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## Social Resilience in Urban Areas

Jeremy Gibberd

jgibberd@csir.co.za

Built Environment, CSIR, 012 841 2839

### ABSTRACT AND KEYWORDS

#### Purpose

Climate change will create significant hazards globally. These are usually described in terms of physical phenomenon such as sea level rises, droughts, flooding and erratic weather conditions. However the way these phenomenon are *experienced* is mediated by social vulnerability. Social vulnerability can be described as the complex interrelationship of social, economic, political, technological and institutional factors that influence how an urban community, household or individual experiences climate change. This paper aims to understand how vulnerability can be addressed in order to support the development of urban environments and communities that are more resilient and able to adapt to climate change.

#### Design

The design of the research consists of the following steps. Firstly, a literature review is carried out to identify the key climate change impacts that are projected for South Africa. Secondly, literature on social resilience is reviewed to ascertain its potential role in enabling communities to adapt to climate change. Thirdly, analysis is carried out to ascertain urban attributes and mechanisms that may be used to foster social resilience. Finally, conclusions and recommendations from the study are drawn.

#### Research limitations

The research is limited to the reviews and analysis and makes proposals that need to be piloted and tested in the field. This is one of the recommendations of the study.

#### Findings based on empirical research

The findings from the paper indicate that significant climate change impacts are projected for South Africa. Through reviews and analysis, it finds that social resilience may play an important role in enabling communities to adapt to climate change.

#### Practical implications

The practical implications of the study are that it may be possible to foster social resilience in urban settings and achieving this could be an important way of enabling communities to adapt to climate change.

**What is original/value of paper**

The paper is carried out in a field where there has been limited research to date. It will be of interest to researchers of urban resilience, social systems and urban climate adaptation and mitigation strategies. It will also be of interest to municipal officials within urban areas.

**Key words**

Social resilience, urban resilience, climate change

**1. INTRODUCTION**

Climate change will create significant hazards globally. These are usually described in terms of physical phenomenon such as sea level rises, droughts, flooding and erratic weather conditions. However the way these phenomenon are *experienced* is mediated by social vulnerability (Vincent, 2004).

Social vulnerability can be described as the complex interrelationship of social, economic, political, technological and institutional factors that influence how an urban community, household or individual *experiences* climate change (Vincent, 2004). This paper aims to understand social vulnerability in order to support the development of more resilient human populations that are able to adapt to climate change. The paper is structured around the following research questions:

- What are the expected impacts of climate change on South Africa?
- What role has social resilience in adapting to climate change?
- How can social resilience in urban environments be fostered?

**2. CLIMATE CHANGE**

Climate change projections have been calculated for South Africa to support the development of urban climate change adaptation and mitigation strategies. Projections are provided at an 8 x 8km grid resolution for the years 2030, 2050 and 2100 (Englebrecht, 2017). This creates a basis for understanding how climate change will affect urban areas. Impacts across South Africa will vary depending on location but broad trends can be summarised as follows:

- Hotter temperatures: Temperature increases of 1 to 2.5°C in the southern coastal areas and 3°C in the northern areas of South Africa are expected for the period 2021 to 2050, relative to temperatures in the period 1961 – 1990.
- Colder temperatures: Minimum temperatures are projected to decrease by 2 to 3°C for the period 2021 – 2050, relative to the period 1961 - 1990

- Very hot days: An increase in very hot days is projected for the period 2021 – 2050, relative to 1961 – 1990.
- Changes in rainfall: Increases in rainfall are projected in the central interior and east coast, while reductions are expected in the western interior and the north eastern parts of South Africa in the period 2021- 2050, relative to the period 1971 – 2000.
- Extreme rainfall events: Extreme rainfall events are projected over most of eastern South Africa with reductions in these events projected for Lesotho and Kwa-Zulu Natal Midlands for the period 2021- 2050, relative to the period 1961 – 2000.
- Increased wind speeds: Increased wind speeds are projected for the northern interior region of South Africa for the period 2021 – 2050, relative to the period 1961 – 2000 (Engelbrecht et al., 2017).

These climate changes will result in significant hazards being experienced South African urban areas such as water shortages, drought, food insecurity, flooding and infrastructure damage from storms and extreme weather events.

Mortimore (1998) points out that climate in Africa has always been variable and that local communities have been able to successfully adapt to this (Dovers, 2009; Burton, Huq, Lim, Pilifosova and Schipper 2002). However, in the past, this change occurred slowly and within a defined range. Current projections will be different as change will occur more rapidly and over a greater range of variability.

