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Abstract

A series of earthquakes has forced Christchurch to re-plan and rebuild. Discussions about rebuilding strategies have emphasized the intention of making it a city for the future, sustainable and vibrant. This paper discusses the relationship between microclimate and urban culture in Christchurch based upon the concept of urban comfort. It explores the relationships between environment, people and culture to help understand the local requirements for urban landscape design. In this paper we claim that cultural requirements also should be taken into account when looking for sustainable strategies. A distinctive feature of this research is its focus on the way people are adapting to both surviving pre-quake and new post-quake environments.

Preliminary findings from the first year of field work using participant observation and 61 in-depth interviews with Christchurch residents are presented. The interviews were carried out in a variety of urban settings including: established sites (places sustaining relatively little damage) and emerging sites (those requiring rebuilding) during 2011-2012. Evidence from the interviews highlight future challenges regarding sustainability and urban comfort issues.

Post-quake Christchurch presents a remarkable opportunity to design an urban landscape which provides environmental, economic, social and cultural sustainability. However, to achieve successful outcomes it is fundamental to respond to the local culture. Field data suggest that the strong connections between urban and rural settings present in local culture, lifestyle and landscape generate a particular aesthetic and recreation preference for urban spaces, which should be considered in the urban landscape design strategies.

Keywords: *urban comfort, microclimate, culture, landscape design*

1. Introduction

In this paper, we investigate the relationship between urban design, urban microclimate, and their influence on the way people use, respond to and adapt to urban open spaces in the context of the Christchurch rebuild. We focus specifically on the concept of *urban comfort*, by which we mean the collective socio-cultural response to microclimate in an urban environment as a result of its regional identity (Hough, 2002). Regional identity is the characteristic of a place that makes it unique due to its location. It is dependent on place specific characteristics that generate the local physical and social environment.

Most work on urban microclimate measuring thermal comfort derives from human physiology and building services. In contrast, our interest is in how local urban culture and the social character of spaces influences peoples activities and perceptions. The question we ask is how can an understanding of urban comfort improve urban liveability as Christchurch recovers from its recent earthquakes? (Tavares, Swaffield, & Stewart, 2013).



Figure 1 – Christchurch Central City post-earthquake

Urban liveability and sustainability are closely related and both depend on economic and social vitality. We argue that the concept of urban comfort can contribute to achieving higher levels of satisfaction with the rebuilt urban environment, thus contributing to the economic and social regeneration of Christchurch.

2. The investigation

The investigation is based upon four linked case studies in Christchurch. Two sites that survived the earthquakes, are termed “Established Urban Settings” and two sites that emerged post-earthquake are termed “Emerging Urban Settings”. Preliminary findings from the first year of field work (October 2011 to November 2012) using participant observation and 61 in-depth interviews with Christchurch residents, in the sites, are presented in this paper.

2.1. Case study context

Christchurch is the third biggest city in New Zealand. Before the earthquakes the population was 376,700 inhabitants, and after the February 2011 earthquake it declined by 13,500 persons (Statistics New Zealand, 2013). The local climate is temperate and relatively dry. Maximum temperatures during summer range from 18 to 26°C, but may rise to more than 30°C. In the winter

daytime maximum air temperatures vary from 7 to 14°C (NIWA, 2013). The local climate perception is strongly dependent on the wind patterns. Cool northeasterly winds from the sea are common for much of the year. Cold southwesterlies are more frequent during winter, tend to bring rain and reduce air temperatures. Hot dry northwesterlies are possible at any time of the year, and during summer the highest temperatures are registered when this föhn wind blows. Northwesterlies can raise the temperature by 10-15°C within an hour or so.

Another important variable is the sun. In New Zealand the sun tends to be very strong because there is less ozone to block the UV rays, the Earth's orbit takes it closer to the sun during the southern summer than during the northern summer, and there is less pollution over the southern hemisphere. Because of its location (43.3 degrees South) and for being located on an island in the Pacific Ocean, Christchurch is cooler during the summer months than cities with the same latitude in the northern hemisphere (ENZ, 2013).

