Urban Comfort in a Future Compact City: Analysis of Open-space Qualities in the Rebuilt Christchurch Central City

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The increase in urban population has required cities to rethink their strategies for minimising greenhouse gas impacts and adapting to climate change. While urban design and planning policy have been guided by principles such as walkability (to reduce the dependence on cars) and green infrastructure (to enhance the quality of open spaces to support conservation and human values), there have been conflicting views on what spatial strategies will best prepare cities for a challenging future. Researchers supporting compact cities based upon public Transit Oriented Development have claimed that walkability, higher density and mixed-uses make cities more sustainable (Owen, 2009) and that, while green spaces in cities are necessary, they are dull in comparison with shopfronts and street vendors (Speck, 2012, p 250). Other researchers claim that green infrastructure is fundamental to improving urban sustainability and attracting public space users with improved urban comfort, consequently encouraging walkability (Pitman and Ely, 2013). Landscape architects tend to assume that 'the greener the better'; however, the efficiency of urban greenery in relation to urban comfort and urbanity depends on its density, distribution and the services provided. Green infrastructure can take many forms (from urban forests to street trees) and provide varied services (amended microclimate, aesthetics, ecology and so forth). In this paper, we evaluate the relevance of current policy in Christchurch regarding both best practice in green infrastructure and urban comfort (Tavares, 2015). We focus on the Christchurch Blueprint for rebuilding the central city, and critically examine the post-earthquake paths the city is following regarding its green and grey infrastructures and the resulting urban environment. We discuss the performance and appropriateness of the current Blueprint in post-earthquake Christchurch, particularly as it relates to the challenges that climate change is creating for cities worldwide.

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KEY WORDS

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Contemporary urban design theory highlights the need for compact, walkable and green cities (Owen, 2009; Speck, 2012). Urban green infrastructure can take many shapes and forms (from urban forests to rain gardens) and provide varied services (for example, microclimate, aesthetics, recreation, social meetings, biodiversity) (Ahern, 2007). However, buildings and grey infrastructure can crowd out urban greenery (Dimoudi and Nikolopoulou, 2003; Klemm et al, 2015; Oke, 1987; Pitman and Ely, 2013). Compact cities are prone to become urban heat islands; dense built form can also create undesired shade and increase water runoff and wind gusts. Tension can arise, therefore, between design imperatives for compact cities and those for green infrastructure. Further, a critical factor in the design of outdoor environments, in particular their microclimate, is that the urban environment succeeds as a social setting (Blotevogel et al, 2008; Gehl, 2010; Hebbert, 2005; Lees, 2010; Montgomery, 1998; Stevens, 2007; Whyte, 2001, 2009).

RESEARCH

A useful perspective on the design integration of compactness with green infrastructure is the quality of urban comfort. *Urban comfort* has been defined as a combination of human thermal comfort, urban life and place-related meanings (Tavares, 2015). It specifically includes considering collective adaptation to microclimate as an achievement (Shove, 2003), extending the conventional framework of microclimate analysis from individual judgement of thermal comfort to focus on how social and cultural values, and meanings developed in a certain time by a certain community, affect experience of urban microclimate. In addition, from this sociocultural perspective, the social meanings of public open space shape people's response to microclimate (Wilson et al, 2007). However, given urban values and meanings may vary from place to place, understanding local lifestyles and preference for urban life is therefore also crucial for planning liveable compact cities.

This paper uses *urban comfort* as an analytical lens to investigate the way compact and green imperatives are being resolved in the rebuild of central Christchurch following the 2010–2011 earthquakes. The investigation is focused on the emerging precincts, streets, courtyards and lanes of the Christchurch central business district (CBD). Before the earthquakes, Christchurch was characterised as a 'Garden City'. While few green streets or spaces existed in the old city centre, the title expressed a distinctive regional culture that valued outdoor recreation and activities, open green space and a provincial style of urban living. The earthquakes radically changed the city's character, with around 800 buildings cleared from the damaged CBD (Carlton, 2013). Over the past six years the central city rebuild has been the concern of a series of design initiatives, which must deal with many of the issues involved in resolving green and compact ideals.

As the first major step towards designing the rebuilt city centre, the Christchurch City Council led a public consultation process called 'Share an Idea' to identify the public aspirations for the city (Carlton, 2013; Christchurch City Council, 2011b). As the central city area was progressively reopened (Backhouse, 2013), 'transitional' projects were undertaken to bring the city back to life and to activate vacant land (Bennett et al, 2013). In 2013 the government announced a new proposal for the redevelopment of the CBD: the Christchurch Blueprint, developed by the Canterbury Earthquake Recovery Authority (CERA) and Warren and Mahoney (Cairns, 2012; CERA, 2015b; Warren and Mahoney, 2016).

