the City of Swan, should provide and maintain streetlights. Funding would be from their budget or from advertisements on street furniture.

5. Enhance cycling and walking facilities.

As revealed in field observation and the household questionnaire surveys, pedestrians and cyclists need more facilities (for example seats and bicycle racks). Facilities can be made available at parks, shopping/ community centres, schools, and other communal places. Enhancing facilities will make walking and cycling more attractive.

Alternatively, another way to make cycling and walking attractive is by building an entrance to a shared path leading to Currambine train station. At the same time, this new entrance may encourage residents to take public transport (train and buses). At the moment, the condition of the lot at the 'entrance' is very poor; the area is marred by graffiti, broken fences, darkness, and an abandoned landscape.

This lot can be the gate to the train station. On this lot, the train timetable could be displayed; lights could be provided; the landscape should be maintained; and units or local shops should be established behind the entrance for people's daily needs (for example a delicatessen and newsagent) but should be the kind with quick transaction to minimise noise and congestion around the entrance. The crowd may

act as eyes for surrounding dwellings and the shops could function as neighbourhood watch.

This recommendation may increase cycling and walking, attract people to use public transport more, create safety around the area (but at the same time could trigger crime since the presence of more people increases the chance for conflict or different opinions), beautify landscape or streetscape, and create more employment opportunity. The downfalls are that it may raise noise or crowd issues, the City of Joondalup has to channel the fund for the development and its maintenance, and it will return to the current condition if abandoned.

Another way to enhance facilities and services for residents is road medians. These and pedestrian ways in Joondalup need to be widened and provided when needed. Both are to facilitate people with mobility restriction, such as people with prams or wheelchairs, the elderly, the very young, and to address road users' safety. LGAs can widen road medians and pedestrian ways by using road reserves and the funding should come from LGAs.

The above recommendations and alternatives certainly depend on available resources (time, personnel, facilities, and funds), priorities (what we need and what we have), as well as the most important factors: the unexpected (RMIT University 2001) and the will. Sometimes priority needs to be re-set and re-ordered although it might be painful (Rookwood 1994). The implementation, however, relies upon willingness of implementers and recipients to carry out programs. Finally, we have to be ready to face unpredictable uncertainties. They can be political changes (governmental shift), environmental changes (catastrophe, floods, earthquake), social changes (overflowed migration), or economical changes (market downturn, collapse of significant national companies). It is very difficult to change conditions which have been in existence for quite a long time within a short period of time. Evaluating a result of an implementation takes time and the implemented evaluation criteria need to be challenged. Hence, we need to have reasonable expectations.

Taking everything into account, there is (always) space for improvement; "It is not possible to step into the same river twice; other and yet other waters are flowing on" (Daneke 1990, p. 43). Improvement will be beneficial if it is put into action through recommendations. One final comment, we are still on the way to our destination:

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sustainable development, which will be the starting point of yet another never-ending journey. As a physicist Fritjof Capra says "... you never end-up with things; you always deal with interconnections" (Daneke 1990, p. 53).

APPENDICES

Appendix 1: A brief overview of policy proposals and documents for sustainable development.

1. International Policies

At the international level, there are policy proposals and policies to address a wide range of sustainable development issues. They are significant in reducing global warming as a result of greenhouse gas emissions effect.

Rio Declaration

The *Rio Declaration* on Environment and Development was attended by 178 nations in June 1992 in Rio de Janeiro, Brazil (Johnson 1992; Koeyers 1993). It yielded the *Agenda 21*, a global programming tool (United Nations Environment Programme (UNEP) n.d.) leading to global sustainable development (Johnson 1992). *Agenda 21* includes a program on promoting sustainable transport system that recognises land-use and transport integration as well as potential land competition between transport, urban, and other fundamental needs. It favours less polluting transport system, higher occupancy public transport, cycle paths and footpaths (United Nations Environment Programme (UNEP) n.d.). This global programming tool has been utilised by many nations including Australia in a form of the *Local Agenda 21* (LA 21). There is an opportunity that sustainable development will be attained in a better way by utilising Local Agenda 21.

Kyoto Protocol

The *Kyoto Protocol* was formulated at the 1997 third Conference of Parties (COP 3) in Kyoto, Japan only by developed nations (Japan, the United State of America, Europe Union, and Australia). The *Kyoto Protocol* is the summit of Global Warming Climate Change Conference (Kompas Cyber Media 1997) which intends to reduce greenhouse gas emissions in transport sector (that was not discussed in the 1987 *Montreal Protocol*) to $\pm 5\%$ on average below the 1990 level. The *Kyoto Protocol* is very important to slow down global warming that leads to climate change if people do business as usual. Although it is said to slow down global warming, there have been controversies over the *Kyoto Protocol* among developed nations. The US President George W. Bush refused to ratify it because it has been interpreted as a stumbling block to the USA economy. This refusal put the *Kyoto Protocol* in danger. Other nations, including Australia, might not want to ratify it either because they believe that their ratification would not put it into effect since mostly the USA is the one holding the baton.

2. National Policies

Green Street

The *Green Street* was published in 1989 and in 1990 with minor revision by the Joint Venture for More Affordable Housing (JVMAH) because land costs increased and family size became smaller. These conditions certainly altered social structure in the PMR. Consequently, household should be made affordable with size adjusted to family size. Therefore the *Green Street* is significant in providing guidelines for a more extensive choice of cost-effective housing with enhanced facilities and services. Hopefully, affordability will enhance home ownership. However, it should be noted that affordability is relative to people.

Australian Model Code for Residential Development

The *Australian Model Code for Residential Development (AMCORD)*, formulated in 1989 and revised within one year by JVMAH, the then Green Street Joint Venture (GSJV). It was formulated after the awareness of needs for more affordable housing choices while at the same time meeting health, safety, and amenity standards. Like the *Green Street*, *AMCORD* aims at providing more affordable housing with improved residential and environmental quality. It provides general technical requirements (such as utilities, lot siting, roads, and public open space) and is addressed to services agencies, as well as decision makers of development applications.

National Strategy for Ecologically Sustainable Development

The 1992 *National Strategy for Ecologically Sustainable Development (NSESD)* was formulated to augment all generations' interests equally by not abandoning and leaving environment behind. It is significant since it contains guidelines for government for their direction in policy and other decision-making, as well as its comprehensive coverage links one aspect of sustainable development to other aspects. The latter significance takes place because all aspects are interdependent.

National Greenhouse Strategy

The *National Greenhouse Strategy (NGS)*, developed by the Commonwealth Government, is the prime device to meet Australia's international commitment. It has as its focus enhancing understanding of greenhouse issues, limiting greenhouse emissions, increasing carrying capacity, as well as developing

adaptation device. It profiles Australia's greenhouse gas emissions, and recognises the need for transport and sustainable urban planning (for example through integrated land use and transport, as well as encouraging greater use of public transport, walking, and cycling).

3. State Policies

Corridor Structure Plans

There are two corridor structure plans applicable to this study: the 1977 *North-West Corridor Structure Plan*, and the 1994 *North-East Corridor Structure Plan* in which Joondalup and Woodlake are located respectively. They are significant in facilitating foundations of development control, statutory planning, and development stages. Moreover, they are strategic land-use documents in planning how a city with its transport system grows and develops. Thus, these land-use documents have been addressed to servicing and transport authorities, as well as to planners in planning urban development.

WAPC Policy Manual

WAPC Policy Manual, an umbrella policy to control development in WA, includes any kinds of development as well as aspects in urban and rural lives. It acts as standards for the WAPC to refer to for decision-making and guides governmental authorities, servicing agencies, as well as developers in preparing and evaluating development applications. This helps applicants to know what controllers require.

In the 1988 *Policy Manual*, two out of six main topics are relevant to this study ('General' and 'Residential'). The six topics and relevant sections are:

1. General
 - a. DC 1.4 Functional Road Classification for Planning (1988; updated by WAPC in 1998).
 - b. DC 1.5 Bicycle Planning (1990; updated in 1998).
 - c. DC 1.6 Planning to Enhance Public Transport Use (1990; updated in 1999).
 - d. DC 1.7 General Road Planning Use (1998).
2. Residential
 - a. DC 2.2 Residential Subdivision (1988; updated in 1992).
 - b. DC 2.6 Residential Road Planning (1989; updated in 1992, 1998).

3. Rural
4. Industrial and Commercial
5. Land Reserved by the Metropolitan Region Scheme
6. Environment and Amenity.

DC (Development Control) 1.6 'Planning to Enhance Public Transport Use' has been long encouraged during the compact city and smart growth movement in the 1970s as discussed in Chapter 2. The policy aims to optimise use of land near public transport facilities to reduce travel demand and time. This inclusion is in accordance with an awareness to ease increasing fossil fuels consumption (the environmental sphere of sustainability) for inter-generational equity to hold the Earth's carrying capacity.

Perth Metropolitan Transport Strategy

The 1995 *Perth Metropolitan Transport Strategy (MTS)* has been prepared for the state and local governments, and other related transport agencies to develop and use transport infrastructure and services in the PMR. This 35-year strategy "... provides direction for achieving a balanced, efficient, effective transport system for the PMR in 2030" (Western Australia Department of Transport 1995, p. 3). It includes all kinds of transport or movement (on roads, across the water, and through the air) for people, as well as for goods and services. In moving people, the MTS, like other transport policies, recognises Perth's car culture, transport issues for the disabled, the need for integrating land-use and transport. Also, it favours public transport, walking, and cycling.

State Planning Strategy

The 1996 *State Planning Strategy (SPS)*, a visionary strategy for WA, was published by WAPC. It is an essential guidance for land use planning in the WA through the year of 2029. It does this by presenting strengths and visions to determine future actions as well as acknowledging development's impact on the environment.

Liveable Neighbourhoods

The *Liveable Neighbourhoods*, published in 1997 and revised in 2001 by WAPC for developers and local governments, functions as development control to address,

only, humankind's sustainable development. The *Liveable Neighbourhoods* is an important turning point when people realised the significance of having a written document on provision of facilities and services within their reach. Thus, it aims to have a more liveable neighbourhood by means of improving residents' quality of life through a sense of belonging or community. Although currently it is not compulsory to follow, it is possible that it will become compulsory.

Metroplan

Released by the WA Department of Planning and Urban Development, the 1990 *Metroplan* is a planning strategy for the PMR to augment and uphold Perth's quality of life. It only offers global framework or structure for growth and change since it recognises dynamic and diversity of local governments by allowing them to plan the details. Its principles and strategies make the PMR ready to facing the challenge of growing region over the next thirty years.

Western Australian State Sustainability Strategy

Since the *Western Australian State Sustainability Strategy (WASSS)* is still a draft, it was not evaluated. However, its presence was acknowledged. This consultative draft was published in 2002 by the Department of the Premier and Cabinet (Sustainability Policy Unit 2002). The strategy draft is essential given that all aspects of people's life towards sustainable development (for example governance, settlements, community, business, and natural resources), flora, and fauna are addressed through strategic actions in detail. It recognises influence of Perth's car dependency on sustainable development, and the need for integrating land use and balanced transport (between car use, public transport, walking, and cycling). Hopefully, this recognition will solve various urban transports for sustainable development issues. The WASSS can be interpreted as a positive sign from the State government to take sustainable development issues more seriously.

4. Local Policies

Town and District Planning Schemes

Every local government in the PMR has its own *Town Planning Scheme (TPS)* or *District Planning Schemes (DPS)*. The schemes are important in controlling and guiding land-use and development in each area of authority, in avoiding or at least minimising conflicts between adjacent land uses, as well as in giving a community a

chance during *TPS/ DPS* examination time to comment on how an area will be developed. These schemes also guide planners and land developers to fulfil what is required by local government in developing land to comply with the Metropolitan Region Scheme (MRS). *TPS/ DPS* used in this study were:

1. The 1972 Shire of Wanneroo *Town Planning Scheme No. 1*, and later the 1991 City of Joondalup *District Planning Scheme No. 2* for Joondalup.
2. The City of Swan *Town Planning Scheme No. 9* (revised in 1997) for Woodlake, Ellenbrook.

Joondalup Centre Development Plan

The *Joondalup Centre Development Plan* (JCDP) was produced for the Joondalup Development Corporation (JDC) in 1982 and updated in 1986 by Shrapnel Urban Planning (a private urban planning consultant). It is a framework for Joondalup Centre in accordance with what had been planned by JDC. Its importance is reflected on its goals and objectives to keep JDC's plans on the right track.

Ellenbrook Structure Plan

The *Ellenbrook Structure Plan* was prepared by Roberts Day Group for Ellenbrook Management Pty Ltd (EPML) as the developer and the real estate management company of Woodlake, Ellenbrook. This company acts as a mediator between Ellenbrook residents and the City of Swan in terms of dwelling subdivision applications. This structure plan was formulated as a response to requirements in the *TPS* since Ellenbrook was under a special purpose zoning. Hence, EPML was required to provide a structure plan to ensure that the development is in harmony with adjacent or neighbouring land uses. This plan is essential for the establishment of Ellenbrook, otherwise its development plan would not be approved by the City of Swan as the local government.

Appendix 2: The first household questionnaire survey.

12. How many vehicles are available in your household?

01. Bicycle(s)	02. Car(s)	03. Motor bikes/scooter(s)	04. Other (please specify)

13. How many times per week do you or your family make use of a local public park in this estate on average?

14. What do you usually do at the local public park in this estate?

15. Are any of you in your household members of clubs and/ or associations?

	In your estate	Outside your estate
01. Clubs	a. Number of memberships b. Type of clubs	
02. Associations	a. Number of memberships b. Type of associations	

16. Have you ever joined community events/ activities in this estate?
 No
 Yes, (number per year on average)

D. HOUSEHOLD MEMBERS' DATA

17. Please indicate your answers by writing or ticking in the appropriate boxes.

01. Please write number of persons who are usually in your household.	Female (Years old)				Male (Years old)			
	<=14	15-54	55-64	>=65	<=14	15-54	55-64	>=65
02. What is the status in your household? (Please tick (✓) in the appropriate boxes).								
<input type="checkbox"/> 01. Daughter								
<input type="checkbox"/> 02. Grandfather								
<input type="checkbox"/> 03. Grandmother								
<input type="checkbox"/> 04. Husband								
<input type="checkbox"/> 05. Son								
<input type="checkbox"/> 06. Wife								
<input type="checkbox"/> 07. Other (please specify)								

18. Your household's annual gross income (A\$):

<input type="checkbox"/> Negative/ nil	<input type="checkbox"/> 8,320-10,399	<input type="checkbox"/> 31,200-36,399
<input type="checkbox"/> 1-2,079	<input type="checkbox"/> 10,400-15,599	<input type="checkbox"/> 36,400-41,599
<input type="checkbox"/> 2,080-4,159	<input type="checkbox"/> 15,600-20,799	<input type="checkbox"/> 41,600-51,999
<input type="checkbox"/> 4,160-6,239	<input type="checkbox"/> 20,800-25,999	<input type="checkbox"/> 52,000-77,999
<input type="checkbox"/> 6,240-8,319	<input type="checkbox"/> 26,000-31,199	<input type="checkbox"/> 78,000 and more

19. Occupations as relevant to your household (You may tick (✓) as many as possible as needed):

<input type="checkbox"/> 01. Clerical and service worker	<input type="checkbox"/> 06. Retired
<input type="checkbox"/> 02. Home duties	<input type="checkbox"/> 07. Student
<input type="checkbox"/> 03. Manager and administrator	<input type="checkbox"/> 08. Tradesperson and related worker
<input type="checkbox"/> 04. Production and transport worker	<input type="checkbox"/> 09. Other (please specify)
<input type="checkbox"/> 05. Professional	

Thank you for your effort and time. Your answer will be treated in confidence.

Household Quality of Life Questionnaire

Date:

This questionnaire is designed to explore opinions from households in this estate. The following questions are divided into four sections to separate your household's perception of quality of life, living behaviour, opinion on local government support and data of household.

A. PERCEPTION OF QUALITY OF LIFE

01. Which suburb and estate do you live in?
 Suburb Estate

02. Please rank factors that influenced you to choose your house in this estate (from 1: for the most important to 8: for the least important).

- 01. Accessible location.
- 02. Affordable price.
- 03. Availability of facilities, e.g. school, shopping centre, place of worship, senior housing.
- 04. Availability of services, e.g. public transport network, wastes recycling, neighbourhood watch.
- 05. Good environmental aspects, e.g. energy efficiency, landscaping, native flora-fauna, recycling.
- 06. Good overall concept for living, working and recreation.
- 07. It was chosen for me.
- 08. Other (please specify)

03. How long have you been living in this estate?
 year(s) month(s)

04. How many more years do you expect to stay in this estate?
 01. No longer
 02. Less than 1 year
 03. 1 year - 2 years
 04. 3 years - 5 years
 05. 6 years - 10 years
 06. 11 years - 15 years
 07. Forever
 08. Do not know

05. i. How satisfied are you with living in this estate?
 01. Very dissatisfied
 02. Dissatisfied
 03. Neutral
 04. Satisfied
 05. Very satisfied

ii. Reasons:.....
 06. i. What do you think of the availability of the following elements in this estate? Please tick (✓) the appropriate boxes.

A. FACILITIES	Element	I. Diversity			II. Quality			III. Quantity		
		01. Do not know	02. Insufficient	03. Sufficient	01. Do not know	02. Insufficient	03. Sufficient	01. Do not know	02. Insufficient	03. Sufficient
01. Child health centre										
02. Deli										
03. Employment										
04. Fitness centre										
05. Footpaths										
06. Hospital										
07. Place of worship										
08. Place to eat										

Elements	I. Diversity			II. Quality			III. Quantity		
	01. Do not know	02. Insufficient	03. Sufficient	01. Do not know	02. Insufficient	03. Sufficient	01. Do not know	02. Insufficient	03. Sufficient
09. Public open space									
10. School									
12. Senior housing									
13. Other (please specify)									
B. SERVICES									
01. Neighbourhood watch									
02. Dentist									
03. Doctor									
04. Public transport									
05. Rubbish collection									
06. Sewerage system									
07. Waste recycling									
08. Other (please specify)									
C. SOCIAL ACTIVITIES									
01. Associations/ clubs									
02. Street festival/parade									
03. Summer events/ concerts									
04. Other (please specify)									

ii. Where do you usually go if you cannot find what you are looking for in this estate?

07. How often do you hear and read about crimes happening in this estate?

01. Everyday 03. 1-2 times a week 05. Less than once a month
 02. Almost everyday 04. 1-3 times a month 06. Never

08. i. Please tick (✓) the appropriate boxes below.

Elements	01. Very unsafe	02. Unsafe	03. Neither	04. Safe	05. Very safe
1. How safe do you feel living in this estate?					
2. How does this estate compare (regarding safety) with other estate(s) you have lived in?					

ii. Please explain how this estate compares in terms of safety with other estate(s) you have lived in.

iii. Where did you live before you moved to this estate?

01. Different estate in the same suburb 04. Overseas
 02. Different estate in different suburb 05. Other (please specify)
 03. In another region/ state

B. OPINION on LOCAL GOVERNMENT SUPPORT

09. What do you think of your local government support in the following elements? Please tick (✓) the appropriate boxes below.

Elements	01. Do not know	02. No support	03. Insufficient support	04. Sufficient support
01. Energy efficiency				
02. Equal opportunity for female-male				
03. Equal opportunity for disabled-non disabled				

Elements	01. Do not know	02. No support	03. Insufficient support	04. Sufficient support
04. Equal opportunity for low-high income				
05. Equal opportunity for youth-elderly				
06. Graffiti control				
07. Local association				
08. Local club				
09. Poster control				
10. Residents group				
11. Wastes recycling				
12. Other (please specify)				

10. i. How satisfied are you with community involvement in council decision-making?

01. Very dissatisfied 03. Neutral 05. Very satisfied
 02. Dissatisfied 04. Satisfied

ii. Reason:

C. LIVING BEHAVIOUR

11. Please tick (✓) in the appropriate boxes to indicate your household's living behaviour. Please note that it is on average for household's members.

Elements	01. More than once a year	02. Once a year	03. Once within two years	04. 1-2 times within five years	05. Never	06. Other (please specify)	07. Work	08. School
01. How often have you changed job or school since you lived in this estate?								
02. If you are in wage work, on what basis are you employed?								
03. Where do you go to work or school?								
04. Type of work or school:								
05. How do you go to work or school? By: (You may tick (✓) more than one box)								
06. How many minutes does the journey take to the workplace or school?								
07. How many kilometres is the journey from your home to the workplace or school? Km(s)								

Analysis of the first household questionnaire survey

n: Number of participants

Joondalup

n		%
46	Household's annual gross income (A\$)	4.4
	8,320-15,599	10.8
	15,600-25,999	13.1
	26,000-36,399	23.9
	36,400-51,999	47.8
	52,000 and more	
		%
49	Duration living in the location (months)	12.1
	0-12	12.0
	13-24	10.1
	25-36	10.1
	37-60	14.3
	61-84	24.2
	85-120	16.2
	121 and more	
		%
49	Duration expectation in staying there in the future (years)	6.1
	Less than 1	14.3
	1-2	14.3
	3-5	8.2
	6-10	6.1
	11-15	24.5
	Forever	26.5
	Do not know	
		%
49	Living satisfaction in the location	2.0
	Very dissatisfied	2.1
	Dissatisfied	6.1
	Neutral	32.7
	Satisfied	57.1
	Very satisfied	
		%
49	Frequency of crimes happening in the location	6.1
	Everyday	2.0
	Almost everyday	28.6
	1-2 times a week	22.4
	1-3 times a month	34.7
	Less than once a month	6.1
	Never	
		%
49	Safety feeling living in the location	2.0
	Very unsafe	6.1
	Unsafe	8.2
	Neither	53.1
	Safe	30.6
	Very safe	

		%
49	Place they lived before	2.0
	Different estate in the same suburb	73.5
	Different estate in a different suburb	18.4
	In another region/ state	6.1
	Overseas	
		%
45	Safety comparison with other locations	2.2
	Very unsafe	2.2
	Unsafe	15.6
	Neither	44.4
	Safe	35.6
	Very safe	
		%
47	Satisfaction on community involvement in council's decision making	2.1
	Very dissatisfied	27.7
	Dissatisfied	55.3
	Neutral	14.9
	Satisfied	0.0
	Very satisfied	
		%
46	Frequency of job changes since lived in the location	6.5
	More than once a year	2.2
	Once a year	6.5
	Once within two years	21.7
	1-2 times within five years	60.9
	Never	2.2
	Others	
		%
43	Basis of employment	4.7
	Casual	11.6
	Contract	58.1
	Permanent	25.6
	Others	
		%
42	Type of work	35.7
	Part time	61.9
	Full time	2.4
	Others	
		%
42	Time needed to go to work (minutes)	14.3
	1-5	9.4
	6-10	33.3
	11-30	33.4
	31-60	4.8
	More than 60	4.8
	Others	
		%
	Vehicles availability in household	
29	Bicycles	27.6
	1	27.6
	2	

	3	27.6
	Others	17.2
49	Cars	55.1
	1	30.6
	2	14.3
	3	
		%
36	Frequency in using public open space	16.7
	Once a week	13.9
	Twice a week	13.9
	Three times a week	11.1
	Five times a week	2.8
	Seven times a week	2.8
	More than seven times a week	13.9
	Not on average	8.3
	Never	13.9
	Less than once a week	2.7
	Others	
		%
	Numbers of club membership	
9	In the location	55.6
	1	33.3
	2	11.1
	Others	
16	Out of the location	37.5
	1	50.0
	2	6.3
	3	6.2
	Others	
		%
	Numbers of association membership	
4	In the location	25.0
	1	50.0
	2	25.0
	Others	
10	Out of the location	40.0
	1	50.0
	2	10.0
	Others	
		%
47	Participation in local community events	44.7
	No	55.3
	Yes	
		%
22	Numbers of activities joined annually on average	81.9
	1-5	9.0
	6-10	4.6
	More than 10	4.5
	Others	

Local government support on local issues										
Level of support	Energy efficiency (%)	Equal opportunity for female-male (%)	Equal opportunity for disabled - non disabled (%)	Equal opportunity for low - high income (%)	Graffiti control (%)	Local association (%)	Local club (%)	Poster control (%)	Residents group (%)	Wastes recycling (%)
Do not know	49.0	57.1	62.5	57.1	22.4	61.7	54.2	59.2	63.3	18.4
No support	14.3	6.2	6.3	8.2	6.2	4.3	6.2	4.1	2.0	8.2
Insufficient support	16.3	6.1	8.3	10.2	30.6	14.9	10.4	14.3	16.3	36.7
Sufficient support	20.4	30.6	22.9	24.5	40.8	19.1	29.2	22.4	18.4	36.7
n	49	49	48	49	49	47	48	49	49	49

Woodlake

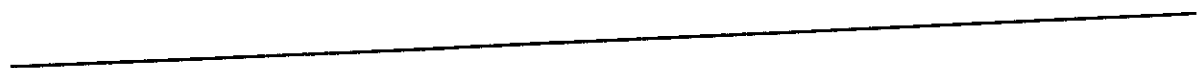
n		%
43	Household's annual gross income (A\$)	20.9
	15,600-25,999	7.0
	26,000-36,399	16.3
	36,400-51,999	55.8
	52,000 and more	
		%
46	Duration living in the location (months)	10.9
	0-12	13.0
	13-24	13.1
	25-36	45.6
	37-60	17.4
	61-72	
		%
46	Duration expectation in staying there in the future (years)	4.3
	No longer	4.4
	Less than 1	8.7
	1-2	21.7
	3-5	19.6
	6-10	2.2
	11-15	15.2
	Forever	23.9
	Do not know	
		%
46	Living satisfaction in the location	4.3
	Very dissatisfied	4.4
	Dissatisfied	47.8
	Neutral	43.5
	Satisfied	
		%
46	Frequency of crimes happening in the location	2.2
	Almost everyday	8.7
	1-2 times a week	26.1
	1-3 times a month	60.8
	Less than once a month	2.2
	Never	
		%
46	Safety feeling living in the location	0.0
	Very unsafe	0.0
	Unsafe	4.3
	Neither	71.8
	Safe	23.9
	Very safe	
		%
45	Place they lived before	4.4
	Different estate in the same suburb	71.1
	Different estate in a different suburb	24.5
	In another region/ state	

		%
42	Safety comparison with other locations	2.4
	Very unsafe	2.4
	Unsafe	9.5
	Neither	38.1
	Safe	47.6
	Very safe	
		%
45	Satisfaction on community involvement in council's decision making	
	Very dissatisfied	2.2
	Dissatisfied	60.0
	Neutral	31.1
	Satisfied	6.7
	Very satisfied	
		%
42	Frequency of job changes since lived in the location	2.4
	More than once a year	2.4
	Once a year	19.0
	Once within two years	26.2
	1-2 times within five years	50.0
	Never	
		%
38	Basis of employment	13.2
	Casual	2.6
	Contract	78.9
	Permanent	5.3
	Others	
		%
34	Type of work	23.5
	Part time	76.5
	Full time	
	Others	
		%
35	Time needed to go to work (minutes)	5.7
	1-5	0.0
	6-10	31.4
	11-30	57.1
	31-60	2.9
	More than 60	2.9
	Others	
		%
	Vehicles availability in household	
22	Bicycles	27.3
	1	27.3
	2	18.2
	3	27.2
	Others	
		%
43	Cars	39.5
	1	48.9
	2	11.6
	3	

		%
43	Frequency in using public open space	34.9
	Once a week	11.6
	Twice a week	14.0
	Three times a week	2.3
	Four times a week	2.3
	Six times a week	18.6
	Seven times a week	2.3
	Daily	14.0
	Others	
		%
	Numbers of club membership	
8	In the location	50.0
	1	25.0
	2	25.0
	Others	
13	Out of the location	61.5
	1	23.1
	2	7.7
	3	7.7
	Others	
		%
	Numbers of association membership	75.0
4	In the location	25.0
	1	
	2	
		%
45	Participation in local community events	26.7
	No	73.3
	Yes	
		%
31	Numbers of activities joined annually on average	38.7
	1-2	51.6
	3-5	6.5
	6-10	3.2
	Others	

Local government support on local issues										
Level of support	Energy efficiency (%)	Equal opportunity for female-male (%)	Equal opportunity for disabled - non disabled (%)	Equal opportunity for low - high income (%)	Graffiti control (%)	Local association (%)	Local club (%)	Poster control (%)	Residents group (%)	Wastes recycling (%)
Do not know	77.3	81.8	84.1	72.1	40.0	51.1	57.8	72.7	44.5	28.9
No support	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0
Insufficient support	4.5	0.0	2.3	2.3	11.1	6.7	8.9	6.8	4.4	8.9
Sufficient support	18.2	18.2	13.6	25.6	46.7	42.2	33.3	20.5	51.1	62.2
n	44	44	44	43	45	45	45	44	45	45

**Appendix 3: Covering letter for the first household
questionnaire survey.**



<<DATE>>

Dear Residents,

Re: 'Sustainability in Housing Areas' Questionnaire

My name is Cathrina Yanuaria. I am a Master of Arts (Planning) student at Curtin University of Technology, Bentley. Currently, I am doing data collection for my thesis, "*Economic, Environmental and Social Indicators: An Analysis of Implementation of Sustainable Development Policies in Residential Subdivisions*".

As part of the thesis, I have prepared a questionnaire that takes a few minutes to complete. It is designed to explore opinions from households in this estate. Your participation would be very useful to give me an understanding of available facilities and services as well as quality of life within this estate. The thesis will make recommendations on factors, which influence 'sustainable development'. This concept of sustainable development comes from the idea that we must plan for overall quality of life in the community with the future in mind and the present, including you.

The data collected will remain confidential and accessible to supervisor, my associate supervisor and myself only. The result will be treated in confidence and be published in the form of a thesis.

I would deeply appreciate it if you could return the completed questionnaire before <<DATE>> in the enclosed reply-paid envelope. Should you have any queries regarding this study, do not hesitate to contact me on <<PHONE NUMBER>> or <<NAME>> (my supervisor) on <<PHONE NUMBER>> at Curtin University of Technology, Bentley.

Thank you for reading and thinking about this information. Your help will be very much appreciated.

Sincerely yours,

Cathrina Yanuaria

Appendix 4: Reminder letter for household questionnaire surveys.

<<DATE>>

'Sustainability in Housing Areas' Questionnaire

Dear Residents,

In <<DATE>>, households in your area should have received a copy of the 'Sustainability in Housing Areas' questionnaire for completion and return to myself.

The results of the questionnaire will be useful in the future planning of residential areas like the one you live in.

If you have not yet completed a questionnaire, I would deeply appreciate it if you could return the completed questionnaire before <<DATE>> in the enclosed reply-paid envelope. Should you have any queries regarding this study, do not hesitate to contact me on <<PHONE NUMBER>> or <<NAME>> (my associate supervisor) on <<PHONE NUMBER>> at Curtin University of Technology, Bentley.

Thank you for reading and thinking about the questionnaire. Your help will be very much appreciated.

Sincerely yours,

Cathrina Yanuaria

B. PUBLIC TRANSPORT (BUS)

1. How far is your house to the nearest bus stop in your suburb?
_____ metres

2. On average, how many times a week do you catch a bus as a means of transport in your suburb?
Number of catching a bus: Times a week Irregularly

3. Do you feel safe when you are at a bus stop within this suburb where you live in?
 Yes No

Reason: _____

4. I am interested in discovering features that make the environment more satisfactory for using the bus. Please tick (✓) the appropriate boxes and please use a separate paper if you want to give suggestions on facilities and services for using the bus. You can use the list in this questionnaire as your guide. I will really appreciate your suggestions.

No.	Elements	Bus	
		Mostly Satisfied	Mostly Dissatisfied
1	Shelter from sunshine and rain		
2	Accessibility of bus stop by walking or cycling		
3	Accessibility of bus stop by car or motorcycle		
4	Availability of bus stop within walking distance		
5	Personal safety (surveillance)		
6	Cleanliness of bus stop		
7	Lighting at bus stop		
8	Availability of timetable at bus stop		
9	Attractiveness of bus stop		
10	Availability of seats at bus stop		
11	Others		
SERVICES			
1	Frequency of bus services		
2	Routes variety of bus		
3	Connection with other bus routes		
4	Others		

5. What encourages and/ or discourages you to catch a bus?

Encouragement: _____

Discouragement: _____

Thank you for your cooperation.
Your participation in this study would be greatly appreciated.

'Transport and Sustainability in Residential Areas' Questionnaire

Dear Residents,

My name is Cathrina Yanuaria, a Master's Planning student at Curtin University of Technology, Bentley. Currently, I am doing research for my thesis on sustainable transport.

In <<DATE>>, you received a questionnaire for my initial study. I am now focusing in depth on transportation. I have prepared a short questionnaire. It is designed to explore residents' opinions on the quality of available transportation facilities and services in this suburb.

The data collected will remain confidential, being accessible only to my supervisor, associate supervisor, and myself. The result will be treated in confidence (in anonymous format).

I would deeply appreciate it if you could return the completed questionnaire before <<DATE>> in the postage-paid envelope provided. Should you have any queries regarding this study, do not hesitate to contact me on <<PHONE NUMBER>> or <<NAME>> (my supervisor) on <<PHONE NUMBER>> at Curtin University of Technology, Bentley.

Thank you for reading this information. Your participation would be greatly appreciated.

Sincerely yours,

Cathrina Yanuaria

Departments:
• Architecture
• Construction Management
• Urban and Regional Planning
• Interior Architecture

GPO Box U1987 Perth
Western Australia 6845
TELEPHONE +61 8 9266 2712
FACSIMILE +61 8 9266 2711

<<DATE>>



(Office use only)

Motorised and Non-motorised Transport Provisions Questionnaire

Date: _____

This questionnaire is designed to explore opinions from residents in this suburb. The following questions are divided into two sections to separate your opinions on planning transport facilities and services of walking, cycling, and bus. Each section should be filled in by the person in the household who uses that mode most often. For example questions on walking should be filled in by the person who most often walks in this household. I would deeply appreciate it if you could return the completed questionnaire before 3 September 2002 in the postage-paid envelope provided.

A. WALKING AND CYCLING

WALKING

1. How far is your house to the nearest community centre in your suburb?
_____ metres

2. On average, how many times a week do you walk as a means of transport in your suburb?
Number of walking: Times a week Irregularly

3. Do you feel safe when you are walking within this suburb where you live in?
 Yes No

Reason: _____

4. I am interested in discovering features that make the walking environment more satisfactorily. Please tick (✓) the appropriate boxes and please use a separate paper if you want to give suggestions on facilities and services for walking. You can use the list in this questionnaire as your guide. I will really appreciate your suggestions.

No.	Elements	Walking	
		Mostly Satisfied	Mostly Dissatisfied
1	Lighting for footpaths		
2	Shade for protection from sunshine, and rain		
3	Personal safety (surveillance)		
4	Protection from motorised vehicles		
5	Width of footpaths		
6	Availability of footpaths		
7	Evenness of footpaths		
8	Graffiti on walls, and on footpaths		
9	Non-skid material of footpaths		
10	Cleanliness of area around footpaths		
11	Attractiveness of footpaths		
12	Attractiveness of destination		
13	Provision of walking facilities (such as seats, water tap)		
14	Signage for direction		
15	Attractiveness of streetscape (such as interesting trees, garden, harmonious houses)		
16	Others		

5. What encourages and/ or discourages you to walk?
Encouragement: _____
Discouragement: _____

Discouragement: _____

CYCLING

1. On average, how many times a week do you cycle as a means of transport in your suburb?
Number of cycling: Times a week Irregularly

2. Do you feel safe when you are cycling within this suburb where you live in?
 Yes No

Reason: _____

3. I am interested in discovering features that make cycling environment becomes more satisfactorily. Please tick (✓) the appropriate boxes and please use a separate paper if you want to give suggestions on facilities and services for cycling. You can use the list in this questionnaire as your guide. I will really appreciate your suggestions.

No.	Elements	Cycling	
		Mostly Satisfied	Mostly Dissatisfied
1	Lighting for cycle paths		
2	Shade for protection from sunshine, and rain		
3	Personal safety (surveillance)		
4	Protection from motorised vehicles		
5	Width of cycle paths		
6	Availability of cycle paths		
7	Evenness of cycle paths		
8	Graffiti on walls, and on cycle paths		
9	Non-skid material of cycle paths		
10	Cleanliness of area around cycle paths		
11	Attractiveness of cycle paths		
12	Attractiveness of destination		
13	Provision of cycling facilities (such as bicycle lockers, bicycle racks, water tap) at the destination		
14	Signage for direction		
15	Attractiveness of streetscape (such as interesting trees, garden, and harmonious houses)		
16	Others		

4. What encourages and/ or discourages you to cycle?
Encouragement: _____
Discouragement: _____

Discouragement: _____

Appendix 6: The list of interviewees.



The list of interviewees:

No.	Place	Interviewee	Date (2002)	Time
1	Joondalup	Public planning officer 1	3 September	10.45am
		Private planning consultant 1	6 September	04.15pm
		Public land developer 1	10 September	09.00am
		Public land developer 2	10 September	10.00am
2	Woodlake	Private land developer 1	5 September	10.30am
		Private planning consultant 2	6 September	09.00am
		Public planning officer 3	10 September	04.00pm
3	Department of Transport	State transport authority	9 September	04.00pm

Appendix 7: Covering letter for interviewees.

<<DATE>>

<<NAME>>
<<COMPANY>>
<<ADDRESS>>

Dear <<NAME>>,

Re: Interview on Policy Implementation

My name is Cathrina Yanuaria, a Master's Planning student at Curtin University of Technology, Bentley. Currently, I am doing research for my thesis "*Transportation Indicators: An Implementation Analysis of Sustainability Policy in Residential Development*".

I have analysed the data from questionnaire survey which I undertook of local residents in Joondalup. To explore the research findings in their policy context, I am conducting a series of semi-structured interviews. I would deeply appreciate it if we could arrange an appointment for an interview to discuss the topic, including:

1. Triangulation of my findings with your personal opinions of the situation
2. Issues in implementing policies
3. Supporting factors in implementing policies
4. Any recommendations for what makes successful policy implementation

Please also read the "Information Sheet" and "Consent Form" accompanying this letter. The data collected will remain confidential and accessible to supervisor, my associate supervisor, and myself only. The results will be treated in confidence and be published in the form of a thesis in Curtin University library. The thesis will propose recommendations for factors which support or deter sustainable development applications.

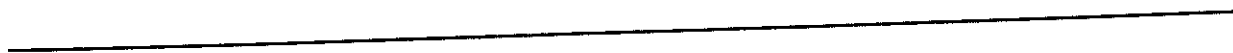
Should you have any queries regarding this study, do not hesitate to contact me on <<PHONE NUMBER>> or <<NAME>> (my supervisor) on <<PHONE NUMBER>> at Curtin University of Technology, Bentley.

Thank you for reading and thinking about this information. Your participation in this study would be greatly appreciated.

