Community gardens as pathways to community resilience? Reflections on a pilot study in Adelaide, South Australia

MELISSA NURSEY-BRAY, ELEANOR PARNELL, RACHEL A. ANKENY, HEATHER BRAY AND DIANNE RUDD

Dr Melissa Nursey-Bray is Senior Lecturer/currently Head of Department and Dr Dianne Rudd is Senior Lecturer in the Geography, Environment and Population Department, University of Adelaide. Professor Rachel A. Ankeny and Dr Heather Bray, Senior Research Associate, are in the History Department, University of Adelaide. Eleanor Parnell is a graduate student of the Geography, Environment and Population Department and was the project's research assistant. The corresponding author's email is melissa.nursey-bray@adelaide.edu.au

Abstract
Cities across the world are facing increasing challenges from the impacts of urbanisation, pollution and climate change. Green spaces and urban vegetation are at ongoing risk of destruction or removal. New residential developments rarely plan for or provide gardens. Nonetheless, the need to maintain urban green spaces is more important than ever. This paper discusses the role of community gardens and whether or not they have a role to play in enhancing community resilience to issues such as climate change. Using a case study of Adelaide, we present the results of a study on community gardens, concluding that they do offer the possibility of building community resilience and social cohesion as well as urban green space.

Introduction
At the turn of last century, Ebenezer Howard's book *Tomorrow: a peaceful path to real reform* (1898) reprinted as *Garden cities: a way forward* (1902), presented a vision for the future of urbanisation and offered a suite of suggestions for how gardens and cities could co-exist. Over a century later, how gardens and cities can co-exist remains a pertinent question, particularly as the need to maintain urban green spaces in the context of growing climate change and food security concerns continues to grow (Burton et al. 2011). By 2030, it is estimated that over 60% of the global population will live in cities. Cities will increasingly be subject to the impacts of climate change and food security: for example, currently London imports more than 80% of its food from outside of the United Kingdom. As noted by a key report on cities and climate change:

> Food distribution, energy provision, water supply, waste removal, information technology, and susceptibility to pandemics are all the Achilles heels of cities. Social unrest from shortages and price spikes of key commodities, mass migration, high unemployment, terrorism, geophysical and climatic disasters also threaten cities. Climate change exacerbates these current threats. (World Bank 2010, 8)

Cities will need an increasingly integrated approach to manage these issues: 'consuming more food that is grown within cities and their immediate hinterland can, therefore, be an important part of these broader programs to build greater urban resilience' (Burton et al, 2013, 3). In this paper we examine community

gardens and using analysis of the literature and the results from a small pilot study of community gardens in Adelaide, we explore whether in fact community gardens can contribute in adapting to change. This project is part of a wider project that is firstly, investigating the connection people living in cities have with urban vegetation, and secondly, it considers the role urban vegetation plays in building adaptive responses to climate change in urban contexts. We conclude that community gardens do have the potential to build local adaptive responses to climate change and food security. They can also act as a mechanism for strengthening community cohesion by building ongoing inter-generational valuing of and attachment to the environment.

Social and community resilience

Resilience is defined by the Resilience Alliance, an international research organisation, as:

> (i) The amount of change the system can undergo and still retain the same controls on function and structure (ii) the degree to which the system is capable of self-organisation, and (iii) the ability to build and increase the capacity for learning and adaptation (www.resalliance.org/index.php/resilience).

Research suggests that existing institutions and traditional top-down decision-making processes are insufficient to achieve ecologically sustainable responses since they may not cope efficiently and equitably with environmental impacts outside their range of experience (Tompkins & Adger, 2005; Dovers, 2001; Rojas Blanco, 2006). The role of communities and industries in adapting to change is crucial: resilience describes how socio-ecological systems respond to perturbations, and what inherent capacities they have to deal with change (Holling, 2001; Walker & Salt, 2006). Adaptive capacity, exposure and vulnerability are terms now widely used to describe the abilities of social and ecological systems to deal with change. The concepts of resilience and vulnerability together comprise an important framework that helps to explain how communities react and adapt to environmental and societal changes (Adger, 2006).

Social resilience

This is defined as 'the ability of individuals and groups to cope with and adapt to environmental and social change and withstand shocks to their social infrastructure' (Adger 2000, p. 361), recognises the need to include human dimensions in planning, and incorporates the notion of inclusiveness and the need to improve the quality of linkages within communities (Tompkins & Adger, 2004). Marshall and Marshall (2007) characterise social resilience as a function of (i) how individuals perceive risk associated with change, (ii) their abilities to plan, learn and re-organise, (iii) their abilities to cope, and (iv) the level of interest in change. It is therefore a proactive process which aims for a desirable state, rather than just a response to stresses and disturbances (Folke, 2006). Wilson (2012) notes that social resilience may be both precautionary (avoiding poor outcomes by developing coping strategies), or it may help to enable recovery after a major stressor or natural disaster. A strong level of social resilience can be developed to cope with such stressors and disasters by having connections between stakeholders and organisations, which can then help to facilitate policy and management direction (Lockwood et al. 2012).