In view of the costs of rebuilding the city – initially estimated at around NZ$30 billion (Swaffield, 2013), a figure that is now almost certainly too conservative – a critical part of CERA's Blueprint was to attract private investment. One of its strategies was to establish a 'green frame' to limit the area of the CBD, hold up land prices and support existing land owners. This in turn reinforced the emergence of a compact city form in the CBD. Higher-standard building codes were also introduced and, to ensure redevelopment was commercially viable, CERA's Blueprint was shaped around defined precincts, involving both public and private investment (Suckling, 2016). The precincts, which include retail, justice, arts, health and residential, were centred on projects intended to 'anchor' development around them to attract people into the central city. Among these anchor projects are the proposed Convention Centre, the Metro Sports Facility, the Canterbury Earthquake Memorial and around 900 new residential dwellings.

Individual developers and architects also sought to differentiate their projects in the urban property market by incorporating a variety of design features, some focusing on green building, others on particular styles of earthquake resilience, distinctive mixes of uses, and spatial qualities such as courtyards and laneways.

Public aspirations, governmental objectives and commercial considerations for the rebuild therefore all seek both 'compact' and 'green' ideals, albeit to different degrees. We offer a preliminary analysis of how the potential tensions between these ideals are expressed in the emerging new urban fabric of the city centre, by asking, 'What is the quality of urban comfort in the new central Christchurch?' The analysis focuses on the micro scale, at three points in time, considering the character of streets, lanes and courtyards before the earthquakes, in the transitional phase and in the Blueprint. In the next section, we briefly explain the conceptual basis for the analysis. We then describe the qualitative and map-based methodology, before presenting our analyses of urban comfort in the changing city and discussing the findings.

Urban comfort in a green yet compact future

As the global population becomes urbanised and cities expand and intensify, the need for cities to become more sustainable is growing. Urban models can take many different forms, and the efficiency and effectiveness of various solutions have been much debated in urban design. While some emphasise the potential of compact cities (Hollis, 2009; Jacobs, 1992; Owen, 2009; Speck, 2012), others tend to assume 'the greener the better' (Pitman and Ely, 2013). In this study, the relationship between these two principles is examined through the lens of urban comfort (figure 1).

Compact cities is a term encompassing a range of urban design and planning ideals that all share a focus on the synergy between three principles: medium to higher density land use, typically expressed as a minimum of 45 units or 100 people per hectare (Carmona et al, 2010, p 226); mixed-uses along streets and in buildings to provide economic and social diversity and vitality (Jacobs, 1992); and accessibility – understood as having reliable and dense networks of public facilities and transport that are accessible by walking and cycling, in order to reduce dependence on private cars (Owen, 2009; Speck, 2012).

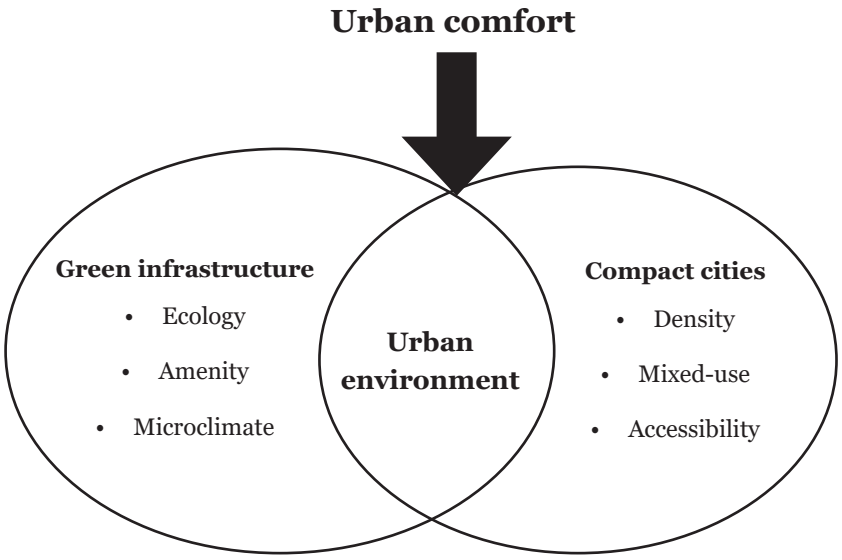

Figure 1: The urban comfort analytical lens

Green infrastructure is also fundamental to urban sustainability as it provides many ecological services and benefits (Benedict and McMahon, 2006). It can increase the amenity values of streets and public space, encouraging walkability (Pitman and Ely, 2013); it can support a healthy urban culture by enabling recreation, providing opportunity for social interactions and enhanced environmental awareness and education (Ahern, 2007); and it is vital in creating an urban microclimate that supports these human activities (Brown, 2010; Brown et al, 2015; Dimoudi and Nikolopoulou, 2003; Erell et al, 2011). Urban green infrastructure can be expressed at a range of scales – from subregional and urban-wide networks to individual street and building design. In this study, while acknowledging the importance of ecological values and networks, we primarily focus on the human qualities needed to make attractive urban spaces, and consider green infrastructure at the human scale of streets, lanes and courtyards rather than larger-scale networks.

