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DEMOGRAPHIC PROFILING: WESTERN AUSTRALIA TOODYAY BUSHFIRES 2009 CASE STUDY

Optimising post disaster recovery interventions in Australia

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Version	Release history	Date
1.0	Initial release of document	17/12/2018

Publisher:
Bushfire and Natural Hazards CRC

December 2019

Citation: Beaini, F, Ulubasoglu, M 2019, *Demographic profiling: Western Australia Toodyay bushfires 2009 - case study*, Bushfire and Natural Hazards CRC, Melbourne 2019.

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ACKNOWLEDGMENTS

Deakin University warmly thanks our Toodyay Bushfires case study end-user Department of Fire and Emergency Services for their cooperation, ongoing support and guidance.

INTRODUCTION

ABOUT THE PROJECT

The "Optimising post-disaster recovery interventions in Australia" project explores the impact of a number of Australian natural disasters on the disaster-hit individuals' economic resilience. By analysing Australian 2006, 2011 and 2016 Census data, the project determines whether their income levels were able to recover post disaster in the short and medium term, considering demographic factors and employment sectors.

The project's natural disaster case studies are:

- The Victorian Black Saturday Bushfires 2009
- The Western Australian Toodyay Bushfires 2009
- The Queensland Floods 2010-11
- Cyclone Oswald 2013

ABOUT THIS REPORT

In this report, we provide some high-level demographic profiling and descriptive analysis of the Shire of Toodyay, a small town in the Western Australian Wheatbelt region that was devastated by bushfires on 29 December 2009.

The profiling utilises the ABS Census as the primary data source (in line with project methodology), at either a SA2 or local government area (LGA) level, depending on available information. It also relies on official government reports for fire-related statistics.

In presenting this information, we note that our demographic profiling captures the overall population-level trends, which are affected by factors including migration and population growth. This enables us to present a baseline of the overall socioeconomic characteristics and conditions of Toodyay both prior to (2006) and post the fires (2011, 2016).

This report is part of a series of demographic profiling reports which will be released for each of the project case studies.

DEMOGRAPHIC PROFILE

LITERATURE REVIEW

Natural disaster economic and emergency management literature suggest that certain underlying socioeconomic characteristics can affect a community's vulnerability to natural hazards, and thus its ability to prepare, respond and ultimately recover from disasters (Finch et al., 2010).

Regions with a larger portion of children, elderly, the poor and less educated populations are considered more vulnerable to natural disasters (DELWP, 2016; Cutter et al., 2008; Frankenberg et al., 2013). These characteristics affect the physical, mental and financial capacity of individuals to respond to natural disasters when they occur.

Many of these characteristics are highly correlated or interdependent, particularly with income, affirming our project's income focus. For example, the affordability of accommodation type and car ownership is often dependent on income, while educational level and income are also interdependent.

Income itself has been shown to be an important socioeconomic indicator of vulnerability to natural hazards. Low-income earners tend to be more vulnerable as their limited economic resources mean they're more likely to be underinsured or uninsured (DELWP, 2016) and live in hazard-prone areas, thus are more limited in their ability to recover from losses once disasters strike. In the case of bushfires, the longevity of disruptions to income post-disaster has been shown to materially affect the mental health of those affected by bushfires (Gibbs et al., 2016).

Understanding these underlying socioeconomic vulnerabilities can help assist policymakers identify more vulnerable areas and cohorts as part of risk-mitigation and in post-disaster recovery interventions.

The ABS SEIFA Indexes (Socio Economic Indexes for Areas) are derived from the ABS Censuses. These indices assign weights to these and other relevant indicators to rank LGAs according to their relative advantage and disadvantage compared to other LGAs within their state and Australia as a whole. The lower the decile ranking, the higher the relative level of disadvantage.

Only broad comparisons can be made with over the Census periods as the SEIFA indices are point-in-time estimates, with some changes to underlying index construction. Nevertheless, they provide useful snapshots of socioeconomic conditions of the Shire of Toodyay as they capture many of the population vulnerabilities discussed in natural hazard risk analysis research (see Appendices).

In the next section, we report on the SEIFA decile rankings of the Shire of Toodyay in relation to other LGAs within Western Australia, and supplement this with relevant demographic information.