Sincerely yours,

Cathrina Yanuaria

Appendix 8: Information sheet for interviewees.



INFORMATION SHEET

- Name of project: "Transportation Indicators: An Implementation Analysis of Sustainability Policy in Residential Development"
- Objectives: To measure the effectiveness of sustainable development policy in outer areas of Perth by using transport indicators.
- Significance: This project will greatly benefit the field of Urban and Regional Planning. It will identify aspects that support or deter the implementation of a Sustainable Residential Development policy. The findings could lead to policy improvement towards a more sustainable future in Western Australia in particular. The enhancement of policy and its implementation would create a better place to live, work and play so that people in Western Australia have a higher quality of life and conserve resources for future generations.
- Purposes of the interview:
1. To seek the relationships between the following:
policy (as written) and its implementation on the ground (as practiced),
and
 2. To enhance understanding of what supports and hinders policy implementation.
- Results: Data collected will remain confidential and accessible to my supervisor, associate supervisor and me only. The result will be treated in confidence (in anonymous format or by grouping data results) and be published in the form of a thesis as part of my study at Curtin University of Technology, Bentley.

I would be very grateful if I can tape-record the interview. If you have any questions regarding this study, do not hesitate to contact me on <<PHONE NUMBER>> or <<NAME>> (my supervisor) on <<PHONE NUMBER>> at Curtin University of Technology, Bentley. If you wish to make a complaint on ethical grounds, you can contact the Ethics Committee (who approved this study) on <<PHONE NUMBER>>.

Thank you for reading and thinking about this information. Your participation in this study would be greatly appreciated.

Sincerely yours,

Cathrina Yanuaria

Appendix 9: Consent form for interviewees.

Measuring Sustainable Development Indicators Study

CONSENT FORM

Name : _____
Organisation : _____
Position : _____

I hereby agree to participate in and being interviewed by Cathrina Yanuaria for her study. I have read and understand the nature and purpose of the study as outlined on the "Information Sheet". Any questions I have asked have been answered to my satisfaction.

I understand that:

1. My participation in this study is completely voluntary.
2. I may refuse to participate in this study and need no justification for my decision.
3. A transcribed interview will be sent to me for confirmation of understanding.
4. I might be contacted again at later stage regarding further information.
5. I am at liberty to withdraw at any time without prejudice or negative consequences.
6. My opinion as the collected data will be published in the thesis provided any personal name or identification is not used.

Please note that by agreeing to being interviewed, it means that you have understood what this project engages and have consented to participate in. If you have any questions regarding this study, do not hesitate to contact me on <<PHONE NUMBER>> or <<NAME>> (my supervisor) on <<PHONE NUMBER>> at Curtin University of Technology, Bentley.

Participant : _____ Date: _____

This information will remain confidential. Thank you very much for your time and effort. Your participation is greatly appreciated.

Appendix 10: The topics outline for interviewees.

Interview (questions) structure:

1. Interviewee's opinions on transportation facilities and services, are they sufficient/satisfactory?
2. If s/he thinks it's sufficient but questionnaire survey result doesn't show the same indication, I'll ask for clarification. Why s/he thinks the provision is enough but not in reality?
3. Supporting factors in implementing policy objectives or performance criteria
4. Hindrances to implementing policy objectives or performance criteria
5. Recommendations in improving policy implementation
6. Recommendations in augmenting the level of policy objectives fulfilment (in terms of transportation)

Appendix 11: Bus timetables for the Joondalup suburb.

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**(Co-ordinator, ADT Program (Bibliographic Services), Curtin University of
Technology, 25/10/04)**

Appendix 12: Bus timetable for the Woodlake suburb.

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**(Co-ordinator, ADT Program (Bibliographic Services), Curtin University of
Technology, 25/10/04)**

Appendix 13: Timeline of Joondalup development.

Timeline of Joondalup development:

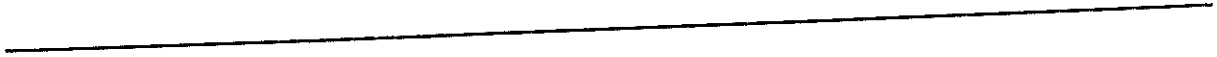
Non-local Events	Statutory	Year	Strategic
The notion of healthy cities concept was initiated by the Health of Towns Association in Liverpool, Britain.		1844	
Urban sprawl was mushrooming after the WW I.		1940s	
	The Wanneroo Shire Council was formed.	1961	
		1962	
The notion of sustainability was initiated in the United Nations Agenda.		1970s	
The idea of compact city was raised by planners and the principles of smart growth was taken up.	Adoption of the State Government's Corridor Plan for Perth.	1970	
	Joondalup was designated as North-West Corridor Subregional Centre.	1970	
		June 1972	
The UN Conference on Human Settlements (UNCHS) was held Stockholm, Sweden where environmental issues became internationalised.			
	The Ministry for Town Planning approved the Shire of Wanneroo <i>Town Planning Scheme No. 1.</i>	August 1972	
		1973	The Maunsell Report examined the North-West Corridor and introduced the concept of Development Corporation.
		October 1974	The Maunsell Report was revised.
		1975	Shire of Wanneroo, MRPA resolved that a design should be prepared for the regional centre Joondalup.
		1976	Two Interim Reports on the study were published.
	The Joondalup Centre Act 1976 came into operation.	22 April 1976	
	Joondalup Development Corporation was established.	April 1977	
	MRPA released the <i>Planning Structure</i> for the	1977	

North-West Corridor.		
The World Conservation Strategy (WCS) put forward the phrase 'Ecological Sustainability' for the first time.	1980	
The UN created the World Commission on Environment and Development (WCED) as a result of General Assembly Resolution.	1985	The Council achieved a City status.
	1986	Detailed design and documentation of Joondalup City Centre was commenced.
	1987	
The WCED produced the <i>Brundtland Report</i> , known as 'Our Common Future'.	December 1987	The Corridor Review Report Planning for the Future of the Perth Metropolitan Region was released.
	1988	Serviced residential allotments were first released.
The World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) founded the Intergovernmental Panel on Climate Change (IPCC).	1988	
The World Health Organisation (WHO) supported workshop in Liverpool.	1989	
- National - The <i>Green Street</i> (amended in May 90) was released.	July 1989 - June 1990	Serviced dwellings were released.
	November 1989	The latest office development in the City Centre and was opened by the then Premier, the Hon. Peter Dowding.
	July 1990 - June 1991	Dwellings were released.
	1990	The International College conducted all its studies.
	1990s	
Smart growth idea was developed.	November 1990	
-National- The <i>AMCORD</i> was published.	December 1990	<i>Metropolitan and Urban Expansion Policy</i> were released.
The UN Conference on Environment and Development (UNCED) was held in Rio de Janeiro, Brazil establishing the <i>Agenda 21</i> .	1991	The Corporation completed stages 5 and 6 (1,465

			dwellings had been constructed up to 30 June 1991).
-National - The <i>National Strategy for Ecological Sustainable Development</i> (NSESD) was published in December.	The Western Australian Land Authority (LandCorp) was established.	1992	
The UN held the <i>Rio Declaration on Environment and Development</i> , formerly known as the Earth Summit.		1992	The electric train system was operated in Joondalup.
Countries ratifying CCC had a COP-1 (1 st Conference of Parties) to the UNFCCC (the United Nations Framework on Climate Change) in Berlin, Germany.		1995	The City of Wanneroo commissioned 2 studies to the development of the <i>Local Agenda 21</i> (LA 21) framework.
-State- The <i>State Planning Strategy</i> was published.		November 1996	
COP-3 (the Summit 1997) successfully formulated the <i>Kyoto Protocol</i> in December.		1997	Ellenbrook won the Urban Design Institute of Australia State Award for major Urban Project – considered as an Urban Design Benchmark.
			Judging criteria: Residential subdivision - Take advantage of surrounding facilities - Offers convenience with a comfortable lifestyle
The Asia Pacific Economic Corporation (APEC) countries held a meeting on sustainable development in Toronto, Canada to discuss a plan to double participants of the continuous process of the LA 21 by the year 2003.		1997	Councillors and community developed a strategic plan for the City of Wanneroo.
-State- The <i>Liveable Neighbourhoods</i> edition 1 was published.		December 1997	
	An administrative separation of the City of Joondalup and the City of Wanneroo.	1998	
		Jul 1998	A report on the LA 21 for the City of Wanneroo.
		June 2000	
-State- The <i>Liveable Neighbourhoods</i> edition 2 was published.	Council approved the <i>District Planning Scheme</i> (DPS) No. 2.	September 2000	
		October 2000	The Department of Transport presented TravelSmart survey's result.

	The DPS No. 2 came into operation.	28 November 2000	
		December 2000	The City of Joondalup completed milestone 1 of green house gas (GHG) emissions target.
		2000/ 2001	Modifications to the Joondalup Structure Plan were introduced.
		2000/ 2001	Completed road and traffic management project.
		2000/ 2001	Council endorsed the 2001/2002-2005/ 2006 <i>Principals Activities Plan</i> .
		Sept 2001	Department of Planning and Infrastructure undertook the Joondalup Integrated Transport Planning Study.
		February 2002	
		2002	
	The 2002 Bush Plan as opposed to the Kyoto Protocol was proposed by George Bush.		
	The UN Conference on sustainability was held in Johannesburg.		

Appendix 14: Timeline of Woodlake development.



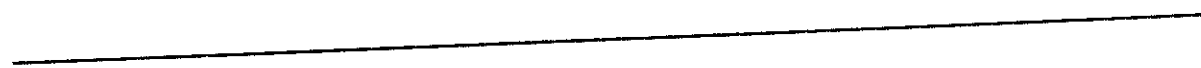
Timeline of Woodlake development:

	Statutory	Year	Strategic
Non-local Events			
The notion of healthy cities concept was initiated by the Health of Towns Association in Liverpool, Britain.		1844	
Urban sprawl was mushrooming after the World War II.		1940s	
The notion of sustainability was initiated in the United Nations Agenda.		1962	
		1970s	
The idea of compact city was raised by planners; the principles of smart growth was taken up.		1970	
	Adoption of the State Government's Corridor Plan for Perth.	June 1972	
The UN Conference on Human Settlements (UNCHS) was held in Stockholm, Sweden.		1980	
The World Conservation Strategy (WCS) put forward the phrase 'Ecological Sustainability' for the first time.		1985	
The UN created the World Commission on Environment and Development (WCED) as a result of General Assembly Resolution.		December 1985	
	Shire of Swan Town Planning Scheme (TPS) No. 9 was gazetted (land for Ellenbrook was zoned as rural).	1987	
The WCED produced the Brundtland Report, known as 'Our Common Future'.		December 1987	
	The idea of the North-East Corridor was first recommended in the report 'Planning for the Future of the Perth Metropolitan Region'.	1988	
The World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) founded the Intergovernmental Panel on Climate Change (IPCC).		1988	
The World Health Organisation (WHO) supported workshop in Liverpool.		1989	
-National-			
The Green Street (amended in May 90) was released.			

Smart growth idea was developed.	1990s	
-National- The AMCORD was published.	November 1990	
The UN Conference on Environment and Development (UNCED) was held in Rio de Janeiro, Brazil establishing the Agenda 21.	December 1990	The Metroplan and Urban Expansion Policy (the ideas for urbanisation) were released.
	June 91	The Metropolitan Development Program indicating that Ellenbrook is the most significant opportunity for development in the North-East Corridor Plan was established.
	October 1991	Discussion paper for North-East Corridor Plan released for public comment.
	1992	
-National - The National Strategy for Ecological Sustainable Development (NSESD) was published in December.	1992	The Western Australian Land Authority (LandCorp) was established.
The UN held a Climate Change Convention (CCC) in Rio de Janeiro.	1992	Urban deferred rezoning application by Roberts Day Group. Public Environmental Review was conducted.
The UN held the Rio Declaration on Environment and Development, formerly known as the Earth Summit.	November 1992	Shire of Swan released draft structure plan for the North-East Corridor.
	16 December 1992	
	December 1992	The Institute of Science and Technology Policy at Murdoch University undertook a study on 'Public Transport Options for NE Corridor' by Ritama Flood and Peter Newman for the Ministry for Planning.
	1994	Roberts Day Group's proposal to consider a revised zoning classification (in TPS: special purpose zone; in MRS: urban zone).
	July 1994	The initial Community Plan was completed by a Community Planning Team comprising representatives of various providers, including

	<p>Ellenbrook is an excellent example of the benefits of large-scale master-planned development. The project presents residents with pleasant surroundings, lifestyle choices and a diverse community environment. This is a benchmark development in its field for planning, urban design, marketing and infrastructure.</p>	<p>Judging criteria: Master-Planned Development - Demonstrates a coherent community within the project - Creates a total lifestyle environment with community facilities</p>		<p>February 2002</p>	
					<p>The 2002 George Bush Plan as opposed to the Kyoto Protocol was proposed by George Bush. The UN Conference on sustainability was held in Johannesburg.</p>

Appendix 15: Policy objectives at the international level.

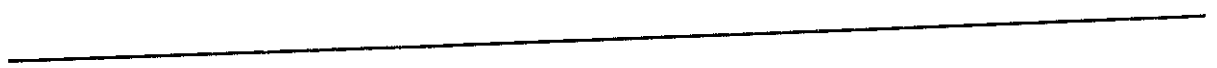


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Policy objectives at an international level

(ADT Co-ordinator, Curtin University of Technology, 5/11/04)

Appendix 16: Policy objectives at the national level.

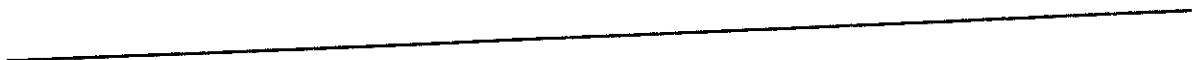


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Policy objectives at the national level

(ADT Co-ordinator, Curtin University of Technology, 5/11/04)

Appendix 17: Policy objectives at the state level.

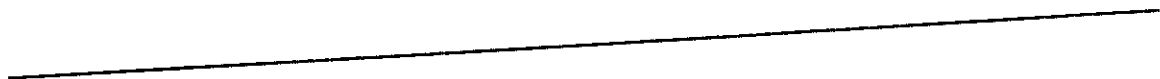


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Policy objectives at the state level

(ADT Co-ordinator, Curtin University of Technology, 5/11/04)

Appendix 18: Policy objectives at the local level.

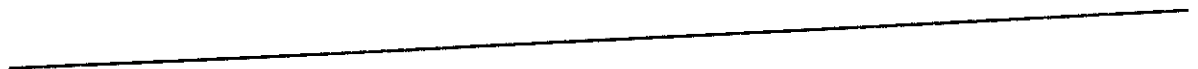


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Policy objectives at the local level

(ADT Co-ordinator, Curtin University of Technology, 5/11/04)

**Appendix 19: Policy implementation – a detailed analysis in
the Joondalup suburb.**



1. Road Network

Table 1 shows evaluation criteria for the road network and the extent of implementation, where the photos are contained at the end of this Appendix.

Only three evaluation criteria were found in policies extant at planning and development phase. Across the suburb, all three are implemented.

Connection between residential streets (A1).

All connection between residential streets is a T-junction or a roundabout (Figure 1a).

Figure 1a: Map analysis for criteria average spacing of junctions (A1), roundabouts (A1, B12), culs-de-sacs (B10), street network (B5), a route exceeding maximum driving time (B7), and spacings of street between blocks (B9, B15).

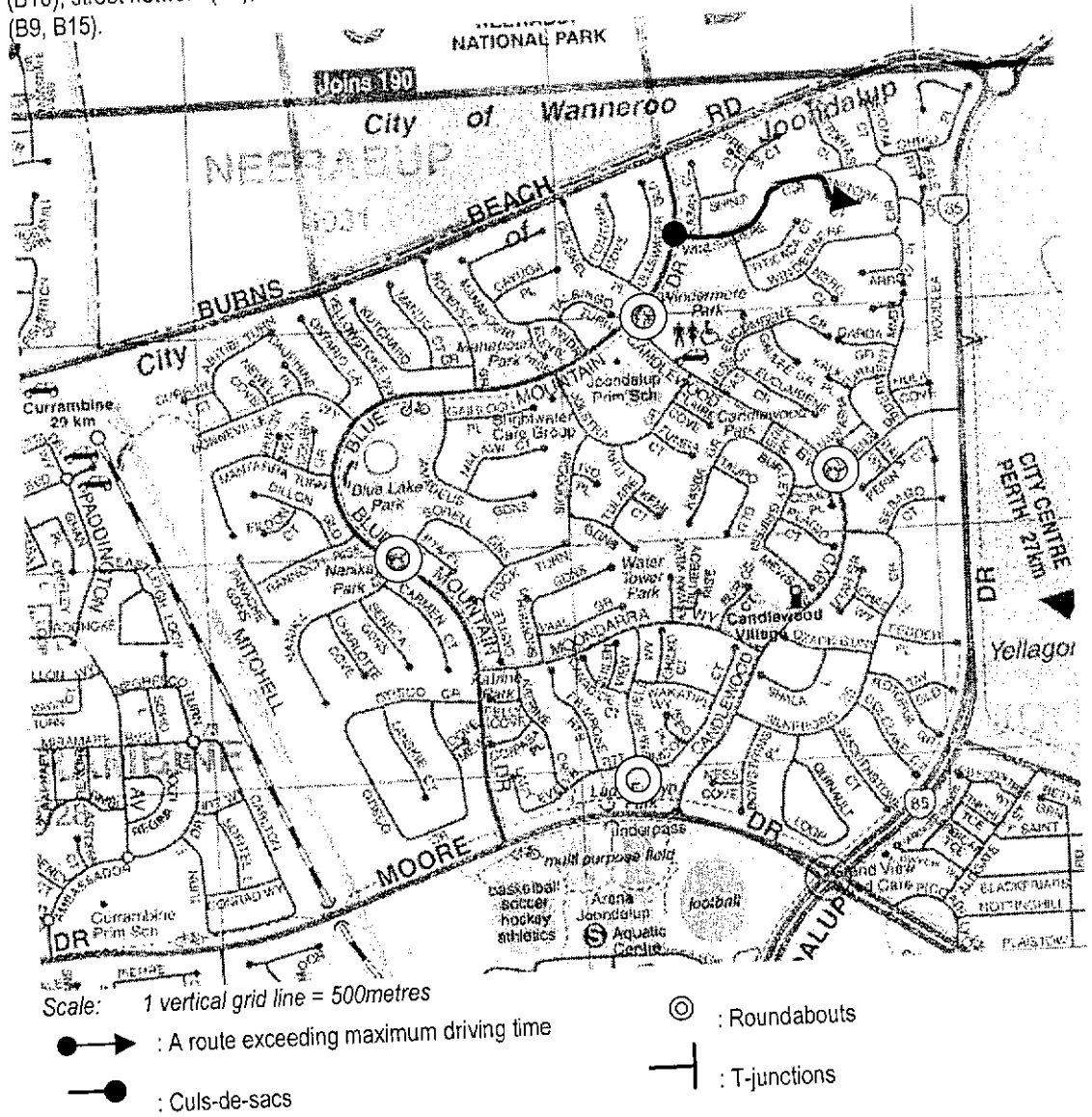


Table 1: Analysis of evaluation criteria for the road network in the Joondalup suburb.

No.	Evaluation criteria	Level of implementation	Supporting data and/or analysis	Policy source
A	... in policies extant at planning and development phase	Y	Figure 1a; Photo 3, 4	AMCORD, JCDP
1	Connections between residential streets should be T-junctions or roundabouts.	Y	Figure 1b	PM (1988)
2	Lots with road access to both front and rear boundaries are not generally favoured.	Y	Figure 1c	PM (1988), JCDP
3	Direct short cuts across the cell are not allowed.			
B	... in current policies (after planning and development phase)	Y	Photo 2	GS
1	Residential areas are not passed by through routes un-associated with the residential area.	M	Figure 1b	LNDC, PM (1989)
2	Culs-de-sac to serve no more than twenty lots.	Y	Figure 1e	AMCORD
3	Streets links are not more than two levels different in the hierarchy.	Y	Figure 1f	AMCORD
4	No more than three turns are required to travel from any address to collector street.	N	Figure 1a	LNDC, SPS
5	Interconnected street network.	N	Figure 1b	LNDC
6	The street network should have no more than 15 percent of lots fronting culs-de-sac.	N	Figure 1a	LNDC
7	A movement network which minimises travel time; maximum driving time from collector street to any allotment is one minute.	Y	Photos 5, 6, 7	LNDC, Metroplan
8	Clear physical distinctions of road hierarchy.	Y	Figure 1a	LNDC
9	Street blocks of no more than 240m.	M	Figure 1a; Photo 1	LNDC
10	Maximum culs-de-sac length should be 120 metres.	Y	Photos 4, 8	LNDC, Metroplan
11	Speed control/ traffic calming devices to achieve the target speeds.	N	Figure 1a; Photo 31	LNDC
12	Traffic signal control rather than roundabout.	N	Figure 1d; Photos 6, 9, 19	LNDC
13	Street design to enable development to front all streets.	M	Figure 1e	LNDC
14	Local street should be provided parallel to arterials.	N	Figure 1a	LNDC
15	Average spacing of junctions (the standard is contained in Appendix 21).	N	Figure 1c	LNDC
16	Average spacing of junctions (the standard is contained in Appendix 21).	N	Figure 1c	LNDC
17	Distance between neighbourhood centres and perimeter is 400-450metres on average.	M	Figure 1d	PM (1989)
17	Access ways should serve no more than 80 dwellings (for culs-de-sac) or 120 dwellings (for loops).	M	Figure 1d	PM (1989)

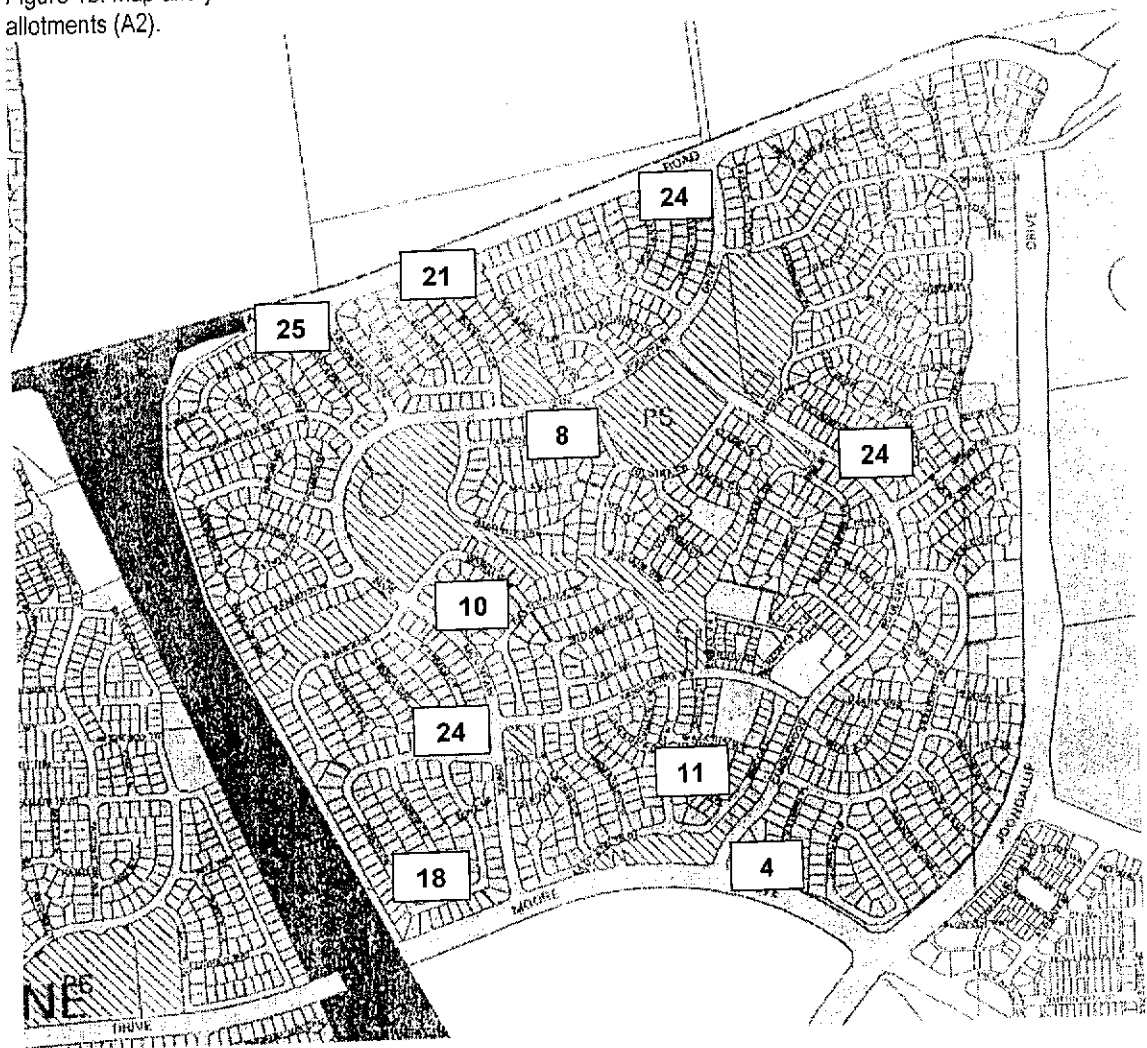
N: The evaluation criterion is implemented in less than half the suburb; M: The evaluation criterion is implemented in more than half the suburb; Y: The evaluation criterion is implemented in the whole suburb; JCDP: 1982 Joondalup Centre Development Plan; PM: Policy Manual (year); GS: 1989 Green Street; AMCORD: 1990 Australian Model Code for Residential Development; SPS: 1996 State Planning Strategy; LNDC: 2001 Liveable Neighbourhoods Community Design Code

There are ninety T-junctions (Photo 3) and four roundabouts (Photo 4); ninety-six percent of intersections are T-junctions. It shows that road users' safety is optimised since roundabouts are more dangerous for cars, buses, pedestrians, and cyclists than T-junctions (Austroads 1999; Curtis 2002; State Transport Authority 2002).

Lots with front and rear accesses (A2).

There is no lot with two accesses (Figure 1b). In the researcher's opinion, two vehicle accesses for a residence brings no benefit since there are few activities in residential development, unlike commercial development. The accesses increase the road surfaces and raises environment temperature which is undesirable for sustainable development purposes.

Figure 1b: Map analysis for criteria lots served by (B2) and fronting a culs-de-sac (B6), and road access to allotments (A2).



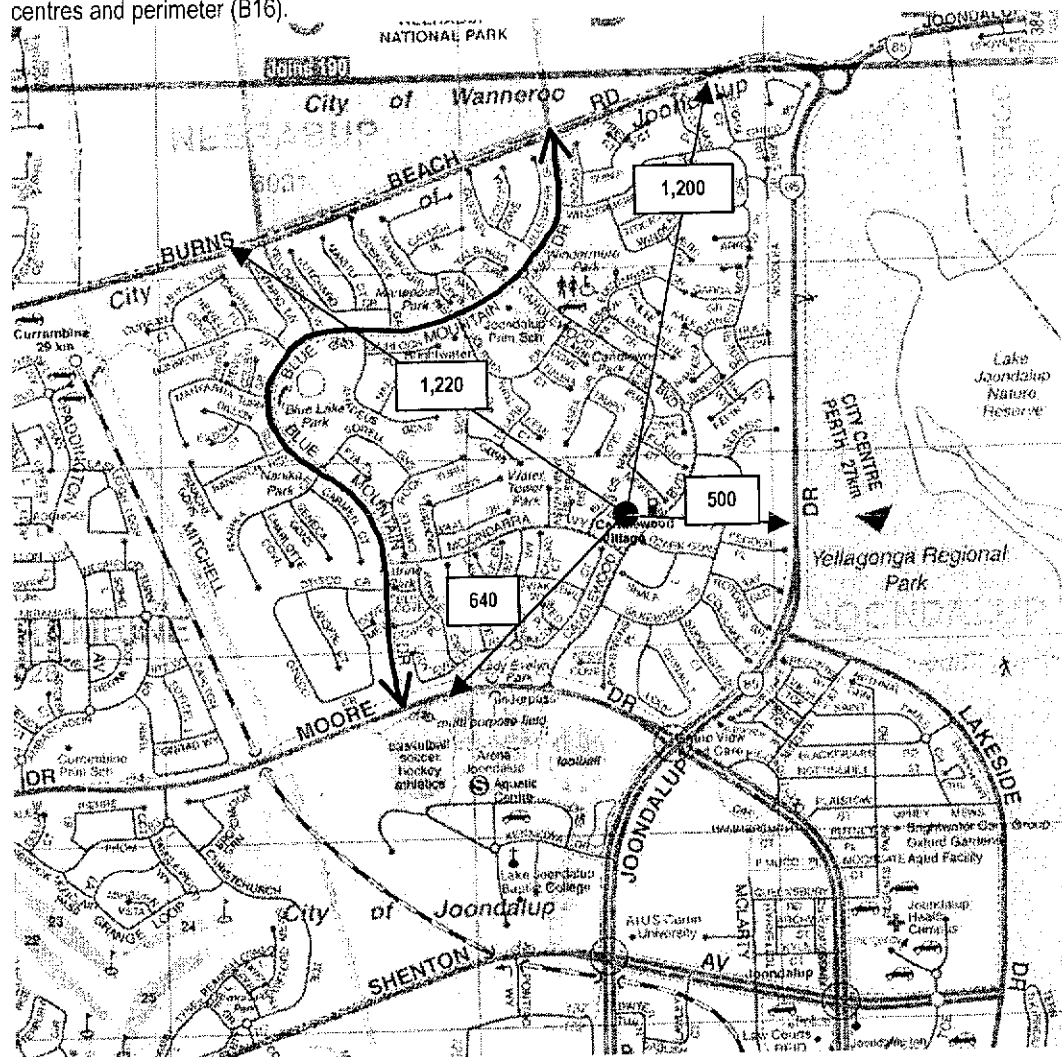
21 : A number of lots served by a culs-de-sac.

—● : Culs-de-sacs

Short cuts across cells (A3).

Blue Mountain Drive and Candlewood Boulevard connect the south to the north of the suburb. The roads provide a possible alternative to Joondalup Drive and function as collector roads of culs-de-sacs connecting to them (Figure 1c).

Figure 1c: Map analysis for criteria routes through residential areas (A3), and distance between neighbourhood centres and perimeter (B16).



Scale: 1 vertical grid line = 500metres

↔ : Blue Mountain Drive as a road connecting the southern to northern part of Joondalup

● : Neighbourhood centre 500 : Distance of neighbourhood centre to perimeter (metres)

Seventeen evaluation criteria were derived from current policies. Six of them are implemented in less than half area of Joondalup. They are:

Interconnected street network (B5).

The interconnection is not implemented in most part of Joondalup because interconnection was not a concern at the time when Joondalup was planned and

developed. The preferred road system at that time was culs-de-sac or tributary system which includes a high proportion of culs-de-sac (Figure 1a).

Street design to enable development to front all streets (B13).


Since Joondalup was designed when personal surveillance towards streets was not a great concern, yet all dwellings in Joondalup do not front main streets (Figure 1d; Photos 6, 9, 19) but face one street. Consequently, some streets are not faced by development.

Figure 1d: Map analysis for criteria dwellings served by access ways and streets not faced by development (B17).



93 : A number of lots served by an access way

- - - : Access way for culs-de-sacs

 : Access way for loops

..... : Street with no development facing it

Dwellings facing culs-de-sac (B6).

As a consequence of being dominated by culs-de-sac, Joondalup suburb does not satisfy the criterion of 'The street network should have no more than 15 percent of lots fronting culs-de-sac' (Figure 1b).

A movement network which minimises travel time (B7).

As a consequence of culs-de-sac, streets are not connected and travel time cannot be at a minimum level. However, among more than 1,000 lots, there is only one lot whose driving time from collector street is more than sixty seconds. The time is 70 seconds (ten seconds or 16% longer than the maximum) from Blue Mountain Drive to Manitoba Court at 50kph (Figure 1a).

Average spacing of junctions (B15).

From seven junctions and one staggered junction on neighbourhood connectors, the average spacing of junctions is 578meters (Figure 1a); very far from requirement (80meters). Long spacing encourages road users to speed and endanger their and others' safety. Thus, roads become unfriendly.

Average distance between neighbourhood centres and perimeter (B16).

Since the neighbourhood centre is located towards the East, only the eastern part is within 400-450metres walking distance (Figure 1c). The distance of the centre and those on northwest side are more than double (1,220metres).

It is not surprising that these new evaluation criteria from policies published after the planning and development phase cannot be performed well by Joondalup suburb; they were not available at the time of planning. The appearance of these new evaluation criteria means that policy standards on transport have evolved to enhance people's quality of life towards sustainable development; people have the right to improved quality of life over time.

Five criteria are implemented in most areas of Joondalup. They comprise:

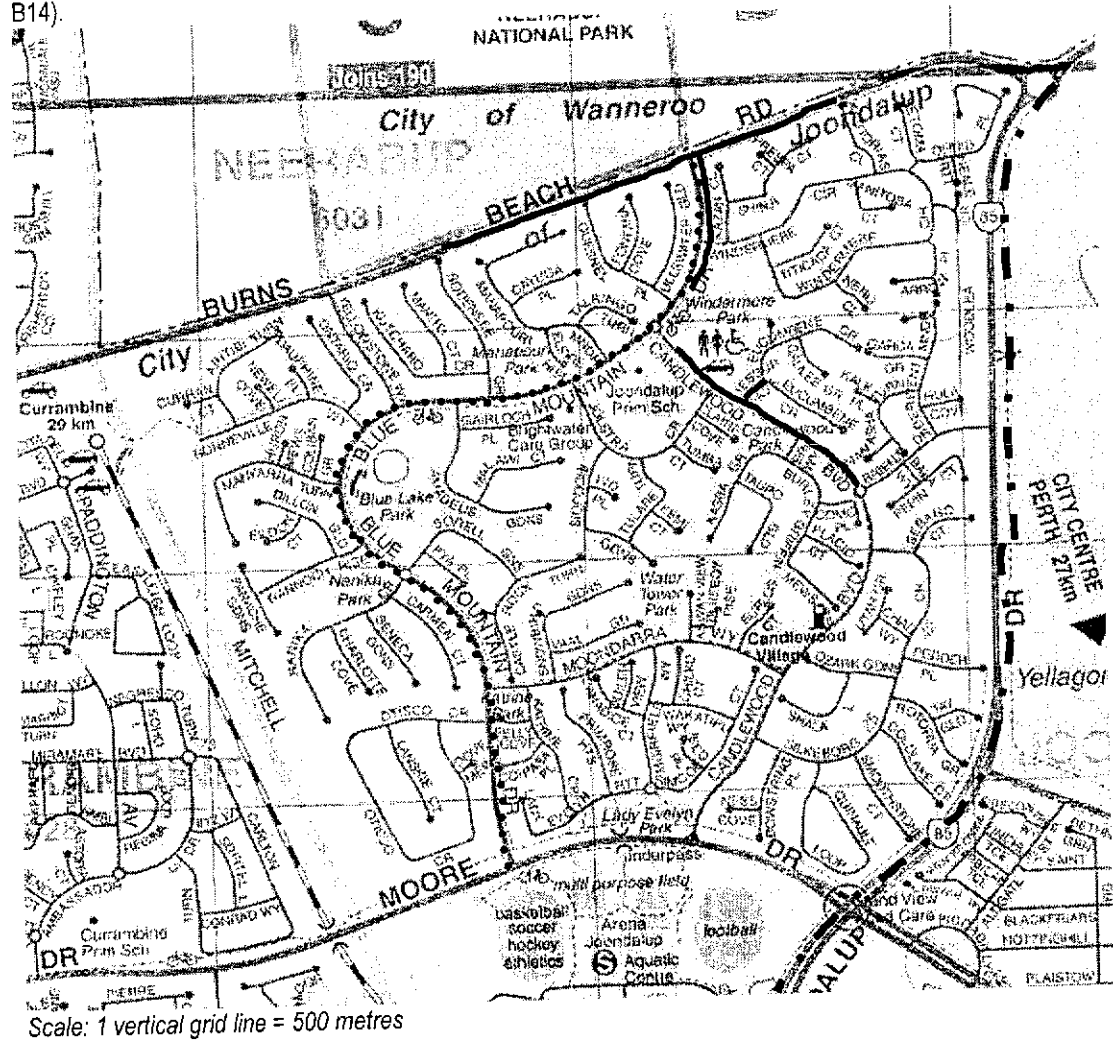
Maximum lots served by a culs-de-sac (B2).

Five out of 100 culs-de-sacs are serving more than 20 lots. It varies from 21 lots to 25 lots (Figure 1b). The least lots served by a culs-de-sac are four lots. This condition unquestionably leads to un-safety of dwellings at the end of culs-de-sac.

Local street should be provided parallel to arterials (B14).

Due to Joondalup's hilly topography, it is apt to design curvilinear streets to follow topography to minimised cut-and-fill or major earthwork. By doing this, Earth's original structure may be maintained and costs of road construction could be minimised. Thus, local streets are not parallel to arterials on more flat surface (Figure 1e).

Figure 1e: Map analysis for criteria links between streets (B3), and relation between local streets and arterials (B14).



————— : Links between streets with no more than two levels in hierarchy.

..... : Local streets

- - - : Arterials

Maximum length of culs-de-sac (B10).

Most culs-de-sacs (56%) are within the maximum length of 120metres. This specification is aimed at traffic calming (discourage speeding) and travel distance reduction (State Transport Authority 2002). This limitation may determine the congestion level at a collecting point (Photo 1).

Traffic signal control rather than roundabouts (B12).

There is one intersection (Moore Drive-Joondalup Drive) having traffic signal control (Photo 31). Another intersection (Burns Beach Road-Joondalup Drive) is controlled by a roundabout (Figure 1a).

Maximum dwellings served by an access way (B17).

Three out of five loops serve more than 120 dwellings and one out of fifteen culs-de-sacs serves more than eighty dwellings (Figure 1d) as required. In total, four out of twenty (20%) loops and culs-de-sacs do not fulfil standard.

The rest (six) of evaluation criteria are implemented in the whole Joondalup suburb.

The six evaluation criteria are:

Roads un-associated with the residential area – ‘rat running’ (B1).

All roads are associated with residential areas. The roads link residential areas to (for example) parks, schools and town centre. These facilities are for the residents’ benefits. Photo 2 shows a road linking dwellings to the Arena Joondalup (south of a case study areas).

Levels of street hierarchy in streets links (B3).

Burns Beach Road (arterial road) is linked to Blue Mountain Drive (collector street); while Candlewood Boulevard (local distributor) is linked to Jessup Pass (access road) as exhibited in Figure 1e. These examples show that streets links are not more than two levels different in the hierarchy. This limitation is for safety of road users from different traffic stream; slow vehicles on a low-level street will not conflict fast vehicles from a high-level street.