Community resilience

While social resilience determines the inherent coping and adaptive capacities of individuals or groups, community resilience on the other hand enables recognition of the inherent dynamism within whole communities. This concept is especially pertinent when considered in the context of how urban communities respond and adapt to environmental and social pressures. For example, it can help to inform how communities may respond to natural disasters such as floods or fire, assist in enabling participatory environmental projects, or give insight into how specific cultural norms may in turn build or weaken resilience in the face of external challenges.

Adger (2000, p. 347) defines community resilience as 'the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change'. Pike, Dawley, & Tomaney (2010, p. 131) describe community resilience as 'a process linking a set of networked adaptive capacities to a positive trajectory of functioning and adaptation in constituent populations after a disturbance'. This is an important factor in building social cohesion by strengthening the ability of groups to work together. Maguire and Cartwright (2008, p. 3) note that a resilient community 'is able to respond to changes or stress in a positive way, and is able to maintain its core functions as a community despite those stresses.' Amundsen (2012, n.p.) defines community resilience as 'the ability of a community to cope and adjust to stresses caused by social, political, and environmental change and to engage community resources to overcome adversity and take advantage of opportunities in response to change'.

This concept is being increasingly employed in natural resource and environmental management to explore how societies will respond to stress. The existence of community resilience can enable adaptive governance and, as part of a social assessment process, help to identify the resources and adaptive capacities that communities can employ as a basis for adaptation planning (Berkes and Ross 2013). Adopting a social and/or community resilience approach to environmental problem-solving can create the conditions for bottom-up innovation (which as a process of self-organisation is a crucial component of social ecological systemic resilience), as it relies on community-driven responses to change rather than external 'fixes'.

In this context, the role of community gardens provides an interesting case study: to what extent are they expressions of community resilience? And can they provide future potential to build adaptive capacity and hence community resilience to the impacts of climate change and food security in urban settings? Can they be viewed and used as vehicles for bottom-up innovation and platforms for urban adaptation? The next section presents the results of a pilot study that aimed to understand the role of community gardens and the value placed on them by community members who participate in the community garden network in the city of Adelaide.

Method

This project aimed to identify the values associated with community gardens as a form of urban vegetation and the implications of these values for policy and adaptation planning in urban contexts. The project received ethics approval from the University

of Adelaide Human Research Ethics Committee, approval H-2014-200. The project was conducted in two parts: (i) via a literature review and (ii) a series of semi-structured interviews with individuals involved in community gardens in Adelaide. The structured literature review was undertaken between August and November 2014, and used electronic databases such as *Web of Knowledge*, *Scopus*, *Google Scholar*, *Academic Search Premier* and The University of Adelaide's library database. Keywords used in the search included 'community garden', 'urban agriculture', 'city farm', 'alternative food networks', 'kitchen garden', 'city food garden', 'values' and 'policy'. Due to time and access constraints, literature was obtained only from online peer-reviewed English language journals, with a specific focus on studies and papers concerning Australian community gardens. Some international research was included for comparison or for use as case studies.

A series of semi-structured interviews were then performed with individuals involved in a wide range of types of community gardens within Adelaide. Community gardens in Adelaide have been in existence for at least twenty years. Tenure of the gardens ranges from land owned by Council, School or Churches. While the individuals seemed to change, there was no issue about tenure being secure in the gardens we visited.Criteria for inclusion for interview were: (i) membership of a community garden, (ii) active involvement and (iii) diversity in garden type. We interviewed 22 individuals representing 17 community gardens, and our overall sample represented at least one of each type of community garden and covered at least one garden within the northern, southern, western, eastern and hills zones of the city. The background of individuals we interviewed varied and included teachers, employees of local councils, church volunteers, retirees, and people recovering from illness. All had a keen interest in gardening, community or both. In the interviews, we asked people about why they wanted to be part of a community garden, their views on the values of community gardening and how they understood or perceived urban vegetation and the urban/rural divide. Interviews were transcribed and then thematised using indicator themes, initially derived from the literature review (Boyatziz 1988). Words or codes were used to identify patterns and recurrences in the interviews, including 'community', 'food security', 'family', 'health', 'nutrition', 'organic', 'climate change', 'fun', and 'garden' amongst others. Consistent with Lincoln and Guba's (1985) evaluation techniques, reliability was established by having three of the researchers independently code the transcripts, and agree collectively on the key findings.