Case based research is widely used to investigate complex phenomena in real-life context (Yin, 2003) and are chosen to inform the research question under investigation (Gerring, 2007). The choice for the case study sites in this research was based upon two key variables – the social nature of the space and its urban condition pre- and post- quake. The sites have significant similarities to important streets in Christchurch's former CBD, such as layout and orientation, microclimate, vibrancy and use.

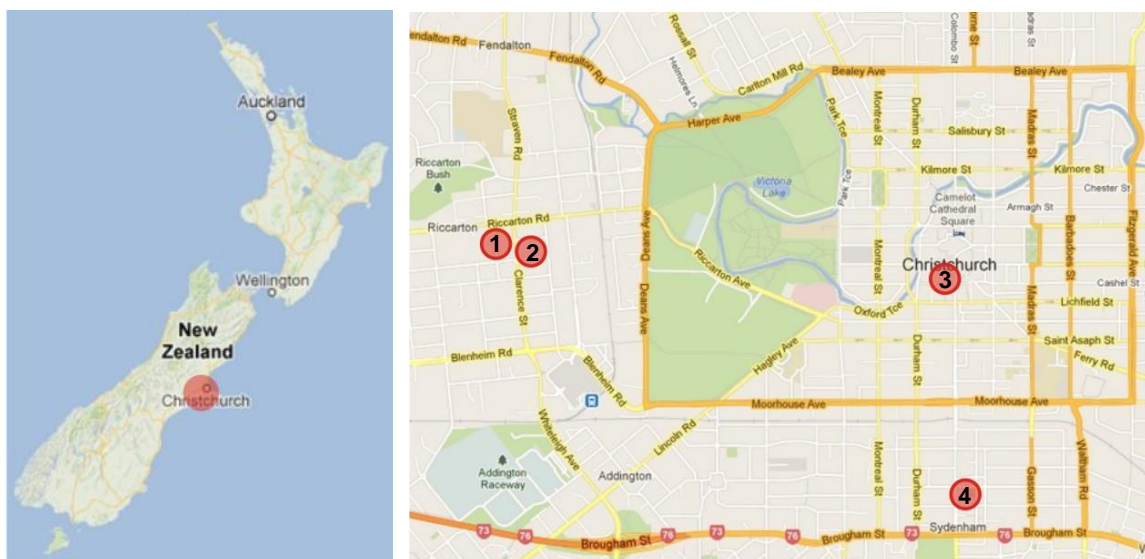


Figure 2 – Map of New Zealand (left) and map of Christchurch with the case study sites (right)

The investigation started with two *Established Urban Settings* that were minimally affected by the earthquakes, and later two new *Emerging Urban Settings* were added. The *Emerging Urban Settings* are spaces re-designed as temporary post-earthquake solutions. The specific choice of sites was influenced by Sommer (1969) who identified different types of personal space.

2.2. Why we chose these sites

The chosen sites are urban settings that attract public use. The detailed choice for the interview locations depended on the presence of a business where the equipment for climate data collection could be safely placed. Cafés became the focus due to the nature of the urban sites and the field work subsequently showed the dependence of the life of these areas on the local coffee culture.

	Urban Social Space	Urban Retreat Space
<i>Established Settings</i>	(1) Rotherham Street (Riccarton)	(2) Windmill Centre (Riccarton)
<i>Emerging Settings</i>	(3) Cashel Mall (Central City)	(4) South Colombo Street (Sydenham)

Table 1 – Matrix of case studies

Rotherham Street (Figure 3) was the first site to be investigated and was used in the pilot, along with Windmill Centre, the other established urban setting. Rotherham Street is located just outside the Westfield shopping mall in Riccarton and the number of people in the place is due to the location of the main door of the mall and nearby stores, restaurant, cafés and pub. This site is a slow traffic street – a pedestrian friendly environment – and includes some greenery and urban furniture, where people linger waiting for friends, in their lunch breaks or after school hours. This street was chosen for its physical similarities to many former inner city streets, including Cashel Mall, and because it corresponds to the proposed rebuild design of a tight urban street. Cashel Mall post-earthquake was later added to this study as a case study site.



