The IDEA Project

Social Benefit Cost Analysis

Prepared for

The IDEA Project Steering Committee

March 2000

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EXECUTIVE SUMMARY

This report provides the detailed results of a social benefit-cost analysis for the St Andrews IDEA Project, as specified in detail in the report *Outline of Social Benefit Cost Analysis Methodology*, September, 1999.

The main strengths of the St Andrews IDEA Project, and a primary source of its benefits, stem from its distinct attraction as an internationally focussed, competitive advantage industry cluster community in the Perth Metropolitan area incorporating high levels of urban design and residential amenity.

These factors are linked closely to and draw on the potential of the Perth metropolitan region to attract and grow world-class activities and enterprises, in a number of industry sectors, including:

1. Educational Campus-Communities
2. Research –St Andrews /Kansai/Hyogo Links
3. Tourism Leveraging
4. Lead Professional Services
5. Endogenous Self-Containment
6. Export Leveraging –Sustainable Urban & Regional Development
7. Lifestyle – Recreation / Arts / Culture
8. Inherent Employment
9. Advanced Manufacturing
10. Value Adding to Natural Resources (exogenous)
11. Infrastructure and Construction (including Network University); and
12. Biotechnology, Health and Medicine

The emphasis on educational and research institutions, professional services, advanced manufacturing, health-related activities and applied R&D is expected to attract high-productivity workers and enterprises to the site. The success of the project will have spin-off benefits to the nation as a demonstration project, that could be repeated elsewhere in other parts of Australia.

The benefits and costs of the IDEA Project are assessed in relation to a broad baseline scenario that assumes, without the IDEA Project, the St Andrews site would ultimately become a predominantly dormitory suburb of Perth with no special design or industry features and only some of the planned infrastructure of the IDEA Project. This is referred to as the Business-As-Usual (BAU) scenario.

The effect of the IDEA Project is to bring forward industry cluster development on-site that would otherwise take place only much later, or more likely not occur at all.

Costs for the BAU baseline scenario and the costs of developing and managing the IDEA Project were drawn from a number of sources, including information provided by a number of Western Australian agencies, the MFP planning process, and cost data for a number of large-scale urban projects including the Commonwealth's Better Cities Program and the MFP concept.

The main sources of on-site benefits from the IDEA Project include:

- *Productivity gains for labour* resulting from clustering of knowledge-based processing, R&D and service activities; reduced commuting time and stress due to proximity of work places and residential areas; teleworking and home-based professional services; enhanced quality of life; social and cultural interaction; and an enhanced sense of well-being.
- *Productivity gains and profit margins for producers* resulting from clustering of activities; access to hi-tech facilities, R&D and service sectors; higher returns and reduced costs in service industries based on internet connections and teleworking; development and marketing of educational services and products; development and marketing of R&D outputs, software, consultancy services and other professional and business services; and the attraction of tourists and other visitors to the site.
- *Gains from cost savings in residential construction* resulting from improved integrated overall site planning and development, and more efficient design and use of infrastructure.
- *Benefits of improved lifestyle and residential amenity* reflected in the higher property prices and the quality of life enjoyed by residents.

Off-site benefits include:

- *Regional benefits from job creation* (direct and indirect) reducing regional unemployment and utilising otherwise unused labour resources.
- *Attraction of tourists, new residents and other visitors to the region* through the unique character of the development.
- *Spin-off benefits on a nation-wide scale using The IDEA Project as a demonstration model* for developments in other areas.
- *Productivity improvements in related industry sectors* in other regions, resulting from development and application of R&D, value-adding to natural resources, marketing, and technical support.
- *Potential benefits to the nation* if similar developments are replicated on a large enough scale, through alleviation of potential congestion costs and containment of other costs required to maintain quality of life in the major metropolitan areas as the nation's population increases.

Table 1 below summarises the findings of the Social Benefit Costs Analysis that compares the Business As Usual case to the St Andrews IDEA Project.

Table 1: Summary of Findings

	Present Values @ Discount Rates			
	$' million 0%	$' million 4%	$' million 7%	$' million 10%
INCREMENTAL BENEFITS				
Productivity gains – wages	$8,271.48	$4,250.82	$2,704.67	$1,787.89
Productivity gains – Gross Operating Surplus	$3,348.94	$1,739.99	$1,116.16	$743.65
Residential construction cost savings	$(243.06)	($143.41)	($102.31)	($76.29)
Land/environmental amenity values	$1,423.61	$839.96	$599.26	$446.84
Travel cost savings	$3,225.28	$1,625.00	$1,020.80	$668.02
Incremental residual value	$1,362.27	$511.01	$251.00	$125.73
Total Incremental Benefits	$16,026.25	$8,312.35	$5,338.58	$3,570.11

Table 1 continued

	Present Values @ Discount Rates			
	$' million 0%	$' million 4%	$' million 7%	$' million 10%
INCREMENTAL COSTS				
On-site infrastructure costs	$496.00	$309.94	$231.21	$180.09
Off-site infrastructure costs	$459.50	$552.17	$550.81	$527.15
Total Incremental Costs	$955.50	$862.11	$782.02	$707.24
NET BENEFITS	$15,070.75	$7,450.24	$4,556.56	$2,862.86
Benefit-Cost Ratio	16.77	9.64	6.83	5.05
Internal Rate of Return	39%			

This analysis clearly demonstrates the positive, economic value to the Western Australian community by the development of the St Andrews IDEA Project when compared to the alternative of the site becoming a predominantly dormitory suburb of Perth with no special design or industry features and only some of the planned infrastructure of the IDEA Project.

SUMMARY OF ESTIMATES

The following tables summarise the employment, market size and scale of development estimates for the St Andrews IDEA Project. These estimates were inputs to the Social Benefit Cost model, see **Annex A**.

1. Educational Campus-Communities

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**1,000**	**2,500**	**7,500**	**10,000**
Market Size	**$150 million pa**	**$375 million pa**	**$1,125 million pa**	**$1,500 million pa**
Scale of Development	**$0.5 billion**	**$1.25 billion**	**$3.75 billion**	**$5.0 billion**

2. Research – St Andrews / Kansai / Hyogo Links

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**500**	**1,250**	**3,750**	**5,000**
Market Size	**$56 million pa**	**$140 million pa**	**$420 million pa**	**$560 million pa**
Scale of Development	**$50 million**	**$125 million**	**$375 million**	**$500 million**

3. Tourism Leveraging – Beaches/Golf/Parks

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**1,200**	**4,250**	**7,500**	**7,500**
Market Size	**$43 million pa**	**$153 million pa**	**$270 million pa**	**$270 million pa**
Scale of Development	**$65 million**	**$223 million**	**$394 million**	**$394 million**

4. Lead Professional Services

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**500**	**1,125**	**2,375**	**3,000**
Market Size	**$70 million pa**	**$157.5 million pa**	**$332.5 million pa**	**$420 million pa**
Scale of Development	**$19.5 million**	**$44 million**	**$93 million**	**$117 million**

5. Endogenous Self-Containment

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**1,000**	**3,000**	**6,000**	**8,800**
Market Size	**$100 million**	**$360 million**	**$840 million**	**$1.32 billion**
Scale of Development	**$61.5 million**	**$185.5 million**	**$371 million**	**$542.5 million**

6. Export Leveraging –SURD

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**25**	**160**	**1,870**	**4,060**
Market Size	**$5 million**	**$34 million**	**$400 million**	**$870 million**
Scale of Development	**$1.3 million**	**$8.5 million**	**$100 million**	**$215 million**

7. Lifestyle – Recreation / Arts / Culture

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**155**	**615**	**3,700**	**6,150**
Market Size	**$5.7 million**	**$22.7 million**	**$137 million**	**$227 million**
Scale of Development	**$6.5 million**	**$25.5 million**	**$153 million**	**$255 million**

8. Inherent Employment

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**750**	**2,560**	**11,300**	**16,125**
Market Size	**$45 million**	**$150 million**	**$630 million**	**$900 million**
Scale of Development	**$37 million**	**$125 million**	**$560 million**	**$800 million**

9. Advanced Manufacturing

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**100**	**500**	**1,500**	**2,000**
Market Size	**$75 million**	**$375 million**	**$1.125 billion**	**$1.5 billion**
Scale of Development	**$100 million**	**$500 million**	**$1.5 billion**	**$2 billion**

10. Value Adding to Natural Resources (exogenous)

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**155**	**615**	**3,700**	**6,150**
Market Size	**$16.25 million**	**$64.5 million**	**$388.5 million**	**$645.75 million**
Scale of Development	**$9.5 million**	**$37.5 million**	**$224.5 million**	**$372.5 million**

11. Biotechnology, Health and Medicine

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**300**	**1,500**	**4,000**	**5,000**
Market Size	**$168.5 million**	**$843.5 million**	**$2.25 billion**	**$2.8 billion**
Scale of Development	**$225 million**	**$1.1 billion**	**$3 billion**	**$3.75 billion**

12. Infrastructure & Construction (including/ Network University)

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment	**1,700**	**4,400**	**10,050**	**11,625**
Scale of Development / Market Size	**$985 million**	**$3.3 billion**	**$13.8 billion**	**$19.7 billion**

Assumptions underlying The IDEA Project Benefit Cost Analysis

In addition to the estimates for employment, market size and scale of development for the St Andrews IDEA Project, a number of core assumptions underpin the Social Benefit Cost Analysis, including:

Business As Usual Case

1. Population otherwise settling in St Andrews would grow to 150,000 over a period of 25 years and settle mainly in the Perth metropolitan area. Population growth is roughly linear over the study period of 25 years.

2. Residential accommodation would consist of conventional subdivision and housing. Houses to cost the current average.

3. Workers otherwise obtaining jobs at St Andrews would obtain jobs in the metropolitan area and earn salaries typical of their occupations or professions. Job availability is assumed to expand at generally the same rate as in the St Andrews enterprise cluster development, with the exception of the Education Cluster and the R&D Cluster, both of which would be much smaller in scale.

4. Those workers not entering the Education Cluster or the R&D Cluster are still employed, and it is assumed they are within the Inherent Employment cluster. A top-down consistency check indicates that the relevant work force demand estimate slightly exceeds the supply estimate. To meet this demand, good transport links within the region will be essential to enable the effective and efficient movement of the workforce.

5. Assumptions are made concerning the percentage of workers that make trips, by private vehicle, to and from work; the average distance travelled; the number of trips per year; and the average cost per km for private vehicle. Note that in the future, the distance travelled is likely to be greater than at present, as a consequence of conventional urban sprawl.

6. Capital investment to construct buildings and other facilities to sustain jobs takes place at generally the same rate as jobs growth but would be spread throughout the metropolitan region, with the exception of the Education Cluster and the R&D Cluster, both of which would be much smaller in scale. It is assumed the Inherent Employment Cluster would increase in scale to absorb the additional workers.

7. Infrastructure costs are reflected in the total cost of establishing conventional development of 150,000 people. The total cost is a "lump sum" estimate that includes housing, buildings, roads, rail, power, water, sewerage, telecommunications and all other required infrastructure.

8. Highway and railway connections to the north are assumed to be established, but not until some stage in the future.

With the St Andrews Project

1. Population would grow to 150,000 over a period of 25 years and settle in St Andrews. The growth trend is the same as for Business As Usual Case (BAU). Population growth is roughly linear within the time frame of the study.

2. Residential accommodation will be carefully planned, with a mixture of housing types. As a consequence, cost savings are likely to be achieved for residential dwellings. The superior environmental amenity created through better planning and urban design results in a higher quality of life, reflected in property (land) value differentials.

3. Workers would obtain jobs in St Andrews and the region. There is provision for workers to travel to jobs in St Andrews, from other regions, and for some residents of St Andrews to work at other locations. Because of reduced travel time, enhanced environmental amenity and commercial synergies associated with enterprise clustering, there are productivity gains at St Andrews, compared with BAU, for labour and business enterprises. The IDEA Project also enables the development of skills associated with large-scale urban development. The effects are reflected in higher wages and business income, from the work force and business facilities, particularly with the expanded Education and R&D Clusters.

4. The percentage of workers making trips to and from work will be lower at St Andrews, as a consequence of the industry clusters, home office work and telecommunications. Where workers do travel to work, the distance travelled will be significantly less than under BAU. This results in lower costs of private transport. Note that travel time savings will be counted in the productivity gains for workers and enterprises, and are not double counted as a component of reduced travel cost.

5. Capital investment to construct buildings and other facilities to sustain jobs takes place at the same rate as under BAU, with the exception of the additional Education and R&D Clusters. However, this investment is concentrated in the St Andrews site, rather than spread throughout the metropolitan region.

6. Infrastructure costs for the equivalent population and job levels in St Andrews are higher than for BAU. The cost of infrastructure covers housing, buildings, roads, rail, power, water, sewerage, telecommunications and all other required infrastructure.

7. Highway and railway connections to the north are assumed to be established, close to the inception of the St Andrews development.

1.0 INTRODUCTION

1.1 Development of Clusters

The Steering Committee for the IDEA Project held a Workshop in May 1999 with the following objectives:

- To consider and identify possible development options, primarily in relation to clusters of commercial activities that St Andrews might seek to attract.
- To consider and provide feedback on the process of evaluating these development options and incorporating them into the Program for the IDEA Project as outlined above.
- To consider and provide feedback on the purpose and structure of a *Social Benefit-Cost Analysis* for the development of the city of St Andrews.
- To consider and provide feedback on the preparations for Workshop 1.

The Steering Committee Workshop resulted in the following outcomes:

- Identification of possible clusters of commercial activities as outlined in the next chapter.
- Appreciation of the wide ranging inputs from the Government and the Tokyu Corporation required by the Programme for the IDEA Project.
- Identification of inputs by Government and the Tokyu Corporation to the Social Benefit-Cost Analysis (SBCA).
- Identification of inputs by Government and the Tokyu Corporation to the preparations for Workshop 1.
- Determination of arrangements for co-ordinating Western Australian Government and Local Government inputs to the SBCA and delivery of the assessments specified by the Programme for the IDEA Project.

An initial indication of the types of commercial activities or cluster categories that the St Andrews' region could attract as a result of its natural and potentially man-made comparative and competitive advantages includes:

- Knowledge-based employment generators
- Environmental research and activities
- Tertiary education linkages
- Health and medicine
- Tourism and lifestyle activities
- Value-adding to primary and other products

During the May Workshop the IDEA Project Steering Committee identified a number of cluster categories for potential investigation through the IDEA Project process including:

1. Educational Campus-Communities
2. Research –St Andrews /Kansai/Hyogo Links
3. Tourism Leveraging – Beaches/Golf/Parks
4. Lead Professional Services
5. Endogenous Self-Containment

6. Export Leveraging –SURD
7. Lifestyle – Recreation / Arts / Culture
8. Inherent Employment
9. Advanced Manufacturing
10. Value Adding to Natural Resources (exogenous)
11. Infrastructure and Construction (including Network University)

Other opportunities, including biotechnology, health and medicine have subsequently emerged as suitable for evaluation for St Andrews.

Profiles and Situational Analyses for the 12 potential enterprise-clusters for St Andrews are set out in Section 3 of this Report.

2.0 POPULATION AND LABOUR FORCE

2.1 Population and Labour Force: Perth Metropolitan Area[1]

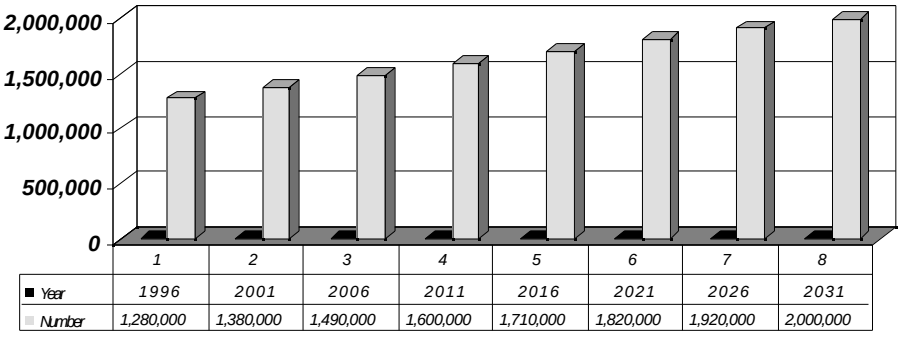
The estimated resident population of the Perth metropolitan region is expected to grow from 1.28 million in 1996 to about 2 million by 2031, an increase in the order of 700,000 new residents over 35 years. Perth's share of Western Australia's population is projected to increase slightly from 73.4% to 74.3%.

During this period, the population is projected or indicated to develop at the following rates:

- 2006 – 1.49 million
- 2011 – 1.60 million
- 2016 – 1.71 million
- 2021 – 1.82 million
- 2026 – 1.92 million
- 2031 – 2.00 million

This growth is indicated in **Figure 1**, below.

Figure 1: Perth Metropolitan Population Growth



	1	2	3	4	5	6	7	8
Year	1996	2001	2006	2011	2016	2021	2026	2031
Number	1,280,000	1,380,000	1,490,000	1,600,000	1,710,000	1,820,000	1,920,000	2,000,000

Over this period the proportion of the population of all age groups over 49 years is expected to increase. The population within the age groups of 15 to 64 will continue to constitute the majority of the population in 2031.

Since the end of the 1980's, Western Australia has had generally the fastest growing economy of all States with an average growth rate of just over 4%. Strong growth rates allow for faster rates of new job creation than in other States. This is reflected in Western Australia achieving the lowest unemployment rate in Australia of 7% in June, 1998.

The industrial structure of employment in Western Australia has changed over time. Technological progress has revolutionised manufacturing with significant increases in productivity.

[1] Source: Future Perth Indicators, June 1999; Household, Dwelling and Labour Force Projections, 1986-2021; Population Projections for Local Government Areas in Western Australia 1991 to 2011.

Consequently, primary and secondary sectors have reduced their share of employment from almost 50% in 1954 to 31% in 1986 to 27% in 1996. These changes have been accompanied by reductions in full-time employment from 74% in 1986 to 68% in 1996.

Ministry for Planning's 1996 Journey to Work data indicated the following resident employment and job distribution in Perth by sectors, see **Figure 2**.

Figure 2: Journey to Work Data

	Destination								
Origin	Inner	Middle	Eastern	NW	SE	SW	No Fixed Place	Outside Perth	Total
Inner	60,783	16,217	1,690	1,393	1,037	2,446	2,028	4,118	89,712
Middle	72,969	75,290	7,239	5,237	3,176	5,160	5,632	3,651	178,354
Eastern	15,234	17,447	22,671	1,225	1,399	573	2,373	1,039	61,961
North West	28,655	24,721	3,924	26,322	365	749	3,766	1,236	89,738
South East	13,844	16,586	1,933	215	17,291	2,258	2,207	630	54,964
South West	13,486	8,627	372	122	994	23,428	1,819	816	49,664
Total Jobs	204,971	158,888	37,829	34,514	24,262	34,614	17,825	11,490	524,393
Resident Employment	89,712	178,354	61,961	89,738	54,964	49,664			
Self Containment	228.48%	89.09%	61.05%	38.46%	44.14%	69.70%			
Self Sufficiency	67.75%	42.21%	36.59%	29.33%	31.46%	47.17%			

The Western Australian labour force participation rates have been increasing over time as a result of the increase in part time and casual work and the increase in female participation.

2.2 Population and Labour Force: St Andrews

The potential population growth that will locate at St Andrews is contained within the projections and indications of **Figure 1**. At a local government level, the Wanneroo Shire is projected to grow from 207,200 in 1996 to 334,000 by 2011. Indicative projections suggest the Shire's population will be 436,000 by 2026.

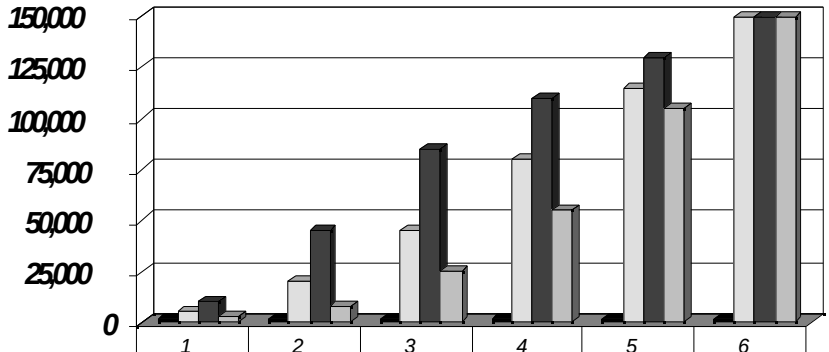
The rate of growth at St Andrews may vary to that of the balance of the metropolitan area. As a result of a wide range of inter-related factors, the start-up, intermediate and end population growth rates may be faster or slower than indicated in **Figure 1**.

Figure 3 indicates three possible growth rate scenarios.

- **Scenario A** assumes reasonably constant population growth, in line with the Perth Metropolitan projections and indications[2].
- **Scenario B** assumes, relative to the overall Perth Metropolitan projections and indications, a much faster initial rate of population growth that slows as the population at St Andrews builds.
- **Scenario C** assumes, relative to the overall Perth Metropolitan projections and indications, a slower initial rate of population growth that increases as the population at St Andrews builds.

[2] See Table 4, Population Projections for Local Government Areas in Western Australia 1991 to 2011, page 11,

Figure 3: St Andrews Population Growth Rate Scenarios



	1	2	3	4	5	6
Year	2001	2006	2011	2016	2021	2026
A	5,000	20,000	45,000	80,000	115,000	150,000
B	10,000	45,000	85,000	110,000	130,000	150,000
C	2,500	7,500	25,000	55,000	105,000	150,000

The actual rate of growth at St Andrews will significantly impact on the infrastructure requirements at any given point in time.