Clear physical distinctions between road hierarchies (B8).

Several factors, for example road width, maximum speed, road curve, and footpath or cycleway provision (Photos 5, 6, 7), physically differentiate road hierarchy. These physical distinctions are important visual cues to road users and suggest particular travel speeds.

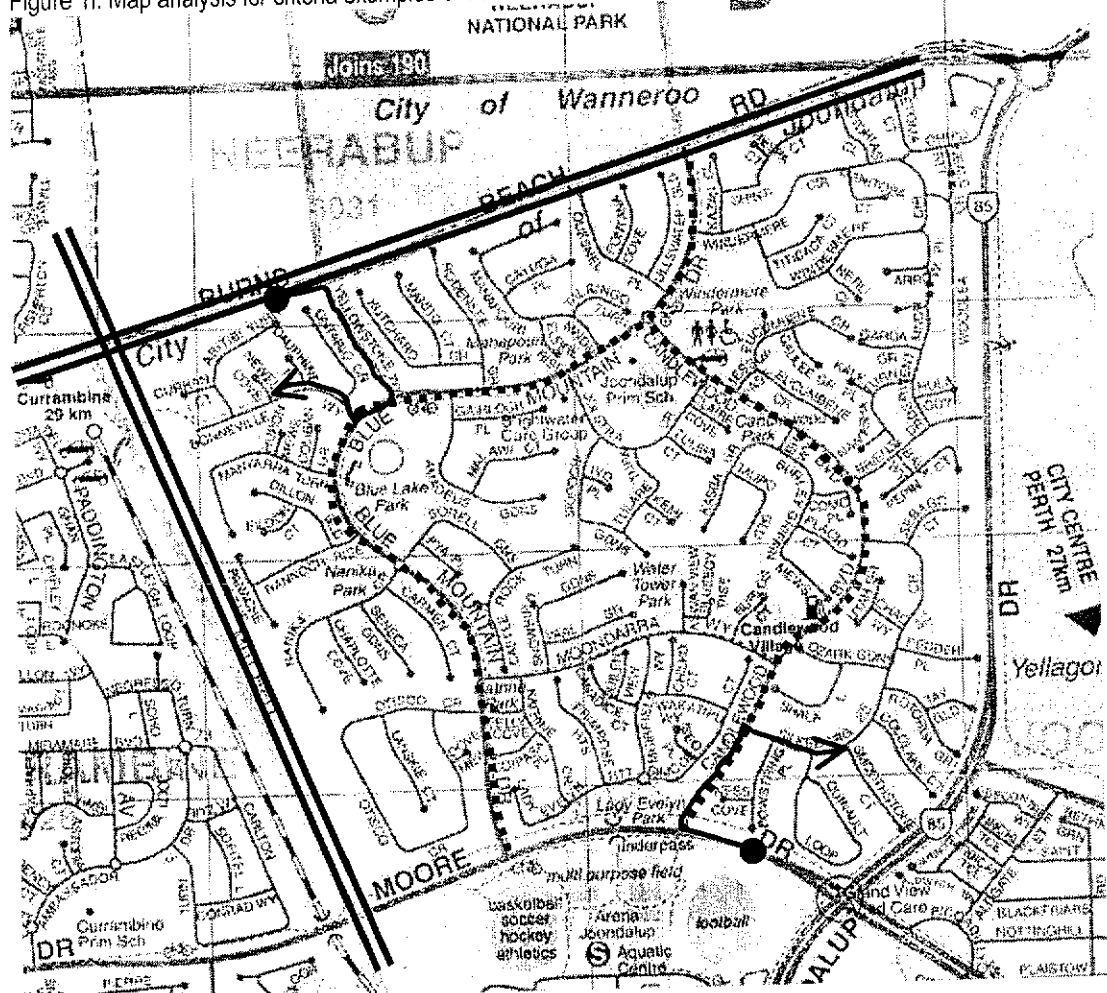
Spacings between blocks (B9).

In Joondalup, there are no blocks with spacings of more than 240 metres (Figure 1b). This criterion is aimed for neighbourhood permeability (Western Australian Planning Commission 2000) and for encouraging non-car use.

Maximum number of turnings (B4).

All addresses to arterial roads are within three turnings (Figure 1f). In my view, the fewer turnings there are, the more convenient a trip will be.

Figure 1f: Map analysis for criteria examples of address which can be reached within three turns (B4).



Scale: 1 vertical grid line = 500metres

- → : Addresses which can be reached within no more than three turnings
- === : Arterial roads
- : Collector streets

Speed control devices (B11).

Traffic calming as a means of speed control devices to achieve the target speeds is useful for pedestrian and cyclist safety (Federal Department of Transport and Communication 1993). Traffic calming can be found either implicitly such as road markings, and signage (Photo 4) or physically such as median islands (Photo 8), and roundabouts.

2. Public Transport

Table 2 exhibits evaluation criteria for the public transport and the extent of implementation. Fourteen evaluation criteria in policies at the time of and after the planning and development phase had been identified from the policy analysis.

One out of four evaluation criteria from policies pre planning and development phase is implemented in most area of Joondalup.

Appropriate services to employment centre (A4).

Just over a tenth (13%) of respondents of second questionnaire survey felt that mismatched bus routes impeded them from using the services. Routes served by buses in Joondalup are contained in Appendix 11.

The other three are applied in the whole Joondalup. They comprise:

Directness of bus routes (A1).

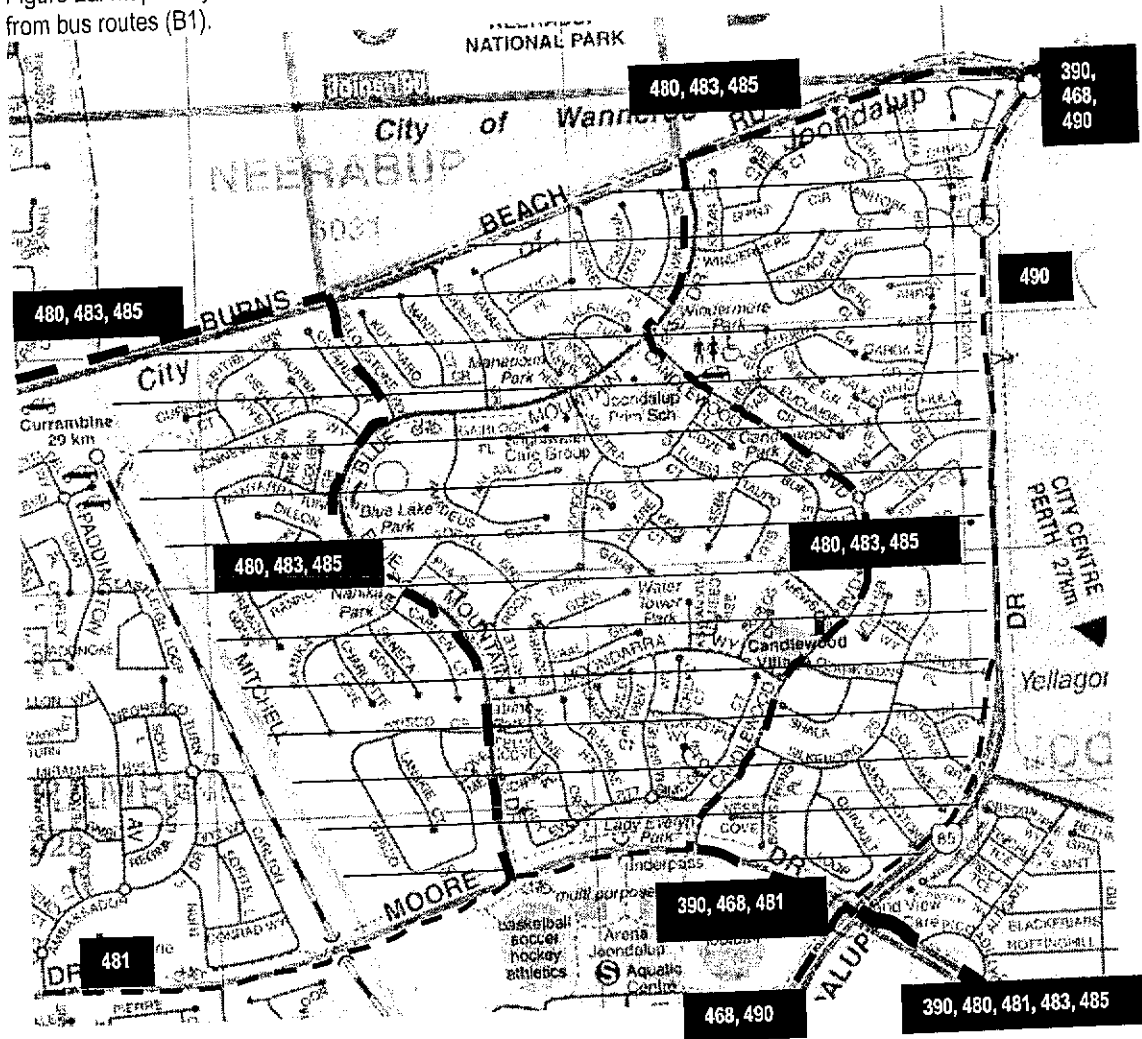
Bus routes in Joondalup run from and to arterial roads (Moore Drive, Joondalup Drive, and Burns Beach Road) through collector roads (Blue Mountain Drive, Candlewood Boulevard) to Yellowstone Way (Figure 2a). From Joondalup, they continue to northern suburbs. They are direct to the Joondalup CBD and train station (south of the suburb), as well as to the Currambine train station (west of the suburb).

Table 2: Analysis of evaluation criteria for the public transport in the Joondalup suburb.

No.	Evaluation criteria	Implementation	Data	Policy source
A	... in policies extant at planning and development phase			
1	Bus routes to be as direct as possible.	Y	Figure 2a	AMCORD, PM (1990), JCDDP, NWC
2	Average spacing between stops is 300-400metres.	Y	Figure 2b	LNDCDC, PM 1990/99, 2.6-1989/98), JCDDP
3	Bus routes to provide good access to local facilities.	Y	Figure 2b	JCDDP
4	Appropriate services to employment centres.	M	Appendix 11	NWC
B	... in current policies or post planning and development phase			
1	At least 90 percent of dwellings are within 400metres straight-line distance from bus route.	Y	Figure 2a	GS, AMCORD, PM (1990), SPS
2	Bus routes are as regular as possible.	Y	Appendix 11	PM (1990)
3	Bus routes are approximately 800metres apart.	Y	Figure 2a	PM (1990)
4	At least 60 percent of dwellings are within 400metres straight-line distance from bus stop.	Y	Figure 2c	LNDCDC, PM (1989), GS, AMCORD
5	Locate bus stop at potential destinations (schools, neighbourhood and town centres, stations, and recreational areas, industrial areas).	Y	Figure 2d	LNDCDC
6	Bus stops have surveillance from surrounding development.	N	Photos 9, 10	LNDCDC, PM (1989)
7	Locate bus stops adjacent to traffic light or median islands.	N	Figure 2b; Photo 9	LNDCDC
8	Safe and convenient access for bus stops.	N	Photos 9	PM (1989)
9	Access to public transport by pedestrians, cyclists, and people with disabilities.	M	Photos 8, 11	PM (1990), Metroplan
10	Provision with public transport network.	M	Appendix 11	LNDCDC, PM (1990)

N: The evaluation criterion is implemented in less than half the suburb; M: The evaluation criterion is implemented in more than half the suburb; Y: The evaluation criterion is implemented in the whole suburb; NWC: 1977 North-West Corridor Structure Plan; JCDDP: 1982 Joondalup Centre Development Plan; PM: Policy Manual (year); GS: 1989 Green Street; AMCORD: 1990 Australian Model Code for Residential Development; SPS: 1996 State Planning Strategy; LNDCDC: 2001 Liveable Neighbourhoods Community Design Code

Figure 2a: Map analysis for criteria bus routes (A1, B3), and dwellings within potential 400metres catchment from bus routes (B1).



Scale: 1 vertical grid line = 500 metres

--- : Bus routes (the thicker the line is, the more numerous the routes are)

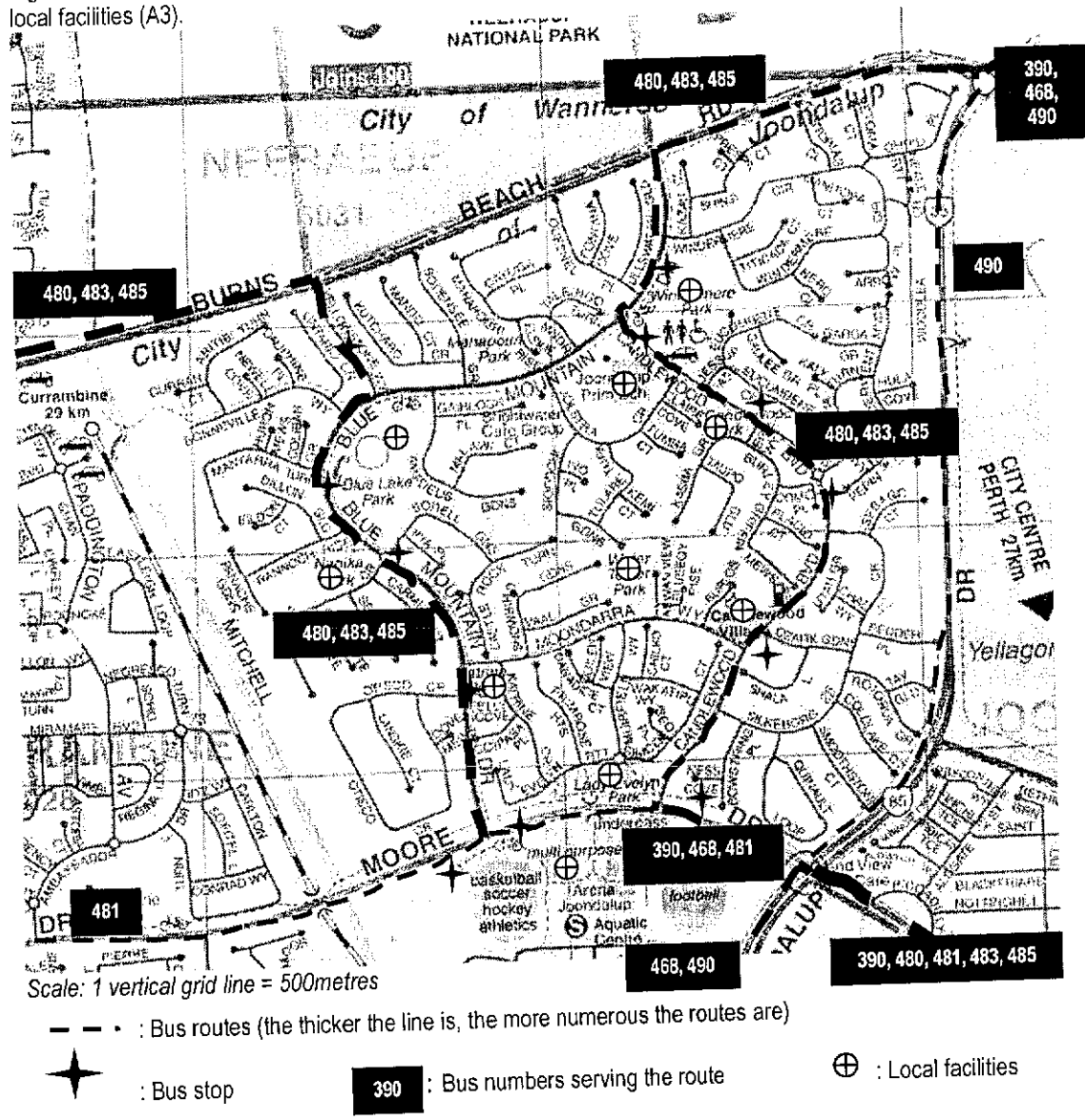
390 : Bus numbers serving the route

— : Dwellings within 400metres straight line from bus routes

Average spacing of bus stops (A2).

Nine bus stops spacing (82%) is 300-400metres, and two bus stops spacing (18%) is more than 400m. The nearest spacing is on Moore Drive (175metres) apart; where the longest spacing is between Candlewood Boulevard and Moore Drive (558metres) apart (Figure 2b). On average, bus stops spacing is 327metres apart which is within standard (300-400metres). In the researcher's opinion, this limitation is to encourage public transport use by providing facilities within walking distance.

Figure 2b: Map analysis for criteria bus stops distance (A2) and location (B7), and bus routes giving access to local facilities (A3).



Access to local facilities (A3).

Local facilities such as school, parks, and village centre are located in areas served by bus routes (Figure 2b). This service allows residents to fulfil their daily needs, recreational, and educational needs.

Ten evaluation criteria were derived from policies post planning and development phase. Three of them are realized in less than half area of Joondalup. They are:

Bus stops surveillance (B6).

Most bus stops do not have surveillance from surrounding uses. It occurs since they are located next to a dwelling's high fence (Photo 9) or near a park with no house facing (Photo 10). A bus stop at the Candlewood Shopping Centre has

surveillance from shops although only during business hours. This might be the reason why 90% of respondents of second questionnaire survey felt safe at the stop.

Bus stops location by traffic light (B7).

Bus stops are located near intersections (Photo 9), in or near park (Photo 10) as demonstrated in Figure 2b. They are not located adjacent to traffic light since the traffic within the suburb is quite low and needs no traffic light. They are neither located adjacent to median islands since streets are too narrow for median islands.

Condition of bus stops access (B8).

As a consequence of insufficient lighting and surveillance from surrounding access to bus stops is unsafe and inconvenient (Photo 9). Forty-four percent of second questionnaire survey felt satisfied with lighting condition at bus stops. This matter is discussed in more detail in the next two sections.

Two out of ten are implemented in most area of Joondalup. They comprise:

Access to public transport by pedestrians, cyclists, and the disabled (B9).

Although there are available accesses, some are unsafe due to factors such as lack of surveillance and lighting. Sufficient wide median islands for pedestrians to wait for the traffic safe to be crossed are not provided (Photo 9). Due to undulating topography (Photo 11), it is more difficult to provide access for the disabled. It may be handled by providing long ramps with a gentle slope. Eighty percent of respondents of second questionnaire survey were mostly satisfied with access to public transport by pedestrians and cyclists.

Public transport network (B10).

Public transport is connected to eight neighbouring residential suburbs (Appendix 11). Seventy percent of respondents of second questionnaire survey were mostly satisfied with bus route varieties and 60% were mostly satisfied with connection to other public transport. A good public transport network is one of ways to make the services close to that of private cars. Hence, people may start using public transport.

Half evaluation criteria are implemented in the whole Joondalup suburb. They are:

Proximity of bus routes to dwellings (B1).

Almost all dwellings are within 400metres straight line from bus routes. In most parts, bus routes are overlapping with one another. However, a few residents at heads of culs-de-sacs are 600-650metres from bus routes (Figure 2a). However, it is useless if bus routes are accessible but not the bus stops. People can only take a bus from a bus stop rather than a bus route. Fortunately, there is an after-7.30pm policy where passengers can ask the driver to stop wherever they want, as long as it is within the bus route. There are fourteen services leaving after 7.30pm from and to Joondalup every day except Sundays.

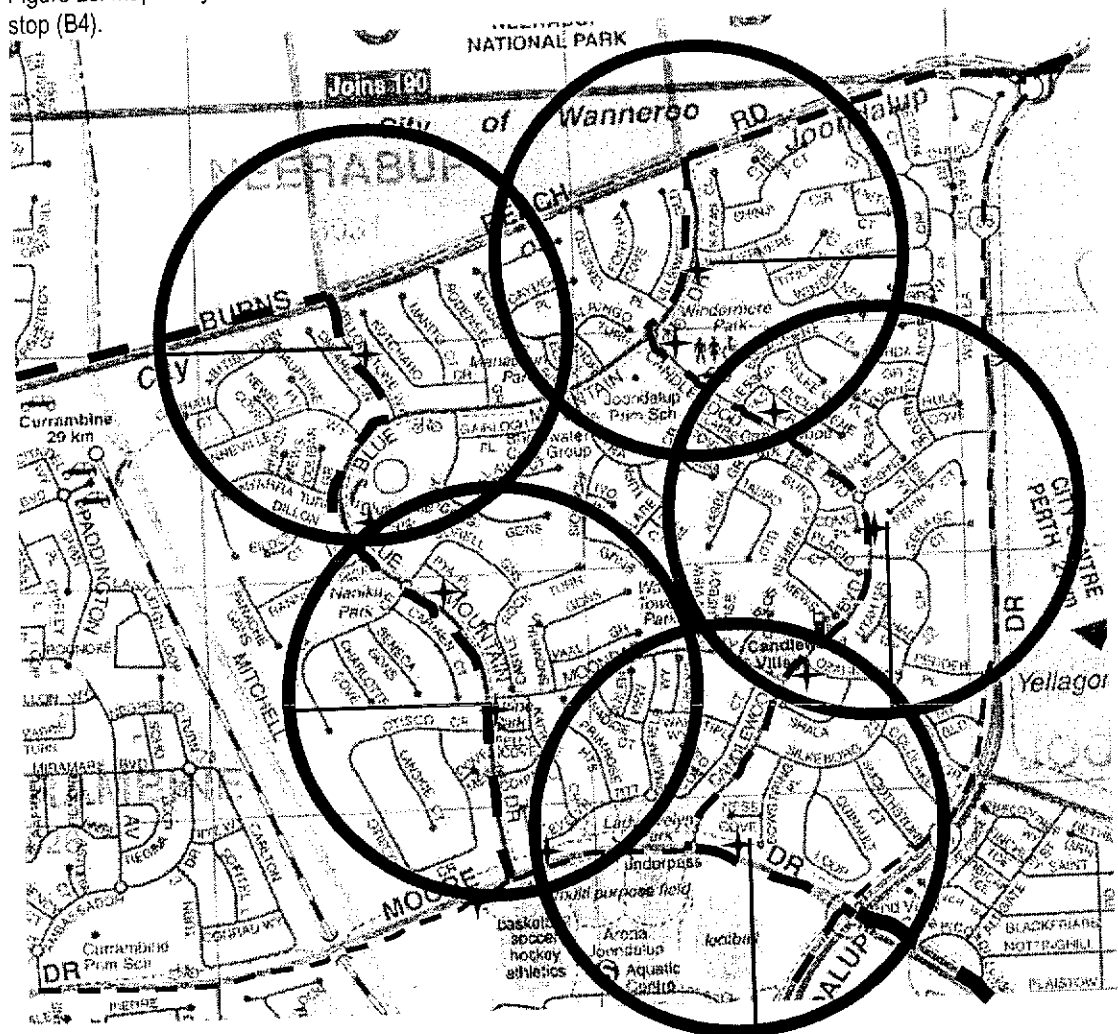
Regularity of bus services (B2).

Based on bus timetables and route maps, bus service runs regularly through Joondalup and serving other suburbs, although half of respondents of second household questionnaire survey agreed. Available bus routes are numbers 390, 468, 480,481, 483, 485, and 490 (Appendix 11); they are connected to train services. From Joondalup to Perth, there are eighteen services within twelve hours (6:00am-6:47pm) on weekdays, and twelve trips within eleven hours (7:19am-6:17pm) on Saturdays. From Perth, the frequency is similar (bus number 390). On average for bus number 468, the services from Joondalup and Wanneroo to Perth runs every half an hour (5:44am-11:35pm) on weekdays and less frequent on weekends and public holidays. The service is more frequent for bus numbers 480,481, 483, and 485. There are fifty-six trips from Joondalup to Perth from 6:02am until 12:38am on weekdays, forty-three trips within sixteen hours (8:12am-12:28am) on Saturdays, and fifteen trips from 8:58am-7:28pm) on Sundays and public holidays. Regarding number 490, the service runs every two hours (8:29am-6:12pm) on average on weekdays and three and a half hours (12:28-3:58pm) on Saturdays.

Proximity of bus stops to dwellings (B4).

Nearly all dwellings in this suburb are within 400metres straight-line distance from bus stop (Figure 2c). However, 'straight line' is questionable since it is ineffective if it is proximate but inaccessible due to steep topography or high walls. They are within walking and cycling distance, based on 80% of satisfied respondents of second questionnaire survey.

Figure 2c: Map analysis for criteria bus routes, and dwellings within 400metres straight-line distance from bus stop (B4).



Scale: 1 vertical grid line = 500 metres

- + : Bus stops
- : Bus routes (the thicker the line is, the more numerous the routes are)
- : Dwellings within potential 400metres catchment from bus stops

Strategic location for bus stops (B5).

Figure 2d demonstrates that bus stops are located near Joondalup primary school, Candlewood village centre, petrol station, and local parks. They are strategic places for bus.

mostly satisfied with bus route varieties. The difference occurs because case study areas of DoT and of this thesis were different; the area for this study was part of DoT's. Connection with other public transport, either buses or trains, is satisfying. This condition was supported by 60% of respondents of second questionnaire survey.

3. Cycling

Table 3 displays evaluation criteria for the cycling and the extent of implementation.

More than a third of evaluation criteria drawn from policies extant at the time of planning and development phase have been implemented in less than half are of Joondalup. They are:

Pleasant, efficient, and safe cycling (A1).

Issues on cyclists' safety within Joondalup suburb include insufficient surveillance from surroundings (Photo 17), protection from sunlight and rain (Photo 18), lights for cyclists (Photo 12) (but the lighting condition satisfies more than half respondents). On the other hand, the bicycle path is protected from roads by trees and plantations (Photo 6, 19). But 83% of respondents of second questionnaire survey did not feel protected. The condition is reflected in the opinions from respondents of the second household questionnaire survey where 57% of them were concerned about personal safety half of the respondents were dissatisfied with protection from sunshine and rain.

Crossing of major roads (overpass and underpass) (A2).

There is one underpass (Photo 17) leading to the Arena Joondalup. Nowadays, few underpasses are considered safe; they are far from surveillance and need to be designed very well to overcome this problem.

Safely integrated with other road users (A3).

Photos 7, 20, 21 display a dual-use path to the Currambine train station. The path is segregated from vehicular traffic but unsafe from speedy motorised vehicles. The paths, discussed below, are not wide enough to share with pedestrians.

Table 3: Analysis of evaluation criteria for cycling in the Joondalup suburb.

No.	Evaluation criteria	Implementation	Data	Policy source
A	... in policies extant at planning and development phase			
1	Pleasant, efficient, and safe cycling.	N	Photos 6, 7, 12, 17, 18, 19	JCDP, AMCORD, LNCDC, NWC, Metroplan
2	Safe crossing of major roads (overpass and underpass).	N	Photo 17	LNCDC, NWC
3	Cycling is safely integrated with other road users.	N	Photo 7	PM (1990), JCDP, Metroplan
4	Cycling is safely integrated with other road users. Bike linkages between trips attractors (schools, local centres, other community activities, bus stops).	Y	Figure 3a Photos 17, 18	LNCDC, JCDP, PM (1990), NWC
5	Provide off-road facilities.	M	Photos 13, 22	LNCDC, JCDP, PM (1990), NWC, Metroplan
6	Paths to open space.	Y	Figure 3a, Photos 28, 29	AMCORD, JCDP, Metroplan
7	Intersect bus route with cycling routes.	Y	Figure 3b	JCDP
8	Cycling systems separate from the road systems.	M	Figure 3a, Photos 20, 21	JCDP, AMCORD
B	... in current policies or post planning and development phase			
1	Cycle paths near cycle routes are 2.0metres wide.	N	Photo 12	AMCORD
2	Dual use paths to school, on neighbourhood connectors, and arterial routes should be 2.5metres wide.	N	Photo 13	LNCDC, SPS
3	Cul-de-sac heads should have a bike path connection.	N	Figure 3a; Photos 15, 16	LNCDC, PM (1990)
4	Dual use path must have a durable, non-skid surface.	Y	Photos 7, 16	AMCORD, LNCDC
5	Segregated dual-use paths or cycle paths along one side of district and local distributor roads.	Y	Photos 7, 23	PM (1989), Metroplan
6	Safe and convenient movement for the disabled, the aged, and the very young.	N	Photos 8, 23	AMCORD, LNCDC, PM (1990), Metroplan

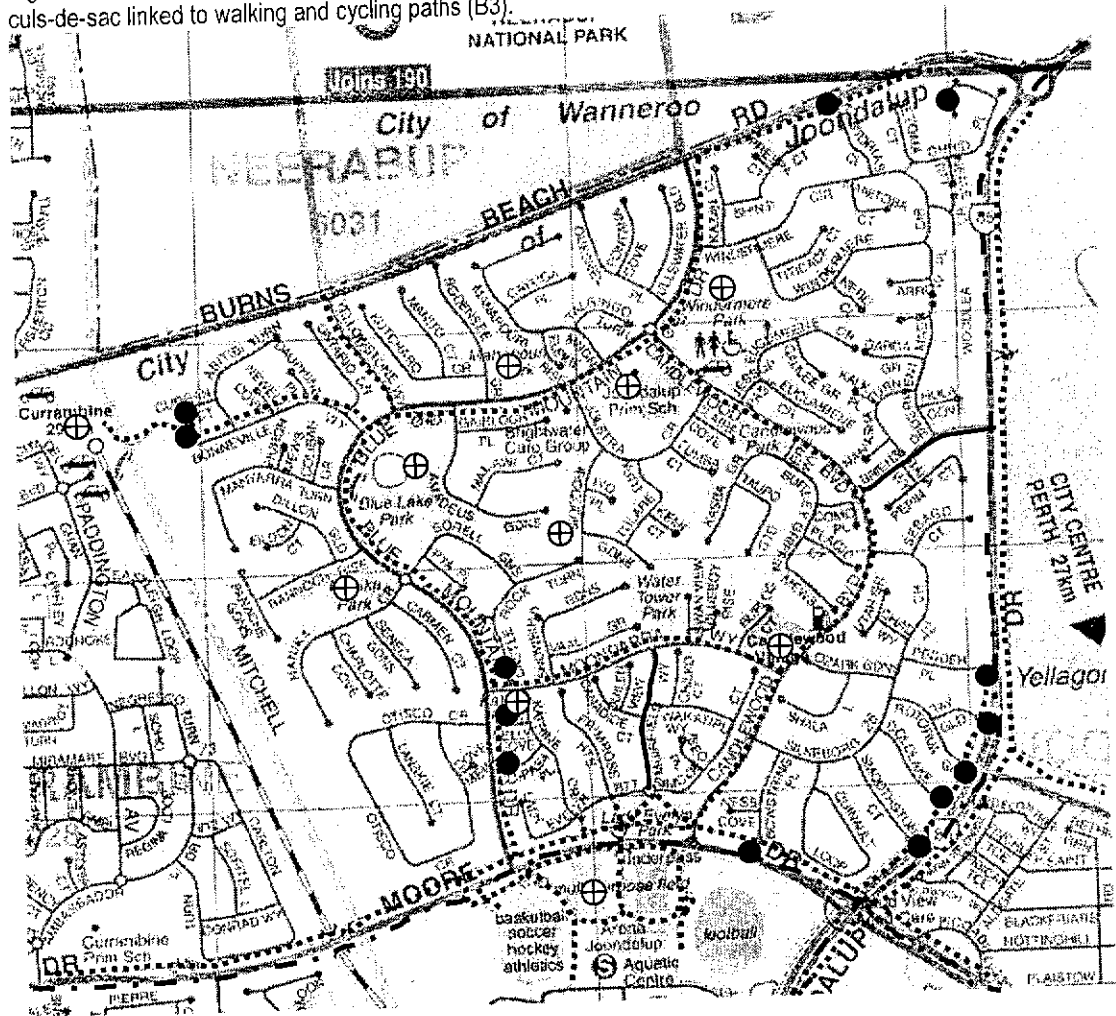
N: The evaluation criterion is implemented in less than half the suburb; M: The evaluation criterion is implemented in more than half the suburb; Y: The evaluation criterion is implemented in the whole suburb; NWC: 1977 North-West Corridor Structure Plan; JCDP: 1982 Joondalup Centre Development Plan; PM: Policy Manual (year); GS: 1989 Green Street; AMCORD: 1990 Australian Model Code for Residential Development; SPS: 1996 State Planning Strategy; LNCDC: 2001 Liveable Neighbourhoods Community Design Code

A quarter of evaluation criteria are realised in more than half of the suburb. They consist of:

Relation of cycling and road systems (A8).

Not all cycle paths are separated from road system (Figure 3a). Some streets do not have cycle paths causing cyclists to use the same space with motorised vehicles. This condition puts cyclists, especially un-experienced ones, in danger.

Figure 3a: Map analysis for criteria the relationship between cycling and road system, trip attractors (A4, A6) and culs-de-sac linked to walking and cycling paths (B3).



Scale: 1 vertical grid line = 500metres

..... : Walking and cycling paths (dual-use paths)

- - - : On-road bicycle lane

● : Culs-de-sac linked with walking and cycling paths

⊕ : Trip attractors

— : Muirfield Way and Brienz Drive

Bicycle parking and end-of-trip facilities (A5).

Bicycle facilities at shopping centre are secluded while other facilities are visible. Unlike the secluded bicycle facilities at the shopping centre (Photo 22), facilities in the school are visible (Photo 13). Location needs considering because it relates to safety of both bicycles and cyclists. Facilities provision can encourage cycling use. But 60% of respondents of the second household questionnaire survey were mostly dissatisfied with off-road facilities.

The other three are realised in the whole part of Joondalup suburb. They comprise:

Bicycle linkages between trips attractors (A4).

Photo 17 shows cycle paths connecting to a sport oval in an adjacent suburb; while Photo 18 illustrates a cycle path connecting to Lady Evelyn Park. Cyclists can go to school, parks, and the shopping centre within the suburb (Figure 3a). These figure and photos show cycling linkages between trips attractors, supported by 80% of respondents of second household questionnaire survey.

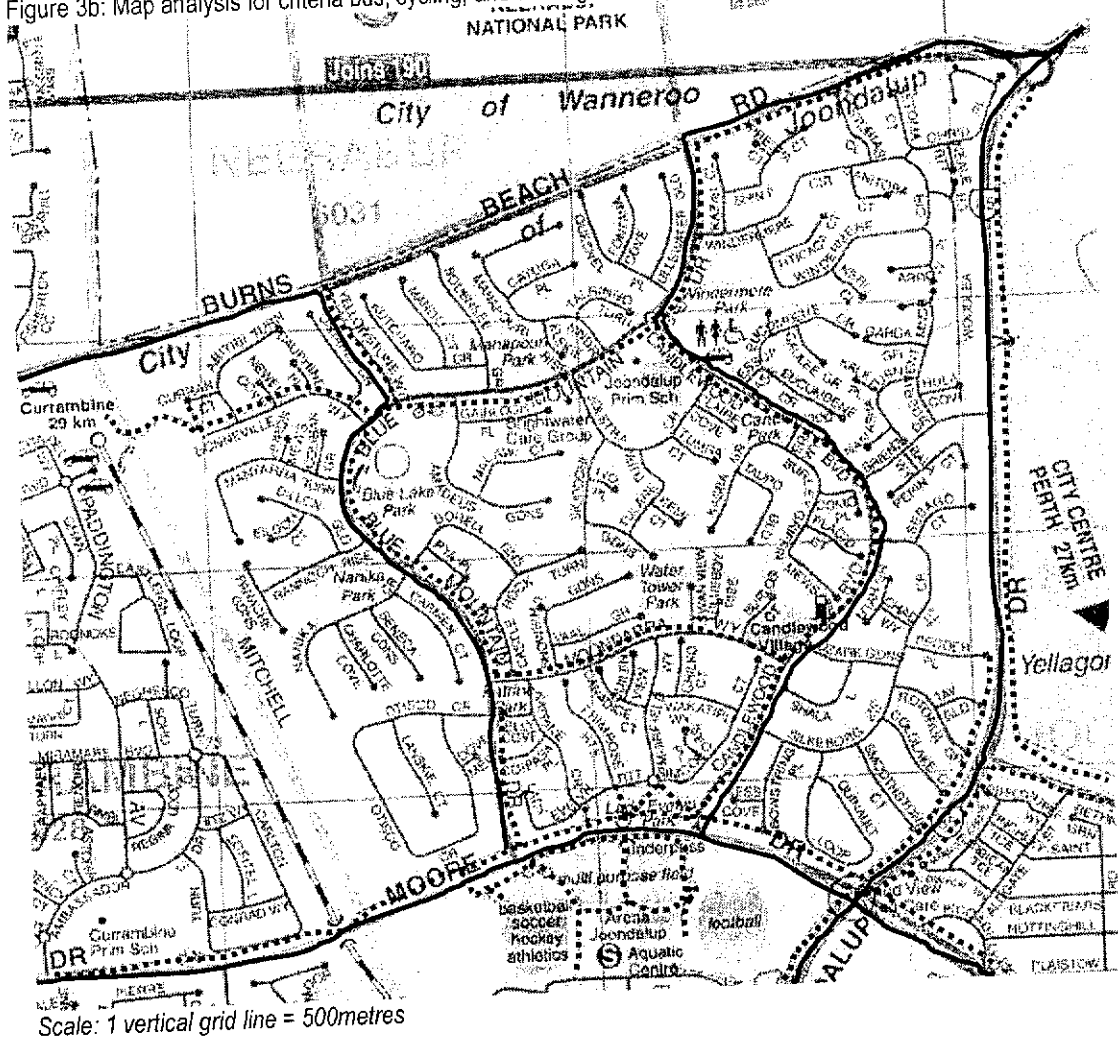
Cycle paths to open space (A6).

Cycle paths to open space for recreation purposes are available in Joondalup (Photos 6, 28, 29). The paths enable all residents (young, old, female, male, and others) to go to open space to exercise, play, and socialise. At open space, teaching and learning processes can also take place.

Relation between bus and cycle routes (A7).

Not only do cycle routes intersect with bus routes, but also in parallel with bus routes (Figure 3b). Cycle routes intersecting bus routes are on Bonneville Way and Moondara Way to Blue Mountain Drive, Moondara Way to Candlewood Boulevard, as well as Moore Drive to Joondalup Drive.

Figure 3b: Map analysis for criteria bus, cycling, and walking routes (A7).



Six of evaluation criteria were drawn from policies post planning and development phase. Two thirds are realised in less than half of Joondalup. They include:

Width of cycle paths near cycle routes (B1).

Photo 12 illustrates that the cycle path on Blue Mountain Road near cycle routes is 1.6metres width; narrower than required (2.0metres width).

Minimum width of dual use path (B2).

The criterion on minimum (2.5metres) dual-use path on neighbourhood connectors or arterial routes to a school is not met in Joondalup. This dual path near Wildermere Park leads students to the school but it is 2.25metres width (Photo 13). Narrow dual-use paths threaten both pedestrians and cyclists. To

augment the fulfilment, this path can be widened by narrowing either the bitumen road or the area for bicycle racks.

Bicycle path network (B3).

