

# Chapter 2

## Food Security in Australia: The Logistics of Vulnerability

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### 2.1 Introduction

Despite Australian Government recommendations that all households hold a store of food, water and other essentials to last them for 14 days in the event of an emergency (<http://www.pantrylist.com.au/>), uptake of this advice remains low. Many Australians would be shocked to know that no food stockpiles are held for use in the event of an emergency. Government emergency infrastructure planning classifies food security as a secondary concern. In short, the majority of Australians take food security for granted. Research presented in this volume suggests that this complacency towards food security is a significant risk to Australians. Local, regional, national and global food systems have immense influence on, and interaction with, social welfare, the state of the environment and economics. Food systems are the foundation of human health and wellbeing, so understanding and managing the weaknesses and vulnerabilities within complex food systems are essential to society. As Australia's population ages and grows, and climate change impacts food systems, the need to ensure effective food systems will only increase.

Following four decades of predominantly declining trends, between 2002 and mid-2008 global food prices increased by 64% (FAO 2008). These price increases were caused by a convergence of stressors including adverse weather conditions, increases in oil prices which impacted production, transport and the market for biofuels, growing demand for meat and dairy from the growing middle classes in India and China, and a reduction in food reserve stock levels as a matter of international trade policy over the 1990s (OECD-FAO 2008; Garnaut 2008). The FAO (2008) estimates that these price movements increased the number of chronically food insecure people in the world, the vast majority of whom live in developing countries,

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by 75 million, reversing modest gains in hunger reduction achieved in the mid-1990s. Counter to what these dramatic increases in global food prices may indicate, Malthus has not yet been vindicated—there is no shortage of food in the world today. Hunger has increased as the world has gotten richer and produced more food than ever before (FAO 2008). Hunger, under-nutrition and food insecurity are the result of social, economic and political factors, not inadequate food supply.

This chapter aims to provide an overview of the dynamics of food systems and food security in Australia, particularly in regards to transport and logistics. Food (in)security is the result of complex interactions within multiple systems; the chapter starts by defining and exploring the concept of food security and possible sites of compromise. Vulnerability to chronic food insecurity is outlined next and particular threats to food security due to supply chain logistics, management and infrastructure are identified and explored, and how these are expected to be exacerbated under climate change. Following is a discussion of disasters and their potential to induce transitory food insecurity events which is compounded by the freight logistics system operating in Australia. Again these challenges are expected to be exacerbated in the future due to climate change.

## 2.2 Conceptualizing Food Security

There has been significant revision of the concept of ‘food security’ in the last 40 years, reflecting the complex nature of food policy. The mid-1970s saw a macro and goal-oriented definition, where food security was seen as ‘availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices’ (1974 World Food Summit). Literally hundreds of definitions of food security had been developed since the 1970s. The concept evolved to focus on the behaviour and status of particularly vulnerable and affected people, and later added a temporal dimension. By the mid-1990s food security had expanded further to consider protein and micronutrient deficiencies, as well as socially and culturally determined food preferences. At the same time ideas relating to human rights and human security entered the food security arena. The definition in wide use today was established at the World Food Summit in 1996 as when ‘all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life’ (FAO 2001).

Ericksen (2008) proposes a framework for assessing how food system activities (producing, processing and packaging, distributing and retailing, and consuming food) lead to food system outcomes that contribute to food security. Food security is defined as food utilization, food access and food availability. The outcomes from food system activities also contribute to, and are impacted by, social welfare and environmental security (see Fig. 2.1). This framework is useful because it highlights the links between social welfare and environmental security to food security in a way that reflects the inherent feedbacks that makes food systems analyses so