We first present a summary of the key themes in the literature, followed by an analysis of the interviews, concluding with some reflections on what insights were gained about how people in Adelaide value the social and environmental services offered by their involvement in community garden programs. Due to the project itself being in early stages, we present more detail in the section summarising the themes from the literature, and then the early findings from our initial work on community gardens. Another paper will provide more detailed treatment of the project as it gains maturity. The paper concludes with some critical reflections about how community gardens as forms of community-based governance may assist in building adaptive capacity and resilience to climate change and food security in an urban context.

Community gardens

The existing scholarly literature reveals a number of key themes including divergent definitions of community gardens; diverse types of community gardens and their common characteristics and goals; and differing motivations for involvement in community gardens. The main focus of the review was on the roles and benefits of community gardening in Australia. However there was a clear gap in the available literature around discussion of community values associated with these gardens and how such gardens can influence policy and strengthen community resilience. Ongoing research thus has a clear role to play in this context.

Definition of community gardens

Community gardens across Australia vary considerably in their purposes, locations, activities, exclusivity, membership and types of produce grown, and this diversity leads to difficulty in establishing a conclusive definition. Some of the literature does not attempt to define community gardens in part because it is thought that the term is largely self-explanatory (Guitart, Byrne & Pickering, 2013). One useful if not somewhat vague definition describes community gardens as 'organised initiatives whereby sections of land are used to produce food or flowers in an urban environment for the personal or collective benefit of their members who, by virtue of their participation, share certain resources such as space, tools and water' (Glover, 2003, p. 264).

A definition that captures the relationships between community gardens and the communities within which they function states that 'community gardens are tangible arenas in which urban residents can establish and sustain relationships with one another, with elements of nature, and with their neighbourhood. These relationships are not uniform or unchanging, but are negotiated in the context of individual gardens' (Kurtz, 2001, p. 656). Other definitions of community gardens focus on the communal nature of the space, and specifically state that the management, produce, labour and resources are shared between participants or members (Mintz & McManus, 2014; Agustina & Beilin, 2012; Guitart, Pickering & Byrne, 2012).

There is limited discussion in the literature as to what 'community' actually means in this context, although one paper sees it as a process of self-conscious communication and participatory democracy (Stocker & Barnett, 1998). There even is some tension in the literature as to whether 'community garden' is an appropriate term. 'Community garden' may create the assumption of a neighbourhood garden maintained by individuals, which can potentially exclude other types of gardens such as therapy gardens (Lawson, 2005). Alternative terms such as 'civic garden', 'urban horticulture' or 'urban agriculture' have been suggested, each of which raise different problems, although space limits do not allow us to explore this issue in any detail here. An overwhelming majority of the literature continues to favour the term 'community garden' (Turner, Henryks & Pearson, 2011), and hence we adopt this usage for our purposes.

Types of community gardens

Community gardening comes in all shapes and forms, and this diversity stems from a range of features, including the different functions, scales, management and motivations for individual gardens (Guitart, Byrne & Pickering, 2013). Although there is limited discussion and agreement with regard to the exact characteristics which make something a 'community garden', some of the most common garden types highlighted in the literature are:

- Community gardens with individual allotments (Mintz & McManus, 2014; Stocker & Barnett, 1998; Guitart, Byrne & Pickering, 2013)
- Community gardens managed collectively for member use or broader general public use (Mintz & McManus, 2014; Stocker & Barnett, 1998)
- School kitchen gardens (Mintz & McManus, 2014; Turner, Henryks and Pearson, 2011; Guitart, Byrne & Pickering, 2013; Schmelzkopf, 1996)
- Gardens with individual plots located in public housing (Mintz & McManus, 2014)
- City farms (Turner, Henryks & Pearson, 2011)
- Therapeutic (or healing) gardens (Turner, Henryks & Pearson, 2011; Guitart, Byrne & Pickering, 2013; Pitt, 2014)
- Institutional gardens (i.e., gardens in prisons) (Guitart, Byrne & Pickering, 2013)
- Work and training gardens (Guitart, Byrne & Pickering, 2013)

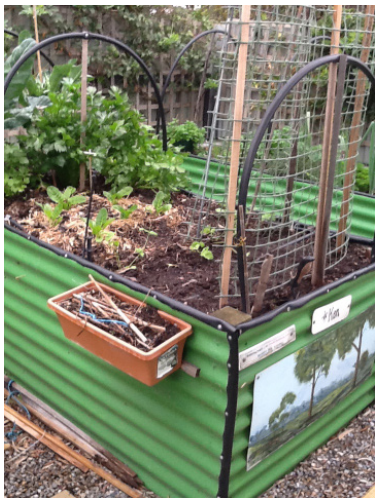
Aims for community gardens

Some of the most common aims associated with community gardens highlighted in the literature are:

- Food production (Guitart, Pickering & Byrne, 2014; Guitart, Byrne & Pickering, 2013; Turner, 2011)
- Combatting food insecurity (Evers & Hodgson, 2011; Guitart, Pickering & Byrne, 2012; Turner, Henryks and Pearson, 2011; Agustina & Beilin, 2012; Pires, 2011; Larder, Lyons & Woolcock, 2014; Cameron & Wright, 2014)
- Building community and social networks (Guitart, Byrne & Pickering, 2013; Ghose & Pettygrove, 2014; Agustina & Beilin, 2012)
- Encouraging sustainable practices (Mintz & McManus, 2014; Larder, Lyons & Woolcock, 2014; Turner, 2011; Stoker & Barnett, 1998).
- Economic considerations, such as reducing the cost of living for participants (Evers & Hodgson, 2011; Mintz & McManus, 2014)
- Improving health and nutrition (Mintz & McManus, 2014; Guitart, Pickering & Byrne, 2014; Pitt, 2014; Ghose & Pettygrove, 2014)
- Assisting with migrant settlement (Mintz & McManus, 2014; Agustina & Beilin, 2012; Guitart, Byrne & Pickering, 2013)

Motivations for involvement

Urbanisation is another key discussion point in the scholarly literature on community gardening. Urbanisation is seen as a threat to viable agricultural land and private green space such as backyards, and leads to a disconnection to food production (Guitart, Byrne & Pickering, 2013; Guitart, Pickering & Byrne, 2014) and in turn as a threat to food security. Community gardening in urban areas has been argued to be



Above: Camden Community Garden in Camden Park began in 2010 growing vegetables and herbs. Members have built planting boxes from roofing iron and timber, painted them green and attached descriptive panels produced by the Community Centre's art class
Below: Chapel Street Community Centre in Magill began in 2012 and grows vegetables, herbs and fruit trees. Members have built raised beds, a rain garden, aqua garden, pergola, pizza oven, barbecue and a scarecrow

able to assist in countering some of the effects of this urbanisation (Guitart, Pickering, and Byrne, 2012; Guitart, Byrne & Pickering, 2013). Turner (2011) sees addressing this disconnect between food and urban consumers as a key benefit of localising food production and fostering the rise of community gardens and sustainable urban living.

Health and nutrition
Numerous studies have linked gardening with health benefits for participants such as greater amounts of physical activity and better nutrition (Guitart, Pickering & Byrne, 2014). Community gardens give people opportunities to access fresh, nutritious food where they might not be able to otherwise (Ghose & Pettygrove, 2014). There are also links between community gardens and increased vegetable and fruit consumption, improved self-esteem and self-confidence, and the psychological

benefits of working outdoors in a safe community space (Mintz & McManus, 2014). The therapeutic benefits of community gardening have been extensively documented in Pitt (2014), which showed that gardeners and visitors experienced positive emotions whilst they are in the gardens, becoming so absorbed in tasks that nothing else seems to matter (termed 'flow'). Some respondents to the study also reported a reduction in stress and anxiety when active in the garden (Pitt, 2014).

School-based food gardens are primarily seen as a useful tool for nutritional education (Somerset & Markwell 2008). The term 'kitchen garden program' refers to programs that, in addition to building a garden with edible plants, include participation in the preparation and cooking of meals in the kitchen–classroom using food harvested from the garden (Gibbs et al. 2013b). School garden programs have been examined in terms of their impacts on a number of areas, such as nutrition knowledge, personal development, and environmental attitudes (Gibbs et al. 2013b). An examination of the impact of the Australia-based Stephanie Alexander Kitchen Garden program revealed that children were more willing to taste a range of new foods following the program. In addition, the researchers found that children appreciated the freshness of fruit and vegetables, as well as the fact that they were grown organically (Gibbs et al. 2013a). These findings are similar to those of Somerset and Markwell's 2008 paper on a year-long study of children in one school in Brisbane where the presence of a school garden led to children attributing added value to vegetables and fruits that were 'garden grown', as well as a substantial increase in the ability of children to identify specific vegetables and fruits

Sustainability

Environmental sustainability is cited in the literature as a key benefit of community gardening that is intrinsically linked to food security, community building and research and development (Stocker & Barnett, 1998). It is typical for community gardens to be identified as models of urban sustainable living. However, research into the exact role that community gardens play in terms of sustainability is mainly limited to discussions of the benefits of organic gardening and the reduction of food miles and emissions which community gardens create in comparison with settings which grow commercially-produced produce (Turner, 2011).

