

5

Regional performance – summary indicators

Eight indicators were selected to summarise the status of the regions across the three themes.

5.1 Accessibility / Remoteness Index of Australia

The Accessibility / Remoteness Index of Australia (ARIA) is a standard approach to measuring remoteness and uses distances to population centres as the basis for quantifying service access and hence remoteness. The remoteness index was developed by the National Centre for Social Applications of Geographic Information Systems (GISCA) on behalf of the (then) Commonwealth Department of Health and Aged Care (1999), and a number of other Commonwealth agencies. The index uses GIS technology to combine road distance to population centres of various sizes as a measure of service access, in developing a standard measure of remoteness. The ARIA is categorised in the following way:

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- **Highly Accessible** (HA: ARIA score less than 1.84) – relatively unrestricted accessibility to a wide range of goods and services and opportunities for social interaction;
- **Accessible** (A: ARIA score 1.84 to 3.51) – some restrictions to accessibility of some goods, services and opportunities for social interaction;
- **Moderately Accessible** (MA: ARIA score 3.52 to 5.80) – significantly restricted accessibility of goods, services and opportunities for social interaction;
- **Remote** (R: ARIA score 5.81 to 9.08) – very restricted accessibility of goods, services and opportunities for social interaction; and
- **Very Remote** (VR: ARIA score 9.08 or more) – locally disadvantaged, with very little accessibility of goods, services and opportunities for social interaction.

Sample ARIA scores across the regions are shown in Table 3. Accessibility is obviously a relative rather than an absolute measure, with the scores being used to display a region's and a town's remoteness compared to its peers. The scores show the very large range of accessibility across the regions. For example, 100 per cent of the Peel Region, located immediately south of the Metropolitan area and centred on the large urban community of Mandurah is rated as highly accessible. Conversely, the three most northern regions, Kimberley, Pilbara and Gascoyne all have over 90 per cent of their areas classed as very remote.

Within these regional scores lie the major regional communities which, viewed in isolation are less remote than the region surrounding them. Thus Port Hedland and Broome, with scores of nine are much less affected by remoteness than are smaller outback towns such as Gascoyne Junction and Meekatharra.

Table 3: ARIA values and selected towns by region

Region	ARIA Values as a percentage of a region's area	ARIA for selected towns
Gascoyne	92% VR, 8% R	Exmouth (12), Carnarvon (8.16), Gascoyne Junction (10.18)
Goldfields-Esperance	80% VR, 15% R, 5% MA	Laverton (10.17), Kalgoorlie-Boulder (3.87), Esperance (7.21)
Great Southern	87% MA, 13% A	Katanning (4.76), Albany (2.69), Cranbrook (3.76)
Kimberley	99% VR, 1% R	Kununurra (12), Derby (11.41), Broome (9)
Mid West	75% VR, 8% R, 16% MA, 1% A	Meekatharra (10.79), Geraldton (2.76), Dongara (3.55)
Peel	100% HA	Mandurah (0.47), Byford (0.76), North Dandalup (1.01)
Pilbara	97% VR, 3% R	Port Hedland (9), Karratha (9), Tom Price (11.83)
South West	42% MA, 36% A, 22% HA	Bunbury (1.14), Busselton (1.84), Margaret River (3.03)
Wheatbelt	12% VR, 41% R, 24% MA, 15% A, 8% HA	Northam (1.30), Narrogin (3.75), Kellerberrin (3.90)

Source: Commonwealth Department of Health and Aged Care (1999).

Presentation of the ARIA values by proportion of the population in each category would present a different picture. For example, most of the Pilbara's population is located in a few towns classified only as remote, while the proportion of the region by area classified as very remote is 97 per cent.

5.2 Population dynamics

Table 4 shows the populations of the nine regions and metropolitan Perth as at 30 June 2001. The majority of the State's population lives in the Perth metropolitan area with less than 30 per cent living in regional Western Australia. The South West contains the highest proportion of the State's regional population (6.8%), followed by Peel (4.0%) and the Wheatbelt (3.8%). The northern regions, the Gascoyne, the Pilbara and Kimberley have the lowest populations, with 100,000 people living 'north of the 26th parallel', representing 4.3 per cent of the State's population.

The total Indigenous population of Western Australia is 66,069, which is 3.5 per cent of the total population. The majority of the Indigenous population live in regional Western Australia (66%). The Kimberley region has the highest proportion of Indigenous residents at 47 per cent. While the Metropolitan area has the highest total Indigenous population of 22,151, this comprises only 1.6 per cent of the total Metropolitan area population.