SHIRE OF TOODYAY

Toodyay is a regional town located in the northern Wheatbelt region of Western Australia, approximately 80km North/East of Perth. It is characterised by agricultural activities and low population density, with 2.7 persons per square kilometre.

Toodyay has a small population, which grew from 4,330 in 2006 to 4,707 in 2013, before declining to 4,500 in 2016. The population is relatively older and ageing – Toodyay's median age reached 51 years in 2016, with the share of residents aged 65 or older increasing from 12.8% to 23.3% over the decade.

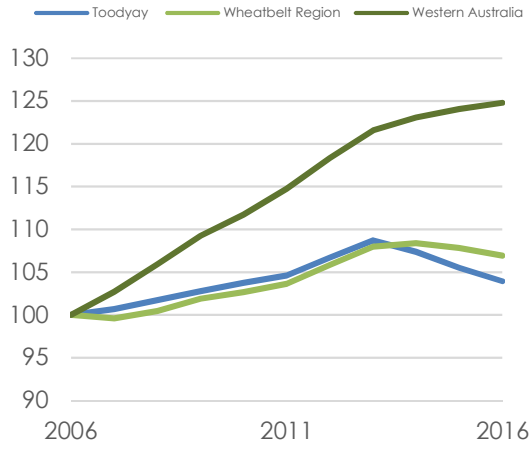

FIGURE 1 POPULATION GROWTH (2006=BASE)

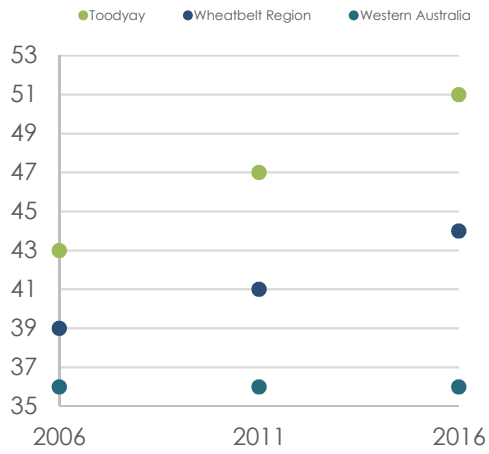

FIGURE 2 MEDIAN AGE

SOURCE 1 ABS, CAT 3218.0 Regional Population Growth; ABS, CAT 2061.0 Census of Population and Housing: Quickstats (2006, 2011, 2016)

Compared to other LGAs in Western Australia, the Shire of Toodyay ranked within the 6th decile in the Index of Socio-economic disadvantage.

Median incomes (personal and household) are broadly in line with the overall Wheatbelt region, and equivalent to ~75-81% of what a typical Western Australian resident would earn in a given year. While the labour force participation rate is strong (averaging 66%), the unemployment rate was considerably higher than the Wheatbelt region and the state average.

Full home ownership rates (38-40%) far exceed the state average (29-30%). For the mortgaged home owner and renter cohorts, median housing costs (i.e. rental payments and mortgage repayments) are above the Wheatbelt average and have increased as a share of household income over the period.

Educational attainment levels are low, with a significantly lower proportion of bachelor and postgraduate degree holders, placing Toodyay within the lowest 5 decile groups of the Index of Education and Occupation within the state. The most common fields of study[1] over the period included engingeering and related technologies (~32%), management and commerce (~13.9%), society and culture (10.7%), health (~10.3%) and education (~9.78%).

[1] Excluding "Inadequately described", "not stated" and "not applicable" categories.