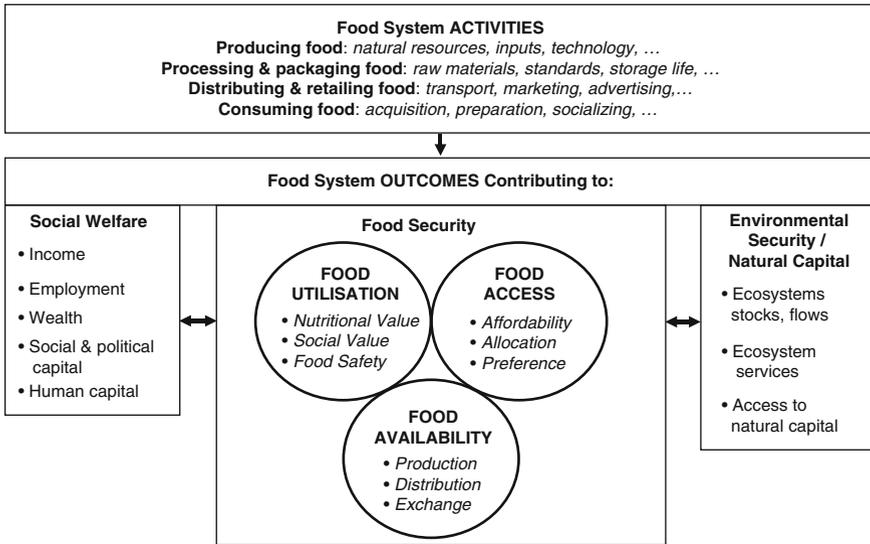


Fig. 2.1 Components of food systems. Source: Ericksen (2008:239)

complex. For example, food security is an essential component of social welfare, and aspects of social welfare such as employment influence food security. Similarly environmental security contributes to food security, and can also be degraded by actions designed to improve food security. Environmental security and sustainability may depend very much on social and political capital (a component of social welfare) and so on. This framework is drawn upon throughout the chapter.

In teasing out how food security is realized it is interesting to note the differences and interactions between food utilization, food access and food availability. For example, food may be affordable (food access) but not distributed due to some blockage in the distribution network (food unavailability) and as such the food supply is insecure.

### 2.3 The Australian Food Supply Chain

The ‘paddock to plate’ chain is a concept that can be used when looking at food systems and food security, and refers to the movement and transformation of food through the food system activities identified by Ericksen (2008). Food that is domestically produced in Australia is generally produced on farms (the paddock). Farm produce requiring processing and packaging is transported, via road or rail freight,

to a processing and packaging site. The food product is transported, again via road or rail freight, to the store or supermarket warehouse.

The Australian food supply chain utilizes road, rail and port infrastructure and is structured around a network of intermodal hubs. At multiple points during the transport stage food products may pass through an intermodal hub where it is warehoused and loaded onto a different transport mode. When food reaches the store or supermarket warehouse, it is transferred to the wholesale or retail outlet where it is purchased and consumed. The risks and vulnerabilities to Australia's food system that are identified below fit into the paddock to plate chain at different, although complex and dynamically interrelated, points.

The average Australian household spends around 12–14% of its after tax income on groceries (ACCC 2008). The Coles and Woolworths supermarket chains form a duopoly that controls approximately 70% of packaged grocery sales, and approximately 50% of fresh product sales. There has been concern over the impact this market power may be having on the choice and price available to consumers, as well as margins extracted from producers, processors and distributors. However, the ACCC grocery price inquiry found that '[g]rocery retailing is workably competitive, but there are a number of factors that currently limit the level of price competition' (ACCC 2008:2).

## 2.4 Chronic Food Insecurity in Australia

While the majority of the world's food insecure people live in developing countries, Australia and other developed countries have some unique issues relating to food insecurity. There are individuals and groups in Australia who suffer chronic (ongoing) food insecurity. Food utilization, food access and food availability are all important in determining food (in)security in Australia.

While we know that some Australians do suffer from chronic food insecurity, there are significant knowledge gaps on their number and distribution. Burns (2004) outlines the results of the Australian National Nutrition Survey (NNS) which included one question relating to food security. This question asked respondents aged over 16 years 'In the last 12 months were there any times that you ran out of food and couldn't afford to buy more?' A total of 5% of respondents answered 'yes' to this question. Some groups were more at risk of food security than the average—23% of unemployed people, 23% of single parent households and 20% of rental households (Burns 2004). These statistics may underestimate food insecurity because they are based on one limited question; the NNS survey does not address issues such as access to food or the nutritional value of food available.

The NNS statistics indicate that people who are in low socio-economic groups have reduced food affordability which is the foremost determinant of chronic food insecurity in Australia. Availability is also a key aspect, for example having affordable food outlets in the neighbourhood is an issue facing some rural and remote

communities (VicHealth 2005). Similarly, people unable to get to the shops to buy food and carry it home face food availability issues due to mobility restrictions or physical infrastructure. These issues may increase in the future as Australia's population ages, with the proportion of the population over 65 years of age, and in particular over 85 years of age increasing significantly (Treasury 2010). VicHealth (2005) argues that socially and culturally appropriate food is not always available to people, highlighting a problem with food utilization.