Table 4: Population by region, 2001

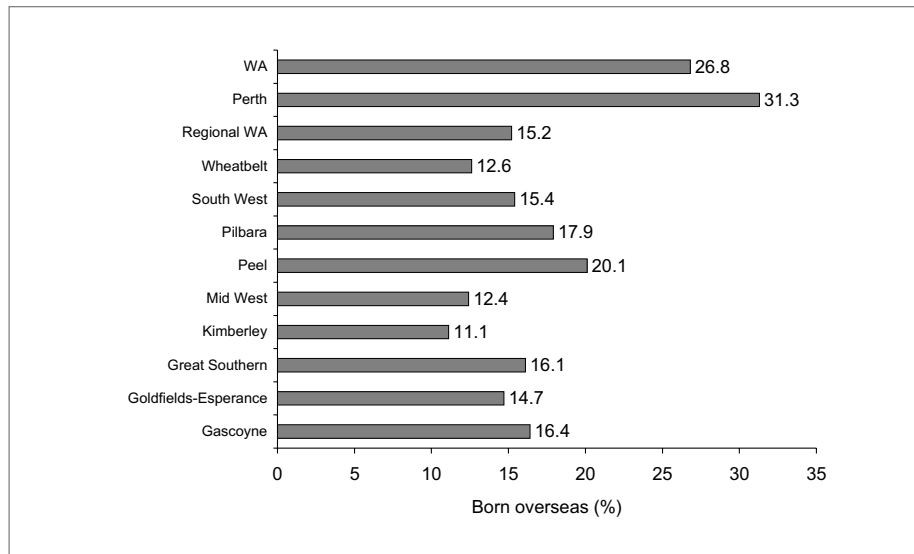
Region	Total ERP*	ERP Regional Distribution (%)	Estimated Indigenous Population Estimates	ERP Indigenous Distribution (%)	Indigenous Regional Proportion (%)
Gascoyne	10,232	0.5	1,731	2.6	16.9
Goldfields-Esperance	55,255	2.9	5,708	8.6	10.3
Great Southern	53,426	2.8	1,942	2.9	3.6
Kimberley	32,700	1.7	15,466	23.4	47.3
Mid West	50,463	2.6	5,196	7.9	10.3
Peel	76,734	4.0	1,219	1.8	1.9
Pilbara	39,676	2.1	6,548	9.9	16.5
South West	129,925	6.8	2805	4.2	2.2
Wheatbelt	872,407	3.8	3,303	5.0	4.6
Regional WA	520,818	27.3	43,918	66.3	8.4
Perth	1,385,296	72.7	22,151	33.7	1.6
State Total	1,906,114	100.0	66,069	100.0	3.5

Source: Australian Bureau of Statistics Census of Population and Housing (2001) and Department of Housing and Works (2002).

* ERP = Estimated Resident Population

Figure 3 shows the percentage of each region's population that are born outside Australia. In regional Western Australia, the Kimberley, Mid West and Wheatbelt regions have populations containing less than 15 per cent of persons who were born overseas. A higher percentage of Perth's population (31.3%) was born overseas, lifting the State average to 27 per cent.

Figure 3: Proportion of population born outside Australia, 2001

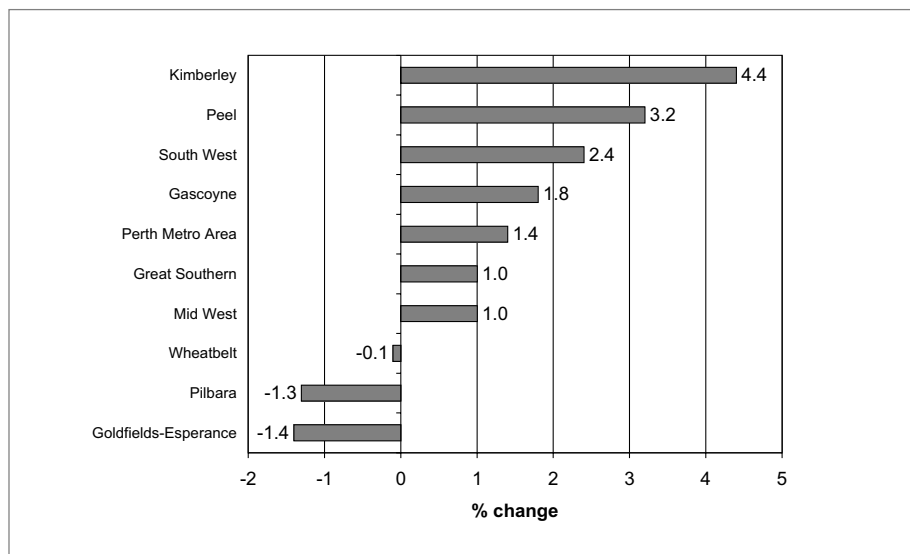


Source: ABS Census of Population and Housing (2001).

5.2.1 Growth rates

Figure 4 is a summary of the trends in Estimated Resident Population (ERP) figures for the period from 2000 to 2001. The population of Western Australia increased to 1,906,114 in June 2001, an increase of 1.4 per cent over the 12 months. This was slightly lower than the Average Annual Growth Rate (AAGR) for the State over the past five and ten year periods, which was 1.5 per cent per year. Non-metropolitan Western Australia had a collective population of 520,818 in 2001, which has increased by 1.3 per cent over the previous twelve months and also by 1.3 per cent on average, per year, for the ten-year period.

Figure 4: Annual Growth Rate, 2000 –2001



Source: Department of Local Government and Regional Development.