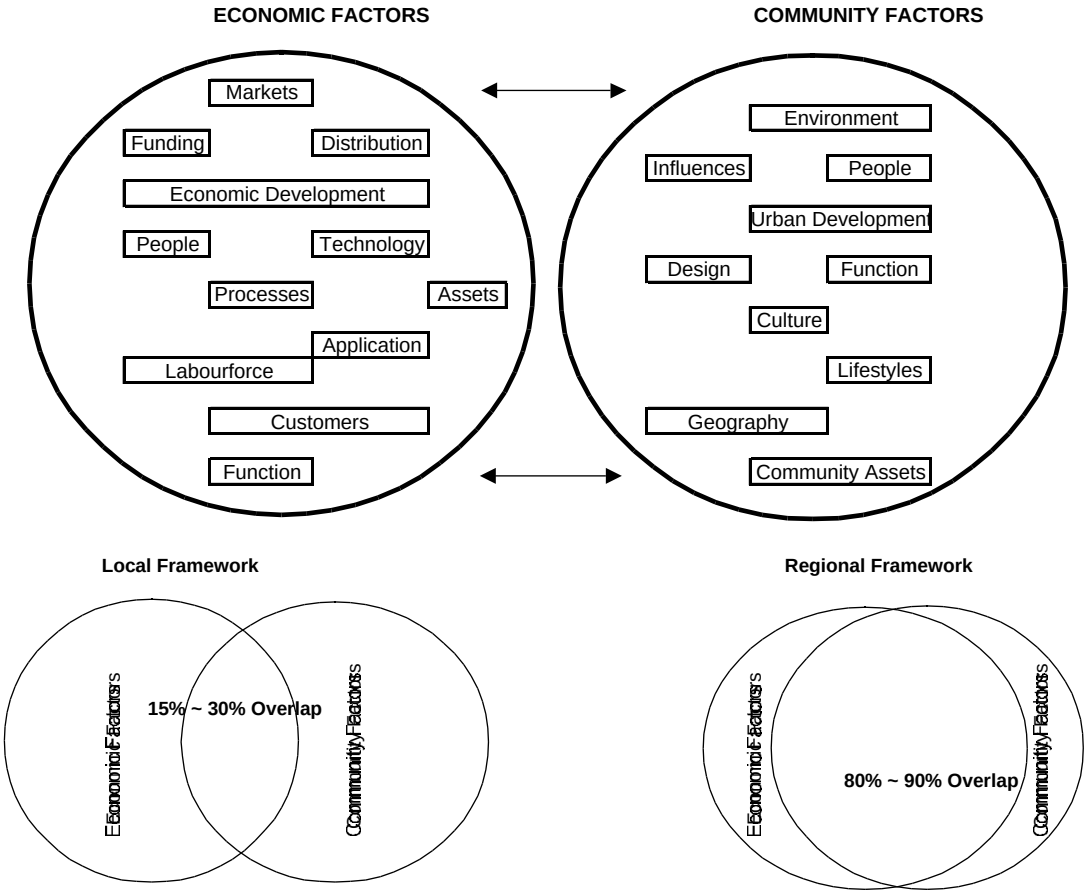
The rate of population growth will also have some impact on the potential scale of the available labour force located at St Andrews during its development. However, in- and out-migration of workers within the North West Corridor Region and beyond is likely to occur under any growth scenario.

The degree that the region can develop higher levels of self-containment will depend on the extent that the economic factors of employment and the community factors available within St Andrews, and within the North West Corridor, overlap or match.

The inter-relationship between a number of economic factors of employment and community factors are outlined in **Figure 4**. The IDEA Project World Study Tour provided opportunities to investigate the inter-relationships between economic factors and community factors that impact on urban development, world-wide. At a local level, the overlap between the two spheres can be reasonably significant, i.e. the local community provides many of the economic and community factors, however at the regional level the overlap can be substantially greater.

The Study Tour destinations demonstrated that urban areas with high levels of local employment also require strong regional transport infrastructure systems. At a local level, some 15% to 30% of the local community has the opportunity to work locally, whereas, at a regional level the overlap can increase to 60% - 80% plus. Appropriate transport infrastructure is required to mobilise the regional labour force.

Figure 4: Urban Development Factors



3.0 INDUSTRY CLUSTER CATEGORIES

3.1 Educational Campus-Communities

Description of Enterprise-Cluster

Regional Western Australia is well placed to take a lead in the development and delivery of major educational programs for regional, rural and remote communities throughout the developing countries of the Indian Ocean region. These programs would provide means of helping these communities to improve their economic performance while enhancing cultural values and attracting investment in social infrastructure.

In this proposal the educational programs would be primarily provided within communities throughout regional Western Australia that have developed in ways that are particularly relevant to the development aspirations of communities in developing countries. This applies especially to northern and eastern regions of Western Australia.

St Andrews on the boundary of metropolitan Perth could house the hub providing the entry-point, orientation courses, start-up courses, sandwich courses, and refresher courses for the very large numbers of overseas and Australian students studying in the regions. It could also provide tele-services support to students in regional communities in Western Australia and on their return to their own countries.

This hub would take the form of campus-communities distributed throughout St Andrews and corresponding to strengths of regional Western Australia and those developed at St Andrews as a whole. Five campus-communities are proposed with a focus on the following themes: "Agribusiness", "Mining", "Health", "Education", and "Ekistics". Synectics prepared outlines of these campus communities for the IDEA Project Steering Committee Workshop in May 1999.

Possible Proponents

Public Sector

- WA Regional Development Council and Regional Development Commissions
- WA Department of Education
- Commonwealth Department of Education, Training and Youth Affairs
- United Nations University, Tokyo-based
- UNESCO

Private Sector

- IDP Education Australia
- Council on International Educational Exchange
- Australian agribusiness, mining, health, education and construction industries

SITUATIONAL ANALYSIS

Enterprise and Cluster Option Information

Major Performers

Australian	Overseas
· Monash University · Kalgoorlie School of Mines · Institute for Regional Development, UWA · SAGRIC International, Adelaide · Australian Centre for International Relations in Agriculture, Canberra	· Montpellier L. R. Technopole, France · Sophia Antipolis, France · St Andrew's, Scotland · Commonwealth Group for International Relations in Agriculture, London-based

Major Development Areas

The five campus-communities would either be located in the centre of projected towns within St Andrews and/or established as self-standing towns, each eventually housing up to 10,000 students and 2,000 teaching staff and support employees.

Major Funders

- Japanese Official Development Assistance Agencies
- AusAID
- Tokyu – The Goto Ikueikai Education Foundation
- Bill and Melinda Gates Foundation
- Other globally prominent foundations: Rockefeller, Carnegie, Aga Khan, Toyota
- Australian agribusiness, mining, health, education and construction industries

SWOT Analysis

Strengths	Weaknesses
Attractive coastal location and natural environment and physical gateway from metropolitan Perth to northern and eastern Western Australia.	Need to obtain widespread involvement of several Australian universities and tertiary institutions often seeking students from the same markets.
Emergence of Perth as a global city.	Unique global venture.
Successful development of wide range of environments found in LDCs.	Need to obtain agreement and involvement of several major funding sources.
World-class telecommunications R&D based in Perth.	

Opportunities	Threats
St Andrews as a telecommunications hub for extranet supporting delivery of educational programs at St Andrews, in regional WA and within developing communities.	Concept plan would fail to attract detailed feasibility study funding.
Provision of tertiary educational facilities throughout regional WA.	Strong competition for detailed feasibility study funding from public sector sources.
Technology and knowledge-systems transfer from regional WA to developing communities through international students and local/national students.	Australian and Perth-based universities would seek to undermine the venture at concept, feasibility and start-up phases.
St Andrews as a telecommunications hub to support coordination of transfer projects.	Emergence of similar ventures in North America and Europe.
Promotion of racial tolerance and harmony.	Racist attitudes against international students.

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

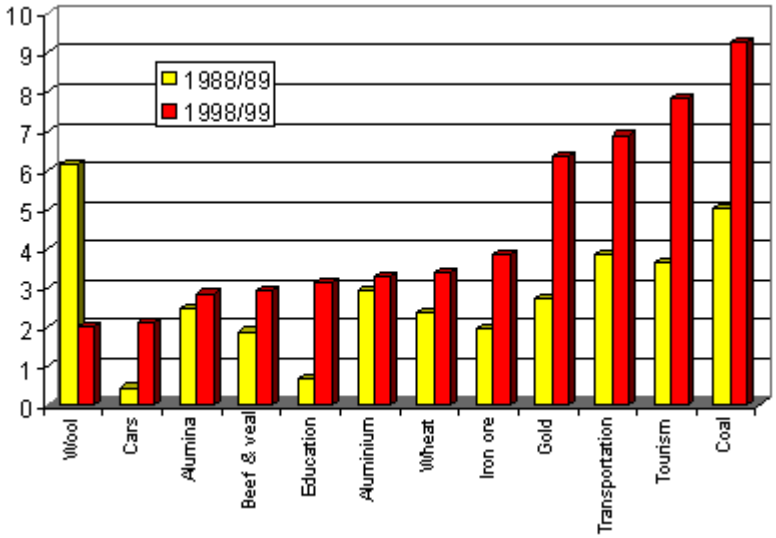
The following estimates of the market for international education are from a 1995 study by IDP Education Australia, an independent, international education organisation with a network of 60 offices and branches in 34 countries and an affiliate of the Council on International Educational Exchange. Professor Gus Hooke of Synectics undertook the economic and projection modelling for IDP.

Aggregated, global demand for university places will grow at 3.5% per year. The number of university students throughout the world will increase to 97 million in 2010, and to 159 million in 2025. For Asia the increase will be from 45 million in 2010 to 87 million in 2025.

The number of international students would rise to 1.78 million by the year 2000 and to 2.75 million by 2010. The proportion from Asia was predicted to increase from 46% in 1995 to 47% in 2000 and 53% in 2010. Australia's share by 2000 would be 5% or 89,000 students. In fact by 1999 Australia there were 99,250 international students in Australian universities, an increase of 15.6% on the previous year.

Figure 5, from data requested by IDP from the Australian Bureau of Statistics, shows Australia's top exports and how they have changed over a ten-year period.

Figure 5: Australia's Top Exports, 1988-89 and 1998-99 ($billion)



Potential to Capture Market Share

A continuation of the growth in education exports shown in Figure 5 could see Australia's share of the international education market grow from 5% to 10% representing over 400,000 largely fee-paying international students by 2025. The program proposed for St Andrews would double this again as a significant percentage of the students would be funded through major grants programs, representing funds in addition to the largely fee-paying student numbers projected in the foregoing. It is proposed that the resulting 400,000 students would be accommodated at tertiary education facilities throughout regional Western Australia with up to 50,000 students being accommodated at St Andrews at any given time for periods of six to eight weeks at the start of their educational programs. The whole enterprise could be referred to as the St Andrews' International Education Network.

Education makes up a substantial component of Australia's *development assistance* to its region. For the last 30 years, technical assistance has been provided through cooperative programs of institutional development to universities in Asia and the Pacific. Australia also provides aid by sponsoring overseas students for study in Australia and in 1995, through the Australian Agency for International Development (AusAID), provided scholarships under aid programs for 6,052 higher education students. While an increase to 10,000 such students and a matching contribution by the Australian private sector would be only 5% of the 400,00, supported largely through public and private international development assistance, it would still provide significant leverage.

Australia is the only OECD country that has first-hand experience of successfully managing the full range of development and environmental challenges in the types of natural environments existing in most of the world's developing countries. In Australia, most of this experience has been gained in regional, rural and remote communities, home to most of the low-income communities and families in developing countries.

Availability of Skills

In addition to relevant on the ground skills possessed by communities throughout Western Australia, Australia has a wealth of research, academic and administrative skills relevant to the delivery of education exports based on the development experiences of regional Western Australia.

A submission by Synectics to the 1997 Committee to Review the Australian Overseas Aid Program noted that, as a developed country located largely in the tropics and sub-tropics, Australia has evolved unique and well-known strengths in conceiving strategies and delivering solutions for sustainable development. An account was provided of well-known Australian skills in:

- Agriculture in the wet and dry tropics.
- Drylands management for pastoral agriculture, mining and community development.
- Management of tropical savannahs.
- Wet tropical forests and coastal zone management.
- Tropical oceans management.
- Sustainable urban and regional development in tropical and sub-tropical zones.

Potentially these strengths are a globally significant capacity. It was reasoned that such a capacity could:

- make a major contribution to achieving the Committee's **one clear objective** of *poverty reduction through sustainable development* on a global scale.
- be used to mobilise a level of resources from global sources many times the magnitude of Australia's development assistance effort.
- eventually be viewed as bankable by the community of developed nations.

The submission made the case that the **maximum contribution** Australia can make to delivering the **one clear objective** of *poverty reduction through sustainable development* is through **one clear strategy**: ***focus on bankable strengths.***

Estimated Number of Jobs at St Andrews

Located in the centre of projected towns within St Andrews and/or established as self-standing towns, each of the proposed five campus-communities would eventually house up to 10,000 students. Some 2,000 teaching staff and support employees are estimated for each of community. The growth to the total 10,000 jobs required to service these communities is projected as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
1,000	**2,500**	**7,500**	**10,000**
Initial			Full capacity

Clearly major successes in mobilising international private and public sector funding could accelerate this rate of growth and the attendant creation of 80,000 jobs to service 400,000 international students in regional Western Australia by 2025.

Estimated Average Wage or Salary Level

In 1998/99, the total value of Australia's education exports was $3.149 billion from 99,250 international students in Australian universities. This converts to over $30,000 per student. Given the foregoing projections of one job for every five students are appropriate there would be an average of about $150,000 revenue generated per employee. Typically average employment earnings in tertiary education delivery is appreciably above the national average. A level of well over $50,000 p.a. could be sustained by the foregoing revenue estimates.

This, of course, is only the direct financial contribution of such an international education venture. The value of the contribution in terms of raising other countries' awareness of Western Australia and St Andrews and its products and services would be incalculable.

Market Size for St Andrews

Based on the above projection of jobs and revenue generated the estimated potential annual revenue would be:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$150 million pa	**$375 million pa**	**$1,125 million pa**	**$1,500 million pa**
Initial			Full capacity

Potential Scale of Development at St Andrews

It is proposed that the five campuses would be integrated with supporting communities with each accommodating 10,000 students at any one time supported by a resident population of staff and service deliverers in each community. Each community would practice high levels of self-containment in energy and water use, materials recovery and recycling and be well served by public transport within and between the campuses-communities and to the Perth suburban rail system. Each campus-community would also feature:

- Medium density educational facilities and buildings and residential buildings with the ground floor of residential buildings largely available for retail and service industry activity.
- A community centre providing:
  - A range of corporate and major events management services.
  - Telecommunications facilities supporting the wide range of distance learning programs offered by the campus-community.
  - A node of an undergraduate, post-graduate education and R&D program on network computing. The five nodes would be linked in a virtual hub ***St Andrews Network University*** that would also facilitate linkages with similar research and education programs throughout Australia and the world – this is considered further in the profile for the enterprise cluster covering Infrastructure Leveraging – Delivery Chain/Network University.
  - Business training facilities focussed on the needs of the campus-community.
  - A major international education and training facility providing developing country student access to the educational programs and supporting the continuing education of these students both in regional Western Australia, Australia, and back in their own countries.

- An international centre to export globally as well as to regional Western Australia and Australia the sustainable urban development experience and expertise involved in establishing the campus-community.

- Gallerias comprising markets for produce from trial facilities operated by the Agriculture Campus-Community, restaurants, indoor and out door cafés, patisseries and bakeries, specialist shops targeting tourists from home and abroad.
- Parkland and recreational lakes and ponds.
- Museums and major exhibits complementing the themes of each campus and operating as educational and research facilities as well as serving to attract tourists, visitors and scholars.
- Car parking for residents and the high levels of visitation during the week by residents in surrounding suburbs and for weekend visitors from the metropolitan region. It is also anticipated that large numbers of visitors and tourists would be drawn from Australia and overseas to enjoy the Yanchep experience and activate wide-ranging business connections.

Based on an expenditure of $100,000 per student for housing and tertiary education facilities and the above growth in student numbers five times the above job projections, cumulative capital development expenditures would be in the order of.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$0.5 billion	**$1.25 billion**	**$3.75 billion**	**$5.00 billion**

Commencement Date for New Infrastructure at St Andrews

To achieve 1,000 employment opportunities in the international education industry at St Andrews in five years, development construction would need to commence in 2002.

Commencement Date for Start of Operations at St Andrews

Initial construction would occur over 24 months enabling commencement of educational activities by 2004.

Timing to Reach Full Capacity in Operations

The timing of the proposed venture in international education would be dependent on the establishment of educational facilities throughout regional Western Australia as well as at St Andrew's. A highly successful effort in attracting the type of funding sought could accelerate the provision of this infrastructure from 25 years to 15 years. This could be considered as part of the sensitivity analysis to be conducted within the overall Social Benefit Cost Analysis

Current Technology Base at St Andrews

Current technology in this context would relate to the provision of major facilities operating a few years before the international education activities commence. These could include a complex of a major resort, recreational, and health enterprises and the research and technology support to these enterprises considered in the St Andrews' "Biotechnology, Health and Medicine Cluster".

Also relevant to the establishment of a 'Health' campus-community would be the operation of enterprises delivering the outcomes sought from the other enterprise clusters:

- Infrastructure & Construction(including Network University), particularly the provision of computer-assisted-design teleconferencing infrastructure and facilities.
- Research – St Andrews-Kansai Links.
- Lead Professional Services.
- Endogenous Self-Containment.
- Lifestyle – Recreation/Arts/Culture.
- Advanced Manufacturing, particularly that supporting biotechnology, health and medical products and services.
- Value Adding to Natural Resources (exogenous).

Current Process Base at St Andrews

At least one of the existing townships could be closely linked to the development of the "Health" campus-community. Two Rocks would provide many attractive features.

A rural residential development in the north east of St Andrews could be closely linked to the proposed "Agribusiness" campus-community.

The proposed "Mining", "Education", and "Ekistics" campus-communities could be located adjacent to other existing townships, proposed townships or as stand-alone communities within the overall fabric of urban development at St Andrews.

3.2 Research – St Andrews / Kansai / Hyogo Links

Description of Enterprise-Cluster

Just as the distributed enterprises of Kansai Science City (KSC) are delivering science, technology and cultural products and services on an increasingly major scale to its neighbouring prefectures of Kyoto, Nara, and Osaka, so also could an equivalent capacity operate from the various urban communities of St Andrews.

Possible enterprises could provide international research and development (R&D) products and services to support the following:

- Enterprises in regional, rural and remote Western Australia and communities in similar environments in developing countries. Much of this could be in collaboration with the proposed international education facilities throughout Western Australia and in developing country communities as considered in the previous enterprise cluster on *Educational Campus-Communities*.
- New town and city developments aiming to achieve high levels of employment self-containment and sustainable development outcomes in developed and developing countries.
- International R&D network support to the enterprise clusters of St Andrews.

While many international research alliances could be forged, it is proposed that particular attention could be given to alliances with enterprises within KSC and the science and technology enterprises being established in the neighbouring Hyogo Prefecture centred on the city of Kobe. KSC institutions have many R&D activities focussed on the needs of developing countries and managing development in the types of environments experienced in these countries.

The report on the recent St Andrews World Study Tour provides an outline of the activities within KSC and provides an indication of strategic alliances with the science and technology effort of St Andrews.

This profile focuses on new jobs in R&D for developing countries that would also deliver significant benefits to Western Australia. Jobs in R&D within enterprises in other enterprise clusters are subsumed in the profiles prepared for these clusters.

Possible Proponents

Public Sector

- Public research enterprises/units participating in the Australian Cooperative Research Centres (CRCs) most closely aligned to the science and technology pursuits of St Andrews.
- UNECSO and the United Nations Institute for Training and Research (UNITAR).

Private Sector

- Australian companies participating in the CRCs most closely aligned to the science and technology pursuits of St Andrews.
- Kansai Science City, through its various international commercial outreach activities.
- Hyogo Science and Technology Association.

SITUATIONAL ANALYSIS

Enterprise and Cluster Option Information

Major Performers

Australian	Overseas
· Several CRCs based or with key players in WA · Several CSIRO Divisions based or with key units in WA · Several research units in WA agencies · Several research departments in major companies operating throughout WA	· Kansai Science City (KSC) · Hyogo Science and Technology Association - Nishi-Harima Technopolis · Montpellier L. R. Technopole, France · Sophia Antipolis, France

Major Development Areas

Like KSC, the research and technology enterprises of St Andrews could be distributed throughout the city. Some of these could be located with the proposed educational campus-communities. In the medium term there could be prospects of attracting a major public research performer corresponding to the key thrusts of the five campus-communities. Private research groups could participate in the appropriate CRCs and if operating at a sufficiently large scale they could attract the headquarters of some of these CRCs to St Andrews.

The research and technology enterprises of St Andrews could operate programs in the field in regional Western Australia and developing country communities in support of the project-based initiatives stimulated by the international educational effort of the campus-communities.