Traditional climate change adaptation and mitigation research has a strong focus on climate change models which are used to project environmental risks, such as droughts and flooding, and their potential impacts on human populations. This approach tends not to include the diversity of vulnerabilities that exist within populations in relation to these risks and therefore is only partial reflection of potential impact (Vincent, 2004). It is therefore important to understand social vulnerability and ascertain how different societies react, and adapt, to climate change.

### **3. SOCIAL VULNERABILITY AND ADAPTIVE CAPACITY**

Vulnerability is a contested term and a wide range of definitions have been proposed (Cutter, 1996). Social vulnerability research is increasingly used to describe bottom-up studies of how human populations deal with environmental change (Vincent, 2004; Cutter, 1996). This argues that humans are not merely passive recipients of climate change hazards and instead actively develop mechanisms to resist and cope with hazards when these occur (Jones and Boer, 2003; Pelling, 2003; Smith, 2001; Blaikie, Cannon, Davis, and Wisner, 1994)

Pelling (2000) argues that the scale and nature of climate change disasters relate to the extent of human exposure to a hazard and the capacity within individual and human systems to cope with this exposure. This 'capacity to cope' however is in constant flux as it is influenced by factors such as the strength of the local economy and changing social and cultural norms (Leichenko and O'Brien, 2002; Clark, Jaeger, Corell, Kasperson, McCarthy, Cash, Cohen, Desanker, Dickson, Epstein, Guston, Hall, Jaeger, Janetos, Leary, Levy, Luers, MacCracken, Melillo, Moss, Nigg, Parry, Parson, Ribot, Schellnhuber, Seielstad, Shea, Vogel and Wilbanks, 2000). Vulnerability can therefore be described in terms of economic, social, political, environmental and technological assets, with climate change impacts being determined by how these assets are allocated (Pelling and Uitto, 2001). From this perspective, vulnerability is a socially-constructed phenomenon governed by institutions and economic factors (Adger and Kelly, 1999).

Gallopín (2003) shows that vulnerability in some situations is beneficial and can lead to positive change. For instance, exposure to moderate flooding may mean that a population moves and avoids impacts associated with severe flooding. The same argument is applied by Walker, Holling, Carpenter and Kinzig (2004), who argues that a crisis can lead to the collapse of poor institutions and lead to the birth of new stronger structures and systems. In these types of situations, it can be argued that "resilience is not always a good thing" (Walker et al., 2004)

Measuring vulnerability has proved to be complex and researchers have resorted to proxy indicators to represent generic vulnerability. For instance, Brooks et al (2005) proposes the following indicators of vulnerability:

- Population with access to sanitation
- Literacy rate, 15–24-year olds
- Maternal mortality
- Literacy rate, over 15 years
- Caloric intake
- Voice and accountability
- Civil liberties
- Political rights
- Government effectiveness,
- Literacy ratio (female to male)
- life expectancy at birth

A review of these indicators suggest that while they may be effective at capturing "symptoms" of vulnerability in a society they may not be effective at ascertaining whether the society have the key characteristics required for resilience. Adger and Kelly (1999) argue that a key factor in enabling resilience is related to entitlement. Entitlement refers to how humans use resources and they argue that that the extent to which individuals or

communities are entitled to resources determines their ability to cope and adapt to stress (Adger and Kelly, 1999).

Entitlement can be understood in terms of the source of these entitlements, the way they are distributed and the institutional framework within entitlements are structured over time and among groups (Adgar and Kelly, 1999). Entitlements to assets are therefore legitimised by government and formal laws. However, entitlement operates differently at an individual and community scale. At an individual scale, vulnerability can be defined by access to resources, diversity of income sources and status within a household or community. At a community scale, vulnerability is defined by institutions, markets, social security, insurance and infrastructure (Adgar and Kelly, 1999). Therefore, the individual and societal conditions that create resilience or vulnerability are important to understanding the impacts of environmental, political and economic stresses faced by urban areas (Parry and Carter, 1998). The rate of change resulting from climate change will require strong resilience, or adaptive capacity, with affected communities (Brooks and Adger, 2003).