The Kimberley region (4.4%) exhibited the largest growth rate over the 12 month period, followed by Peel (3.2%) and the South West (2.4%). The Goldfields-Esperance and Pilbara regions exhibited the largest decline in population over the last year (-1.4% and -1.3% respectively) and over the preceding five-year period (-0.4% and -0.4% respectively). The Pilbara experienced the largest decline over the ten-year period (-1.6%). It is likely that changes in the nature of activities in the mining activity have generated this trend.

Summary of estimated resident population changes, 1991 to 2001:

The trends over the last decade presented below incorporate all the changes to Local Government Area (LGA) boundaries that occurred to the time of the census and applies these boundary changes retrospectively to 1991 making identification of population change more accurate. These data are the final release figures and incorporate revisions of all previous released ERP data for the last ten years.

- The LGA exhibiting the highest average annual population growth over the ten-year period, was Wiluna, increasing its population from 394 (1991) to 920 (2001) at an average rate of 8.9 percent per year. This increase can be attributed to an increase in mining activity and in the Indigenous population.
- Wanneroo had the second highest growth rate for the ten-year period (6.1%) and grew by an average annual rate of 5.4 per cent over the five-year period due to the general growth in residential developments in the northern suburbs.
- The LGA of Perth exhibited 5.4 per cent average annual growth over the ten-year period (third highest). Perth had the highest AAGR over the five-year period (7.3%) and again over the twelve months from 2000 to 2001 (9.0%). This was due to the increase in the provision of inner-city high density housing.
- Broome also exhibited high population growth, having the second highest rates over the five-year (6.3%) and twelve month (6.4%) periods, due to the flow-on effects of tourism activity and increased residential land release. Broome's population grew on average by 5.3 per cent per year over the ten-year period.
- The general urban and commercial expansion of greater Bunbury has resulted in Dardanup's population increasing from 5,458 people to 9,001 over the ten-year period to 2001, at an AAGR of 5.1 per cent.
- The Shire of Capel's population increased over the twelve-month period to 2001 by 6.1 per cent, due to recent commercial and residential developments.
- The increase, in recent years, in the Indigenous population has resulted in Halls Creek achieving average annual growth rates of 6.1 per cent for both the five-year period and over the twelve months to 2001.
- Significant growth rates, over the ten-year period, were also achieved by the LGAs of Rockingham (5.4%), Mandurah (5.3%) and Augusta-Margaret River (5.1%); whereas Wanneroo and Busselton grew by 5.4 and 5.1 per cent respectively, on average for the five-year period.
- Changes in the level and nature of mining activity is likely to have contributed to the population declines experienced by the Shires of East Pilbara, Sandstone, Cue, Dundas, Meekatharra, Leonora, Coolgardie and Yilgarn over the five-year, ten-year or twelve-month periods.
- In predominantly agricultural regions, increased efficiencies in broad-acre farming, and structural adjustment to address declining terms of trade for agricultural commodities can partially account for the population declines experienced in Carnamah, Trayning, Koorda, Yilgarn and Kondinin over the ten-year, five-year or twelve-month periods.

5.2.2 Migration

Western Australia recorded net gains through interstate migration during the period from 1974 to 1990, and ranked second after Queensland as the most popular destination for interstate movers. Net losses were recorded in Western Australia during the period 1991-1993, but the State returned to net gains after 1994. However, it is intrastate migration that involves by far the greatest number of movements in Western Australia, with an estimated 133,000 moves taking place between statistical divisions in the period 1991-1996⁷. During this period there were only two regions that gained net population through intrastate migration, being the South West by about 11,300 and Perth by about 6,500.

Migration into a region has a positive net benefit on the regional economy by providing additional labour and stimulating the housing, retailing, education and entertainment sectors. In the past Perth has been successful in attracting both interstate and overseas migrants mainly due to the employment opportunities available in a growing economy, and perceived advantages in the quality of life.

5.2.3 Population projections

Table 5 presents the current regional population projections to 2031 for Perth and regional WA.

Table 5: Population projections 2006 to 2031

Region	2001 (current)	2006	2011	2016	2021	2026	2031	% Diff. (2001 -31)
Gascoyne	10,200	10,500	11,200	12,100	12,900	13,900	15,100	+48.0
Goldfields-Esperance	55,300	68,200	74,000	79,500	84,900	90,200	95,100	+72.0
Great Southern	53,400	56,100	59,300	62,500	65,600	68,200	70,300	+31.6
Kimberley	32,700	34,200	37,100	40,400	43,800	47,200	50,700	+55.0
Mid West	50,500	57,200	59,900	62,400	64,600	66,200	67,300	+33.3
Peel	76,700	95,200	114,300	131,100	148,500	165,400	180,800	+135.7
Pilbara	39,700	44,800	46,500	48,000	49,400	50,400	51,100	+28.7
South West	129,900	142,200	157,300	172,300	187,700	203,000	218,000	+67.8
Wheatbelt	72,400	78,900	85,800	94,100	102,500	110,400	117,700	+62.6
Regional WA	520,800	587,300	645,400	702,400	759,900	814,900	866,100	+66.3
Perth	1,385,300	1,509,100	1,619,400	1,733,400	1,842,400	1,945,500	2,041,700	+47.4
StateTotal	1,906,100	2,096,400	2,264,800	2,435,800	2,602,300	2,760,400	2,907,800	+52.6

Source: ABS -2001, Department for Planning and Infrastructure (DPI) - 2006 to 2031

Note: The DPI population projections for Western Australia include the Shire of Serpentine-Jarrahdale in the Perth Planning Region. However, in the table above, the Shire of Serpentine-Jarrahdale has been included in the Peel figure as per the Peel Regional Development Commission region.