Major Funders

- For strategic planning: *Strategic Planning Support Scheme* of the Centres of Excellence in Industry Focussed Research and Development Program in the Western Australian Department of Commerce and Trade - Science and Technology Division.
- For major R&D initiatives: *R&D Start* program of the Commonwealth Government: $739 million over four years to 2000/01.
- For venture capital high technology startup firms: *Innovation Investment Fund* program of the Commonwealth Government: $153 million over four years to 2000/01.
- For scoping and initiating international collaboration: *Technology Diffusion Program* of the Commonwealth Government: $108 million over four years to 2000/01.
- For business planning support: possible new funds resulting from the *National Innovation Summit*, Canberra, February 2000.
- For funding national/state collaborative research initiatives: Australian agribusiness, mining, health, education and construction industries.
- For funding international collaborative research initiatives:
  - Japanese Official Development Assistance Agencies; AusAID; Tokyu – The Goto Ikueikai Education Foundation; Bill and Melinda Gates Foundation
  - Other globally prominent foundations: Rockefeller, Carnegie, Aga Khan, Toyota

SWOT Analysis

Strengths	Weaknesses
Attractive coastal location and natural environment and the emergence of comprehensive plans for a new metro-satellite city geared to achieving high levels of employment self-containment through the operation of knowledge-based enterprise.	Need to imbue Australian governments and industry with the same spirit for supporting "science city" developments on the scale of KSC, Nishi-Harima Technopolis, many other similar initiatives in Japan, Montpellier L. R. Technopole, and Sophia Antipolis.
Countless R&D initiatives have successfully solved a wide range of the problems faced by environments found in LDCs.	Need to prepare scoping, strategic and broad business plans that clearly demonstrate the benefits and costs of science-based initiatives on the scale envisaged.
Impressive research base already in place in WA.	Need to approach several different sources for financial support to prepare these plans.
World-class telecommunications R&D based in Perth.	Wide-ranging research interests have to be consulted in preparation of plans.

Opportunities	Threats
St Andrews as a telecommunications hub for an extranet supporting delivery of research and technology transfer programs at St Andrews, in regional WA and within developing communities.	Attracting funding support even for research planning is highly competitive in Australia.
Provision of R&D facilities and programs throughout regional WA.	Scoping, strategic and broad business plans may fail to attract start-up capital in some cases.
Technology and knowledge-systems transfer from regional WA to developing communities through Australian researchers working with researchers in developing countries.	Australian and Perth-based universities and research units could seek to undermine the venture at concept, feasibility and start-up phases.
St Andrews as a telecommunications hub to support coordination of technology transfer projects.	Emergence of similar ventures in North America and Europe delivering to the same markets.

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

Australia is currently investing about $15 billion in education, training and research – about 2.5% of its Gross Domestic Product of $600 billion for 1998/99. Of this Australian Government expenditure in R&D totalled about $3.7 billion in 1998/99. The total Australian industry expenditure on R&D is about $4.2 billion. This is exceed or matched by many individual global companies such as: Siemens (Germany) $6.8 billion; IBM (US) $6.6 billion; Fujitsu (Japan) $4.2 billion; Du Pont (US) $4 billion; NT&T (Japan) $3.8 billion; Bayer (Germany) $3.6 billion; Johnson & Johnson $3.6 billion; Microsoft (US) $3.3 billion; Roche (Switzerland) $3.3 billion; Glaxo-Welcome (UK) $3.1 billion.

OECD countries are moving towards a knowledge-based economy:

- Knowledge-based industries (i.e. high- and medium-high-technology manufacturing industries and services such as finance, insurance and communications) have been outpacing growth of GDP for many years and are now more than 50%.
- Investment in knowledge (R&D, software, public spending on education) now represents 8% of OECD-wide GDP, a figure similar to investment in physical equipment. The OECD average exceeds 10% when private spending on education and training is included.
- Investment in telecommunications, hardware and software represents 7% of OECD-wide GDP.

Potential to Capture Market Share

Australia makes a significant investment in global R&D relative to its size; accounting for over 2% of the world's research despite a much smaller population share. This provides significant leverage in gaining access to the other 98% of international research.

The *National Innovation Summit* (February 2000) is being promoted as the first step in creating a national strategy for enhanced innovation performance. The key focus is on building industry-research linkages through the development of a robust information network, collaboration between firms, research institutions, education centres and government, and the formation of clusters and international links. Campbell Anderson, President, Business Council of Australia considers that:

> *"The growth of business is driven by ideas, and that puts innovation at the heart of economic well being and business prosperity. Capitalising on ideas in the knowledge-based future will require leadership and vision, as well as strong partnerships... I believe the Summit is an important first step towards achieving that objective."*

By raising significant resources for the proposed international educational campus-communities, St Andrews would be well placed to attract major R&D funding supporting these initiatives and to become a key Australian player in leveraging access to international research for the benefit of Australia and its international clients.

Availability of Skills

The notes made concerning the availability of skills required to underpin the educational campus-communities apply equally well to this enterprise cluster.

Estimated Number of Jobs at St Andrews

It is likely that attracting R&D enterprises that support and are located within the educational campus-communities will strengthen the viability of the communities. Clusters of R&D enterprises with the same focus as the five campus-communities could attract some 1,000 research-based employees to each community, say 25% scientists, technologist and engineers, 50% technicians and 25% support professionals (including management) within each cluster. The growth to a total of 5,000 jobs is projected as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
500	**1,250**	**3,750**	**5,000**
Initial			Full capacity

Clearly major successes in mobilising national and international funding from private and public sector sources could increase this rate of growth and the attendant creation of research-based jobs co-located with the proposed international educational facilities throughout regional Western Australia. This could result in larger numbers of research-based enterprises and much higher levels of research-based jobs at both St Andrews and throughout regional Western Australia. As an example, Sophia Antipolis in the south of France has attracted over 1,000 enterprises mostly engaged in research-based activities in 25 years.

Estimated Average Wage or Salary Level

CSIRO's total income for 1998-99 was $728.3 million. Of that amount 65.3 per cent was provided directly by Parliament; 34.7 per cent came from external sources, including competitive granting schemes, research funded by industry and other users, and earned revenue. With 6,500 employees the budget allocation per job is around $112,000 per annum.

Investment in CSIRO research returns economic, environmental and social gains to Australia, the latter through such examples as improved health and nutrition or better quality water. Studies of specific projects show a typical benefit:cost ratio in the range of 4:1 to 8:1. These results are consistent with numerous international studies that show that R&D brings an average rate of return to society of 50 per cent, making it a valuable investment.

Market Size for St Andrews

Based on the above projection of jobs and revenue generated being restricted to investment attraction of $122,000 per employee the estimated potential annual revenue would be:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$56 million pa	**$140 million pa**	**$420 million pa**	**$560 million pa**
Initial			Full capacity

Contract research and associated consultancy delivered from the other enterprise clusters could generate commercial returns on investment in R&D roughly 2.5:1 such that an investment of $112,000 per employee would result in revenues of $280,000 per employee. Thus 5,000 jobs of this kind could result in revenues of $1.4 billion per annum. However, to avoid double counting these jobs would be accounted for within the employment profiles for the other enterprise clusters.

Potential Scale of Development at St Andrews

The notes made concerning the potential scale of development for the educational campus-communities are also applicable to this enterprise cluster.

Based on an expenditure of $100,000 per employee for research buildings and facilities, cumulative capital development expenditures would be in the order of.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$50 million	**$125 million**	**$375 million**	**$500 million**

Commencement Date for New Infrastructure at St Andrews

To achieve 500 employment jobs in international R&D at St Andrews in the first five years, development construction would need to commence by 2003.

Commencement Date for Start of Operations at St Andrews

Initial construction would occur over 24 months enabling commencement of R&D jobs and activities by 2005.

Timing to Reach Full Capacity in Operations

The timing of enterprises delivering international R&D corresponding to the themes of the five campus-communities would be dependent on the establishment of international educational facilities throughout regional Western Australia as well as at St Andrew's. A highly successful effort in attracting the type of funding sought could accelerate the provision of this infrastructure from 25 years to 15 years. This could be considered as part of the sensitivity analysis to be conducted within the overall Social Benefit Cost Analysis.

Current Technology Base at St Andrews

Current technology in this context would relate to the provision of major facilities and enterprises operating in the educational campus-communities one year ahead of the international R&D-based enterprises. Relevant enterprise initiatives including R&D-based activities could have commenced a few years earlier in various other enterprise clusters.

Current Process Base at St Andrews

As with the educational campus-communities, at least one of the existing townships could be closely linked to the development of international R&D in health and the proposed "Health" campus-community, with Two Rocks providing many attractive features.

The proposed rural residential development in the north east of St Andrews could be closely linked to international R&D in agribusiness and the proposed "Agribusiness" campus-community.

International R&D in mining, education and ekistics could be closely linked to the proposed "Mining", "Education", and "Ekistics" campus-communities, located adjacent to other existing townships, proposed townships or as stand-alone communities within the overall fabric of urban development at St Andrews.

3.3 Tourism Leveraging

Description of Enterprise/Cluster

Significant potential exists at St Andrews to deliver a full range of tourism products and services to international and domestic tourists, as well as for convention, incentive and event travel. The proximity to the ocean, National Parks and other areas of open space provides a sound basis for nature-based tourism and sports tourism as well as the more traditional forms of tourism.

In 1996, some 214,000 day trips were made to the St Andrews area by Western Australians. The top three activities undertaken there were sports and physical activities, picnics, and pleasure driving. Water activities also featured strongly for this area.

St Andrews is also well placed to tap into the successful *Best on Earth in Perth* promotions of EventsCorp Western Australia.

Tourism infrastructure requirements would include additional accommodation across all standard levels, restaurants, cafes and other food and beverage outlets, a range of activities and planned spaces for passive and active recreational use and the necessary infrastructure for planned events.

Possible Proponents

Public Sector
- WA Tourism Commission / EventsCorp
- Department of Conservation and Land Management
- Ministry of Sport and Recreation
- City of Wanneroo

Private Sector
- Major hotel chains
- Food and beverage franchisees
- Theme Park operators
- Event organisers

SITUATIONAL ANALYSIS

Enterprise and Cluster Option Information

Major Performers

Australian	**Overseas**
· Accor · McDonald's · Sea World, Queensland · Exhibition Park, Canberra	· Pan Pacific · McDonald's · Disney · Lehman and Associates

Major Development Areas
- Coastal strip
- Adjacent to National Park and other conservation zones
- St Andrews Golf Course region

Major Funders
- Accommodation operators/investors
- Food and Beverage operators
- Site specific development enterprises

SWOT Analysis

Strengths	Weaknesses
Coastal location	Proximity to world markets
Climate	Low base of existing tourism infrastructure
Wide range of natural environments in region	Low accessibility by public transport
Within Perth metropolitan area	

Opportunities	Threats
Nature-based tourism potential	Competing public infrastructure projects
A component on the IDEA Project	Alternative sites within Perth metro area for tourism accommodation and other infrastructure
Increased leisure time by many members of the community	Timeframe to build critical mass in infrastructure

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

The travel and tourism industry was estimated to contribute 11.6% to world Gross Domestic Product (GDP) in 1998. Some 262 million people or 9.4% of all jobs world wide are employed in this industry.

At an Australian level, this industry contributed 7.4% of expenditure on GDP in 1995/96. Some 694,000 people or 8.4% of the workforce are employed in the travel and tourism industry.

In Western Australia, the travel and tourism industry contributed 3.9% to the Gross State Product in 1996/97. The attraction of over 6.7 million visitors in 1997 generated $2.083 billion of tourism expenditure.

Tourism related employment in Western Australia is estimated at between 71,000 and 78,000 or 1 job in each 12 across the State. Of these, 90% are employed in the Perth metropolitan area.

It is estimated that each million dollars of tourism expenditure in Western Australia generates nineteen (19) new, permanent jobs.

An estimated $163.3 million was invested in 45 tourism projects in 1998. Nearly two thirds of the projects were developed in Perth and the South West of the State.

Potential to Capture Market Share

At its eventual completion, St Andrews will have approximately 150,000 residents, some 7.5% of the Perth metropolitan population. This community will have the potential to support tourism employment at a level higher than the current Western Australian ratio of 1:12 jobs due to its locational and environmental attributes.

Tourism is also likely to be an early cluster development given the base that exists with Club Capricorn, the golf course and tennis and bowls infrastructure at St Andrews and the National Park and other conservation areas.

Availability of Skills

Activities making up the tourism industry require a wide range of skills including facilities management, food and beverage catering and systems, events organisation, promotions, cleaning, repairs and maintenance, transport and travel, tourism retail, and convention organisation.

There is a large pool of skilled tourism staff in Perth. The tourism industry employs more than 8% of the Western Australian work force. Of these, some 90% are employed in the Perth metropolitan area, equating to more than 13% of the metropolitan Perth work force.

A number of highly regarded tourism training facilities are also located in Perth including the many TAFE colleges. These facilities will ensure a continuing supply of skilled workers for industry including the tourism industry.

Estimated Number of Jobs at St Andrews

The tourism industry already provides a number of jobs at St Andrews in several sectors including accommodation, food and beverages.

This activity provides a base for attracting a range of new tourism enterprises to St Andrews early on in the development timeframe.

Based on the existing employment characteristics of the Western Australian tourism industry the estimated number of additional jobs over time at St Andrews are set out below:

Five Years	Ten Years	Twenty Years	Twenty Five Years
1,200	**4,250**	**7,500**	**7,500**
Initial		Full capacity	

Estimated Average Wage or Salary Level

The tourism industry is categorised by a high proportion of part time and casual staff. Average full time equivalent wages are in the order of $25,000 per annum.

Market Size for St Andrews

The tourism industry already provides revenue at St Andrews in several sectors including accommodation, food and beverages.

Based on the existing revenue generation characteristics of the Western Australian tourism industry the estimated potential additional annual revenue points over time at St Andrews are set out below:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$43 million pa	**$153 million pa**	**$270 million pa**	**$270 million pa**
Initial		Full capacity	

Potential Scale of Development at St Andrews

The potential scale of tourism industry development at St Andrews is likely to be extensive as it would include open space areas as well as the development sites for accommodation, activities, food and beverage, convention and event space, etc.

Based on the linkage between capital cost and employment generation in the tourism industry, the above job estimates would require the following cumulative capital development expenditures. It is likely these estimates are conservative.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$65 million	**$223 million**	**$394 million**	**$394 million**
Initial		Full capacity	

Commencement Date for New Infrastructure at St Andrews

To achieve 1,250 employment opportunities in the tourism industry at St Andrews in five (5) years, additional development construction would need to commence in 2002.

Commencement Date for Start of Operations at St Andrews

Initial construction would occur over 12 to 18 months enabling commencement of the additional activities in 2004.

Timing to Reach Full Capacity in Operations

As the population base and the economy of the St Andrew's region expand, the tourism industry will continue to develop and grow in scale. As a result of the locational advantages of St Andrews, and the existing base tourism infrastructure, the tourism industry is likely to be a lead enterprise within the region. It is likely to reach full capacity prior to the completion of the St Andrews overall development, and for the purposes of the Social Benefit Cost Analysis, full capacity is assumed to occur within twenty (20) years.

Current Technology Base at St Andrews

The tourism technology at St Andrews includes a wide variety of tourism facilities, some of which have been there for many years, others of which are relatively new.

In addition to the coastal and water activities including swimming, surfing, diving, sailing and fishing, other tourism activities include:

- Horse riding tours and trails.
- Visiting the Balga Mia Village and experiencing local Aboriginal Heritage.
- The Yanjidi Walktrail now has two viewing platforms and a new boardwalk. This 2-kilometre, one-hour trail takes walkers around the heart of the Loch McNess wetland.
- For a shorter walk, visitors can experience the Boomerang Gorge Trail, a 500-metre, half-hour trial that follows the base of a limestone gorge. This trail is suitable for people in wheelchairs.
- Visitors can also explore the majestic Yonderup and Crystal caves and view the thousand year old stalagmites and stalactites. The Yonderup Cave, recently opened after extensive conservation work.
- A new jetty has been established on Loch McNess. Visitors can experience the tranquillity of the lake on one of 20 refurbished rowboats or relax on the Kiwanis Club launch wetland tour.
- Visiting the Gloucester Lodge Museum and learning about the rich history of the Yanchep National Park and surrounding area. How Yanchep derived its name from the local Aboriginal language and how its status as one of the State's oldest national parks came about.
- There are wide expanses of lakeside lawns with barbecues and shady trees for active and passive recreation.
- A nine (9) hole golf course.

Current Process Base at St Andrews

Process structures are in place at St Andrews for the public and private tourism activities that exist, including the National Park, golfing and tours. As the tourism industry expands, however, significant expansion in the process base will be required. To optimise the development of the tourism industry at St Andrews some over-arching co-ordination may be required to promote the region efficiently and effectively.

Current Human Resource Base at St Andrews

Wanneroo Shire had a population of 207,200 in 1996 and today it has grown to be in the order of 245,000. The St Andrews area has a resident population at Yanchep and Two Rocks in the order of three thousand persons, however, in the Statistical Local Area of Wanneroo North West, the population was 16,968 at the 1996 Census. Of this population, 8,835 were aged 18 years or over.

At the 1996 Census the labour force in this Statistical Local Area was 4,259 males and 3,169 females, of which a total 6,564 were employed.

The area is growing rapidly with over 11, 300 persons enumerated at a different address for the 1991 Census. Only 2,866 persons were enumerated at the same address for both the 1991 and 1996 Census.

Selected 1996 Census Medians for the Statistical Local Area of Wanneroo North West were:

- Median age 28.
- Median individual income $307 per week.
- Weekly household income of $639 per week.
- Average household size 2.9.

Only a small proportion of the existing human resource base at St Andrews is likely to be involved in the tourism industry.

Current Distribution Base Available at St Andrews

St Andrews currently has a limited distribution base that serves the local community and its enterprises. There is no public transport system.

Most visitors to the region travel by private vehicle, however, as the industry grows more are likely to arrive via bus or coach in organised tours.

3.4. Lead Professional Services

Description of Enterprise/Cluster

As urban development at St Andrews expands a number of business, finance and property-related services will become increasingly in demand by the community. Initial design and construction will generate the need for surveyors, planners, environmental technologists, engineers, architects and urban designers, landscaping, building and construction trades, legal, finance, accounting and other 'front end' development services. These providers will themselves generate further demand for goods and services as development continues.

A proportion of this demand will initially be met from spare capacity in existing enterprises and firms operating in Perth and elsewhere. However, the scale of development and the high levels of environmental design standards planned for St Andrews will, over time, generate the need for additional providers of these lead professional services. The proposed high levels of urban amenity at St Andrews will create a location where many lead professionals will choose to live.

As the St Andrews development takes place the lead professionals involved with this development are likely to acquire skills not readily held in other urban areas of Australia as the planning and development and successful implementation of urban areas of the scale proposed are not common. Australian examples are few and include Canberra, the national capital and a planned garden city, that has a resident population of 300,000. The Multi Function Polis (MFP) was planned to accommodate a population of around 100,000 or possibly more, however, it failed to materialise.

The specialised lead professionals in large scale urban development will be in high demand from other areas around the world with growing urban populations of this scale, many of which are in Asia and relatively close to Western Australia. This factor is likely to lead to the development of a lead professional export cluster at St Andrews. This aspect is addressed more fully in the Export Leveraging Enterprise Cluster.

Possible Proponents

Public Sector

- LandCorp
- Department of Commerce and Trade
- Department of Land Administration
- Ministry for Planning
- Small Business Development Corporation
- Small Business Institute
- Public infrastructure providers
- Regional development agencies

Private Sector
- Consulting and civil engineering firms
- Land planning and management organisations
- Legal and accounting firms
- Environmental technologists
- Chambers of Commerce
- Professional Institutes
- Private infrastructure providers

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Major Performers

Australian	Overseas
· ACT Electricity & Water (ACTEW) · Lend Lease · Delfin · Dames and Moore · Sinclair Knight Merz	· Tokyu Corporation · Sophia Antipolis SAEM · Weyerhaeuser Real Estate Company · Development Securities PLC · The Woodlands Operating Company

Major Development Areas
- The St Andrews Project

Major Funders
- Consulting and civil engineering firms
- Legal and accounting firms
- Environmental technologists
- Private infrastructure providers

SWOT Analysis

Strengths	Weaknesses
Single large scale project over long timeframe	Developing sufficient scale in the short term to generate demand for additional services
Excellent training infrastructure in Perth for new recruits to the industries	Difficulty in funding start-up of smaller enterprises
Attractive lifestyle and high amenity to attract lead professionals	

Opportunities	Threats
To develop skills not readily available in Australia	Fear of moving some activities or enterprises from current locations to an area where they can expand
To develop a world class enterprise cluster with significant capacity to meet demands in overseas urban developments	

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

A number of detailed econometric assessments were undertaken for the Better Cities Program to consider and quantify the capacity and extent that innovative and planned urban development could have on private sector investment and employment generation[3].

These studies were based on the Commonwealth's contribution of $816 million over the five year life of the program (1991-1996) and the additional $1.5 billion contributed from the States and local government.

After excluding State and local government expenditures that would have occurred in the absence of the Better Cities Program and expenditures that were re-allocated by postponing expenditure on other projects or the same projects in non-Better Cities strategy areas, the long-run or resource efficiency enhancement was conservatively estimated at:

- An increase in Gross Domestic Product at least double the combined Commonwealth, State and local government expenditures;
- Average annual employment *increases* of between 5,000 and 12,000 jobs between the commencement of expenditure under the Program (1991/2) and 2009/10.

Allowing for the impacts of inflation, it is estimated that for each one (1) billion dollars of urban development, 2,500 to 6,000 average annual employment *increases* are generated. However, not all these jobs are lead professionals. Industry estimates indicate some 5% (125 to 300 average per annum) could be classified as lead professionals.

Scale of Development

Over the development timeframe of the St Andrews project many billions of dollars will be invested in urban infrastructure including land servicing, housing, commercial and industrial construction, arterial roads, hydraulics, electricity reticulation, education facilities, health facilities, community facilities, public transport and open space, and sports facilities.

A number of benchmark studies have addressed the estimated development costs of large scale urban developments[4]. A number of smaller scale developments have also been subject to Benefit Cost Analysis, including Vasse Newtown, Gateway to the Margaret River, WA.

In general, the larger scale studies indicate an order of cost of around $16.5 to $19 billion for a typical urban 150,000 population base. St Andrews is likely to have significant infrastructure over and above this amount, particularly in the Education and R&D Clusters.

[3] Spiller Gibbins Swan Pty Ltd, January 1995; Morris Consultants April, 1995; Morris Consultants, October, 1995, NIEIR, October 1995:
[4] MFP: An Urban Development Concept, July 1990, Hastings 2000, June 1991, Teluk Merbau, May, 1994, Teluk Merbau, May, 1996, Chongqing, China, 1998/9.