Figure 3 – Rotherham Street

The second established site, Windmill Centre (Figure 4), caught our attention because of the number of people using the open space even on colder days. Because of the setting orientation– it faces north and is protected from the east – the microclimate in this area tends to be very benign and attractive even though the area faces a parking area. The site is close to Rotherham street – located in a parallel street – but the urban environment and the users are very different. The parking area has very little greenery and is predominantly a hard landscape. It does not include benches and urban furniture, and although it is adjacent to a busy street, the design of this space creates the impression of being further away from street traffic.



Figure 4 – Windmill Centre

Cashel Mall, or “The Container Mall” (Figure 5), located on Cashel Street, reopened in October 2011, and was added to this research in May 2012. It is a pedestrian based street and, at this stage, a one block area comprised of containers hosting stores, cafés and food courts. Trees, well-tended gardens, buskers and Ballantynes – a traditional local store – are currently the main attractions of the area. The choice for this site was due to its symbolic significance in a post-earthquake environment and its current changing nature. The nature of transitional sites and how locals are adapting to these environments is important in understanding adaption and future possibilities. The easily movable – and frequently changing – modules influence the urban environment, and consequently the perception of urban comfort. Every day of field work noted some change, such as rearranged containers, new market areas, establishments that arrive or leave, new short term containers and so forth.



Figure 5 – Cashel Mall

South Colombo Street (Figure 6) was the last site to be added to the case study. The site itself consists of a streetscape with a few empty sites where some containers have been placed and are currently used as dairy and stores. It also hosts a garden area, with a picnic table, a gazebo and a café including tables, chairs, benches and a mini golf area, all within the vicinity of the café. The project of this area is part of the Gap Filler (Gap Filler, 2013) and Greening the Rubble (Greening The Rubble, 2013) projects. The area is surrounded by offices and not far from a shopping mall. The Gap Filler office was located in the corner of the café area but has been removed, emphasizing the changing nature of the site. The café shack was built with old wood and decorated with Lego, and the garden area, including the gazebo, was built using pallets. Although it is part of a temporary

project, this site is similar to the Windmill Centre as it is generally used by individuals or small groups.



Figure 6 – South Colombo Street

2.3. Data collection

The research used three different methods of data collection: participant observation, in-depth interviews and (micro) climatic data collected in the case study sites. The (micro) climatic data collection used a portable weather station (La Crosse, model WS2355) placed on a tripod 1.20m from the ground, corresponding to the height of an average person, when seated. Field data was collected in the four case study sites from October 2011 to December 2012. Interviews took between 15 minutes and one hour to be completed. Both field notes and in-depth interviews were qualitatively analysed using the process of coding and memoing (Lofland, Snow, Anderson, & Lofland, 2006).

3. What we found out

Post-quake Christchurch presents a unique opportunity to design urban landscapes which provide environmental, economic, social and cultural sustainability. The success of these efforts depends on applying the right strategies in accordance to the local culture. The regional identity is closely related to *"two fundamental criteria: first, with the natural process of the region or locality – what nature has put there; second, with social processes – what people have put there"* (Hough, 2002, p. 210). In Christchurch, the connections between urban and rural settings present in local culture, the lifestyle, and local landscape all generate a particular aesthetic and recreation preference for urban spaces. These preferences are key to promoting liveability in the city, and should be considered in urban landscape design strategies.

Wind and sun are the main climatic variables that influence urban comfort in Christchurch. A sunny location tends to be desirable, while wind typically the most unpleasant factor. On sunny days, if the wind is kept out the microclimate is usually pleasant, even in the winter. This also stresses the importance of providing people with direct experience of the microclimate before making a decision of staying in or outside, as the local microclimatic conditions may vary widely from the forecast for the city as a whole.

In the case study sites the influence of microclimate on the patterns of use proved to be more significant in Urban Retreat Spaces than in Urban Social Spaces. When seeking a peaceful and quiet experience in a retreat space, users' relationship with the place and its qualities is stronger and the expectations for a "more perfect" thermal comfort are higher. When a 'social' place is chosen due to

the presence of other people or to the activities available in that place, the influence of the climate – and the extent to which it is expected to be “perfect” – is more flexible. As a respondent in Cashel Mall said: *“The perception of having people there makes me feel not as bad [about] the weather. But it depends on what you are doing, so you might want to go somewhere [else] to have more solitude”* (043). This relationship is also clear when the patterns of use of each site are analysed (Table 2).