Similarly, food security is a key issue that is often discussed in conjunction with sustainable and community driven food production and has been acknowledged as a reason for the recent renewed academic interest in community gardening (Guitart, Pickering & Byrne, 2012). Threats to food security such as peak oil (the hypothetical point in time when the global production of oil reaches its maximum rate, after which production will gradually decline), climate change and economic pressures are growing (Pires, 2011; Evers & Hodgson, 2011), yet community gardens are also constructed as sites of resistance against hunger, poverty and disconnection from food (Ghose & Pettygrove, 2014). Interestingly enough, there also has been little research in Australia into the role that community gardens can play in biodiversity conservation, perhaps because most of the plant species grown in community gardens appear to be non-indigenous flora; this topic is worth further exploration. There also is a lack of metrics to measure if and how much community gardens contribute to

Australian urban ecology (Beilin & Hunter, 2011). Perhaps most importantly, there is little on the role that community gardens can play in building community resilience.

The case study: community gardens in Adelaide

Currently there are over 50 community gardens in Adelaide. Community gardens in Adelaide operate under three models: communal lots, individual lots and gardens run as a whole by volunteers. Garden tenures are tied to leases owned by the local council, church or school and subject to various fees and regulations. Fees or dues to become a member of a community garden range from $20 to $100 per annum, although different groups receive different goods and services according to the amount charged and to the garden to which they belong.

Almost all gardens attempt to be organic, although some used pesticides for pathways or to target problem weeds. Volunteers or members of community gardens ranged in age, although older people and young children were more prevalent. There were many instances where community gardens were used for therapeutic purposes (for example, people recovering from illnesses, or to help mentally handicapped people or those sick with cancer). Almost every garden has a waiting list, some for up to two years, and most facilitate or are part of wider food exchange systems, markets or networks.

Our interviews revealed that the main motivation for being involved in community gardens related to the sense of community and social life obtained through the experience. Australian community gardens differ from British allotments in that although they are commonly described in the United Kingdom as community gardens, they are usually tended as individual allotments rather than run communally by a collective of individuals. For this reason, it is unsurprising that individuals when interviewed, felt being part of community was a big motivating factor affecting their involvement. The second most frequently mentioned motivation was the desire to grow fresh food and vegetables, followed by an aspiration to be part of social enterprise that was committed to sustainability, addressing food security and adapting to climate change. Summarised below are the main themes that emerged in the interviews, together with some indicative quotes that showcase the key sentiments and opinions that people have relating to their involvement in community gardens.

As indicated below, environmental issues did motivate people's involvement in community gardening, whether to try and do a 'little bit' for climate change by reducing food miles, or by feeling they were building insurance in the context of food security. Common norms for the gardens hence included commitments to no use of chemicals or pesticides; being organic; use of rainwater (and supplementing when necessary), solar power, and recycled materials; and composting. A focus on growing food plants dominated all interviews: it was often implicit or assumed that community gardens were about providing organic, eco-friendly (i.e. reduced food miles) and more diverse types of fruit and vegetables, and avoiding commercially-produced produce. Participants also felt growing food was important as they perceived there was a decline in rural agriculture. Individuals reflected on how urban sprawl had led to peri-urban agricultural land disappearing, and 'local' food and vegetable sources significantly diminishing.

Summary of themes about the value of community gardens and selected quotes

Social side/value of community

- 'The interesting thing is that you're starting at the premise of looking for some space to do some gardening and what we actually discover is the community side of it.'
- 'The best thing about it has been meeting other people.'
- 'It's about people first rather than plants and vegetables. The plants provide the common theme for people to connect, to meet each other and to share knowledge…most people join up to have a sense of being part of that community.'
- 'I love the fact that my kids have this place as a fantastic alternative to sitting inside playing computer games. I love that they can come over here and just run wild with their friends.'
- '…my philosophy is 90% people and 10% gardening.'

Dissatisfaction with commercial food system

- 'My wife and I have decided we're not happy with [the] industrial food system. We don't buy any food from supermarkets at all.'

Trust

- 'If we don't grow it ourselves we want to buy it from somebody we know who either grew it or knows the person that grew it so that we have faith or we trust our food sources.'

Value of organic produce, knowing where it comes from, diversity

- 'If you have diversity in the garden you don't need chemicals.'
- 'We're all about diversity in food production. All about diversity.'
- 'It's an organic garden *obviously…'*
- 'I'd rather see pesticides and herbicides weren't used. I'd rather see it as more, not an intensive type of environmentally destructive agriculture. I'd rather see organic practices.'

Therapeutic value

- 'I had a stroke seven years ago and one of the therapists that I was working with contacted the garden because I love gardening and got me here as a volunteer. So, I've been coming ever since.'
- 'people who are disabled, people with mental illness, people with physical disabilities, older folk, especially that will come to gardens like this and you know it's more important to me.'

Sharing with friends and family

- 'Then we share, like when we have snow peas or something so we all share that, or the mandarines.'