The concept of *urban comfort* integrates consideration of the two realms of urban microclimate and social life in cities at this human scale. Urban microclimate research and design have largely focused on creating the best possible microclimate in streets and public spaces, based on quantitative modelling and assessments of human thermal comfort as experienced at the individual level, which can be controlled and manipulated through a variety of urban microclimate design strategies and interventions (Chatzipoulka et al, 2015; Lenzholzer, 2008; Lenzholzer and van der Wulp, 2010; Nikolopoulou and Steemers, 2003). It is clear, however, that in some climates – including the cool, temperate climate of Christchurch – for much of the year it is not possible to design urban outdoor spaces in a way that keeps them within human thermal comfort thresholds (see Olgyay, 1963) at all times of the day. Previous research using an urban comfort perspective in Christchurch has shown that in these situations the social quality of space becomes an important factor in the design of liveable streets, courtyards and lanes, and that the social function and character of urban spaces generate different adaptive practices in response to microclimate conditions (Tavares, 2015). In urban *retreat* spaces, the microclimate is one of the most important variables influencing urban comfort, and the environmental attributes of a particular place, including factors such as thermal comfort and green amenity, provide the reason for being there. In urban *social* spaces, on the other hand, vibrancy and activity dynamics are more important than the microclimate. The reasons people choose to be in these spaces include street activity and the presence of other people. Choice between social and retreat spaces is influenced by factors such as age and preferred urban lifestyle. We use these insights into urban comfort to focus on the changing nature of small open spaces within the Christchurch central city as it is rebuilt.

Methodology

Research approach

This study adopts a qualitative methodology to evaluate urban comfort in the emerging new urban spaces in the Christchurch CBD based on assessment of the qualities of microclimate (resulting both from street and building design, and from greenery), quality and amount of greenery, social activity, and social accessibility (see table 1). We used an interpretive approach, for several reasons.

First, our aim is exploratory, to stimulate debate rather than suggest answers, as questions of urban microclimate and green infrastructure provision are not yet central in decision making but are emerging as potential concerns. Second, the city fabric is itself in the process of rapid change, and systematic surveys and measurements would rapidly become outdated. Our approach is therefore intended to be rapid and diagnostic. Third, the qualities we are investigating are spatially and temporally complex, and we have therefore used nominal categories and maps and diagrams to quickly capture the essence of this situation. This is a limitation of the study and we see a more systematic and detailed investigation as necessary once this initial wave of change has passed.

Research design

Case studies are recognised as being well suited to investigating complex and dynamic situations involving multiple dimensions (Yin, 2013), and they should be selected to gain maximum theoretical insight (Flyvbjerg, 2006). The Christchurch rebuild provides opportunity to contrast the pre-earthquake conditions with the planned Blueprint and emerging character of the post-earthquake city. The pre- and post-earthquake situations offer two extremes: on the one hand, a historic city fabric that emerged through 150 years of individual plot-based development, with modest and traditional land-use planning controls (Wilson, 2005); and on the other hand, a comprehensive, precinct-based, top-down government-led rebuild, that in principle could use the best urban design expertise available. Between the two, the transitional city provides an example of bottom-up innovation.

The main green infrastructure element of central Christchurch is the Avon River corridor (Craig et al, 1993). However, despite Christchurch being known as the Garden City, the pre-earthquake central area was dominated by grey infrastructure of streets and laneways, rather than green spaces. We have focused our analysis on the streets, lanes and small green spaces such as courtyards in this central area bounded to the north and west by the Avon, to the south by Lichfield Street, and to the east by Madras Street, as they provide a human-scale indicator of how green might be integrated with grey in the compact city of the future.

Methods

We investigated the status of urban comfort in the Christchurch CBD based on the analysis of conditions at three distinct times: pre-earthquake (2007), immediately post-earthquake temporary sites (2011–2012) and the Blueprint and emerging urban environment (2012–2016). The urban open space conditions were initially investigated through figure-ground maps and photography. The map analysis is inspired by Giambattista Nolli (Tice et al, 2005) because, while figure-ground has a biophysical focus on building footprints, Nolli's approach adds to these building footprints the social life of urban space. Hence we were focused not only on urban form but also on the biophysical character (in regard to microclimate and greenery) and social character (in regard to activity and accessibility) of these open spaces – what we have conceptualised as urban comfort (table 1). A key innovation of Nolli's work was its distinction between public and private space, which he considered both within buildings and outdoors. Although we did not consider interior space such as covered malls, our interest was stimulated by the social character of the emerging courtyards. We therefore analysed the accessibility of spaces, and distinguished between those with 24-hour access

(such as public lanes, pedestrian streets and potential movement shortcuts) and open areas within precincts that may have more restricted access (such as private courtyards and lanes). The analysis of social character, including private–public relationships, helped inform our assessment of the potential of the emerging spaces to contribute to urbanity and to urban life in a democratic and open way.