Joondalup provides bicycle tracks at its entrances (Figure 3a). They are continuous along neighbourhood roads and connected to main roads. However, there are thirteen out of 100 (13%) culs-de-sac heads are connected to bicycle path (Photos 15, 16). Cyclists need to cycle on roads with motorised vehicles. This low level of connection appears, as at the time this area was designed, discontinuity was not considered an issue.

Safe and convenient movement for the disabled, aged, and very young (B6).
At some places, the disabled will find difficulties, for example a bar in middle of footpath (Photo 23) can block those with wheelchair to continue their journey. There is no flat surface on median islands (Photo 8). It is unsafe for people with prams or wheelchair to wait for the traffic to be safe to cross. The aged and very young also have difficulties when cycling on a gravel surface (Photo 26).

The other two evaluation criteria are implemented in the whole Joondalup suburb.

Surface of dual use path (B4).

For users' safety, dual use path surface must have a durable, non-skid surface (Photo 7, 16). Cycle paths within Joondalup are from concrete and bitumen, in accordance with *AMCORD* (The Model Code Taskforce of the Green Street Joint Venture 1990). This accordance satisfied residents. Eighty percent respondents of the household questionnaire survey were mostly satisfied with the pavement material.

Segregated dual-use paths or cycle paths along district and local distributor roads (B5).

Photos 7, 20, 21 show a dual path leading pedestrians and cyclists to the Currabine train station is segregated from vehicular traffic by a fence. This segregation is for cyclists and other road users' safety. However, it is unsafe enough for cyclists since the fence is not strong enough to protect them from 80kph-vehicles.

4. Walking

Table 4 shows evaluation criteria for the walking and the extent of implementation. Eighteen evaluation criteria in policies extant at the time of and after the planning and development phase have been identified from the policy analysis.

Nearly half of evaluation criteria from policies pre planning and development phase are realised in less than half of Joondalup. They are:

Crossing of major roads (overpass and underpass) (A3).

Photo 17 illustrates an underpass towards a multi-purpose field. Currently, few underpasses are considered secure; they are far from vigilance and need to be planned very well to surmount this issue.

Safely integrated with other road users (A4).

Photo 7 shows that walking is integrated with bus routes. Photos 7, 20, 21 demonstrate that a dual-use path guiding pedestrians and cyclists to the Currambine train station is segregated from vehicular traffic but it is hazardous from speedy motorised vehicles.

Safe and convenient pedestrians movement (A2).

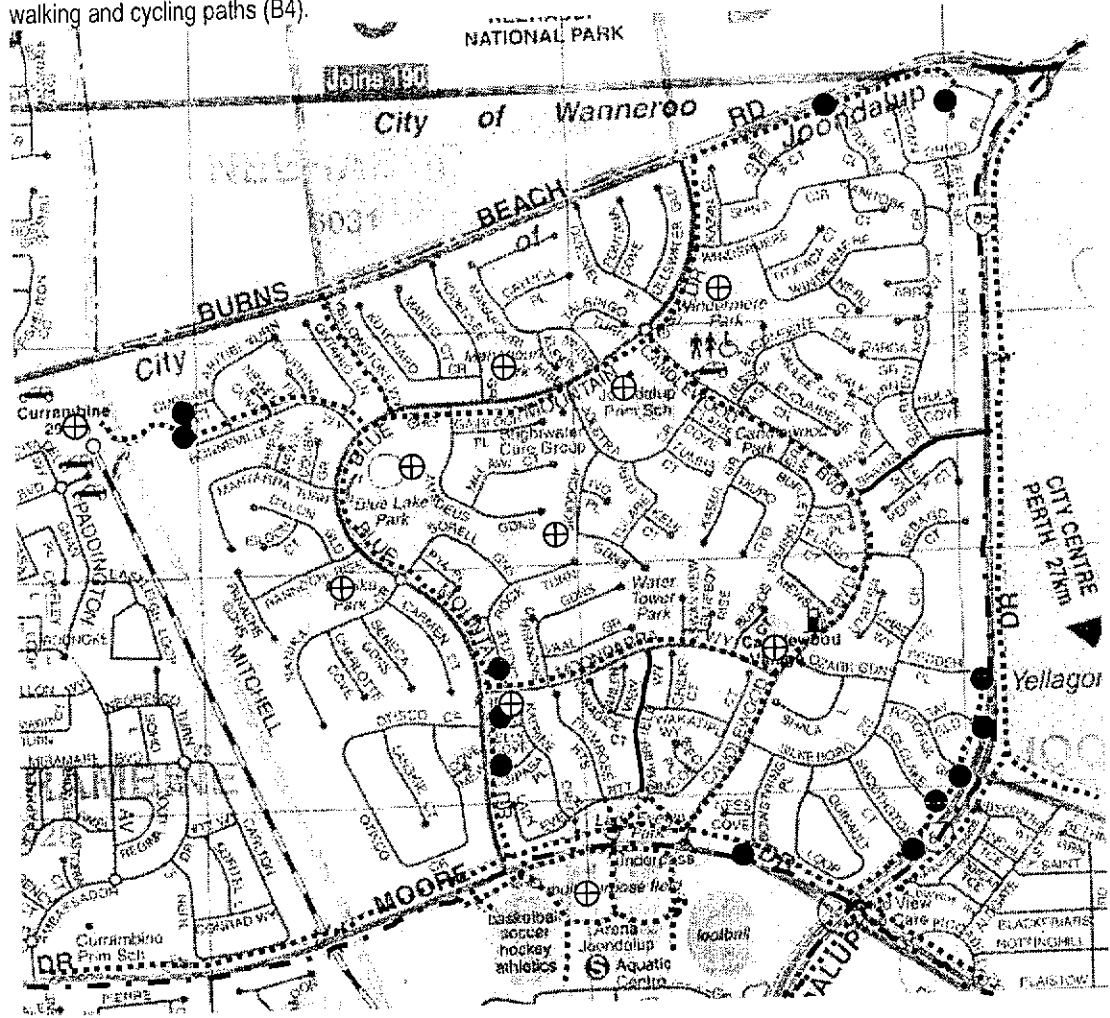
Issues on pedestrians safety and convenience include inadequate surveillance from surroundings (Photos 25, 26), light for after hours usage (69% of respondents of second questionnaire survey felt safe during the day), clear direction signage at footpath junctions (Photo 18), width of median islands for people waiting for the traffic before crossing roads, and protection from sun light and rain where 65% of respondents did not satisfy with the condition. Other examples are high residential fence (175cm height or higher) as shown in Photo 19, and insufficiently protected from high-speed vehicles at 80kph since the protection is simply in the form of road line markings line (Photo 7). But 12% of respondents of second questionnaire survey felt that walking within Joondalup was unsafe (during the night). However, it is good that pedestrians are protected from motorised vehicles by landscape (Photo 30) and road reserve areas (Photo 14).

Table 4: Analysis of evaluation criteria for walking in the Joondalup suburb.

No.	Evaluation criteria	Implementation	Data	Policy source
A	... in policies extant at planning and development phase			
1	Pedestrian paths through parks for recreation purposes	Y	Photos 10, 28, 29	LNDCD, AMCORD, JCDD, Metroplan
2	Safe and convenient pedestrian movement.	N	Figure 4a; Photos 7, 14, 18, 19, 21, 25, 30	LNDCD, GS, AMCORD, JCD, NWC, Metroplan
3	Safe crossing of major roads (overpass and underpass).	N	Photo 17	LNDCD, NWC
4	Walking is safely integrated with other road users.	N	Photo 7	JCDP
5	Linkages between trip attractors (schools, local centres, bus stops, other community activities).	Y	Figure 4a; Photos 17, 18	JCDP, PM (1989), LNDCD, NWC
6	Intersect bus routes with walking.	Y	Figure 4b	JCDP
7	Separate pedestrians systems from road systems.	M	Photos 10, 28	JCDP
B	... in current policies (after planning and development phase)			
1	No footpath in low traffic volume.	Y	Photo 5	GS, PM (1989)
2	Footpaths should be 1.5metres minimum width (2.0metres at schools, shop, other activity centres).	M	Photo 23	LNDCD
3	Footpaths are on both sides on arterial routes, access streets, and neighbourhood connector streets.	N	Photos 5, 9	LNDCD
4	Cul-de-sac heads should have a footpath connection.	N	Figure 4a; Photos 15, 16	LNDCD, PM (1990)
5	Safe, convenient movement network for the disabled, the aged, and the very young.	N	Photos 8, 23	LNDCD, AMCORD, PM (1990), Metroplan
6	Pram crossings are available at all intersections.	M	Photos 4, 8	LNDCD
7	Dual-use paths must have a durable, non-skid surface.	Y	Photos 7, 16	AMCORD, LNDCD
8	Segregated dual-use paths or cycle paths along one side of district and local distributor roads from vehicular traffic.	Y	Photos 7, 20, 21	PM (1989), Metroplan
9	Dual-use path to school on neighbourhood connectors and arterial routes is 2.5metres width.	N	Photo 13	LNDCD, SPS
10	Footpaths are along one side of local distributor roads and access way.	M	Figure 4a; Photos 8, 9	PM (1989), GS
11	Footpath, where required, of 1.2metres width.	Y	Photos 6, 8, 10, 23, 28	AMCORD

N: The evaluation criterion is implemented in less than half the suburb; M: The evaluation criterion is implemented in more than half the suburb; Y: The evaluation criterion is implemented in the whole suburb; NWC: 1977 North-West Corridor Structure Plan; JCDD: 1982 Joondalup Centre Development Plan; PM: Policy Manual (year); GS: 1989 Green Street; AMCORD: 1990 Australian Model Code for Residential Development; SPS: 1996 State Planning Strategy; LNDCD: 2001 Liveable Neighbourhoods Community Design Code

Figure 4a: Map analysis for criteria pedestrian movement (A2), trip attractors (A5) and culs-de-sacs linked to walking and cycling paths (B4).



Scale: 1 vertical grid line = 500metres

- : Walking and cycling paths (dual-use paths)
- : Cul-de-sacs linked with walking and cycling paths
- : Muirfield Way and Brienz Drive
- - - : On-road bicycle lane
- ⊕ : Trip attractors

Joondalup also provides pedestrian ways at its entrances. They are continuous along neighbourhood roads and connected to main roads (Figure 4a). However, not all footpaths are connected to culs-de-sac heads. Pedestrians are only offered a choice of unsafe pedestrian ways.

One of the seven (14%) evaluation criteria is implemented in more than half of Joondalup.

Relation of pedestrian and road systems (A7).

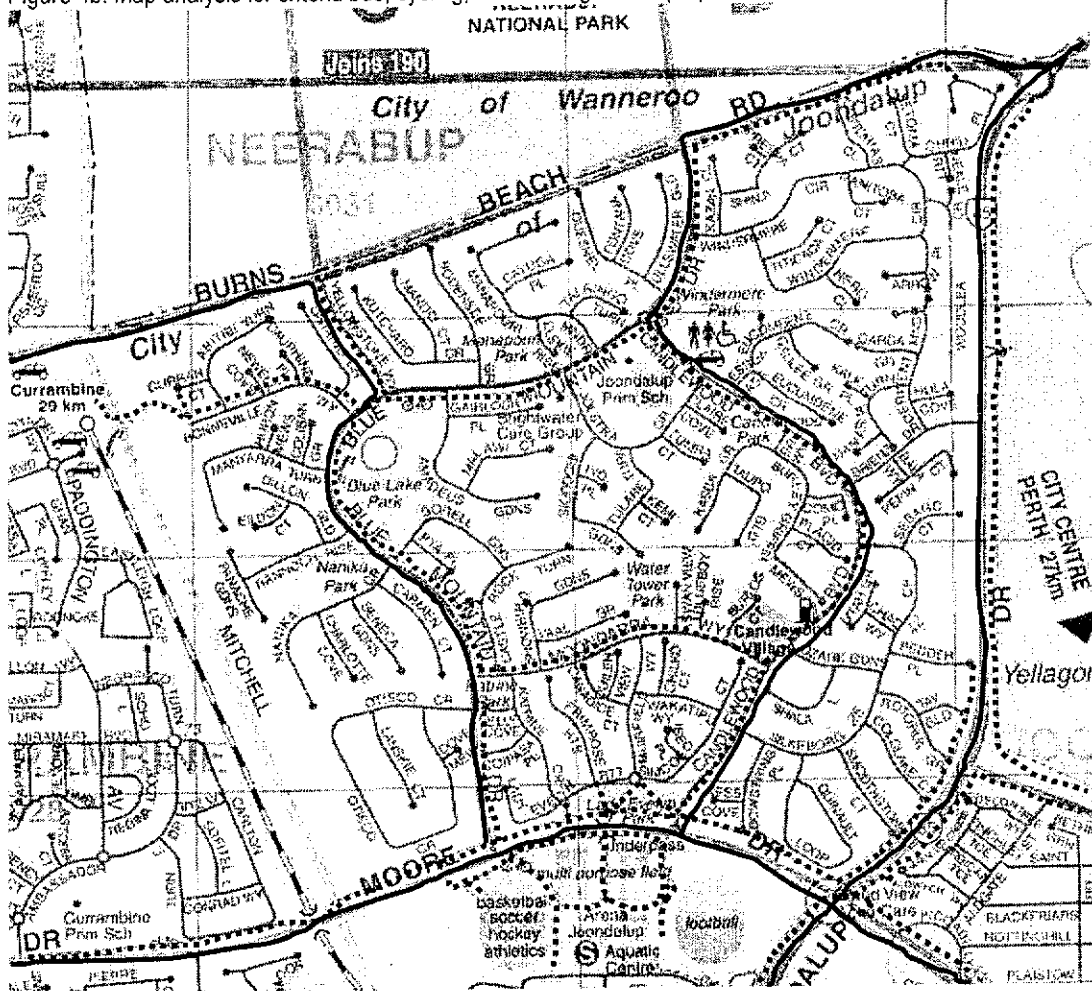
Some footpaths are separated from road system (Photos 10, 28). Streets with no footpaths make pedestrians using a same space with motorised vehicles. This condition compromises pedestrians' safety.

The other three (43%) are realised across the Joondalup. They comprise:

Relation between bus and pedestrian routes (A6).

Pedestrian routes intersect and are parallel with bus routes (Figure 4b). Cases in point are Moore Drive to Joondalup Drive, as well as Moondara Way to Candlewood Boulevard.

Figure 4b: Map analysis for criteria bus, cycling, and walking routes (A6).



Scale: 1 vertical grid line = 500metres

..... : Cycling and walking paths (dual-use paths)

———— : Bus route

Pedestrian paths through parks (A1).

Pedestrian paths through parks for recreation purposes are available in Joondalup (Photos 6, 28, 29). The paths enable all residents (young, old, female, male, and others) to go to parks to work out, relax, and socialise.

Walking linkages between trips attractors (A5).

Photo 17 demonstrates footpaths connecting to the Arena Joondalup; while Photo 18 shows a cycle path to the Lady Evelyn Park. These paths enable pedestrians to go to trip attractors within suburbs (Figure 4a). Ninety-four of respondents of second questionnaire survey were satisfied with destinations.

Eleven of those evaluation criteria were drawn from policies after the planning and development phase. Four of them (36%) have been implemented in less than half of Joondalup. They comprise:

Number of footpath on streets (B3).

There is only one (Photo 9), instead of two as required, footpath available but none in streets, like Sorell Gardens (Photo 5). The requirement to provide footpaths on both sides on arterial routes, access streets, and neighbourhood connector streets is not fulfilled. At the time when Joondalup was designed, provision of a footpath on one side of the road was more preferred than two footpaths. Therefore, this suburb complies with previous policy but not with current policy.

Footpath connection at culs-de-sac heads (B4).

There are thirteen out of 100 (13%) culs-de-sac heads connected with footpath (Photo 16). Figure 3a shows that only 13% of culs-de-sac heads are connected to a footpath. This low level of connection appears since discontinuity was not considered an issue at the time Joondalup was planned.

Minimum width of dual use path (B9).

The criterion on minimum (2.5metres) dual use path on neighbourhood connectors or arterial routes is not met in Joondalup. This dual path near Wildermere Park is 2.25metres width (Photo 13). Limited dual use paths threaten both pedestrians and cyclists.

Safe and convenient movement for the disabled, aged, and very young (B5).

At some places, the disabled will find difficulties when they are walking around. A bar in middle of footpath (Photo 23) can block those with wheelchair to continue their journey. There is no flat surface on median islands (Photo 8) to

wait for a safe traffic to cross. The aged and very young will face difficulties in walking on gravel and unstable surface (Photo 26).

Nearly a third (28%) have been implemented in more than half of Joondalup. They include:

Minimum footpath width (B2).

Footpath connecting culs-de-sac heads at Curran Court and Bouneville Way is 150-155cm width; while those on local distributor roads are 100-115cm width (Photo 23).

Availability of pram crossings (B6).

Photo 48 displays an intersection without pram crossings. This unavailability will put those with prams in hazard. They need a space to wait until the traffic is safe to cross.

Footpaths on local distributor roads and access way (B10).

Figure 3a and Photos 8, 9 illustrate that footpaths are available on local distributor roads and access way. However, some access ways such as Muirfield Way and Brienz Drive do not have footpaths.

The other four (36%) are applied across Joondalup. They are:

Footpath in low traffic volume (B1).

As shown in Photo 5, footpath is not necessary in low traffic streets. However, pedestrians will be more comfortable to walk on a footpath.

Surface of footpaths (B7).

For users' safety, dual-use path surface must have a durable, non-skid surface (Photos 7, 16). Ninety-four percent of respondents of the household questionnaire survey felt that the paving material was safe for them.

Segregated dual-use paths or cycle paths along district and local distributor roads (B8).

More than three quarters (77%) respondents of second questionnaire survey felt that walking within the suburb was adequately protected from motorised vehicles traffic. However, the feeling occurred when they walked on roads within the suburb, not on the main road on the fringe of the suburb, for example Burns Beach Road. Photo 23 shows a dual-use path for pedestrians and cyclists

segregated from vehicular traffic for users' safety. The segregation is in the form of either kerb or road markings (Photo 7). The segregation is clearly provided quantitatively but it is inadequately provided qualitatively. Road line markings alone do not protect pedestrians from motorised vehicles as drivers can take up pedestrians' space anytime.

Width of footpath where required (B11).

All footpaths in Joondalup are more than 1.2metres width (Photos 6, 8, 10, 23, 28). This condition contributes to pedestrians' convenience and encourages walking.

PHOTOS

Taken in 2001.

Photo 1



Photo 2

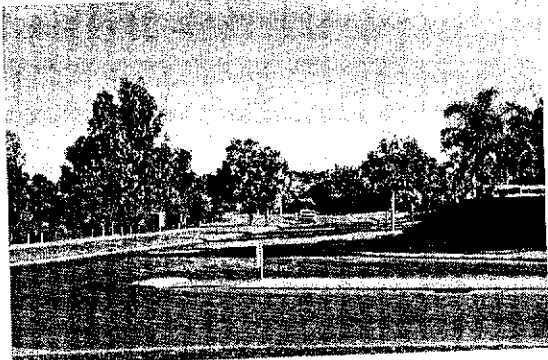


Photo 3



Photo 4

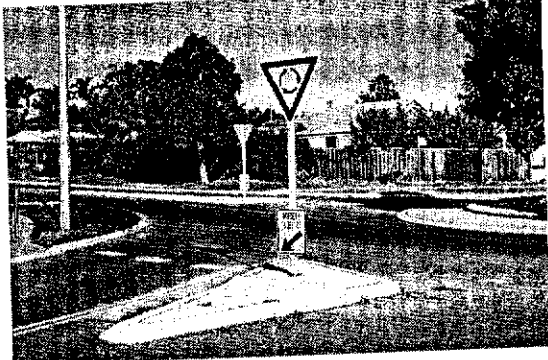


Photo 5

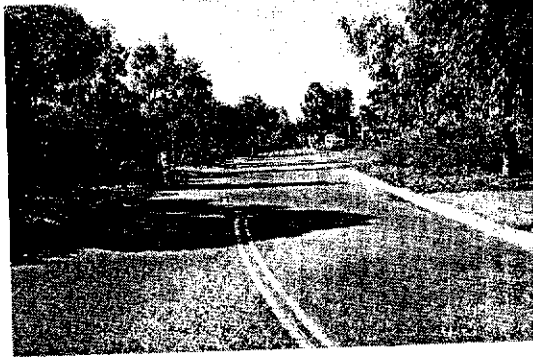


Photo 6

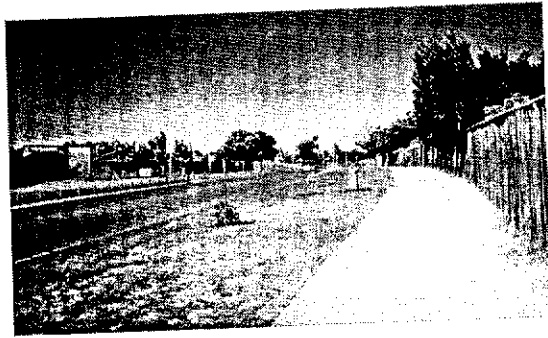


Photo 7



Photo 8

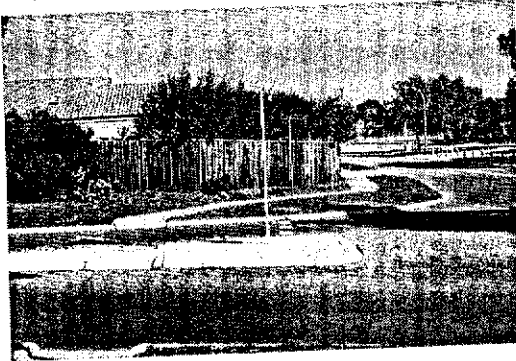


Photo 9



Photo 10



Photo 11

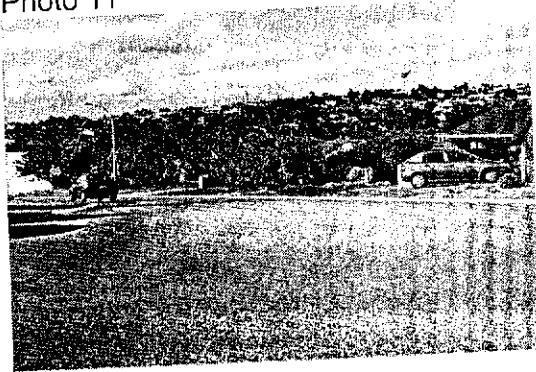


Photo 12



Photo 13

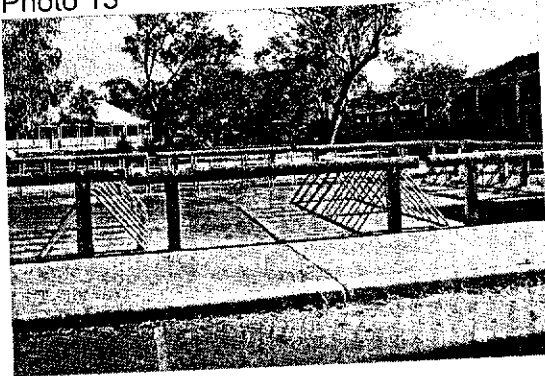


Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19

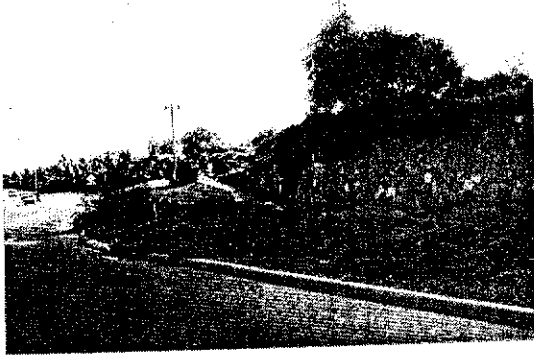


Photo 20



Photo 21



Photo 22

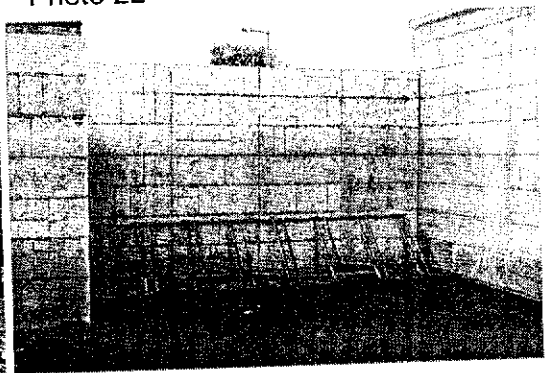


Photo 23



Photo 24

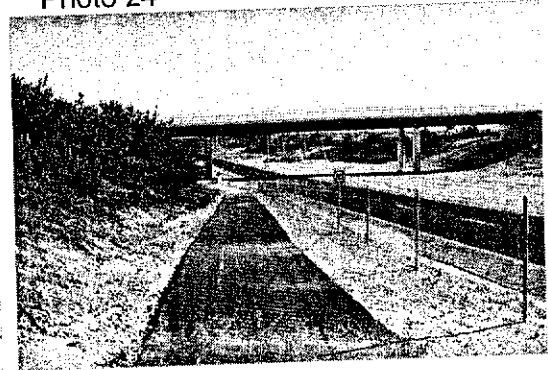


Photo 25



Photo26



Photo 27



Photo 28



Photo 29

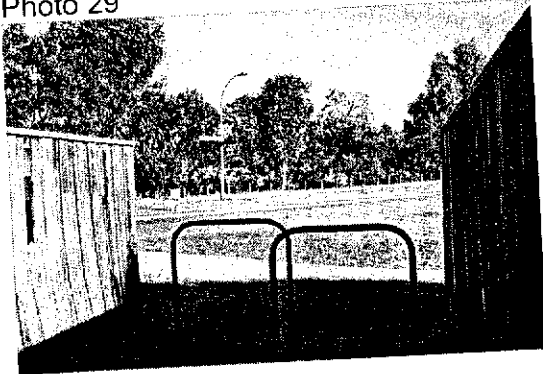


Photo 30

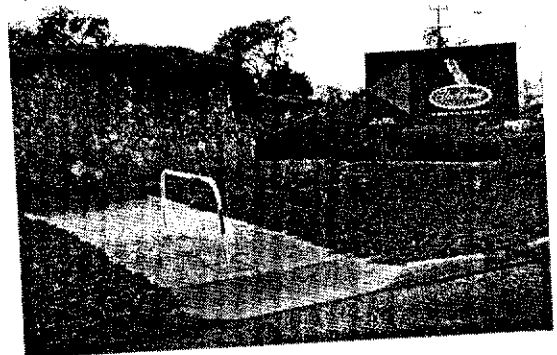
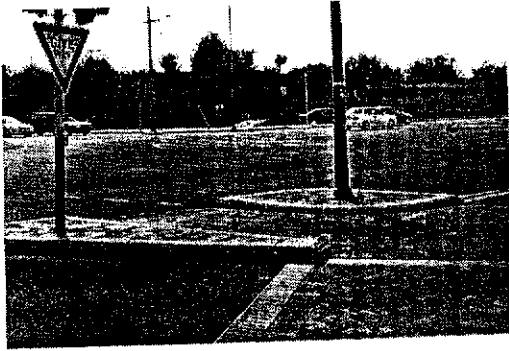


Photo 31



Household questionnaire surveys results

Public transport/ Bus

No.	Satisfaction with	Mostly satisfied (%)	Mostly dissatisfied (%)
1	Safety	88	12
2	Shelter from sunshine and rain	50	50
3	Accessibility by walking and cycling	80	20
4	Accessibility by motorised vehicles	90	10
5	Availability of bus stops within walking distance	90	10
6	Bus stops surveillance	90	10
7	Bus stops lighting	44	56
8	Timetable availability at bus stops	30	70
9	Bus stops attractiveness	40	60
10	Available seat at bus stops	50	50
11	Frequency of service	50	50
12	Variety of routes	70	30
13	Connection with other service (10% added "depends on the time")	60	30

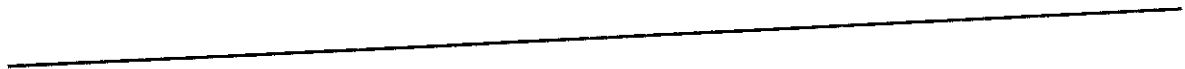
Walking

No.	Satisfaction with	Mostly satisfied (%)	Mostly dissatisfied (%)
1	Lighting	69	31
2	Shade from sunshine and rain	35	65
3	Surveillance	88	12
4	Protection from motorised vehicles	77	23
5	Evenness of footpaths	77	23
6	Graffiti on walls and paths	56	44
7	Non-skid material used	94	6
8	Cleanliness of footpaths	82	18
9	Available attractive destinations	94	6
10	Facilities provision	41	59
11	Signage availability	80	20
12	Streetscape	81	19

Cycling

No.	Satisfaction with	Mostly satisfied (%)	Mostly dissatisfied (%)
1	Safety	57	43
2	Lighting	67	33
3	Shade from sunshine and rain	50	50
4	Surveillance	43	57
5	Protection from motorised vehicles	17	83
6	Evenness of footpaths	57	43
7	Graffiti on walls and paths	60	40
8	Non-skid material used	80	20
9	Cleanliness of footpaths	80	20
10	Available attractive destinations	80	20
11	Facilities provision	60	40
12	Signage availability	80	20
13	Streetscape	100	0

**Appendix 20: Policy implementation – a detailed analysis in
the Woodlake suburb.**



This Appendix demonstrates Woodlake's performance of implementation of evaluation criteria for the road network, public transport, cycling, and walking. Analyses are presented in a tabular form, maps, and photos; the photos are contained at the end of this Appendix.

1. Road Network

Table 1 shows evaluation criteria for the road network and the extent of implementation. Of the twenty-one evaluation criteria, nine were from policies present at the time of planning and development phase. One of nine is implemented in most Woodlake.

Lots with front and rear accesses (A6).

There are lots with road access to both front and rear boundaries (Photos 1, 25).

There are two vehicle accesses at some dwellings. In the researcher's opinion, rear laneways in this suburb are inefficient, especially since they are exclusively utilised only by a few dwellings backing the laneways. They will be better used for backyards or road reserve. Rear laneways are more useful for allotments fronting public parks or fronting a road with no vehicles accesses to the allotments (Curtis 2002) with the consequence of the loss of privacy.

The other six are implemented across Woodlake. They are:

Roads un-associated with the residential area – 'rat-running' (A1).

All roads are not through routes un-associated with residential areas. The roads link dwellings to (for example) schools (Photo 2) and town centre (Photo 3).

These facilities are associated with residential areas since they are for residents' needs.

Table 1: Analysis of evaluation criteria for the road network in Woodlake.

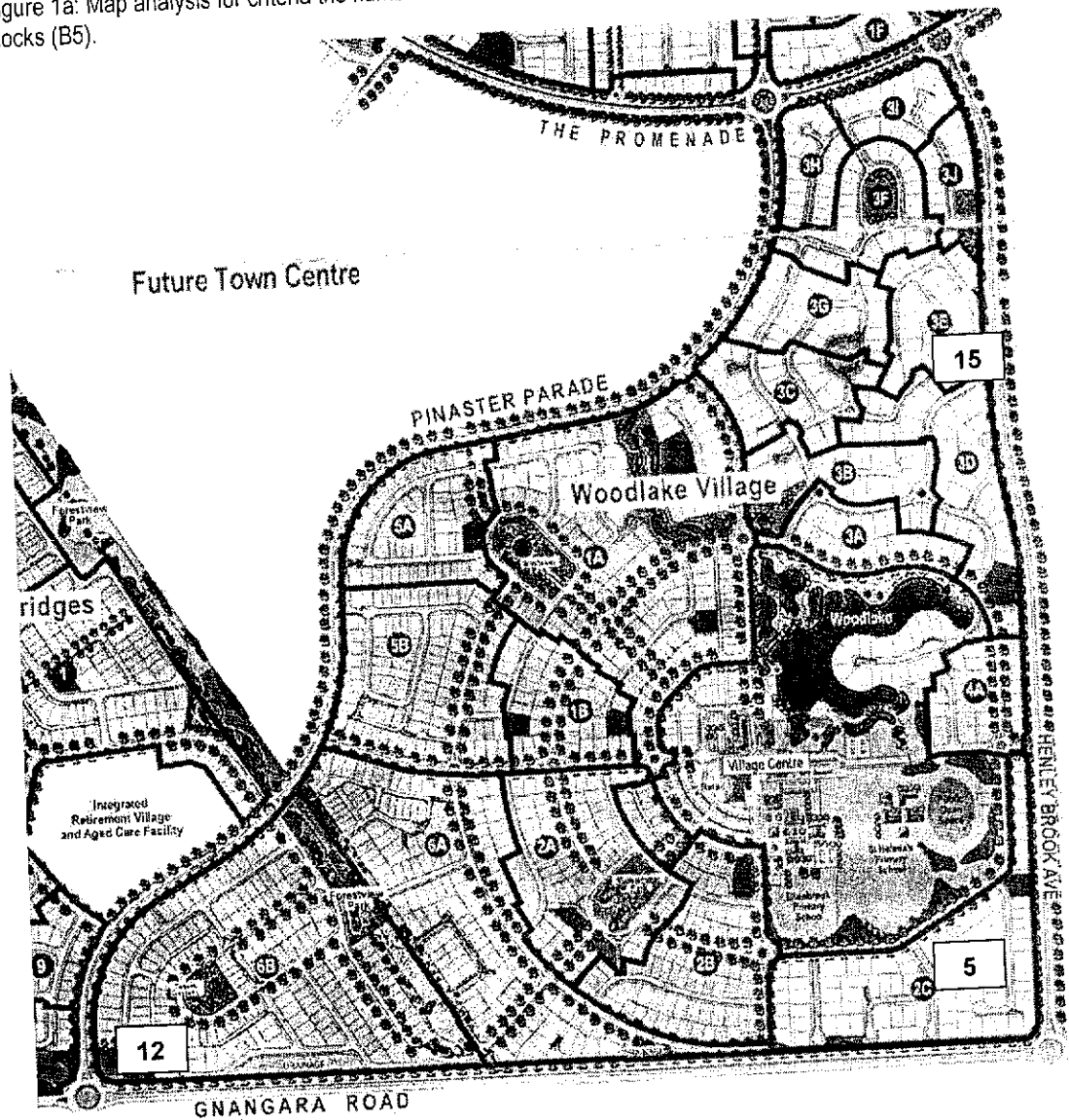
No.	Evaluation criteria	Implementation	Data	Policy source
A	... in policies extant at planning and development phase			
1	Residential areas are not passed by through routes un-associated with the residential area.	Y	Photos 2, 5	GS
2	Culs-de-sac to serve no more than twenty lots.	Y	Figure 1a	LNDCD, PM (1989)
3	Streets links are not more than two levels different in the hierarchy.	Y	Figure 1b	AMCORD
4	Connections between residential streets should be T-junctions or roundabouts.	Y	Figure 1c; Photos 3, 24	AMCORD
5	No more than three turns are required to travel from any address to collector street.	Y	Figure 1d	AMCORD
6	Direct short cuts across the cell are not allowed.	M	Photos 1, 25	PM (1988)
7	Direct short cuts across the cell are not allowed.	Y	Figure 1e	PM (1988)
B	... in current policies (after planning and development phase)			
1	Interconnected street network.	M	Figure 1f	LNDCD, SPS
2	The street network should have no more than 15 percent of lots fronting culs-de-sac.	Y	Figure 1f	LNDCD
3	A movement network which minimises travel time. Maximum driving time from collector street to any allotment is one minute.	Y	Figure 1d	LNDCD
4	Clear physical distinctions of road hierarchy.	Y	Photos 4, 5, 6	LNDCD, Metroplan
5	Street blocks of no more than 240metres.	Y	Figure 1a	LNDCD
6	Maximum culs-de-sac length should be 120metres.	M	Figure 1f	LNDCD
7	Speed control devices to achieve the target speeds.	Y	Photos 1, 3, 4, 7	LNDCD, Metroplan
8	Traffic signal control rather than roundabout.	M	Photo 3	LNDCD
9	Street design to enable development to front all streets.	M	Figure 1e; Photo 15	LNDCD
10	Local street should be provided parallel to arterials.	Y	Figure 1b	LNDCD
11	Average spacing of junctions (the standard is contained in Appendix 21).	N	Figure 1c	LNDCD
12	Distance between neighbourhood centres and neighbourhood perimeter is 400-450metres on average.	N	Figure 1c	LNDCD

N: The evaluation criterion is implemented in less than half the suburb; M: The evaluation criterion is implemented in more than half the suburb; Y: The evaluation criterion is implemented in the whole suburb; PM: Policy Manual (year); GS: 1989 Green Street; AMCORD: 1990 Australian Model Code for Residential Development; SPS: 1996 State Planning Strategy; LNDCD: 2001 Liveable Neighbourhoods Community Design Code

Maximum lots served by culs-de-sac (A2).

All culs-de-sacs in Woodlake serve less than twenty lots, i.e. 6-17 lots (Figure 1a). This requirement may impact on the level of congestion at a collection point.

Figure 1a: Map analysis for criteria the number of lots served by a culs-de-sac (A2), and spacings of street blocks (B5).