'Doing something' about climate change/food security

- 'I guess sustainability issues really concern me. I used to get really quite depressed. It just feels so helpless and I think for me even though this is just, a very small step for me it feels like a step in the right direction...the building of a stronger community will stand us in good stead whatever the future holds…'
- 'I am also deeply concerned about climate change and wanted to make a difference when I could feel as though I can actually affect this little sphere of my world.'
- 'Bit of power to the people really…that's another thing that we're all about is promoting resilience.'
- 'in terms of edible gardens it's food miles comes into it in terms of environment factor you know growing your own food locally so you don't get all the other environmental costs for bringing food from overseas or interstate So that's important obviously from a psychological wellbeing and also from an environmental perspective putting oxygen into cities. Cooling cities, you know the temperature. You know cities that don't have trees for example are hotter'.
- 'there's also the environmental factor which is the food miles that we've talked about before. Food security… that you're actual growing your food locally and, [we want to] encourage that…making people aware and things like that..'
- 'Oh it worries me silly that it's diminishing and diminishing. I mean this area up here ..was full of market gardens and now they're all gone….I worry about Australia not growing its own food… it's pretty disappointing really'.

Individuals also located their motivations for participating in community gardens as an alternative to having backyard gardens: 'I mean these days of course the backyard garden is dying out. People don't have backyard gardens and so that's why these sorts of community gardens are popping up, people have the chance to grow vegetables even though they haven't got any place to grow at home'. This was partly as a function of the fact that increasingly people are living in houses that do not provide large backyard garden spaces. This concern is clear in the following reflection: 'You don't get many people who are avid gardeners in today's society because they haven't got time and they haven't got room and they have these big houses on small blocks'.

Implications: community gardens, a pathway for community resilience?

Overall, our study highlights that people in Adelaide engage in community gardening for social and functional reasons. While very local in scale, these results are nonetheless consistent with the international studies summarised above which find that common motivations for involvement in community gardening include the desire to consume fresh produce, reduce food costs, pursue social networking and develop improved mental and physical health (for example, Guitart, Pickering & Byrne, 2013, 2012; Stocker & Barnett, 1998).

The focus on agency, (by which we mean the aspiration of individuals to initiate actions that have particular effects—in this case contributing to the climate change and food security) and aspirations to offset fears about food security and climate change also is consistent with ongoing discourse at wider levels: in recent years there has been an increase in mainstream discussion around food security issues in

Australia, especially after natural disasters such as floods and cyclones in Queensland which have impacted food availability for the whole country (Larder, Lyons & Woolcock, 2014). One paper estimates that food insecurity affects more than 5% of the population, particularly those living in urban areas (Pires, 2011). Future impacts are being researched: for instance, a study in Sydney found that 52% of the city's vegetable production sites are within areas proposed for future urban development (Larder, Lyons & Woolcock, 2014). In direct terms, community gardening allows people the space and tools to grow their own fresh produce, which is particularly important when urban densification means that private backyard ownership is becoming scarcer (Agustina & Beilin, 2012).

Community gardening represents a merger of public and private responses to food insecurity through individual and collective action (Evers & Hodgson, 2011) that builds resilience not just of communities but whole cities: 'community gardens can contribute to the creation of resilient urban neighborhoods and facilitate a city's recovery when faced with a sudden crisis such as a natural disaster or human-made conflict' (Tidball & Krasy 2007 cited in Okvat & Zautra 2011, 376). Indeed, the Cuban city of Havana provides an illustrative example of how community gardening can build community resilience; from 1990, in response to rising fuel costs and the inability of local communities to access or afford food, it turned to growing its own. With over 26,000 gardens across 2,439 hectares in Havana that produce 25,000 tons of food annually, in effect 40% of households in Havana are involved in urban community gardens. Although the Cuban garden program was a government initiative, its success highlights the efficacy of and benefits of community based gardening in urban/city contexts. As Burton et al (2013, v) conclude: 'Urban agriculture has the potential, … to contribute to the adaptations that most cities are engaged in as they strive to be more resilient in the face of various existential threats, including climate change.'

In the context of urbanisation, and the growing impacts of climate change, our pilot study also reveals the potential for community garden networks to offer opportunities to build community capacity and resilience to what are the 'big ticket' issues of our day. Ultimately, this project provides food for thought when considering how communities can become involved in and empowered by their involvement in activities that connect them to the environment such as community gardens. It also suggests that given most respondents see their involvement as a social activity, that community gardening can build adaptive capacity within communities, which in turn helps facilitate community resilience. In turn, community gardens by being communities of practice that connect individuals to the environment may play a further role in ecologically grounding people and enhancing appreciation of native plants and produce. All cities could benefit from further development of diverse types of community gardens, with clear structures to further goals associated with community resilience and food security. They can provide alternatives to commercially- and industrially-driven food production, become spaces that build social and community networks and enhance capacity to build individual and community food security. In so doing, community gardens do have the potential to build community resilience and become a pathway to urban adaptation that is

socially as well as ecologically fulfilling (Okvat & Zautra 2011). As Burton et al (2013, v) conclude:

> Urban agriculture has the potential, … to contribute to the adaptations that most cities are engaged in as they strive to be more resilient in the face of various existential threats, including climate change … this in turn will contribute to the overall resilience of Australian cities and to their sustainable growth in the future.