In the case of the pre-earthquake CBD, photos of streets and open space were sourced from Google Street View (Google, 2016), and the character of the transitional city and post-earthquake CBD spaces was recorded through on-site photography. Figure-ground maps were used as a basis to visualise the morphology of the city pre- and post-earthquakes, and the Blueprint itself was analysed based on the plan developed by CERA and Warren and Mahoney (Warren and Mahoney, 2016). In one specific case a simple computer simulation generated on SketchUp shows the shading in the resulting street after the rebuild. We also used documentary sources to assess what people put forward as desirable through public consultations such as 'Share an Idea' (Carlton, 2013; Christchurch City Council, 2011a, 2011b) and as published in the document *Ideas to Reality* (CERA, 2015b). This was an attempt to identify these desired elements and spaces in the emerging city.

Previous research has shown that regional identity in Christchurch is closely connected to peaceful spaces, greenery and social activity in public spaces (Bell and Matthewman, 2004; Craig et al, 1993; Tavares, 2015). These preferences influence Cantabrians' expectations of the city and their response to urban microclimates, making locals scan and search for places where they can be in a peaceful and pleasant microclimate while in contact with nature. These characteristics of local preferences and behaviours constitute the local concept of urban comfort, and have been investigated through four features of the spaces: microclimate, greenery, social activity and social accessibility. The urban comfort in relation to each feature of the spaces was defined as high, moderate or low regarding the new CBD's qualities. Table 1 sets out the criteria used to define each category.

The emerging city was investigated through maps, drawings and photographs to explore the resulting microclimate, presence of greenery, potential for social activity and accessibility. Results of this analysis are discussed next.

Table 1: Matrix of nominal categories based on features of spaces (microclimate, greenery, social activity and social accessibility)

			Urban comfort		
			High ■	**Moderate** ■	**Low** ■
Feature	**Biophysical character**	**Microclimate**	Protection from winds and sufficient insolation	Some protection from winds and insolation throughout the year, but microclimate is not a main feature of the site	No protection from winds and/or insufficient insolation
		Greenery	Trees for shade and planters throughout the space	Some greenery exists in the space	No greenery exists in the space
	Social character	**Social activity**	Active frontages, pedestrians	Active frontages may be present and pedestrians use the space, but the space is not used as a congregation area	No active frontages and a very quiet space
		Social accessibility	Free access to all people at all times	Does not offer free access to all people at all times	Limited access

Results

In this section, we present the results of our analyses and evaluations for the three time periods.

Pre-earthquakes

The pre-earthquake maps showed a range of types and characters of public spaces. For the purpose of this study, we have classified them as follows.

- **Predominantly pedestrian streets and lanes** are areas planned and designed for congregating people. They are focused on social activity and accessibility (figures 2a, 2b and 2c).
- **Active green spaces** have some greenery and bring people together, generating social activity (figures 2d, 2f and 2g).
- **Functional lanes** offer social accessibility and pedestrian connections, but tend to be unattractive, hard landscapes with little social activity.
- **Arcades** offer social accessibility during business hours, but are privately managed. This is a predominant typology in the emerging central city (see the results on CERA's Blueprint and figure 2e).
- **Car parks** are hard landscapes dedicated to space for parking cars, with no social function.

Figure 2 shows the map and location of a range of central city settings and some examples extracted from the 2007 Google Street View.

In terms of microclimate, the predominant east–west streets in the central city received limited sun, and the significant number of very tall buildings generated strong down-winds and gusts at street level. Cashel Mall was an exception in that it received some sun due to height restrictions on the north side, but it was open to strong easterly winds. New Regent Street was sheltered from the east, but it was also shaded by a large building to the north-west (figure 2a). Three streets had a few large trees, either on public land – Cashel Street between Oxford Terrace and Colombo Street, and Gloucester Street close to Oxford Terrace – or on building setbacks – Manchester Street. Overall, however, pre-earthquake Christchurch CBD streets and lanes did not offer any significant level of thermal comfort or green amenity, and previous research suggests that public perceptions of important streets in the central city were largely negative (Tavares, 2015, pp 137–138).