0 500m

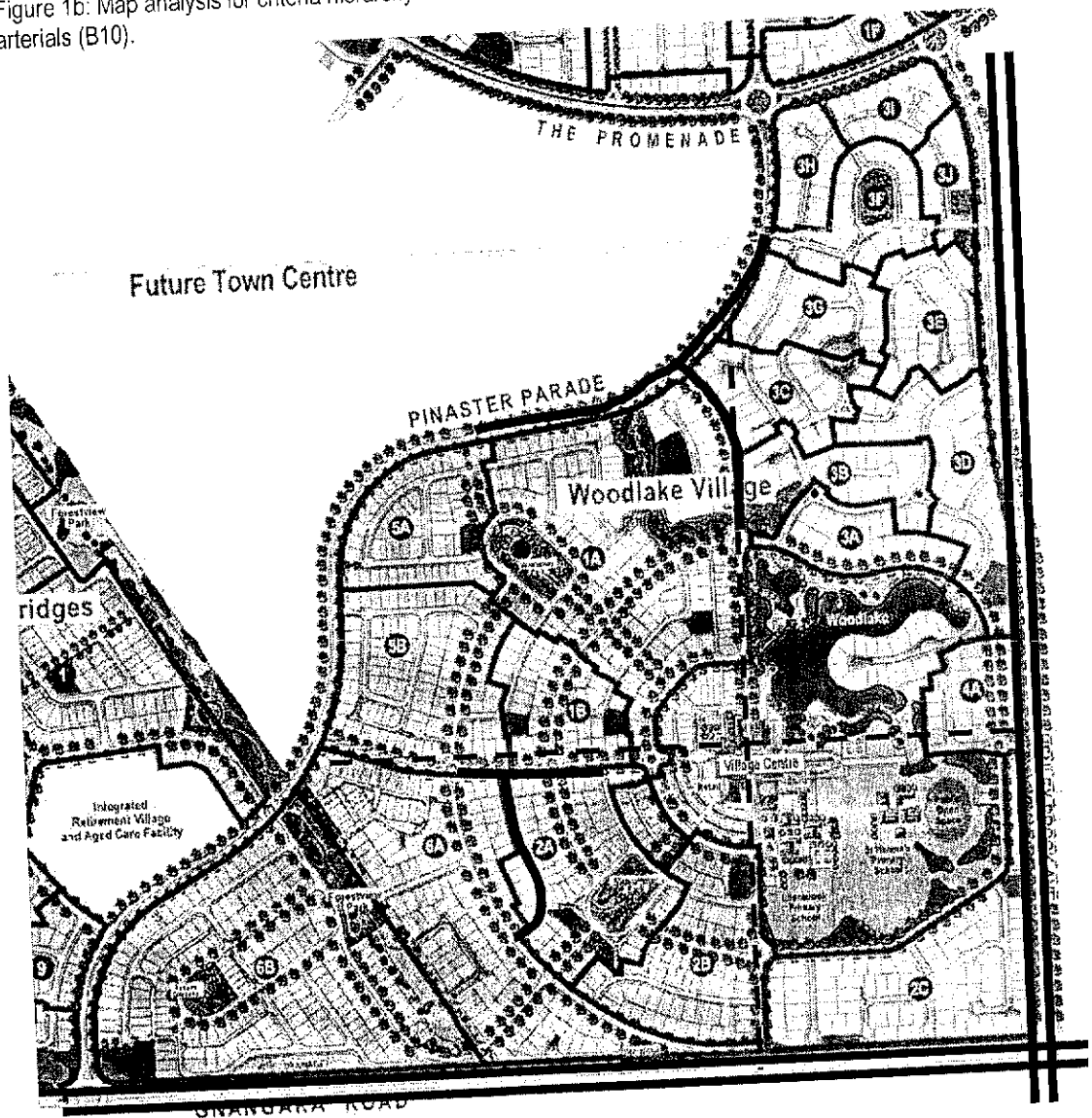
10 : The number of lots served by a culs-de-sac.

Levels of street hierarchy in streets links (A3).

Streets links in this case study areas are no more than two levels different in the hierarchy. Links between Pinaster Parade (neighbourhood connector)–Highpoint Boulevard (local distributor), and Woodlake Boulevard (local distributor)–Pinea

Turn (access road) are examples of streets links with one level higher (Figure 1b).

Figure 1b: Map analysis for criteria hierarchy level of street connection (A3), relation between local streets and arterials (B10).



Scale: Proportional

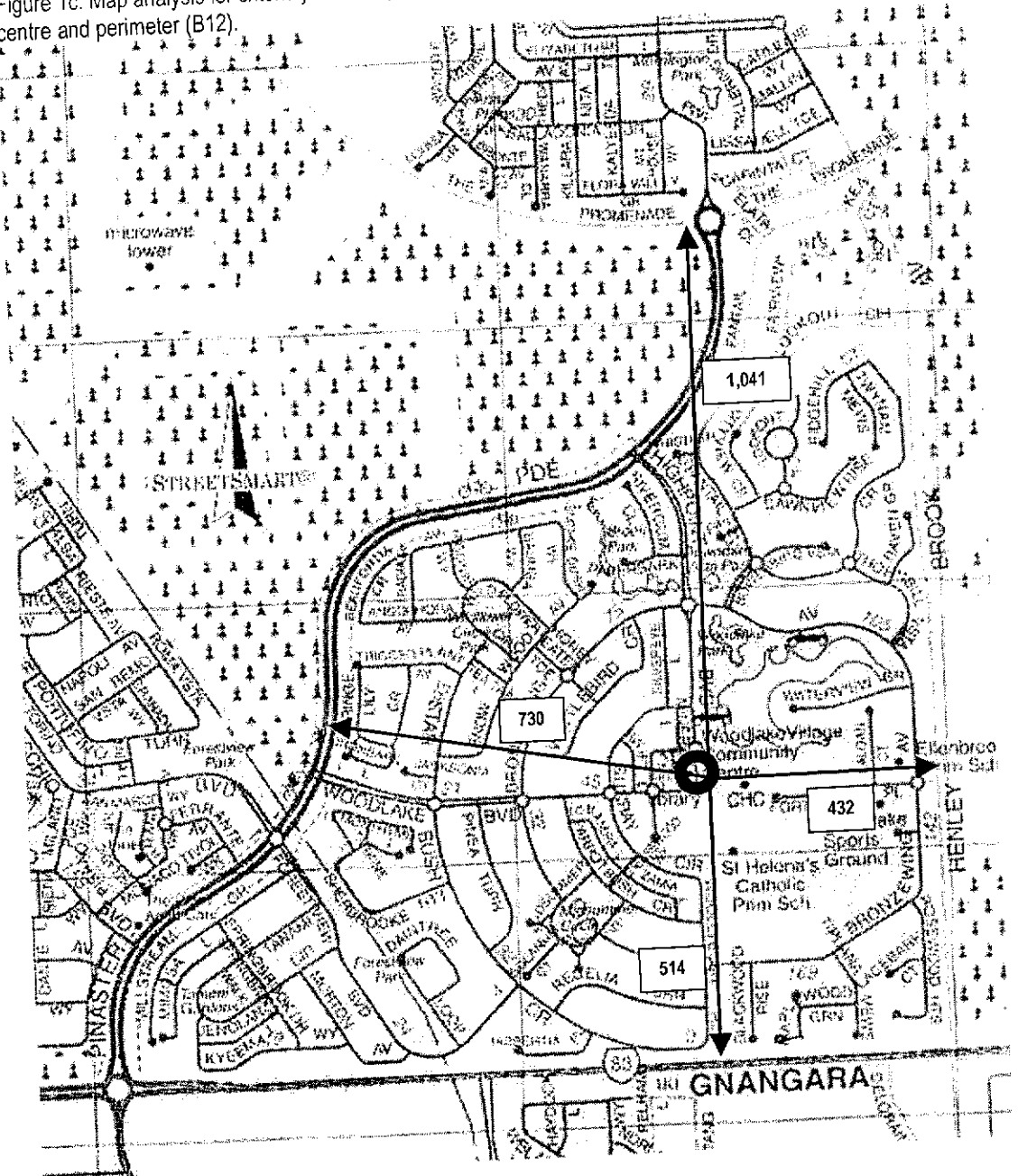
- : Links between streets which are not more than two levels in hierarchy
- ==== : Arterial roads
- - - : Local streets

Connection between residential streets (A4).

There are sixty-one T-junctions and twelve roundabouts (Photos 3, 24); eighty-four percent of intersections are T-junctions (Figure 1c). It signifies that road users' safety could be optimised since T-junctions are less risky for buses,

cyclists, and pedestrians than roundabouts (Austroads 1999; Curtis 2002; State Transport Authority 2002).

Figure 1c: Map analysis for criteria junctions (A4), roundabouts (B11), and distance between neighbourhood centre and perimeter (B12).



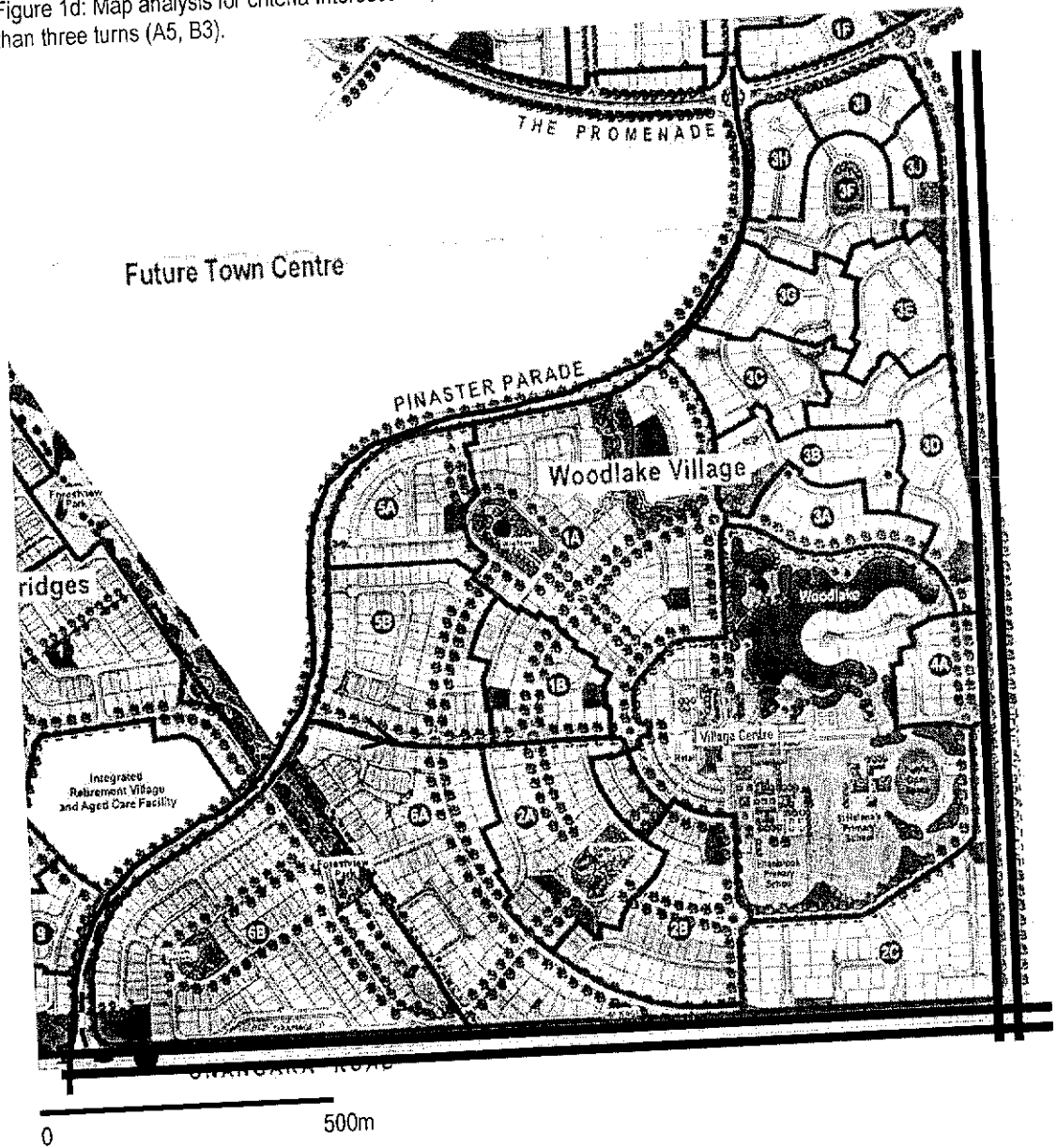
Scale: 1 vertical grid line = 500metres

- : Culs-de-sac
- : Roundabouts
- ⊥ : T-junctions
- (with dot) : Neighbourhood Centre
- 514 (in box) : Distance from neighbourhood centre to perimeter (metres)

Maximum number of turns (A5).

The whole Woodlake has no more than three turns required to travel from any address to collector street (Figure 1d). All addresses can be reached within maximum turns.

Figure 1d: Map analysis for criteria Intersections, and examples of address which can be reached within less than three turns (A5, B3).



Scale: Proportional

==== : District distributor

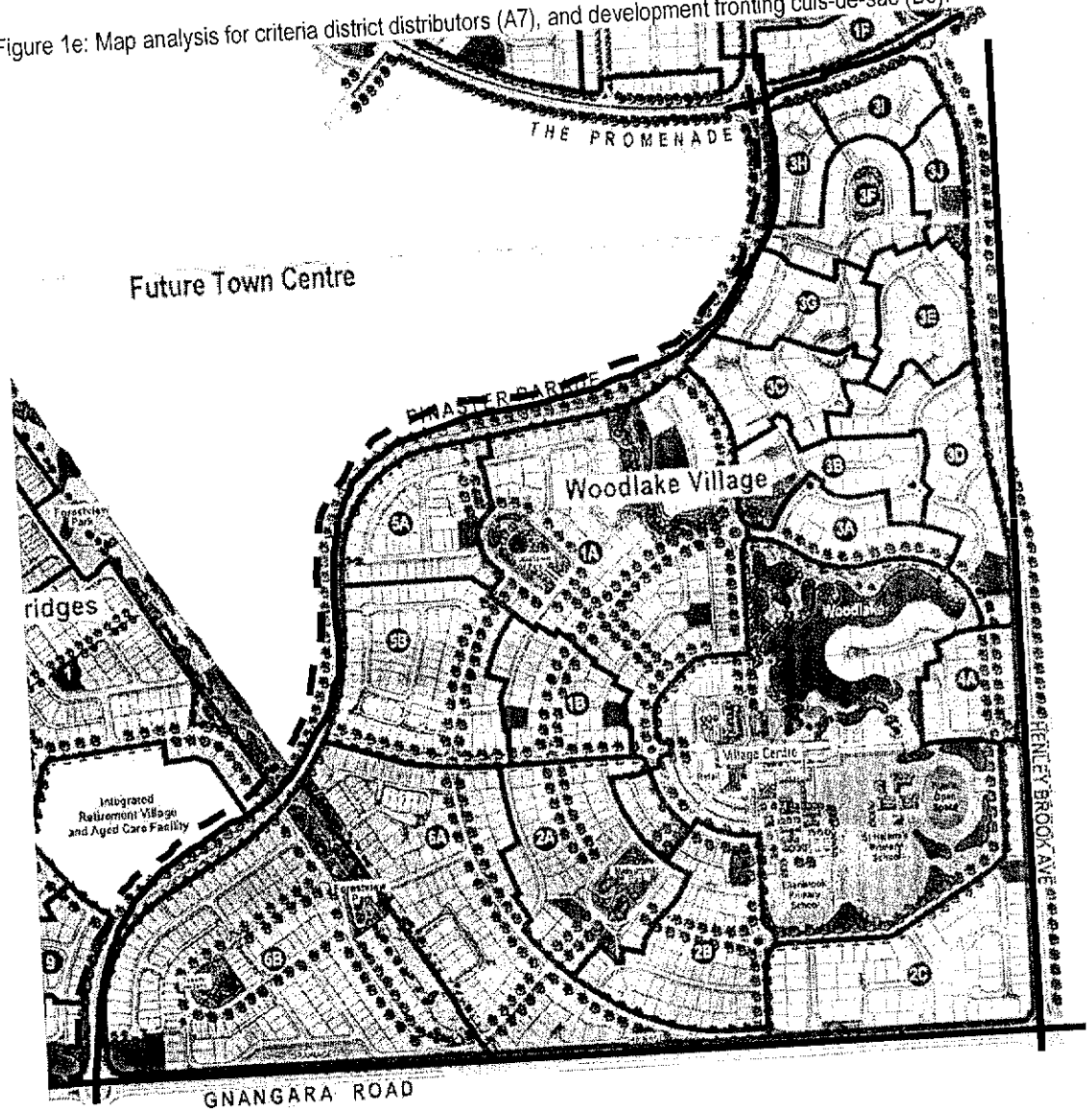
———— : Collector street

● -> : Address which can be reached within no more than three movements

Not allow direct short cuts across the cell (A7).

There is no direct short cut across cells within Woodlake (Figure 1e). District distributor (Gnagara Road) links Woodlake (residential areas) to Joondalup (another residential area) as the primary network. Pinaster Parade connects the north to the south of the suburb.

Figure 1e: Map analysis for criteria district distributors (A7), and development fronting culs-de-sac (B9).



Scale: Proportional

— : Street with no development fronting

- - - : Pinaster Parade as a road connecting the southern to northern part of Woodlake

The second part of Table 1 illustrates twelve evaluation criteria from policies present after the planning and development phase. Two of them are implemented in less than half of Woodlake.

Average spacings of junctions (B11).

The average spacing of junctions on neighbourhood connectors is 334meters (Figure 1c) which is four times higher than required (80meters). Straight and long spacing of junctions stimulates road users to speed and jeopardises their and others' safety; roads become hostile which is the opposite of traffic calming.

Distance between neighbourhood centres and perimeter (B12).

The Woodlake village community centre is located towards the east, thus only the eastern part is within 400-450metres walking distance (Figure 1c).

Moreover, since open space dominates the centre and since there is no catchment on the eastern side of development, only approximately 25% of dwellings can access it within 400-450metres.

One third are applied in more than half of Woodlake. The criteria are:

Traffic signal control rather than roundabouts (B8).

Low traffic and minor intersections are controlled by a roundabout (Photo 3). At the moment traffic signal controls are unnecessary since Woodlake traffic is relatively low.

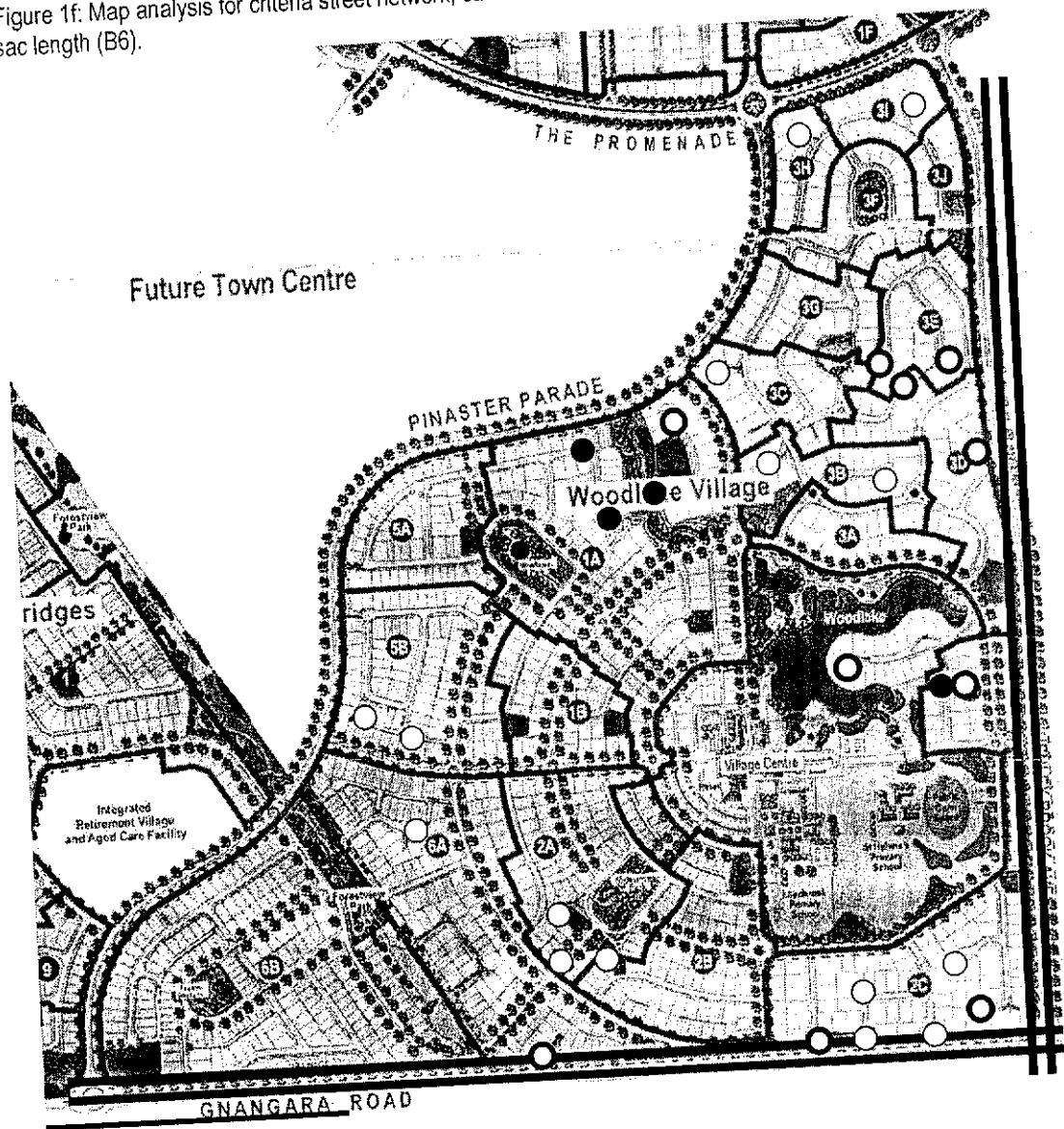
Street design to enable development to front all streets (B9).

This criterion is compatible with street surveillance for road users, especially in the dark. Since this criterion was published after Woodlake's planning and development phase, some development in Woodlake does not face main street (Figure 1e) such as Pinaster Parade (Photo 15).

Street network to be interconnected (B1).

Interconnected street network is implemented in most Woodlake (Figure 1f). The interconnection is to increase permeability and is a new design idea promoted under new urbanism as discussed in Chapter 2.

Figure 1f: Map analysis for criteria street network, culs-de-sacs (B1), lots fronting culs-de-sac (B2), and culs-de-sac length (B6).



Scale: Proportional

○ : Cul-de-sacs

○ : Cul-de-sacs more than 120metres length

● : Cul-de-sacs linked to walk and cycle paths

≡ : District distributor

Maximum culs-de-sac length (B6).

Most culs-de-sacs in Woodlake are within the maximum length (120 metres). Thirty six percent or ten out of twenty-eight culs-de-sacs are longer than the maximum length (Figure 1f). On average, culs-de-sacs length is 147.5 metres long or 23% longer than they should be. This requirement is aimed at the reduction of travel trip distance and at support of traffic calming (State Transport Authority 2002).

The other half are realised in the whole Woodlake. They cover:

Percentage of dwellings facing culs-de-sac (B2).

As a consequence of having a few (twenty-eight) culs-de-sacs, Woodlake fully satisfies the criterion of 'The street network should have no more than 15 percent of lots fronting culs-de-sac'. Almost all dwellings are facing interconnected streets (Figure 1f). This criterion is to amplify permeability and interconnected road network.

A movement network which minimises travel time (B3).

All allotments can be reached from collector street within one minute (Figure 1d). It is as a result of interconnected road network that minimises travel time (time efficiency).

Clear physical distinctions between road hierarchies (B4).

Road width, road curve, streetlight, speed, and pathways provision differentiate road hierarchy in Woodlake (Photos 4, 5, 6). These distinctions are important visual reminders for road users to achieve required travel speed. Road hierarchy system is useful for determining road function and capacity.

Required spacings between blocks (B5).

All blocks in Woodlake are within 240metres. Generally blocks in Woodlake are at spacings of 200metres (Figure 1a). This criterion is compatible with increasing neighbourhood permeability (Western Australian Planning Commission 2000) and to stimulate non-car uses.

Speed control devices (B7).

Speed control devices to achieve traffic calming are valuable to keep pedestrians and cyclists safe from motorised traffic (Federal Department of Transport and Communication 1993). The devices can be in many forms, for instance street humps (Photo 1), signage, roundabouts (Photo 3), median islands, and road markings (Photo 4). Speed control also applies to non-motorised modes; bars in the middle of cycle path protect pedestrians from being hit by cyclists (Photo 7).

Relation between local streets and arterials (B10).

Local streets in Woodlake are parallel to arterials. They cover Woodlake Boulevard and Gnangara Road, Highpoint Boulevard and Henley Brook Avenue (Figure 1b).

2. Public Transport

Table 2 displays evaluation criteria for the public transport and the extent of implementation. Five evaluation criteria taken from policies extant at the time of planning are implemented.

Bus services regularity (A3).

Bus routes in Woodlake are infrequent as indicated in Transperth bus timetables 335, 336, and 337 (Appendix 12). Two of three bus routes run only on weekdays and are connected to the Midland train station (twice a day within eighty minutes in the morning only) and Bassendean train station (eight times a day). Both train stations are connected to the Perth train station. The services will take passengers from both train stations to the Perth in half an hour.

The other route is connected to the Morley bus station every day. The service runs twelve times on weekdays from 6.45am-4.45pm, five times every two hours from 7.20am-3.40pm on Saturdays, and three times every 3.5 hours from 8.35am-3.20pm on Sundays and public holidays. Fifty-three percent of respondents of second household questionnaire survey were mostly dissatisfied with this infrequency. The City of Swan received complaints from youths since once they left Ellenbrook, they had to come back much earlier or much later than they required (Local Government Officer 3 2002). In the light of bus frequency, Woodlake seems to be secluded from Perth CBD. It is because there are inadequate passengers for Transperth to operate its services at Woodlake. Yet, the Ellenbrook Management had subsidised the services in the first twelve months of development to address car dependency early on (Private Land Developer 2002) before the second car would have been bought. It is understandable as Ellenbrook is a relatively new suburb. Currently, there are approximately 7,000 people in the whole Ellenbrook (Local Government Officer 3 2002). Within 15-20 years, the population is projected to be 65,000 people in Ellenbrook and its neighbouring suburbs (Edgerton and Henley Brook). This infrequency can also be because there is a rural area with limited residential areas and population on the way to and from Ellenbrook.

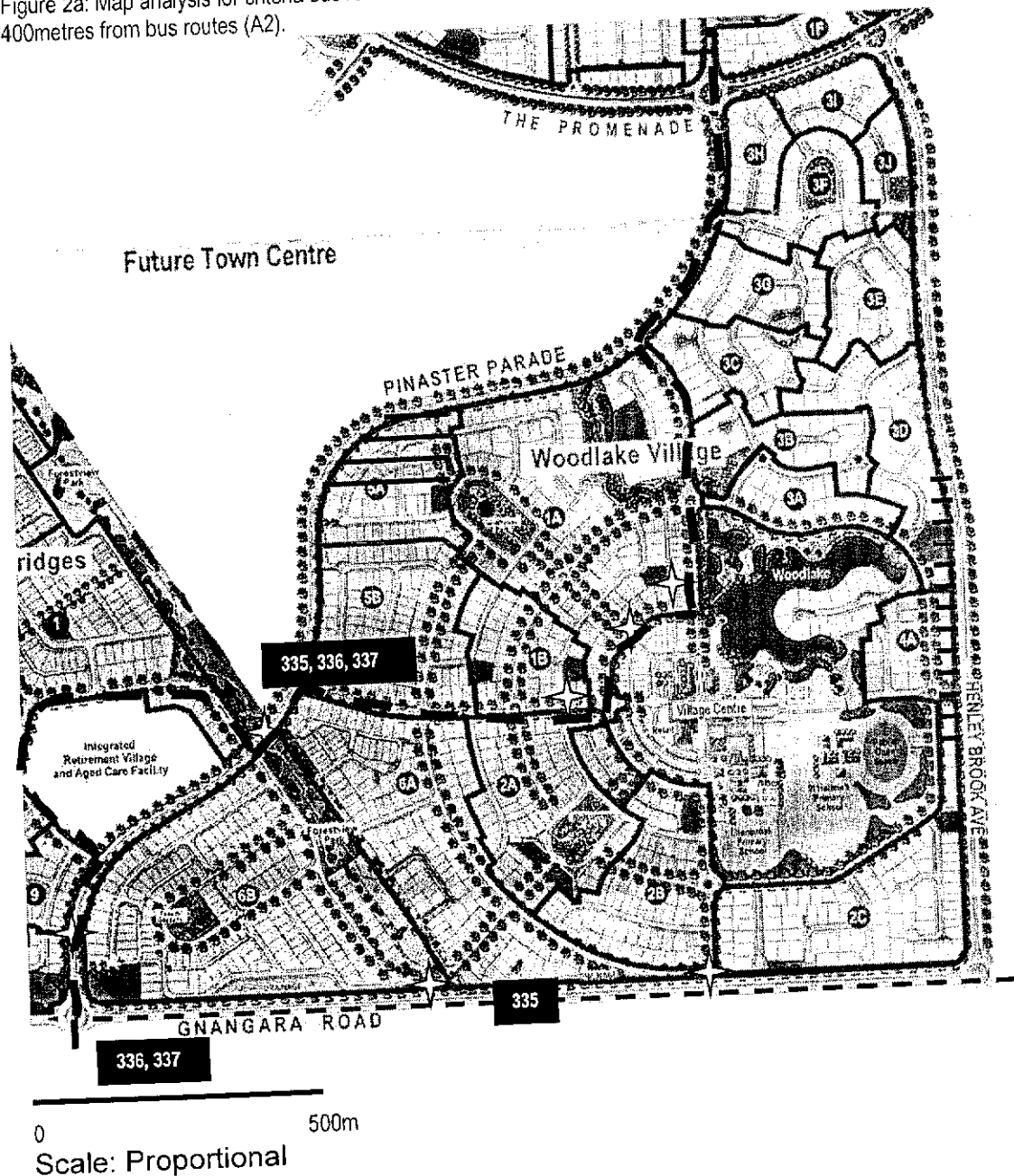
Table 2: Analysis of evaluation criteria for the public transport in Woodlake.

No.	Evaluation criteria	Implementation	Data	Policy source
A	... in policies extant at planning and development phase	M	Figure 2a	AMCORD, PM (1990), NEC
1	Bus routes to be as direct as possible.	Y	Figure 2a	GS, AMCORD, PM (1990), SPS
2	Bus routes to be within 400metres straight-line distance from bus route.	N	Appendix 12	PM (1990)
3	At least 90 percent of dwellings are within 400metres straight-line distance from bus route.	N	Figure 2a	PM (1990)
4	Bus routes are as regular as possible.	Y	Figure 2c	LNDCDC, PM (1989), GS, AMCORD
5	Bus routes are approximately 800metres apart.	N	Figure 2b	LNDCDC, PM (1989)
6	At least 60 percent of dwellings are within 400metres straight-line distance from bus stop.	M	Figure 2b; Photo 8	LNDCDC, PM (1989)
7	Average spacing between stops is 300-400metres.	M	Photos 8, 9	PM (1989)
8	Bus stops have surveillance from surrounding development.	Y	Photos 10, 11	PM (1990), Metroplan
9	Safe and convenient access for bus stops.	N	Appendix 12	LNDCDC, PM (1990)
10	Access to public transport by pedestrians, cyclists, and people with disabilities.	N	Appendix 12	ESP, NEC
11	Provision with public transport network.	Y		
B	Appropriate services to employment centres.	Y	Figure 2b	LNDCDC
1	... in current policies (after planning and development phase)	Y	Photo 8	LNDCDC
1	Locate bus stop at potential destinations (schools, neighbourhood and town centres, stations, and recreational areas, industrial areas).			
2	Locate bus stops adjacent to traffic light or median islands.			

N: The evaluation criterion is implemented in less than half the suburb; M: The evaluation criterion is implemented in more than half the suburb; Y: The evaluation criterion is implemented in the whole suburb; PM: Policy Manual (year); GS: 1989 Green Street; AMCORD: 1990 Australian Model Code for Residential Development; NEC: 1994 North-East Corridor Structure Plan; ESP: 1995 Ellenbrook Structure Plan; SPS: 1996 State Planning Strategy; LNDCDC: 2001 Liveable Neighbourhoods Community Design Code

Bus routes are approximately 800metres apart (A4).
 There is only one bus route available within Woodlake (Figure 2a), thus
 Woodlake cannot fulfil this criterion

Figure 2a: Map analysis for criteria bus routes and numbers (A1), catchment (A4), and dwellings within 400metres from bus routes (A2).

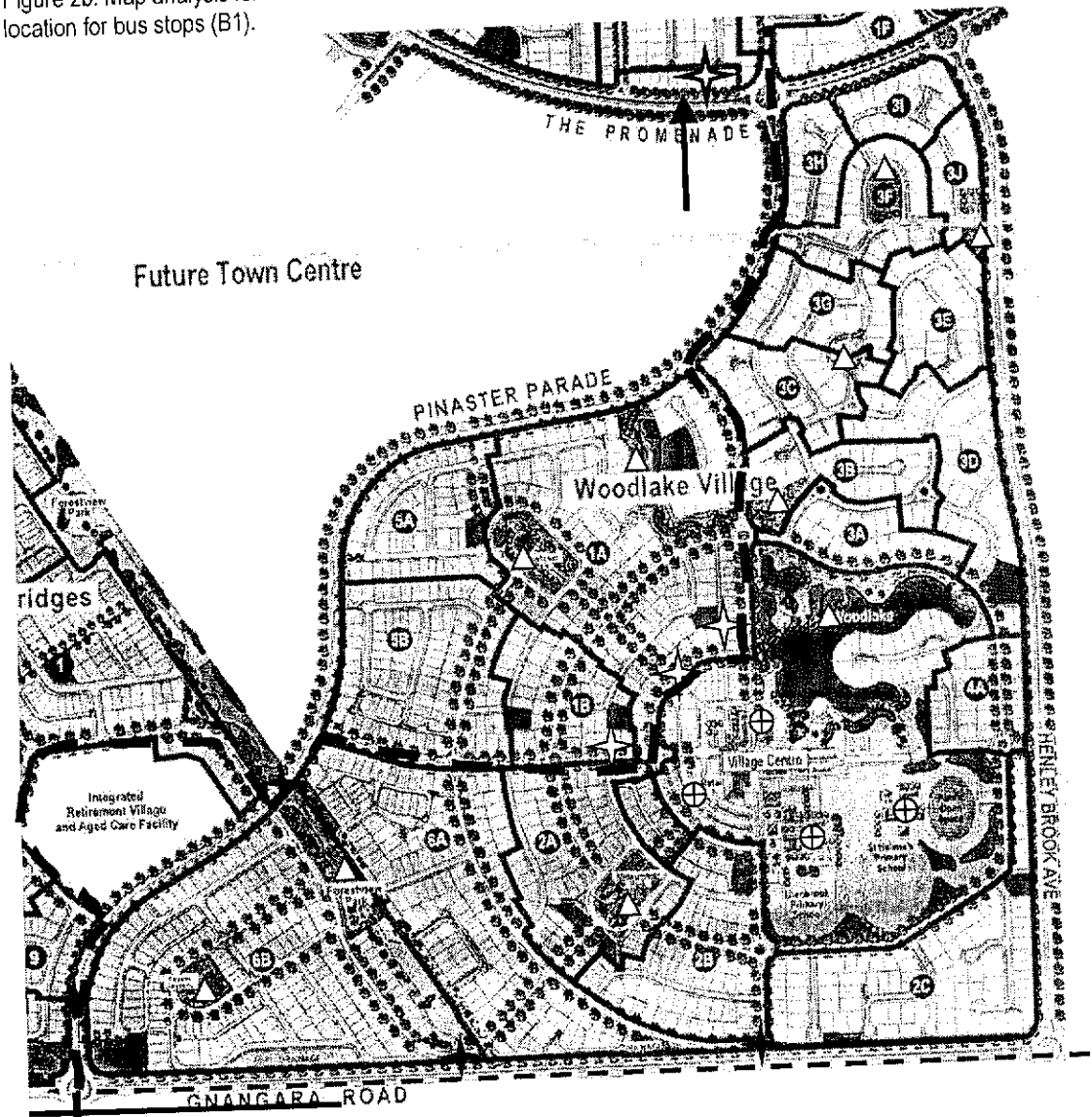


- : Bus routes (the thicker the line is, the more routes there are)
- 335 : Bus numbers
- ==== : Dwellings beyond 400metres catchment from bus routes

Average spacing between stops (A6).
 On average, spacing between bus stops in Woodlake is 477 metres or 19%-
 59% beyond the standard (300-400metres). The closest bus stop spacing is

240metres at the village centre (Figure 2b); whilst the farthest spacing is more than 930metres, located between Woodlake and Coolamon (the northern village of Woodlake). In the researcher's opinion, this limitation is to make pedestrians comfortable (distance and time) when heading to a bus stop.

Figure 2b: Map analysis for criteria bus routes, spacings of bus stops (A6), their surveillance (A7), and potential location for bus stops (B1).



0 500m

Scale: Proportional

- ✦ : The farthest bus stop spacing (the arrow indicates that the bus stop is beyond case study area)
- ✧ : The closest bus stop spacing
- ✦ : Bus stops
- ⊕ : Commercial development as trip attractors
- : Bus routes (the thicker the line is, the more routes there are)
- △ : Open space

Public transport network (A10).

Within Woodlake, there is only one bus route served by three buses. The service connects Woodlake to industrial and commercial areas: Bassendean, Midland, and Morley (Appendix 12). However, local residents felt that public transport network was inadequate. Sixty-seven percent of respondents of second questionnaire survey were mostly dissatisfied with the varieties of route.

Services to employment centres (A11).

Public transport system does not provide adequate services to employment centre Perth CBD with connection to other buses or train. From Woodlake, passengers need to go to Bassendean, Morley, or Midland (industrial and commercial areas) before reaching Perth.

Nearly a third (27%) are implemented in most Woodlake. They are:

Directness of bus route (A1).

The route takes passengers directly to Village Centre from Gnangara Road and Lord Street (Figure 2a). It does not go directly to Perth CBD and beyond where most residents (74%) went to work (Figure 6-9 in the thesis).

Bus stops surveillance (A7).

There is insufficient surveillance from surrounding development occurs at some bus stops. They are located next to dwellings' fence or at a park (Photo 8). Three out of seven bus stops (43%) have surveillance from the surrounding areas. Two of them are located at the Village Centre (Figure 2b). However, their surveillance will disappear after business hours. Yet, 84% of respondents of second questionnaire survey felt that bus stops had adequate surveillance. The researcher believes it is since the service only runs in daytime.

Lack of surveillance also occurs since bus stops are not well-lit according to 61% of respondents of second questionnaire survey. It occurs since planning and designing stages of engineering (lightings) and of bus stops happen at different times (Private Planning Consultant 2 2002). Their provision agencies have different ways of calculating where provision should be located.

Safe and convenient access to bus stops (A8).

As a consequence of insufficient bus stops surveillance (Photo 8, 9), safe and convenient access for bus stops cannot be fulfilled satisfactorily in all parts of

Woodlake. Although, 94% of respondents felt safe, once they arrived at a bus stop, it became inconvenient as there is no seat (74%) and insufficient lighting (71%).

The other three are implemented across Woodlake. They are:

Proximity of bus routes to dwellings (A2).

Since bus routes catchments are overlapping with one another, more than 90% of dwellings are within 400metres straight line from a bus route as required (Figure 2a). Only stage 2C is outside the boundary.

However, the researcher believes that it should be 'bus stops' rather than 'bus routes' as people can take a bus only from a bus stop rather than along bus route. Fortunately, there is an after-7.30pm policy where passengers can ask the driver to stop wherever they want, as long as it is within the bus route. However, this policy does not help since there are only two services which run after 7.30pm to Woodlake on weekdays. There is no service which runs after 7.30pm on weekends and weekdays from Woodlake.

Access to public transport by pedestrians, cyclists, and people with disabilities (A9).

Pedestrians, cyclists, and people with disabilities have access to public transport. Footpaths, cycle paths, and wide-enough median islands (Photos 10, 11) for the disabled, especially, are provided within Woodlake. In this way, intra-generational equity has been applied to a certain degree in Woodlake.

