register a 100% figure. These tend to be dominated by institutions such as Enoggera Barracks, the Villa Maria Nursing Home neighbourhood in Fortitude Valley, the Banyo seminary and the Amberley RAAF base. By contrast there are 22 neighbourhoods in which there were no households in rental accommodation. Most of these were in the Eagle Farm-Brisbane City corridor, around Surfers Paradise and the Wacol prisons. The mean ratio across all CCDs in the region is 28.5% and the spatial distribution is shown in Figure 3.14.

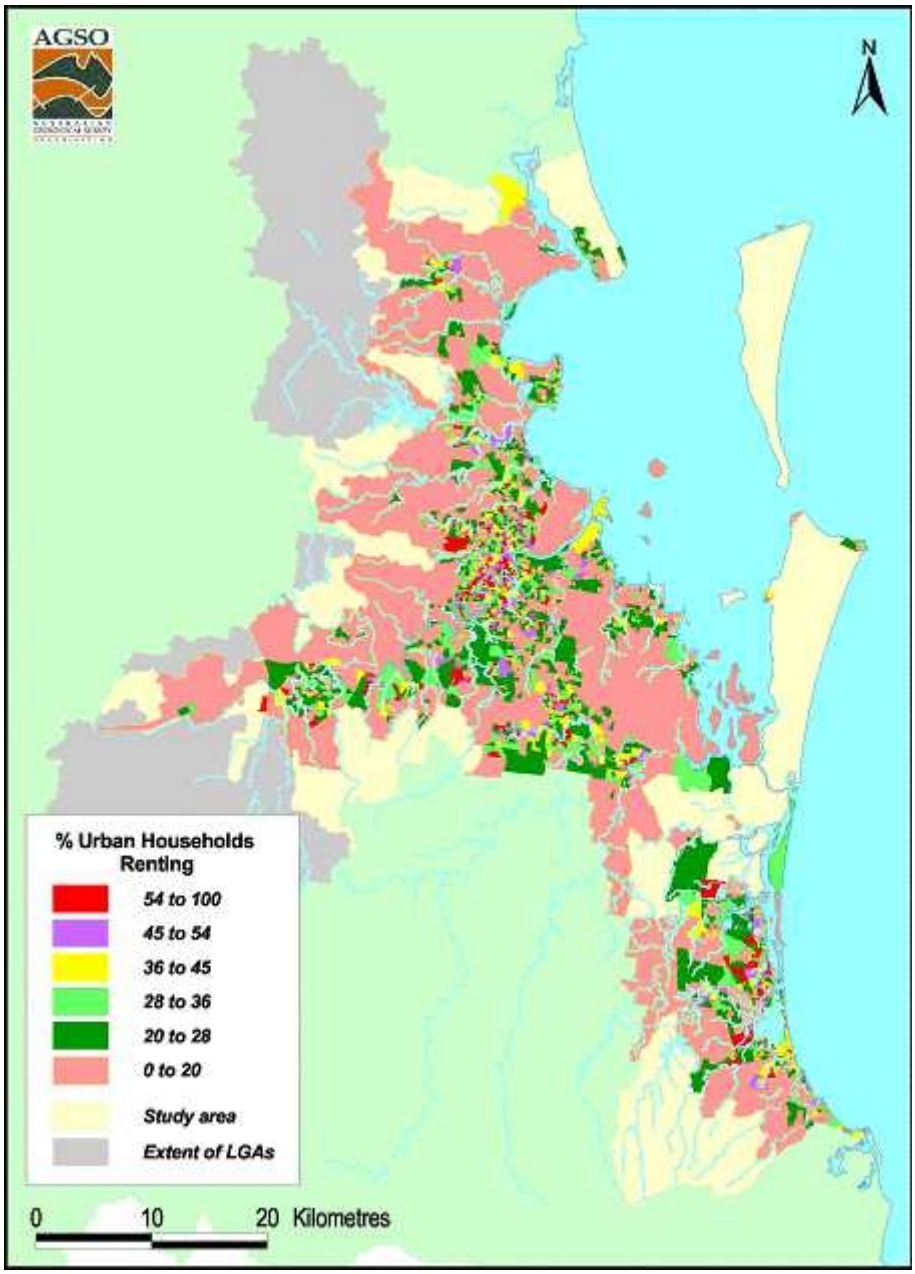

Figure 3. 14 South-East Queensland percentage of urban households in rental accommodation (ABS, 1998a data)

An *Index of Socio-Economic Disadvantage* has been compiled by the ABS by undertaking a principal components analysis on 20 weighted variables from the 1996 census. The attributes, such as low income, low educational attainment, high unemployment and jobs in relatively unskilled occupations, were selected to highlight disadvantage (see Table B1 in Appendix B for a list of variables used). The resulting index has been standardised to have a mean of 1000 and a standard deviation of 100 across all CCD in Australia (ABS, 1998b). The mean index value for the South-East Queensland study areas is

1001.0, essentially the same as the national mean. There were two CCD with index values under 600 (i.e. more than four standard deviations below the national mean). These were neighbourhoods in Inala and Leichhardt. At the other end of the scale, three CCD had indexes of 1200 or more (two standard deviations above the national mean). These were in Stephens, Chapel Hill and Spring Hill. The spatial distribution is shown in Figure 3.15.

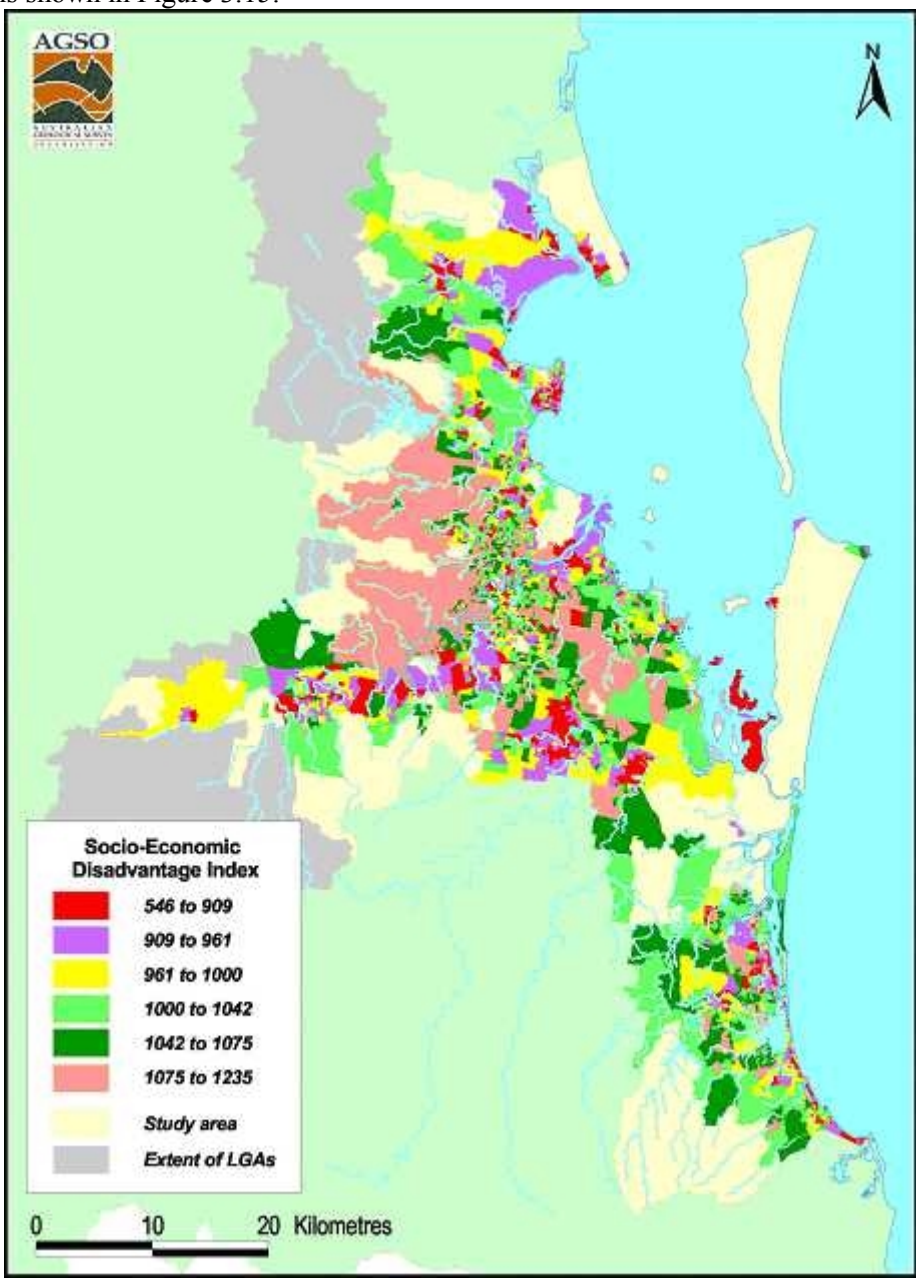

Figure 3. 15 South-East Queensland Index of Socio-Economic Disadvantage (based on data from ABS, 1998b)

A similar *Index of Economic Resources* is also available. This index is based on a profile of the economic resources of families. It is compiled from 22 weighted variables that reflect the income and expenditure of families, including measures of income, rent and home ownership (see Table B2 for a list of variables used). This index is also standardised with a national mean of 1000 and a standard deviation of 100. The region's mean index value is 1007.9, again very close to the national mean. The lowest index value is 696.6 (more than 3 standard deviations below the national mean) in an Inala CCD, whilst the highest value of 1325.22 is in Southbank (three standard deviations above the national mean). The spatial distribution is shown in Figure 3.16.

Protection: The full range of public safety services is provided in the region. Police services come under the Queensland Police Service (QPS). There are some 80 QPS establishments distributed across South-East Queensland. These range from the State Headquarters in Brisbane, the Police College at Oxley, to a number of specialist units such as the Dog Squad, Mounted Police and Water Police, to shop-front 'Police Beats' located in some of the larger shopping malls. For administrative purposes the area is divided between four Regions: North Coast Region which includes Redcliffe and Caboolture, headquartered at Maroochydore; Metropolitan North Region, headquartered in Brisbane Metropolitan South Region, headquartered in Mount Gravatt; and South East Region, headquartered in Surfers Paradise. More details can be obtained from the QPS web site at www.police.qld.gov.au.