The main exception was the west-facing portion of Oxford Terrace, where shelter from the east and sun exposure to the west led to development of 'The Strip' (figure 2d), a line of cafés and restaurants with outdoor areas overlooking the green Avon corridor. Two relatively new developments – Sol Square (figure 2f) and Poplar Lane (figure 2g) – showed the possible directions for the future. Developed around existing service lanes, both became prime hospitality sites: Sol Square with several bars, restaurants and shops, and Poplar Lane centred on a craft beer pub. Notably, all three of these developments were social spaces and all three featured nightlife. While Sol Square and Poplar Lane were more intimate spaces, in Oxford Terrace the social character was combined with a favourable microclimate and outlook over the Avon, and was busy from lunchtime onwards. It is no coincidence that this favourable location is the focus of investment in the rebuild.

Figure 2: Pre-earthquake public spaces (Base map: CERA, 2010, used under CC BY 4.0 NZ): (a) New Regent Street (Photo: Google Maps Street View, 2007d); (b) Chancery Lane (Photo: Google Maps Street View, 2007b); (c) Liverpool Street (Photo: Google Maps Street View, 2007c); (d) Oxford Terrace – 'The Strip' (Photo: Michelle Sullivan); (e) Cathedral Junction and Press Lane (Photo: Google Maps Street View, 2007a); (f) Poplar Lane (Photo: Martin Bennett and Google Maps Street View, 2007e); (g) Sol Square (Photo: Google Maps Street View, 2007f, and Neil Macbeth).

Post-earthquake temporary sites

The large range of transitional projects in Christchurch has been widely reported and investigated. Our analysis of this 'in-between time' (Bowring and Swaffield, 2013) is focused on experiments that explored the potential for change and improvement. After damaged buildings were cleared, the central area lost virtually all of its spatial definition and became essentially open brownfield with remnant large buildings (figure 3 highlights the change). However, the clearance also created opportunity, from which a range of 'transitional' projects and programmes was developed, with different aims, such as 'Gap Filler' (Gap Filler,

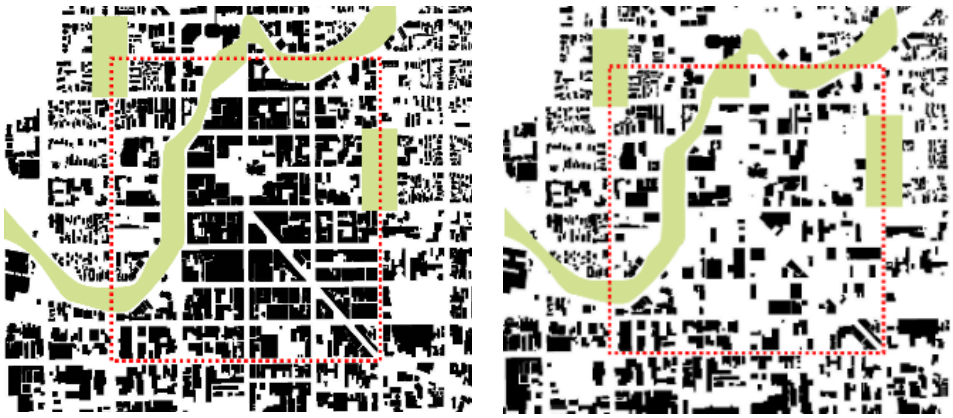

Figure 3: Pre-earthquake (2010) and post-earthquake (2015) figure-ground maps. (Base maps: CERA, 2010, 2015a, used under CC BY 4.0 NZ.)

2016) and 'Greening the Rubble' (Greening the Rubble, 2016). A notable central city project with implications for urban comfort in the future compact city was the Re:START Mall.

Re:START was a temporary retail mall created with converted shipping containers (figure 4) on vacant land at the west end of Cashel Mall. Four of its features that were important in the context of urban comfort were: first, the limited height of structures (maximum two containers – approximately 6 metres), which allowed sun into the pedestrian areas; second, the configuration of small intimate spaces that provided wind shelter; third, the creation of attractive planting areas; and fourth, the inclusion of a variety of social opportunities and activities, including outdoor cafés and food stalls (see more details in table 2). Interviews with users identified high levels of urban comfort (Tavares, 2015), and a pedestrian survey revealed that Re:START Mall had more foot traffic in 2013 than the old City Mall had in 2008, before the earthquakes (Fairfax, 2013).