	Types of users	Main climatic variables	Space use patterns*	
Established Urban Settings	Rotherham Street	Area used by business people before 9am. Shopping Mall opens at 9am, and then the public becomes more varied – age groups, lifestyle and activity. During weekends business meetings are substituted by families. Most of the year, apart from the hours when the sun reaches the place, the majority of users are smokers.	North-south oriented street. Lingering on the street is dependent on microclimate – sun and wind. East side is more protected and used. During mid-season the sun reaches the east side of the street from 1:30 to 3pm and during the winter for a shorter period. During the summer the sun reaches the area until 5.30pm. The café situated on the east side is busier during these hours.	Opens from 7:00am to 10pm, weekdays and 8am to 10pm weekends. Busy before 8:30, especially around the cafes. The mall opens at 9am and the area gets increasingly busy until around 1.30pm. Between 1.30 and 3.30pm it is quiet. After 3.30pm it gets busier with students, as the area counts on many schools in a short walking distance.
	Windmill Centre	Commercial area instead of a street. Does not have urban facilities and furniture. Quiet atmosphere, frequently used by business people for meetings and rarely used by teenagers. Not many children around, as in the other settings. Attracts people that look for more quiet environments.	Microclimate is an attractor. Faces north and is protected from easterly winds. In the site, the weather station showed 24°C in a day when the official MetService Website showed the maximum of 14°C for the city. During winter, the open area is intensely used in sunny days without wind. The outdoor area of the café has its use intensified from spring to autumn.	Opens from 8am to 5.30pm. Busier during lunch time because of restaurants in the area. The café is busier around 9am and 11am-1.30pm. Number of users slows down between these periods and after 3.30pm. Restaurants do not use the open areas of the commercial centre, and then the café is what gives life to the area. During weekends the centre is quieter, although the café opens on Saturdays and Sundays.
Emerging Urban Settings	Cashel Mall	Based upon commercial establishments. Has urban furniture and provides conditions for lingering. This is a social setting with varied activities, then attracting varied types of people. Teenagers, elderly couples, families, tourists, business people, families and women with young kids are frequently around. Teenagers use the space after school hours. As the Garden City, Spring time attracts many tourists. After Christmas time, although it is still used by tourists, the use of street by locals is predominant.	Cashel Mall microclimate is usually remembered as very unpleasant. This is an east-west street which has a reputation of channelling the easterly winds. Christchurch is famous for the four seasons in a day patterns of weather, and the microclimate is one of the main factors for street use as a place for lingering. During the days of field work when the weather changed the number of users decreased. From that moment on the street became empty or with people walking quickly to get to a destination.	Stores open from 10am to 5pm. Cafes are open from 9am to 5.30pm. Peak time is between 10:30 and 2pm. During spring and summer and especially after the food court was added in September 2012, numbers of people using the area increased. In some festive times, the establishments opened until 21hs. Throughout the year, the dynamics of this place changed from slow movement of local users to a very quiet winter, with people outdoors from 11am to 2pm; and later to a busy spring (especially tourists) and summer.
	South Colombo Street	Mostly businesses that stop on their way to work to drink a coffee or buy their “take away”. Although it is a nice space with seats and beautiful gardens, it is a take away place. The site is located in a street with busy traffic. Although there is a shopping mall one block away, there is not many pedestrian traffic.	Wind is the main problem of the site. The only protection is a gazebo and umbrellas, which cannot be used in windy days. In hot summer days, when the umbrellas cannot be placed, the space also becomes unpleasant. Mostly a “take away” place during winter, although a gas heater is placed outside.	Opens from 7am to 4pm from Monday to Friday, and from 8am to 2pm on Saturdays. It is closed on Sundays. It is very busy early in the morning until 9am. Then it gets busy again from 10 to 11-11:30am and from that stage on it gets considerably quieter.