The Australian Federal Police have offices in Spring Hill and the Gold Coast suburb of Robina.

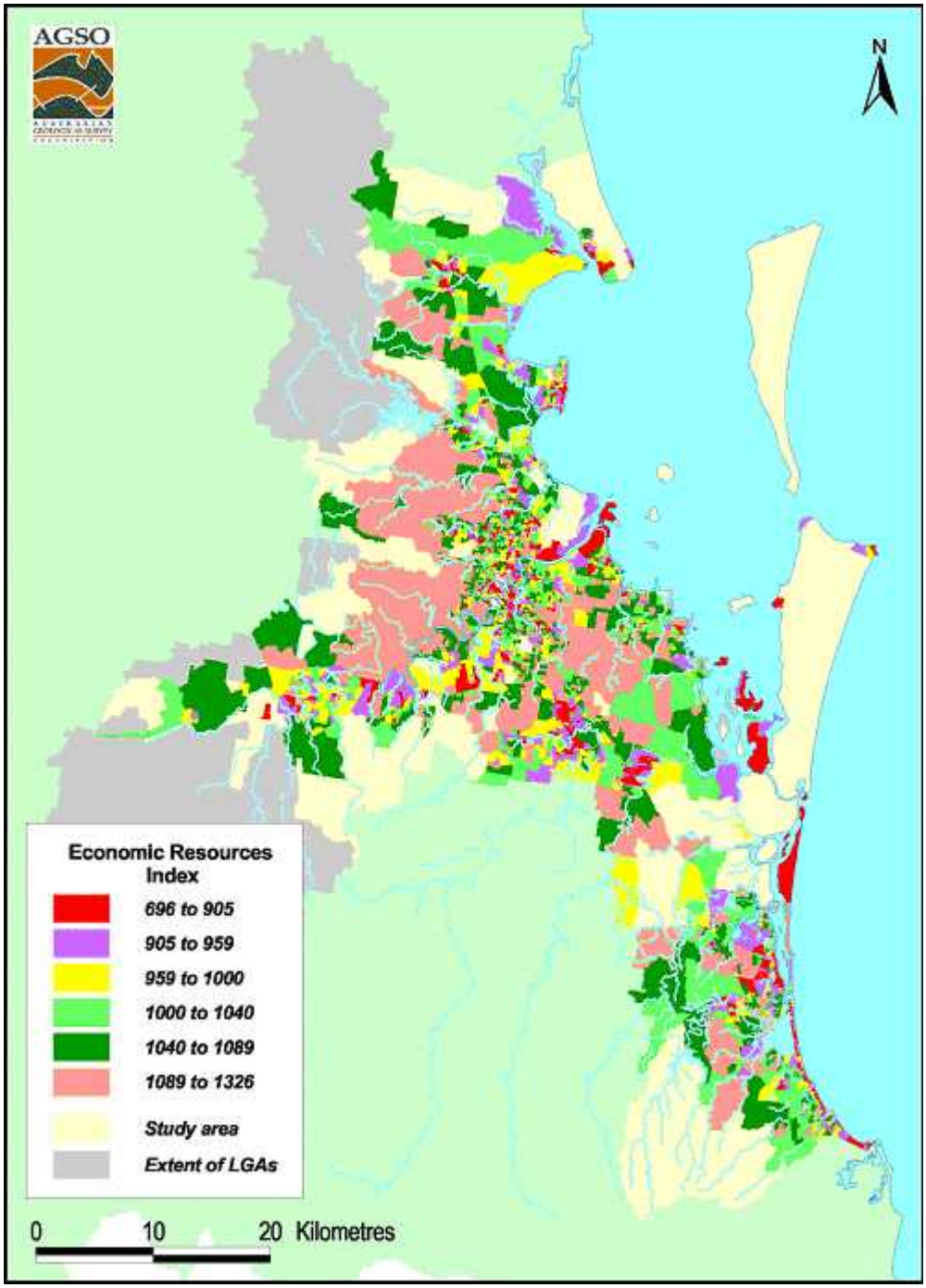

Figure 3. 16 South-East Queensland Index of Economic Resources (ABS, 1998b data)

The other emergency services come under the Department of Emergency Services which is headquartered at the Emergency Services Complex at Kedron Park. The headquarters of the Queensland Ambulance Service (QAS), the Queensland Fire and Rescue Authority (QFRA) and the Counter Disaster and Rescue Services Division (which oversights the SES and other volunteer groups as well as maintaining the operational Chemical Hazards and Emergency Management Unit and Queensland Rescue Aviation Services). The State Disaster Coordination Centre, which is activated in times of major emergency or disaster, is also located within the Kedron Park complex.

Ambulance services throughout the State are provided by the QAS. Within South-East Queensland there are 46 ambulance stations spread throughout three Ambulance Regions: Greater Brisbane Region, headquartered at Kedron Park; and South East, headquartered in Beenleigh. For details see their web site at www.ambulance.qld.gov.au. QAS resources are supplemented at major events, such as the RNA Exhibition and New Year festivities, or in times of emergency, by volunteers from the Saint Johns Ambulance Brigade who are trained in first aid.

The QFRA units within South-East Queensland include 50 urban brigades staffed by full time officers and 38 rural brigades staffed by volunteers. Several rural brigades provide fire services in rural villages such as Samford and Springbrook. The area is divided between three QFRA Regions: Brisbane North, extending from the Brisbane River north as far as Caboolture, with headquarters at Kedron Park; Brisbane South, covers the southern suburbs of Brisbane and the Redland area, with headquarters also at Kedron Park; and, South Eastern, which covers Ipswich and the southern parts of the area to the NSW border, with headquarters in Beenleigh. In addition to fire fighting and fire prevention activities, QFRA units are also responsible for road rescue activities such as extracting people trapped in motor vehicle accidents. For details see their web site at www.fire.qld.gov.au.

Fire services are provided at Brisbane International Airport by the Airport Fire Service which has two stations on the airport; at the Amberley air base by the RAAF Fire Service; and in the Gallipoli Barracks at Enoggera by Army fire fighters. Other major facilities such as the port and the fuel refineries also have their own staff trained in fire fighting duties. There is a mutual aid agreement in place between the QFRA and the NSW Fire Brigades that enables units from either state to assist each other if required. This is especially significant along the border between Coolangatta and Tweed Heads.

Both Ambulance and QFRA response management for the region is controlled from two joint Ambulance and Fire Communication Centres (AFCom), one located in the Spring Hill Ambulance Station and the other at Emergency Services Communications Centre in Southport.

Training and administration of State Emergency Service (SES) volunteer units is coordinated by the Department of Emergency Services (DES) Disaster and Rescue Services Division's District Managers throughout the State. There are two such districts covering South-East Queensland; Metropolitan, which covers SES units in Caboolture, Pine Rivers, Redcliffe, Brisbane and Redland from its headquaters in Brisbane; and South East District, headquartered in Beenleigh which covers SES units in Ipswich, Logan and Gold Coast. Details can be found on the web site at www.emergency.qld.gov.au/ses.

Local SES units are the responsibility of each individual LGA, with planning and coordination the responsibility the Local Counter Disaster Committee (LCDC). LCDCs are typically chaired by the LGA's mayor or another senior elected official, and supported by an executive officer. In the larger councils, such as Brisbane and Gold Coast, the executive officer is a full-time professional disaster coordinator, whilst in smaller councils this role is added to the duties of a senior official, typically the senior engineer or works manager. The LCDC is also responsible for the development and implementation of the local disaster plan.

Marine rescue services are provided by the Australian Volunteer Coast Guard, Volunteer Marine Rescue Association of Queensland and Surf Life Saving Queensland. Each of these is a volunteer organisation, however, they each receive funding support and administrative coordination through DES. Volunteer marine rescue bases operate from Bribie Island, Scarborough, Shorncliffe, Manly, Victoria Point, Cleveland, Currumbin, Main Beach, Jacobs Well, South Stradbroke Island, Southport. There are 22 surf lifesaving clubs on the Gold Coast and one on Bribie Island.

DES also operates its air wing (both rotary and fixed wing) rescue services from their base at Archerfield Airport, whilst the Royal Flying Doctor Service operates from Brisbane International Airport.

The Queensland Corrective Services Commission oversights correctional centres in the region. The major prison complex is at Wacol and includes the Moreton Correctional Centre, Sir David Longland Correctional Centre and the Wacol Remand and Reception Centre. The Numinbah Valley Correctional Centre is located on Nerang-Murwillumbah Road, in the Gold Coast hinterland. The Woodford Correctional Centre, located in Caboolture Shire, is outside the area covered by this study.

South-East Queensland hosts a number of Defence Force establishments that are potentially significant to public safety. The largest of these is the Army base at the Gallipoli Barracks, Enoggera which is headquarters to armoured (2/14 Light Horse), artillery (1 Field Regiment) and infantry (6 Royal Australian Regiment and 9 Royal Queensland Regiment) combat units of the 7th Task Force, together with supporting elements including electrical and mechanical engineers (104 Field Workshop), intelligence, medical (including 2 Field Hospital), military police, transport, and signals (1 JSU, 136 Signal Squadron and 7 CSU) units. Logistic support resources are headquartered at the Bulimba Barracks with a detachment at the Banyo Barracks. Training units are at Wacol (1st Training Group) and St Lucia (Queensland University Regiment). Other establishments include the Greenbank range complex and camp, the Defence Centre at Victoria Barracks, Milton and the Army's Land Warfare Centre which is partially located within the Gold Coast. The Kokoda Barracks at Canungra, are, however, within Beaudesert Shire. There are Reserve establishments in Caboolture, Ipswich, Logan and Gold Coast.

RAAF Base Amberley is home to No 1 and No 3 Squadrons (F-111), which make up the RAAF Strike and Reconnaissance Group, No 38 Squadron (Caribou), of the Air Lift Group, and numerous support, maintenance and training elements. The base is essentially self supporting though significant numbers of personnel and their families live in the general Ipswich community.

The Royal Australian Navy maintains a naval support office in the Bulimba Barracks.

The Commonwealth's Bureau of Meteorology Regional Office at 295 Ann Street, Brisbane City houses the regional forecasting centre and the Cyclone Warning Centre (when activated). This agency provides warnings of severe weather events and floods throughout Queensland.