⁷ Western Australia Tomorrow, Population Projections for Statistical Divisions, Planning Regions and Local Government Areas of Western Australia. Population Report No. 4, October 2000, Ministry of Planning (now Department for Planning and Infrastructure).

These estimates suggest that the population of regional Western Australia will grow at a faster rate than Perth, with very high growth in the areas close to the city in the Peel Region. The predictions suggest some slowing of the growth rate compared to recent trends in the Kimberley and a reversal of recent population declines in the Pilbara and Goldfields-Esperance. Population growth will continue to be strong in the South West region.

5.3 Gross Regional Product

Background

Gross Regional Product (GRP) is an indicator of the level of economic activity occurring in a region. It includes all aspects of the economic activity, including primary (e.g. mining, agriculture), secondary (e.g. manufacturing, food processing) and tertiary (e.g. education, financial services) sectors. The value of the indicator can be enhanced by considering factors such as GRP per capita (i.e. per person) and the rate of economic growth. Its main limitations as an indicator are that it does not address how the region's economic activity is distributed across:

- the three economic sectors – primary, secondary and tertiary;
- the region's people; or
- entities and people within and outside the region.

Current situation

Gross Regional Product for the regions is shown in Table 6.

Table 6: Gross Regional Product, 2000-2001

Region	GRP (\$billion)	5 yr average annual growth rate (%)*	GRP per capita (\$)	Major primary contributors	Percentage of GSP
Gascoyne	0.50	5.2	48,448	Fishing, mining, agriculture, transport	0.7
Goldfields-Esperance	5.53	8.1	100,084	Mining, construction, property	6.9
Great Southern	1.56	4.1	29,271	Agriculture, forestry, fishing, manufacturing, finance and insurance	2.1
Kimberley	1.27	6.3	38,783	Mining, health and community services, transport	1.7
Mid West	2.95	6.8	58,509	Mining, agric, forestry and fishing, construction	3.8
Peel	2.27	6.5	29,612	Mining, manufacturing, construction	3.0
Pilbara	4.55	8.4	114,625	Mining, construction and transport	5.6
South West	4.56	6.0	35,085	Mining, manufacturing, construction	6.0
Wheatbelt	3.01	4.4	41,555	Agriculture, forestry and fishing, mining, transport	3.9
Regional WA	26.20	6.6	50,301		33.7
Perth	47.92	6.0	34,593	Finance and insurance, property, manufacturing	66.3
State Total	74.12	6.2	38,885		100.0

* Calculated as average annual growth rate, not adjusted for CPI, over five years – 1995/96 to 2000/01.

Source: Department of Local Government and Regional Development.

Comments

Overall, the Gross Product per capita in the regions is higher than in Perth, by 45 per cent. This difference is influenced strongly by the contribution made by the capital intensive mining industries in two regions – the Goldfields-Esperance and Pilbara regions. In the more labour-intensive economies in other regions such as Peel, Great Southern and the South West, GRP per capita is closer to the Perth figure of \$34,593.

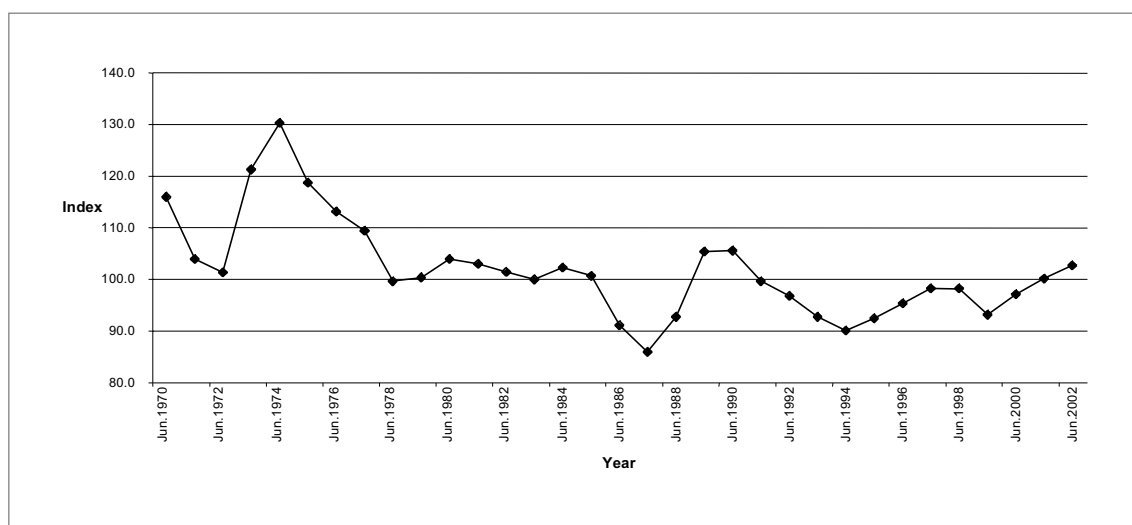
The two most obvious characteristics of the regional economies are the large differences between them in GRP per capita and in their average annual growth rates over the last five years. The Gascoyne, Great Southern, South West, and Wheatbelt have been growing more slowly than the regions either close to Perth (Peel) or where recent mining developments have been occurring – in the Goldfields-Esperance, Mid West and Pilbara regions.