CERA's Blueprint and the emerging city

CERA's Blueprint conveys two strong visions relevant to this discussion. The first is that large parts of the future central city will be 'green' (conceived in general terms), particularly when compared with the previous urban configuration. The Blueprint proposes retaining and redesigning the Avon River corridor; creating

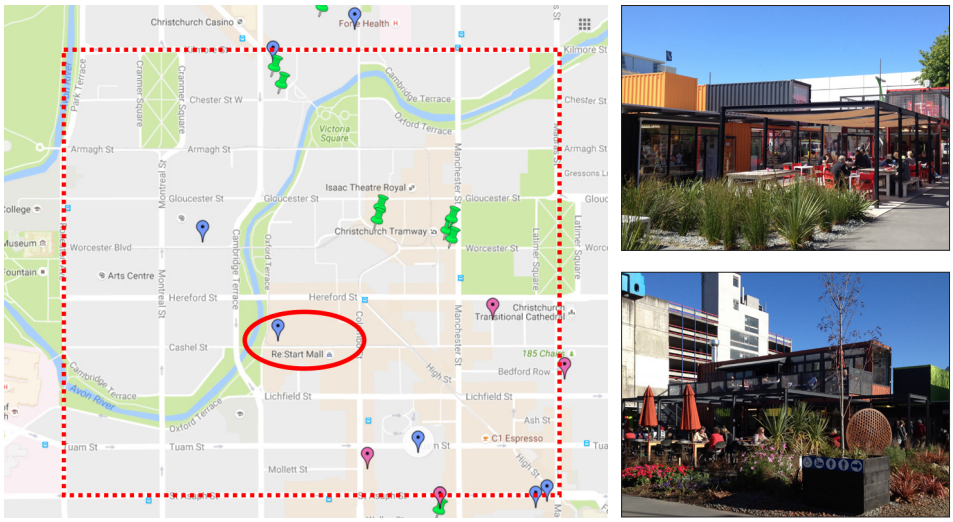

Figure 4: Re:START Mall in its temporary site at Cashel Mall. (Base map: Gap Filler, 2016; Photos: Silvia Tavares.)

eastern and southern ‘green frames’, which combine with Te Papa Ōtākaro/Avon River Precinct to delimit the new CBD; a new north–south boulevard (Manchester Street); and extensive green streets, squares, lanes and courtyards (figure 5).

The Blueprint’s second key vision is of a ‘precinct’ approach to the redevelopment, designating different areas of the CBD for different types of activity – for example the Retail Precinct, the Health Precinct, the Performing Arts Precinct and the Justice and Emergency Services Precinct. Across the plan too is a series of ‘anchor’ projects designed to encourage further development in the central city. Implementation of this approach is distributed between Crown agencies and the city council, working in partnership with large developers. The precincts most advanced in their development are the Retail (figure 6) and Justice and Emergency Services (figure 8) precincts. We include illustrations from them, together with a recently completed major private development (the Awly building – figure 9) that is across the Avon to the north-west of the central city and illustrates the style of development that predominates across the rebuild.

The Retail Precinct is centred between Colombo Street and the Avon, and includes the site of the former Re:START Mall. Several large developments to the north of Cashel Street are well advanced, and plans include courtyards and lanes (figure 6).

Figure 7 shows the potential for using basic modelling tools to create appropriate windbreaks and buildings that respond to sun geometry. Local climate is influenced strongly by rapidly changing winds. Cool north-easterly winds are common; hot, dry north-westerlies are possible at any time and can raise temperatures by 10–15°C within an hour, generating summer maximums of more than 30°C. Cold south-westerlies are also present all year, but more frequent in winter, bringing rain as well as reducing temperatures and thermal comfort (McGann, 1983). In this climatic context, the potential of east–west streets is stronger than it is for north–south streets because, for most of the day, one façade could be in the sun. In north–south streets the wind is less of a problem, but sun during the day in less consistent.

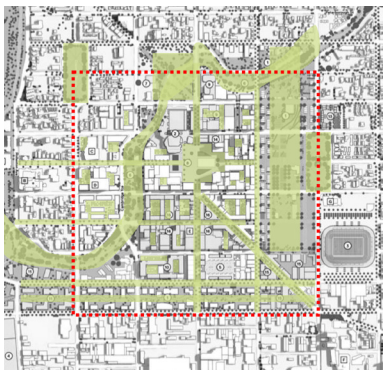

Figure 5: Blueprint and its proposed green spaces. (Base map: CERA, 2012, used under CC BY 3.0 NZ.)