Chronic food insecurity in Australia is related to the characteristics of food insecure people, the characteristics of their environments, and how these interact with each other within the food system. Personal and environmental characteristics can compound to increase food insecurity. For example people on low incomes may also live in low socio-economic areas lacking adequate food infrastructure (VicHealth 2005). A lack of availability and affordability of healthy foods in rural areas is contributing to higher levels of chronic food insecurity and poorer health (Burns et al. 2004; Harrison et al. 2007).

Food insecurity is of particular concern in remote Indigenous communities. The majority of people living in remote Indigenous communities source their food from the community store, a set-up that is exposing residents to several breakdowns in food security outcomes (NRHA 2006; Shannon 2002). The food available for purchase in community stores may be expensive relative to both the national average and relative to the incomes of community members. Food utilization is challenged by a lack of 'health hardware' in the home such as refrigerators, storage and preparation spaces (NRHA 2006).

The food security issues faced by both Indigenous and non-Indigenous Australians living in rural and remote areas are partly due to logistical challenges. The long transportation distances required to get food to these areas drives up the price of the food and reduces the availability of perishables. Transport infrastructure may also be limited and subject to disruption due to events such as flooding.

Evidence suggests that there is in fact a strong link between poverty, food insecurity and obesity in developed countries (Burns 2004). Burns (2004) finds that the risk of obesity is 20–40% higher for Australian women who are food insecure. The reason for the link between food insecurity and obesity is still unclear however hypotheses point towards issues surrounding the psychological impact of the threat of inadequate food, and more importantly food affordability, preference and availability (VicHealth 2005).

### ***2.4.1 Freight Logistics and Chronic Food Insecurity***

This section outlines infrastructure and regulatory problems with Australia's transport industry relating to road, rail and intermodal hubs that are increasing the risk of chronic food insecurity amongst vulnerable groups. Bottlenecks, inadequate infrastructure and an inappropriate regulatory system are believed to be increasing the price of freight transport. These price increases are passed onto food consumers,

and thus increase the vulnerability of lower income groups to chronic food insecurity. This effect is compounded for consumers living in rural and remote areas. Similarly, problems with bottlenecks and inefficient freight transport can leave fresh and dairy produce in transit for longer than optimal times, reducing its nutritional value.

There are over 810,000 km of roads and 44,000 km of rail in Australia, and demand on this transport infrastructure is expected to double over the next two decades (AFPRG 2006). Food and live animal transport by road freight has seen an annual growth rate of 4% between 1995 and 2001. This is the highest freight growth rate for any commodity except mineral fuels, lubricants and related materials, presumably due to the mining boom (BTRE 2003). Growth in demand for transport infrastructure is concerning because Australia's transport infrastructure is already under stress from bottlenecks, inadequate rail systems and congestion (Sims 2007). BRTE (2006) estimates that approximately 76% of Australia's non-bulk freight is transported by road. There is growing interest in increasing rail's share of Australia's freight load because of the growing demand and also due to concerns regarding higher greenhouse emissions from road transport which impacts climate change (and hence food security), and a desire to reduce road congestion in urban areas.

Without comprehensive policy reform and investment, the capacity of the rail network to take a larger share of growing demand is questionable. While Australia's east–west rail corridor has a significant share of the east–west freight task, use of rail on the east-coast north–south corridor has declined steadily since the 1970s to only 10% of the freight task. Australia's rail networks are under stress; infrastructure in some areas has not been upgraded in many years, lines have been closed, service is unreliable and pricing is uncompetitive. For many food and agriculture businesses road freight is now the only viable option. The need for more pick-up and drop-off services when using rail also increases its price (AFPRG 2006, Australian Logistics Council 2008). This price increase can flow onto the cost of food, hence reducing food availability, particularly when the food has been transported over significant distances.

Another significant challenge to the food supply chain as demand grows is the current network of intermodal terminals, where freight moves from one transport mode to another. Australia's intermodal terminal sector comprises services to international imports and exports, which is largely port-oriented, and the domestic system concerned with the movement of non-bulk cargo. Some terminals simply provide cargo exchange and container storage services, while others 'value-add' in terms of warehousing, container repairs and cleaning, truck repair, and insurance and banking services (Meyrick 2006).