Society

The capacity of individuals, families, households and neighbourhoods to withstand the impact of disaster has much to do with the cohesiveness and resilience of those communities. Social cohesion is a very complex thing and difficult to measure, especially in a population as mobile as that found in Brisbane. The development of indices of social vulnerability has still a long way to go, however, the measures discussed below, including family structure, language and ethnicity, religion, length of residence, education and community services, appear to be amongst the most relevant.

Family structure: The literature on community vulnerability has identified the structure of families as having a significant bearing on susceptibility or resilience to disaster impact. Single parent families, especially 'women-led' families with younger children, and large families, for example, have been shown to be particularly susceptible. Morrow (1999), for example, identifies those types of family as having been amongst the most adversely affected by the 1992 impact of Hurricane *Andrew* in Florida.

Table 3.5 summarises the number of families in the South-East Queensland according to their size and structure. There are 216 305 households made up of a couple plus their children, of which 27.1% contain 5 or more people (i.e. notionally 3 or more children). There are 66 561 households made up of a single parent and their children, of which 19.0% contain 4 or more people (likewise three or more children).

Table 3. 5 Number of households with children by type and size (Source: ABS, 1998a).

	Number of people usually resident					
	2	**3**	**4**	**5**	**6+**	**Total**
Couple with children		69 899	87 734	41 835	16 837	216 305
One parent family	30 986	22 904	8922	2670	1079	66 561
Totals	30 986	92 803	96 656	44 505	17 916	282 866

The spatial distribution of large families and single parent families expressed as a percentage of all families, is shown in Figure 3.17 and Figure 3.18 respectively, based on ABS (1998a) data. As a broad generalisation, the larger families tend to be located in the rural fringe and areas of recent urban growth, whilst the single parent families tend to be concentrated in the inner and older suburban areas.

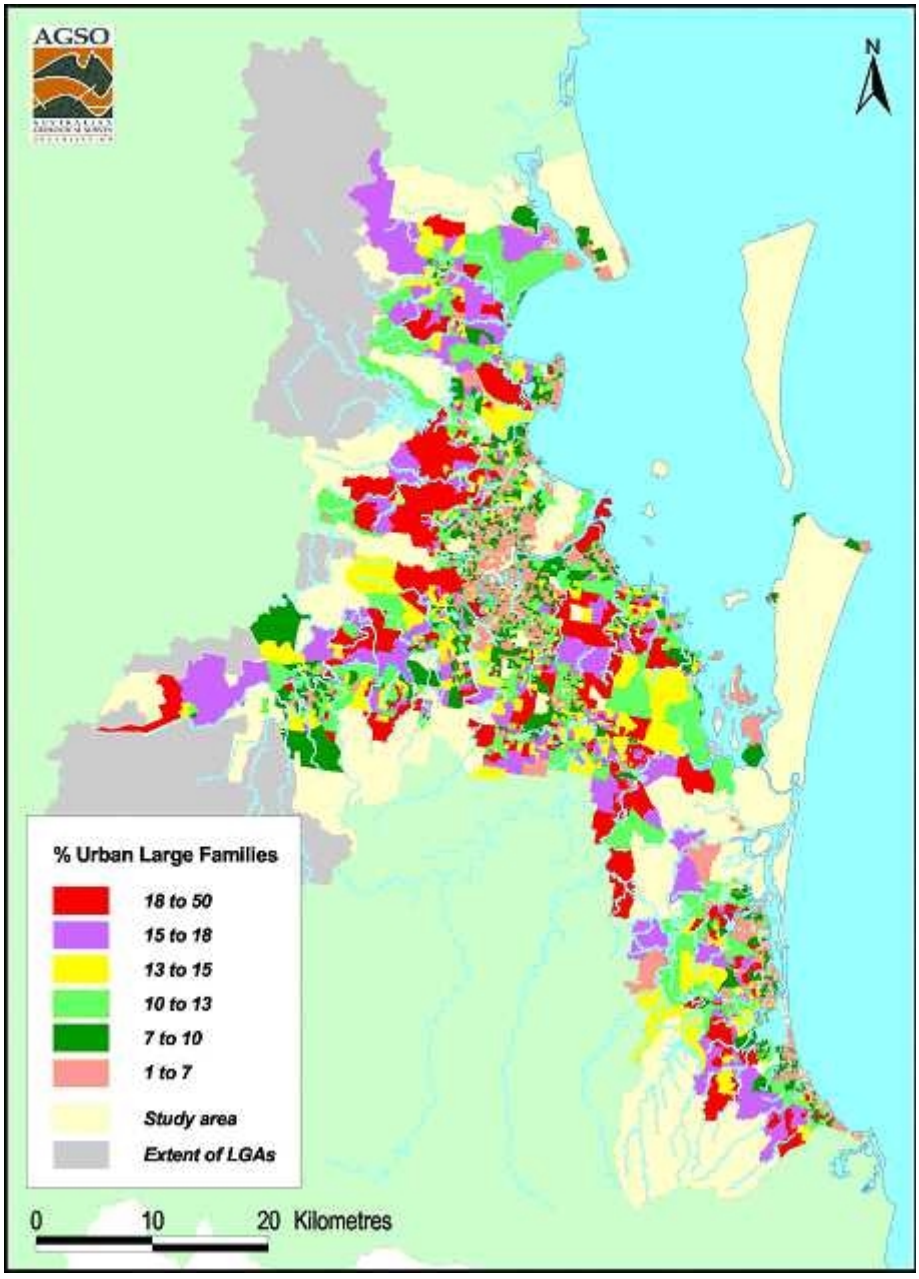

Figure 3. 17 South-East Queensland urban proportion of large families (ABS, 1998a data)

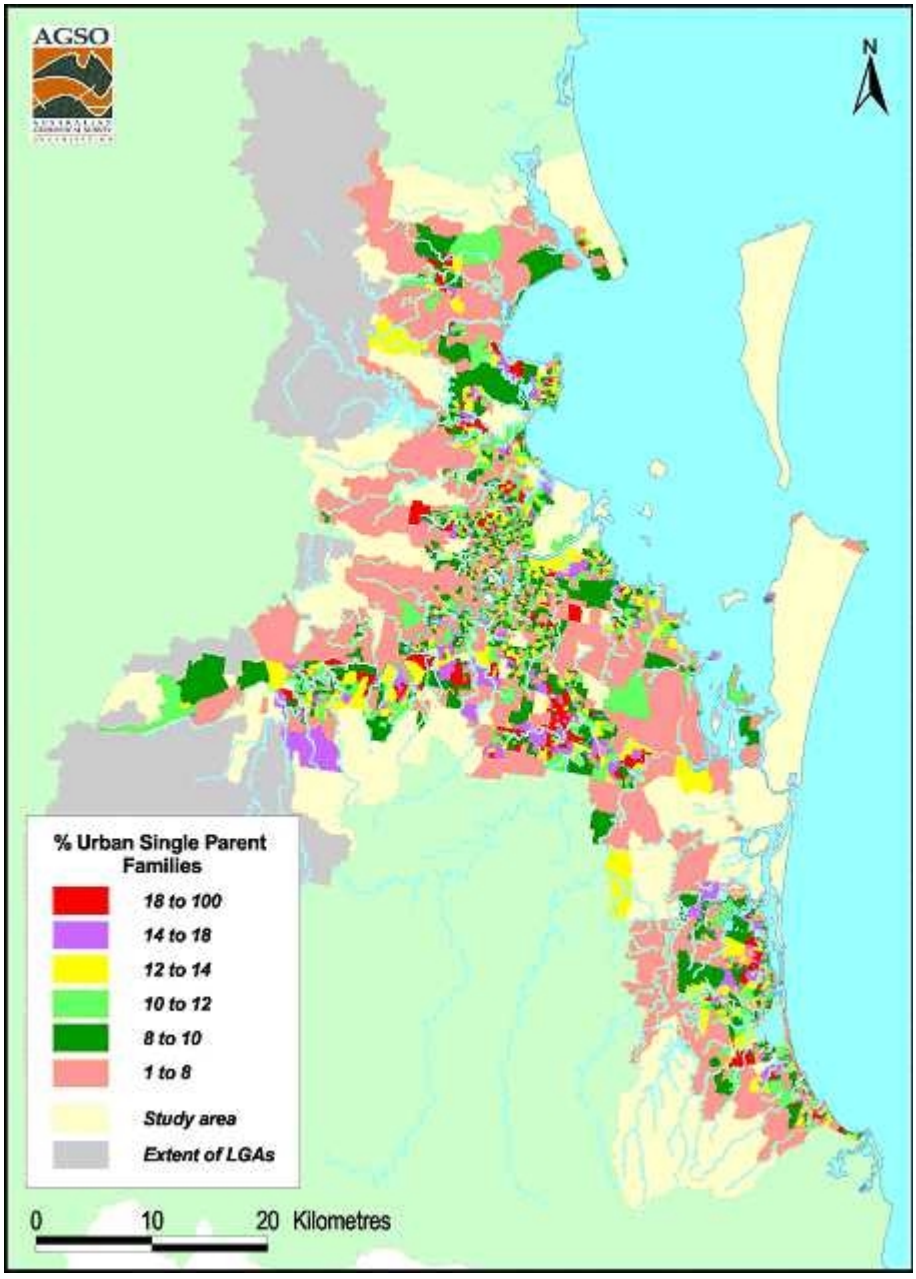

Figure 3. 18 South-East Queensland proportion of urban single parent families (ABS, 1998a data)

Across the study area the overall percentage of large families is 7.9%. There are 19 neighbourhoods across the region with percentages of 25% or greater. These are mostly in Brisbane City (10/19), with Gold Coast (4/19), Logan, Ipswich (both2/19) and Pine Rivers also represented.

Around 23.5% of all families, across the study area, have children with only one parent present. There are 63 neighbourhoods where the percentage exceeds 25%, one of which has 100% (the CCD which contains the women's prison in Wacol). The majority of these neighbourhoods are in Brisbane City (32/63), with Gold Coast, Ipswich (each with 9/63), Caboolture, Logan (each with 4/63), Pine Zrivers (3/63) and Redcliffe (1/63).