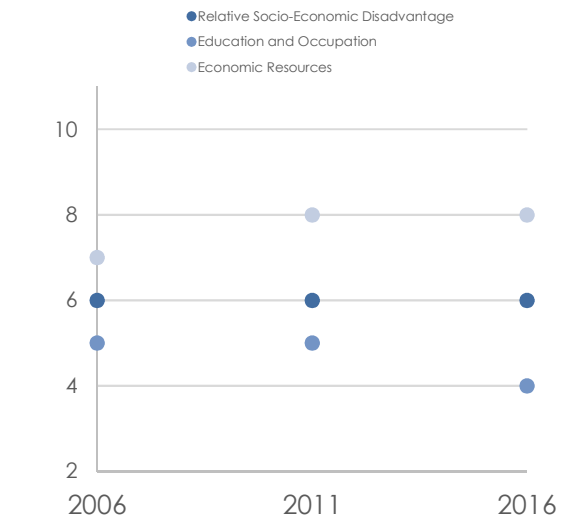

FIGURE 3 ABS SEIFA INDEXES

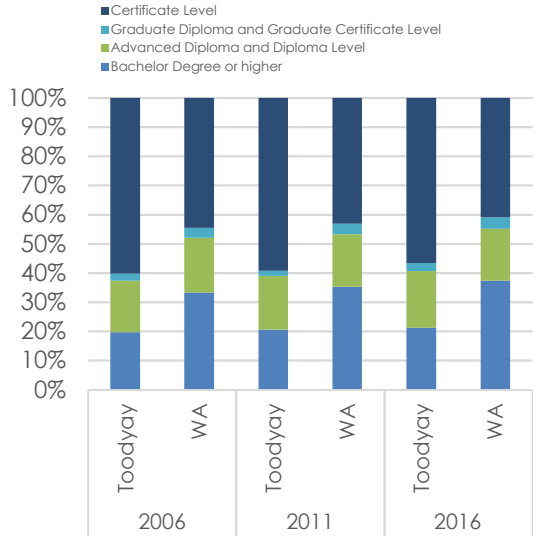

FIGURE 4 EDUCATIONAL ATTAINMENT LEVELS

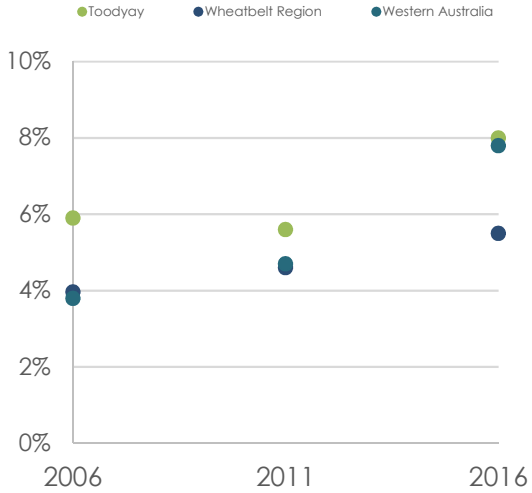

FIGURE 5 UNEMPLOYMENT RATE (%)

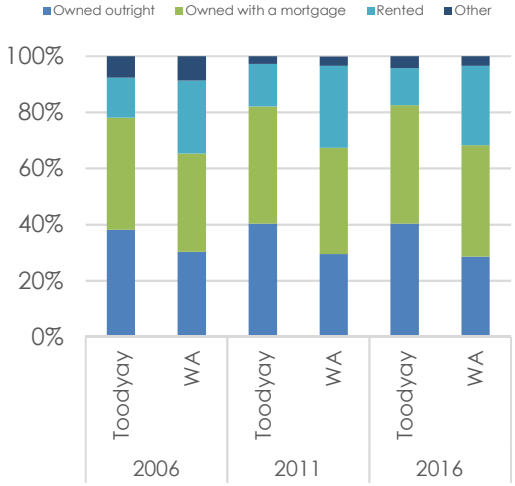

FIGURE 6 OCCUPIED PRIVATE DWELLINGS, BY TENURE TYPE

FIGURE 7 REAL HOUSEHOLD INCOME (2011-12 = BASE YEAR)

FIGURE 8 REAL PERSONAL INCOME (2011-12 = BASE YEAR)

SOURCE 2 ABS, CAT 2033.0.55.001, Census of Population and Housing: Socio-Economic Indexes for Areas; ABS, CAT 2061.0 Census of Population and Housing: Quickstats and Table Builder (2006, 2011, 2016); ABS, CAT 3218.0 Regional Population Growth; ABS, CAT 6401.0 Consumer Price Index, Australia. Note: median Income figures are In 2011-12 Dollars (based on ABS Perth All Groups CPI figures)

ECONOMIC PROFILE

LITERATURE REVIEW

Estimating the total economic costs of natural disasters can be difficult, owing to the lack of complete and systematic data, conceptual difficulties (Kousky, 2014), and divergent predictions from growth theory about the effects of natural disasters on economic growth (Loayza et al., 2012).