Acknowledgements
We would like to thank all the people in Adelaide who willingly gave their time to us and showed us through their beautiful and inspiring gardens. We would also like to thank Laura Sissman, an intern from the Agrocampus Quest, an agricultural college in France, and Sarah Hender, a graduate student from the University of Adelaide, for undertaking research work on this project. We also acknowledge the support of the Faculty Research Committee of the Faculty of Arts, University of Adelaide who gave us funds through the Faculty Research Active Grant Scheme, to conduct the project.

References

Adger, N 2000 Social and ecological resilience: are they related? *Progress in Human Geography*, vol. 24: pp. 347-364.

Adger, N 2006 Vulnerability, *Global Environmental Change*, vol. 16 (3): pp. 268-281.

Agustina, I & Beilin, R 2012 Community Gardens: space for interactions and adaptations, *Procedia—Social and Behavioral Sciences*, vol. 36: pp. 439- 448.

Amundsen, H 2012 Illusions of resilience? An analysis of community responses to change in northern Norway, *Ecology and Society* vol. 17 (4): p. 46. Retrieved from http://dx.doi.org/10.5751/ES-05142-170446 on 15 April 2015.

Beilin, R & Hunter, A 2011 Co-constructing the sustainable city: how indicators help us 'grow' more than just food in community gardens, *Local Environment*, vol. 16(6): pp. 523-538.

Berkes, F. & Ross, H 2013 Community resilience: toward an integrated approach, *Society and Natural Resources: An International Journal*, vol. 26 (1): pp. 5-20.

Boyatzis, RE 1998 *Transforming qualitative information: thematic analysis and code development,* Thousand Oaks, London,& New Delhi: SAGE Publications.

Burton, P, Lyons, K, Richards, C, Amati, M, Rose, N, Des Fours, L, Pires, V & Barclay, R 2013 *Urban food security, urban resilience and climate change*, National Climate Change Adaptation Research Facility, Gold Coast, 160 pp.

Cameron, J & Wright, S 2014 Researching diverse food initiatives: from backyard and community gardens to international markets, *Local Environment: The International Journal of Justice and Sustainability*, vol. 19 (1): pp. 1-9.

Dovers, S 2001 Institutions for Sustainability, *TELA: environment, economy and society issue 7*. The Australian Conservation Foundation, The Environment Institute of Australia, Land and Water Australia. Retrieved from https://een.anu.edu.au/download_files/een0101.pdf on 30 May 2015.

Evers, A & Hodgson, N 2011 Food choices and local food access among Perth's community gardens, *Local Environment: The International Journal of Justice and Sustainability,* vol. 16 (6): pp. 585-602.

Folke, C 2006 Resilience: The emergence of a perspective for social-ecological systems analyses, *Global Environmental Change*, vol. 16 (3): pp. 253-267.

Gibbs, L, Staiger, PK, Johnson, B, Block, K, Macfarlane, S, Gold, L, Ukoumunne, O 2013a Expanding children's food experiences: the impact of a school-based kitchen garden program, *Journal of Nutrition Education and Behavior,* vol. 45 (2): p. 137.

Gibbs, L, Staiger, PK, Townsend, M, Macfarlane, S, Gold, L, Block, K, Waters, E 2013b Methodology for the evaluation of the Stephanie Alexander Kitchen Garden program, *Health Promotion Journal of Australia,* vol. 24: pp. 32-43. <http://dx.doi.org/10.1071/HE12905>

Ghose, R & Pettygrove, M 2014 Actors and networks in urban community garden development, *Geoforum,* vol. 53: pp. 93-103.

Glover, TD 2003 Community garden movement, in Christensen, K & Levinson, D (eds.) *Encyclopaedia of Community*, Thousand Oaks, CA: Sage, pp. 264–266.

Guitart, D., et al. 2012 Past results and future directions in urban community gardens research, *Urban Forestry and Urban Greening*, vol. 11: pp. 264-373.

Guitart, D, et al. 2014 Color me healthy: food diversity in school community gardens in two rapidly urbanising Australian cities, *Health and Place*, vol. 26: pp. 110-117.

Guitart, D et al. 2015 Greener growing: assessing the influence of gardening practices on the ecological viability of community gardens in South East Queensland, Australia, *Journal of Environmental Planning and Management*, vol. 58 (2): pp. 189-212.