Language and ethnicity: One of the strongest social links in a community is derived from language and ethnicity. For the resident population, English is overwhelmingly the most common language spoken, with 86.6% of the population over five years of age speaking only English at home. The next largest

groups are 'other' (2.3%), Chinese (1.6%), Italian (0.8%), Vietnamese (0.7%), German (0.6%) and Greek(0.5%). The 'other' group appears to include mainly Pacific Island and Asian languages such as Polynesian, Japanese and possibly Korean.

These figures relate specifically to the resident population. In 1999, however, Brisbane received 704 428 international visitors, of whom at least 53% were from non-English speaking countries, especially Japan (108 056), Taiwan (66 837), Germany (26 623) and other European countries (93 151).

Some 74.4% of the population living in the region in 1996 was born in Australia. Of the overseas born community, the United Kingdom (6.4%), New Zealand (3.8%), Germany (0.6%) and Vietnam (0.6%) were the major sources. About 1.2% of the population was of Aboriginal or Islander descent. The most significant concentration of any single ethic group is in Darra where 30% of the population in one CCD were born in Vietnam, and in several Inala neighbourhoods where up to 12.4% are of Aboriginal or Islander descent.

Religion: One of the more significant linkages that tend to span social cleavages such as ethnicity, is religion. In South-East Queensland, the majority (80.0%) of residents who provided answers to the questions on religion in the 1996 census were Christian. Of the remainder, 1.0% were Buddhist, 0.6% Islamic, 0.5% Hindu and 0.2% Jewish, whilst 17.4% said they had no religion. Of the Christian faiths, Catholic (35.5% of all Christians), Anglican (31.4%), Uniting (12.0%), Presbyterian (6.1%) and Baptist (2.9%) have the largest congregations. Distribution across the city is quite even, though localised concentrations are obviously found where there are institutions such as convents, boarding schools and church-run nursing homes.

Length of residence: Awareness of the local hazard history, environment and how to cope with disaster, as well as the level of integration into the local community, can be measured by the length of time people have lived in the area. The population of the region is clearly a mobile one, with only 53.0% of the population at the 1996 census living at the same address that they were living at five years previously. Around 3.7% (or 117 CCD) had more than 75% of their population living at different addresses five years previously. The main concentrations of new residents are clearly apparent in Figure 3.19.

Some of the higher figures were recorded in 'institutional' areas such as Enoggera (the army barracks), Amberley (the RAAF base), Saint Lucia (the University) and Wacol (the prisons). Also obvious are the suburbs in which urban development is in progress in all LGA. Perhaps less obvious, but also quite important is the inner Brisbane area where re-development, 'gentrification' and densification of settlement is strongest. This change is overwhelmingly based on in-migration.

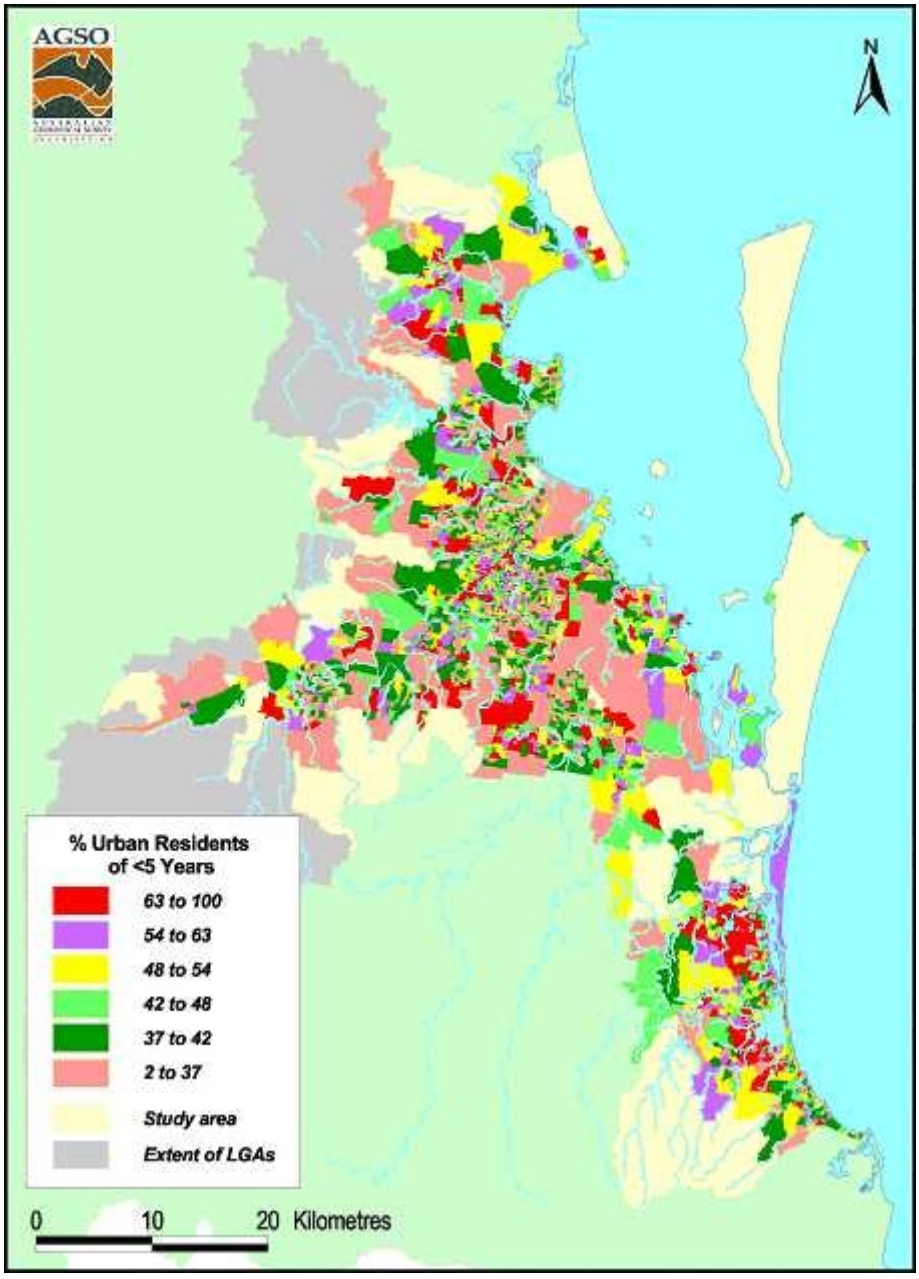

Figure 3. 19 Proportion of urban population at census address for less than 5 years (ABS, 1998a data)

Elderly living alone: Another category of community member that has a particularly elevated level of susceptibility consists of the elderly folk who are living on their own. Whilst many of these may be living in 'managed' communities such as retirement villages, a substantial number are living in their own homes, In many instances these people can become isolated from their neighbours and the community as their mobility declines. The distribution of people who are over 65 and living alone is shown in Figure 3.20. Over the whole region the CCD mean is only 2.9% of the total population, however, this is clearly uneven. Twenty-seven CCDs have more than 15% of their population as elderly living alone. These neighbourhoods are in Brisbane (14/27), Gold Coast (6/27) Redcliffe (4/27) and Caboolture, Ipswich and Redland (each with 1/27). The distribution shows a clear preference for localities closer to the coast and the major rivers.

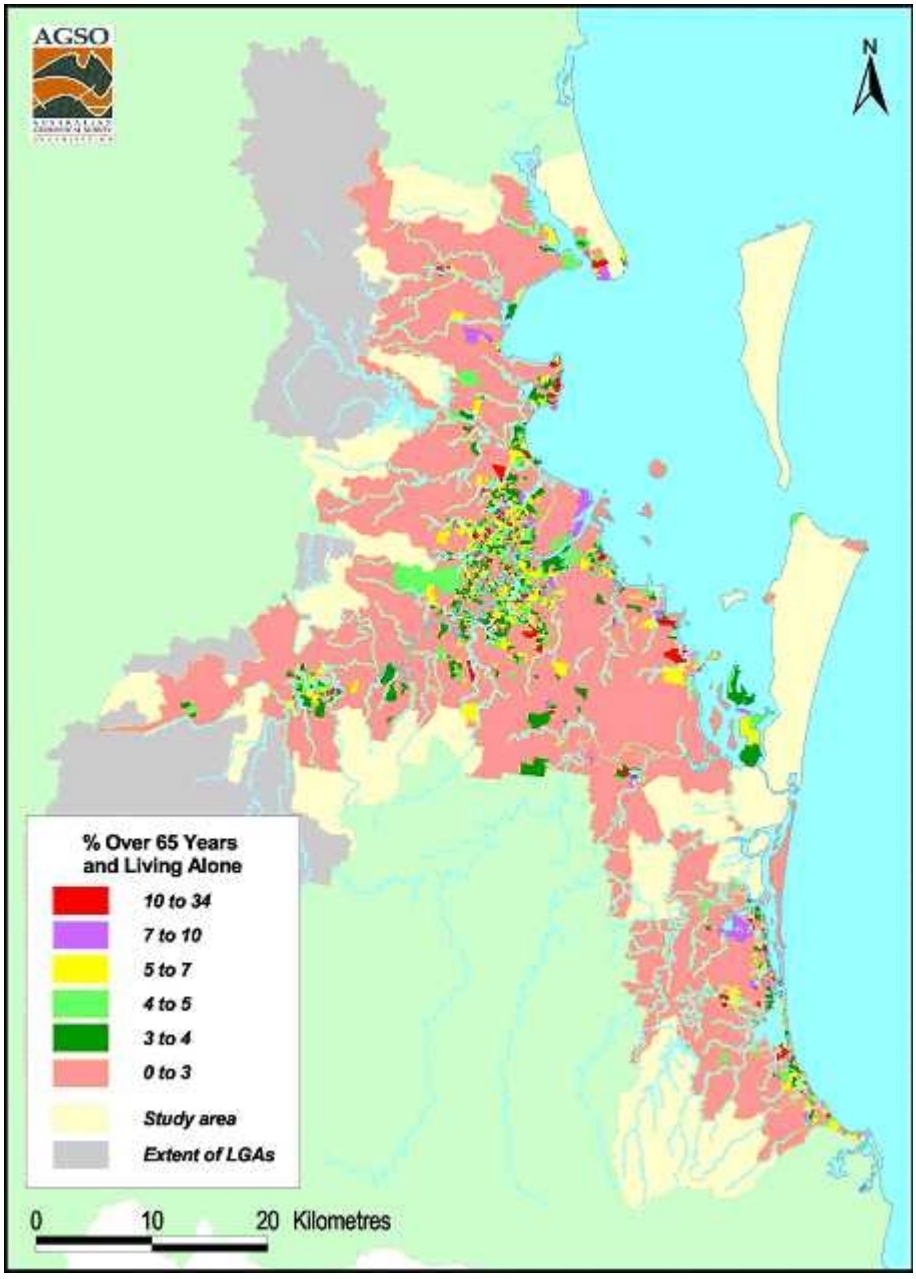

Figure 3. 20 Proportion of population who are over 65 and living alone (ABS, 1998a data)

Education: The disaster management literature suggests that the capacity of the community to understand and respond to information on risk or hazard potential is, to some degree, dependant on education and literacy. Much of the research reported in this literature, however, relates to developing countries where levels of literacy and access to information are typically poor. In a developed country such as Australia, basic levels of education and literacy are comparatively high across the community. In South-East Queensland some 28.9% of people over 15 had gained some form of post-secondary qualification and the vast majority of the remainder being at least literate. In this community, therefore, education levels are unlikely to make a particularly significant contribution to community vulnerability.