It is unsurprising, therefore, that the literature on overall economic effects is inconclusive, with some studies reporting negative effects, while others finding positive or insignificant effects (Loayza et al., 2012).

This isn't to say there are no areas of agreement. For example, a meta-analysis of natural disaster economic literature conducted by Lazzaroni and van Bergeijk (2014) finds that natural disasters have a negative impact in terms of direct costs. Multiple studies show that economic and human losses are more pronounced in poorer countries (Schumacher and Strobl, 2011), with institutional factors and educational attainment levels important determinants that influence resilience and recovery (Kousky, 2014; Felbermayra and Gröschl, 2014).

Broadly, there is also support for differentiated impacts based on the disaster severity and frequency. For example, more severe disasters, particularly those with higher fatalities and/or ones with multiple events, cause the highest damage, and are more likely to lead to long-term and/or negative consequences (Boustan et al., 2017; Kousky, 2014).

There is also evidence of distributional effects, with some industry sectors being harder hit, while others benefiting from transfers natural disasters generate, at least in the short-term. Due to its land-intensive nature, the agricultural sector is often the most adversely affected sector by natural disasters. In developing countries, it has been estimated that the agriculture sector absorbs approximately 22 percent of the economic impact caused by medium and largescale natural hazards (FAO, 2015). Locally, a study of major Victorian bushfires found that industries most susceptible to direct or indirect impacts are the Agriculture, forestry and fishing sector and retail trade (Stephenson, 2010). Conversely, the construction sector may experience a boom in the immediate aftermath of the disaster as households redirect expenditure towards rebuilding that they otherwise would've deferred, only to experience a lull in the next few years once that expenditure subsides (Kousky, 2014).

Relying on a single economic sector for income has also been shown to make communities more vulnerable and slower to recover from a disaster compared to diversified economies (Cutter et al., 2008). Even with a diversified economy structure, the interdependence of sectors can have knock-on effects despite a sector's own ability to withstand the immediate effects of the disaster (Yu et al., 2014). Thus, industries more heavily reliant on inputs from the agricultural sector are likely to experience adverse effects to their production.

In the next section, we complement our demographic profiling with an overview of the economic composition of Toodyay, noting to the dominant industries of employment over a fifteen year period.

SHIRE OF TOODYAY

Since 2006-07, there have around 400 businesses on average located in the Shire. A significant share of these businesses are non-employing[2], and are mostly concentrated in the disaster-sensitive agricultural and construction sectors.

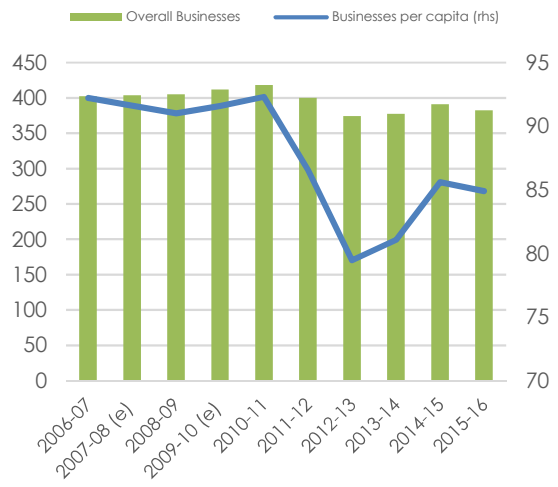

FIGURE 9 TOODYAY BUSINESSES, OVERALL AND PER 1000 PERSONS

FIGURE 10 TOODYAY BUSINESSES, BY EMPLOYMENT SIZE (% TOTAL)

