# Improving Adaptation of Coastal Communities through Self Initiated Bottom-Up Approaches: A Case Study of the Cardwell Community, Australia

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## Abstract

**During the 20th century there has been a dramatic development of the coastline leading to substantial population growth in coastal areas worldwide. Given that this trend is expected to continue in the future it raises critical challenges as climate change is likely to exacerbate the exposure of coastal populations to extreme weather events. While the severity of extreme events affecting those areas may lead to widespread damage and disasters, they might generate opportunities for change to occur in their socioeconomic, political and organisational systems improving their adaptation to climate change. For example, opportunities might be created to review how those areas are planned and managed as well as to gather lessons from past extreme events.**

**This paper investigates how those opportunities emerge and are optimised by focusing on the Cardwell community in Far North Queensland, Australia. Like many other coastal locations worldwide, Cardwell is particularly vulnerable to sea level rise and tropical cyclones leading to severe storm surges and intense rainfall events. Cardwell's vulnerability to extreme weather events was confirmed in February 2011 when category five tropical cyclone Yasi affected the town causing widespread damage to its coastal community. Nonetheless, this community has begun a distinctive recovery phase by initiating the preparation of a long term strategy for its future independent of official planning processes of State and local governments.**

**The paper focuses on this distinctive recovery phase in which the Cardwell community took the initiative of developing a long term strategy to maximise the opportunities presented in the post Yasi reconstruction phase and beyond. The paper describes the collaborative process involved in developing this strategic planning initiative which culminated in the proposition of a long term vision as well as a set of priority actions to improve adaptation of the Cardwell community. We also discuss how this bottom-up, community initiated and led, visioning and strategic planning initiative, may contribute to inform the planning process for climate change adaptation in urbanised coastal areas.**

**Key words: adaptation, community recovery, strategic planning, coastal settlements**

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## 1. Introduction

Urbanisation of coastal areas has increased significantly during the last century (Nicholls et al, 2007). As a result, coastal areas host significant populations and provide important socio-economic activities for regions worldwide (Birkmann et al, 2010). For example, it is estimated that they are now home for 10% of the world's population (McGranahan et al, 2007) and have an average population density 3 times higher than the global average (Small and Nicholls, 2003). The combination of increased population growth in coastal areas and forecasted climate change impacts is likely to exacerbated the vulnerability of many coastal communities (Nicholls et al, 2007). In the face of climate change urbanised coastal areas are likely to be vulnerable to coastal and riverine flooding, sea level rise and storm surge (Brooks et al, 2006; Nicholls et al, 2007; Solomon et al, 2007; Hunt and Watkiss, 2011).

The fact that climate change impacts are expected to be spatially non-uniform across the world (Füssel, 2007) indicates that cities and regions will need to adapt to climate change in different ways. While there is strong evidence that climate change is already happening (Solomon et al, 2007), many communities worldwide have experience in dealing with extreme weather events such as tropical cyclones and therefore provide important knowledge based on experience that can inform future climate adaptation. Consequently, it is important to capture the idiosyncrasies of different communities across the world in their efforts to adapt to extreme weather events. This paper focuses on the example provided by the town of Cardwell, Queensland, Australia, where category five Tropical Cyclone Yasi made landfall in February 2011 causing widespread damage to this coastal community.

Coastal areas in Australia followed the worldwide trend of coastal urbanisation and about half of the current country's population lives along the coast (Chen and McAneney, 2006). For example, the east coast of Australia hosts major urban centres and many smaller townships such as Cardwell that will need to adapt to climate change. Specifically, the north east coast of Australia is particularly vulnerable to tropical cyclones and associated impacts. While climate change is likely to decrease the frequency of tropical cyclones affecting this area of Australia, the intensity of such storms is likely to increase (Suppiah et al, 2010). Coastal communities such as Cardwell, because of the uncertainty related to global environmental change, increased population growth and trend in development are likely to have increased exposure to extreme weather events in the future (Nicholls et al, 2007).