Educational facilities are typically identified in disaster plans as shelters or evacuation centres following disaster because they have ample space and facilities such as toilets and canteens. There are approximately 700 pre, primary, secondary and special schools in South-East Queensland. There are, in addition, five universities – Australian Catholic University (Enoggera campus), Bond (Robina), Griffith (Gold Coast, Logan, Morningside, Mount Gravatt, Nathan and South Brisbane campuses),

Queensland University of Technology (Carseldine, Gardens Point and Kelvin Grove campuses) and University of Queensland (St Lucia, Dental School, Medical School and Veterinary Farm campuses). There are 17 TAFE campuses spread across the region. There are also several vocational institutions, such as theological colleges, tourism and hospitality colleges, secretarial colleges, art schools and so on.

At the other end of the educational process are at least 650 child care centres and kindergartens that serve areas of employment and all residential suburbs. Given the very young age and vulnerability of children at these centres, they deserve particular attention.

The SEIFA *Index of Education and Occupation* also provides an overview of the distribution of population with an educational 'advantage'. As with the two SEIFA indexes already discussed, this index is also standardised with a national mean of 1000 and a standard deviation of 100. The South-East Queensland study area mean value is 1003.9 (very close to the national mean) and ranges from a high (high educational levels and high occupation status) of 1312.8 (more than three standard deviations above the national mean) in St Lucia, to a low (low education levels and job status) of 724.6 (more than two standard deviations below the national average) in a Woodridge neighbourhood. The spatial distribution is shown in Figure 3.21. Table B3 lists the variables used to build this index.

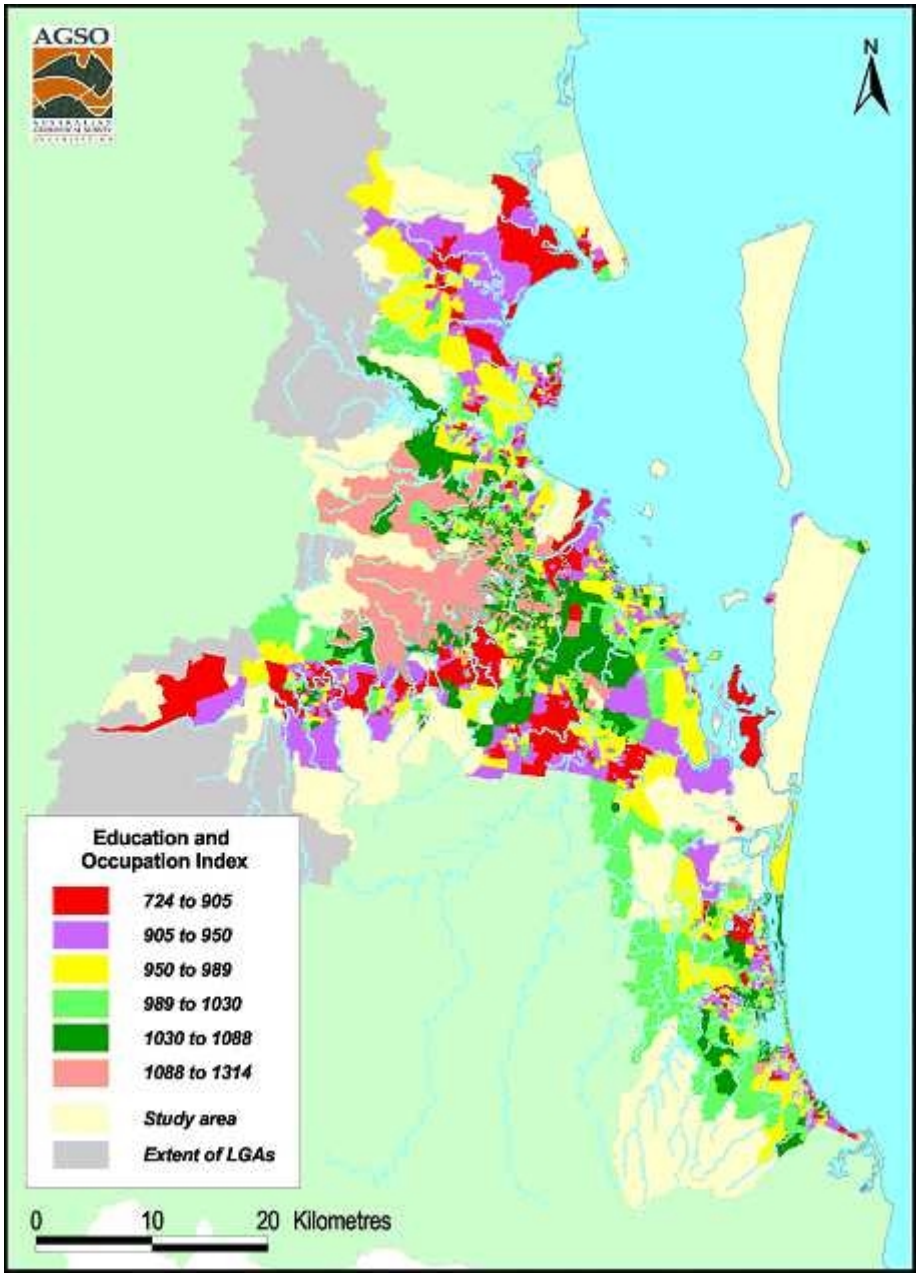

Figure 3. 21 Index of Education and Occupation (ABS, 1998b data)

Community services: Community based groups provide a significant level of social resilience and effective networks for the dissemination of information. The region is extremely well served by these groups, which include those based on schools (e.g. Parents and Citizens Associations), churches (e.g. youth groups, fellowships, etc), sporting activities and community service clubs (e.g. Apex, Rotary, Boy Scouts, etc). It is likely that there is a degree of cross membership between these various groups, a situation that has been observed in other communities and which greatly enhances community resilience and cohesion.

Cultural and Natural Heritage: One of the more intangible and frequently overlooked, group of elements at risk are those features that make up the community's cultural and natural heritage. These range from Aboriginal such as the many Bora Ring sites and prehistoric occupation sites such as the South Stradbroke Island middens, to modern attractions such as the Gold Coast theme parks.

Given that Brisbane is the oldest urban centre and the State capital, it is not surprising that there is a concentration of cultural heritage features present. These include historic and otherwise significant

structures, libraries, art galleries, museums, document archives and so on. Most of the more significant cultural heritage features, such as the State Library, Queensland Art Gallery and Queensland Museum, Old Government House, Newstead House and Parliament House, are concentrated around or close to the city centre. The National Trust of Australia (Queensland) maintains a register of places that have been identified as being significant to the local and national heritage estate. The David Fleay Wildlife Park and the Currumbin Sanctuary on the Gold Coast, for example, are listed on this register. The Queensland State Archives are housed in Runcorn whilst each LGA has its own archival repository.

The region also contains several areas of significant natural heritage value. Perhaps the most important of these are the wetland areas of Moreton Bay that have been classified under the 1971 Ramsar Convention on Wetlands as a primary site of international importance, especially given their significance as a feeding ground for migratory water birds and the various national parks that occupy much of the western borders of the area.

Critical, High Risk and Hazardous Facilities

The distribution of facilities that are critical to the safety and sustenance of the community provides a strong indicator of community vulnerability, particularly in the aftermath of a disaster impact. At least 550 such facilities have been identified in region that would meet this criteria. They include facilities such as port, airport and rail infrastructure, telephone exchanges, power substations, water treatment plants, major fuel and food storage facilities, and so on.

Some of these facilities could, under certain circumstances, exacerbate the impact of a hazard event by adding to the danger. The loss of containment of hazardous materials such as chemicals or flammable substances as the result of a hazard impact, for example, would magnify the danger because of toxic contamination, fire or explosion. The hazards contained at some of these facilities are not always obvious. For example, large commercial cold storage facilities typically use large quantities of ammonia as their refrigerant (as much as three tonnes in some facilities). Apart from its noxious properties, as a gas, ammonia is highly flammable.

A wide range of essentially incompatible chemicals may be stored on the same premises. Supermarkets, garden supply nurseries, pool supply shops, hardware stores, school chemistry laboratories, pharmacies and so on, store a wide range of chemicals (generally in small quantities) that can become very dangerous if not properly contained and stored. Some chemicals, such as the various forms of cyanide, can be extremely dangerous, even in very small quantities. Some of these are used in a wide range of processes and can be found in the most obscure businesses such as fibreglass manufacture, electro-plating, jewellery manufacture and the manufacture of dental prostheses. Most facilities that store quantities of hazardous substances over certain thresholds, however, must display safety placards that identify the chemicals and the nature of the hazard they represent.

Facilities in which people concentrate at various times can also be considered to be high risk facilities (in terms of people exposed), especially for hazards such as earthquakes which can strike without warning at any time of day. Such facilities are too numerous to list individually, but would include the following groups of facility:

- schools, preschools and other educational facilities;
- entertainment, recreational and sporting facilities;
- transport terminals;
- tourist accommodation such as hotels, resorts and hostels;
- shopping, commercial and professional centres; and,
- hospitals and nursing homes.