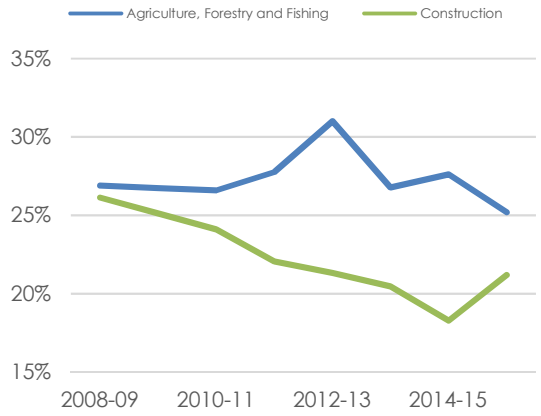

FIGURE 11 NON-EMPLOYING AGRICULTURAL AND CONSTRUCTION BUSINESSES (% TOTAL NON-EMPLOYING)

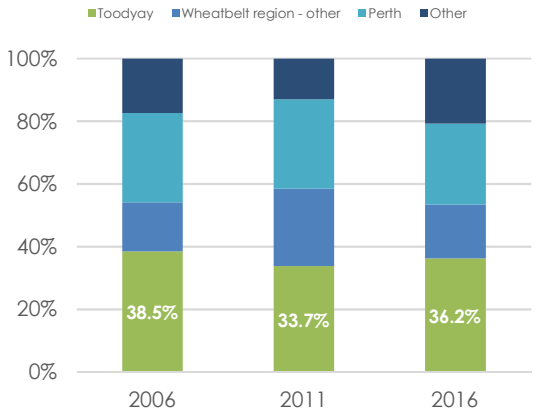

FIGURE 12 TOODYAY RESIDENTS PLACE OF WORK (%)

Source 3 ABS, CAT 8165.0 Counts of Australian Businesses, including Entries and Exits; ABS, CAT 3218.0 Regional Population Growth; ABS Census of Population And Housing (2006, 2011, 2016) (Usual Residence Data) retrieved via Table builder. Excludes Place of Work "Not Stated" Or "Not Applicable".

Over 60% of Toodyay's employed residents typically work outside the Toodyay Shire, mostly in Perth (~28%) and neighbouring Northam (~16%).

The top 5 employing industries have typically accounted for 49% of employment. While the overall rankings are different, the common top industries of employment between 2001 and 2016 were Health care and social assistance and Construction.

Compared to the overall Wheatbelt region, Toodyay's workforce has seen a greater shift away from manufacturing and the agricultural sector, which dropped from the largest employer in 2001 and 2006, to become the sixth largest employing industry in 2016. Health care and social assistance became the top

[2] The ABS defines non-employing businesses as businesses that are sole proprietorships or partnerships without employees.

employer in 2011, while mining also exhibited the strongest gain, most notably over the 2011-2016 period.

TABLE 1 TOP INDUSTRIES OF EMPLOYMENT (% OF TOTAL)

Top 5 Industries of Employment	2001	2006	2011	2016	Trendline	2001-2016 Annualised Δ
Toodyay						
Agriculture, forestry and fishing	12.56%	11.10%	7.73%	7.69%		-3.22%
Construction	10.22%	10.97%	10.81%	9.84%		-0.25%
Manufacturing	9.16%	8.17%	6.28%	5.88%		-2.91%
Health care and social assistance	9.01%	9.48%	11.40%	10.06%		0.74%
Public administration and safety	8.52%	8.04%	8.60%	9.89%		1.00%
Retail trade	8.02%	9.10%	9.53%	7.86%		-0.14%
Education and training	7.45%	8.35%	8.02%	8.42%		0.82%
Mining	1.99%	3.62%	6.22%	8.59%		10.25%
Wheatbelt region						
Agriculture, forestry and fishing	29.19%	25.70%	20.28%	20.78%		-2.24%
Retail trade	9.25%	10.01%	9.54%	8.82%		-0.31%
Education and training	7.78%	8.00%	8.54%	8.97%		0.96%
Health care and social assistance	7.19%	8.36%	9.21%	10.02%		2.24%
Construction	6.33%	7.03%	8.28%	7.72%		1.34%

SOURCE 4 ABS Census of Population and Housing, Industry of Employment by Age and Sex (SA2) (2001, 2006, 2011, 2016). Excludes "not stated" and "not applicable" categories

FIRE PROFILE

SHIRE OF TOODYAY

Overall

According to 2008-09 ABS estimates, 4,450 residents and 405 businesses would have been residing/located within the Shire at the time of the fires.