Potential to Capture Market Share

The successful development of the St Andrews project will require the skills from a wide range of disciplines and areas of professional practice. Given the scale of the project, planning, construction and development are likely to extend over the next several decades. The St Andrews project is planned to incorporate high levels of urban amenity, creating an attractive location for business and professionals to live and raise their families. These factors provide a basis for the long term development of enterprise clusters providing lead professional services to the St Andrews project and other developments in Australia and internationally.

Availability of Skills

There are many lead professionals and professional firms in Perth, Western Australia and Australia with extensive experience in small to medium scale urban development projects. A number have some experience at urban development levels of 20,000 to 30,000 populations, However, few individuals or organisations have practical experience in planning and implementing developments of the scale planned at St Andrews. This is a function of the patterns of urban development within Australia, historically being mainly incremental along transport networks.

The professional skills base at St Andrews is, however, capable of being developed to meet the complexities of development at the scale proposed as a result of the existing strong qualifications base, superior educational capacities within Western Australia and Australia and the capacity to learn from existing large scale developments overseas.

Estimated Number of Jobs at St Andrews

Based on the foregoing estimates of average annual employment *increases* generated per billion dollars of urban development and the potential scale of development at St Andrews, the following table provides conservative estimates of numbers of additional lead professional jobs at St Andrews. On these assumptions lead professionals will comprise some 2% of the population. Note, these lead professionals have capacity to work on other projects in addition to St Andrews to even out their work flows.

Five Years	Ten Years	Twenty Years	Twenty Five Years
500	**1,125**	**2,375**	**3,000**

Estimated Average Wage or Salary Level

Salary levels for lead professionals span a wide range depending on the actual profession and the particular level of skill relative to that skill's demand in the market place.

At the upper end, annual salaries and bonuses for partners in larger firms can exceed $500,000 while senior associates and senior project managers are in the order of $60,000 to $120,000 per annum. For this Social Benefit Cost Analysis, the estimated average annual wage of salary for a lead professional is $70,000.

Market Size for St Andrews

Using an industry rule of thumb that a professional should generate at least two to three times their salary in revenue for their firm, the following market size can be estimated for the additional lead professionals at St Andrews.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$70 million pa	**$157.5 million pa**	**$332.5 million pa**	**$420 million pa**

Potential Scale of Overall Development at St Andrews

The scale of overall development at St Andrews at any point in time will be a function of the rate of population growth. On the assumption the rate of growth will be similar to that projected for Scenario A in Figure 1 the Perth Metropolitan region overall, the following table sets out the estimated scale of overall development at St Andrews.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$19.5 million	**$44 million**	**$93 million**	**$117 million**

Commencement Date for New Infrastructure at St Andrews

To achieve 500 lead professional employment opportunities at St Andrews in five (5) years, additional development construction would need to commence in 2002.

Commencement Date for Start of Operations at St Andrews

Lead professionals are required at the front end of the planning and development cycle. Initially, some of the demand would be met from existing spare capacity, however, it is envisaged lead professional enterprise clusters would start to emerge within the St Andrews project in 2003.

Timing to Reach Full Capacity in Operations

Full capacity would be reached as the development moves towards its completion in around 2020 to 2026. It is likely that throughout the project, lead professionals working on the St Andrews project would have developed particular skills in relation to large scale urban developments. Given the projected demand for these skills in the emerging cities across Asia, significant potential would exist to develop export opportunities.

Current Technology Base at St Andrews

Within the current population base of the St Andrews region it is likely that several potential/actual lead professionals reside, however, the projected demand for lead professionals within this project indicates a significant increase in this particular technology base will be required over time.

Current Process Base at St Andrews

Virtually no lead professional process structures are currently evident at St Andrews.

Current Human Resource Base at St Andrews

Within the current population base of the St Andrews region it is likely that several potential/actual lead professionals reside, however, the projected demand for lead professionals within this project indicates a significant increase in this particular human resource will be required over time.

Current Distribution Base Available at St Andrews

Virtually no lead professional distribution base is currently evident at St Andrews.

3.5. Endogenous Self-Containment

Description of Enterprise Cluster

This section describes the emerging enterprises and activities servicing the new market of cash-rich, time-poor, double-income households. Enterprises contributing to endogenous self-containment would do so by utilising natural and human resources within St Andrews to deliver products and services for both local consumption and global markets. Enterprises characterised as endogenous self-containment include the following categories:

- *Outsourced Household Services (OHS) Providers* - SOHO-based individuals and small businesses providing services to households such as:- delivery of prepared meals, washing and ironing; house cleaning; lawn mowing; car washing; house repairs, maintenance and painting; tutoring, and many more. Conventional fast food services and health care are considered in the enterprise-cluster *Inherent Employment*.
- *Small Office/Home Office (SOHO) Workers* - includes individuals and small groups using e-commerce enabled SOHO facilities and/or business/enterprise incubation facilities and flexible rental office spaces as a base; for example:- journalists, consultants including those operating as 'global nomads', professionals (such as accounting, architecture, engineering, legal, graphic art, web designing, &c), office-support service providers, telesales providers, network computer specialists. Many if not most of these workers will deliver products and services to meet the outsourcing demands of private and public enterprises. Excludes artists, authors, musicians, and writers covered by the enterprise-cluster *Lifestyle–Recreation/Arts/ Culture* and the professionals in the enterprise-cluster *Lead Professional Services.*
- *Micro-Industrial Symbiosis (MIS) Participants* - clusters of small enterprises operating at the community, neighbourhood or urban village level to achieve high levels of resource recovery and recycling (3R) outcomes integrated with local food production-processing-packaging. Excludes activities covered by conventional food production-processing-packaging in the enterprise-cluster *Value Adding to Natural Resources (exogenous)* and electricity, gas, water and sewerage in the enterprise-cluster *Infrastructure & Construction (including Network University).*

Imagination and resourcefulness of residents will be the only limits to the growth of this enterprise-cluster.

The exchanges between enterprises in these three categories are shown on the next page.

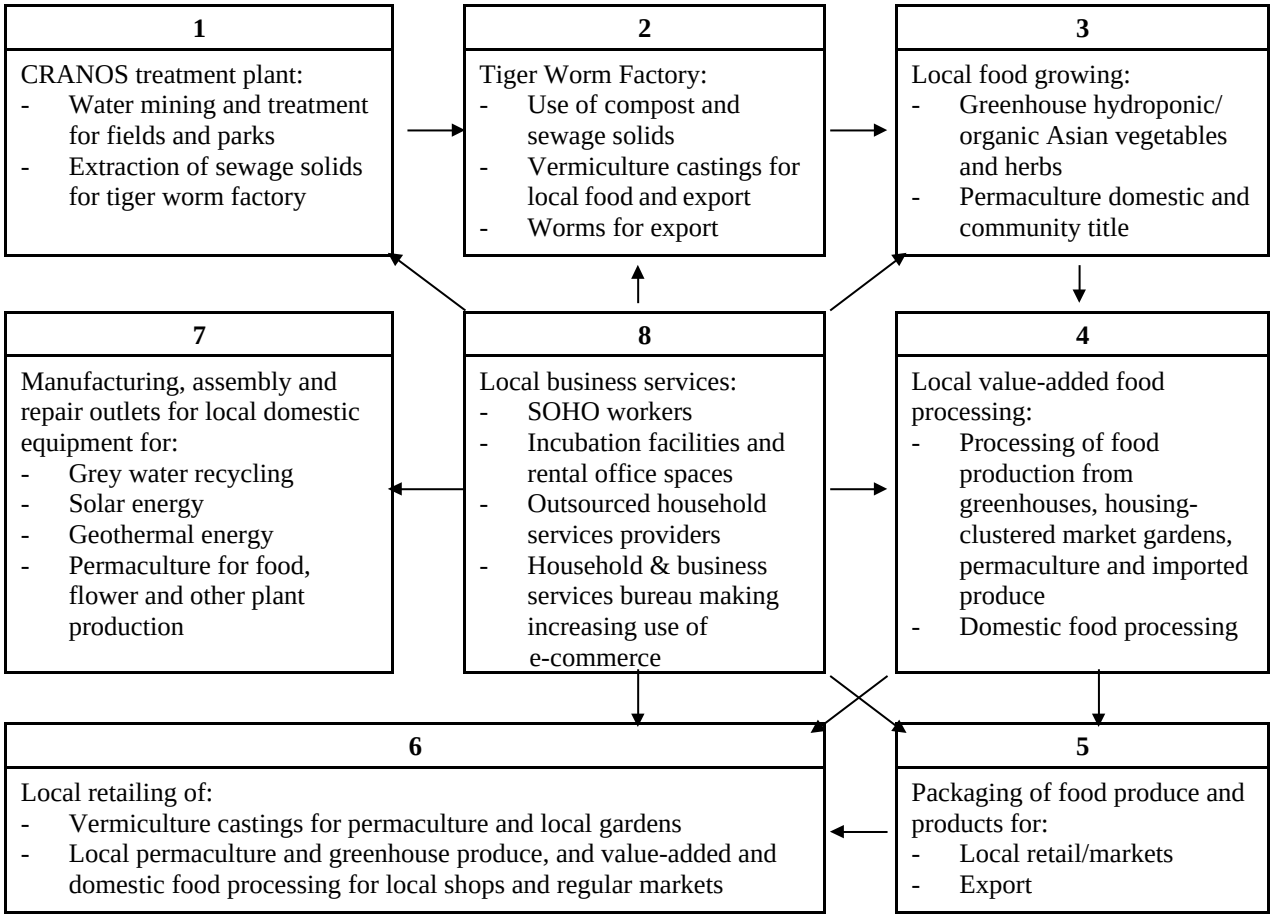
Possible Proponents

A new market of cash-rich, time-poor, double-income households will drive the growth in the OHS providers. An increasing number of the players servicing this new market could be SOHO enterprises and workers achieving rising standards of living.

The provision by public and private sector players of state-of-the-art telecommunications and online learning infrastructure to the household and local business centre level as considered in the enterprise-cluster for Infrastructure & Construction (including the Network University) could support explosive growth in SOHO enterprises and workers.

The increasing number of groups and individuals in society seeking to get back to basics in the application of technology for the delivery of power, water, sewerage, resource recovery, local food production-processing-packaging could do so as participants in achieving Micro-Industrial Symbiosis. These groups and individuals will be increasingly empowered by medium to large enterprises and financial institutions providing the opportunities for individuals to invest in the development and application of technologies and ventures accelerating the delivery of Micro-Industrial Symbiosis.

Generic Enterprise-Cluster for Endogenous Self-Containment



SITUATIONAL ANALYSIS

Enterprise and Cluster Option Information

Major Performers

Australian	Overseas
· ACTEW, Canberra in wiring households with optical fibre cable through the TRANSACT project · ACTEW ventures to recycle grey water and black water at the household level · ACTEW CRANOS water treatment plant for communities of 1,500 to 30,000 people · ACT Waste Management's ventures in delivering *Zero Waste by 2010* including vermiculture and planned establishment of a resource recovery & recycling estate · Crystal Waters, Queensland in advancing permaculture and eco-village developments	· Celebration, new urbanism development by Disney-Development Corporation, featuring state-of-the-art electronic community networks linking all households · Eco-village developments world-wide such as Findhorn, Scotland · *Global Eco-village Network* stimulating and linking eco-village developments in Denmark and world-wide · *Tridos Bank* (Netherlands) and *Merkur Bank* (Denmark) providing finance for endogenous self-containment initiatives and ventures

Major Development Areas

Every urban village or township throughout the St Andrews development, possible upwards of 30 in number, could feature an enterprise-cluster for *endogenous self-containment.*

Major Funders

- Communities establishing their own banking institutions/arrangements to support the funding of local ventures in endogenous self-containment.
- Enterprises and financial institutions providing the means for their investors to support the many and varied ventures characterised as delivering outcomes in endogenous self-containment.
- Small Business Development Corporation (WA Government) and Federal/State/Local Government and local business support for business enterprise centres and initiatives.
- Australian private foundations.

SWOT Analysis

Strengths	Weaknesses
St Andrews is preparing to become a new metro-satellite city geared to achieving high levels of employment self-containment.	To achieve the levels of self-containment and the potentially high direct and spin-off benefits requires a significant departure from conventional forms of urbanisation.
Ideal natural environment to attract and retain the required types of individuals and enterprises.	While many of the elements of this significant departure have been implemented elsewhere there is no experience in delivering on such a comprehensive scale.
The proponent Tokyu Corp realises the value of providing world-class telecommunications infrastructure to major developments and is already doing so in Japan.	Australian SMEs are slow to take up e-commerce, a key driver in SOHO-based enterprises now and increasingly for OHS and MIS enterprises.
World-class telecommunications R&D based in Perth that could be linked to Information Technology & Telecommunications (IT&T) drivers required to attract required types of individuals and enterprises..	Investment in the enabling R&D underpinning the development of customised IT&T drivers will be difficult to raise. Indications that this is changing in Australia, particularly for well-conceived business plans.

Opportunities	Threats
The development of knowledge-based products and services could demonstrate how Australia could reduce and reverse its increasing deficit in information technology products and services.	While OHS trends are already evident it will require a major planning effort and the attendant provision of educational/training materials and incentives to achieve the levels of uptake envisaged for St Andrews.
Reversal of OECD trend "to hollow out" middle class – see section on Current Process Base below	While SOHO-based trends are already evident it will require a major planning effort and the attendant provision of incentives to achieve the levels of uptake envisaged for St Andrews.
High levels of social cohesion by achieving the "hollowing out" reversal and delivering high levels of enterprises and employment self-containment.	While industrial symbiosis has been proven to work elsewhere it will require a major cultural shift in society to deliver its outcomes elsewhere.

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

The market scale estimates and projections provided in the next two sub-sections are drawn in part from recent articles by Phil Ruthven for the Business Review Weekly.

Outsourced Household Services

According to Ruthven, there are enormous opportunities for growth in existing and yet-to-be-born industries. Avenues of outsourcing are far from exhausted on the eve of the new century and millennium. Australians 15 years and over still spend 56% of their working hours on household and personal activities on a DIY basis. Their paid work in one of the industries takes up 44% of their working time. The outsourcing of just 10% of the DIY work at home would restore full employment in Australia.

Ruthven also projects that household services will do better than tourism ($57 billion). As a sector it is already valued at more than $33 billion (the same size as the agricultural industry). The household-services industry employs more than 720,000 people and contributes about 3% to GDP. In 1997-98, the household services industry:

- Included about 144,000 establishments (13% of the nation's total establishments);
- Generated revenue of $33 billion (2.1% of the nation's total revenue);
- Created $16 billion in value added (2.7% of GDP);
- Employed one in 12 of the nation's 8.6 million employees (many as part-timers or casuals).

Cooking is the biggest outsourced industry, with more than $14 billion now spent on meals (takeaway food and meals eaten in restaurants). Yet Australians now outsource only one in five meals; in the US, consumers buy almost two out of five meals. In this case only cooking prepared in home-based kitchens for neighbourhood households is considered. The growth of conventional fast food production and consumption is considered in *Inherent Employment*.

The foregoing growth in market share figures suggest that OHS will grow from about 5,000 to 10,000 jobs in a population of 150,000 residents. Assuming that St Andrews will attract the drivers (cash-rich, time-poor, double-income households) of OHS, it is reasonable project the 10,000 job level by 2025. However, about half of this already accounted for in *Inherent Employment*, suggesting around 5,000 jobs in this form of OHS by 2025.

Small Office/Home Office (SOHO) - Outsourced Business Services, Nationally and Globally

Ruthven also reports that industries are similarly doing an enormous amount of non-core DIY (in-house) activity that could be outsourced to other industries or to service industries of a type yet to emerge. Even so, in the past two centuries, businesses have already outsourced more of their non-core activities than households have done. The figures are about 63% of total value-added for industry and 44% for households. The type of work involved has included trucking and other transport, utility services, wholesaling and construction. A new wave of outsourcing is adding to the list: personnel activities, legal services, accounting, information technology, information and research, catering, cleaning, maintenance.

Franchising will add enormously to the outsourcing trend. It now provides 6% of total business revenue in Australia but is likely to rise five or tenfold in the 21st century.

Others that already outsource, or could do so, is made up of foreign customers. About 20% of world GDP is in exports, which means countries on average are outsourcing 20% of their economic needs. Australia itself is outsourcing its requirements overseas to an increasing degree. The 14% of all gross national expenditure (GNE) spent in this way in the 1970s has become 21% in 1999, and is likely to reach 25% in the first 25 years of the new century. It works both ways: other countries are outsourcing more to Australia, and the export share of the Australian GDP has risen in line with the imports. The newer exports from Australia tend to be in services such as education, tourism and information, together with energy minerals, manufacturing and new agricultural products.

A great deal of these outsourced services will be delivered by SOHO workers operating as individuals, in groups with others within their own communities, and with individuals and groups located anywhere in the world.

SOHO-based employment is likely to match non-conventional OHS but as many will be operating within the OHS market the projection is halved to 2,500 jobs by 2025. Assuming about 500 of these jobs are in the enterprise-cluster for *Lead Professional Services* and 500 in the enterprise-cluster for *Export Leveraging–SURD* this reduces this total to about 1,500 jobs.

Micro-Industrial Symbiosis

Estimates for this category of endogenous self-containment are not available from existing studies. However, the activities involved will be more labour intensive than the conventional means of delivering power and water, treating and using waste water, achieving high levels of resource recovery and recycling, and producing, processing and packaging foods locally.

Given current Western Australian averages about 574 people are employed in the delivery of electricity, gas, water and sewerage industries for a residential population of 150,000. However this employment has already been accounted for in the enterprise cluster *Inherent Employment*. It is assumed that about three times as many would be involved in the labour intensive delivery of MIS outcomes. This is adjusted by the above amount for conventional servicing leaving a net doubling or 1,148 jobs.

Currently Western Australia averages about 1144 people in food production and processing for a population of 150,000. However, this employment has already been accounted for in the enterprise cluster *Value Adding to Natural Resources (exogenous).* Furthermore the latter covers a wider range of foodstuffs, say double. Given a doubling of the labour intensity for half the range of foodstuffs this suggests a further 1144 jobs.

This leads to an estimated 2292 jobs by 2025 from the practice of *micro-industrial symbiosis* throughout St Andrews.

Potential to Capture Market Share

Access to leading-edge telecommunications technology and ongoing training in e-commerce will be the key driver of growth in jobs in all three categories of *endogenous self-containment* enterprises.

Anything less will lead to a marked reduction the rate of start-up of these enterprises and the attendant growth of employment. This applies to all three categories of enterprises, including those participating in micro-industrial symbiosis, as knowledge sharing nationally and globally will greatly enhance the viability of operations.

Availability of Skills

Some of the residents in the existing townships of St Andrews probably engage in SOHO-based activities. Possibly many others would choose to do so given the opportunities and supporting infrastructure. The same would apply the other two categories of *endogenous self-containment* enterprises.

Estimated Number of Jobs at St Andrews

The total jobs estimated for OHS, SOHO and MIS above is 8,792 by 2025. This is assumed to grow to this level as shown below:

Five Years	Ten Years	Twenty Years	Twenty Five Years
1,000	**3,000**	**6,000**	**8,800**
Initial			Full capacity

Estimated Average Wage or Salary Level

The levels of remuneration will vary markedly from a few thousand dollars per annum for small growers to millions of dollars per annum generated by global nomads. As noted above, a new market of cash-rich, time-poor, double-income households underpins the household services industry.

The following observations by Ruthven on OHS wages and salaries are relevant:

- There will come a time before the end of this new age - about 2040 - when the household services industry is likely to be bigger than Australia's manufacturing industry, employing more people at higher wages.
- Many suggest that these new household services industries are creating a lower class of servants, maids and drudges in Australia. This is the same fallacy that arose when the manufacturing industry emerged at the end of the 19th century. This industry went on to require skilled tradespeople, managers and entrepreneurs, all of them doing better than those in most of the older industries and with higher status and wages.
- And will poorer households ever be able to afford the purchase of such services? Of course. It is always the well-off households that buy new goods and services first, then the middle class, then the poor. Higher volumes, innovation and competition lead to lower prices, creating a point at which nearly everyone can enjoy the new products.

It is likely that the average wages and salaries for the 8,792 employees and entrepreneurs in this cluster will steadily increase in the next 25 years from a level of around $40,000 p.a. to $60,000 in 1998 dollars. For the Social Benefit Cost Assessment an average annual salary of $50,000 has been assumed.

Market Size for St Andrews

As a high proportion of those working in this cluster will do so as small business owners and sole traders with tax effective strategies to underpin the growth of their enterprises, it is likely that the revenue per job will be considerable higher than the average wage or salary. This will range from 50% above the average wage to several times this average. The following projected revenue assumes a doubling of the average for every job and a straight-line increase of the underlying average between $40,000 in 2000 and $60,000 in 2025. Overall these activities should generate a productivity gain in the order of 2.5:1.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$100 million	**$360 million**	**$840 million**	**$1.32 billion**
Initial			Full capacity

Potential Scale of Development at St Andrews

The facilities required for the OHS activities will range from home-based offices or work areas to small commercial offices, warehouses, or workshops.

Assume 40% of OHS jobs require a home-based office or work area, (at $25,000 per person land and construction), 40% require commercial office space (at $60,000 per person land and construction), and the balance of 20% require commercial warehouse and storage facilities (at $60,000 per person land and construction). This provides cumulative estimates of the scale of development at St Andrews for OHS growing in proportion to the above employment totals as follows:

Outsourced Household Services $46,000 per job

Five Years	Ten Years	Twenty Years	Twenty Five Years
569 jobs	**1707 jobs**	**3414 jobs**	**$5,000 jobs**
$26 million	**$78.5 million**	**$157 million**	**$230 million**

The facilities required for the SOHO activities will range from home-based offices or work areas to small commercial offices.