Adaptive capacity can be described as the ability to cope, coping capacity, or the capacity of response (Turner, Kasperson, Matson, McCarthy, Corell, Christensen, Eckley, Kasperson, Luers, Martello, Polsky, Pulsipher and Schiller, 2003; Smit and Wandel, 2006). More detailed definitions refer to actions taken by communities to adjust to changing conditions (Smit and Wandell, 2006). Smit and Wandell (2006) indicate that efforts to improve adaptive capacity of communities to climate change have only been moderately effective and that better results are achieved when adaptive capacity is addressed within broader programmes related to issues such as risk management, land use planning, livelihood enhancements and water management systems, development initiatives. Conway (2004) makes a similarly case and argues that addressing health, education and governance in African countries is a valuable way of improving adaptive capacity. This is supported by work that shows that the most vulnerable sectors of the human populations to climate change are the elderly, the young and those suffering diseases such as HIV/AIDs (O'Brien and Mileti, 1992; Vincent, 2004).

Cannon (1994) and Burton et al (1993) suggest that economic wellbeing plays an important role in adaptive capacity. Economic wellbeing can be defined as access to resources and relates to the ability of individuals, families, groups and communities to secure a livelihood (Blaikie *et al*, 1994). At a national level, a strong economy provides a valuable safety both for anticipatory strategies as well as for coping with post-shock events. At an individual level, access to resources can be used to cope with hazards (Vincent, 2004). Vincent (2004) also argues that rural population who are resource-dependent become vulnerable if this resource is threatened and this often results in rural-urban migration. This ultimately often increases vulnerability as the social networks that provided adaptive capacity in the rural area do not exist in the urban area (Adger, 2000; Moser, 1996).

Adger (1999) argues that there are strong links between inequality and vulnerability. Inequality reduces the communal allocation of resources and the pooling of risk. The concentration of resources in fewer and private hands, limits the extent to which these can be available to address a hazard (Adger and Kelly, 1999). How resources are distributed is fundamentally related to local institutions and therefore the nature and structure of these are an important factor in determining local vulnerability. Local institutions may formal (such as agencies of the state) or informal (such as cultural) and directly affect vulnerability by governing economic activity and property rights (Adger, 1999).

Cash, Clark, Alcock, Dickson, Eckley, Guston, Jager and Mitchell (2003) argues it is important to construct suitable institutions and organisational structures to address vulnerability to climate change. These should be based on credible climate change data and ensure that this forms the basis for effective local policies and strategies. The development of local strategies should be co-produced by stakeholders and be supported by social learning and synergistic relationships (Pahl-Wostl, 2007; Pelling, High, Dearing and Smith, 2008; Lemos and Morehouse, 2005). Institutions concerned with climate change risk and how this should be addressed should also be involved with the development of disaster management plans which deal with post-impact activities such as relief and reconstruction (Clack, Keim and Macintyre, 2009; Keim, 2009; UNISDR, 2002). Schipper and Pelling (2006) show that disaster management plans are increasingly taking a more proactive approach and aim to reduce risks and increase local preparedness prior to the occurrence of hazards.

In addition to strong institutional structures, suitable public infrastructure can help deal with hazards. Infrastructure, such as flood defences, can avoid climate change hazards causing human impacts (Handmer, Dovers, and Downing, 1999). It can also provide a 'lifeline' which enables the continued movement of people goods and services during and after a hazard (Platt, 1995). Information and communications infrastructure is identified by Blaike et al (1994) as being of particular value in reducing vulnerability.

Berrang-Ford, Ford, and Paterson (2011) argue that adaption responses to climate change by developing and developed countries have distinct differences. In developed countries responses are characterised by short term stimuli such as market conditions. Responses tend to occur at individual, family unit or community level with limited governmental involvement. Adaption responses tend to focus on securing resources and include activities such as avoiding, retreating, coping and spreading risk. In developed countries, responses are characterised by a greater involvement of government who develop anticipatory adaptations to address climate change hazards (Stern, 2006; Costello, Abbas, Allen, Ball, Bell, Bellamy, Friel, Groce, Johnson, Kett, and Lee, 2009). Folke (2006) suggests that one of the major challenges to humanity will be the development responsive adaptive governance which enable sustainable development pathways.

## **4. FOSTERING SOCIAL RESILIENCE**

An analysis climate change projections, social vulnerability and adaptive capacity can be used to construction an understanding of social resilience and how this can be promoted. This analysis identifies a number of key factors which can be used to promote social resilience. These are presented and discussed below.