Forecasting by Ernst & Young (2006) found that increases in freight demand will exceed the capacity of existing intermodal terminal infrastructure in coming decades. Intermodal terminals in Melbourne, Brisbane and Sydney are constrained by land availability. Inconsistent policy approaches focusing on one transport mode rather than the whole system have contributed to these problems. There are inadequate transport links through urban centres to reach some ports—the quality of rail access to on-dock terminals is a problem for the Port of Melbourne (AFPRG 2006; Meyrick

2006). There is little further data and information on the status of, and projections for, Australia's intermodal terminals. This information is critical if current problems faced by the industry are to be addressed (Meyrick 2006). The problems faced by intermodal terminals are particularly important for the food industry because food transport is characterized by the utilization of multiple transport modes.

Reform in road and rail pricing has been suggested as a way of addressing the need for improvements in efficiency and infrastructure investment in the sector. The Productivity Commission (2006) argues that the regulatory system is undermining the productivity of the road sector, and productivity and competition in the rail sector. Rail in its current form cannot provide a competitive alternative service to road. Similarly, the ability of rail to compensate for congestion issues in urban areas is dependent on the capacity of the urban rail network to absorb increased cargo traffic (Meyrick 2006). Infrastructure problems are compounded by and in some cases linked to, cumbersome, confusing and overlapping state and territory regulatory regimes (Sims 2007).

The Productivity Commission (2006) argues that prices for heavy vehicle use of roads (a) do not reflect enough of the real costs of road use in terms of truck weight and distance travelled, (b) are not accurate enough as they are conservative aggregate estimates and (c) must increase to match infrastructure spending requirements. In response to the Commission's report the Council of Australian Governments (COAG) endorsed a reform of road pricing (COAG 2008). A key step towards improving the road pricing system would be to use more sophisticated price calculation instruments to consider truck size, weight and distance travelled, so road use could be better valued and pricing send more appropriate price signals. While substantive economic modelling on food prices in relation to transport supply chains has not been undertaken, it is fair to propose that if demand for land freight services increases under the current infrastructure and regulatory environment, the price of freight services will increase. In the food industry this could be passed onto consumers and as such may increase vulnerability to chronic food insecurity for people on low incomes and in rural and remote areas.

Adding to supply side problems is a transport and logistics industry that is plagued by high staff turnover and a shortage of managers (Meyrick 2006). Queensland and Western Australia saw a decline in the number of drivers compared to the number of trucks between 1996 and 2001. Driver shortages are a particular problem for long haul operations and in rural and remote areas (BTRE 2003). Driver shortages could further reduce the food security of rural and remote Australians in terms of food availability, food access (affordability, preference) and nutritional value via longer transit times. The industry requires human resource analysis and policies to improve staff retention.

#### ***2.4.2 Chronic Food Insecurity Under Climate Change***

Climate change is causing a steady increase in average yearly temperatures (see Hennessy et al. 2008; CSIRO 2007b) and poses a significant risk to food security in

Australia at several points along the paddock to plate chain. On the supply side production is vulnerable; by the end of this century runoff in the Murray-Darling Basin is expected to cease, spelling the end for irrigated agriculture in Australia's food bowl. As temperatures rise the areas suitable for a particular crop, for example, will shift, requiring constant adjustment by farmers (Quiggin 2007). Increasing temperatures are also predicted to bring about increased pest, disease and weed management issues that could impact food production (Stokes and Howden 2008). Predicted disruptions in production will impact food availability by increasing the price of food. People with characteristics that make them vulnerable to chronic food insecurity will be worse off as climate change increases many food system stressors.

The stresses on the food transport industry outlined above may be compounded by the fact that freight transport in Australia is highly dependent on fossil fuels. The capacity of the industry to adapt to a low-carbon economy, which may be pursued for climate change mitigation, is paramount if food prices are to remain affordable. Higher transport costs will be passed onto food consumers, increasing the risk of chronic food insecurity. Dependence on fossil fuels by the freight transport industry is also increasing the threat of climate change, which feeds back into the food system.

A national or international carbon trading scheme would also impact food security. On the one hand, agriculture is a significant contributor to Australia's emissions and if it were included in a carbon trading scheme it is likely that food prices would increase. On the other hand food security and environmental sustainability are intrinsically linked and without climate change mitigation food security will suffer. Within the parameters of the existing food system climate change mitigation via carbon pricing will be felt disproportionately by those on lower incomes, who spend a greater share of their income on necessities (Garnaut 2008; Larsen 2008).