The significance of a facility may extend beyond the community in which it is located if a wider community of interest depends on it for services or supply. For example, the disabling of the Mount Crosby water treatment plants would, at least temporarily, disrupt the supply of safe water to much of South-East Queensland population. In general, however, alternative facilities are available within a fairly short distance in neighbouring local government areas.

A Composite Community Vulnerability Profile

In this chapter so far we have described a broad range of the elements at risk within the Brisbane community and identified some of the key aspects that contribute to their vulnerability. These have been drawn from the large amount of high resolution data accumulated on the people, buildings and infrastructure of Brisbane. Whilst these data provide a detailed quantitative description of specific aspects of the area's risk environment, they do not, of themselves, provide an adequate measure of overall community vulnerability. Nor do they individually reflect the relative levels of vulnerability across the area.

We consider that it is highly desirable, however, to be able to identify those parts of the study area that would provide a potentially disproportionate contribution to community risk because of the number and nature of the elements at risk they contained.

There is little in the risk or disaster management literature to provide a guide for this task so we created our own methodology for the Cairns study (Granger and others, 1999), based on the 'five esses' described in this and the previous chapter, and a composite, or combined community vulnerability assessment. We modified that methodology slightly for the Mackay study (Middelmann and Granger, 2000) to take account of a review of the Cairns work by the Centre for Disaster Studies, James Cook University (King, Moloney and MacGregor, 2000) and that approach has been maintained, with some further minor additions, here. Appendix D provides a detailed explanation of the methodology and the logic behind the selection of the variables included in this study. The key difference in the method used here, as opposed to Cairns, is that vulnerability profiles have not been aggregated to the suburban level but have been calculated at the CCD level only. Suburb boundaries are overlain on the 'vulnerability surfaces' for ease of reference.

It is emphasised that the values indicated on the following maps do **not** equate to a risk rating. They are simply index values that provide an indication of the **relative contribution** made to overall community risk across the study area, assuming that an even and equal exposure to the impact of all hazards existed. (The lower the index number, the greater the relative degree of susceptibility.) This is clearly not the case, as will be explored in the following chapters. The following six figures show the 'vulnerability surfaces' for each of the five 'esses' (setting, shelter, sustenance, security and society) and a composite 'community vulnerability' surface.

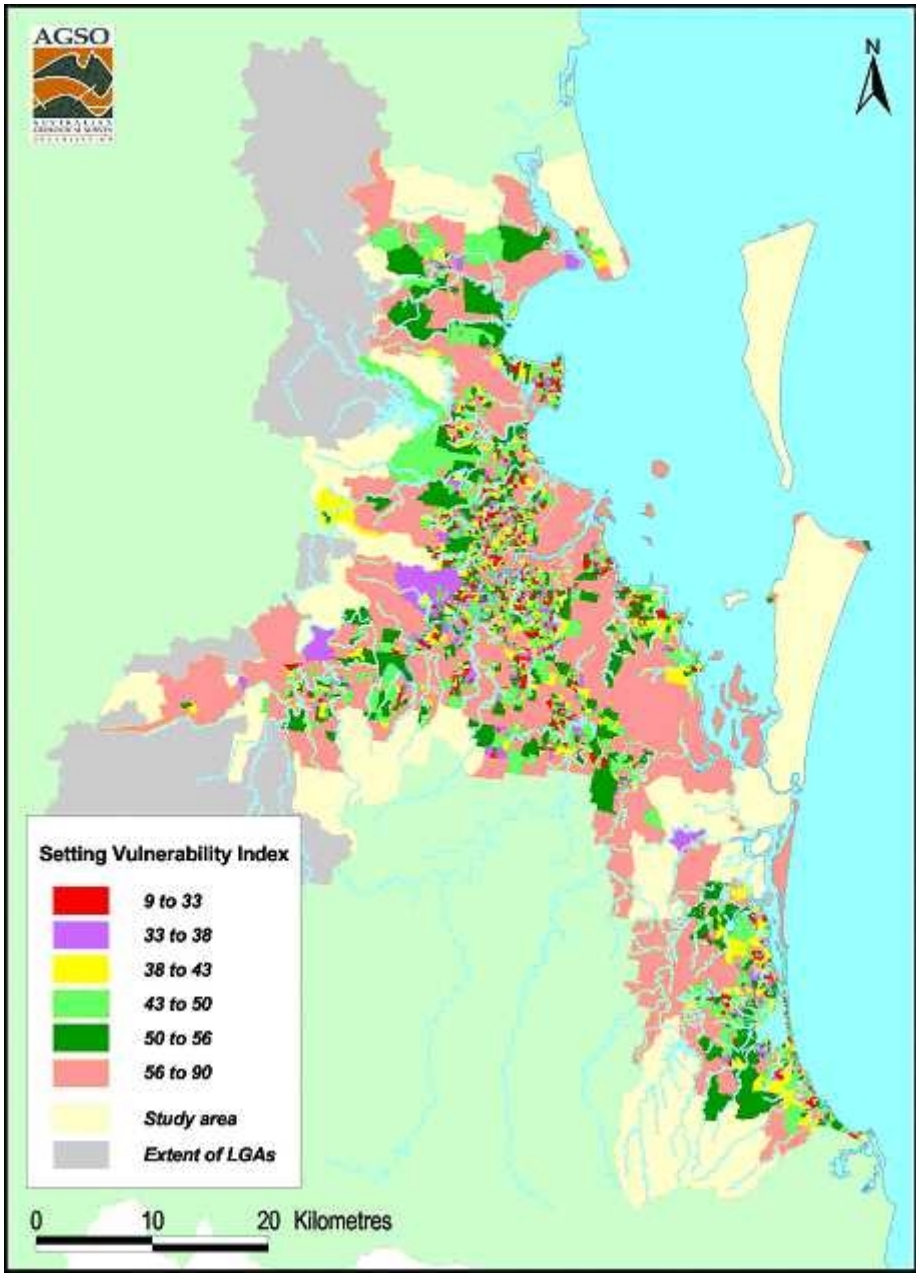

Figure 3. 22 Setting Vulnerability Index

The suburbs which contain the top 1% of setting vulnerability indexed neighbourhoods (i.e. those that contribute most) are (in alphabetic order):

> Auchenflower, Balmoral, Benowa, Bethania, Birkdale, Broadbeach Waters, Camp Hill, Carina Heights, Carseldine, Chermside, Coolangatta, Coombabah, Herston, Indooroopilly, Ipswich, Kangaroo Point, Labrador, Lutwyche, Mermaid Beach, Nerang, Norman Park, Redcliffe, Sandgate, Southport, South Brisbane, Sunnybank, Surfers Paradise, The Gap, Woodridge, Wynnum West and Zillmere.

The bottom 1% of neighbourhoods (those that contribute least) are contained in the suburbs of:

> Albion, Banyo, Boondall, Camira, Cannon Hill, Carole Park, Daisy Hill, Donnybrook, Eden Island, Eight Mile Plains, Elimbah, Goolman, Greenbank, Heathwood, Karawatha, Karragarra

Island, Kippa Ring, Labrador, Moreton Island, North Booval, North Stradbroke Island, Oxley, Pannikin Island, Priestdale, Richlands, Russell Island, Saint Helena Island, Virginia, Wacol

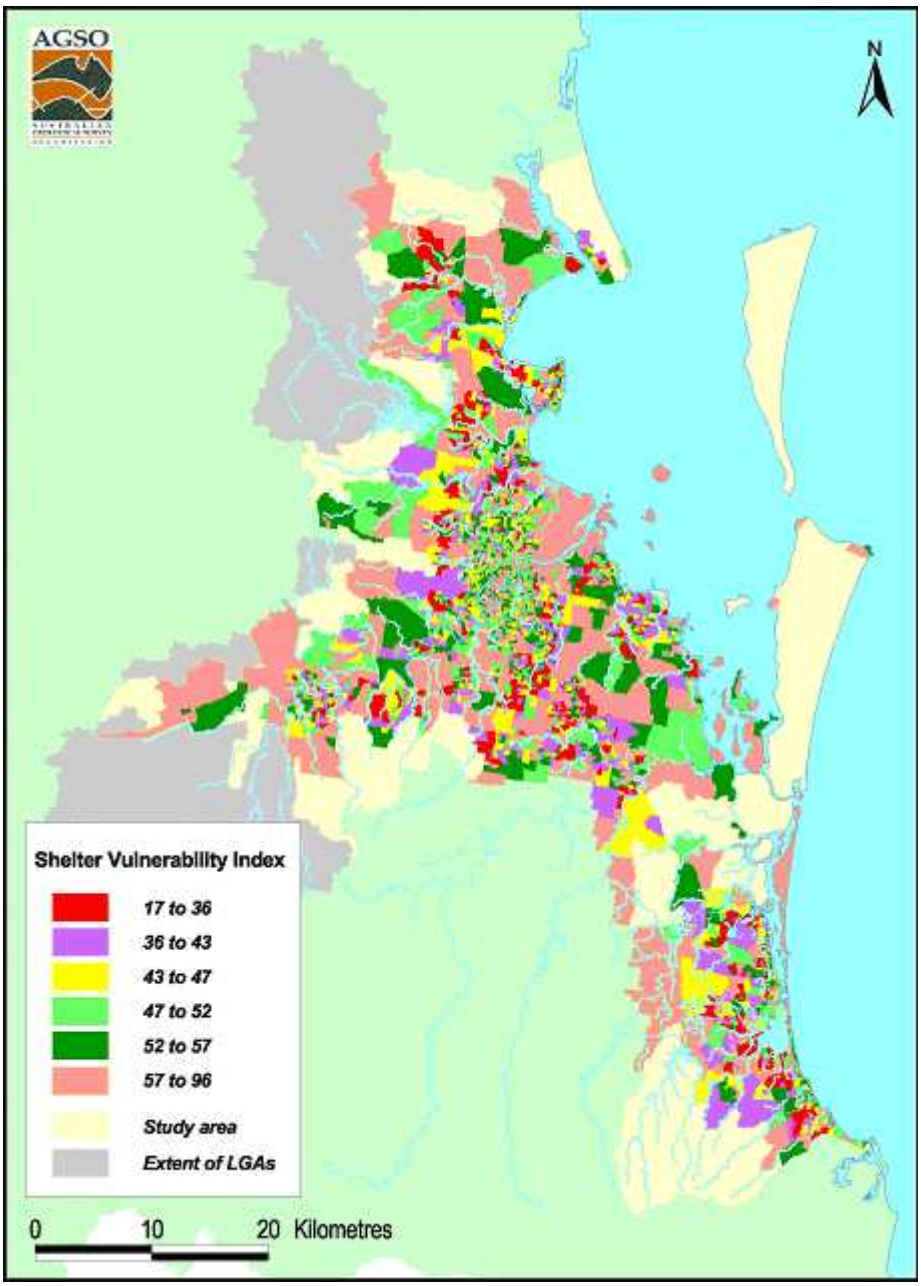

Figure 3. 23 Shelter Vulnerability Index

The suburbs which contain the top 1% of shelter vulnerability indexed neighbourhoods (i.e. those that contribute most) are (in alphabetic order):

Aspley, Calamvale, Carrara, Carseldine, Collingwood Park, Deception Bay, Eight Mile Plains, Elanora, Gailes, Kallangur, Kingston, Labrador, Lawnton, Manly West, Mansfield, Mudgeeraba, Nerang, Oxenford, Robertson, Rochdale South, Runcorn, Stevens, Sunnybank Hills, Tanah Merah, The Gap and Tingalpa.