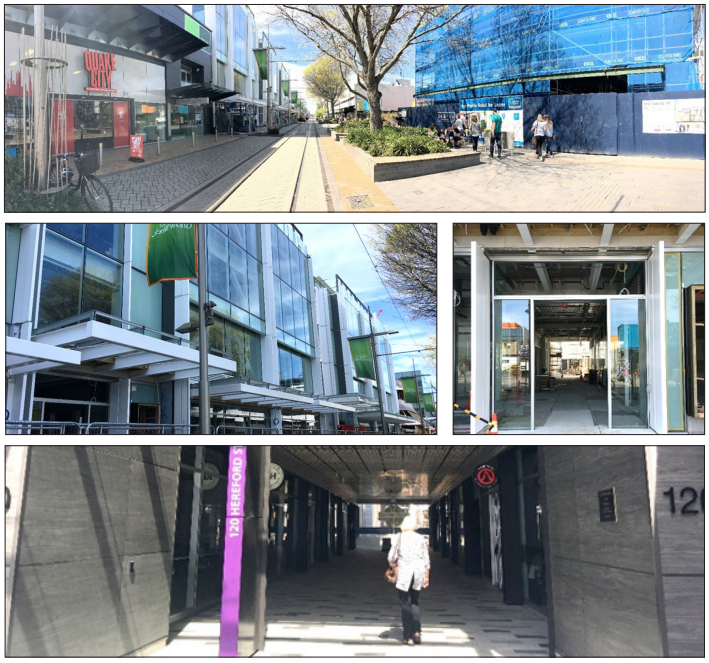

Figure 6: Retail Precinct. (Photos: Silvia Tavares; Base map: CERA, 2012, used under CC BY 3.0 NZ.)

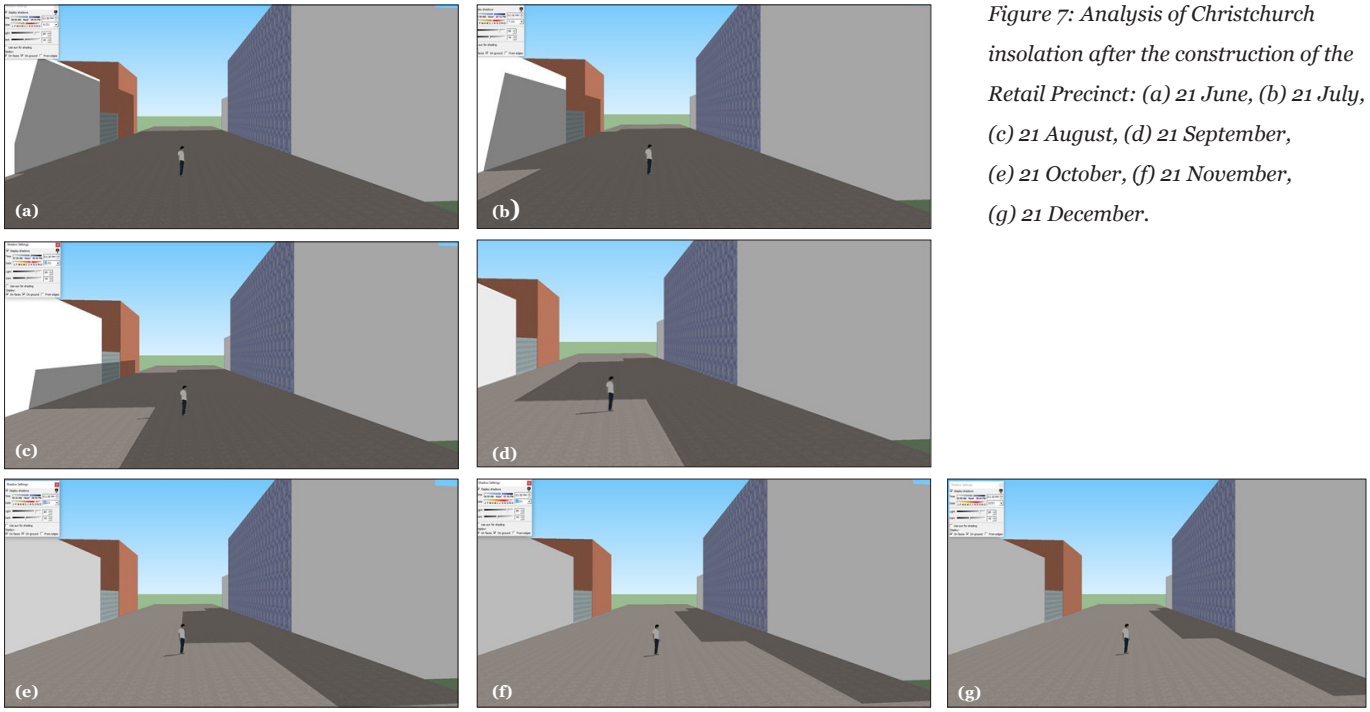

Figure 7: Analysis of Christchurch insolation after the construction of the Retail Precinct: (a) 21 June, (b) 21 July, (c) 21 August, (d) 21 September, (e) 21 October, (f) 21 November, (g) 21 December.

As a comparison, figure 4 shows the same street during the transitional phase. Not only did Re:START receive greater foot traffic than pre-earthquake Cashel Street (Fairfax, 2013), it may also prove to have outperformed the street post-earthquakes.

The Justice and Emergency Services Precinct (figure 8) is located a block further south, running east–west along Lichfield Street. It also has lanes and courtyards.

The Awly building (figure 9) is a private development located west of Durham Street, opposite the historic Provincial Buildings. It includes a courtyard as well.

Figure 8: Justice and Emergency Services Precinct. (Photos: Silvia Tavares; Base map: CERA, 2012, used under CC BY 3.0 NZ.)