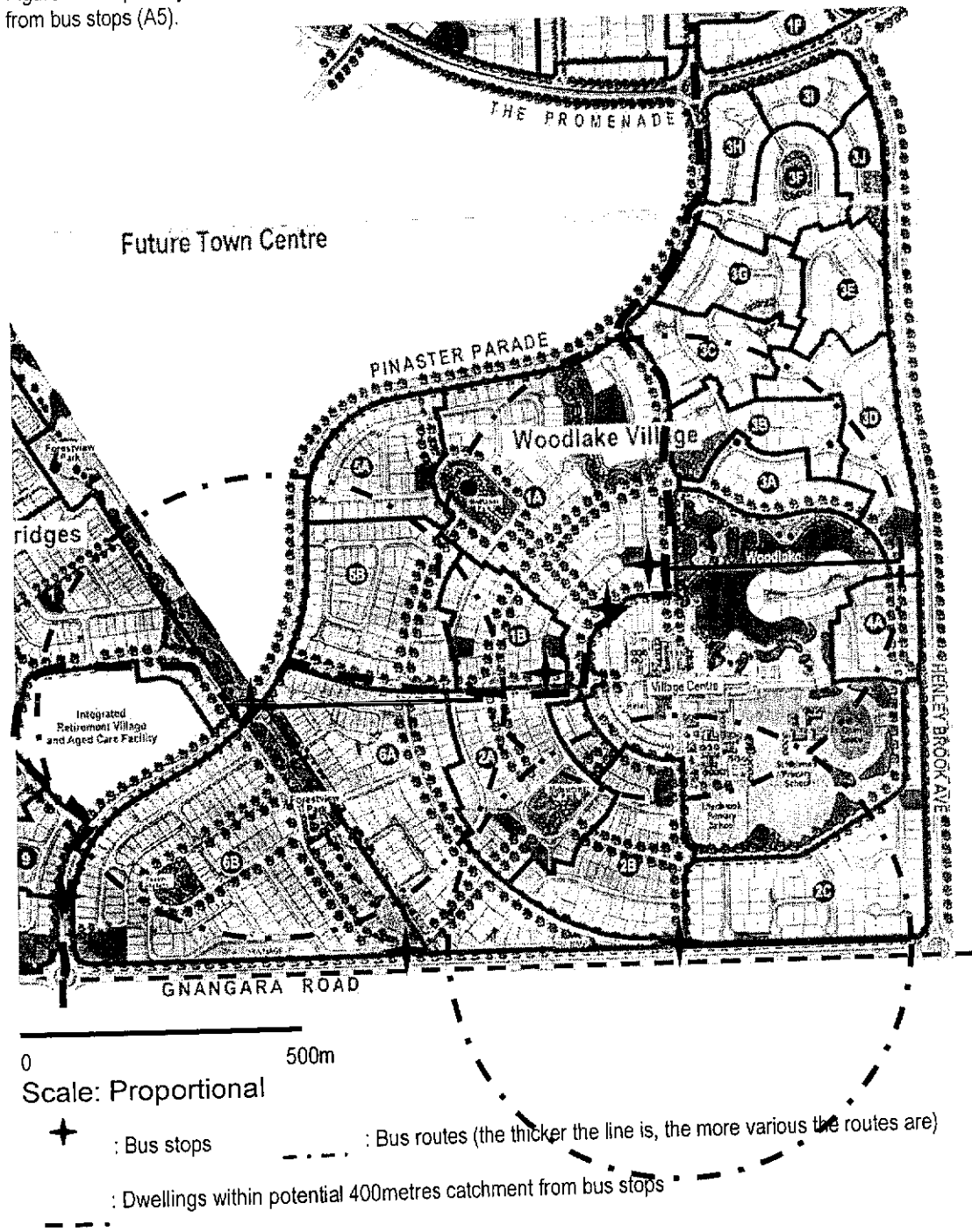
Dwellings within 400metres catchment from bus stop (A5).

Almost all dwellings are within 400 metres straight line from a bus route.

Accordingly, more than 60% of dwellings are within 400metres catchment from bus stops (Figure 2c) especially since a bus stop is an element of a bus route.

Only some residents at heads of culs-de-sac are not within the 400metres walking distance. The researcher believes that the 400metres catchment should be 400metres walking-distance since catchment does not guarantee accessibility.

Figure 2c: Map analysis for criteria bus stops, bus routes, and dwellings within potential 400metres catchment from bus stops (A5).



Two of evaluation criteria in Table 2 were drawn from policy present after the planning and development phase and are implemented in all parts of Woodlake.

Potential location of bus stops (B1).

Figure 2b illustrates locations of bus stops at potential destinations, such as near the Woodlake Village Centre (community centre), Forestview Park (recreational areas). There is at least one bus stop at each strategic location for bus patrons. These places are strategic places for bus patrons.

Location of bus stops by traffic light (B2).

Two bus stops are located adjacent to traffic light near the main entrance on Pinaster Parade (Figure 2b). Other bus stops are located adjacent to median islands giving pedestrians (with or without disabilities) a chance to wait until the traffic is safely to cross (Photo 8).

3. Cycling

Table 3 displays evaluation criteria for the cycling and the extent of implementation. Of the thirteen evaluation criteria from policies present at the time of planning and development phase, two are not implemented in most part of Woodlake. They are:

The number of cycle paths on district distributor roads (A2).

There is only one district distributor road (Gnangara Road) within this case study area. Yet, it only has one cycle path (Photo 4) instead of two paths as required.

Connection at culs-de-sac heads (A3).

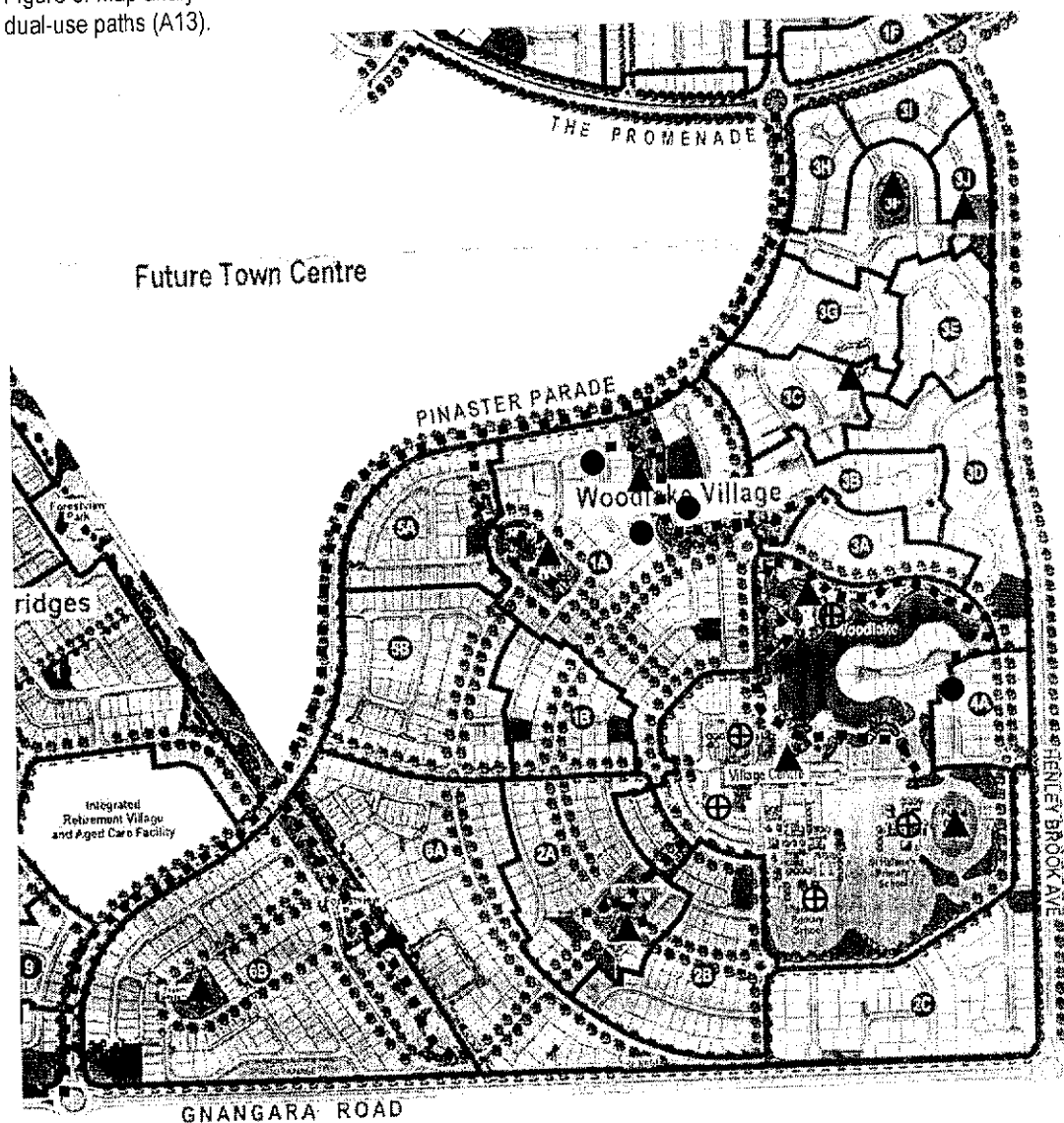
There are barely four out of twenty-eight (14%) culs-de-sac connected with cycle paths (Figure 3). At the time this suburb was designed, there was no such policy yet for Ellenbrook although interconnection issues existed. The factor may be such policy was still in the process.

Table 3: Analysis of evaluation criteria for the cycling in Woodlake.

No.	Evaluation criteria	Implementation	Data	Policy source
A	... in policies extant at planning and development phase			
1	Cycle paths near cycle routes are 2.0metres wide.	Y	Photo 2	AMCORD, ESP
2	Paths on district distributor roads should be on both sides.	N	Photo 4	ESP
3	Cul-de-sac heads should have a bicycle path connection.	N	Figure 3	LNDCD, PM (1990)
4	Pleasant, efficient, and safe cycling.	M	Photos 5, 7, 9, 12, 13, 14	ESP, AMCORD, LNDCD, NEC, Metroplan
5	Safe crossing of major roads (overpass and underpass).	M	Photo 4	LNDCD, NEC, ESP
6	Dual use path must have a durable, non-skid surface.	Y	Photos 15, 20	AMCORD, LNDCD
7	Cycling is safely integrated with other road users.	Y	Photos 15, 16	PM (1990), Metroplan
8	Segregated dual-use paths or cycle paths along one side of district and local distributor roads.	Y	Photos 2, 15, 16	PM (1989), Metroplan
9	Bicycle linkages between trips attractors (schools, local centres, other community activities)	Y	Figure 3	LNDCD, PM (1990), NEC
10	Provide off-road facilities.	Y	Photos 17, 18, 19	LNDCD, PM (1990), NEC, Metroplan
11	Paths to open space.	Y	Figure 3; Photos 13, 14	AMCORD, Metroplan
12	Safe and convenient movement for the disabled, the aged, and the very young.	M	Photos 10, 11, 20, 21, 22, 23	AMCORD, LNDCD, PM (1990), Metroplan
13	Cycling systems separate from the road systems.	M	Figure 3; Photos 8, 9, 20, 21, 22, 23	AMCORD
B	... in current policies (after planning and development phase)			
1	Dual use paths to school should be 2.5metres wide.	N	Photo 2	LNDCD, SPS

N: The evaluation criterion is implemented in less than half the suburb; M: The evaluation criterion is implemented in more than half the suburb; Y: The evaluation criterion is implemented in the whole suburb; PM: Policy Manual (year); GS: 1989 Green Street; AMCORD: 1990 Australian Model Code for Residential Development; NEC: 1994 North-East Corridor Structure Plan; ESP: 1995 Ellenbrook Structure Plan; SPS: 1996 State Planning Strategy; LNDCD: 2001 Liveable Neighbourhoods Community Design Code

Figure 3: Map analysis for criteria links to culs-de-sacs (A3), community activities, open space (A9, A11), and dual-use paths (A13).



Scale: Proportional

-: Dual-use paths
- : Culs-de-sacs linked to dual-use paths
- ⊕ : Community activities
- ▲ : Open space

Four of thirteen are realised in more than half of Woodlake. They comprise:

Pleasant, efficient, and safe cycling (A4).

Minor issues on cyclists' safety include insufficient surveillance from surroundings because of high residential fence (Photo 12) as well as the high and thick bushes (Photo 9); yet all respondents were satisfied with available surveillance. Another issue is light in some areas (although cyclists should have lights on their bicycle; Photo 7) since most respondents (80% were satisfied with the lighting). Other issues include protection from motor vehicles as there is no

cycle path available (Photo 5), and protection from sun and rain (66% of respondents of second questionnaire survey were dissatisfied with the shade condition). Accordingly, cyclists (including the unexperienced) will need to cycle on road with other motorised vehicles. However, there are available cycle paths to parks to make cycling pleasant (Photos 13, 14).

Safe crossing of major roads (overpass and underpass) (A5).

There is neither overpass nor underpass on Gnangara Road (Photo 4) as the traffic is not as heavy as Moore Drive, Joondalup. Presently, few underpasses are considered secured; a well-planned design could surmount the issue.

Safe, convenient movement network for the disabled, aged, and very young (A12).

A bar blocking the way of people with restriction in mobility in the middle of footpath (Photos 21, 22), and narrow footpaths that have to be shared between the disabled with other pedestrians (Photo 20) contribute to difficulties the disabled, aged, and very young are facing. These groups do not have a continuous level of access either; some surfaces have no pathway hence they are soft (Photo 23). Yet, there is flat surface on median islands to allow cyclists to wait for the traffic until safely (Photos 10, 11).

Relation between cycling and road systems (A13).

Cycling system to open space is separated from road system (Figure 3; Photos 13, 14) for cyclists' safety and comfort. Yet, it is necessary to integrate cycling and road systems (Photo 27) to address road users' needs for travelling.

The other seven are applied in whole Woodlake. They cover:

Width of cycle paths (A1).

This cycle (dual) path near cycle route on Pinaster Parade as trunk collector is 2.0metres width (Photos 15, 16). This width is in accordance with the minimum standard.

Surface of dual use path (A6).

For users' safety, dual use path surface must have a durable, non-skid surface (Photos 15, 20) where concrete and bitumen are favoured (The Model Code Taskforce of the Green Street Joint Venture 1990). All respondents of second

household questionnaire survey were mostly satisfied with the pavement material.

Integration of cyclists with other road users (A7).

Dual paths are segregated from motorised vehicular traffic by shrubs (Photo 15, and 16). Thus, cyclists (91% of respondents of second questionnaire survey) felt satisfied being protected from motorised vehicles. Accordingly, non-motorised and motorised road users can still interact.

Segregated dual-use paths or cycle paths (A8).

Photos 2, 13, 15, 16 exhibit segregated dual-use paths or cycle paths along one side of district and local distributor roads from motorised vehicle users. This segregation is for cyclists and other road users' safety.

Bicycle linkages between trips attractors (A9).

Figure 3 illustrates that cycle paths lead cyclists to school, parks, shopping centre, and community centre to stimulate cycling. These potential destinations function as trip attractors. Unsurprisingly, all questionnaire respondents were satisfied.

Provision of off-road or end-of-trip facilities (A10).

Off-road facilities such as bicycle racks are provided. Those facilities can encourage and support people to use their bicycles. One bicycle rack (for 6 bicycles) is available in the Ellenbrook primary school (Photo 17), two bicycle racks (each for 8 bicycles) are at the Village Centre (Photo 18), and one bicycle (each for 8 bicycles) is at the shopping centre (Photo 19).

Bicycle facilities at village centre and primary school are visible from roads, unlike those at shopping centre. The latter is secluded and located at the back where customers seldom see. At school, a bicycle rack is available in the oval far from the school building but close to the skateboard rink. Students can park their bicycles nearby the rink for surveillance while they are skating.

Cycle paths to open space (A11).

Cycle and/or dual-use paths to open space is useful for recreational, communal, and educational purposes. The paths are available within village (Figure 3; Photos 13, 14).

One new evaluation criterion in Table 3 was drawn from policies present post planning and development phase. It is only realised in less than half of Woodlake.

Dual-use paths width to school (B1).

Width of cycle/ dual-use path on arterial routes to a school is 2 metres (Photo 2).

It means that the 2.5metres minimum width is not fulfilled. This path can be widened by narrowing either the road reserve or school oval.

4. Walking

Table 4 shows evaluation criteria for the walking and the extent of implementation. Thirteen evaluation criteria in policies present at the time of and after planning and development phase have been identified from policy analysis.

One of them (8%) is not implemented in most Woodlake.

Footpath connection at culs-de-sac heads (A4).

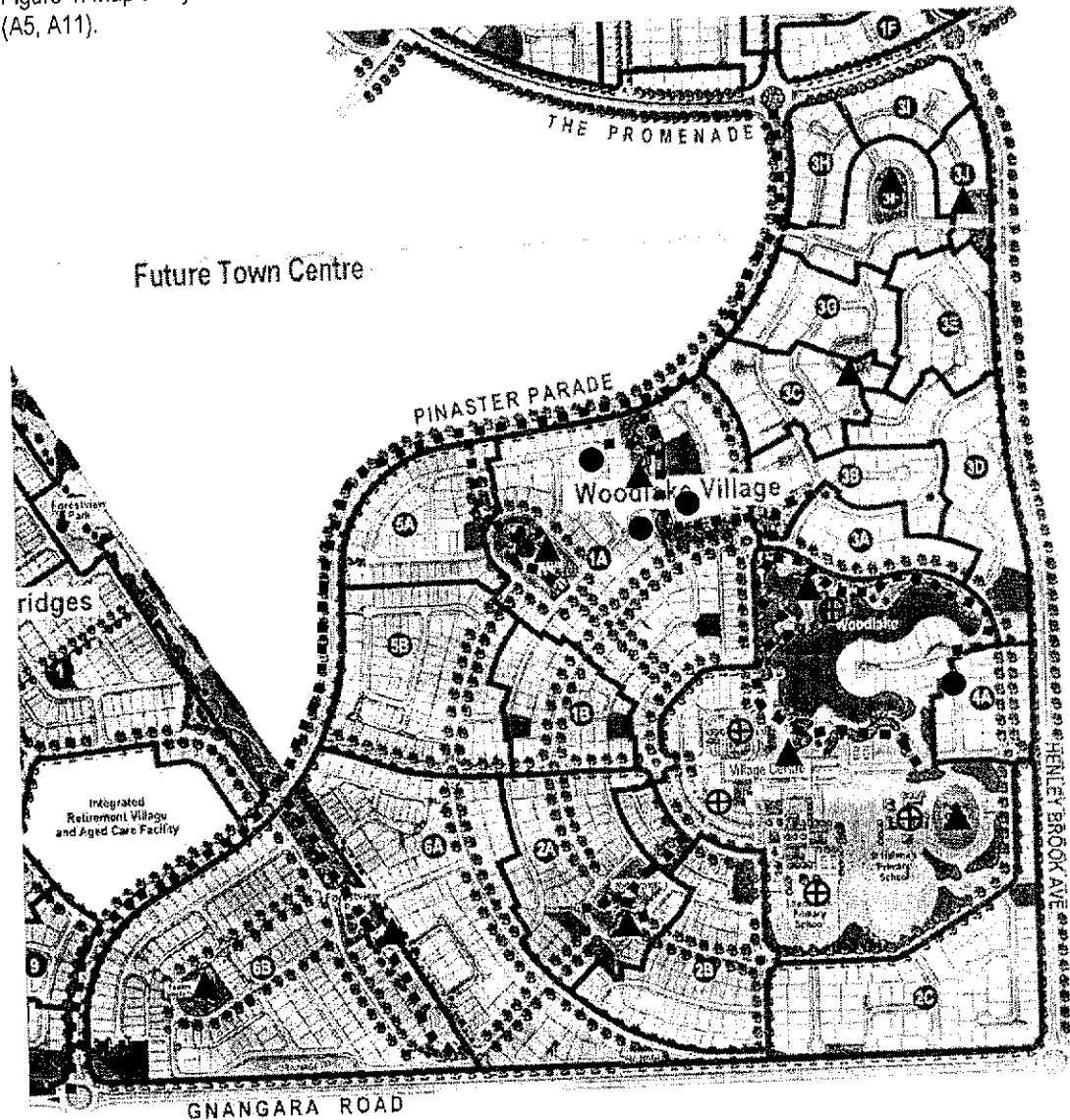
There are only four out of twenty-eight (14%) culs-de-sac connected with a footpath (Figure 4; Photo 6). This results in lack of road network permeability.

Table 4: Analysis of evaluation criteria for the walking in Woodlake.

No.	Evaluation criteria	Implementation	Data	Policy source
A	... in policies extant at planning and development phase			
1	No footpath in low traffic volume.	Y	Photo 5	GS, PM (1989)
2	Footpaths should be 1.5metres minimum width (2.0metres at schools, shop, other activity centres).	Y	Photos 2, 8, 20	LNDCDC, ESP
3	Footpaths are on both sides on arterial routes, access streets, neighbourhood connector streets.	M	Photos 6, 16	LNDCDC, ESP
4	Culs-de-sac heads should have a footpath connection.	N	Figure 4; Photo 6	LNDCDC, PM (1990)
5	Pedestrian paths through parks for recreation purposes	Y	Figure 4; Photos 13, 14	LNDCDC, AMCORD, Metroplan
6	Safe and convenient pedestrian movement.	M	Photos 2, 5, 7, 9, 12, 22	LNDCDC, GS, AMCORD, ESP, NEC, Metroplan
7	Safe, convenient movement network for the disabled, aged, and very young.	M	Photos 9, 10, 20, 21, 22, 23	LNDCDC, ESP, AMCORD, PM (1990), Metroplan
8	Safe crossing of major roads (overpass and underpass).	M	Photo 4	LNDCDC, NEC, ESP
9	Dual use paths must have a durable, non-skid surface.	Y	Photos 3, 13	AMCORD, LNDCDC
10	Segregated dual-use paths along one side of district and local distributor roads from vehicular traffic.	Y	Photos 13, 15, 16	PM (1989), Metroplan
11	Linkages between trip attractors (schools, local centres, bus stops, other community activities).	Y	Figure 4	PM (1989), LNDCDC, NEC
12	Footpaths are along one side of local distributor roads and access way.	Y	Photos 2, 6, 8	PM (1989), ESP, GS
13	Footpath, where required, of 1.2metres width.	M	Photo 20	AMCORD
B	... in current policies or post planning and development phase			
1	Pram crossings are available at all intersections.	M	Photos 3, 10, 11, 20, 23	LNDCDC
2	Dual-use path to school on neighbourhood connectors and arterial routes is 2.5metres width.	N	Photo 2	LNDCDC, SPS

N: The evaluation criterion is implemented in less than half the suburb; M: The evaluation criterion is implemented in more than half the suburb; Y: The evaluation criterion is implemented in the whole suburb; PM: Policy Manual (year); GS: 1989 Green Street; AMCORD: 1990 Australian Model Code for Residential Development; NEC: 1994 North-East Corridor Structure Plan; ESP: 1995 Ellenbrook Structure Plan; SPS: 1996 State Planning Strategy; LNDCDC: 2001 Liveable Neighbourhoods Community Design Code

Figure 4: Map analysis for criteria links to culs-de-sacs (A4), and location of community activities, open space (A5, A11).



Scale: Proportional

-: Dual-use paths
- : Culs-de-sacs linked to dual-use paths
- ⊕ : Community activities
- ▲ : Open space

Five of thirteen (38%) are implemented in more than half Woodlake. They include:

The number of footpaths on streets (A3).

There are two footpaths on both sides of a road (Photo 16) on neighbourhood connector streets (Pinaster Parade). But there is only one footpath on one side of a road on some access streets (Photo 6). Thus, pedestrians on the other side have to walk on the grass or on the road. It is not comfortable for those with prams and wheelchair, as well as the aged especially because the surface is soft, or when it is wet after rain or when the lawn is being reticulated.

Safe and convenient pedestrian movement (A6).

Pedestrian safety is implemented in most Woodlake. Yet, issues include surveillance (Photos 9, 12) although 85% of respondents of second questionnaire survey were mostly satisfied, and streetlights for pedestrians (Photos 2, 7). Others include protection from motor vehicles as there is no footpath available (Photo 5) although only 4% were dissatisfied, and protection from sunlight and rain (Photo 22) especially since less than half (48% of respondents were mostly satisfied.

In the light of second household questionnaire survey, 57% of residents did not feel safe as paths were dark, dogs were off-leash, and disturbance from other road users. Seventy-two percent of respondents of second household questionnaire survey were mostly satisfied with lighting in their area. The footpaths to the school (Photo 2) are safe for students during the day in terms of lighting. From the author's observation, at night when pedestrians do not use the path for educational purposes, it becomes less safe as there is no lighting except from natural resources (moonlight and starlight).

Safe, convenient movement network for the disabled, aged, and very young (A7).

At some places, the disabled will find difficulties, for example a bar in middle of footpath may block their way (Photos 21, 22), and narrow footpaths that have to be shared between the disabled with other pedestrians (Photo 20). The disabled either does not have continuous level of access, as some surfaces are soft (no path way) as in Photo 23. They have to operate wheelchairs on the grass.

Unlike shown in Photo 20, there is flat surface on median islands to allow for people with prams or wheelchair to wait for the traffic safely (Photo 9). Some median islands allow the disabled to cross road to continue to the other side of the road (Photo 10).

Crossing of major roads (overpass and underpass) (A8).

There is neither overpass nor underpass on Gwangara Road (Photo 4). The researcher believes that pedestrians can cross the road without underpass or overpass when the traffic is low.

Minimum width of footpaths when required (A13).

Footpaths on Currant Court and Bouneville Way are 1.5metres width (wider than the 1.2metres standard); while those on local distributor roads is 1.0metre width (Photo 20). Narrow paths makes walking less comfortable when pedestrians bump into each other.

Over a half (54%) are applied in whole Woodlake. They embrace:

Footpath in low traffic volume (A1).

As illustrated in Photo 5, footpath is not necessary in low traffic streets.

However, pedestrians will be more comfortable to walk on a footpath.

Minimum width of footpaths (A2).

Footpaths should be 1.5metres minimum width (2.0metres at schools, shop, other activity centres). In neighbourhood connector streets, Pinaster Parade, and near shopping centre, the dual path is wider (190-205cm) than required (Photos 8, 20). The width of neighbourhood connectors to the school (Photo 2) is the same as the standard (2.0metres).

Pedestrian paths through parks (A5).

Pedestrian paths through parks for recreation purposes is available within village (Figure 4; Photos 13, 14). Its background shows that the path leads to a playground and sports areas for recreational and communal purposes.

Surface of dual-use paths (A9).

For users' safety, dual-use path surface must have a durable, non-skid surface (Photos 3, 13). Ninety-six percent respondents of second household questionnaire survey were mostly satisfied with the pavement surface.

Segregated dual-use paths or cycle paths (A10).

Photos 13, 15 illustrate segregated dual-use paths along one side of district and local distributor roads from vehicular traffic. This segregation is for pedestrians and other road users' safety.

Walking links between trips attractors (A11).

Figure 4 illustrates footpaths taking pedestrians to school, open space, and village centre. Eighty-nine percent of respondents of second questionnaire were satisfied with the condition. These strategic destinations act as journey appeals.

Footpaths along one side of local distributor roads and access ways (A12). There are footpaths on both sides of Pinaster Parade (Photo 8), and on one side along access way (Photo 2) and access place (Photo 6). It is very positive that Woodlake exceeds minimum standard. This can be a constructive example for other residential development.

The second part of Table 4 demonstrates two new evaluation criteria drawn from policies existing after the planning and development phase. One of them is performed in less than half Woodlake.

Dual-use paths width to school (B2).

Width of this dual-use path on arterial routes to a school is 2.0metres (Photo 2).

It means that the 2.5metres minimum width is not fulfilled. This criterion may be performed well by using road reserve.

The other one (50%) is performed in most part of Woodlake.

Pram crossings availability (B1).

Photos 3, 20 illustrate that there are unavailable pram crossings at intersections; while Photos 9, 10 demonstrate available pram crossings at some intersections.

These photos indicate that not all intersections have a pram crossing. Some road medians are too narrow for prams. Even at the Ellenbrook main entrance on Gnagara Road (Photo 23), there is no hard or stable surface once pedestrians with prams cross the road.

PHOTOS

Taken in 2001.

Photo 1

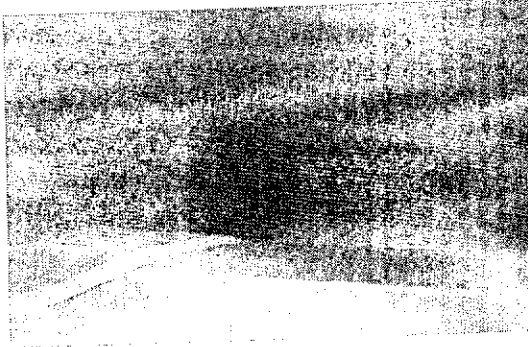


Photo 2

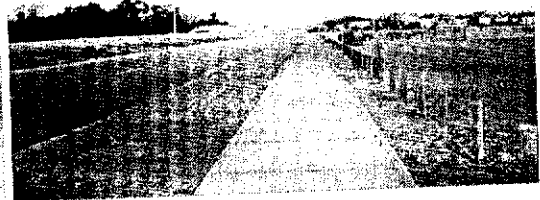


Photo 3



Photo 4

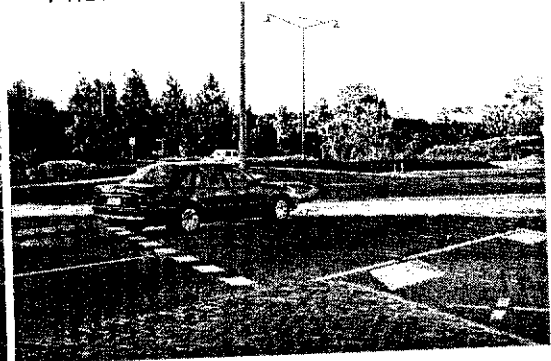


Photo 5

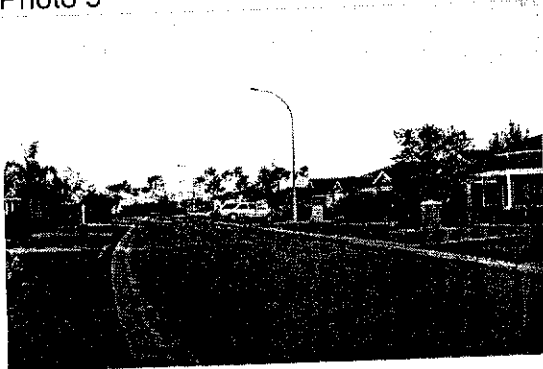


Photo 6



Photo 7



Photo 8

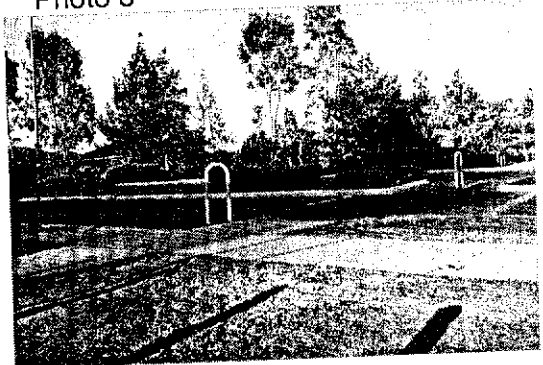


Photo 9

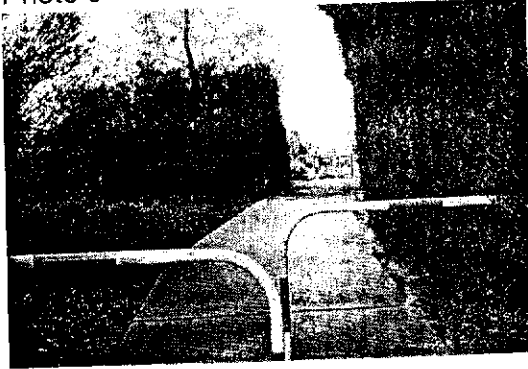


Photo 10

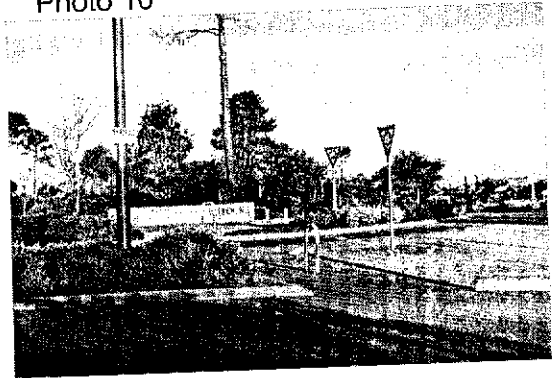


Photo 11

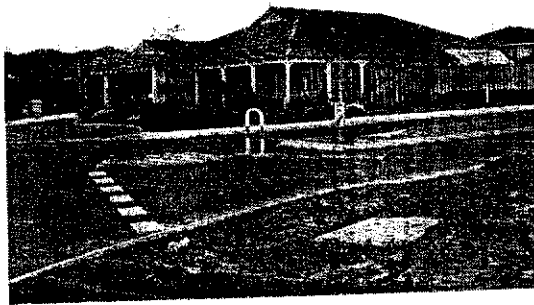


Photo 12



Photo 13

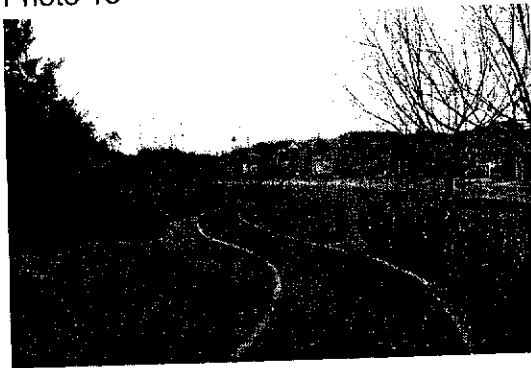


Photo 14



Photo 15



Photo 16



Photo 17

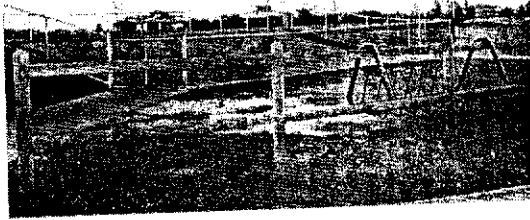


Photo 18



Photo 19

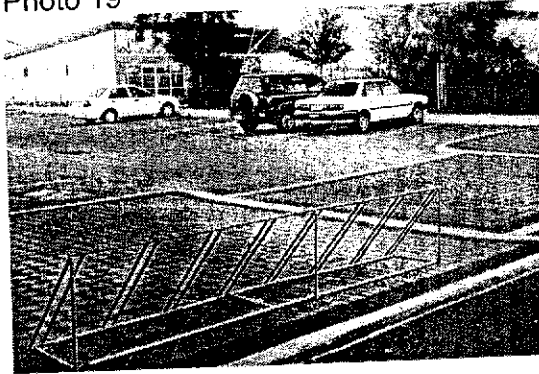


Photo 20

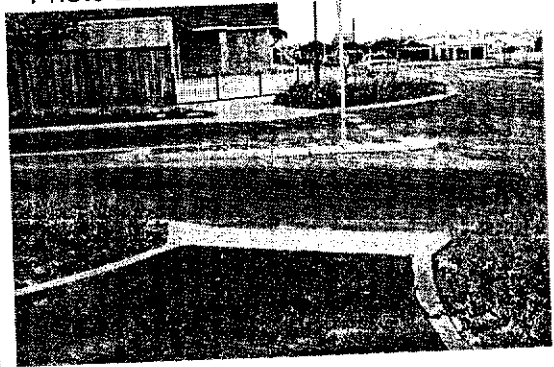


Photo 21

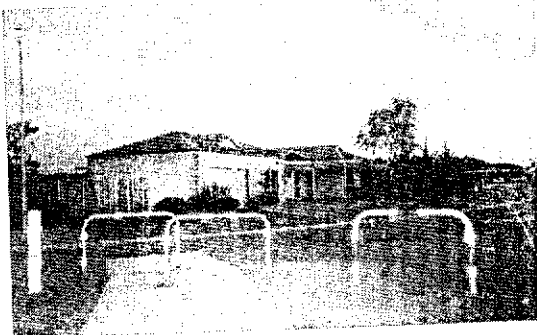


Photo 22



Photo 23



Photo 24

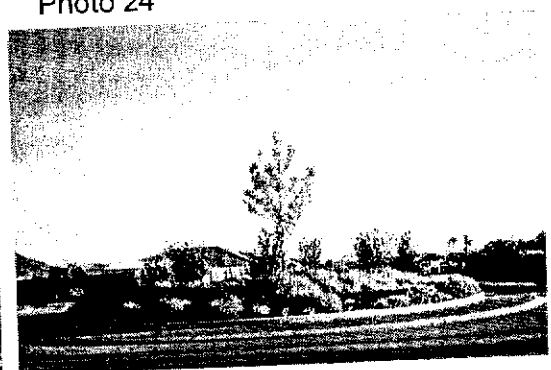


Photo 25



Household questionnaire surveys results

Public transport/ Bus

No.	Satisfaction with	Mostly satisfied (%)	Mostly dissatisfied (%)
1	Safety	94	6
2	Shelter from sunshine and rain	21	79
3	Accessibility by walking and cycling	95	5
4	Accessibility by motorised vehicles	82	18
5	Availability of bus stops within walking distance	95	5
6	Bus stops surveillance	84	16
7	Bus stops lighting	39	61
8	Timetable availability at bus stops	32	68
9	Bus stops attractiveness	59	41
10	Available seat at bus stops	26	74
11	Frequency of service	47	53
12	Variety of routes	33	67
13	Connection with other service	58	42

Walking

No.	Satisfaction with	Mostly satisfied (%)	Mostly dissatisfied (%)
1	Lighting	72	28
2	Shade from sunshine and rain	48	52
3	Surveillance	85	15
4	Protection from motorised vehicles	96	4
5	Evenness of footpaths	100	0
6	Graffiti on walls and paths	75	25
7	Non-skid material used	96	4
8	Cleanliness of footpaths	88	12
9	Available attractive destinations	89	11
10	Facilities provision	70	30
11	Signage availability	87	13
12	Streetscape	96	4

Cycling

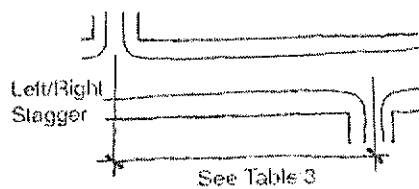
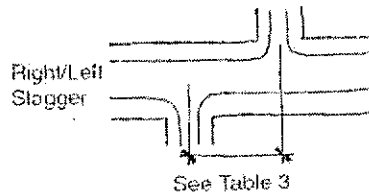
No.	Satisfaction with	Mostly satisfied (%)	Mostly dissatisfied (%)
1	Lighting	80	20
2	Shade from sunshine and rain	44	56
3	Surveillance	100	0
4	Protection from motorised vehicles	91	9
5	Evenness of footpaths	100	0
6	Graffiti on walls and paths	78	22
7	Non-skid material used	100	0
8	Cleanliness of footpaths	82	18
9	Available attractive destinations	100	0
10	Facilities provision	70	30
11	Signage availability	91	9
12	Streetscape	100	0

Appendix 21: Standard of junctions spacing.