The bottom 1% of neighbourhoods (those that contribute least) are contained in the suburbs of:

Acacia Ridge, Amberley, Banyo, Belmont, Boondall, Brisbane City, Camira, Carole Park, Coolangatta, Daisy Hill, Eagle Farm, Elimbah, Fortitude Valley, Karawatha, Kippa Ring, Nathan, Oxley, North Stradbroke Island, Pannikin Island, Richlands, Saint Helena Island, South Brisbane, Stephens, Surfers Paradise and Wacol.

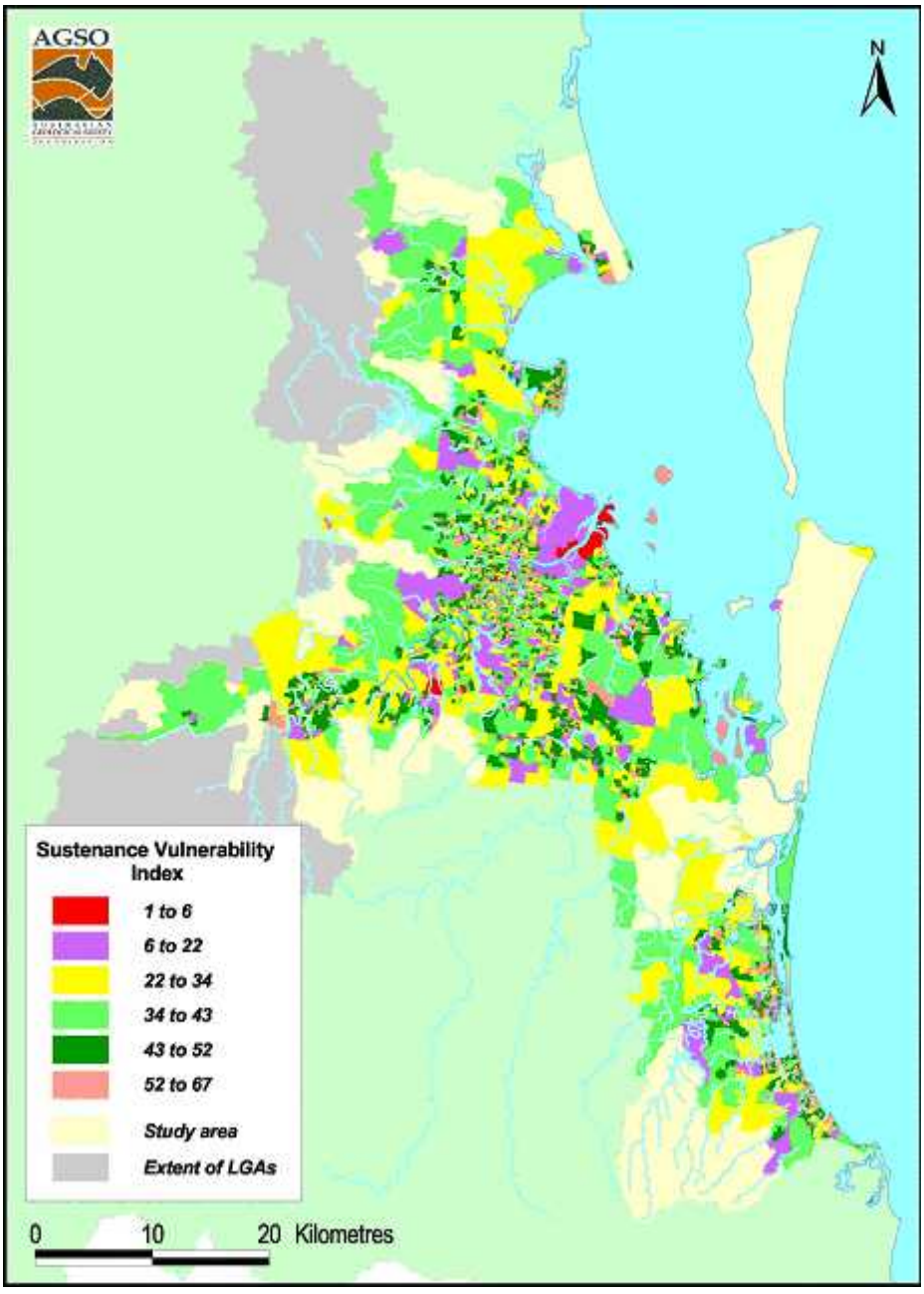

Figure 3. 24 Sustenance Vulnerability Index

The suburbs which contain the top 1% of sustenance vulnerability indexed neighbourhoods (i.e. those that contribute most) are (in alphabetic order):

Andrews, Aspley, Bald Hills, Banyo, Brendale, Brisbane City, Calamvale, Camp Hill, Darra, Eagle Farm, Fortitude Valley, Hemmant, Inala, Loganholme, Lytton, Murarrie, Nerang, Newstead, Norman Park, Norwell, Pinkenba, Redcliffe, Rocklea, Rothwell, Salisbury, Sandgate, Sherwood, Underwood, Wacol, Willowbank and Wynnum.

The bottom 1% of neighbourhoods (those that contribute least) are contained in the suburbs of:

> Biggera Waters, Broadbeach, Burleigh Heads, Main Beach, New Farm, North Stradbroke Island, Pannikin Island, Richlands, Runaway Bay and Surfers Paradise.

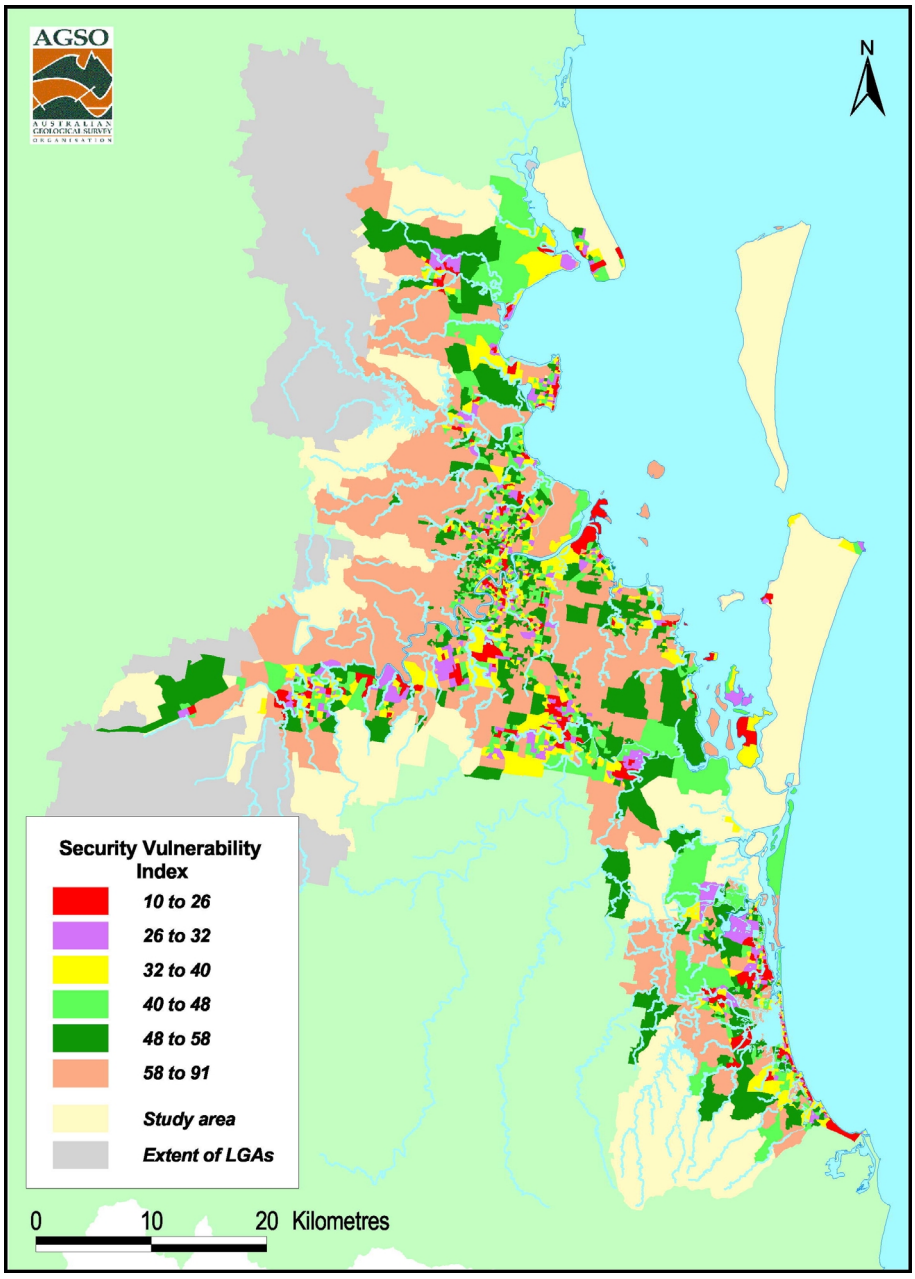

Figure 3. 25 Security Vulnerability Index

The suburbs which contain the top 1% of security vulnerability indexed neighbourhoods (i.e. those that contribute most) are (in alphabetic order):

> Beenleigh, Booval, Caboolture, Cleveland, Coolangatta, Fortitude Valley, Holland Park, Inala, Ipswich, Kelvin Grove, Lytton, Marsden, Morayfield, Riverview, Scarborough, Southport, Stafford, Tugun, West End, Windsor, Woodridge and Zillmere.