5.4 Terms of trade for the principal industries

The terms of trade index in Figure 5 shows the relationship between Australia’s export and import prices. A rise in the terms of trade indicates that Australia could purchase a greater volume of imports with a given volume of exports; a fall indicates that a greater volume of exports is required to purchase a given volume of imports. Given that regional Western Australia’s economy is highly dependent on an ability to export profitably, an understanding of trends in the terms of trade is fundamental to an interpretation of regional economic performance and trends.

Between 1990-91 and 1993-94, there was almost a 10% deterioration in Australia’s terms of trade, reflecting falling export prices and strongly rising import prices. The terms of trade had improved by 1997-98 (returning to just under their 1990-91 level), then again deteriorated 5% in 1998-99, owing largely to fluctuations in import prices. Rising export prices thereafter brought the terms of trade in 2000-01 back to a little above their level of a decade earlier.

Figure 5: Terms of trade for Australia



Source: Australian System of National Accounts 2001-02, ABS (2002).

Industry composition of total factor income

Individual industry contributions to total factor income for 2001-02 are shown in Table 7. In line with long term trends, there has been a shift in economic activity from goods producing industries to service providing industries over the period 1989-90 to 2001-02.

However, this trend is less apparent in Western Australia where mining is responsible for 20 per cent of total factor income, which is a much higher figure than for any other jurisdiction than the Northern Territory. Given that virtually all of the mined commodities are produced in the regions and exported, this makes the Western Australian regional economies more sensitive to trends in the overall terms of trade. Declining terms of trade, as seen in the period from 1990 to 1994 put increased pressure on exporting industries which need to increase their productivity to ensure that they can trade profitably in world markets. Increasing terms of trade improve the conditions for these industries and encourage investment in further production.

Table 7: Industry contribution to total factor income⁸ (2001-2002)

	NSW %	Vic %	Qld %	SA %	WA %	Tas %	NT %	ACT %	Aust %
Agriculture, forestry and fishing	3	4	5	8	4	6	4	-	4
Mining	2	2	8	3	21	2	24	-	5
Manufacturing	12	14	10	14	9	14	4	2	12
Electricity, gas & water supply	2	3	2	2	3	6	1	3	2
Construction	6	6	7	6	7	5	7	7	6
Wholesale trade	6	6	6	5	5	4	2	2	5
Retail trade	5	5	7	5	5	6	4	4	5
Accommodation, cafes and restaurants	3	2	3	2	2	3	3	2	2
Transport and storage	5	4	5	4	5	5	4	2	5
Communication services	3	4	3	2	2	3	3	2	3
Finance & insurance	9	8	5	6	4	6	3	4	7
Property & business services	14	13	9	9	10	6	9	14	12
Govt. admin & defence	3	3	4	3	2	5	9	27	4
Education	4	5	5	6	4	5	5	5	5
Health and community services	6	6	6	8	6	9	6	6	6
Cultural and recreational services	2	2	2	2	1	2	2	3	2
Personal and other services	2	2	3	3	2	3	2	3	2
Ownership of dwellings	12	9	8	9	6	9	5	8	9
General government(b)	2	2	3	2	2	3	3	5	2
Total	100	100	100	100	100	100	100	100	100

Source: Australian System of National Accounts 2001-02, ABS (2002).

- nil or rounded to zero (including null cells)

(a) Industries may not add to total due to rounding differences.

(b) State details for general government gross operating surplus by industry are not available.

⁸ Total factor income is the total domestic income generated by all the producing units in an accounting year within the domestic territory of the country.

5.5 Life expectancy in the regions

Background

Life expectancy is defined as the average number of years a person is expected to live if the current mortality conditions (i.e. age-specific mortality rates) prevailed throughout their lives. Life expectancy and infant mortality data have some validity in assessing overall health conditions in a country / region.

Current situation

The values of life expectancy in Figure 6 are 'experimental' estimates and are indicative only. Life expectancy for males ranges from 71.8 years in the Kimberley to 79.5 year in the Wheatbelt. Life expectancy for females is consistently higher, ranging from 78.4 years in the Kimberley to 85.7 years in the Wheatbelt and Great Southern.

Figure 6: Life expectancy, 2001



Source: Department of Health.

In 1998, Western Australian Indigenous females had a life expectancy at birth 6.8 years higher than Indigenous males (Table 8). At this time, life expectancy amongst Indigenous males and females was 59.6 years and 66.4 years respectively. Between 1992 and 1998 there was a 1.6 year increase in the life expectancy of Indigenous males from 58.0 years to 59.6 years and for Indigenous females, a 2.4 year increase from 64.0 years to 66.4 years.