Further, economic damages associated with extreme weather events have increased through time due to both social vulnerabilities and change to physical hazards (Adger et al, 2005). For example, the economic impact associated with cyclone Yasi in terms of damage costs is estimated to be three times higher than previous category four

cyclone Larry's half billion dollars (O'Brien and Howells, 2011; Australian Bureau of Meteorology, 2007). While natural hazards are an ongoing part of human history, a changing climate coupled with coastal development and population growth may exacerbate the exposure of coastal communities to their impacts (Nicholls et al, 2007) and continue to challenge their ability to respond appropriately as well as their economic recovery (Gunderson, 2010). Extreme weather events resulting in disasters also lead to a range of intangible social costs such as trauma which is likely to affect 95% of people in the early aftermath of the disaster and continue to affect 10-25% of people after the immediate recovery period (Gordon, 2007). Consequently, there is an urgent need to build resilience of coastal communities given their vulnerability to extreme weather events and future climate change impacts (Adger et al. 2005).

It is argued that planning plays an important role in safeguarding communities against future climate change impacts, particularly through adaptation (Bulkeley, 2006). Adapting to climate change thus is challenging and demands a rethink in the way in which our cities and towns are planned and built (Leitch et al, 2010). Such rethink will need to take place in partnership with those communities which are vulnerable to extreme weather events as they are at the forefront of impacts when those events occur. Coupled events such as sea level rise and tropical cyclones leading to severe storm surges and intense rainfall events will posit significant challenges to how coastal areas are managed as well as testing the strength of the communities inhabiting those areas. While the severity of extreme weather events affecting those areas may lead to widespread damage and disasters, they might also generate opportunities for change to occur in their socioeconomic, political and organisational systems (Pelling and Manuel-Navarrete, 2011). This paper explores how those opportunities emerge and are optimised by focusing on the recovery process of the Cardwell community which initiated a process to develop a long term strategy for its future independent of official planning processes of state and local governments.

**To this end, the paper is structured in three parts following this brief introduction. In the first part, we present the research approach which includes elements of participatory intervention research. In the second part, we describe the collaborative process involved in developing this strategic planning initiative which culminated in the proposition of a long term vision as well as a set of priority actions to improve adaptation of the Cardwell community. Last, we discuss how this bottom-up, community initiated and led, visioning and strategic planning initiative, may contribute to inform the planning process for climate change adaptation in urbanised coastal areas.**

## 2. Research Approach

This study adopted a research-intervention methodology (Hatchuel, 2001). This type of research methodology, also called participatory intervention research (Daniel et al, 2011), has gained momentum over the last decades amongst sciences which deal

with collective action processes (Hatchuel, 2001). It is an approach that builds on elements of action research (Hatchuel, 2001) first developed by Kurt Lewis in the 1940s (*cf.* Halkup et al, 2004). Widely used in the fields of human health where it is referred to as community-base participatory research (Halkup et al, 2004; Wallerstein and Duran, 2011) and management research (Hatchuel, 2009), it comprises a type of research which allows collaboration/interaction between actors and researchers to generate the means for collective action (Daniel et al, 2011). Midgley (2008) defines intervention related to research methodology as a "purposeful action by an agent to create change" (pp. 56).

Advantages of adopting this type of research methodology include its contribution to aid decision-making processes as well as the fact that researchers play a dual role of investigators and stakeholders in the process which can increase its path to impact (Daniel et al, 2011). Furthermore, intervention-research is conducive to bring about positive change (Midgley, 2008).

In adopting research-intervention as our methodology we created a broader scope for the collaborative component of the study. Advantages of establishing collaborative approaches in the planning context are well discussed in the literature and extensively represented by the work of Patsy Healey (2006, 2008). Specifically, collaborative planning provides opportunities for the argumentation and debate of critical issues in the policy-making practices (Healey, 2008, pp. 285). In this collaborative process, negotiations between stakeholders assist in defining which focal issues are included or discarded as well as responsibilities and accountabilities further down the track when implementation takes place (Daniel et al, 2011).

In our context, the research comprises a partnership between the Cardwell community and the research team established to conceptualise and develop a long term strategy for the community's future. The research was complemented by a three-pronged approach related to data collection which involved:

a) Literature review and background research ;
b) Semi-structured interviews (Hay, 2005) with community members focused on disaster preparation, response and recovery; and
c) Participant observation (Hammersley and Atkinson, 1983; Tedlock, 1991) during workshops with the community.