Holling, CS 2001 Understanding the complexity of economic, ecological, and social systems, *Ecosystems,* vol. 4: pp. 390-405.

Howard, Ebenezer 1898 *Tomorrow: a peaceful path to real reform,* Chicago: Ebenezer Howard reprinted in 1902 as *Garden cities: a way forward,* London: S. Sonnenschein & Co., Ltd.

Kurtz, H 2001 Differentiating multiple meanings of garden and community, *Urban Geography*, vol. *22* (7): pp. 656-670.

Larder, N Lyons, K. & Woolcock, G 2014 Enacting food sovereignty: values and meanings in the act of domestic food production in urban Australia, *Local Environment: The International Journal of Justice and Sustainability*, vol. 19 (1): pp. 56-76.

Lawson, LJ 2005 *City bountiful: a century of community gardening in America*, Berkeley, CA: University of California Press.

Lincoln, YS & Guba, EG 1985 *Naturalistic inquiry,* Newbury Park, CA: Sage Publications.

Lockwood, M, Davidson, J, Hockings, M, Haward, M & Kriwoken, L 2012 Marine biodiversity conservation governance and management: regime requirements for global environmental change, *Ocean & Coastal Management*, vol. 69: pp. 160-172.

Maguire, B & Cartwright, S 2008 *Assessing a community's capacity to manage change: a resilience approach to social assessment.* Canberra: Bureau of Rural Sciences.

Marshall, N & Marshall, P 2007 Conceptualising and operationalising social resilience within commercial fisheries in northern Australia, *Ecology and Society,* vol. 12 (1): Retrieved from www.ecologyandsociety.org/vol12/iss1/art1 on May 15 2015.

Maguire, B & Cartwright, S 2008 *Assessing a community's capacity to manage change: A resilience approach to social assessment,* Canberra: Bureau of Rural Sciences.

Mintz, G & McManus, P 2014 Seeds for change? Attaining the benefits of community gardens through council policies in Sydney, Australia, *Australian Geographer*, vol. 45 (4): pp. 541-558.

Okvat, H & Zautra, A (2011) Community gardening: a parsimonious path to individual, community and environmental resilience, *American Journal of Community Psychology*, vol. 47: pp. 374-387.

Pike, A, Dawley, S, Tomaney, J 2010 Resilience, adaptation and adaptability, *Cambridge Journal of Regions, Economy and Society*, vol. 3, pp. 59-70.

Pires, V 2011 Planning for urban agriculture planning in Australian cities, *State of Australian Cities National Conference 29 November-2 December 2011*. Retrieved from: http://soac.fbe.unsw.edu.au/2011/papers.html on 15 April 2015.

Pitt, H 2014 Therapeutic experiences of community gardens: putting flow in its place, *Health & Place*, vol. 27: pp. 84–91.

Rojas Blanco, AV 2006 Local initiatives and adaptation to climate change, *Disasters*, vol. 30 (1): pp. 140-147.

Schmelzkopf, K 1996 Urban community gardens as contested space, *Geographical Review,* vol. 85 (3): pp. 364-381.

Somerset, S, & Markwell, K 2009 Impact of a school-based food garden on attitudes and identification skills regarding vegetables and fruit: a 12-month intervention trial, *Public Health Nutrition,* vol. 12 (2): pp. 214-221. <http://dx.doi:10.1017/s1368980008003327>

Stocker, L & Barnett, K 1998 The significance and praxis of community-based sustainability projects: Community gardens in western Australia, *Local Environment: The International Journal of Justice and Sustainability*, 3 (2): pp. 179-189.

Tidball, KG, & Krasy, ME 2007 From risk to resilience: what role for community greening and civic ecology in cities?, in AEJ Wals (ed) *Social learning towards a sustainable world*, Wageningen, The Netherlands: Wageningen Academic Press, pp. 149–164.

Tompkins, LE & Adger, WN 2005 Defining response capacity to enhance climate change policy, *Environmental Science and Policy*, vol. 8: pp. 562-71.

Turner, B 2011 Embodied connections: sustainability, food systems and community gardens, *Local Environment: The International Journal of Justice and Sustainability*, vol. 16 (6): pp. 509-522.

Turner, B, Henryks, J. & Pearson, D 2011 Community gardens: sustainability, health and inclusion in the city, *Local Environment: The International Journal of Justice and Sustainability*, vol. 16 (6): 489-492.

Walker, B & Salt, D 2006 *Resilience thinking: sustaining ecosystems and people in a changing world*, Washington, DC: Island Press.

Wilson, GA 2012 Community resilience, globalization, and transitional pathways of decision-making, *Geoforum*, vol. 43 (6): pp. 1218-1231.