Table 8: Indigenous life expectancy, 1998

	Males	Females
Indigenous	59.6	66.4
Non-Indigenous	76.4	82.1
Difference	- 16.8	- 15.7

Source: Department of Health.

Comment

Life expectancy for both males and females is lowest in the Kimberley region, and highest in the agricultural regions of the Great Southern and Wheatbelt regions. For males, the Great Southern, South West and Wheatbelt regions recorded levels of life expectancy greater than the Western Australian average. For females, those same three regions along with the Gascoyne held a life expectancy greater than the State average. In aggregate, Western Australia's life expectancy for males and females is above the Australian average, which is 76.6 for males and 82.0 for females.

In general, Indigenous people have poorer health and higher mortality rates than non-Indigenous people. Consequently, life expectancy among Indigenous people is significantly lower than for the rest of the population. In 1998, life expectancy amongst Indigenous people in Western Australia was some 24 to 28 per cent lower than for non-Indigenous people.

5.6 Social Capital score

Background

In the 2000 Health and Wellbeing Survey (Department of Health, Western Australia), a reliable index of social capital was included, which was the first time such an index had been used in an Australian population health survey. The Social Capital Index ©⁹ has been developed as a valid and reliable means of relating the relative social health of a community to its physical health and well-being. The Short-form (SF-11) version of the Social Capital Index © has eleven separate items which respondents score on a strongly agree – strongly disagree scale. The scores for each item are then aggregated into the following three core dimensions.

- 'Social cohesion and generalised reciprocidity' – includes items which measure the importance of neighbourhood relationships, friendships, and support to respondents.
- 'Generalised trust' – includes items which measure a respondent's preparedness to trust neighbours and the general community.
- 'Community identity' – includes items which measure a respondent's sense of belonging in their local neighbourhood and their satisfaction with the local community.

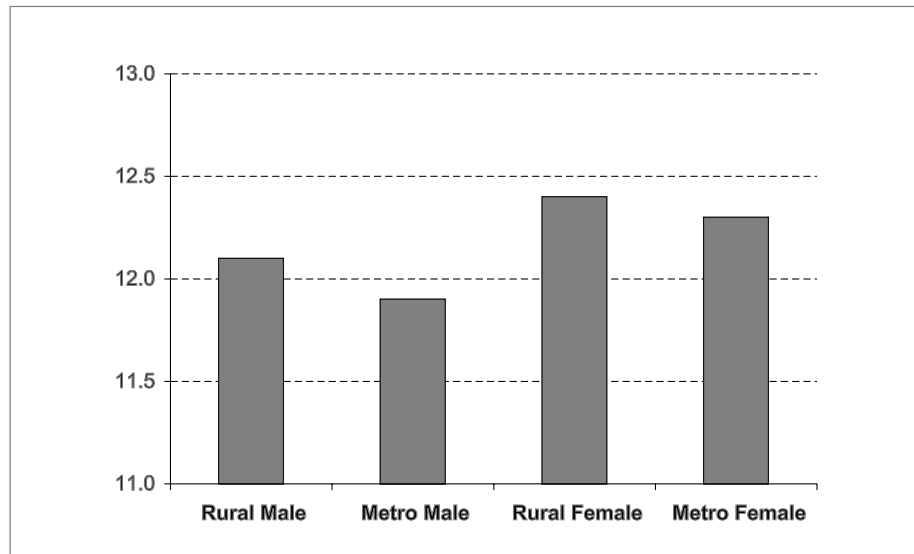
A further aggregation of the three dimensions can produce a single score for social capital.

Current situation

The Social Capital Index © has been used by the WA Department of Health to report on social capital in regional and metropolitan WA. Separate scores for each region are not yet readily available. Figure 7 shows the available data.

⁹ Copyright for the Social Capital Index © is held by Dr Janice Dillon, Department of Epidemiology and Biostatistics, University of Curtin. Permission to describe and present the Index is acknowledged.

Figure 7: Mean Social Capital by gender and location

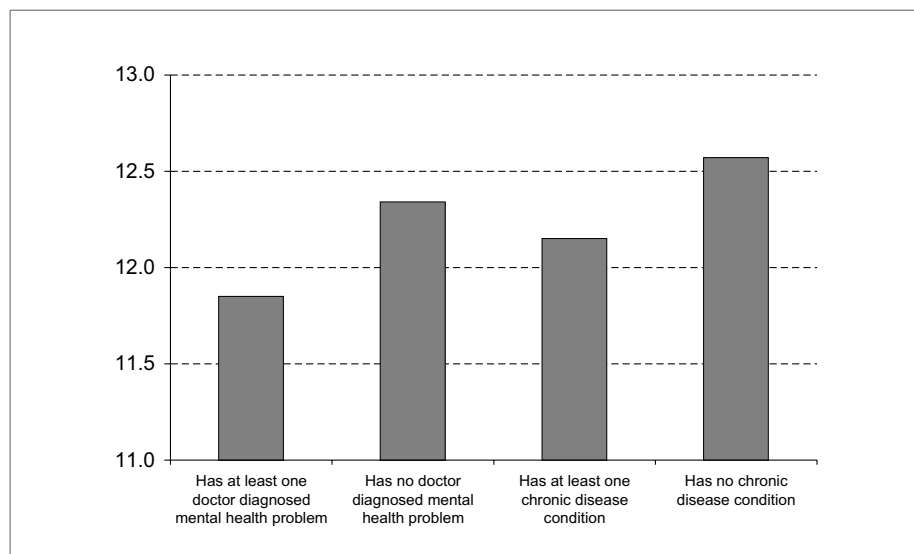


Source: Health and Wellbeing Survey (2000).