Assume 70% of SOHO jobs require a home-based office or work area, (at $25,000 per person land and construction) and 30% require commercial office space (at $60,000 per person land and construction). This provides cumulative estimates of the scale of development at St Andrews for OHS growing in proportion to the above employment totals as follows:

Small Office/Home Office Workers $35,844 per job

Five Years	Ten Years	Twenty Years	Twenty Five Years
171 jobs	**513 jobs**	**1,026 jobs**	**1,500 jobs**
$6 million	**$18 million**	**$37 million**	**$54 million**

Western Australia averages about $226,000 in conventional electricity, gas, water and sewerage facilities per employee in these industries. Assume a 50% decrease in this average relative to a three-fold increase in labour intensity for all types of MIS jobs. This provides cumulative estimates of the scale of development at St Andrews for OHS growing in proportion to the above employment totals as follows:

Micro-Industrial Symbiosis $113,000 per job

Five Years	Ten Years	Twenty Years	Twenty Five Years
261 jobs	**783 jobs**	**1566 jobs**	**2292 jobs**
$29.5 million	**$89 million**	**$177 million**	**$258.5 million**

The total scale of development for this enterprise-cluster is then given by:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$61.5 million	**$185.5 million**	**$371 million**	**$542.5 million**

Commencement Date for New Infrastructure at St Andrews

To achieve a significant contribution to the 3000 jobs in the endogenous self-containment cluster St Andrews in the first five years, the construction of business incubation facilities and office space, renewable energy facilities, and waste water treatment plant would need to commence in the next few years.

Commencement Date for Start of Operations at St Andrews

Initial construction works could start as soon as feasibility and assessment studies and investigations have been completed, say 2002.

Timing to Reach Full Capacity in Operations

It is likely that the growth of employment in this cluster would be roughly in proportion to the overall growth in population of St Andrews.

Current Technology Base at St Andrews

A survey of existing households would be required to provide a response to this question. It may be possible to extract limited insights from *Household Expenditure Surveys* conducted by the Australian Bureau of Statistics.

Current Process Base at St Andrews

Current in this context of the following observations is the next five years and to some degree it may apply to some of the existing residents of St Andrews. There are many highly unfavourable trends in the evolution of societies in OECD countries that could be reversed by delivering endogenous self-containment at the levels envisaged above. Trends reported by Barbara Lepani for the recent Future Perth Economy Conference include:

- The shift from an industrial mode of development to an informational mode of development is leading to the "hollowing out" of the middle class in most OECD countries that is linked to:
  - International shifts in competitive advantage favouring manufacturing in Asia.
  - Redistribution of economic wealth.
  - Technological displacement of many jobs in manufacturing.

- The global knowledge economy is producing a profound shift in the socio-economic profile of OECD nations towards much higher levels of social inequality, and a general trend towards increasing proportions of children living in families in poverty.
- A new class of wealth has emerged amongst DINKS (double incomes, no kids) with professional couples either deferring children till their middle age (after all assets have been accumulated), or finding child rearing incompatible with their lifestyle.
- The traditional single income family is struggling to match such households in competition for well-located housing.
- Due to high rates of divorce and separation, many children are being raised in single parent households, many dependent on basic welfare pensions which keeps them below the poverty line, particularly in major cities due to the high cost of housing.
- A corollary to this pattern is the growing problem of drug and alcohol addiction, particularly among the young, and a distinct pattern of alienation and anomie amongst a significant proportion of young men, linked to high rates of suicide.
- While girls are increasing their participation rate in education and training, and their share of professional employment, there is evidence of educational under-performance among boys.
- The emergence of an underclass constituting a rogue economy of welfare dependence, crime and violence.
- While almost everywhere public services are cut to reign in burgeoning deficits, police and prisons are expanding, and the private security industry is on eof the fastest growing in the world.
- The security implications of wealth disparity is seeing a convergence between first and third hand world cities, with upper income housing estates with privatised recreational and service facilities and private security services. For example, Clark reported in 1994 that there were 30,000 gated communities in the USA, each housing between 100 and 500 families. (Pilita Clark, "Fortress America", SMH, Spectrum, 30.4.94.

3.6 Export Leveraging – Sustainable Urban & Regional Development (SURD)

Description of Enterprise/Cluster

Against a backdrop of growing community awareness and a demand for cleaner and greener ways of doing things, many Western Australian organisations, companies and individuals are working to support the development of world-class sustainable urban and regional development activities. These activities not only provide sustainable development answers for Western Australia and Australia but are capable also of playing a vital export role in the world. This is particularly the case if the development scale they have expertise in matches markets elsewhere.

The planning and development of a large scale project such as St Andrews is likely to attract a unique blend of world-class professionals in fields as diverse as:

- land planning,
- architecture and urban design,
- financing,
- community consultation,
- resource management,
- land administration,
- economic and industry analysis,
- solid and liquid waste management and recycling,
- pollution control including noise, odour and radiation control,
- land management,
- soil remediation,
- cleaner production methods,
- clean energy production, monitoring and sensor instrumentation, and
- environmental sciences including laboratory analysis, etc.

This potential milieu provides significant opportunity to develop enterprise clusters that not only service the St Andrews region, but the larger scale developments in Asia and elsewhere, where improved sustainable urban and regional development outcomes can substantially improve the social, environmental and economic outcomes for millions of inhabitants.

Possible Proponents

Public Sector

- LandCorp
- Department of Commerce and Trade
- Department of Land Administration
- Ministry for Planning
- Public infrastructure providers

Private Sector

- Consulting and civil engineering firms
- Land planning and management organisations
- Legal and accounting firms
- Environmental technologists
- Chambers of Commerce

Private Sector continued
- Business Council
- Professional Institutes
- Private infrastructure providers

SITUATIONAL ANALYSIS

Enterprise and Cluster Option Information

Major Performers

Australian	Overseas
· Asia Pacific Design Group · Qnetwork Marketing International · Freehill Hollingdale and Page · CSIRO	· Collaborative Economics · Calthorpe Associates · ICF – Kaiser · East-West Centre, Hawii

Major Development Areas
- North East Asia
- South East Asia
- South Asia
- Africa
- Western Europe

Major Funders
- World Bank
- International Monetary Fund
- International Development Agencies including in Japan, Holland, Canada.
- National governments, including Chinese Central Government;
- Provincial governments/agencies, including Chongqing Construction Commission

SWOT Analysis

Strengths	Weaknesses
WA contains many organisations with significant potential to export SURD goods and services	Needs co-ordination to optimise cluster development
St Andrews development is at a world scale	Starting from a low professional service base and initial rate of growth may not be sufficient to develop critical mass in any cluster
Perth is an excellent location from which to service Asian clients	
St Andrews will have high environmental amenity to attract world-class professionals	

Opportunities	Threats
St Andrews is likely to attract world-class calibre professionals	Other industry participants in Perth are also trying to establish a SURD Export Cluster
Billion dollar markets close to WA already exist and they continue to grow	Other regions in Australia are also trying to establish a SURD Export Cluster

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

Protecting the environment from adverse human impacts is a multi-billion dollar business that is generating jobs in new goods and services industries. Internationally, this broad spectrum of technical and economic solutions is already a key contributor to achieving sustainable development, particularly in the application of science, engineering and technology to minimising and cleaning up human impacts on the environment.

The producers of environmental/SURD products together form a relatively new services sector. In 1998 this sector seems to be where the information technology sector was ten to fifteen years ago. It is an emerging growth sector.

Population density will drive a significant proportion of the demand for Environmental/SURD products. United Nations figures for 1994/95 indicated the world population density was 427 per 1,000. This compares to Asia as a whole at 1,229 per 1,000 ha, but with some individual counties many times this density including Bangladesh at 9,388, India at 3,016, South Korea at 4,508 and Vietnam at 2,178 per 1,000 ha.

As the developing counties of Asia and Africa mature, the proportion of their populations living in urban areas increases. This also generates significant demand for Environmental/SURD products. Current rates of urban population growth are almost three times that of rural population growth, however, some Asian counties are well above this rate.

In terms of numbers, the following list identifies the most urbanising nations[5]:

- China – 2000-2025 - +390 million to cities
- India – 2000-2025 - +340 million to cities
- Pakistan –2000-2025 - +100 million to cities
- Nigeria – 2000-2025 - +91 million to cities
- Indonesia – 2000-2025 - +81 million to cities
- USA – 2000-2025 - +68 million to cities
- Brazil – 2000-2025 - +62 million to cities

Taking the conservative assumption that Asia and Africa are the main target markets for Australian environmental industry, and that minimal entry is likely to be made into the other world markets, these two (2) markets have a combined value as set out in the following table.

Asia and Africa Demand for Environmental/SURD Products, 2000-2025 in $US Billions

	2000	**2010**	**2020**	**2025**
Asia	96	325	1,116	1,980
Africa	4	10	29	51
Total	**100**	**335**	**1,145**	**2,031**

[5] Perth in a Global Context. Prof. L Neilson, Future Perth Conference, October 1999.

UNESCO has estimated that Australia produces approximately 1.5% of the scientific endeavour and output (goods and services) of developed nations. It is assumed that the provision of environmental goods and services to the world will mainly flow from developed nations.

Sectors within the Environmental/SURD industry market, with their share of the market as at 1992, are outlined in the follow table.

World Production of Environment Products, 1992

Sectors	**$ (billions)**	**Share (%)**
Solid Waste Management	62.3	21.1
Water Utilities	48.2	16.3
Resource Recovery	35.6	12.1
Hazardous Waste Management	31.9	10.8
Consulting	31.4	10.6
Water Infrastructure	28.7	9.7
Waste Management Engineering	25.4	8.6
Air Pollution Control	11.9	4.0
Asbestos Abatement	6.8	2.3
Engineering Services	4.9	1.6
Analytical Services	4.0	1.3
Instruments Manufacture	4.0	1.3
Total	**295.0**	**100.0**

Australia has strengths in all sectors of the Environmental/SURD industry market, and on this basis Australia is well placed to provide 1.5% of the environmental goods and services to the identified markets, as set out in the following table.

Potential Scale of the Value of Environmental/SURD Products to Asia and Africa by Australian-based Industry, 2000-2025 in $US Billions

	2000	**2010**	**2020**	**2025**
Asia	1.44	4.88	16.74	29.70
Africa	0.06	0.15	0.44	0.77
Total	**1.50**	**5.03**	**17.18**	**30.47**

Potential to Capture Market Share

Western Australian and Perth environment/SURD producers have the capacity to equal or exceed the average Australian per capita delivery of these products to the world markets as a result of developing solutions to meet the needs of a diverse climatic range, geological range and industry range.

Perth is the home for many public and private R&D facilities involved with environment/SURD products including a number of Co-operative Research Centres such as the Australian Maritime Engineering CRC (ocean engineering and extending the safe life of ships), the CRC for Broadband Telecommunications and Networking, the Australian Petroleum CRC (improved well quality, environmental impacts), A J Parker CRC for Hydometallurgy (reduced environmental impacts), Australian CRC for Renewable Energy, CRC for Legumes in Mediterranean Agriculture, CRC for Biological Control of Vertebrate Pest Populations, and the CRC for Conservation and Management of Marsupials.

The States R&D capacity supports the on-going development of environment/SURD products that would have application not only in the State but world-wide.

Availability of Skills

The level of R&D in environment/SURD products and the number of providers of environment/SURD products in Perth indicates there is a significant availability of skills, however, few would be located within the St Andrews area at the present.

A paper presented to the Future Perth Conference in October 1999[6] indicates there has been substantial growth in a number of employment sectors in Perth over the decade 1986-1996. Major job growth sectors include:

- Marketing and Business Management Services (13.1% pa)
- Other education (13.6% pa)
- Computer Services (13.7% pa)
- Services to finance and investment (7.4% pa)
- Other business services (8.5%)

Environment/SURD producers cross all of these sectors and more.

Market Size for St Andrews

Due to above average population growth, Perth is likely to increase its proportion of the overall Australian population during the St Andrews development timeframe. However, for this Social Benefit Cost Analysis it is assumed that Perth's population remains at a constant proportion of the overall national population.

Perth currently has approximately 7% of the nation's population. On this basis if it equalled the average Australian per capita delivery of environment/SURD products to the world markets it would have potential markets of $2.1 billion y 2025.

As a result of pro-active marketing and promotion, and the development of infrastructure and high amenity that would attract environmental/SURD producers to St Andrews, the proportion of the Perth market share that it could capture should be greater than the per capita average. For this Social benefit Cost Analysis it is assumed St Andrews captures five (5) times its average share.

6

On these assumptions the following table sets out the potential market size for environment/SURD products from St Andrews.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$5 million	**$34 million**	**$400 million**	**$870 million**
Initial			Full capacity

Estimated Number of Jobs at St Andrews

The producers of environment/SURD products will range from individuals providing services, manufacturers proving goods, through to organisations value adding to goods and services.

No data exits for the relationship between market size and employment numbers in the environment/SURD industry. However, for the purposes of this Social Benefit Cost Analysis alternative industries will be substituted as proxies for environment/SURD industries.

A composite of health and biotech industries and consulting, civil and mechanical engineering will provide an indication for inclusion in the Assessment.

An assessment of public and private enterprises involved in these industries indicated the following relationships between turnover and employment numbers.

- Health industries: 1 job per $100,000 turnover
- BioTech industries: 1 job per $450,000 turnover
- Consulting engineers: 1 job per $120,000 turnover
- Mechanical engineers: 1 job per $100,000 turnover
- Civil engineers: 1 job per $300,000 turnover

Assuming the mix of environment/SURD activities at St Andrew reflect the average of the above, the following table sets out the estimated number of jobs at St Andrews.

Five Years	Ten Years	Twenty Years	Twenty Five Years
25	**160**	**1,870**	**4,060**
Initial			Full capacity

Estimated Average Wage or Salary Level

Employment positions within the environment/SURD industries range from production workers in manufacturing, through to consultants and small/medium business owners to R&D technicians and marketing and sales staff.

Salary ranges would fall across the band from $25,000 to $200,000 plus per annum, however, the majority would fall between $35,000 and $60,000 per annum.

On this basis, the estimated average wage or salary for those engaged in the environment/SURD industries at St Andrews is $45,000.

Potential Scale of Development at St Andrews

Environment/SURD activities will require a wide range of facilities including home and commercial offices, warehouses and storage, manufacturing facilities and

There is no fixed ratio for the numbers of employees to the space required for environment/SURD activities. Warehousing and storage facilities have a low ratio of numbers of employees to space (labour extensive), while some office, manufacturing and process work can be the opposite (labour intensive). The degree of automation also significantly impacts on space requirements. Studies in Australia, the USA and Europe indicate the following indicative ranges per employee.

- Office workers: 20 m^2 - 25 m^2
- Manufacturing: 50 m^2 – 100 m^2
- Warehouse/Storage: 200 m^2 – 1000 m^2

Assuming 60% of jobs in the environment/SURD industries require office space (at $40,000 per person land and construction), 30% require manufacturing space (at $75,000 per person land and construction)and 10% require warehouse/storage space (at $60,000 per person land and construction), the following table estimates the scale of development at St Andrews in respect to environment/SURD activities.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$1.3 million	**$8.5 million**	**$100 million**	**$215 million**
Initial			Full capacity

Commencement Date for New Infrastructure at St Andrews

To achieve additional employment opportunities in the environment/SURD industries at St Andrews in five (5) years, additional development construction would need to commence in 2003.

Commencement Date for Start of Operations at St Andrews

Initial construction would occur over 12 to 18 months enabling commencement of the additional activities in 2005.

Timing to Reach Full Capacity in Operations

It is likely the development of the environment/SURD activities will progress at a rate paralleling the rate of population growth. On this basis, full capacity will occur with the completion of the project in 2026.

Current Technology Base at St Andrews

Within the current population base of the St Andrews region it is likely that several potential/actual environment/SURD providers reside, however, the projected growth for

environment/SURD providers indicates a significant increase in this particular technology base will be required over time at St Andrews.

Current Process Base at St Andrews

Virtually no environment/SURD process structures are currently evident at St Andrews.

Current Human Resource Base at St Andrews

Within the current population base of the St Andrews region it is likely that several potential/actual environment/SURD participants reside, however, the projected growth for environment/SURD activities indicates a significant increase in this particular human resource will be required over time at St Andrews.

Current Distribution Base Available at St Andrews

Virtually no environment/SURD distribution base is currently evident at St Andrews.

3.7 Lifestyle – Recreation / Arts / Culture

Description of Enterprise/Cluster

The Lifestyle cluster has a close alliance with the Tourism industry cluster (see section 3.3) and in some cases there can be overlapping areas and activities, particularly in respect to active recreation.

The Tourism industry cluster figures in section 3.3 incorporate the impacts for active sport resulting from facilities such as tennis, golf and other forms of organised sport. This section, Lifestyle - Recreation / Arts / Culture, addresses the impacts of art and cultural heritage and to some degree passive recreation.

What is Cultural Heritage?

Cultural heritage encompasses material culture, in the form of objects, structures, sites and landscapes, as well as living (or expressive) culture as evidenced in forms such as music, crafts, performing arts, literature, oral tradition and language. The emphasis is on cultural continuity from the past, through the present and into the future, with the recognition that culture is organic and evolving.

John Naisbitt in his 1990 book, *Megatrends 2000*, argues for the growing significance of the arts, spiritually and economically. His insights include the following:

> "From the United States and Europe to the Pacific Rim, wherever the affluent information economy has spread, the need to re-examine the meaning of life through the arts has followed."
>
> "It is a spiritual quest, but its economic implications are staggering."
>
> "As the arts become more important in society, individuals, corporations, cities, and towns will increasingly decide their fate under the influence of the images, personalities, and lifestyles of the arts."

In *Global Paradox* Naisbitt argues that the drive for communities to differentiate culturally is intensifying, at the same time that American culture permeates all forms of media world wide. His views are apparent in statements such as:

> "The bonding commonality of human beings is our distinctiveness."
>
> "E-mail is a tribe-maker. Electronics makes us more tribal at the same time it globalises us."
>
> "With the new emphasis on what is tribal in a world increasingly global, the New Age mantra *Think Globally, Act Locally* is turned on it head. It is now: *Think Locally, Act Globally*."
>
> "The more universal we become, the more tribal we act."
>
> "The more we integrate the world, the more we differentiate our experiences."
>
> "A growing number of countries are recognising that the world's appetite for experiencing environments and cultures other than their own is a golden economic opportunity."

Spirit of Place

The essence of cultural enrichment is the opportunity to build and enjoy a true *spirit of place*. Such a spirit will assert itself in St Andrews through the confidence of its citizens, the uniqueness of its goods and services and the physical 'shape' of an integrated environment. This could be achieved by involving the community from the outset in expressing the uniqueness of living in this place. A lead in this regard could be taken from the geophysical environment, the unique setting of the ocean and the Swan Plain as well as the richness of natural species of flora and fauna.

The prospects for cultural development by local communities and those who govern them have been well explored in recent work undertaken by the Australia Council through its Community, Environment Art and Design Committee and the Australian Local Government and the Arts Task Force. Strategies arising from this work are relevant (Sansom Pty Ltd and Praxis Research 1994).

Cultural Development

Culture highlights those local functions which make major contributions to local identity, a sense of place and quality of life. Such functions include:

- Support for entertainment, arts and cultural activities.
- Library services.
- A range of civic, cultural and community facilities.
- Community services and development programs.
- Building, urban and landscape design.
- Land-use planning and development control.
- Heritage conservation.
- Parks, playgrounds and recreation facilities.

Infrastructure must be planned and implemented to support these functions. Cultural development is nevertheless not a prescriptive concept. There is no 'right' way to promote it. Each component of the community will define its cultural development path according to its particular interests, resources and needs.

Commercial Opportunities from Cultural Development

Cultural development offers many opportunities for profitable activities. Some basic strategies to encourage them include the following:

- Recognise the arts as significant economic and employment generators, and plan accordingly.
- Initiate design and improvement projects for local centres.
- Support local designers and crafts people.
- Provide spaces for display and sale of local arts and crafts.
- Use local identity and culture to promote tourism.
- Liaise with training bodies to foster cultural industries.

Resident Companies: The opportunity to provide facilities for one or more performing arts companies, in dance, drama, or musical production could be provided, and every effort made to encourage high profile practitioners in some artform to take up residence in the region.

Incentives to make St Andrews a centre of rich creativeness could be pursued from appropriate funding sources such as ArtsWa's Arts Venture Capital.

Art for Public Places[7]

Public art is accessible art, the result of an artist's expression that is available to a wide audience. It may be temporary or permanent. Art in the environment can communicate many things and the best public art involve the viewer. They may refer to the site, the community, the past or the future or the ideas the artist wishes to convey. It can provide rich cultural experiences that influence our perceptions, at the same time enliven our environments, offering provocative or soothing combinations of colour, material and form.

It can also increase the public's awareness of the value of art. New opportunities for the employment of artists are created at the same time as improving the public buildings and spaces.

Electronic Media: Opportunities for the development of local creative networks and the capacity to develop links with the outside world can be facilitated through the installation of modern information and telecommunications technologies as part of the basic infrastructure. Such technologies could include holographic projection, cable television, computer networking. Broadcasts of local productions, events, conferences and so on could enhance opportunities to derive significant income from locally generated products and services.

Placemaking

The term 'placemaking' describes programs of urban design and other improvements undertaken to foster a stronger sense of local identity and enhance quality of life.

Placemaking emphasises partnerships between the local authority and the community in both planning and implementing design projects. Typically these will include streetscape development; creation and upgrading of parks, art for public places, playgrounds and other public spaces; tree planting, bush regeneration; and so on. Such activity would stimulate broader cultural activity. The concept of sustainable design is particularly important:

> "Sustainable design integrates consideration of resource and energy efficiency, healthy buildings and materials, ecologically and socially sensitive land use, and an aesthetic that inspires, affirms and ennobles...sustainable design can significantly reduce adverse human impacts on the natural environment while simultaneously improving quality of life and economic wellbeing." (World Congress of Architects, June 1993, *Declaration of Interdependence for a Sustainable Future*, Chicago).