The literature review and background research involved assembling and analysing background planning data and documents and climate change data; confirming key existing and potential planning initiatives for ongoing engagement by the Cardwell community (including planning process opportunities and initiatives); and identifying potential natural and socio-economic triggers for the area.

The semi-structured interviews and participant observation during the workshops and strategic action planning process enabled the investigation of the critical community attributes, community networks and essential steps of successful community bottom-

up approaches that may lead to improved community resilience and adaptation to natural hazards and climate change, particularly in coastal areas.

## 3. The Collaborative Process

Located in Far North Queensland, Australia, the broader Cardwell has a population of approximately 9,500 (Australian Bureau of Statistics, 2006). The township itself is located more than 1,500km from the State capital Brisbane and halfway between two regional centres, Townsville and Cairns (see Figure 1). The area is known to be vulnerable to extreme weather events such as cyclones (see Figure 2) which often cause widespread floods and wind destruction (Australian Bureau of Meteorology, 2011).


Figure 1. Location map for Cardwell, Australia (source: Google Earth)

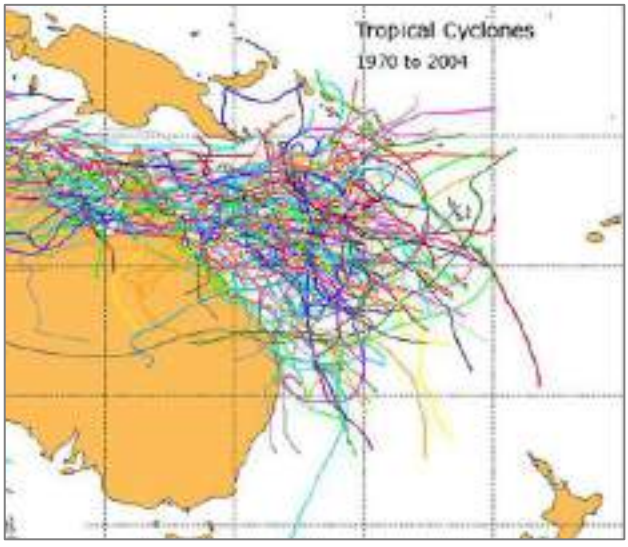


Figure 2. Tropical cyclones affecting the Australian East Coast (source: BOM)

The collaborative process of developing a long-term strategy for the Cardwell community was initiated by the Cardwell Chamber of Commerce in the aftermath of cyclone Yasi in March 2011. A partnership was then established between the

Cardwell community (facilitated by the Cardwell Chamber of Commerce) and the research team.

The research to date has involved the conduct of five community workshops which included community members representing 24 community groups (see Figure 3 for

**Workshop 1**- a preliminary scoping workshop with the Chamber of Commerce (CCoC) to define a Cardwell 'Community of Interest'; and develop a long term vision for Cardwell.

**Workshop 2** - a community workshop with a broad representation from the Cardwell community to confirm the Cardwell Community of Interest; identify community networks; confirm the long term Vision for Cardwell; completed a SWOT analysis to identify the strengths, weaknesses, opportunities and threats that may influence post-Yasi Cardwell development; define community priorities; and scope options for community responses to future natural hazards and disasters. As an outcome of this workshop, a number of factsheets was produced that summarised information on a range of relevant topics to further enhance an understanding of the key issues involved.

**Workshop 3** - a community workshop to identify the key drivers of change influencing the community of Cardwell over the next 25 years; identify key strategic initiatives and proposals; and identify preliminary strategic actions (responsibilities/timings/priorities/resources etc.).

**Workshop 4** - a community workshop to develop and assess a set of initial 'Future Options' for consideration in the Cardwell small Strategic Action Plan.

**Workshop 5** - a community workshop to assess and confirm preliminary Future Options to be included in the small Strategic Action Plan.

**Figure 3. Outline of workshops**

an outline of each workshop). As a result of these workshops, the Cardwell community in partnership with the research team has developed and confirmed a vision for the future of the community (see Figure 4); identified a series of future options for the community; and composed a draft action plan which contains a series of prioritised actions that will have to be implemented over the life of the action plan in order to achieve its vision and strategic intents.

**Vision Statement**

**Cardwell – *a future community of eco-living*** will be noted for its embrace of a high standard of ecologically sustainable living, energy efficient buildings and its town location and design that provides maximum safety and security from natural hazards.