The bottom 1% of neighbourhoods (those that contribute least) are contained in the suburbs of:

Amberley, Camira, Camp Mountain, Carindale, Chappell Hill, Boondall, Daisy Hill, Eight Mile Plains, Ferny Grove, Figtree Pocket, Forestdale, Heathwood, Jindalee, Kenmore, Kippa Ring, Lawnton, Mount Ommaney, Pannikin Island, Richlands, Robertson, Saint Helena Island, Samford Valley, The Gap, Westlake, Whiteside and Wacol.

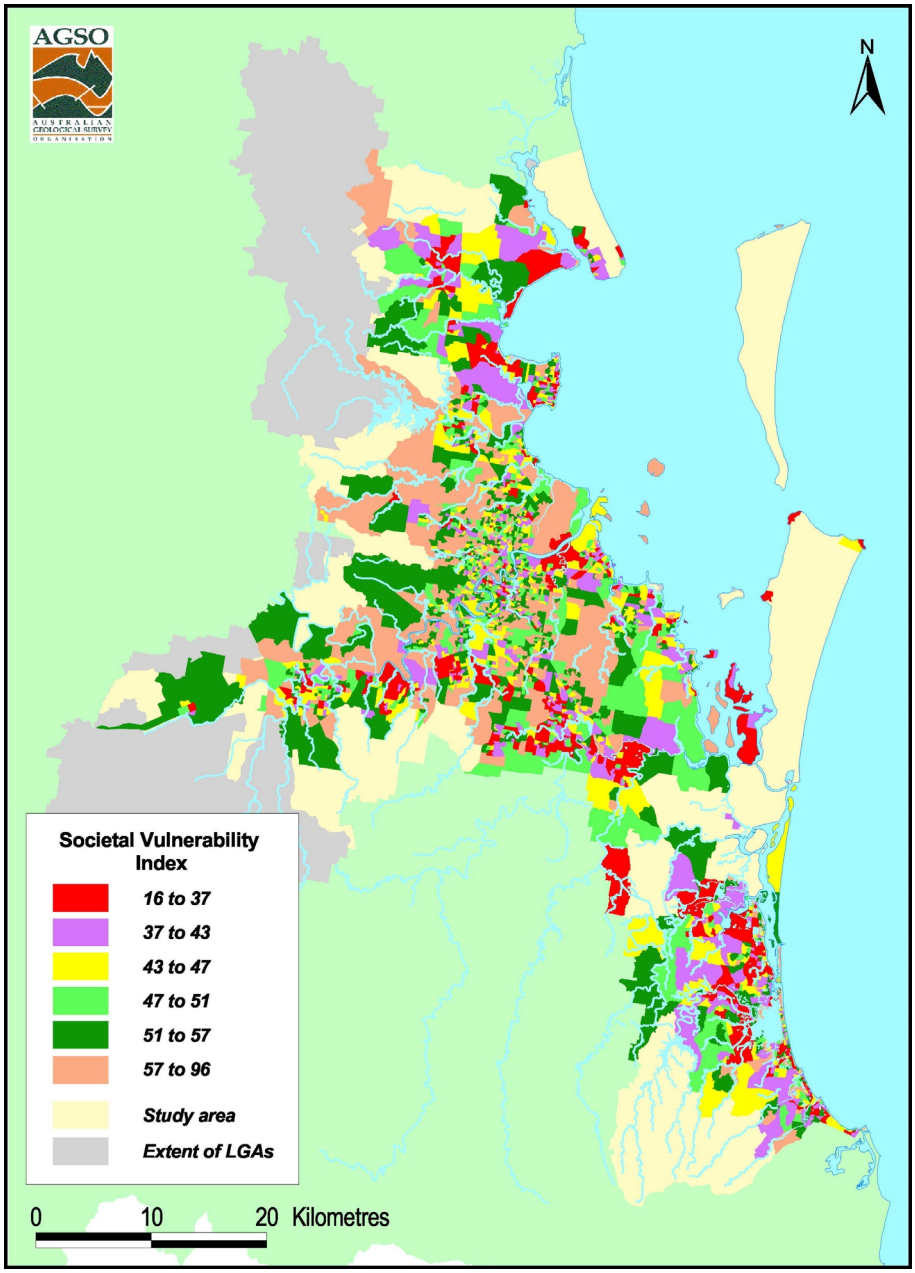

Figure 3. 26 Societal Vulnerability Index

The suburbs which contain the top 1% of societal vulnerability indexed neighbourhoods (i.e. those that contribute most) are (in alphabetic order):

Ashmore, Beenleigh, Biggera Waters, Caboolture, Cleveland, Clontarf, Coomera, Deception Bay, Eagleby, Goodna, Heritage Park, Inala, Kallangur, Labrador, Morayfield, Macleay Island, Marsden, Mudgeeraba, Nerang, Palm Beach, Southport, Tugun

The bottom 1% of neighbourhoods (those that contribute least) are contained in the suburbs of:

Acacia Ridge, Bellbowrie, Boondall, Brisbane City, Broadbeach, Camira, Carindale, Carole Park, Coolangatta, Forestdale, Fortitude Valley, Heathwood, Karawatha, Kippa Ring, Lawnton, Oppossum Creek, Pannikin Island, Richlands, Saint Helena Island, Stephens, Surfers Paradise, Underwood and Wacol.

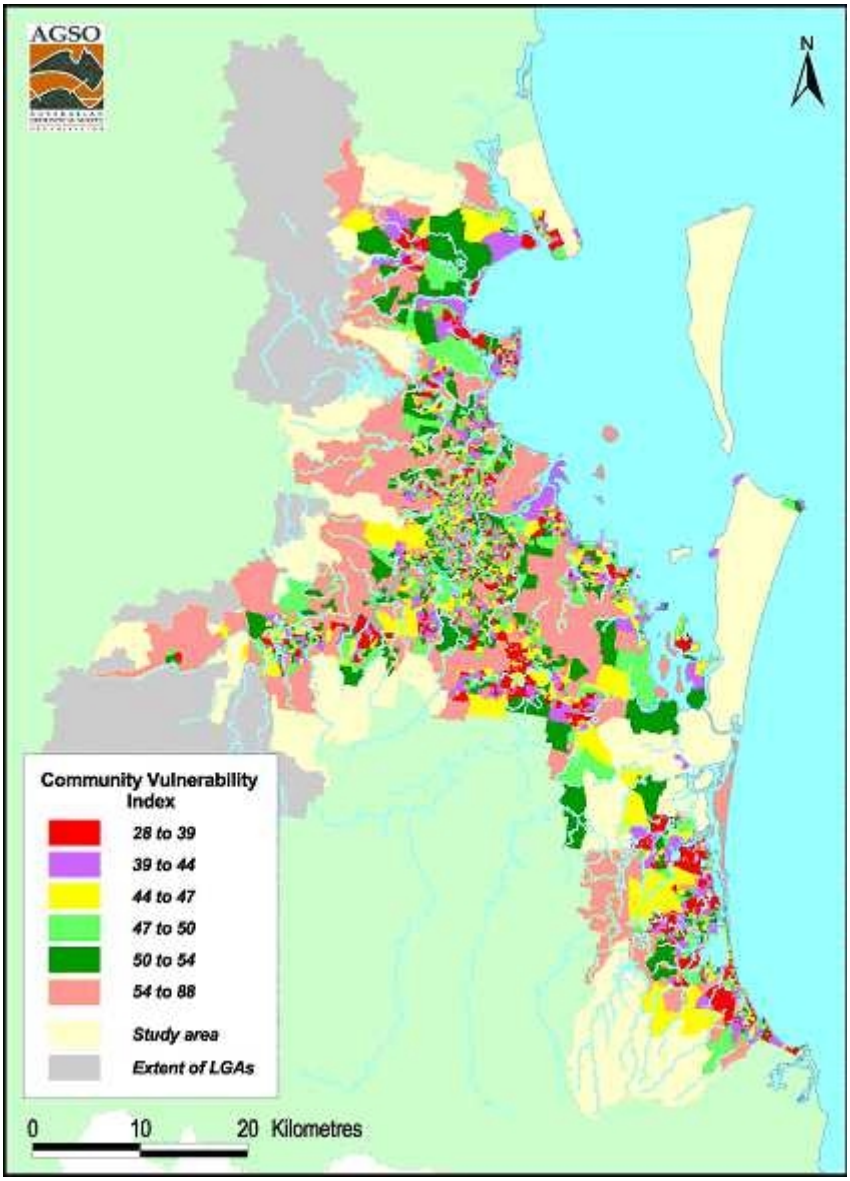

Figure 3. 27 Community Vulnerability Index

The suburbs which contain the top 1% of overall community vulnerability indexed neighbourhoods (i.e. those that contribute most to overall community vulnerability) are (in alphabetic order):

Ashmore, Boronia Heights, Caboolture, Capalaba, Carina Heights, Coombabah, Deception Bay, Dinmore, Goodna, Inala, Kallangur, Kingston, Lawnton, Nerang, Oxenford, Redbank, Redcliffe, Riverview, Rothwell, Stephens, Waterford West, Woodridge, Woody Point and Wynnum West.

The bottom 1% of neighbourhoods (those that contribute least) are contained in the suburbs of:

Amberley, Bellbowrie, Boondall, Brisbane City, Camira, Carole Park, Coolangatta, Daisy Hill, Eagle Farm, Ferny Grove, Fortitude Valley, Greenbank, Heathwood, Karawatha, Kippa Ring, Lawnton, North Booval, North Stradbroke Island, Oppossum Creek, Pannikin Island, Priestdale, Richlands, Saint Helena Island, South Brisbane, Stephens, Surfers Paradise, Wacol and Wulkuraka

Conclusion

The understanding of the South-East Queensland community that has been developed here provides the essential 'elements-at-risk' and 'vulnerability' input to the risk formula. It provides the essential description and definition of the urban landscape of South-East Queensland, across which a range of hazard events have, and will, impacted. We now turn out attention to the hazard phenomena and the way in which they will affect this community.