Cultural Action

The process of cultural development could be supported by action taken in the following specific ways in line with strategies recommended by the Report of the Local Government and the Arts Task Force in 1991.

[7] Art for Public Places program, South Australian Department of the Arts and Cultural Development.

These recommendations deal with:
- Cultural and Entertainment Activities and Facilities.
- Children's Playspaces.
- Sport and Recreation Facilities.
- Riding, Running and 'Robics.
- Generating Strong Local and Civic Pride.
- Meeting Social Needs and Promoting Community Life.
- Enhancing the Natural and Built Environments.

A regions cultural heritage can significantly underpin a region's tourism appeal and therefore its economic impact.

Possible Proponents

Public Sector
- ArtsWA
- Centre for Indigenous History & the Arts (University of Western Australia)
- Western Australian Museum
- Library and Information Service of Western Australia
- Perth Theatre Trust
- ScreenWest
- Ministry of Sport and Recreation

Private Sector
- Property developers
- Individual artists and performers
- Corporate benefactors
- Private benefactors

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Enterprise and Cluster Option Information

Major Performers

Australian	**Overseas**
· National Gallery of Australia · National Museum of Australia · Western Australian Museum · Heytesbury Corporation	· Guggenheim Foundation · Tokyu Corporation – Bunkamura · Louvre, Paris · Chicago Museum of Modern Art

Major Development Areas
- Throughout the entire St Andrews project

Major Funders
- Individual artists
- Corporate and Private Benefactors
- Property developers

SWOT Analysis

Strengths	Weaknesses
Can contribute to a 'spirit of place' and vibrancy with a community	Funding for the arts and culture can be highly competitive
Differentiates St Andrews from elsewhere	Difficult to evaluate the economic value to the community from developing a cultural heritage
Can positively contribute to the overall St Andrews economy	Overlap between the benefits of tourism and the benefits of art and culture

Opportunities	Threats
Potential to develop resident companies at St Andrews	The free market can suppresses artistic innovation, because it is easier and cheaper to do without it
Develop the north west corridor's art community – bot indigenous and non-indigenous	If the value of art and culture to the community is not promoted it can be left out of the development equation
To contribute to the Department of Commerce and Trade's Export Strategy for the Cultural Industries	Leaving the responsibility for providing Art for Public Places to the public sector

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

According to a recent study (1998) undertaken for the Australia Council, the arts and related industries are worth more than $19 billion annually to Australia, and employ more than 500,000 people or 7% of the workforce.

Australia Council Chair, Dr Margaret Seares is optimistic that this huge growth is likely to continue, particularly with the increased international interest in our films, books, performing arts and indigenous arts."

However, included within these figures as 'related industries' are components estimated in section 3.3 of this Social Benefit Cost Analysis i.e., the Tourism Industry, as well as entertainment and other sectors of the economy estimated within enterprise-cluster *Inherent Employment*.

An assessment of leading job growth sectors with Metropolitan Perth between 1986 and 1996[8] estimated that 'Services to the Arts' (ANZSIC Code 925) grew by 179% to 444 jobs and 'Arts' (ANZSIC Code 924) grew by 128% to 799 jobs. In addition significant numbers of Perth-based artists are scattered throughout the other ANZSIC classifications as many work in other jobs full or part time and carry out their artistic endeavours in their spare time.

Should Dr Seares' prediction be correct that this growth will continue, the arts and related artistic and cultural activities could provide an important source of employment at St Andrews over time.

[8] Perth: An Economic Profile, Spiller Gibbins Swan, Sept. 1999. Future Perth Conference, October 1999.

Based on the Australia Council's figures, the arts and related industries would contribute some $1.3 billion per annum to Perth's economy and employ approximately 35,000 people. If the ANZSIC employment split is applied to separate out the related industry figures, the arts would contribute some $850 million annually to Perth's economy and employ some 23,000 people.

Potential to Capture Market Share

A number of potential attributes of St Andrews indicate good capacity to capture a significant market share of artistic and cultural talent within the development. It will have high amenity, has a coastal location and will have high levels of urban design. These characteristics provide a wide range of avenues for artistic and creative output.

The potential for incorporating Art for Public places throughout the development enhance these characteristics further. Another area for enhancement is the potential to develop synergies between the arts and the Education Cluster, see section 3.1.

ArtsWA also have policies and programs that can be tapped into to assist in the funding of the arts. The scale and integrated planning of the St Andrews project would enable it to mount a strong case for individual consideration. The funding programs include:

- *The Arts & Cultural Export Program*, which aims to promote Western Australia's arts interstate and overseas, supporting performance tours, exhibitions and product launches that have the potential to increase the artistic and/or financial status of the exporter; and
- *The Global Residencies Program*, which aims to assist talented Western Australian artists and other arts professionals to take up residencies with national and international arts organisations and to sponsor visits to Western Australia by talented artists and other arts professionals.

The Department of Commerce and Trade's Export Strategy for the Cultural Industries could also assist the development of the arts at St Andrews.

Availability of Skills

Western Australia has a wealth of artistic and cultural talent across all forms of creative endeavour. A significant proportion of this talent resides with the Perth Metropolitan area. Many of Perth's retail outlets offer local indigenous and non-indigenous art and crafts, and there are numerous theatres, playhouses, dance, music, film making, writing and performing arts studios throughout the city.

By providing the right financial and non-financial incentives, a considerable artistic and cultural community could be developed at St Andrews.

The development of this artistic and cultural cluster could be assisted by ArtsWA. ArtsWA is the arts industry development service agency within the Ministry for Culture & the Arts. Its vision is for a society in which the arts are flourishing and are recognised as integral to the social, economic and cultural vitality of the Western Australian community.

Its mission is to facilitate, for the diverse Western Australian community, a vibrant and viable environment for the arts and cultural industries, through advocacy, investment, industry development initiatives and policy development.

ArtsWA's role is to address the overall development of arts and culture in Western Australia through:

- increasing the community's awareness of the arts and culture;
- developing partnerships with the private sector to gain new resources for the arts
- community;
- developing strategies to better manage and market the State's arts and cultural
- resources;
- promoting new commercial opportunities; and
- investing in the arts.

Estimated Number of Jobs at St Andrews

Several factors will impact on the numbers of people employed in the arts and cultural cluster at St Andrews. The proposed high amenity lifestyle at St Andrews and its coastal location are likely to attract more than the average per capita level of artistic and cultural activity. Further, the arts and cultural industry has been growing rapidly as a component of the economy. Over the past decade in Perth employment growth in these activities has averaged over 8% to 10% per annum.

It is highly likely that a proportion of the existing St Andrews community is currently involved in arts and culture.

Taking the existing arts and cultural industry employment indications into account, and assuming employment growth will continue, but at rates of 5% per annum, the following table sets out the estimated numbers of additional jobs at St Andrews in the Arts and Cultural cluster:

Five Years	Ten Years	Twenty Years	Twenty Five Years
155	**615**	**3,700**	**6,150**
Initial			Full capacity

Estimated Average Wage or Salary Level

Australia Council's General Manager Ms Bott indicated that the average annual income for artists in Australia was only $20,000 and less for writers and visual artists.

Market Size for St Andrews

Taking the existing arts and cultural industry market indications into account, and assuming growth will continue at rates of 5% per annum, the following table sets out the estimated additional market size of the Arts and Cultural cluster at St Andrews:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$5.7 million	**$22.7 million**	**$137 million**	**$227 million**
Initial			Full capacity

Potential Scale of Development at St Andrews

The space and building requirements for people involved in the art and cultural cluster will vary widely. Many could operate from a home-based studio, while a range of facilities including play houses, theatres, and larger scale studios and warehouses will be required by others.

Assuming 30% of jobs in the art and cultural cluster require a home-based studio, (at $25,000 per person land and construction), 40% require studio/warehouse/storage space (at $40,000 per person land and construction), and the balance of 30% work from community facilities including libraries, museums, art galleries, theatres, auditoriums, and convention halls, (at $60,000 per person land and construction) the following table estimates the scale of development at St Andrews in respect to the arts and culture cluster.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$6.5 million	**$25.5 million**	**$153 million**	**$255 million**
Initial			Full capacity

Commencement Date for New Infrastructure at St Andrews

To achieve additional employment opportunities in the arts and cultural cluster at St Andrews in five (5) years, additional development construction would need to commence in 2003.

Commencement Date for Start of Operations at St Andrews

Initial construction would occur over 12 to 18 months enabling commencement of the additional activities in 2005.

Timing to Reach Full Capacity in Operations

It is likely the development of the arts and culture cluster will progress at a rate paralleling the rate of population growth. On this basis, full capacity will occur with the completion of the project in 2026.

Current Technology Base at St Andrews

Within the current population base of the St Andrews region it is likely that several potential/actual art and cultural cluster members reside, however, the projected growth for art and culture within the St Andrews project indicates a significant increase in this particular technology base will be required over time.

Current Process Base at St Andrews

Virtually no arts and culture process structures are currently evident at St Andrews.

Current Human Resource Base at St Andrews

Within the current population base of the St Andrews region it is likely that several potential/actual art and cultural cluster members reside, however, the projected growth for art and culture at St Andrews indicates a significant increase in this particular human resource will be required over time.

Current Distribution Base Available at St Andrews

Some arts and cultural activities distribution base is currently evident at St Andrews, in particular those activities linked to tourism such as heritage tours in the National Park.

3.8 Inherent Employment

Description of Enterprise/Cluster

Inherent employment includes the typical service providers in an established urban development such as retail food and non-food outlets, local and state government employees such as teachers, postal, police, emergency services, etc., wholesale traders, transport, personal services such as child care, community health services including general practitioners and chiropractors, gymnasiums, household repairers, etc. This category or cluster is in addition to those activities described in section 3.5 Endogenous Self-Containment, above.

Possible Proponents

Public Sector
- Department of Commerce and Trade
- Small Business Development Corporation
- Ministry for Planning
- LandCorp
- Local Government

Private Sector
- Chamber of Commerce
- Business Council
- Trader's Associations
- Community councils

SITUATIONAL ANALYSIS

Enterprise and Cluster Option Information

Major Performers

Australian	Overseas
· State/Local Government Offices · Franchise retailers, i.e. Harvey Norman, Ahearns, etc. · Franchise fast food, i.e. McDonalds, KFC, Ali Baba, etc. · Buying associations i.e. Newsagents, grocery outlets, liquor shops, fuel stations, etc.	· State/Local Government Officers · Franchise retailers, i.e. Macy's, JC Penneys, etc · Franchise fast food, i. E., McDonalds, KFC, Shoney's, etc · Buying associations i.e. Halfcase, Farm Co-op, liquor shops, fuel stations, etc.

Major Development Areas
- Within the commercial, residential, retail and industrial areas of St Andrews.

Major Funders

- State and Local Government
- Independent small business
- Fast food franchises
- Retail chains

SWOT Analysis

Strengths	Weaknesses
Can provide employment to a large proportion of the community, including young, part time and females	Although this is an important component of any community, it does not produce any external benefits by way of export.
Good planning can optimise the location of retail, industrial, commercial, community sites relative to residential.	Often, inherent employment can be low paid

Opportunities	Threats
To maximise any synergies between individual inherent employment enterprises, i.e. Fast Food clusters, car sales, etc	Poor planning can cause service functions to be dispersed
Potential to co-locate a number of government services within one development to provide a regional context to St Andrews	New, emerging communities can begin to rely on other community's facilities and delay the establishment of their own

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

This component is usually in the order of 25% of total employment within a community. However, Perth's North West Corridor currently yields approximately 18%. This is a function of the relatively low self sufficiency and self containment exhibited in the North West Corridor, see Figure 2.

Potential to Capture Market Share

Good planning and design can improve the capacity for a community to capture an optimum level of inherent employment. Business enterprises are encouraged to establish where the various commercial land uses are arranged in a spatial pattern that facilitates easy vehicle and pedestrian circulation and good visual sighting.

Land release programs can also influence the capacity for inherent employment enterprises to establish. Early identification and sale of prime commercial sites can lead to an initial development that then drives further investment in its sphere of influence.

Availability of Skills

The Perth labour force contains a wide range of skill level, many of which have relevance to the inherent employment enterprises.

The characteristics of inherent employment indicate a higher than average level of part time and casual employment, and a high level of female participation.

Estimated Number of Jobs at St Andrews

The level of inherent employment in a well designed and functionally efficient community is in the order of 25% of the labour force. On this basis the following table indicates the likely number of inherent employment opportunities within St Andrews.

Five Years	Ten Years	Twenty Years	Twenty Five Years
750	**2,560**	**11,300**	**16,125**
Initial			Full capacity

Estimated Average Wage or Salary Level

The full time equivalent wages and salaries for inherent employment workers ranges between $20,000 and $60,000 per annum. The average for the purposes of this Social Benefit Cost Analysis is $30,000.

Market Size for St Andrews

An analysis of the average family budget indicates the typical expenditure on activities related to inherent employment is in the order of $12,000 to $15,000 per annum. In addition to this is the spending on these functions by non-residents, estimated to be an additional 25%. On this basis the following table sets out the estimated market size of inherent employment enterprises in St Andrews.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$45 million	**$150 million**	**$630 million**	**$900 million**
Initial			Full capacity

Potential Scale of Development at St Andrews

The facilities required for the inherent employment activities will range from home-based businesses providing personal and business services to large commercial and retail centres and warehouses.

Assuming 10% of jobs in inherent employment require a home-based studio, (at $25,000 per person land and construction), 70% require commercial space (at $60,000 per person land and construction), and the balance of 20% require warehouse and storage facilities (at $60,000 per

person land and construction) the following table estimates the scale of development at St Andrews in respect to the inherent employment cluster.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$37 million	**$125 million**	**$560 million**	**$800 million**
Initial			Full capacity

Commencement Date for New Infrastructure at St Andrews

To achieve additional employment opportunities in inherent employment at St Andrews in five (5) years, additional development construction would need to commence in 2003.

Commencement Date for Start of Operations at St Andrews

Initial construction would occur over 12 to 18 months enabling commencement of the additional activities in 2005.

Timing to Reach Full Capacity in Operations

It is likely the development of inherent employment will progress at a rate paralleling the rate of population growth. On this basis, full capacity will occur with the completion of the project in 2026.

Current Technology Base at St Andrews

The existing population at St Andrews contains some inherent employment in the form of small retail outlets and personal service providers. The projected growth of the population within the St Andrews project indicates a significant increase in the inherent employment technology base will be required over time.

Current Process Base at St Andrews

Virtually no inherent employment process structures are currently evident at St Andrews.

Current Human Resource Base at St Andrews

The existing population at St Andrews contains some inherent employment in the form of small retail outlets and personal service providers. The projected growth of the population within the St Andrews project indicates a significant increase in the inherent employment human resource base will be required over time.

Current Distribution Base Available at St Andrews

Virtually no inherent employment distribution systems or structures are currently evident at St Andrews.

3.9 Advanced Manufacturing

Description of Enterprise Cluster

Advanced manufactures or *elaborately-transformed manufactures* (ETMs), including products such as consumer electronics and information and communications equipment have been the major source of growth in world trade for the past 50 years.

Recently ETMs have expanded to include industries providing the "virtual" infrastructure so vital to e-commerce. This includes industries such as smart cards, security, telecommunications and authentication, providers of hardware, software, services (e.g. smart card scheme operating), related consultancy services and systems.

The industrial and trade performance of countries are becoming increasingly dependent upon performance in the production of ETMs, especially the information and communication technologies (ICTs) cluster of ETMs. Strategically the information industries are central to raising the speed limit to growth.

Possible Proponents

Public Sector

- Public research enterprises/units participating in the Manufacturing Technology centres of the Australian Cooperative Research Centres (CRCs)
- Western Australian Technology & Industry Advisory Council (TIAC)

Private Sector

- ETM enterprises attracted to St Andrews.
- Private research enterprises/units participating in the Manufacturing Technology centres of the Australian Cooperative Research Centres (CRCs).
- Australian Electrical and Electronic Manufacturers' Association
- Australian Telecommunications Industry Association
- Australian Telecommunications Research Institute
- Kansai Science City, Advanced Telecommunications Research Institute International.

SITUATIONAL ANALYSIS

Enterprise and Cluster Option Information

Major Performers

Australian	Overseas
· BHP Transport Pty Ltd; James N Kirby Pty Ltd · Aerospace Technologies of Australia Pty Ltd; Australian Defence Industries Limited · Fujitsu Australia, ERG Telecommunications, Telstra · Sausage Software · CRC for Australian Maritime Engineering attracts active WA public and private sector participation. · CRC for Australian Telecommunications, headquartered in Perth	· Semi-conductor manufacturers, including Intel, Motorola, Compaq, IBM, Fujitsu, Acer, Siemens · Manufacturers integrated and clustering with semi-conductor manufacturers, over 400 types. · Microsoft, Oracle

Major Development Areas

ETM-based enterprises are likely to cluster with research-based enterprises and in the proposed campus-communities along with research-based enterprises. They are likely to be very heavy users of the proposed Network University widely distributed throughout as proposed in the enterprise cluster *Infrastructure & Construction (including Network University).*

Major Funders

- ETM-based enterprises.
- For ETM-based R&D initiatives: *R&D Start* program of the Commonwealth Government: $739 million over four years to 2000/01.
- For venture capital high technology startup firms: *Innovation Investment Fund* program of the Commonwealth Government: $153 million over four years to 2000/01.
- For scoping and initiating international collaboration: *Technology Diffusion Program* of the Commonwealth Government: $108 million over four years to 2000/01.
- For business planning support: possible new funds resulting from the *National Innovation Summit*, Canberra, February 2000.

SWOT Analysis

Strengths	Weaknesses
WA resource sector operates at world's best practice and is globally oriented.	Western Australia has a narrow economic base dependent on commodities.
WA ICT companies have relatively strong export performance earning more than twice the national average from overseas.	Western Australia has a good track record of innovation....as with the rest of the country, it has an appalling record in commercialisation..
Distance/isolation create imperative to seize opportunities enabled by ICT.	The value of resource commodities has been falling over time and continues to fall.
Strong technical base, with a well educated, English-speaking workforce.	The State Government accounts for 40 per cent of Western Australia's ICT consumption.
Time Zone precisely eight hours from the UK and the west coast of North America.	Australia is a heavy consumer of (predominantly imported) ICTs not used very productively.
Strongest growing State economy, although exports are dominated by resources.	Massive trade imbalance in ICTs without always generating the productivity returns.
Attractive physical environment.	Australia has an extremely low level of ICT exports.

Opportunities	Threats
Social and Economic: The transition from a provincial to a global perspective on the part of the business community and government.	Attracting venture capital for ETM start-ups is difficult in Australia but improving.
Technological: To reconceptualise the Resource Industries as heavy users of information and that this can become the foundation of a business(es) in its own right..	Western Australia is a significant exporter of highly skilled talent. This is also an opportunity if the venture capital can be attracted
Environmental: Address impact of ICT's on WA's physical isolation, particularly re effect on various industries' value chain and building online relationships for social and global business development.	Multi National Corporations (MNCs) dominate Australia's Information Industries. The global information economy will be made up of big winners and big losers.
Political: Encourage Federal Government to reframe Taxation and Industry Policies to account for Global information economy.	Globalisation is driving increasing levels of competition in all markets.

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

One of the notable trends in world trade is the long-term decline in the share of natural resource-based products vis-a-vis engineered products. ETMs have been the major source of growth in world trade for the past 50 years. And yet commodities still dominate Australia's exports. This means that our exports are not providing us with the same level of growth opportunities that ETM exports are providing to other countries and would provide to Australia if it were a significant exporter of ETMs.

Moreover, prices fetched on world markets for natural resource-based products are falling vis-a-vis those fetched by ETMs. As a result, the things Australia is exporting are earning less and less on world markets, while the things we are importing are costing us more and more. Compared to the mid 1960s Australia now has to export 50 per cent more commodities (by volume) to be able to afford to import the same volume of manufactures. (Source: AEEMA 1997 Submission to the Information Industries Taskforce, Australian Electronic Equipment Manufacturers Association, Canberra).

Revenue by sector in the Western Australian Information Technology Industry: 1992-93

	Sales $m	% Total	Staffing (exc admin.)	% Total	Revenue/ employee - $'000s
Manufacture of IT equipment	69	21	400	23	172.5
Prod'n of software	40	12	560	32	71.4
Distribution of IT products	116	36	270	15	429
Provision of IT services	97	29	520	30	186
Provision of services through IT	7	2	not known	-	-
TOTAL	**329**		**1750**		**188**

Source: Information Technology Industry and Market Survey - Western Australia, EIIC, 1995

Information technology and telecommunications industry breakdown, 1997-98

Industry class	Revenue $billion	5-year growth % pa	Value added $billion	Employment (' 000)	Establishments (number)
Computer and business machine manufacturing	1.3	-3.5	0.23	2.8	155
Telecom equipment manufacturing	2.73	1.4	1	8.1	160
Other electronic equipment manufacturing	2.42	5.8	0.88	11	400

Source: Phil Ruthven, IT&T, galloping into the future, BRW. 1999.

The Western Australian ICT-based industry is 0.1 per cent of the global industry.

Potential to Capture Market Share

The assessments provided in the following are drawn from the recently released report *From Mines to Minds: Western Australia in the Global Information Economy* (Western Australian Technology & Industry Advisory Council (TIAC), 1999).

Developed economies are moving into the fastest growing sectors - information and knowledge-based industries and ETMs. ICTs are significantly changing the relationships between regions; between centralisation and decentralisation.

Although a small section of a very global sector, the WA industry has developed a number of strong niche areas of expertise. In 1995-96 the local industry had revenues of just over $2.8 billion, more than half of this from telecommunications services.