* Opening hours indicated in the table refer to the hours when the supporting establishments (cafés) are open

Table 2 – Dynamics of places

In Urban Social Spaces, use patterns are more regular and predictable, as they depend on the presence of people, which relates to the rhythm of urban life. In Urban Retreat Spaces, on the other hand, the attraction and use of the open areas depends more upon the weather and microclimate, and therefore varies in use more, particularly on less pleasant days.

Different people look for different things in the city depending on their activity, lifestyle and age. Figure 7 shows in summary form the relationship between age, lifestyle and types of activity of users and the type of space. Social Spaces tend to attract younger people. Retreat Space users are more selective, by age, lifestyle and activity, and activities are more dependent on the microclimate. Some interviewees said it depends on their mood to choose where to go, because *“sometimes you want to see people and sometimes you just want peace”* (044) and this is also reflected in the findings.

Age is significant. Elderly people tend to prefer the retreat and peaceful spaces. Adults choose a setting depending on their company, activity at that day or time and even on their “mood”. Young adults tend to be less variable on their preferences, usually looking for social spaces with higher numbers of people. Lifestyle preferences also influence the choice of place. If people regard themselves as “outdoor people”, they tend to be less tolerant of busier and noisy places and prefer retreat spaces within the city. In contrast people that see themselves as “urban people” vary their choices according to company and activity at the specific moment. Another significant aspect observed during week days was the preference for one or other character of place according to the activity at the time. In work breaks business people said they prefer quieter places, while workers and people that use these spaces for leisure had mixed opinions.

	Retreat	Mixed	Social
Age	Elderly	Adults	Young adults
Lifestyle	Outdoor	Urban	
Activity	Business	Leisure and work breaks	

Figure 7 – Results summary

It is clear that the regional outdoor culture is a significant consideration in shaping these preferences and patterns. For Christchurch people, the outdoor culture is expressed as sports and outdoor recreation or gardening. Accessibility to outdoors, preference for living out of the city, the importance of a peaceful context and connection to nature, opportunity for sports practice and backyard space are also important. A large number of respondents of this investigation live outside the inner city, closer to the beaches, hills or the rural outskirts. A frequent reason for choosing that lifestyle is accessibility, as in Christchurch it is possible to easily live outside of the city and in a short period of time be in the CBD.

Most of the people interviewed in the Urban Retreat Settings or during quieter times in the Urban Social Settings expressed reasons for their choice of place that were linked to outdoor culture, and

were well aware of the influence of that culture. *“People who live in Christchurch or in the outskirts of Christchurch are more outdoor people than people that live in Auckland, who are in big rush”* (047). In contrast, respondents that prefer the urban life and the more vibrant lifestyle were more frequently encountered in the Urban Social Settings. For many respondents, a combination of a vibrant central city and peaceful surroundings for living were identified as an ideal quality of the urban environment.

Christchurch residents also have a very particular attitude regarding microclimate preferences. Many respondents of this study indicated they feel comfortable in a wide range of thermal conditions, suggesting that temperatures needed to get down to “single digits” to make them “feel cold”. Generally, local conditions do not restrict outdoor activities as it is a *“pretty mild climate”* (022). However, warmer days, over 25°C, have been widely described as ‘hot’, although most respondents believe Christchurch does not get uncomfortably hot because of its frequent wind.

The climate shapes Christchurch residents’ lives in many ways, from choices of places to linger within the city – when they tend to scan for a sunny place sheltered from the winds – to seasonal sports. The microclimate attracts or repels the users of public open spaces, as a respondent described his choice for the Windmill Centre café: *“I have been here before and it can get hot because it is quite sheltered from the winds, so I knew this little area is quite warm, and I knew I could come here and I would be alright”* (026).

Combined with the character of the place – retreat or social – the adaption to the local climate is also subject to some environmental qualities such as greenery and personal space. As an example, an indoor worker said she always goes outside for her work breaks, provided there is *“some greenery around or a tree to sit under”* (027).

Another important aspect of the dynamics of open public spaces is that of balance between the sense of personal space and the way other people use public space. It is important for respondents that the environment is interesting and vibrant, but still provides enough personal space where *‘you are not going to be the centre of attention’* (051). Some respondents also highlighted that their attitude toward climate is affected by having company or not, as the perception of having people in the place reduces the effect of unpleasant weather.