Table 3: Junctions on local streets and arterial routes

Street type	Typical* average Junction spacing (m)	Min spacing of staggered junction	
		L/R	R/L
Local streets			
Laneway	N/A	N/A	N/A
Access street	40	20	20
Neighbourhood Connector	80	40	40
Arterial routes			
District distributor			
Integrator 'B'	100	60	40
District distributor			
Integrator 'A'	150	150	50
Primary distributor	300-1000	200	200

- Typical average junction spacing relates to the total number of junctions along both sides of the specified local street or traffic route. Each cross road counts as one junction. A right/left stagger on an arterial route counts as one junction.
- Median breaks in arterial routes should generally be greater than 300 m in spacing, with a minimum of 200 m.
- Additional left in, left out turns to supplement cross roads and staggered junctions should be provided wherever practical.



Note: that the length on the left-right stagger is greater to provide a waiting area for turning vehicles

Source: Western Australian Planning Commission 2000, p. 34.

Appendix 22: Transcripts of interviews.

TRANSCRIPT OF INTERVIEW

Interviewee: Public Planning Officer 1
Interviewer: The researcher
Date: September 03, 2002
Time: 10.45am

1. Interviewee's opinions on transportation facilities in Joondalup

They're probably as good as can be provided given the constraints of low density development and broad urban design of the area being not designed to support public transport. It's designed to support private rather than public transport, so it's difficult to justify coping public transport. There's no support from community (because of the low density, and dispersed land use). People are not convenient to use public transport; they prefer using private transport.

The community are comfortable with cars. They can support buying more than 1 vehicle. They drive to work, drive children to school, go for shopping, recreation, and entertainment. They also use 4WD to drive kids to school. They're too comfortable with the cars. They do everything with private vehicles, although they know public transport services are provided. But do they use it? Very few of them use public transport, unless there's an incentive. They believe that they have good transport system. If you select respondents who depend on public transport, they'd give different response.

2. Reasons why some policies implementation are not reviewed

It's very much an economically driven exercise. It's about money to be made at the production end, not money to be made in the following up of the cycle. That's really a step should be made by local government and state. Resources have not been available to concentrate on that part of the cycle. Resources have been applied to help other parts of it where people make money and noise. They are not for checking how good the planning is. It's a matter of politics and money.

3. Supporting factors in implementing policies objectives

There should be a clear vision of what is wanted to be achieved, a very good understanding of the way the various factors interact with one another. Both of them are not there in planning and transport. Relatively recently, we've started to understand the importance of the movement economy.

In urban areas through history, the activities are taken place where the roads are. Just now we realise why certain things are not working.

For example, busy roads will support shops or economics activities. In Joondalup the shops are away from the busy roads, so they are not flourishing and are not providing jobs. We can use the exposure and the trade that can be gathered from that road. That supports the little shopping. That's why stations are put on the road rather than in centre. But planners think it'll create congestion. That's the real key to the transport system. People travel to and from work. It's because we aren't providing the jobs where people are. People need to travel where the jobs are. It's a matter of land use management. If we create business around houses, the jobs are closer and people won't travel far. We won't get huge steep transport system travel demand. Therefore, have jobs locally.

If you put the jobs near the people in the first place rather than put huge transport system in place to try to move people to the jobs... Although the jobs don't suite people, sometimes, that's fine. But if the jobs are there, people have the options, particularly as the economy is changing. We're losing the proportion of full time jobs and replacing them with more part time. It becomes less viable for people to travel

great distances for part time, probably low paid, jobs. And the full time, high paid, are not around anymore, so people will realise that they can't afford the travel costs. If the jobs are local, then people could walk or take a bus for a couple of blocks. So it's more feasible for them. The relationship of people with the jobs is very fundamental to the urban structure. By making yourselves so dependent on transport as we have at the moment, we let ourselves vulnerable. Where does our city go? How do you get to work if you can't buy petrol to start with? But if it's available, but only the rich who can afford it, what happen to the jobs and people and their income. It's got a bit scary. It's not outside the realm of possibility to be thinking of interruption to oil supply.

4. Interviewee's opinion on whether Joondalup needs retrofitting in response to its low density

The society is changing. The level of density has changed over the years. Now we have a quarter acre of blocks. Lot sizes have changed from 1,000 to 800, 700, 600, and 500 m². People still perceive as it's a single separated house. We wouldn't be able to change that, but there is a possibility that we can change little pockets where we've got shopping or town centre to get some medium density development around those areas. So that we get concentration of density, that then can support the alternative to private vehicle. We can leave most of the density as the way it is with some pockets of more dense development. That is a good place to have more bus stops because we have people around there and not bigger walk for the people from low density. Rather than come up with some ideas of making everybody's density increased to have leave most people as they way as they are.

We can use pockets of high density. Based that on transport system, we can give support the train system, and the next level of feeder. I 'm probably not terribly supportive the idea of the way we try to match up buses and train at the moment. We've got fewer stops along the way where train move fast. People need to take the bus. People need to wait for the bus, and if they miss the connection, they have to wait. People become inconvenient. People don't want to bother: "Bother this, better to get my car out". I feel that if we have more stops towards the station, people can walk to the stops.

If we're going to have whatever system to have, better have urban density around the stops supporting that system. Rather than what we've done with the bus routes through our suburbs, we just accepted the very low density and have bus routes going 400m apart. It means that you can't provide the services that is really supportive to people who really need that services. If we get people congregated into certain areas and we can start to provide more frequent services to those areas, it becomes more viable. The density then supports the transport.

In response to low density around train station, they way it works in the northern corridor is putting a train station in the freeway, and then you have open space type uses for the freeway. It's not good as people have to walk for a long distance to any house from the train station. The only way is to use bus or car, and it's not encouraging people. Things could be done. You could develop quite dense mixed-use centre if you have the motivation to change some of the land uses, and have the ability to build across the top and like things done in other countries. But it's different for Perth. But you could see that we can have denser centre.

Attractive destinations also encourage people to walk. People won't realise that they've walked for a long distance. If we put some shops, shelters, shade along the way, people would feel the distance differently. They will feel too far no more

5. Whether resources improvement can increase the level of policy objectives

It's more to where it's gonna be focus. Where you're using and focusing them. It's necessary for the local authorities to take a very good look at the issue of design and transport, the interaction. What they can do about it; what they're gonna do about it. Then design the policy accordingly. I don't feel they've brought the consideration together, generally, and come up with the policies that support them. I haven't done an analysis, certainly other local authorities. I would doubt that we have any policy here that can be pulled out: "Yeah, it is supporting the development of transport". The policy has been in the provision of transport: "O yeah, we will provide roads or services, whether you want them or not", and in planning, they haven't brought things together. They haven't realised the relation between the two, what's necessary to be done to make it successful.

For example Department of Transport came here and wanted to work (on Travel Smart) with local authorities. They didn't get a lot of encouragement from the local authorities. It's probably that the community is too comfortable. From their findings, we got the highest car usage in Perth and getting up around the world. And it's why it's the opportunity to cut down private car usage. But I think it's because of the level of comfort. No one cares... To my mind, we should be not only aiming to move people out from private transport into public transport, but I like to move people onto foot. That's the next step; to get people walking.

Until you've got recognition there's a problem and that something needs to be done about it and that policy can do something about it and then we should take action. We'll just do things we've been doing. We did try to do something last year with going back and looking at suburbs and that ended up being opposed by the local communities. And underneath, they didn't wanna change anything. Too comfortable with they are. And it's possibly the solution that we 're presenting to them ... probably it was too soft, not too radical. The answer is you're not able to get local authorities to move a long way in front of community. The first step is to get community to realise that there's a problem, and there's something we could be done with the problem, and the local authorities will start doing it. So, resources wouldn't be answer.

A suburb in the North East Corridor has higher car dependency than Joondalup, but the car usage in Joondalup, or the km travelled is higher in some suburbs here. Check with Department of Transport.

TRANSCRIPT OF INTERVIEW

Interviewee: Public Planning Officer 3
Interviewer: The researcher
Date: September 10, 2002
Time: 04.00pm

1. Interviewee's opinions on transportation facilities and services in Woodlake

They're probably not adequate for the expected population in Ellenbrook generally. But in Woodlake in particular, because the location of Woodlake (on the urban fringe) is quite some distance in major transport infrastructure, there are a number of problems in regional transport, public transport. However in the local area, there's probably a different case. Accessibility to facilities in Woodlake is quite good from the point of view of urban design. I think the main problem with Woodlake is that developments are quite isolated from regional transport facilities (basic road highway, infrastructure and public transport). So if Woodlake and Ellenbrook were perhaps here in Midland or in the City, they would be very well served by transport.

To make it better from the point of a view of sustainable transport, it's fair to say that here in Perth, we're far too rely on roads and private motor vehicles and that areas like Woodlake and Ellenbrook with a mixture of social demographic groups (young people, older people, young family and people in between) that form a sustainable transport pint of view, there's not enough choice of transport. So public transport policy for Perth I think requires a lot of work so that people living on the fringe of the city have an equal accessibility to transport as those who live in the middle and inner suburbs. At the moment I believe there is inequitable provision of public transport. The passenger rails system ends at Midland and yet we have new suburbs such as Ellenbrook and Woodlake, which are beyond the range of rail services. So that the potential of extension of public transport facilities (whether it's passenger rail, light rail or bus services) need some attention. Coming back to the accessibility to the road network, places like Ellenbrook are inequitably funded by the state government. There's one road into and out Ellenbrook. There are plans for improvement to the regional road network in the area of Ellenbrook (the Perth Darwin National Highway that will involve the upgrading the Lord Street access, and Gnangara Road). It's the state government's responsibility in terms of construction. Those roads have been identified in the past and for many years have been necessary to be upgraded to provide for better access to Ellenbrook for private vehicles and yet the work hasn't been done.

The roads don't provide sufficient capacity for the volume of the traffic that has been expected for the future. As far as we can tell at this stage, there are no specific plans by the state government to actually fund the upgrading and construction of those regional roads. What needs to be done is effort to improve public transport equality and accessibility, effort to ensure that road construction proposals are carried out in the timely way so that when the population grow in those areas there is sufficient infrastructure for them to have better accessibility from a range of transport choices.

Woodlake does comparatively very well for walking and cycling facilities because the planning is quite comprehensive to try to develop a neighbourhood with a strong sense of community where the area isn't dominated by cars and roads. The roads are quite deliberately designed to allow for managed traffic flow and to provide as much as possible for pedestrians safety. The planning for Woodlake has included footpath and bicycle network within the road system to allow for shared use of roads and as much as possible the intersection designs and road design have been done to try to ensure that traffic doesn't dominate and pedestrians and cyclists can be safe. Compare to other more traditional suburbs, I guess it's simply because of the timing involved that Ellenbrook is fairly very recent development. There's a much greater awareness of the

need to provide bicyclists and pedestrians in place like Woodlake. Ten to twenty years ago in suburbs such as Ballajura, Beachborough were basically designed for the cars. I think Ellenbrook provide a reasonable balance between the need of people in cars and the need of pedestrians and cyclists by providing a fairly safe network for them. But it doesn't mean that there's nothing could be more done. We can look at how we can encourage more pedestrians and bike activities to reduce reliance on private vehicles. From the point of view of walkability within Ellenbrook, the planning has tried to ensure that people are able to walk to local facilities. In general, that sense works better in Ellenbrook than in any more traditional suburbs. But again in the future we can provide better facilities for pedestrians and cyclist so that we can encourage more and more people to get out of their cars.

[The researcher: Lighting and safety for pedestrians' issues on Pinnaster Parade.] Pinnaster Parade is a funny road. I don't think it has been well designed actually, the landscaping is inappropriate, not create a safe road environment for pedestrians. One issue relating to safe urban design is to make places as open to surveillance as possible and the existing of thick vegetation provides places to carry out antisocial behaviour and crime to occur. I guess Pinnaster Parade is a fairly major arterial road, I'm thinking more to local roads around Woodlake; roads surround community and shopping centre, which is a lot friendlier for pedestrians. Pinnaster Parade needs to be looked at again from pedestrians and cyclists safety. Vehicles travel at a very high speed; the vegetation is inappropriate; it's not great for safety. In other parts of Ellenbrook, particularly in Woodlake, we've tried to ensure that the subdivision design has provided as much as possible for pedestrians and cyclists.

Provision of facilities is based on planning documents (Ellenbrook Community Plan) that we prepared at the time of original proposal and that was put forward and agreed to. The Plan provides an outline what's required in the future in Ellenbrook (community centre, child care, telephone box, street furniture, parks). It's essentially our strategic document for community facilities in the future. We also have a community committee that operates in Ellenbrook, which make decisions on a year-by-year basis as where the funds will go. So if there's an area in Ellenbrook where a particular facility needs upgrading then that community committee makes the decisions annually as to whether or not they should provide in the budget for those facilities to be provided, and to review the effectiveness of the facilities. We also have a number of policies relating to provision for POS (what sort of facilities needed on parks), capacity of bicycle lanes on roads. It comes from Australian design standards for roads.

2. Interviewee's opinions on the fact that there are no enough people for public transport to be improved

That's right. It's only 7,000 people in Ellenbrook. When Ellenbrook, Edgerton, and Henley Brook are fully developed in about 15-20 years, there will be a total of about 65,000 people in around those areas. It's important from transport sustainability and in fact the urban sustainable point of view generally, there's a sufficient choice for those people. Although they are in early stages of development, it's important that planning for transportation occurs now so that fund can be set aside in the future.

I think the other issue relating to sustainability and the capacity to provide effective transport is that we need to look the development density in those areas. Woodlake, Ellenbrook is really a low density despite the factor that it does include some new urbanism principles. It really still a low density form. The problem with providing cost effective public transport is that they're not enough people. If we increase the density of those development and providing for higher or medium housings that might allow better economic scale in terms of providing transportation.

[The researcher: But DoT will not provide provision if there' re not enough people]

They may not. But you then have to ask the question why the state government support the rezoning the land to urban. That process was initiated by the state, in fact there's insufficient transportation to meet those people needs. It comes back to the chicken and an egg argument. If we're going to plan the growth of the fringe of activity then we need plan for sufficient population and also plan for infrastructure and transport facilities to meet those people's needs. That's a problem for both the council and for the state government that the development is now preceding and yet appears that there hasn't been sufficient work done to provide for transport facilities.

3. Reasons why state government approved Ellenbrook rezoning

The development process in WA, perhaps more than any other states, is very much driven by developers, not by planning authorities. In early 1990s as a part of NE Corridor Structure Plan, the proposal for development of urban land at Ellenbrook was put forward by a consortium of private developers, and the MfP at the time agreed that the land would be rezoned for development. So there was, in a sense, a push from the private sector to develop that land. The government for one reason or another agreed. And yet you might argue that now ten years later, we still don't have sufficient planning at government level for transport facilities and infrastructure. I think that's one of the problems that we have in Metro Perth generally that the development of private land and public infrastructure isn't coordinated and managed so that the two can work together. We have a situation where these areas developing on urban fringe with government's approval and yet there's not a matching commitment by the government to provide these facilities for those communities.

I think the term integration is the very important one. In planning decision is often made by planners in relation to land use, land capability and the desirability of increasing population in certain areas and providing for population growth and yet the decision about public transport, health and community facilities are made by other agencies with other priorities. The decisions are made in isolation from each other. We have a planning authority that rezones land, yet we have the authorities that make decisions about railways, roads, hospital and community facilities. I think one of the positive things that comes out from the recent restructure of state planning agencies is that transport and to a degree road planning has been included within the overall planning portfolio. But the decisions about the funding and provision of actual infrastructure on the ground are still made in an isolated way. So you might have a situation where, o yeas the government through planning agencies decides that land should be developed. But there're not necessary any plans are put in place to ensure that facilities are provided from the public point of view.

4. Possible reasons for why they don't want integrate

Everyone wants to integrate. But bureaucracy is a funny thing isn't it? We have different departments at the state and at local levels. The council have departments dealing with different issues. We have planning department dealing with land use and development, engineering and infrastructure department providing roads and parks, and other areas dealing with community facilities (child care, recreational facilities). The City of Swan are doing our best to integrate the planning so we have a team of people across areas to work together on plans for new urban development to make sure that as land develops we can provide as much as possible the services needed. At the state level, however, we have very little influence over the decisions on major road network or public transport project. We're competing with other local governments for those funds. I think at the state level, integration is starting to occur with the restructure of the DPI. However, there's a great need for a much more coordination between that a particular agency and the other service agencies (health, transport, railways).

5. Whether it is appropriate if state policy include more detailed guidelines

It'd probably be worse. The way that road planning occurs is the state take responsibility for regional major roads controlling access highways (Tonkin and Reid Highways) and other regional roads (Gnangara Road, Great Northern Highway). A good reason why state doesn't involve in local roads because that's something that subjects to the need of local community as oppose to state policy and from our point of a view, we would prefer that local government maintains responsibility for planning at the local road network. But the reason why state need to continue to be responsible for regional roads is that they provide access between subregion of Metro area. Roads (highway) go across a number of local government boundaries and it's important that development and management of those road networks is with a higher authority. When you get within the local government boundary, I think it's much easier for local council to manage the local road network and local transport issues (bicycle and pedestrians network) because we're more in touch with what our local communities need.

6. Whether policies are reviewed

Probably not enough. The Ellenbrook Community Plan was adopted in 1993, reviewed in 1997, and 2002 given that the needs have changed. We also carry out a major strategic planning in the city. The main purpose is to provide for integrated planning for areas such as Ellenbrook and try to bring together as much as possible the different people who work on different aspects of development, different people across the organisation to look at planning and development issues in Ellenbrook to identify which policy needs reviewing and if there's no policy, which policy needs to be developed. Following the release of 2001 census data, the issues need reviewing is the standard of development for community facilities in Ellenbrook.

7. Supporting factors in implementing policies

A financial constraint is the biggest one. The City of Swan has thirty-three suburbs and we have to try to manage our funding to provide equitable facilities for our communities. There will always be a competition for money. Pretty bluntly, we don't have enough money to implement what we might like to do in an ideal world.

Working with local community is becoming more and more difficult. Different sections in community want to spend money on different aspects (parks, transport, and security services). It's very difficult to get agreement within community. Local government is constantly criticised by communities for making decision to put resources in certain things when segments believe that they're the priorities.

The other thing is the role of local and state government are confused and unclear. In the planning area, the DPI controls the subdivision process and yet the local government controls the development application process. WA is the only state in Australia, which has a different level of government dealing with subdivision process as compared with development process. In most other states, local government carries most of the responsibility in subdivision as well. It creates problem in relation to coordination of planning where you have two different levels of government dealing with two sides of the same coin. DPI shouldn't being involved in detailed in subdivision design at the local level. They should certainly set the state policy, such as LN. But when it come to considering individual subdivision proposal, I believe local government is capable in doing that. That allows us to better coordinate the subdivision process with actual development process and to coordinate the provision of local facilities with that process. At the moment, the subdivision process is dealt with outside of our control. So we are left with subdivisions where we don't have really much to say in terms of how it's approved and designed. That creates problem.

The way to improve it is we can abolish state government [Kidding]. There're certain areas that state government should let go off. Subdivision control should be delegated to local government. The need for state services providers (main road, health services) to better coordinate their activities with ours. Each year, it'd be desirable for us to sit down and meet with the various state agencies and talk about what's plan for the next year and to try the activity as much as possible. That doesn't occur at the moment.

It's better to inform the community about what the issues are in terms of sustainability and our financial restriction. Many communities believe that local government should provide everything and should provide it now. It's better to educate community that we don't have the financial capacity to do that. We need to work with the community what the priority should be. Having agreed on those priorities, we can then work best to fund them. It's very difficult to reach agreement on what the priorities are. Certainly our intention within one to two years is to engage our community into that discussion. And to attempt through the Place Planning Process to reach agreement with the community as to what the major priorities are for planning and facilities, and for us to develop our business plan for providing those on the basis on the agreement; try to inform community and seek community views.

8. Who will pay for the retrofit when it is needed

We do that in partnership with state government agencies. For example Lockearge project (in 1980s with social problems, quality of housing, streetscape). We had a joint effort between ourselves and with Homewest (Department of Housing) to reduce public housing. At the moment, there's a development in Midvale (the City of Swan contributes 1.4 millions to the project, we pay half the costs of retrofitting). It's far more cost effective if it's planned right in the first place than have to come back latter and try to fix it up.

Midvale doesn't have enough funding for long time. Lots of suburbs have no alternative other than have to go back and inject fund. The only alternative to retrofitting is to get right in the first place. That's why we spend lots of effort in places like Ellenbrook by working with developers, having community fund and community committee whereby we can try as much possible to plan and develop community infrastructure so that they can last a lot longer. Local government needs to involve more in a cyclical planning process where we don't simple allow suburbs to be developed, provide the facilities and then go away and come back ten years latter when there are problems. We need to constantly monitor how these areas are going, what the communities are, about their areas quality and infrastructure, and as much as possible to have continuous planning cycle of implementing-reviewing-monitoring-replanning-implementing again. That's our community plan in the City of Swan. It just commences to happen.

Retrofitting and redeveloping areas is becoming more and more important in sustainability point of view to try to increase population in areas where there's already infrastructure. The main aim is to encourage increased population where there are public transport infrastructure and community facilities. In Perth Metro, councils attempt to increase urban density, to increase the viability of town centre and railway station. It's generally a reaction for community to increase of density because of their concern on privacy and lifestyle. The fact that the residents of Perth won't give up their cars. Perth has the highest km travelled in any cities in Australia per head population. One of the main supporting factors in encouraging better urban development and better use of transport and facilities is to encourage more pedestrians' activities and more walking to local centre. I think a cultural difficulty with that as Australians we find it very difficult to follow European lifestyle where they walk and cycle more. It's very difficult to promote higher density where they protect privacy and drive.

But population doesn't guarantee, as in Jakarta where population is higher but less people walk there. But we have to take into account that Indonesia is a developing country whereas Australia is a developed one. The resources consumption, culture, socio-economic are also different.

Planners in Australia should be able to manage resources consumption and to change policies, so that we can be more sustainable. We should've learnt from our past mistakes and try to rectify those. I guess cities like Jakarta or Ho Chi Minh haven't had the chance to learn from their mistakes or maybe Australia should lead the way. The whole issues in sustainability is change our behaviour otherwise roads won't be able to cope the cars as supported by many studies on roads in Perth with the growth of motor vehicles, especially in inner city suburb and regional centre.

But it's not easy to change people behaviour. And that's part of our roles as planners and as policy makers is how to encourage people to change behaviour by pointing out the benefits they can get. We need to educate people the consequences and the costs (environmental, social, economical costs) if we don't change our behaviour. People don't realise the costs, but some people do realise that and change their behaviour. Travel Smart is a good example to shift people in changing their behaviour. But sometimes they have no choice, no facilities for them to change behaviour. It's not a good chance to change people behaviour unless you actually have the facilities to allow them to change. It's a dilemma for government. Government will provide transport system if there are enough people who use it, but people won't take public transport unless it's upgraded. So which one to do first.

TRANSCRIPT OF INTERVIEW

Interviewee: Public Land Developer 1
Interviewer: The researcher
Date: September 10, 2002
Time: 10.00am

1. Interviewee's opinions on transportation facilities and services in Joondalup

The road network is probably an example of Radburn. It's a bit too spaghetti and probably wouldn't be built these days. From the transport point of view, people are quite difficult in finding their way around. There's a reasonable public transport (bus) system. From pedestrians' security point of view, it's not good because there are a lot of lots backing onto major roads. It's a bit dated. But it could be safer. There are places where you feel comfortable and uncomfortable. I think that 's where it comes from.

Planning policies have changed. You would have a hard time getting it approved if you put an application with spaghetti roads like that. They've changed because at the time when those plans were popular, the traffic engineers were king and lots of those plans came from planning for cars as oppose to planning for pedestrians. Now there 's more sensible combination of those two things in policies.

Market doesn't lead those things at all. I think the planners and developers are always looking for an edge point of difference. They have come up with one and partially we've done through projects such as Joondalup City North with smaller lots and laneways. That's a combination of worldwide planning changes that has lead to the change in policies. Then that can be implemented successfully because the developers created it as a market edge. The public or market don't sit there and say we want lane ways and small lots.

But policy doesn't dictate market either. The policies followed developers. Landcorp developed City North to what become the LN style long time before LN was invented. Planners and developers probably lead those sorts of things and policy follow.

2. Hindrances in implementing policies

The biggest hindrance is the policies themselves because usually by the time that they're drafted, they're so complicated and so rigid that counterproductive. Another aspect is, particularly in the local authority and in the state regulatory areas, they've got relatively inexperienced people applying policies but not having either the mandate or the ability or even the combination of that to apply common sense and discretion and apply principles rather than rules.

[The researcher: Are they too rigid?]

Well you'll end up with stupid things that .. The intend is clearly one thing but the rule, if applied by someone with no experience because the rule is so complicated and convoluted, ends up being countered to the original intend.

[The researcher: Different people interpret policy differently.]

But if it all comes back to principles, then the principles need to be clear and policy should be based on principles, not on rules. In 'carrot and sticks' I believe in carrot not sticks.

3. Whether Joondalup needs retrofitting

No, I think .. You've got to look at the history of why that's there. When Joondalup residential area and Connolly were developed, they were well ahead of development front. They were done to try to get a critical mass of people so that there was ... even though the city centre was gonna be ahead of its time, there was still gonna be some

people that would be there early on. In hindsight you probably you might've done differently or done things closely or mixed the densities but I don't think you can do a uniform to make it all higher density because you have to have a mix. And at the moment there's a big trend to raise densities and that doesn't need to be done because we're actually filling up, making up for the time when higher densities weren't done. But it doesn't mean to say that the higher density should replace the lower densities, it's just the mixed should be better. We're playing catch up on a higher density mixed. There could be an argument for infilling bits of Joondalup neighbourhood area but those sort of plans probably is quite difficult to retrofit and you've got to accept that the people up there have chosen to live there because it offers a lifestyle. You can't go in there and tell them that they have to have a higher density.

They've chosen and you can't tell them that it's wrong. This is when the marketing comes in. If you develop a product and convince people that they would rather be somewhere else, that's a different thing. They can choose it but you can't tell them that that's what they should have. But mixed is preferred. There are lots of household types and dwelling types, different income groups within that as well. You look at the mix that pulls out of that.

Currabine train station is a disaster of planning in terms of access. Even though it's very close to the top end of Joondalup residential area, you couldn't get to it. If you look at the layout of the spaghetti you actually have to walk to the opposite direction of freeway reserved for about 200-300m to get out to Burns Beach Road. The environment is very dark and unsavoury.

4. Clarification on whether the City of Joondalup support imposing higher density around existing station

[The researcher showed the DPS where it is written that the City of Joondalup doesn't believe in imposing higher density around existing station.]
That's about retrofitting. I think they're right in saying that you can't necessarily impose things over existing residential areas. Existing areas have existing rights. You can't tell what's good for them. You can only perhaps plan for things to evolve over time. That part of lower density is the valid part of the mix. It's just that at the moment there are too much of that in proportion to the other sorts of densities.

What we forget is that the average person in there have got no idea of planning concept, and nor should they. They live here because they like a certain lifestyle and certain values. And one of those values is space. So while we need to be more efficient about our plan in planning a new stuff and look at strategic opportunities for infilling those sorts of things, you can't compromise the values of those people who have already entrenched.

5. Whether it would be better if state policy include more detailed guidelines

Ideally, that would be one set of policies rather than two levels but I don't know which level it would be. My guess is it would be somewhere in between the two; perhaps some sorts of regional policy. But you can't de structure the system of government that we have. It's unusual that a country has three levels of government. So we're over governed. We might be better off with federal and regional, especially given our low population. I don't know how many politicians we've got per capita. But I'm sure it's too many.

The population will increase. With environment al considerations, we've got to be much more careful about how we plan our growth.

[The researcher: So is WA underpopulated?]

How long is a piece of string. I don't think you can never say that a place is under or over populated because it's just a state of where things are. All you can do is to make sure that whatever population you have, that population is happy and has a good living standard. If that's the case then the population, the number of people, doesn't matter. Quality of life, that's what matters. If you've got 10 millions people and all have got a good quality of life or if you've got 1.5 millions people and all have got a good quality of life, then either way works.

6. Interviewee's opinions on whether by being developed by JDC, government authority, helped to keep balance between the have and the have not in Joondalup

In other words, it's about affordable housing. It's interesting because when we did the Joondalup neighbourhood, we also did the Connolly. The Joondalup was a lot lower socio-economic than the Connolly area for example. So while it didn't happen within one subdivision area, it did happen in the region. Probably that's still to separate. So I think you'd try to mix it up. You need not only the socio-economic mix but also need to mix up household types and age ranges and all those different things. So it's not just about those the have and the have not.

By mixing up the products you can attract a great range of people. For example the different land values. But that's the difficulty that hasn't been solved yet anywhere. But if a land has a certain value and you want to mix up to make some of it become more affordable to people who undervalue the land if you like, then how do you deal with that. But you work more with agencies like Department of Housing and others.

Certainly need be better coordinated in terms of policy, not just the planning level but policy across government such as the housing policies. People decide what services they're going to provide and where, and all sort of stuff but they don't always talk to each other. It's not because they don't want to. It's because there is no forum. I've been trying to get them together for another project down at Thompson Lake for a regional centre there. And they're saying to me: "Oh that's great that you're talking to us". And I'm actually coordinating this and getting the police to talk to health department and those sorts of things because nobody else facilitates that. That soft infrastructure is just as important as.... probably more important than the roads, the pipes and things. It's just as much than the planning authority's roles to pull all those people, facilitate that coordinated planning as it is to facilitate land use planning. I think it'll come around. [The researcher: But dunno when.] Certainly make my views know.

TRANSCRIPT OF INTERVIEW

Interviewee: Public Land Developer 2
Interviewer: The researcher
Date: September 10, 2002
Time: 09.00am

1. Interviewee's opinions on transportation facilities and services in Joondalup

The road network is a modified grid, which is created to allow the development over time of the CBD area into the residential area so that the road system in residential area will accommodate commercial use as the needs arise as the city develops. So it's modified, so far that no cul-de-sac and through traffic, rear laneways to houses to supplement in the future additional loading facilities for commercial access for vehicles. The layout is robust enough to cater that transition from residential into future commercial area.

We've made provisions for cycle path. That became an important part for the city design. It's disappointing that it's not utilised. The evidence for the last six months, the local authority has increased the amount of car park and utilised the cycle path for additional vehicles parking. Parking has been a problem in the city centre and in residential area. Mainly because the public has been slow to accept the fact that this is inner city living where they shouldn't be dependent on the motorcar, but it does happen. When we started, we're allowing rear laneways and double garaging. The thought and the plan was that because you've got a close proximity of CBD to residential, it would encourage people walking and cycling to CBD, going to the train station. What happens is that the mentality of normal suburbia where you've got room to park, 2-3 cars per family. And not being taken to the city centre where the parking has been kept to minimum to encourage people to walk. That hasn't worked out. They brought suburbia behaviour in to the city area. People then criticised that there's no enough car parking, on-street parking.

It's a matter of education. We thought we've done a good marketing job but in my personal opinion we attract the buyers to build in this area. So building wasn't a problem. They brought their four cars in too. As you notice, much of them are students (as it's a university city). It attracted a lot of students and students not ready to relinquish the vehicles, they brought their cars in too.

There's been some pressure on the area by on street parking. [The interviewee supports the Joondalup ITP findings saying that the car dependency is high, no enough walking and cycling.] It's been disappointing that we've provided the provision, walking and cycling paths right to city centre and everywhere cycle paths. Even in the early years, we have events to encourage. I think it's about the concept from the public. It'll happen over the years but now we are restricted by the fact that the council has chosen to utilise some of those cycle paths for additional car parking.

There's no support from government. There was a pressure from the car-driven public, and the council made an easy solution by providing additional car parking now but to the death of cycle path. Local government didn't support cycling. I think it was a short-term means of satisfying an immediate need. There's a pressure for the council to react to the need of the ratepayers and there's criticism of not enough car parking in the CBD. But the car park won't change into walking and cycling paths again even if pedestrians and cyclist complaint. It would be unlikely.

2. Supporting factors in implementing policies

But I think parking is the issue between Landcorp and local authority to the extent that we're providing additional land and this is part of the change or the handover of

Landcorp to the city. In early days Landcorp had a charter to provide certain things. There have been changes over the years, and part of that is certainly in the car parking provision. There had been the planning principles of multi-deck car parking and I think that's something that we'll have to come. But that's a provision for that for the whole city centre planning.

My personal opinion on policy implementation, there has been a slow reaction and I think probably the policy is a little bit too advanced and we expect things to happen sooner than what they have. The growth of the city has certainly been ... We have to be a limiting factor on the way in implementing policy. There are so many factors. As CBD growth, the pressure of car park provision becomes a more pressuring issue and implementing policy by providing multi-deck car parking ... But because the development of CBD has been slower than we thought, it would happen by number of factors. There hasn't been the reason to implement those policies of multi deck parking. There has been a foresight in providing that space. I think the policy has been implemented as much as the development of the CBD will allow. There has been a transition of ... If you graph the development of CBD in commercial sense, it has peaked, flatten off and had reseeded in preference to the residential development and at the moment the residential development is strong within the CBD. That has a different car parking regime or requirement to the commercial. The residents commute in the morning to Perth City and then in the evening they all come back in so the pressure is there, all at one time. Where do they park? Providing parking for the CBD means you're providing for people coming in to the city during the day and then leave at night. Because the development of the CBD has been slower than we expected, it's going to be more residentially than commercially oriented.

3. Who'll pay if Joondalup needs retrofitting

It's local authority's responsibility as they've got the land and got the sites that have been established as part of the regional structure plan. From here on, it's local authority responsibility to create a policy that's going to work. They should be reviewing policies continuously because of the growth of the city. You can't always predict which way to go. For example Ansett built a course centre near kiss and ride at railway system. Because of the demise of Ansett, the course centre was closed. And the need to have parking for those people has changed. The car park is no longer needed. Council supports the expanded facilities for rail commuter and they started to work last month. It would encourage people to use train. The provision should be provided in accordance to the demands of the growth of CBD area.

Retrofit funded by private is only the minibus to CBD centre. Transperth will help if the re enough people will use it. But what our plan is that Transperth provides the services so people will be attracted to use it, whereas they work on the reverse. I can see why they want to have the demand before they put their product there.

4. Interviewee's opinions on whether by being developed by JDC, government authority, helped to keep balance between the have and the have not in Joondalup

When JDC or Landcorp was created, with the charter to create a satellite city, they started with a grant of a 1,000ha. So they had the ability from day one to utilise the value of that land and then by developing it create a fund to finance all infrastructure, facilities and services (parks, irrigation, lighting). You have to provide all that before you can sell the land. Then you can start having the profit. The development of Joondalup has certainly been benefit to the City toward to the state because profit has been made and goes to treasury.

Joondalup provide products for second or third homebuyers. It hasn't been one way to provide for the first homebuyer. It's been a good healthy development, improvement

in land value. The quality of buyer has been consistent throughout. We see that people living in CBD and City North are predominantly business and matured families, active retirees. No young families because it wasn't meant for. There's no diverse socio-economic. Joondalup has a structure layout. People buy their lifestyle.

5. Clarification on whether the City of Joondalup support imposing higher density around existing station

[The researcher showed the DPS where it is written that the City of Joondalup doesn't believe in imposing higher density around existing station.]
It's talking about railway station and the CBD itself. I agree with that. The higher density should be within the CBD and its immediate surround of the CBD. I think they're talking about train station outside the CBD. We have mixed use occur near the Joondalup health campus, AIUS College. There's no residential mixed around railway station but there is a commercial mix. I don't see the benefit encouraging mixed use around railway station. To my mind, they should encourage commercial development and the residential around those areas ... You've got nodes around them. You can get restaurants around those areas that will get used at night.

They don't support mixed used in suburban rail station not that in CBD. I can't see the benefit from having a mixed use of residential and commercial in the rail station area in CBD. There's a better area for it. Residential area provides passive surveillance to the community or environment. The train station isn't an encouraging or lifting environment. Usually it's pretty grimy.

TRANSCRIPT OF INTERVIEW

Interviewee: Private Land Developer 1
Interviewer: The researcher
Date: September 05, 2002
Time: 10.30am

1. Interviewee's opinions on transportation facilities and services in Ellenbrook

I think, the services currently we have are realistic for the stage of development. We have approximately 2,300 families, with the population of 8,000 people. We have a very good and regular bus services connecting Midland and Morley; and Midland connection particularly to the railway line. So I think the reflection of our location and the stage of development that's probably all what we can expect. It would be lovely if government for example had a railway line here but it's just not viable and not many people to pay for that sort of investment. That's an issue where we are a bit underserved in terms of roadways as at the moment there's only one access road into Ellenbrook. It's so much transportation issues as an access issues. The planning that has been approved by all government agencies allows for the reservation of some land on our western boundary for the Perth Darwin Highway. We have been submitting to the government that it's time for them to build the first leg of that along our western boundary to provide access to our future town centre, which is about two years away from being developed. And by that time, you're talking about the population of 11,000 or 12,000 people; you're talking about substantial retail development, which will attract people from outside of Ellenbrook as well. Easy road access is quite important and we're submitting that there's an obligation on government to provide that road. It's not developer's requirement to provide that kind of road. It's a matter of government.

So public transport is all right and it'll continue to grow with the community but the issue of road infrastructure is a matter of where I think the government needs to improve.

2. Interviewee's comments on the new transit corridor

[The researcher asked the interviewee about the new public transport corridor.]
Yes, there's a reserve in MRS in terms of public transport. But the use of that public transport corridor is a matter of government. I would suspect that government wouldn't do anything there for sometimes. The reserve is to accommodate for heavy rail. But I dunno when the population will be sufficient to justify. But the transit corridor at the same time could be used for dedicated bus way. And my anticipation is that it'll be a few years down the track.

3. Interviewee's comments on some questionnaire survey's results

[The researcher said that residents of Woodlake felt that shelter and lighting for public transport were insufficient.]
It's interesting because the government doesn't provide bus shelters. The City of Swan doesn't either and it's policy matters. The City of Swan has a policy against having bus shelters with commercial contents, advertising billboards. What we have been doing, though, is that we have two bus shelters on Pinaster Parade and in the Bridges, both of which are funded out of community fund that's contributed equally by ourselves as the developer and the City of Swan.