The 400 IT and multimedia firms in WA include multinational and local companies involved in the manufacture, development or wholesaling of equipment, software or services in which the primary product is the delivery of information processing, multimedia or communications. Of these about two thirds are locally owned, the remainder is either owned by overseas or east-coast interests. Despite this, the bulk of the revenue earned by the industry (52 per cent) was earned by non-WA enterprises.

Compared to other Australian ICT companies the Western Australian firms tend to be more export oriented. The multi-national companies tend to do little exporting from Australia and that which is done is managed from either Sydney or Melbourne. Twelve per cent of the state industry's revenues come from overseas sales, while the national figure was only 5.6 per cent.

ICTs contribute to the productivity of industries across the economy. Australia already has a large and growing trade deficit in them as well even though it is well recognised that strategically the information industries are central to raising the speed limit to growth.

Availability of Skills

The TIAC report notes that there is no current data available to identify major clusters within the local ETM-ICT industry.

However, it is clear that the state has strong existing companies and research organisations working in imaging (for a variety of applications) and in aspects of communications, particularly wireless and broadband telecommunications.

Research undertaken in 1994-95 identified imaging, advanced communications and multimedia as areas of greatest interest to the Western Australian industry. Much of the work being done in each of these areas within the state is globally significant with commercial and research links overseas.

Other firms are recognised global players in smart cards and EFTPOS technologies, RF systems, security, phone traffic management, intelligent home systems and various other technologies. Further work needs to be undertaken, and maintained on a continuing basis, to track these industry clusters.

Estimated Number of Jobs at St Andrews

Detailed data on WA's ETM and ICT industries is not available (TIAC, 1999). This report recommends that the State Government undertake feasibility studies of the potential costs and benefits of attracting:

- A semiconductor fabrication plant to the State.
- A short-run, contract manufacturing plant to the State to assist in the development of ETM enterprises.

The attraction of the fabrication plant to St Andrews would result in a step increase of between 1,000 jobs for a small plat to 5,000 jobs for a major plant. The latter would also lead to major job opportunities. Over the 25 years of the project it is reasonable to assume that St Andrews will attract 2,000 jobs in ETMs, particularly if it achieves the progress projected in educational and research-based enterprises.

A growth scenario to a total of 2,000 jobs is projected as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
100	**500**	**1,500**	**2,000**
Initial			Full capacity

Estimated Average Wage or Salary Level

Consideration given by Intel in 1998 to $US3bn-plus investment in building a fabrication plant in Australia, produced estimates that even a $US1bn plant would generate exports of $US750m a year and create more than 1,000 skilled jobs.

Given revenues of $750,000 per employee and a return on salary of 7:1 would result in an average salary level of around $100,000.

The study by Allen Consulting (Allen Report, 1998) supporting these estimates assessed that while revenue per employee in the tourist industry is about $20,000, a state of the art semi-conductor fabrication plant would generate up to $1m per employee and single-handedly boost national productivity levels.

Market Size for St Andrews

Based on the above projection of $750,000 revenue per employee the estimated potential annual revenue would be:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$75 million p.a.	**$375 million p.a.**	**$1.125 billion p.a.**	**$1.5 billion p.a.**
Initial			Full capacity

Potential Scale of Development at St Andrews

Assuming investment in ETMs in general is in the same ball-park as the outlays for fabrication plants, an investment of about $2 billion would be required to sustain the foregoing job levels. Growth to this scale of development in proportion to the growth in jobs over a 25-year period is shown below:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$100 million	**$500 million**	**1.5 billion**	**$2 billion**

Commencement Date for New Infrastructure at St Andrews

It is possible that one or more medium sized ETM-based enterprises could be attracted to St Andrews bringing several hundred jobs before 2005 if the type of telecommunications infrastructure foreshadowed in the enterprise-cluster *Infrastructure & Construction (including Network University)* infrastructure was available in advance.
Synergies with the *Biotechnology, Health and Medical* cluster could accelerate the establishment of ETM and ICT enterprises. This is outlined in the *Biotechnology* cluster.

Commencement Date for Start of Operations at St Andrews

Initial construction would occur over 12 months enabling commencement of jobs and activities between 2003 and 2005.

Timing to Reach Full Capacity in Operations

If St Andrews is particularly successful in attracting ETM enterprises then the 2,000 job level could be passed much earlier than 2025. For example, the Allen study noted the tendency for cluster developments of ETM enterprises including fabrication plants and outlined how five major plants would generate about 25,000 jobs.

Current Technology Base at St Andrews

Very little of the current activities would contribute to the required technology base.

Current Process Base at St Andrews

Apart from the availability of optical fibre cable in some areas to support advanced telecommunications there are virtually no process structures relevant to supporting ETM enterprises currently evident at St Andrews.

3.10 Value Adding to Natural Resources

Description of Enterprise/Cluster

St Andrews has potential to develop a cluster of enterprises that add value to a range of Western Australia's natural resources including fibre, timber products and food. St Andrews is reasonably placed to access a vast range of natural resources including seafood, cereals, wool, timber and meats.

Primary industries such as agriculture and forestry create value from natural resources. In a few instances, the primary products created are sold directly to final consumers as primary products, or to another industry as raw materials. The second industry uses factors of production plus other purchased inputs to *add value* to the raw materials. This creates a final product for consumers, or an intermediate product for a third industry. There may be several more intermediaries before the product reaches the final consumer. Each adds value by combining factors of production with intermediate products or raw materials.

Value adding activities at St Andrews could draw on the experiences gained by the Study Tour during their visit to Kalundborg, Denmark where by-products of one commercial process became inputs to others.

Possible Proponents

Public Sector
- Department of Commerce and Trade
- Agriculture Western Australia
- Department of Resources Development
- Small Business Development Corporation
- TAFE Colleges

Private Sector
- Small and medium enterprises
- Farmers and graziers, horticulturists
- Aquaculture operators
- Smallgoods manufacturers
- Weavers
- Caterers

SITUATIONAL ANALYSIS

Enterprise and Cluster Option Information

Major Performers

Australian	Overseas
· Heinz · San Remo Pasta · Poachers Pantry · Manjimup Syndicate Coolstores Ltd · Jensen Jarrah Pty Ltd · Visy Paper	· Kraft · Nestles · Nabisco · Kimberly-Clarke · R J Renyolds

Major Development Areas

- Industrial areas of St Andrews and region.

Major Funders

- Small and medium enterprises
- Investors
- Primary Producers

SWOT Analysis

Strengths	Weaknesses
WA has a diverse range of natural resources that can be value added to.	Industry sector consists of many small enterprises -can lack cohesion among key participants.
Significant market in Perth for value added products, plus export potential	Difficulty in funding start-up / new businesses
Good skills base exists	
High levels of access to production areas such as Swan Valley, Gingin horticulture, etc	

Opportunities	Threats
To develop eco-industrial synergies between value adding activities	Environmental impacts of some value adding activities
New products for export to Asian markets seeking Western-style convenience foods	South West Western Australia has similar advantages
Availability of labour at St Andrews	

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

The value adding to mineral and energy resources account for 54 percent of the $17.5 billion in total manufacturing turnover in Western Australia. Food and beverages, at 15.6 percent of turnover, comprises the second largest manufacturing subgroup in the State.

Value-adding in WA Forests: Timber Products

Western Australian timber and timber products are winning admirers and opening up important new markets for value-added products. In fact, they have the capacity to be counted among the most highly valued timbers in the world.

The beauty and diversity of WA's native hardwoods result in a range of high quality products and particularly fine furniture. This, in turn, leads to them replacing imported timbers such as cherry wood and oak, and creating more local jobs in our timber processing industries.

Karri, for example, has always been renowned as a great structural timber, but seasoning, machining and gluing difficulties have led the manufacturing industry to overlook it for use in fine furniture production. CALM's Wood Utilisation Research Centre at Harvey, however, has overcome those problems with research into kiln drying techniques, adhesives and dressing, sanding and finishing processes.

Marri has also been ignored because of its extensive bloodwood gum veins and imperfections. However, these are now being recognised as selling points and artistic features, creating highly valued products.

The research which has produced marri and karri timber suitable for furniture making represents a significant step towards increasing the value of WA's native hardwoods.

A special karri and marri network is being established with timber and furniture industry input to develop market opportunities. One avenue could be the use of the species in furniture, flooring and profiled mouldings highlighting the beautiful golden tones of marri and the reddish brown hues of karri.

The industry's value adding average is now around 52 per cent for jarrah sawlogs, ahead of the 1997 target to add value to 50 per cent of the jarrah sawlog resource.

WA's native hardwoods traditionally have been used for structural timber, but in the past 10 years there has been a major change towards the production of high quality wood products.

For example, 10 years ago less than 10 per cent of jarrah timber was converted into high value timber products whereas today the average is just under 52 per cent and some bigger mills are value adding more than 80 per cent of the jarrah timber they produce.

It is now mandatory for sawmillers to maximise the quality of the products they produce from native hardwoods.

Examples of fine furniture from Western Australian timber are at:

http://www.e-world.net/~raytech/jensenjarrah.htm

Agriculture

In 1997/98, Western Australia's production of agricultural commodities totalled $4.2 billion with wheat accounting for 37 percent of agricultural output. The State is also a major producer of fisheries and aquaculture with output valued at over $A538 million in 1997/98.

Market reforms and significant growth in world consumption mean the potential exists for agricultural exports to increase in value to more than $8 billion in nominal terms within 10 years.

Individual agricultural sub-industries include the Western Australian Flour industry which produces 150,000 to 170,000 tonnes of flour for the domestic bakery industry, the Western Australian Pig industry which is relatively small now at 36,400 tonnes of carcass meat, but which is planned to triple in scale to 91,000 tonnes of pig meat by 2001. Of this volume, some 35,000 tonnes is planned to be exported..

Horticulture and floriculture offer significant opportunities to value add. AgWest provide strategic assistance in many forms including the provision of contacts of growers, exporters, marketing and business services.

Examples of value adding include *Noodles Australia*, a firm owned by two Western Australian wheat farmers that is making a success of exporting fresh and frozen noddles to restaurants and supermarkets in the US, Canada, Malaysia, Singapore and across Australia, see Commerce and Trade News, Vol. 4, No. 4, October 1999.

The development of Gnangara Park, including the re-vegetation of 23,000 hectares of pine may also open up additional opportunities for value adding at St Andrews.

Overall, the potential market for value adding to natural resources in Western Australia is several billions of dollars per annum.

Market demand for natural resource value added products is being fostered through marketing and promotion activities. For example, the 12 day *Land of Plenty* exhibition held in London and Manchester in September and October 1999 showcased more than 100 products from 50 Western Australian food and beverage companies. Products included wine, beer, seafood, coffee, meat, bread, fruit, vegetables, and processed products. This exposure to the British and European markets was supported with a special Western Australian cookbook, a wine and food trade exhibition at Australia House and three Western Australian chefs.

Potential to Capture Market Share

The IDEA Project provides the framework to attract industry and enterprises to St Andrews, as it develops over time. Appropriate marketing to targeted value adding activities would be likely to generate significant demand for premises in which to value add to Western Australia's natural resources including fibre, timber products and food products.

The St Andrews location provides good access to a number of the State's natural resource production areas including the Swan Valley, Gnangara Park, the northern sections of the Avon Arc and into the Wheatbelt and beyond.

The preparation of a master plan for a purpose designed *Value Adding to Natural Resources Estate* with infrastructure designed to facilitate the easy movement of one activity's by-products to another activity as an input to their production cycle would be likely to have strong market appeal.

Availability of Skills

Western Australia has demonstrated strong capacities in the various fields of value adding to natural resources for many years. This has led to the development of a workforce with high skill levels in all fields of relevance to value adding.

The multi-campus network of 16 TAFE Colleges underpins the on-going development of this skills base. TAFE works closely with industry to provide training that is relevant to today's needs.

Activities showing significant job growth over the past decade include fruit and vegetable processing (average growth 9.6% pa), Tobacco product manufacturing (average growth 9.3% pa), specialised food retailing (average growth 4.4% pa).

Estimated Number of Jobs at St Andrews

It is estimated that the Value Adding to Natural Resource activities at St Andrews would be comparable in employment numbers to the Arts and Cultural Cluster, see section 3.7. The following table sets out the estimated numbers of additional jobs at St Andrews in value adding to natural resource activities

Five Years	Ten Years	Twenty Years	Twenty Five Years
155	**615**	**3,700**	**6,150**
Initial			Full capacity

Estimated Average Wage or Salary Level

It is estimated the average wage or salary for those employed in the Value Adding to Natural Resources cluster would be in the order of $35,000 per annum.

Market Size for St Andrews

A workforce of the level estimated would, at full capacity, support some 250 to 300 individual SME's. With a productivity factor of 3:1, the following table sets out the estimated market size for St Andrews.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$16.25 million	**$64.5 million**	**$388.5 million**	**$645.75 million**
Initial			Full capacity

Potential Scale of Development at St Andrews

The facilities required for the Value Adding to Natural Resources activities will range from home-based businesses undertaking small scale value adding to larger commercial and retail centres and warehouses.

Assuming 5% of jobs in Value Adding to Natural Resources activities require a home-based studio, (at $25,000 per person land and construction), 70% require commercial space (at $60,000 per person land and construction), and the balance of 25% require warehouse and storage facilities (at $70,000 per person land and construction) the following table estimates the scale of development at St Andrews in respect to the Value Adding to Natural Resources activities cluster.

Five Years	Ten Years	Twenty Years	Twenty Five Years
$9.5 million	**$37.5 million**	**$224.5 million**	**$372.5 million**
Initial			Full capacity

Commencement Date for New Infrastructure at St Andrews

To achieve additional employment opportunities in Value Adding to Natural Resources at St Andrews in five (5) years, additional development construction would need to commence in 2003.

Commencement Date for Start of Operations at St Andrews

Initial construction would occur over 12 to 18 months enabling commencement of the additional activities in 2005.

Timing to Reach Full Capacity in Operations

It is likely the development of Value Adding to Natural Resources will progress at a rate paralleling the rate of population growth. On this basis, full capacity will occur with the completion of the project in 2026.

Current Technology Base at St Andrews

Some members of the existing population at St Andrews are likely to currently undertake some limited value adding to natural resources. However, the potential growth of Value Adding to Natural Resources at St Andrews indicates a significant increase in the relevant technology base will be required over time.

Current Process Base at St Andrews

Virtually no Value Adding to Natural Resources process structures are currently evident at St Andrews.

Current Human Resource Base at St Andrews

The potential growth of Value Adding to Natural Resources at St Andrews indicates a significant increase in the relevant human resource base will be required over time.

Current Distribution Base Available at St Andrews

Virtually no Value Adding to Natural Resources distribution bases are currently evident at St Andrews.

3.11 Biotechnology, Health and Medicines

Description of Enterprise Cluster

The description of this cluster is drawn from reports of Biotechnology Australia, an initiative of the Federal Government announced in the 1999-2000 Budget.

What is Biotechnology?

Biotechnology is a broad term covering the use of biological discoveries for the development of industrial processes and the production of useful organisms and their products. Uses include the production of foods and medicines, the reduction of wastes and the creation of renewable energy sources.

Biotechnology, in the form of traditional fermentation techniques, has been used for decades to make bread, cheese or beer. It has also been the basis of traditional animal and plant breeding techniques, such as hybridisation and the selection of plants and animals with specific characteristics to create, for example, crops that produce higher yields of grain.

Gene technology is a specific subset of biotechnology, based on the manipulation and modification (recombination) of the genetic material of living organisms to develop new characteristics, processes or products. The products of modern biotechnology include new vaccines, pharmaceuticals and diagnostic tests, pest resistant crops, and foods with improved nutritional qualities as well as new bio-processing technologies for industry and mining.

Biotechnology: Current and Potential Biotechnology Applications

An indication of the applications of biotechnology in addition to health and medicines follows:

Health
- More specific therapeutics with minimal side effects, developed through a better understanding of disease.
- New and improved vaccines and diagnostic tests.
- Improved production of pharmaceuticals and novel therapeutics.
- Testing and treatment for genetic diseases.

Agriculture
- Improved food storage and nutritional quality.
- Improved pest and disease resistance.
- Selective herbicide tolerance.
- Tolerance of water, temperature and saline extremes.
- Domestication of new wild or non-commercial plants.
- Vaccines and diagnostic tests for animal diseases.
- Production by plants or animals of speciality chemicals and novel products (therapeutics, and ingredients for oils and plastics).
- Improved animal welfare.
- Higher yields and quality.

Forestry
- Faster tree growth.
- Improved fibre and wood quality.
- Disease resistance and saline tolerance.
- Improved enzymatic treatment of pulp and processing wastes.

Mining
- Leaching of ores
- Mine site rehabilitation

Manufacturing/bioprocessing
- Improved production of high value products. (e.g. Pharmaceuticals and flavours).
- Production of gas, liquid fuels and commodity chemicals.

Environment
- Bioremediation of heavy metals, oil and chemicals.
- Conversion of waste to energy.
- Contaminant testing.

Food Processing
- Improved quality

Beverages
- Improved maturation and preservation techniques.
- New and novel foods.

Marine biotechnology
- New pharmaceuticals, enzymes and biomolecular materials (e.g. Bioceramics).

Aquaculture
- Biomonitors (e.g. via bioluminescence)`
- New and improved varieties and management of aquaculture

Biotechnology and Medicines

Biotechnology has been used for more than a decade to create therapeutic medicines for both people and animals. Medical biotechnology offers the prospect of new and improved pharmaceuticals to address major diseases, improved methods of diagnosis and improved preventive medicines. Human therapeutics also offers opportunities for containing health costs in the future and improving the quality of life of the aged and infirm.

Biotechnology is being used to make quicker diagnosis of diseases and to make medicines more effective. For example, insulin for diabetics is now made in laboratories using biotechnology. It may also be used in diagnosis and treatment of diseases such as cancer, asthma, arthritis, malaria, hepatitis, HIV/AIDS, Alzheimer's disease and cardiovascular disease.

Gene technology is also used in tests that quickly diagnose infectious diseases in humans (and animals) and in developing new vaccines to protect against diseases.

Frontiers

It is the view of many thinkers that genetic technologies will overwhelm all other technologies, including information technologies, in the 21st century. In the recent book High Tech High Touch, John Naisbitt and his co-writers observe that:

> *Not since splitting the atom have we developed such consequential technologies. Nuclear power gave us the power to destroy mankind. New genetic technologies give us the power to create life from death; to create new hybrids between genuses, not simply between species; to rejuvenate and adult cell to a primordial cell; and soon to direct human evolution itself.*

Possible Proponents

Public Sector

- Biotechnology Australia.
- Public research enterprises/units participating in the Medical Sciences and Technology centres of the Australian Cooperative Research Centres (CRCs)

Private Sector

- Major biotechnology enterprises in Australia.
- Australian Biotechnology Association
- Private research enterprises/units participating in the Medical Sciences and Technology centres of the Australian Cooperative Research Centres (CRCs).
- Santen Pharmaceutical Co. Ltd, Nara R&D Center, Kansai Science City.
- Research and Education Center for Genetic Information, Nara Institute of Science and Technology, Kansai Science City.

SITUATIONAL ANALYSIS

Enterprise and Cluster Option Information

Major Performers

Australian	Overseas
· Major players: Australia Wide Industries; Biota Holdings; Biotech Australia; Biotech International; CSL Ltd; FuCell; PanBio Pty Ltd; Progen Industries · SMEs: AMRAD Operations P/L, AMRAD Biotech Peptech Ltd.	· Glaxo Wellcome · Roche Bioscience · PanVera · Telluride Pharmaceutical Corporation

Major Development Areas

Biotechnology enterprises would most likely cluster with the appropriate health R&D enterprises within the proposed Health Campus-Community.

A major attractor would be the establishment of world-class recreation and fitness building facilities and resort-based accommodations targeting the differing needs of different age groups. Such a complex might also attract a major world-class private hospital and could be used to attract business people from the Asia-Pacific region recuperating from major illnesses treated in Australian or overseas health facilities. The latter could be supported by tele-medical facilities based in St Andrews and backed up by the Network University - see enterprise cluster *Infrastructure & Construction (including Network University)*. These business people on return to health and fitness could be invited to consider major investment opportunities in St Andrews in general and biotechnology enterprises in particular.

Synergies could also be created with enterprises in the *Endogenous Self-Containment* and *Value Adding to Natural Resources (exogenous)* clusters in relation to the production-preparation-packaging of advanced foods for hospitalised and recuperating patients.

Major Funders

- Biotechnology Australia is an initiative of the Federal Government announced in the 1999-2000 Budget. The announcement includes details of funding, development of a National Biotechnology Strategy, a public awareness program and a new system of regulation of gene-technology.
- International and biotechnology companies.
- Financial institutions and venture capital

SWOT Analysis

Strengths	Weaknesses
Australia has very strong intellectual property and resources in biotechnology, biological sciences and medical science and technology.	WA has next to no presence in the 11 Medical Science and Technology CRCs. UWA is a participant in the CRC for Asthma.
High standard of intellectual property laws	WA has a good track record of innovation....as with the rest of the country, it has an appalling record in commercialisation..
Available pool of specialist scientists and biotech technicians	Major structural problems in Australian financial and legislative environments.
Practical recognition from all governments.	
Attractive physical environment.	

Opportunities	Threats
The lack of a WA participation in 10 of the 11 Medical Science and Technology CRCs could be an opportunity for St Andrews if the proposal for a Health Campus-community and world-class resort-recreation-medical-recuperation complex took off.	Australian Biotechnology Association submission to the 1997 Mortimer report claimed that biotechnology companies in Australia are starved of investment. "Indeed, one is tempted to assert that Australia is not just performing poorly in biotechnology, but that we are in fact in crisis.
Biotechnology is opening a window for the export of non-genetically modified foods from Australia	Australia is a significant exporter of highly skilled talent. This is also an opportunity if the venture capital can be attracted to facilitate the return of this talent.
Signs that the new GST regime is encouraging overseas corporations form investment alliances with Australian inventors and researchers.	Multi National Corporations dominate Australia's fledgling biotechnology industries.
Political: Encourage Federal Government to reframe Taxation and Industry Policies to account for Global information economy.	Globalisation is driving increasing levels of competition in all markets.