Food wastage contributes to environmental damage and climate change. Australians throw away \$5.2 billion worth of food annually and this translates into significant financial costs to the community as well as greenhouse gas emissions from rotting food. Food wastage not only translates into direct greenhouse gas emissions but also adds to the environmental cost of food production and processing (Baker et al. 2009). Baker et al. (2009:5) conservatively estimate that the amount of greenhouse gas emissions associated with household food waste is similar to that of the manufacture and supply of iron and steel in Australia. Population growth coupled with declining household size (associated with increased food waste) provides a recipe for ever increasing food wastage in Australia.

## **2.5 Disasters and Transitory Food Insecurity in Australia**

Australians are also at risk of transitory food insecurity events where there is a sudden shock to the food system and food is temporarily unavailable. Disasters such as a disease pandemic or flooding along major transport routes, and short- to

medium-term market shocks can cause disruptions in the food supply chain. Dense urbanization along the east-coast and narrowly concentrated food supplies have contributed to Australia having one of the most concentrated food supply systems in the world (Haug et al. 2007). This makes Australia particularly vulnerable to rapidly developing food shortages in the event of a disaster.

The Department of Industry, Tourism and Resources (2006) identifies a human disease pandemic, such as an influenza pandemic, as a serious threat to food security. Such a pandemic is predicted to develop and spread quickly in waves each of which could last months. The pandemic would have the most significant impact on Australian food businesses through a massive drop in staffing levels, with 30–50% of staff absent at the pandemic's peak. Such a significant reduction in staff could severely disrupt the entire supply chain. Disruptions could also drive the price of food upwards, further compromising food affordability for those already vulnerable in a time of crisis.

Spurred on by concern for market efficiency and as a matter of international trade policy (OECD-FAO 2008), Australia does not currently hold any food reserves for use in the event of a major disruption to the food supply. Australians in general are unprepared for a food shortage. As supermarkets provide a significant majority of food to consumers, these private businesses would be the locus of food distribution during a disaster, a role for which they are unprepared (FoodLegal 2008), these issues are discussed below.

### ***2.5.1 Freight Logistics, Disasters and Transitory Food Insecurity***

It is conceivable that an event such as a disease pandemic, major power disruption or natural disaster could cause disruption in the food logistics system and spark transitory food insecurity if the system is unable to operate under the abnormal circumstances. Lack of food stocks for use in the event of a disaster further compromises the ability of the food supply system to operate under abnormal circumstances. Infrastructure pressures outlined above could also increase the vulnerability of the food logistics industry in the event of a disaster.

The road freight sector in particular is characterized by high competition and tightening profit margins (BTRE 2003). Food supply chain management is characterized by 'just-in-time' logistics structures where sophisticated logistics management systems, designed to improve efficiency, result in food being sourced, transported and delivered to retailers as quickly as possible. These logistics structures operate effectively during normal circumstances. However, the lack of margins means that a disruption can throw the whole system into disarray. If the food supply chain were disrupted, supermarkets (which are responsible for the majority of food retailing in Australia) would only be able to continue supplying food for less than a week.

The road freight sector encompasses both contractors and in-house logistics operations. While there are currently more in-house operators compared to contract operators, evidence suggests that this balance is shifting. Owner drivers and small freight businesses represent two thirds of the industry although only 12% of its income

(BTRE 2003). The effect of the number and size of the businesses in the industry during a disaster is uncertain. On the one hand a lot of small operators may provide the industry with flexibility in times of disaster. Alternatively, many small operators with no central organizer could prove to be ineffective outside of normal circumstances.

The inventory systems that currently operate in Australian supermarkets hold minimal buffer stock and stock replenishment is triggered by customer demand via electronic monitoring of stock levels. These systems are dependent on consistent purchasing patterns. A major disruption to the food supply would likely prompt panic buying, with consumers changing their buying patterns from small, frequent purchases, to larger, less frequent purchases, which may further throw food chain management into disarray (FoodLegal 2008).

A disaster in or around a key intermodal terminal could put strain on the food supply and possibly induce transitory food insecurity in some areas. Australia's major domestic freight terminals are located in capital cities, and each state has an intra-state network of smaller terminals. For example a large, food-contaminating disaster at Dynon Rail Precinct at the Port of Melbourne (Victoria's largest intermodal terminal, transferring both international and domestic freight) could compromise the food supply. Effective disaster management requires managers and staff who have been fully briefed and are confident in abnormal, pressing circumstances. With regards to the transport industry, high staff turnover and need for increased management competencies do not engender confidence in the capacity of the transport logistics industry to operate effectively in the event of a disaster.