The social capital score is slightly higher amongst rural dwellers than those who live in the Perth metropolitan area. Further, in both domains, females have higher social capital scores than do males.

Mean social capital scores by physical and mental health status indicators are presented in Figure 8. These data show that a higher proportion of people with below average social capital scores have at least one doctor-diagnosed mental health problem compared with people who have average or above social capital scores. Also, a higher proportion of people with below average social capital scores have at least one chronic disease condition compared with people who have average or above social capital scores.

Figure 8: Mean Social Capital scores by physical and mental health status indicators



Source: Health and Wellbeing Survey (2000).

5.7 Landscape health

Background

The National Land and Water Resources Audit (2001) has undertaken a rapid assessment of landscape health across Australia. Landscape health is a relative measure developed by comparing the current state of the landscape against the pre-European settlement state as a benchmark. The indicators used to describe 'landscape health' include native vegetation, land use, soil and hydrology, weeds, feral animals and threatened ecosystems and species. Some other attributes such as fire regime could not be used due to a lack of available data. Landscape health has been estimated for two major 'mega-regions' – the intensive areas, being in WA the areas south and west of the limit of agricultural land use; and the extensive zone, being the remainder of the State. Within these major zones, the separate attributes were aggregated to develop an index of 'landscape stress'.

Current situation

The assessment is presented in the Audit at sub-bioregional scale. For the purpose of the presentation here, the sub-regional data have been summarised for the bioregions¹⁰ in each RDC regional area. The assessments are shown in Table 9. The information presented shows that the relative level of landscape stress is higher in the more closely settled bioregions and those where clearing of native vegetation for agriculture is most evident. The most stressed landscapes in WA are those in the Avon Bioregion, which lies mainly in the Wheatbelt Region, with overlaps into the Mid West and South West regions. The principal drivers of stress are the low level of remaining native vegetation, and the pressures imposed by weeds, altered hydrology, dryland salinity and feral animals.

The lowest levels of landscape stress are found in the sparsely populated inland semi-arid and arid areas in the Pilbara and Goldfields-Esperance regions, and in those parts of the pastoral areas subject to low levels of grazing, such as in the North Kimberley and Dampierland.

Comment

Landscape-scale responses are required in nearly all of the bioregions in the State, particularly those in the southern regions in the intensive zone. Priorities identified as part of the Audit process include protecting and managing the remaining native vegetation resources, and increasing the area under native vegetation. The next indicator (Section 5.8) addresses the requirement for establishing a comprehensive, adequate and representative conservation reserve system.

¹⁰ 80 Bioregions have been defined for Australia, according to the Interim Bioregionalisation completed by Thackwell and Cresswell 1985. A bio-region is a landscape with common geomorphology, climate and vegetation. Bioregions are the base unit for considering environmental management in Australia and in State of the Environment reporting at state and national scales.

Table 9: Landscape stress of Bioregions

Region	Major Bioregions represented*	Level of landscape stress
Gascoyne (G)	Carnarvon	Very high
	Gascoyne	Very high - high
Goldfields-Esperance (GE)	Esperance Plains (share with GS)	Low
	Mallee (share with GS and W)	Very high - high
	Coolgardie	Very low
	Great Victoria Desert	Very low - lowest
	Nullarbor	Lowest
	Hampton	Lowest
	Central Ranges	Lowest
	Gibson Desert	Lowest
Great Southern (GS)	Warren (share with SW)	Very low
	Mallee (share with GE and W)	Very high - high
	Jarrah Forest (share with SW, GS and Pe)	Very high - high
Kimberley (K)	Northern Kimberley	Lowest
	Central Kimberley	Very low
	Dampierland	Lowest
	Ord-Victoria Plains	Lowest - high
	Victoria-Bonaparte	High
	Tanami	Very low
Mid West (MW)	Geraldton sandplain (share with W)	High
	Yalgoo	High
	Avon (share with W and SW)	Highest
	Murchison	Very high
Peel (Pe)	Swan Coastal Plain (share with SW)	Very high
	Jarrah Forest (share with SW and GS)	Very high - high
Pilbara (Pi)	Pilbara	Very high – high - lowest
	Great Sandy Desert	Very low
	Little Sandy Desert	Lowest
South West (SW)	Swan Coastal Plain (share with Pe)	Very high
	Jarrah Forest (share with GS and Pe)	Very high - high
	Warren (share with GS)	Very low
	Avon (share with MW and W)	Highest
Wheatbelt (W)	Avon (share with MW and SW)	Highest
	Mallee (share with GE and GS)	Very high to high
	Geraldton sandplain (share with MW)	High

Source: National Land and Water Resources Audit (2001).