The 29 December 2009 Toodyay Bushfires burnt around 2,900 hectares, the equivalent of 2% of the Shire of Toodyay's total area. The fire conditions were some of the worst seen in Western Australia at the time.

The total cost of damages was estimated at $100 million (FESA, 2010b), though no breakdown is provided. The fire's ignition point was close to the urban interface, destroying 38 houses and damaging over 170 properties (FESA, 2010a). Some of the properties lost were holiday or second homes (Barnett, 2010). One-thirds of affected residents did not have adequate insurance (Parliament of Western Australia, 2010).

The fires caused material damage to the agricultural sector. 18 cows (Perth Now, 2011) and 100 sheep were killed (FESA 2010b), with damage to 20 sheds, fencing, farming machinery, crops, orchards, vineyards, dairies and olive groves (Moylan, 2010). There was also considerable damage to electricity distribution lines, with repair and restoration of public assets totalling around $443,000.

While costly, the Toodyay fire was relatively small (FESA, 2010a), with no fatalities and only 4 injuries recorded (FESA, 2010b).

Assistance

The Toodyay fire was declared a natural disaster, with Category A and B assistance provided by the Federal Government totalling $1.7 million. Over half of this assistance was provided within six months of the disaster.

TABLE 2 FEDERAL GOVERNMENT ASSISTANCE (NDRRA)

NDRRA Measure	2009-10	2010-11	2011-12	Total
Category A assistance	**$ 299,285**	**$ 139,065**	**$ 208,414**	**$ 646,764**
Emergency Food, Clothing or Temporary accommodation	$ 2,343	$ 37,431	$ 3,065	$ 42,839
Removal of debris from residential properties	$ 170,699	$ 3,880	$ 29,228	$ 203,807
Counter Disaster Operations assistance to individuals	$ 87,593	$ 32,478	$ 11,477	$ 131,548
Personal and financial counselling	$ -	$ 616	$ 3,247	$ 3,863
Extraordinary costs of delivering Category A assistance	$ 38,650	$ 64,660	$ 161,397	$ 264,707
Category B assistance	**$ 646,205**	**$ 370,878**	**$ 46,370**	**$1,063,453**
Restoration or repair of essential public asset	$ 131,452	$ 311,392	$ —	$ 442,844
Counter Disaster Operations assistance to the general public	$ 514,753	$ 59,486	$ 46,370	$ 620,609
ANNUAL TOTALS	**$ 945,490**	**$ 509,943**	**$ 254,784**	**$1,710,217**

SOURCE 5 DFES, supplied

Apart from the federal assistance, the State Government, in conjunction with Western Energy, announced a $10 million financial assistance package for affected individuals on 11 October 2010.

TABLE 3 TOODYAY FINANCIAL ASSISTANCE PACKAGE

Category	Description	Maximum payment	Assistance cap
Residential buildings	Established homes which were damaged or destroyed	**$ 150,000**	**$190,000 total payment for each property**
External Structures	Sheds, fences and other external structures	**$ 15,000**	
Site Clean-up	Cost of site clean-up and rubbish removal	**$ 5,000**	
Home Contents	Home contents	**$ 30,000**	
Tools of Trade	items used for employment purposes (tools and equipment)	$ **5,000**	
Private Motor Vehicles	private motor vehicles including cars, motor homes and motorbikes.	**$ 10,000**	

SOURCE 6 Barnett, 2010

It is noted that the payments were provided regardless of insurance cover (Parliament of Western Australia, 2010) and were directed at assisting with residential rather than commercial losses. The first payments were reported in December 2010 (Farm Weekly, 2010), with less than half of the funds paid as at 24 October 2012 (Parliament of Western Australia, 2012).

Combined with public bushfire appeals and Western Power settlements, available monetary assistance for the Toodyay bushfires totalled $16.5 million, with up to $10.6 million distributed as at October 2012.