One of the difficulties is (we budget to provide more on those shelters) because Ellenbrook is developing; the bus routes change as the development occurs. You run a great risk putting a bus shelter at a location and in twelve months later the bus won't be there. It is planning and management matters. Yes there's a need for them but we need to take other factors into account.

[The researcher asked the reasons why local government doesn't support advertisement at bus shelter.]
It's because of their policies, I think. We've made some enquiries about sponsorship of the bus shelter and the reality is the company who organises those advertising is not prepared to pay for it. They actually wreck the bus shelter themselves, so there's no costs to anyone. They only do that on major routes and they don't regard Ellenbrook as having a sufficient traffic and population to justify. So even if the City of Swan policy is different, I don't think we'll get anyone to do it yet. Again, we're in early stage of development, you can't have everything upfront.

We have worked hard to try to make sure that facilities are provided either on the timely basis or even in advance sometimes. The best example of this is when the project developers allocated \$100,000 subsidy to have a bus service provided on day one where there were a very few residents. We subsidised for the first twelve months until the population grew. That's why in which we can provide services and facilities. During that time, the bus running with no one on it. But as people moved in, and they saw the buses were there, they got into the habit of being able to use them. And the services continued to grow, services were more frequent. The bus contractor, the Swan Transit, did a good job. But the routes have to be revised and changed as Ellenbrook continues to grow. We just completed Morgan Fields and we'll be talking to Swan Transit. They have to go to the government and get the contract to provide additional services. But part of that annual review, we'll look at the bus services in the Morgan Fields next year, I hope. There'll be loops there, so people can get on bus without having to walk out to Gnangara Road. As people get there so the services are required. The way bus services are offered is that the state government issues a contract to a contractor, Swan Transit, and Swan Transit is constraint by the term of that contract. They can't put additional services just because they want to. They have to seek approval from state government in order to do that.

4. Supporting factors in policy implementation

The term of planning generally the City of Swan is very much involved. In WA, we have two tiered planning approval system, WAPC who approves the broad structure plan for the entire development and then later on has to approve its subdivisional stage, let's say 40 or 50 lots. In between that, the City of Swan is involved in approving what we call development plan or ODP, which we generally do for each village. Which shows the major roads network and where the key areas of POS or community facilities such as shops or school will be located. Now when we submit an ODP, we also include a traffic study as part of that. And we hire a consultant to provide traffic study, which shows the number of vehicles movement and looks at transport and also the design or layout also looks at bicycle and walking trails. So there's a total package there that seems to work pretty well. And the City of Swan ... we consult with the City of Swan and seek their approval at the appropriate stages of the process. So I think they look at transport issues in the context of the overall development not separate from anything because transport issues depend on where schools and shops are gonna be, depends on land use.

5. Hindrances in policy implementation

The hindrances are mainly to do with two related things: the time that is taken for approval and secondly is the unavailability of approving officers (whether they'll be in the City of Swan or Department of Planning) to be able actually come out on the site and get the understanding of the total picture of what's been developed on the ground. Often, a decision is made in isolation of other land use factors. So I think it's important if ... I understand that these people are very busy and got other responsibilities other than our project, but if they have an understanding of what's happening on the ground then may be they would be better able to make decision

and recommendations to their committee and councils on a speedier basis so we wouldn't have the delays.

I think the other thing that is a problem in terms of providing hindrance to policy implementation is the fact that you have to go to multiple agencies to get approvals. You have to go to the City of Swan, DPI, DEP, Water and Rivers Commission, Watercorp.

In theory, the DPI has to pull them all together but in practice each one of those different agencies have their own agenda and it's very difficult to get a unified approach and often there are conflicting views. The City of Swan might insist you do something but the DEP says you can't do that. I got a situation in relation to drainage management. We're proposing the Water and River Commission want to change but the Watercorp doesn't want them to change. So I dunno how to overcome that. Very difficult.

[The researcher raised the issue of conflicting ideas, for example lighting and safety. People turn off the light to save energy. But on the other side, streets will become dark at night and it'll be unsafe for pedestrians.]

In the end, it comes back to urban design and sound planning principles to take those factors into account. So that areas like parklands for example are overlooked by laneways; street lighting is planned in an appropriate way; and the layout and the linkages with dual paths are such that you don't create dark and isolated spots where safety and security issues arise. You avoid doing that by good planning.

I think that energy efficient can be achieved in a number of ways. If you need a few lights in a park to provide a safer environment, well .. you need it. You need to do that; it's a question of balance. You have to remember that sustainability is about the balance of the triple bottom line: social, environmental, and economic. Social issue might be safety and environmental issue might be energy, and economic issue might be who pays. There's no perfect answer.

And I don't think one should be a priority above others. I think all three should be looked at and considered in each case, and worked out the appropriate balance in each case. I think one of the difficulties is, what we experience at the moment, that people for sometimes have been confusing sustainability with the environmental sustainability. Sustainability isn't just environmental sustainability. Preservation environment is important and fundamental to what we do, but you can't consider that given the total priority over everything else. It needs to be in balance with the social and economic objectives. If things don't work socially or economically, then the environment won't be preserved.

[The interviewee agreed when The researcher thought it needed trade-offs to have a balance.]

6. Who will be the appropriate agency to be the umbrella agency

My personal view is that the planning agencies, WAPC and DPI, have an umbrella role to why all those things are in balance. One of the difficulties is that the environmental legislation is so strong and independent that they can do their own things and totally ignore other balancing issues in a sustainability equation. If I were the king for the day, I would get the legislation in balance to give the planning commission the primary role and to make the balancing judgement between the environmental economic and social sustainability. That's what I would do.

People involved in environmental debate would not agree with that. I think it's important that the environmental protection not be weakened at all. I'm not talking

about its weakening. I'm just promoting a sense of an arrangement to get things in balance. Sometimes there are environmental issues, which are put forward which aren't under significant for some people who would like to suggest.

7. Clarification whether policies in WA are reviewed

Yes and no. Most departments these days do have regular views of policies. A lot of legislation these days have some sets of clause in it requiring be reviewed after certain time. So I think they're reviewed. One of the issues in policy clause that it can be so rigid that it doesn't take into account real world or changing circumstances, so it's important to be reviewed and be framed in terms that it has some flexibility in it. But the other thing I have a view of it that is the tendency of governments to introduce a new policy on top of existing policy. And I think they should be a rule which says if you wanna introduce a new policy, you've got to get rid the old one.

For example recently the City of Wanneroo released a draft of tree policy, which is about preserving trees. And that tree policy didn't mention any other land use issues. It only concerns itself on tree. It didn't consider roads; it didn't consider where people should live in relation to school and shops; it didn't consider pathways, infrastructure such as sewerage, water and power, where they have to go so on so forth. It seems to me that the policy conflicted with any all other policies that the City of Wanneroo already had. If you gonna introduce a policy, you've got to take into account what's already there. If you going to introduce a policy that makes sense then it needs to balance other issues, and if they need to be modified or deleted or whatever, you should do that. Not just keep adding policy on top of policy, on top of policy because you'll end up with a very confusing mess.

That's why perhaps the best management of that situation. What should've happened was the draft tree policy should've been looked at by other sections of the City of Wanneroo before it's released; should've been looked by engineers, landscape, planners instead of just put it straight out. It's important that you have consulted the process. I think they should also consult with the industry whose sustainable job is to create new communities and build a new area.

If you don't take things into account, you'll end up with bad policies. The development industries have spoken with the City of Wanneroo and I think the City of Wanneroo agreed that they didn't do it properly and should've done differently.

8. Interviewee's opinions on accessible bus routes

It's important to have reasonable walkable catchment around bus stops and the like. One of things is that it'll be a bit difficult when you're developing a new area because you sometimes have to put the buses on road that aren't really designed for buses in the long term and you have to have short-term measures and it might be inconvenient for people until the development is completed and settled down. It's a good planning to have accessible bus routes, especially like Ellenbrook, in the urban fringe and especially for mothers with young children. The walkability is very important.

TRANSCRIPT OF INTERVIEW

Interviewee: Private Planning Consultant 2
Interviewer: The researcher
Date: September 06, 2002
Time: 09.00am

1. Interviewee's opinions on transportation facilities and services in Ellenbrook

They need breaking down into categories. The vehicle access is excellent. The subdivision pattern for Ellenbrook is based upon interconnected road system with radial road to village centre so vehicles have a number of options in which to travel through to the villages, and also to each of them. In dual use path, pedestrians and cyclists are well provided for. In fact in Ellenbrook, we make sure that walk and cycle paths throughout the villages are available. Probably in excess to what required by government policy

With the radial roads, the pedestrians and cyclists can get straight to the centre. Public transport definitely needs improvement. We've done some surveys and got feedback from up there [Ellenbrook]. There's a bus route operating both to and from Midland and other regional centres such as Morley and Galleria. The frequency of services, especially in the evening and weekends, are very low. A lot of youth in Ellenbrook complaint that once they got out of Ellenbrook, they couldn't get back. They need to get back a lot early or late than they require. Given that being a growing area on the fringe, the level of services is probably good for public transport service, but definitely there are rooms for improvement.

The public transit corridor hasn't been used but the land is being reserved under MRS and actually SPC and DOLA own that land. It's been designed based on heavy rail but it's unlikely to have rail there unless there's a political decision opposed to straight transport decision. It's more likely that it'll be dedicated to bus way by given the fact that Perth Darwin Highway isn't in now, there's no connection from this transit corridor heading south and there's not even development between Ellenbrook to Henleybrook and Midland. There's a large gap where no one is living. We have been advised that in 10-15 years there might be a dedicated bus way in that corridor up to the centre in Ellenbrook, which is a logical destination point. No further than that; and any sort of rail will be very long-term. It's a good strategic planning that transit corridor is there, but in the short term it will remain as remnant pine trees and Ellenbrook is proposing to put temporary dual path for walking and cycling so that people can use it.

[The researcher: facilities (lighting and safety) for walking and cycling.]

The villages were designed on the 5-10 minute walk for people to get to the centre. There are lots of combinations of dual path; the path will be increased. There's always probably an area where people walk and cycle, regardless of age, off the street environment if they need too. This street environment itself is safe as disperse nature of the traffic and the multitude access to the village. There are not really heavy local distributors roads and not many cul-de-sacs.

In terms of lighting, it can always be improved. The street lighting is very good according to some standards. Some lighting at parks needs to be improved. The street network is fully covered by lighting, which is good. In terms of street lighting, the street lighting at bus stops needs coordinated with the engineers. Street lighting came in first and shelters later. So there's no good coordination in that regard. There might be bus stop sitting under the light and other stops have dim lights. If there's some distance between lighting and shelter, it wouldn't surprise me.

2. Reasons why those agencies do not want to coordinate in the planning or design

It's simply because of timing. The lighting designed is done detailed at engineering stage for subdivision approval. It's a very early before it's constructed. It's done by the

engineering based upon assuring areas have sufficient lighting. It's a fairly ordered process in term of lighting. After that the bus operators go through and determine where bus stops are based upon spacing and the road network, the intersection, the catchment they try to cover. So the engineering people when they put the lighting do not know where the bus stops are and the bus stop people do it on their desk rather than on site to check where the lights are. Both probably are doing their work from their desks rather than on site. That's probably why there is no combination in linking those two together. No match.

3. Supporting factors in policy implementation

The best policy to get everything right in Ellenbrook is that we have a meeting every second week where engineering landscape, planners, managers, all come together to discuss how we're implementing, how are things going on the ground, how the approval we are at and when certain stages are required. Basically we try to get interaction across disciplines to match all those issues together and make sure that we don't have hole in provision and services in the lots.

In terms of coordination in Ellenbrook, the project meeting all discipline is the best way. You can have policy, people can speak with each other (disciplines) but you really need facilitator and interaction. You can find reasons that they're busy; can't do this, can't do that. This meeting will save a lot of time in the office when we know the exact time when we'll speak. A lot of issues can be resolved very quickly if they speak with each other. Everyone gets the plans and information with them. The interaction occurs immediately when an issue comes up.

It's good to involve some of government agencies in, maybe once a month or once every two months where you have someone from DoT or DPI or local government for issues like POS, parks, road issues, etc. We're actually talked about the possibility of inviting government officers in Ellenbrook. We've done it in the past at special occasions at early stages. We're talking about the possibly of doing it monthly or bimonthly process of getting the government officers out to the project meetings and seeing what happens. And possibility of imputing on issues such as bus stops occasions; it could be one of the points to discuss.

One of the biggest hindrances I guess is approval. The multitude of policies on state and local governments and different government agencies in many ways touch on similar subjects but they have their own specific requirements. And sometimes there is a very little coordination between government agencies and levels of government in terms of policies. The biggest issue is individual officer's interpretation on that policy when they word it very generally. Such as POS; you probably have a dozen different interpretations of what we can put in POS in terms of slopes, facilities, grass, structures, etc. It's an individual interpretation; what could be acceptable and unacceptable. So you can get one part approved in terms of size and contents but when you come a few months later for the next stage, and you have similar criteria for park lodged for approval, it could be rejected; need more modification. It's officers' individual interpretation.

[Even if you said it was approved before.] Officers would say: "But it's not how I'm reading it". It comes from the point of view that various officers are given different various level of responsibility. Every officer's view on that policy is different from their colleagues. The managers aren't really look into enforce the same or common standard, they're quite happy and let their officers have different opinions, which is fine. But they're not doing in a manner which is made easy for someone to ... especially for Ellenbrook that tries to establish where the benchmark is so at least you can move from that fixed point. It 's just an issue in getting approval and implementation.

[The researcher: whether it is because too mush freedom given to officers.]

Not too much freedom, just professional interpretation and try to achieve ... instead of just try to enforce the policy. Policy is drafted for reasons. This is usually the common factor of the why policy has been drafted, rather than having individual interpretation of specifics ... All you'd like to do is the officers understand why the policy was drafted and seeing that achieving that goal could be one or a dozen outcomes all which achieve that goal but different in their action specifics. Having officers who can see that is rare; it's what supposes to do.

4. Whether policy is good

Policy is good. Policy provides guidance for project. You want to see what agencies or government are trying to achieve. There's a number of ways in achieving their goals and that's what makes development is different. That makes designs and proposal different. You need them to know what sort of benchmarks, subjective needs to be achieved. You need that guidance to ensure what you put in the system complies. Policies are essential. More time should be spent in policy to say why the policy was drafted, why there's a policy for this particular requirement. It's like performance approach. This is the reason of policies, and these are what we'd like to achieve, in a broad sense. Rather than have specifics, we'd like to achieve pedestrians and cycle permeability throughout the residential areas to allow access to major focal points. And pedestrian don't have to walk for more than certain distance before reaching foot paths and don't have to walk on a major distribution roads before reaching a foot path. Rather than saying every street shall have a path 3.20m wide based upon this width and have to be connected with network here. The design and implementation process allow you to ways to achieve the result without having always do it in the same way.

5. Are policies reviewed

The policies that we have to comply with from local government and state aren't reviewed regularly. They've been very constant. Probably the biggest review since Ellenbrook started is LN, which is really a review of DC planning policy. Local government, the City of Swan, hasn't really made any major changes a lot in their policies. In Ellenbrook, we've made changes in terms of road standard policy which is road width that we have up there on smaller lots, policy on lane ways was introduced, and set back requirements with 10-12 m frontage for 300-350m² lots (smaller lots).

The review really came out reacting to the product when it's out on the ground. It wasn't a proactive response in that regard. In terms of policy change since those changes have been made, state and local haven't reviewed policies. We seek to modify them quite regularly by putting different stages and different products up there. They're dealt as exception and special approval but there' have been no attempts to modify the policies.

6. Policies used in Ellenbrook

Ellenbrook has additional layer of policy or approval process. Once we've got subdivision approval, Ellenbrook has ability to chose detailed site plan or detailed area plan. We usually use it on smaller lot, solar orientation issues, and rear access to garages. That can be adopted by council as to approve detail site plan. It helps to put built form on the grounds especially for smaller lots.

We're different from LN. Ellenbrook was not up and running and this initiative was in place before LN came along. We find that in a commercial sense LN isn't always ... we believe LN isn't entirely correct. We're different from it in terms of neighbourhood retail centre location, which we centrally locate with primary school and other commercial facilities instead of putting it in the edge of neighbourhood and local distributor road. With interconnected traffic, some streets have such a low volume of traffic. Having a footpath down in every street on both sides is just over provision. We generally provide a path down every street on one side but not on both sides. The nature of street, the volume of traffic

and the ability for people to interact in the street environment itself just don't warrant that provision of infrastructure.

Not every body wants to walk on footpath. Some people are happy to walk on the road without a footpath but with immediate access into it simply by crossing the street that has virtually no traffic ... we're different from the code but happy to adopt. We believe that LN has a lot of positive provision in them, which have reflected in Ellenbrook.

[The researcher: clarification Ellenbrook doesn't have to comply LN.
We don't submit ODP or subdivision under LN. We put them in under the DC policy. They simply reflect a lot of LN provisions but we don't submit them for approval under LN, because those points are different and because we don't comply with some of the key criteria. We're happy to disagree with the officers.]

7. Which one is better: cul-de-sac or grid

We have no negative opinions on cul-de-sac. They are components of design street network. We have cul-de-sac and usually use it in location with topographical constraints where you can't connect the roads. We use cul-de-sac on the boundaries, the stage where to get in to a point where no further connection possible. They re' legitimate use and certain segments of population fully support cul-de-sac. But the reason we don't use them, as much as probably in some conventional areas, that cul-de-sac has quiet environment only people live there go to that street and you can create those street with interconnected network where there's connection everywhere so that people have many options where they move. Interconnected network picks up and improve down fall of cul-de-sac in terms of permeability and connectivity, distance for travel for vehicles that cul-de-sac doubles up every time you go there. Connecting cul-de-sac with footpath creates social problem in terms of overlooking backyards. So they're closed.

If you do interconnected street patterns, there are multitudes of street that display the same characteristics as cul-de-sac but simply have connections at both ends instead of one end. So we think there's a better way than cul-de-sac. But when cul-de-sac is appropriate, we still use it.

[The researcher: the possibility where kids can play at the cul-de-sac's head.)
They can play in interconnected streets as well. Generally the street just around residential traffic; and kids play on road as well. They're just being exposed to vehicles travelling down the street.

[The researcher: interconnecting street and people checking out houses]
They can do that in cul-de-sac as well. No surveillance at one end of cul-de-sac. So it's completely dead space. With no one drives passes even in a passive sense or walks pass cul-de-sacs. Cul-de-sac produces a more unsurveilled area. People won't go to cul-de-sac if they don't live here. Crime prevention and surveillance, cul-de-sac definitely has deficiency has oppose to connected streets.

TRANSCRIPT OF INTERVIEW

Interviewee: Private Planning Consultant 1
Interviewer: The researcher
Date: September 06, 2002
Time: 04.15pm

1. Interviewee's opinions on transportation facilities and services in Joondalup

Very good, it has freeway, railway to Joondalup centre, and bus services/ routes go to some other streets.

[The researcher then informed the interviewee that Joondalup is unsustainable according to some resources. Car dependency is high; there are not much walking and cycling, not many routes bus either.]

Car dependency is high, as people prefer using cars. Different issue is whether car dependency is good or not. But the opportunity would be there for public transport and walking, primarily for public transport for long distance (Mandurah railway to Joondalup Centre) I don't know for sure the details. There should be bus routes from Joondalup to Joondalup Centre, feeder bus. If people use cars in the situation of Joondalup, unlike some other areas, it's more by choice than absolute necessity. In some other areas, there is car dependency because if they don't use cars they can't do things. In Joondalup, the car dependency isn't so high. People probably still choose to use cars just as much but I think they do have choices available if they want to.

In some other areas, they have no choices as much as Joondalup. In Joondalup the choices for public transport is quite good. They prefer using car, as the natural flexibility of cars: being able to travel wherever, for personal comfort and privacy. I think that utility or flexibility of car is terrific for people who have cars during off-peak period to non-central locations, say Perth CBD. Whereas they are travelling to Perth, the utility of cars is greatly reduced because you get on the freeway, slow down like anybody else. You'd be far better to use train if you're coming to Perth CBD to work. And people in Joondalup have that choice; they can get on the train. I think the benefit of the car is all there to people. I'm not talking in terms of economic and environment, The utility is there when there's no congestion. When there's congestion that's when public transport needs to be used and where Joondalup people have the choice.

2. Interviewee's opinions in response to the Joondalup ITP result where there are not many people walk or cycle

It gets more complex there, because they do walking and cycling for pleasure. However, to do it as a formal function transport, the area doesn't need to be differently planned. They need to be sort of high density so that services are closer. The area hasn't been really designed to encourage walking and cycling as the major formal transport; it's too low density. However, it's more pleasant than some other places. Because one of factors in walking, studies have shown that if you can have a pleasant walk, if it's attractive and enjoyable, you can use that as a formal transport. But if it's ugly and horrible; No. But in Joondalup there is quite an attractive suburb, and there are opportunities to have a pleasant walk. The thing is the distance, because it's a low-density development; it's difficult. The Joondalup suburb itself is quite hilly, that maybe discourage cycling for transport purposes. To get from Joondalup suburb out to Joondalup Centre and other areas, it's quite a major barrier by the roads, (Joondalup drive, Moore Drive). Have to be a serious cyclist to do that regularly, I think.

[The researcher's questionnaire survey also indicates that some people do not walk because of the topography: hilly.]

You always get people who do that for exercise and pleasure. In Subiaco, people can do that as formal transport. It's better to walk, it's quicker than take the car because it's high density and more direct. In low-density areas, people walk for pleasure and exercise rather than mode of transport.

3. Whether Joondalup should be increased the density

Yeah, I think that Joondalup suburb could now benefit from increases in density. When it's first planned, I was working with JDC; I did the initial design for that area. Simon Holthouse was employed as well. We deliberately set out a plan that neighbourhood completely in accordance with the current policy that was applied at that time. The policies include road hierarchy, excluding through traffic, no direct lot frontage on 3,000 vpd roads. We planned it as state of the art using current policy. But now, it's terrible. To look at what's acceptable back then in early 1980s and go back now after the development in recent years, it's terrible. There are probably no excuses for doing this at the time, but in terms of open space, they are all back fences facing open space [Blue Lake Park]. Where as now you wouldn't plan like that. And the main roads, the distributor roads, all of them are back fences. That's because the traffic volume is gonna be more than 3000 vpd.

If I was a millionaire, I'll go and buy up Joondalup and re-do it. In that process, I think you could include some more medium density. Even now between neighbourhood centre, in its vicinity and away from there but down towards the regional centre. I think it'd be good to redevelop some of the housings for medium density. Single residential housings might not happen for quite some times.

[The researcher asked whether there 's a possibility to increase the density.]
Well, only over a period of time. Unless someone wanna buy the single residential properties and redevelop them, which is possible. I think that's a real case for doing that. But whether or not it'll be economically feasible for doing that at this point of time, I dunno. Certainly, when it's planned and developed, the Joondalup Centre was a bit of a long-term plan, haven't really taken of as now. It was decided to be a single residential areas, but in retrofit (retrofit is a wonderful thing) it would've been good to plan it at higher density because it's so close to Joondalup centre. But at that time, even areas that were close to future regional centre wouldn't have been planned as a medium density area. Single residential was being done. Not much medium density was done at that time as there's now. If that's all happening ever again like, Alkimos, Brighton, 450, 500 m2 lots have been developed. The density is almost twice than Joondalup. I just wanna show you what reasonable then at the time and what reasonable now. At that time 450 lots would be unlikely approved by the planning department.

4. Who will pay for the retrofit

It'll have to get a point where ... Most, unless it's required by Homewest or the Housing Department, all redevelopment is private. It would need a developer to see an opportunity to buy some of existing land and redevelop it for more medium density. So that's what would be required. Perhaps in suitable some areas would need to be rezoned. But at the moment ... if it's R20 as many are, some of them can be redevelop, but if it's R12.5, it couldn't unless some of them got rezoned to, let's say, R40. So if you identify suitable areas for R40 zoning, give them the potentials. But then it's a matter of how economic it's to acquire the property, and redevelop to medium density.

I suspect at the moment it wouldn't be. Firstly, I think the land values aren't quite high enough. Secondly, the housing stock there is probably still quite good. So there are lots of economic live in it. May be in another ten years or more, the housing stock would be running down. So that ... it's not worn out, not so modern, getting a bit old. And the Joondalup Centre would've grown more so the value as a medium density would've

been increased. Don't forget that it's taken hundreds of years or more for Subi Centro and East Perth and some of those to get to the point where major redevelopment occurred. But in other inner areas, redeveloping of big houses with small houses, it happens incrementally in years, especially near centres.

5. Whether there is any possibility to follow current policy objectives

Not in a practical way. In theory, there are things you could do. The cul-de-sac design is so firm, there is no way that you can connect, in most of the areas, you can't connect cul-de-sac through to distributor road because there are houses and houses are backing on the distributor roads. Even if you knock down the fences, you'll have backyards. It really would need a comprehensive redevelopment in certain areas to fix it up. And the topography doesn't help either.

In some places it's not too bad to have back fences. There are certain areas where back fences are lengthy, but it's too much there. The lower park [with the lake] is just a total waste, the way they're just back fences. The property opposite that park have their back fences facing the park instead of presenting nice house frontages all the way around. That's something that wouldn't be approved now.

Lowering the fences is unacceptable. People won't mind low front fences but low back fences is too much. People like private backyard. The best things is more heavily landscape in the vicinity of shopping centre and down near park. It needs people who wanna to do it if it want to occur. I'd like to do it, if I was a millionaire. Most developers couldn't be bothered because they wanna do other things.

Surveillance isn't such an issue, topographically. The back fences face the park. Instead of facing the park, the fences are backing the park. It's not the same situation as.... There 'are worse places where back fences are directly fronting the open space. It's overlook as it brings traffic. It's not bad from that point of view but it's bad from an experience points of view. Near the centre there where fences instead of houses facing it. It's bad. It's a poor design probably. But this road hierarchy, cul-de-sac accurately reflected the current policies.

[The researcher thinks that cul-de-sac allows kids to play at the cul-de-sac's head.] People do like it. House buyers still appreciate cul-de-sac. In redesigning, we need to be very careful that we just recreate the situation that existed before that led to embracing cul-de-sac. Straight grid road is very dangerous. What we do know is to develop responsively, which still maintains the hierarchy in a way but it doesn't do it rigidly. There is lots of flexibility but you have a grid but there's no way you can have through traffic. Still make this area relatively quite little precincts. Because they don't have cul-de-sac, people can walk and drive in any directions and the hierarchy is still there. But you might still have a road doing something like that, many long cul-de-sacs. But you can choose from several different points rather than have all roads [Charlotte Cove, Seneca Gdns, Carmen Ct] are channelled to the same [one] road where all cul-de-sacs are going to one road [Nanika Cr].

If you do it from scratch, we can create interconnected roads. Unlike Connolly, this cul-de-sac can be connected, in theory. Here [Blue Mountain Dr], the houses front all the way around cul-de-sac. In order to connect through, you need to knock down all the houses. It wouldn't be worth it. The value is actually trying to fix up in area like this. The cost; it's really not worth it. These people probably would like the way it is. That's generally the case. If people don't like where they live, they generally move.

6. Reasons behind cul-de-sac length limitation

[The researcher asked whether there were any reasons in limiting cul-de-sac length by 120m long.] It's for so that you don't have huge long cul-de-sacs, so that someone

doesn't have to go all the way up and find out that it's a dead end and come all the way back. So there was some of length limitation. I dunno whether in all cases it was adhere to. But you can't say here, there all of that is cul-de-sac. So in theory, that should've been in line with policy. But there, that policy really says long cul-de-sac is acceptable but they shouldn't be over long. Even there, it was recognised that it wasn't good to have huge dead end areas. But even so that's pretty horrific by today's standard. You wouldn't design that. It was the best way at the time. The more cul-de-sac's the better. That's the marketing value, that's what people wanted. They still do but in choosing I believe they don't ... I don't believe that we have to choose between cul-de-sac or horrible through road. In good design, you could have some connected streets that still quite attractive but they're just connected; and for the benefit they bring.

My plan in Broome, near Broome airport, we still have one or two cul-de-sacs but most streets are connected. But you still have hierarchy of road, that's the main. But as you can see the residential streets are grid. And you see that could be loops. There's no way that traffic coming from outside the neighbourhood going to rumbling down those streets. But where appropriate, cul-de-sac is still good, short cul-de-sac. There are places where I guess nowadays people are more incline to look at things on merits rather than implement any standard approach.

7. Whether it is appropriate if state policy include more detailed guidelines

There shouldn't be too many controls and guidelines. I think people can get overboard on that. So I think the state government and local government need to be quite selective in the control of such implement and should have regard to the fact they could make mistakes. Look at these policies and the results of those policies. In a few years later they turn out to be completely wrong. I think they need to be treated very warily but people have different views. I tend to think state level should be generalising, strategic. And any detail policies should be at the local level but there shouldn't be too much of it. Local government planners shouldn't try and design the urban environment through policies. It creates stultified. There should be some key areas identified that everybody agrees; it would be good. And they should stick to those, not trying get too intricate or too detailed and enforcing what only might turn out passing fads. You have to leave the way open for things to change and develop. Hopefully over time, the next result is improved.

By all means where policies are appropriate, the strategic ones should be the state ones and detailed one should be local. Some people like in development industries might object that local policies mean that too much variation throughout the region, and that's a nuisance and impractical. I don't agree with that view at all. I think one of the characteristics of locality is that it should have the potential to be different from another locality. So there's no reason why the same detail standard should apply in Joondalup as they apply everywhere else. Why not have difference. By having the ability to have difference, you can have different things occurring and people can decide which is best. Every site has its own strengths. It's my views and I'm sure that there are many people who wouldn't agree with it.

8. Clarification on whether the City of Joondalup support imposing higher density around existing station

[The researcher showed the DPS where it is written that the City of Joondalup doesn't believe in imposing higher density around existing station.]
Because they're recognising that the existing built environment doesn't lend itself to it, and they have a point but equally I don't think by ... You don't impose densities by facilitating them. It's a different thing. In zoning, if you zone an area R40, you're not imposing ... You're imposing the zoning but you're not imposing the development. In order for the development to occur is actually to take somebody to do it, which it will

have to be done under a separate process and would need to get approved. You are imposing it and ... I think it's just badly worded and not very well thought through. They could be facilitated by zoning it any if people want to keep it as much as it was, they could. Having said that, they might be something about the street, the way they're laid now that really makes it sensible. For example the housing near East the railway station might be at the end of a cul-de-sac coming from the other direction or something like that. In this case, it would make no sense really to zone the area at the end of cul-de-sac for high density where the rest of the area is low density. So that's what they're talking about. But generally they support the policies "... with the qualification that it does not believe that higher residential densities should be necessarily be imposed over existing residential areas that surround a railway station ...". Implicit in that the idea is that may be it can be imposed in other areas in some situation.

So that's just stating the position; that it's not closing off the option, I would say. It's typical of blur that you get in Town Planning Scheme that matters very little. What matter is if you have a situation where the physical reality on the ground makes sense to do it. They're just kind of suggestive words, a certain way of thinking about it. They are words you wanna try to get around if you have the good opportunity to do it.

9. Hindrances in implementing policies

It depends on kinds of policy. Some policies are good policies that most people would agree with, and with logic direction. Some policies might be controversial. I think the first thing is ... not necessarily flexible. But it has to be a good policy. Most people know whether it's good when they saw one. I think that's the factor.

[The researcher asked the criteria for good policy.]

Some potential policies you'll find that almost no one can argue with. Like to maintain environmental quality of something the residential environment or something like. Any sort of policies that clearly would help reserve the residential amenity that no one would argue with because everybody can see that that 's a good objective. Whereas some other policies like commercial centre policies for example, they can be quite controversial; they could be quite a lot of reasonable ways of doing something different. And yet the policy might be very rigid in certain direction, without justification. It might be reasonable to do other things. Those are policies need to be flexible. You need some flexibility where there are more uncertainties. As long as you get the mix right, policies objectives and the way to implement it, as long as the balance is right, you might not have many hindrances. But the basic hindrance of policy implementation is people who don't wanna do it. That's the hindrances. Where that occurs, I think the planning authority really need to question itself where in some areas planning can legitimately say ... "Look this should happen even if the majority didn't understand it". There might be some circumstances. But on the whole, I'd say most policies have to stack up as being reasonable to a normal intelligent person. I think any policy that does that won't get many hindrances.

TRANSCRIPT OF INTERVIEW

Interviewee: State Transport Authority
Interviewer: The researcher
Date: September 09, 2002
Time: 04.00pm

1. Interviewee's opinions on transportation facilities and services in suburb of Joondalup and Woodlake, Ellenbrook

Joondalup has a very high standard of public transport. Joondalup network is very much based on cars in a way it's designed. The road structure for the city centre itself has a good interconnection but the suburbs around it have large securities; roads and road hierarchy make it very inefficient from distance travelled view point to get around in motor cars. The services for public transport for Joondalup is quite good except for the eastern part of the city where currently there're no bus services, so we'll be introducing some in a month or two time.

[The interviewee pointed the eastern are development.]
The bus services are OK but the road hierarchy is very strong so there's very little choice where the buses can go, which is contrast to Woodlake.

Woodlake has much better interconnectivity of roads. I recall it has much better pattern and there're bus services there but I don't know the details. It's quite isolated from the rest of subdivision as well, which makes it difficult to use pedestrians and cycle movement to local high sch, shop centre that are outside of suburb.

2. Supporting factors to improve policy implementation

I guess a lot of the transport policies are almost by inference rather directly. At Joondalup, when that was subdivided some time ago there were policies, which relate to road hierarchy, not fronting houses on busy roads (more than 3000vpd type road), philosophy and views on cul-de-sac that really created that area.

Ellenbrook was much more modern and subdivided in the days when we were trying to push the community code. There again I'm not sure whether that subdivision was a result of policy, that style was a result of policy, but over trend where the subdividers' saw there's interest to go that way to maximise their profit and make the best result for community. That's my perception. I wasn't involved in the subdivision directly but I'm aware of some issue.

3. Hindrances in policy implementation

If policy goes against market trends. [The researcher: So the policy has to follow market trends.] Almost. It would be very difficult to implement a policy if the subdivider didn't perceive that as also being in their own best financial interests. So if the subdivider thought that they're going to loose money because they have to comply the policy; they wouldn't do it.

There could be a better of leverage to say if the subdivider complies with the policy and it'd be easier to get the subdivision through. Therefore that's an advantage. But I think you'll find that subdividers would very rarely go against what do you want to do. It is to make its profit anyway. So the implementation of policy is probably more of When you want people to do something differently, it's more to sell it to them and they might want to do it. "It's the rulebook; you've got to do it that way". There's obviously a place for both. But traditionally, I think we've done on the basis of we'd like to do it this way. And it's your interest to do it that way and let them to subdivide it according with to what we call it a good policy.

[The researcher: What are the criteria for good policy.]
15-20 years ago we thought it's a good policy to have a very strong road hierarchy, so there were cul-de-sacs, collector roads, district collectors, main roads, and separated heavy traffic; there were safe roads and dangerous roads if you like. Our thinking has moved on. In fact someone said moved backward to years ago when we did gridiron subdivisions where there were lots of intersections and lots of interconnectivities. Trips could be short and it's much easier to get around the suburb be it by motor vehicles, pedestrians, cycle, or bus; whichever. Certainly in the interconnected network, gridiron networks, planning bus services is a lot easier because you've got a choice. But in Joondalup there was a very define road network ... So we're very strongly going back toward the high connectivity at the moment.

4. If policy at state level is more detail than local level, will it be more successful

The state government has control over subdivisions and the councils don't. So in some senses, the state needs to be aware of the detail subdivisions developed, which is a strange situation but a lot of subdivisions are in responsibilities of local councils. There's a balance between getting a lot of details and getting bogged in the detail and I guess it's a bit of a danger if the state getting in too much detail. Probably it's local government 's responsibility because they'll end up managing the asset in the end of the day. They'll manage the footpath, the drainage, sewerage, and structure. They're the ones that need to be satisfied on the detail. As a decision-making authority you have to take account to that detail but whether the policy has to get into that level of detail, I don't know.

5. Are transport policy in WA reviewed or evaluated

There's probably a very little evaluation, I would suggest. There's a policy related to development around rail way stations, that's been knocking around for 15 yrs, I don't know... long time. But I'm sure it hasn't been evaluated and hasn't been successful either.

I don't think there's much evaluation in policy. The reasons I guess ... Transport policy in the past was tended to be part of other things, and not necessary isolated. In community code, transport is part of land use, planning, part of the whole process, which is the way it should be. So it's been ... Reviewing is important. We should be knowing whether we're going to the right direction or not. We'd like to think we are.

[The researcher: Whether policy objectives in transport policies are fulfilled mostly.]
I'm not really close enough to the industry to know that answer at the moment with new residential subdivisions. I guess it's fair to say that it's lots better than yesterday. Things have improved over the last ten years.

That's where we've seen that the trend is away from cul-de-sac and spaghetti, long distance to drive just to get out of residential subdivision; we are back to more grid orientation. We still find that there's a definitely hierarchy within the grid and connection to regional roads; there's very limited connection which you might want to increase. It is certainly going to the right direction. And the reason for that is to minimise trip distance.

6. Dilemma of cul-de-sac

Kids can also play in that environment as well. The problem is when the kids get to teenagers, and they want to visit their friends. If there's no access way connecting cul-de-sac to other access road, they have to go for a long way. And there's no direct route to get to schools, friends and others then they're significantly disadvantaged. If we get the situation where petrol 's price is very high like in Europe (\$2/lit), people would say we couldn't drive anymore. People living in that situation would be very disadvantaged. Perth

is very spread out and to get anywhere at the moment generally you get a long way certainly compared to most of cities in the world.

7. The reasons behind cul-de-sac length and roundabouts limitation

You really don't want to increase the distance too far. If it's straight, people would tend to speed. You want to keep it short and in travelling to intersection people would stop or slow down; much reduced. It's permeability as well. In Netherlands, if you have super block with 250-300m, even though it's grid but there's no good permeability.

Roundabouts tend to be good for distributing traffic especially on medium busy roads. But they're very dangerous for pedestrians and cyclists, and if you've got a very busy road with a roundabout and the traffic flow never stops. If you've got traffic lights, it stops the traffic from time to time so that you can cross the street when there's no traffic. So you have to be careful in using roundabout. Some councils use it just to slow the traffic down. Generally roundabout works best in traffic sense, when the volume of traffic on the different leg is the same. So if you have a busy road and a very quiet road, the roundabout won't work very well because you don't get cars stopping for other cars because it's inconvenient.

T-junctions are good for bus. Roundabout is a disaster for a bus; ... the passengers got thrown from one side to another. It's very uncomfortable. So t-junction slows the bus; Slows the bus a lot more than slows the cars down too because it's big. And although at some roundabouts you might be able to go through if you have a sport car without having to slow down. And the bus is probably the last vehicle you want to slow down.

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