Staffing levels would also be a significant problem for supermarkets during a disaster such as an influenza pandemic. With 30–50% of staff absent due to illness or quarantining, already compromised supermarkets would be under significant strain (Department of Industry, Tourism and Resources 2006). This issue could be compounded by the young demographic of some supermarket staff.

### ***2.5.2 Freight Logistics, Disasters and Transitory Food Insecurity Under Climate Change***

Drought has been a feature of Australian agriculture since before records began and is expected to increase under climate change. The most recent El Niño-induced drought lasted from 2002 to 2008, and was the longest, hottest drought on record (Jones, cited in Wahlquist 2008). In 2002–2003 alone, the drought caused a 20% drop in the gross value of farm production (DAFF 2004). It has been suggested that the severity of this drought may have been increased by effects of climate change (Murphy and Timbal 2008). The most direct effect of drought on food security is by reduction in food production and hence food availability.

Climate change also will increase the frequency and severity of extreme weather events such as fire and flooding (Garnaut 2008). These are predicted to result in higher average food prices, and increased frequency of price shocks, for both locally

produced and internationally traded products (Quiggin 2007). As discussed above, an increase in disasters coupled with a food transport and distribution industry that is already ill-equipped to deal with disasters may increase the frequency of transitory food insecurity events. If, as predicted by Garnaut (2008), Australia becomes increasingly dependent on food imports, this is a major vulnerability in the face of increased frequency and severity of food supply shocks.

The increased frequency and severity of extreme precipitation events has the potential to cause significant damage to food transport infrastructure such as roads, rail, bridges, airports, ports and especially tunnels. Port and coast infrastructure are at particular risk when storm surges combine with rises in sea level. Rail operations could be increasingly compromised if climate change increases the frequency of lightning strikes (CSIRO 2007a). Historical records of environmental conditions such as rainfall, wave height, etc, have informed the construction of Australia's transport infrastructure (Australian Logistics Council 2008). Under climate change Australia is already experiencing historical firsts in terms of temperatures, rainfall levels, etc. These trends are expected to put our transport infrastructure under further strain. Climate change risk assessments need to be carried out on existing and proposed supply chain infrastructure.

## 2.6 Conclusions

Analysis and planning for transport infrastructure is hampered by significant data and information gaps relating to the transport industry. Data is not consolidated to a central database, and inappropriate secondary sources are often the only information available to planners and policy-makers (BTRE 2003; Meyrick 2006). Consolidation of existing data, and collection of good quality raw data, on the transport industry to inform planning decisions would be extremely beneficial for planning purposes.

Food security in Australia has been analysed using a food systems analytical tool that highlights the complex and dynamic interconnectedness of food security, social welfare and environmental sustainability. The status of food security in Australia is complex and ever evolving, as are the vulnerabilities to both chronic and transitory food insecurity. These vulnerabilities exist for different groups at different times, and are realized at different points along the 'paddock to plate' chain.

Socio-economic status and geographical remoteness are the major contributors to chronic food insecurity in Australia at present. An ageing population may also increase the prevalence of food insecurity in the community. Australia does not currently have comprehensive data or information on the extent or nature of chronic food insecurity in the community. Australia does not hold any official food reserves for use in the event of a shock to the food supply. Global economic and food market movements, a local disease pandemic, or extreme weather events could all disrupt food production and distribution. People who are already vulnerable to, or experiencing, chronic food insecurity will be most affected in the event of a disaster.

An efficient and well-operating food logistics system is essential for food security. Significant infrastructure upgrades are required if the food system is to meet the demands of an increasing population in the future. While the current system is largely efficient and effective under normal circumstances, its ability to continue operating in the event of a major disaster is questionable. The food logistics system is built around the principle of ‘just-in-time’ movement of freight; this reduces inefficiency under normal circumstances but leaves no margins in the event of a disaster. This chapter has identified several issues in relation to the logistics and management of Australia’s food logistics system.

Climate change will increase the frequency and severity of extreme weather events, as well as inducing a more gradual change in climatic conditions that will have significant impacts on food production in Australia. Agriculture is a significant contributor to greenhouse emissions, and must be lowered to reduce the extent of climate change. Ironically, methods of adaptation that reduce greenhouse emissions from agriculture may reduce the availability of food, compromising food security.

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