5.8 Management of land for nature conservation outcomes

Background

Conservation of biodiversity needs to occur at a bioregional scale, with local actions supporting these regional outcomes. Biodiversity conservation depends on actions taken to conserve and manage available habitat, the control of stresses such as feral animal and weeds and the prevention of exotic diseases and pests. In respect of terrestrial biodiversity, most action focuses on the management of areas of natural habitat that contain important components of the bioregion's biodiversity. The State's aim is to establish a 'comprehensive, adequate and representative' (CAR) conservation reserve system.

An assessment of the comprehensiveness, adequacy and representativeness (CAR) of the reserve system in each region was undertaken by using the Interim Biogeographic Regionalisation of Australia (IBRA). The IBRA (Thackway and Cresswell 1995) categorises the Australian continent into regions of like geology, landform, vegetation, fauna and climate. There are 80 such 'Bioregions' throughout Australia, and 26 occur in Western Australia. These classifications were used as a surrogate measure of vegetation types. This analysis was undertaken on the basis of representation of Bioregion provinces in the total conservation estate and not within areas specifically gazetted as conservation reserves. In the southern regions the conservation estate includes State forest reserves, although these may not provide the same level of nature conservation security as National Parks and other dedicated conservation reserves. Results for these regions are likely to be an overestimate of the level of representation within a CAR conservation system. The principal government agency with responsibility for achieving nature conservation outcomes is the Department of Conservation and Land Management (CALM).

Current situation

'Representation' and 'Comprehensiveness' is assessed by the percentage area of each bioregion province that is held within the Conservation Commission estate in each region. 'Adequacy' of representation in each region is summarised by Table 10 where the number of bioregion provinces with representation at 0 per cent, and less than 5, 10 and 15 per cent by area is shown. There is still ongoing debate as to what adequate representation is, with early arguments for comprehensive representation of 10 per cent by area. As conservation estates have improved and better knowledge obtained this may now have shifted to a goal of 15 per cent or more.

Results show that some 8.6 per cent of WA is within the conservation estate (inclusive of State forests) held under the auspices of the Conservation Commission of WA. The level of representation varies greatly across RDC regions. The Pilbara, Kimberley, and Mid-West regions have a representation of near to 5 per cent. Other non-forested regions are Gascoyne (13.1%), Goldfields-Esperance (11.6%), Great Southern (15.3%), and Wheatbelt (9.6%). Representation in regions with forests (and with the Conservation Commission estate likely to include greater areas of State forest reserves) are much higher: Peel (47.2%), Perth (24%), and South-West (59.2%).

Table 10: Adequacy of Bioregion conservation in each RDC Region

Region	% CALM	No. of Bioregions	0%	<5%	<10%	<15%
Gascoyne	13.1	8	1	3	4	5
Goldfields-Esperance	11.6	20	4	6	11	15
Great Southern	15.3	7	-	2	2	4
Kimberley	5.0	14	5	7	10	12
Mid West	5.2	16	5	9	12	13
Peel	47.2	2	-	-	1	1
Pilbara	5.6	16	7	10	14	15
South West	59.2	4	-	-	1	1
Wheatbelt	9.6	11	-	2	4	5
Perth	24.0	3	-	1	1	1

Source: Department of Conservation and Land Management.

As well as variability between RDC regions in the area conserved, there is also great variability of representation between bioregions within each RDC region. Table 10 also summarises the average level of representation of Bioregion provinces in each RDC region, but also breaks this down by showing the number of provinces in each region, and the number with representation below a range of 'Adequacy' thresholds. For example, the Pilbara has an average representation in the conservation estate of 5.6 per cent. There are 16 different Bioregion provinces in the Pilbara, and of those provinces seven are not represented in the conservation estate at all and 10 of the 16 are represented at a level of less than 5 per cent by area. Similarly for the Gascoyne, Goldfields-Esperance, Great Southern, Kimberley, and Mid-West regions, more than a quarter of the Bioregion provinces in those regions are poorly represented in the conservation estate (less than 5 per cent by area).

Comment

An important objective for Government will be to continue to acquire land for the conservation estate, with the objective of having a comprehensive, adequate and representative reserve system. For example, Government is currently (December 2002) establishing 30 new National Parks in the old growth forest areas (in the South West region), and is purchasing pastoral leases in the Gascoyne and Mid West regions to add to the conservation estate in those areas.

The information provided above discusses actions by government only. Adequate biodiversity conservation will require action to be taken to manage biodiversity wherever it occurs, such as on private land holdings. Government and private sectors are encouraging this approach, through the following actions.

- Enactment of new biodiversity conservation legislation to replace the *Wildlife Conservation Act 1950*. The new legislation will incorporate recent understandings of the requirement for biodiversity conservation.
- Development of approaches for ecologically sustainable management of grazing enterprises on pastoral leasehold land.

- Support for private conservation reserves through projects establishing special management arrangements for remnant vegetation on private land, and through support for entities such as the Australian Wildlife Conservancy.
- Support through schemes such as the Natural Heritage Trust for community volunteers who are managing biodiversity at local scales.
- Research into the identification, management and rehabilitation of WA's biodiversity being undertaken by government, universities and mining companies.