TABLE 4 TOODYAY BUSHFIRES DISASTER ASSISTANCE

		Total distributed			
Assistance	**Total allocated**	**2009/10**	**2010/11**	**2011/12**	**As at October 2012)**
NDRRA (a)	$ 1,710,217	$945,490	$509,943	$254,784	$1,710,217
Toodyay Financial Assistance Package (b, c)	$10,000,000	—	$4,084,280	—	$4,084,280
Lord Mayor Disaster Relief Fund - Toodyay Bushfires (d)	$193,000	$193,000	—	—	$193,000
Salvation Army Toodyay Bushfire Appeal (e)	$1,626,000	$1,100,000	$526,000	—	$1,626,000
Western Power settlements (f)	$3,000,000	—	—	—	< $ 3,000,000
Total	**$16,529,217**	**$2,238,490**	**$5,120,223**	**$254,784**	**~$10,612,497**

SOURCE 7 (a) DFES, supplied; (b) Barnett, 2010; (c) Parliament of Western Australia 2011; (d) Lord Mayor Disaster Relief Fund, 2010; (e) Salvation Army, 2010; (f) Parliament Of Western Australia 2012.

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APPENDICES

APPENDIX 1

TABLE 5 Population Vulnerability Indicators and corresponding ABS SEIFA Indexes Indicators

Indicator	Index of Relative Social Disadvantage	Index of Economic Resources	Index of Education and Occupation	Indicator description
Single parents	**ONEPARENT**	**ONEPARENT**	—	Face demands of dependant children but with no additional support
Volunteering	—	—	—	More likely to have social networks which can be of assistance in times of emergency by providing information, support and resources
Income	**INC_LOW**	INC_HIGH **INC_LOW**	—	Low income households may face more difficulty in recovering materially from a disaster. They may also be underinsured or uninsured
Employment and Occupation	**UNEMPLOYED** **OCC_LABOUR** **OCC_DRIVERS** **OCC_SERVICE_L** **CHILDJOBLESS**	**UNEMP_RATIO** **UNEMPLOYED1 (2016 only)**	**UNEMPLOYED** OCC_SKILL1 OCC_SKILL2 **OCC_SKILL4** **OCC_SKILL5**	
New to region	—	—	—	If a person has moved to an area in recent years, they may be unfamiliar with local environmental hazards and may be unaware of procedures for preparing for, or responding to, an emergency
Housing	**LOWRENT** **OVERCROWD** **RENT_SOCIAL (2006 only)**	**LOWRENT** **HIGHRENT (2006 only)** **RENT_SOCIAL (2006 only)** **OVERCROWD** **OWNING** **MORTGAGE** **HIGHBED** **HIGHMORTGAGE** **LONE** **GROUP (2011 and 2016)**	—	Socio-economic disadvantage is a requirement for receiving public housing and those who are disadvantaged are likely to have a variety of social and economic problems that may require additional support in an emergency situation Absentee owners may not have high levels of engagement with the local community nor may they have the time to attend meetings or undertake full fire preparations on their property
Education level	NOSCHOOL (2006 only) NOQUAL (2006 only) NOYR12ORHIGHER NOEDU	—	NOYR12ORHIGHER CERTIFICATE **ATUNI** DIPLOMA NOEDU (2016 only) NOYEAR12 (2006 only) NOQUAL (2006 only)	People with high levels of education are more likely to understand a range of information related to risks and preparation as well as warnings information
Need assistance	**DISABILITYU70**	—	—	People who identify that they have a need for assistance with self-care are likely to need help in an emergency, for instance with evacuation. **Youth at risk:** Dependent on others for care

				Elderly: Tend to be more frail, have more health issues, and may be dependent on others for care. While individual older people may be fit and active, aggregate data show that the number of people needing assistance increases with age
Car ownership	**NOCAR**	**NOCAR**	—	People with no car access will be unable to evacuate themselves in an emergency
Language Proficiency	**ENGLISHPOOR**	—	—	People with limited English may find it more difficult to access or understand various emergency messages and information
Indigenous	**INDIGENOUS (2006 only)**	—	—	Indigenous Australians are more likely to have socio-economic disadvantage in relation to health status, education and employment outcomes, and life expectancy compared to non-Indigenous
Other	NONET DIVORCED (2006 only)	—	—	—

SOURCE 8 DELWP, 2012 (Vulnerability indicators); ABS, CAT 2039.0.55.001, 2006 (SEIFA Indicators)