With its permanent population capped at sustainable levels of 3000-4000 persons, its urban centre will comprise three low rise nodes, each with a distinctive core function. The polycentric urban centre will focus on and support five core regional businesses, namely: agriculture, aquaculture, eco-tourism, aged-care, and services.

The community will maximise its diverse tourist opportunities afforded by its location in proximity to World Heritage areas and national parks.

**Figure 4. Community vision**

The remaining step in the process is to disseminate the action plan to the wider community as well as authorities from both local and state governments. Ultimately, it is expected that the proposed future options put forward by the Cardwell community will be integrated and incorporated as part of the review of official plans and strategies that have direct implications for Cardwell.

The compilation of future options for the community involved an iterative process in which community members were given the opportunity to submit a selection of options to be assessed by the whole group during the workshops. These future options were accompanied by the following descriptors: the source of the idea; the relevant area or location for its applicability; main mechanisms for its implementation; identified responsibility for its implementation; identified anticipated benefits; identified undesirable or unintended impacts; and priority relative to other options.

Initially, a total of 25 preliminary future options were proposed to be included in the action plan. These options were tested against a set of five 'What If' questions during workshop 4 which sought to evaluate:

i. the extent to which the option would enable the community to deal with future major natural hazards;
ii. the extent to which the option would enable the community deal with future shocks and surprises (e.g. economic downturn, collapse of the international and national tourism industry, dramatic changes to oil availability);
iii. the extent to which the option would represent the best use of public money;
iv. the extent to which the option would have a negative impact on the community; and
v. the extent to which the option assisted in achieving the proposed vision for the future of the community.

Future options were then reviewed by the research team and re-confirmed by community members before being reassessed during workshop 5.

The major themes under which those future options were grouped include: planned retreat (with provision of cyclone shelter); economic development (by fostering and enhancing existing industries); sustained population growth; town development and promotion; improved infrastructure provision; opportunities for youth development; strengthening its cultural policy; supporting its Indigenous community; and improved skills base.

## 4. A Way Forward

Understanding how communities function to recover in the long term from the impacts of natural hazards and what are the necessary attributes that can lead to resilient communities is of critical importance, especially to government agencies from all levels, as they seek to support and meet the needs of these communities. The research sought to improve this understanding by relying on primary data obtained through both workshops and interviews.

Drawing on workshop outputs, two characteristics were identified in the Cardwell community that are understood in the literature to be important elements that assist the community recovery process after disasters (Airriess et al, 2008; Colton and Samper, 2008). These include place attachment and strong social networks. These two characteristics became evident during workshop 2, when participants undertook a SWOT analysis to identify the community's strengths, weakness, opportunities and threats. In doing so, participants were able to indirectly reflect on the actual impact of Tropical Cyclone Yasi upon their community and identify key characteristics of their community that enabled them to overcome/deal with such impact. Specifically, a strong sense of belonging and identity was identified to be one of the key strengths of their community. This was exemplified by the high valorisation of their lifestyle which is enabled by the attributes of the surrounding landscape, e.g. located between the boundaries of two World Heritage areas and micro climate; and by the high level of voluntary participation and involvement of community members in the town and district's affairs through multiple memberships across community groups.

Interviews also confirmed the strong place attachment and strength of social networks that characterise this community. In particular, they highlighted the strong commitment and involvement community members have in doing voluntary work across a range of fields, including amongst others charity work, sport and cultural activities, training and advice, assistance to elderly people and voluntary rescue services. Additionally, they demonstrated the level of social networks in place exemplified by the mutual assistance that was provided during cyclone Yasi. A few qualitative explanations of these characteristics are provided on Table 1.

With regard to the collaborative process described in section 3, the community was able to identify and deliberate on focal issues perceived to affect their community and therefore requiring attention by relevant government bodies. Specifically, there was a clear call for increasing the involvement of the community in the decision-making process concerning their area. Specific issues included the lack of political support and weak political representation of the community's interests and needs and overregulation. The need to rehabilitate communication channels between the community and local authorities was also noted and articulated. These issues are particularly relevant to the planning process currently in place in the area as they indicate fractures in current community engagement initiatives.