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

World sales of biotechnology products are estimated at about $15 billion, with health care accounting for about 90% of that. It is estimated that the global market for biotechnology application will be about $80 billion by 2005.

The impact of biotechnology is forecast to be equivalent to that of the information and communications industries.
There are more than 180 businesses engaged in biotechnology in Australia. Australia's biotechnology enterprises are predominantly small in size, the only large businesses being subsidiaries of multinationals. With a small domestic market and highly specialised products, most have a global orientation and more than three-quarters are exporters.

There are more than 60 companies in Australia working specifically on medical biotechnology. Some are subsidiaries of multinational corporations and some are 'home grown' Australian businesses. As an example, Biota is an Australian company that has concentrated on the development of treatments for influenza and the common cold. Its patented product 'Relenza', has been approved as a flu treatment in over 25 countries. Biota has also created BTA 188 as a treatment for the common cold.

Transgenic seeds and genetically modified foods have grown rapidly in North America and Argentina opening markets for non-genetically modified foods from Australia to global consumers concerned about adverse health impacts of genetically modified foods. This will include markets in North America.

Potential to Capture Market Share

The Australian Biotechnology Association in its submission to the 1997 Mortimer Inquiry pointed out that "While Australia has been well placed technologically in biotechnology it is missing the boat with respect to commercialisation. There are major structural problems in our financial and legislative environments that adversely affect the creation of companies, jobs and wealth, not only in biotechnology but in the commercialisation of most high technology."

Institutional aversion to financial risk is a significant impediment to Australia capitalising on its own breakthroughs in biotechnology. However, a recent surge of interest in developing Australia's' biotech industry could lead to greater self-sufficiency and less offshore drift as promising companies chase investment capital. The 1999/2000 budget has allocated an extra $614 m funding for the National Health and Medical Research Council and a $20m commitment to existing research centres and new "centres of excellence".

The Ralph Report and the reformation of Australia's capital gains tax regime should avoid the triggering of a tax debt when a biotech group brings in an equity investor and transfers assets to a new joint equity.

Availability of Skills

Australia has strong intellectual property and resources in biotechnology, biological sciences and medical science and technology. It also has high standard of intellectual property laws and a significant available pool of specialist scientists and biotech technicians.

Biotechnology research in Western Australia is focussed on agriculture, primarily conducted by the WA State Agricultural Biotechnology Centre (SABC), a major research centre located on the Murdoch University campus. The SABC has access to special purpose software and major databases provided by the Murdoch Bioinformatics Research Group (MBRG) and the Australian National Genome Information Service.

MBRG collaborates with the Department of Clinical Immunology (DCI) at Royal Perth Hospital. This has enabled the combined purchase and maintenance of bioinformatics software. MBRG's establishment was endorsed by its inclusion in the 1997 application by the SABC to the WA Department of Commerce and Trade for a "Centre of Excellence".

Estimated Number of Jobs at St Andrews

Biotechnology employment is growing at a compound rate of 10 to 20 per cent per annum globally. In some regions it is growing faster. In 1997, Europe experienced a 42 per cent increase in employees in entrepreneurial life science companies. If Australia's biotechnology industry emulates the growth experienced in other countries, a conservative estimate of new employment by 2005 would be around 5000 highly skilled and qualified people. Growth of 15 per cent per annum would result in over 80,000 skilled and qualified people working in the biotechnology industries in Australia.

WA will have to greatly increase its presence in biotechnology research to have any prospect of attracting enterprises that will ensure its inclusion in the post-informational industry era. Should it do so and St Andrews provides a lead in this regard then it should be possible for St Andrews to attract 2,500 of these jobs in human therapeutics, possibly much larger.

A growth scenario to 2,500 jobs in biotechnology is projected as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
150	**750**	**2,000**	**2,500**
Initial			Full capacity

The employment multiplier from the application of biotech is 15 ("The great biotech breakthrough", Overseas Trading, November 1999). It is assumed that at least 1 in 15 is other high-income jobs such as those employed by world-class recreation and fitness building facilities, resort-based accommodations targeting the differing needs of different age groups, and a major world-class private hospital.

It is assumed that the resulting 2,500 jobs leveraging from human therapeutics base would grow as above:

Five Years	Ten Years	Twenty Years	Twenty Five Years
150	**750**	**2,000**	**2,500**
Initial			Full capacity

Job growth in total would then be as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
300	**1,500**	**4,000**	**5,000**
Initial			Full capacity

Estimated Average Wage or Salary Level

The biotechnology industry involves high intensity research and development, changes rapidly and employs a large proportion of highly qualified people. The range of skills required includes not only research and development functions, but also financial management, intellectual property management, marketing and others.

Currently, 30 per cent of staff in the Australian biotechnology industry are involved in research and development. In North America, the trend is for a higher intensity of research and development.

It is assumed that salaries for those working in biotech and highly skilled professions that immediately leverage from this will range from $50,000 to $250,000 per annum with an average of around $100,000. This level will be required to retain such highly skilled people in Australia.

Market Size for St Andrews

Revenues of well in excess of $750,000 per employee in biotechnology are likely. Assuming the lower figure suggests a growth in biotech market size at St Andrews as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$112.5 million p.a.	**$562.5 million p.a.**	**$1,500 million p.a.**	**$1,875 million p.a.**
Initial			Full capacity

It is assumed that revenues about half the above rate would be achieved from the highly skilled jobs leveraged from the jobs in human therapeutics, suggesting a growth in this market size at St Andrews as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$56 million p.a.	**$350 million p.a.**	**$750 million p.a.**	**$925 million p.a.**
Initial			Full capacity

Growth in market size in total would then be as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$168.5 million p.a.	**$843.5 million p.a.**	**$2,250 million p.a.**	**$2,800 million p.a.**
Initial			Full capacity

Potential Scale of Development at St Andrews

An outlay of about $100,000 per employee would be required for buildings, facilities and equipment in human therapeutics yielding a growth in the scale of development as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$150 million	**$750 million**	**2,000 million**	**$2,500 million**

Assuming an outlay of $50,000 per employee for the directly leveraged jobs, the growth in the attendant scale of development is as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$75 million	**$375 million.**	**$1.0 billion**	**$1.25 billion**
Initial			Full capacity

Total growth in the potential scale of development would then be as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$225 million	**$1.1 billion**	**$3.0 billion**	**$3.75 billion**
Initial			Full capacity

Commencement Date for New Infrastructure at St Andrews

The world-class resort, recreation and recuperation facilities and private hospital would be a major attractor of enterprises in human therapeutics. It may even be possible to get some companies operating from St Andrews before these facilities are available. Construction activities could commence as early as 2002

Commencement Date for Start of Operations at St Andrews

Initial construction would occur over 12 months enabling commencement of jobs and activities by 2003.

Timing to Reach Full Capacity in Operations

If St Andrews is particularly successful in attracting human therapeutics enterprises then the 5,000-job level could be passed much earlier than 2025. Indeed a much higher level of highly skilled jobs than projected above could be leveraged from a base of 2,500 jobs in human therapeutics.

Current Technology Base at St Andrews

Very little of the current activities would contribute to the required technology base.

Current Process Base at St Andrews

Apart from the availability of optical fibre cable in some areas to support advanced telecommunications there are virtually no process structures relevant to supporting human therapeutics enterprises currently evident at St Andrews.

3.12 Infrastructure and Construction (including Network University)

Description of Enterprise/Cluster

The 3Ts - Transport-Telecommunications-Trade

Leading-edge Transport (1st T) and Telecommunications (2nd T) are necessary but not sufficient conditions for world-class performance in Trade (3rd T). The significance of the 3Ts has long been recognised by the most dynamic and progressive trading regions of the world. In her presentation to the recent *Future Perth Economy Conference*, Barbara Lepani had this to say:

> "Because of the importance of time-based competition in the new global economy of increasing technological convergence, telecommunications and transport infrastructure are now the critical elements of urban efficiency. It is the cost and ease of access to data highways and the time of travel between international airports, hotels and business deals which drives the location decisions of higher order functions, as opposed to cheap disciplined labour which attracts volume manufacture. However while technological diffusion will also see a convergence in these basics of the world city, the critical X factor will be lifestyle and urban amenity and it is here where Australia must compete."

In this enterprise cluster consideration is given to the jobs and scale of development in providing conventional transport and telecommunications systems, electricity, gas, water and sewerage, residential construction, and education, health, community, recreation and other public facilities for a development the size of St Andrews. Employment and development costs for commercial and industrial construction is embedded in the profiles for the other enterprise clusters.

Consideration is also given to the jobs and scale of development in providing a telecommunications infrastructure, including the progressive establishment of a *Network University*, which would be beyond world's best practice.

Infrastructure Planning

Considerable transport planning has already been undertaken for St Andrews. Plans link St Andrews to the rest of the north-west corridor of Perth via the extension of regional distributor roads from the south. These comprise Marmion Avenue and the Mitchell Freeway that would be linked with the area by a system of east-west distributor roads. In the short term access to areas of further development would be via the existing roads which service the area; Wanneroo Road, Yanchep Beach Road and Two Rocks Road.

Road transport planning within the site has included a distributor road system, network analysis including assessments of freight movements, a public transport system, including integrated rail and bus networks, and a pedestrian and cycle network. In broad terms the distributor road system would comprise a series of north-south regional distributors; Mitchell Freeway, Marmion Avenue, Two Rocks Road, etc., linked by east-west district distributors; Yanchep Beach Road, Sunset Drive etc. The planned northern section of the Mitchell Freeway has been aligned with the Tokyu property to meet with the Perth-Lancelin Highway just north of the metropolitan boundary.

Planning has also been undertaken for a railway reservation to provide for the future extension of the northern suburbs rail line through the St Andrews area. The reservation runs north-south roughly bisecting the Tokyu property.

The existing telecommunications development at Yanchep and Two Rocks is serviced by exchanges at each location and the main cables from the south along Wanneroo Road, Yanchep Beach Road and Two Rocks Road. The cables have recently been upgraded to optical fibre and will provide significant spare capacity for future growth.

Other public utility services; electricity, gas, water and sewerage could be provided to serve urban development through expansion of the existing services both locally, in the short term, and from the south, in the longer term.

The Network University

The proposed *St Andrews Network University (SANU)* would focus on providing the basis for St Andrews to develop a learning culture, supporting and nourishing multi-layered networks of communication and learning. This would build links between research, education and training organisations (in the campus-communities and public and private enterprises in general) and commercial enterprises, using the purchasing power of government to support local enterprises in developing world's best practice, and so driving innovation through customer demand.

SANU would operate as a virtual university with staff located at many advanced telecentres throughout St Andrews. Each telecentre would be supported by computer-assisted-design video-conferencing (CAD-V) facilities. CAD-V is an extrapolation of the more common video-conferencing that facilitates collaboration between individuals and teams in different locations through dual or multiple control of CAD-V facilities, interactive computer modelling, video, audio channels, scanning and online electronic whiteboards.

Each telecentre would have 50 or more highly skilled information and telecommunications technologists. A core facility in each centre would be a theatre providing the facility for up to 100 participants in CAD-V sessions. Some 40 centres are envisaged to service the following:

- One centre per 10,000 residents, particularly those involved in the activities profiled in the *Endogenous Self-Containment* cluster - i.e. 15 centres.
- Two centres in each of the five campus-communities profiled in the *Educational Campus-Communities* cluster - i.e. 10 centres.
- Five centres supporting international R&D as profiled in the enterprise-cluster *Research – St Andrews/Kansai/Hyogo Links.*
- Five centres supporting other research-based enterprises throughout St Andrews.
- Five centres supporting clusters of medium-sized enterprises throughout St Andrews.

Many large companies operating from St Andrews in the future would have these facilities in-house but this has been factored into the scale of development accounts for the other enterprise-clusters. They could, however, participate in collaborative programs within the *SANU* structure.

Possible Proponents

Public Sector
- Western Australian Government, including Ministry for Planning, Department of Transport, Office of Information and Communications of the Department of Commerce and Trade.
- Wanneroo Shire Council
- Australian Government
- Public infrastructure providers
- Public sector players in the CRC for Telecommunications headquartered in Perth
- Telstra

Private Sector
- Major developers
- Major building and construction companies
- Cisco Systems
- Private sector players in the CRC for Telecommunications headquartered in Perth
- Telstra
- Private infrastructure providers, including BOOT and BOO consortia

SITUATIONAL ANALYSIS

Enterprise and Cluster Option Information

Major Performers

Australian	Overseas
· ACT Electricity & Water (ACTEW)	· Tokyu Corporation
· Lend Lease	· Sophia Antipolis SAEM
· Delfin	· Bilfinger+Berger
· Civil & Civic	· Development Securities PLC
· John Hollands	· The Woodlands Operating Company
· Egis	· Egis, Tollway BOO projects

Major Development Areas

St Andrews area carrying all physical and social infrastructure, including the many locations for the proposed *St Andrews Network University*.

Major Funders
- Major developers
- Major building and construction companies
- Cisco Systems
- Private sector players in the CRC for Telecommunications headquartered in Perth
- Telstra
- Private infrastructure providers, including BOOT and BOO consortia

SWOT Analysis

Strengths	Weaknesses
Major land holding within metropolitan Perth	Few examples world wide of developed or even developing high amenity and high employment self-containment cities on the scale of St Andrews.
Detailed infrastructure planning by Ministry for Planning involving widespread consultation with residents.	Vision may be too visionary for Australia's risk-averse financial institutions and political pragmatists.
MOU between Tokyu Corp and Western Australian Government	Australia has missed the IT&T boat, is in danger of doing the same in biotechnology and may not see the point of getting behind a city-scale drive into e-commerce.
Tokyu Corp committed to major investment 25 years ago, have very significant global and Japan-based credentials as city-scale developers, transport systems providers and operators, telecommunications systems providers and operators, retail complex providers, entertainment complex providers.	In Australia, WA is least stimulated by benefits flowing from e-commerce. The greater use of e-commerce disadvantages mining. The benefits expected to be obtained in WA are offset somewhat by the reduction in mining in the state. See *E-Commerce - beyond 2000*, report on the economic impacts of electronic commerce commissioned by National Office for the Information Economy (NOIE)

Opportunities	Threats
Massive repeat business as city-scale developers by getting it right	Insufficient commitment by the Australian Government.
Accelerate Perth to global city status.	Insufficient interest by key financial institutions.
Demonstration of how to retain existing levels of urban amenity throughout a metropolitan region that is expanding rapidly on many development fronts.	Insufficient interest by key public and private sector organisations in Australia.
Make a major contribution to establishing Australia's credentials as a smart/clever country.	Insufficient interest by key public and private sector organisations internationally.

ASSESSMENT OF POTENTIAL MARKETS

Market Scale

Consideration is given in the enterprise-cluster *Export Leveraging* to the massive opportunities to export services up to and including the scale of planning and building of new cities throughout Asia and the world.

Consideration is given in the enterprise-cluster *Lead Professional Services* to studies funded by the *Better Cities Program* to consider and quantify the capacity and extent that innovative and planned urban development could have on private sector investment and employment generation.

After excluding State and local government expenditures that would have occurred in the absence of the *Better Cities Program* and expenditures that were re-allocated by postponing expenditure on other projects or the same projects in non-Better Cities strategy areas, the long-run or resource efficiency enhancement was conservatively estimated at:

- Increases in GDP of at least double the combined Commonwealth, State and local government expenditures.
- Average annual employment *increases* of between 5,000 and 12,000 jobs between the commencement of expenditure under the Program (1991/2) and 2009/10.

Allowing for the impacts of inflation, it is estimated that for each one billion dollars of urban development average annual increases in employment of 2,500 to 6,000 are generated.

While Australia has substantially missed the boat in the manufacturing of information and communication technologies it has the opportunity to be among the smartest of users of these technologies to support enterprise-to-customer and enterprise-to-enterprise e-commerce. The projected markets for both these forms of e-commerce are massive.

Potential to Capture Market Share

The successful development of the early stages of St Andrews will virtually guarantee the capture of contracts to plan and manage the development of projects up to and including the scale of city developments in Australia, Asia and the world.

St Andrews with an early commitment to and investment in the proposed Network University infrastructure would begin to establish itself as a major player delivering the systems required to achieve convergence in telecommunications, data systems technologies and creative content for advanced e-commerce. As such it could expect to capture a significant share in the rapidly increasing markets for e-commerce based trade and in so doing taking a lead for Western Australia and Australia.

Availability of Skills

Australia has the full gamut of skills necessary to deliver the outcomes planned for St Andrews. Delivery of the early stages of St Andrews will extend this skill base to capture global markets in sustainable urban development leveraging of the St Andrews's experience and outcomes.

Estimated Number of Jobs at St Andrews

Construction Employment

An estimate of the number of construction jobs in each period for the total development can be derived by applying the ratio of the Output per Construction Worker ($120,517 from the Western Australian I-O tables) and the cost of the incremental scale of development (i.e. for that period).

As estimated in the enterprise-cluster for *Lead Professional Services*, the scale of development projections in providing infrastructure for residential accommodation, schools, hospitals, other public buildings, roads, rail, conventional telecommunications networks, electricity, gas, water and sewerage is as follows:

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Scale of Development	**$965 million**	**$3.2 billion**	**$13.5 billion**	**$19.3 billion**

The incremental scale of development is as follows:

Incremental Scale of Development	**$965 million**	**$2.2 billion**	**$10.3 billion**	**$5.8 billion**

This leads to total employment in each period and an estimate for the average level of annual employment as follows:

	Five Years	Ten Years	Twenty Years	Twenty Five Years
Employment in period	**8,007**	**18,255**	**85,465**	**48,126**
Avg. Employment level	**1,601**	**3,651**	**8,547**	**9,625**

Network University

As noted above, 40 advance telecentres each providing 50 highly skilled jobs are envisaged.

The 2,000 jobs provided by the telecentres are assumed to build up as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
100	**750**	**1,500**	**2,000**

This leads to a total employment level in each period as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
1,700	**4,400**	**10,050**	**11,625**

Estimated Average Wage or Salary Level

Average salaries for construction workers from ABS 1996 data for the construction sector and adjusted for inflation is about $32,000.

Salaries for employees in infrastructure construction would vary from $50,000 to $1500,000 with an average of $50,000.

Market Size for St Andrews

Construction

The incremental scale of development costs provides the estimate for the market size for construction in each period as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$965 million	**$2.2 billion**	**$10.3 billion**	**$5.8 billion**

Network University

A productivity factor of 2.5:1 is assumed for the IT technologists generating a return per job of $187,500. It is likely to be very much higher than this figure.

This leads to a growth in market scale at St Andrews as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
18.75 million	**140.63 million**	**281.26 million**	**375.00 million**

The total market scale is as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$0.98 billion	**$2.34 billion**	**$10.58 billion**	**$6.18 billion**

Potential Scale of Overall Development at St Andrews

Construction

The potential scale of overall development at St Andrews, as considered in the foregoing, this is estimated to grow as follows

Five Years	Ten Years	Twenty Years	Twenty Five Years
$0.965 million	**$3.2 billion**	**$13.5 billion**	**$19.3 billion**

Network University

The estimated cost of $4.28 million for each of the 40 telecentres comprises:
- Computer labs for 50 technologists - $2.5 million
- Computers - $500,000
- High end servers - $500,00
- Bandwidth costs - $500,000 per annum
- CAD-V centre seating 100 participants - $180,000
- CAD-V equipment - $100,000

This leads to a scale of development cost for the Network University as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$8.56 million	**$64.20 million**	**$128.40 million**	**$171.20 million**

The total scale of development costs for each period is projected as follows:

Five Years	Ten Years	Twenty Years	Twenty Five Years
$0.985 billion	**$3.3 billion**	**$13.8 billion**	**$19.7 billion**

Commencement Date for New Infrastructure at St Andrews

To achieve a construction work force level of over 1,500 by 2005 large scale infrastructure construction activities would need to commence by 2002.

Commencement Date for Start of Operations at St Andrews

Major infrastructure facilities would become available from 2003. It would be possible to establish a telecentre delivering CAD-V capabilities supporting the construction effort and to serve as an attractor for high tech business as early as 2001.

Timing to Reach Full Capacity in Operations

Completion of the infrastructure construction program for a resident population of 150,000 at St Andrews is planned for 2025. Full capacity would be reached as the development moves towards its completion in around 2020 to 2026. Preliminary planning consideration is being given to larger residential populations being accommodated in the same time frame.

The commencement of telecentres is likely to grow at the same pace as the overall development of St Andrews. The role and physical layout and fit-out of these centres will change markedly over time. It is likely that much greater capacities to communicate will be realised for the outlays projected above for each period.

Current Technology Base at St Andrews

There is probably very little of the technology base required for construction available at St Andrews. The availability of optical fibre cable at Yanchep and Two Rocks means that telecentres could be established rapidly.

Current Process Base at St Andrews

There may be some construction process structures available but it is unlikely that this would include processes for telecommunications installation.

Current Human Resource Base at St Andrews

There is a possible skill base to contribute to the construction program and there may be a number of IT technologists operating locally.

Current Distribution Base Available at St Andrews

None known of.

ANNEX A: SOCIAL BENEFIT COST MODEL

This annex is available on line as an Excel workbook.
http://www.ideaproject.com.au/public/archives/IDEA_SBCA.xls

Synectics
Creative Collaboration

Dr Don MacRae
Jeremy Morris
Dr David James

PO Box 160 Red Hill
ACT 2603 Australia
Tel: 61 (0)2 6295 0153
Fax: 61 (0)2 6295 1519
E-mail: morrisjp@ozemail.com.au