In summary, more people appear to prefer Urban Retreat Spaces in Christchurch, and it seems to be influenced by the regional identity of outdoor culture and the desire to have a peaceful setting, even when in the urban environment (see Tavares, et al., 2013). Local urban comfort is therefore affected by the regional outdoor culture. In most cases, the choice of open public space depends on good microclimate – defined by the local perspective of “good” – an adequate amount of greenery; not heavy traffic; congregation of people but no crowds; and both relaxed spaces and more vibrant ones to offer choices for different types of people.

4. Design implications

The four settings investigated in this study are different regarding types of users – based upon age, lifestyle and activity – which are attracted by different types of urban environment. Based upon this outcome some practical design strategies can be outlined:

1. In *Urban Social Spaces* the users like to “see and be seen”. People are the main attraction to the places. Although the microclimate is not the key factor, it still has to be considered, especially during summer and winter. If badly planned it can hinder the use of open spaces due to excessive wind or sun. The lesson here is to amend microclimate without impairing socialization processes, such as the general view of place activity.
2. In *Urban Retreat Spaces* users look for a peaceful and comfortable time and the place itself is the attraction. In these settings, microclimatic design is most important, even if it interferes with the street view. Being part of an urban environment, users also do not want to be isolated, but a comfortable and attractive environment is more important than crowds of people.
3. Strategies adopted both in *Urban Retreat* and *Urban Social Spaces* need to be related to the scale of intervention. In *Urban Retreat Spaces* the design needs are finely textured and focused on creating a “great” thermal environment, even if it compromises some connections to street life. In *Urban Social Spaces*, the appropriate microclimatic strategies must be weighed up with wider urban activity patterns, in a way that all possible social connections are kept alive.
4. Some common strategies used to amend microclimate were seen to be inefficient, demonstrating the need to consider microclimatic variables in the design concept phase. As an example, although umbrellas are useful regarding sun protection in seasons with higher sun, they are not the best solution for the windy summer in Christchurch, and so wind shelter is an essential part of the design.
5. When possible, green elements for shade and windbreaks should be used instead of built ones.

Overall, users’ urban comfort requirements should inform the choice of the type of streetscape design – retreat or social – in each area of the city. The main outcome of providing the right environment for the type of user, and microclimatic solutions to ameliorate undesired variables is the provision of urban comfort.

5. Conclusion

Regional identity is the collective expression of the way people live in their environment. This is closely influenced by the way people adapt to the environment and how they change it to suit their needs. We explored the variables that characterise *urban comfort* in Christchurch through the lens of the regional identity. The regional outdoor culture – especially recreational activities and gardening – are a big part of the regional identity and influence the perception and adaptation to the climate. For the respondents of this study, climate does not hinder their use of open spaces, although it influences the frequency that activities happen. In general, discomfort caused by the heat is seen as more unpleasant than that caused by cold, as it is found easier to adapt to the cold.

The research suggests that preferences for local urban culture are connected to the regional identity of outdoor culture, and are a key factor in how people adapt to urban microclimate. Christchurch people express a lot of pride in the reputation of the Garden City and their relationship to the outdoor life, expressed by sports and recreation or even gardening. This strong sense of outdoor living as a local attraction creates a particular need for a green and natural look in the urban environment. These expectations need to be considered in the rebuild of Christchurch.

Weather patterns cannot be changed, but microclimate can be modified through design (Brown, 2010, 2011; Brown & Gillespie, 1995; Sullivan, 2002). As this research shows, protection from wind and openness to sun are vital in Christchurch. Furthermore, retreat spaces are fundamental to the

city as they are seen as “ideal spaces” for work breaks in busy work days and for individual visitors. Although social areas are well used, in many cases they need to provide just “enough” vibrancy.

Christchurch has a variable climate, and for that reason improvement of the liveability in public urban spaces is highly dependent on microclimatic strategies. Liveability and vibrancy measures are traditionally based upon numbers of people and business success. This paper suggests that the more subtle but extremely important variable of urban comfort is equally important in extending the use of urban open spaces throughout the year.

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