While, one of the key challenges related to establishing effective public engagement initiatives relates to the difficulties to involve and motivate the community to participate (Head, 2007), the circumstances exemplified by the Cardwell community

also indicate that in some cases the community is willing to participate but appropriate channels are not provided by authorities to do so. Scholars have pointed out that there are limitations associated with establishing community engagement initiatives at larger scales in terms of the number and representativeness of social

Table 1. Evidence from interviews supporting key community characteristics

| Key characteristic | Qualitative explanation |
|---|---|
| | "*I would say I volunteer three to probably about four to five hours a week."* (Full-time employed female community member)<br><br>"*I volunteer one day a week at our* (organisation 1*) *I'm also the secretary of* (organisation 2), *which is pretty involved because you do have a lot of paperwork; you have to deal with that and you actually have to run the whole thing. So that would take up, I don't know, probably a day a week. I'm on the committee,* (organisation 3), *I was the secretary. I just got rid of that job and so I do a bit of work for the* (organisation 4) *and the* (organisation 5)." (Retired female community member) |
| Place attachment and Social networks | (on cyclone Yasi) "*We also had some local people who were being told to leave their home, and we just took as many people that wanted to come and stay. We basically all sat in the dining room so that we had a couple of walls between us, and I also had my two kids here. So, you know, there was probably about 10 or 12 of us here or something that night*" (Full-time employed female community member)<br><br>(on cyclone Yasi) "*We had people ringing up saying, "Can we come out?" And that was the same with our neighbours. Everyone knows ... Road is well above sea level and we had nine in our house. The neighbours had, I think they had, they'd left but they let people use their house. I think there was about eight people in that house. There was about 30 something in – 20 something in the house two up from us. 30 something in the house above that. We didn't know this until the next morning, but that many people."* (Full-time employed male community member) |

* Names were omitted for privacy reasons

groups that can be involved, specially the hard to reach groups (Few et al, 2007; Wiseman et al, 2010). Another potential reason for this lack of involvement of the Cardwell community in official decision-making process could be related to episodic/tokenistic approaches in public engagement initiatives (Head, 2007). Both barriers certainly need to be further investigated to determine the extent to which

they are engrained in the planning practices and hindering the establishment of broader community engagement initiatives in the Cardwell area.

Furthermore, complex and highly contested issues such as climate change demand the adoption of better collaborative approaches in planning practices to aid decision-making (Head & Ryan, 2003; Innes & Booher, 2004; Horlick-Jones et al, 2006). The collaborative process, the subject of this study, demonstrates that there are critical issues that the community would like to see discussed/incorporated in future official plans concerning their local area. These were identified through the iterative process of developing and assessing future options for their community which ultimately would enable the Cardwell community to deal with future extreme weather events. The extent to which these issues will be incorporated in future official plans is yet to be determined however efforts are already in place to improve the communication channels between the community and government authorities. These efforts can be mostly attributed to the Cardwell community itself further demonstrating the strength and will of its members to bring about positive changes.

Lastly, there are two key aspects of the partnership established between the Cardwell community and the research team that enabled the success of this collaborative process thus far. These are related to the reputation of the research team in undertaking collaborative research elsewhere in partnership with other stakeholders and the existence of community champions. Both aspects are understood to be critical for the success of intervention-research as indicated by Daniel et al (2011). According to the authors, on the one hand, reputation of the participants in this type of research model is seen as a crucial because it brings trust to the process. On the other hand, while involving community champions requires clear protocols to avoid the dominance of individual interests in the outputs of process, it is an essential aspect to ensure ongoing participation of other community members throughout the process.

Nevertheless, collaborative process through intervention-research such as the one outlined in this study need to be continuously evaluated to ensure its legitimacy and robustness. These would involve some key criteria such as the ones proposed Holkup et al (2004), including: credibility, transferability, fairness, level of participant involvement, community voice, acceptable problem solution and feasibility of project sustainability.

## 5. Conclusion

Intervention-research is perceived to be a useful research model to generate the means for collective action. This study confirms its usefulness as it generates important information related to the community's values and interests that should be discussed and potentially incorporated in future plans for their area. Additionally, the collaborative process between the community and research team, implemented through this intervention-research, is fostering the re-establishment of communication channels between the community and government authorities.

However, the real effectiveness of this collaborative process will continue to be tested in the years to come as the action plan is widely disseminated to both the broader community and government officials.

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