### **3.2 Access to productive resources**

A productive resources are resources that can be used to sustain livelihoods and provide incomes to individuals and households. Examples of resources include agricultural land that can be used for farming and tools and workshop space which can be used to manufacture products for sale or provide repair and maintenance services. Local access to these resources improves social resilience as control over these resources is retained locally and resources can be adapted to respond to change. The increased diversity of economic activity resulting from local productive resources reduces vulnerability by generating local social networks and reducing exposure to economic downturns in one sector. Increased self-sufficiency generated by these resources can also reduce vulnerability to external shocks such as food price increases (Blaikie et al, 1994).

### **3.3 Provision for health and education**

Health and education are important factors in improving the resilience of a population (Conway, 2004; O'Brien and Mileti, 1992; Vincent, 2004). Healthy populations are less vulnerable to disease and able to carry out activities, such as evacuation or the construction of basic flood defences, in case of climate change hazards such as flooding. Improved levels of education increase resilience by supporting a greater awareness and understanding about climate change and how it can be addressed. Increasing resilience through health and education can be supported by ensuring that basic health and education infrastructure such as clinics and schools are in place. In addition, other factors that promote health and education such as access to healthy food and clean drinking water as well as the provision of safe environments for learning should be in place.

### **3.4 Access to information**

Social resilience to climate change can be promoted by access to clear information about climate change and its potential impacts. This information

may be provided by local and national government and civil action groups and provides information such as climate change projections and their implications for the local area. It can also provide practical recommendations about what can be done to address these changes. This information should be presented in a way that people readily understand it and can act on it (Pahl-Wostl, 2007; Pelling et al, 2008; Lemos and Morehouse, 2005). Information about local climate resilience plans, disaster management plans and institutions that support resilience should be available.

### **3.5 Shared facilities**

Shared local facilities and infrastructure such as local parks, sports facilities, recreational areas and community centres can be an important way of support social cohesion and networks and therefore enhancing social resilience. These facilities can encourage social interaction and shared community activities, such as sports and recreation which build trust and relationships. Shared facilities can also be used to support the development of institutions and provide a venue for public meetings which can be used to increase awareness of climate change and support the development of local climate resilience plans.

### **3.6 Institutional and cultural arrangements**

Local institutions, such as neighbourhood and civil groups can be an important way of fostering social resilience through increased social cohesion and social networks and as well as through coordination of local climate change plans (Cash et al, 2003). These groups can increase resilience in a range of ways. Firstly, they can be conduit for information about climate change and its impacts and help ensure that this reaches residents of a local area. Secondly, these groups can hold meetings and other fora which involve local community members and enable them to discuss climate change hazards and develop local plans to address this. Finally, these communities can develop organisational structure which are able to support and coordinate local actions to proactive address climate change hazards before these occur as well as dealing with impacts and recovery after an event.

### **3.6 Local climate resilience plans**

Social resilience can be enhanced through collaborative activities involved in the development of local climate resilience plans. By working together to

understand local climate change hazards and how these can be addressed, coordination structures and communication systems can be developed which enhance social resilience. Well understood and communicated plans can ensure that local actions to improve resilience in the face of climate change are coordinated and efficient.

### **3.6 Disaster management plans**

Disaster Management Plans, structure actions which reduce the impacts of disasters and help support recovery following a disaster. If these are developed with local community, strong buy in and support of these plans can be achieved. The development of plans and their implementation can be used to coordinate and structure disaster related activities and enhance local social resilience (Clack et al, 2009; Keim, 2009; UNISDR, 2002). These plans can also be used to ensure that appropriate resources and infrastructure are available within appropriate entities such as local government to address climate change disasters such as flooding when these occur.

### **3. CONCLUSIONS AND RECOMMENDATIONS**

An analysis and review of climate change projections, social vulnerability and adaptive capacity has been applied to propose key factors that may be used to promote social resilience in urban communities. These factors include: access to productive resources, provision for health and education, access to information, shared facilities, local climate resilience plans and disaster management plans. A review of these factors indicates that these are well aligned with the mandate of local councils. Therefore, the following recommendations are made:

- The identified social resilience factors are tested by piloting programmes that promote these in a selected urban community.
- Detailed monitoring and evaluation processes are put in place during testing to ascertain the effectiveness of the factors in promoting social resilience and to ensure that lessons are learnt.
- Where data indicates that programmes have been successful in promoting social resilience, methodologies are captured and consolidated in guidelines to be applied by other communities and councils to build social resilience as means of addressing climate change.

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