Summary of results

Table 2 summarises the results from the analysis of the central city pre-earthquakes and the two times post-earthquakes – the initial temporary sites and the longer-term Blueprint. It classifies the qualities of the spaces into high, moderate and low, according to their microclimate, greenery and social activity and social accessibility, as we explained in the research design section.

Table 2: Summary of results from the pre-earthquake, temporary sites and Blueprint analysis

Sites		Urban comfort				
		Microclimate	**Greenery**	**Social activity**	**Social accessibility**	**Notes**
Pre-earthquakes	New Regent Street	🟨	🟥	🟩	🟩	N-S street, no green features, active frontages, people on the street
	Chancery Lane	N/A	🟥	🟩	🟨	N-S lane, no green features, some shops, but in an indoor area
	Liverpool Street	🟨	🟥	🟨	🟩	N-S street, no green features, no active frontages, public free access but few pedestrians
	Oxford Terrace	🟩	🟩	🟩	🟩	West-facing strip, protected from easterly winds, facing the Avon River
	Cathedral Junction / Press Lane	N/A	🟥	🟩	🟨	Covered pathways/lanes, no green features, some shops, but in an indoor area
	Poplar Lane	🟨	🟨	🟩	🟩	Courtyard protected from the wind, but little sun access apart from midday. Few green features and largely used by bars and restaurants generating the social character
	Sol Square	🟨	🟥	🟩	🟩	Courtyard protected from wind, but little sun access apart from midday. No green features and largely used by bars and restaurants generating the social character
Transitional city	Cashel Street	🟨	🟩	🟨	🟩	E-W street unprotected from easterly winds but with reasonable sun access due to the low height of containers
	Re:START courtyards	🟩	🟩	🟩	🟩	Sunny and wind-sheltered courtyards with some green features and predominantly social character due to shops, food containers and bars
Blueprint, post-earthquakes	New Retail Precinct	🟩	🟨	🟩	🟨	Part of the new Retail Precinct is the previous Oxford Terrace. It also has a courtyard that is protected from winds and will be sunny up to mid-season (little sun during the winter), but it belongs to a private development and will be closed or privately secured after hours. Active frontages with retail establishments on the ground floor
	Justice and Emergency Services Precinct	🟨	🟨	🟥	🟥	The building has a courtyard that is protected from winds and will be sunny up to mid-season (little sun during the winter), but it belongs to a private development and will be closed or privately secured after hours. Ground frontages are offices and therefore not active. Public areas are not fully visible from streets
	Awly building	🟨	🟨	🟨	🟨	The building has a courtyard that is protected from winds and will be sunny up to mid-season (little sun during the winter), but it belongs to a private development and will be closed or privately secured after hours. Active frontages with retail establishments on the ground floor

Key: 🟩 = high; 🟨 = moderate; 🟥 = low; E-W = east–west; N-S = north–south

Discussion

This study was aimed at investigating the trends in urban comfort, such as preferences for social activity and for peaceful retreat spaces with a comfortable microclimate and contact with nature in the city. The comparison between the pre-earthquake central city and the proposed Blueprint maps shows an apparently dramatic increase in green areas (see figures 5 and 10). However, the post-earthquake 'transitional city' sites are greener than the permanent Blueprint solutions, and the Blueprint has decreased the public accessibility of green and pleasant microclimates by concentrating on private or semi-private courtyards.

Greening of the public realm is another aspect that appears to be aspirational rather than specific. Many 'green' zones are intended, in practice, to be largely built-up. The amount of greenery appears to be linked to funding sources for upgrades. Projects funded by central government seem to be generously treed. Major effort has been focused on reconfiguring the Avon corridor, including the Margaret Mahy Playground. Notably, however, proposals to dramatically remodel Victoria Square were toned down in the face of public protest. In contrast, the street projects that the Christchurch City Council is funding appear less well-endowed with greenery due to capital constraints. Private investment is focused internally within projects, as street frontage setbacks are no longer required, and the size of new courtyards means most greening is on a small scale, not providing the desired ecological or cultural services Ahern (2007) suggests. Few new buildings have adopted soft-green strategies such as green roofs, but most use green building technologies particularly for energy efficiency.

In terms of social character, a key principle for compact cities is mixed-use – ideally within each building. Many European cities used as models for the compact city ideal have retail and hospitality on the ground floor, offices above and living in the upper part of buildings (see Carmona et al, 2010). In other situations, a variety of functions is gathered around small squares or streets. The

Figure 9: Awly building. (Photos: Silvia Tavares; Base map: CERA, 2012, used under CC BY 3.0 NZ.)

precinct model adopted in Christchurch is in many ways a return to the functional differentiation that characterised planning in the 1960s and 1970s (Cocozza, 2007; El-Dahdah, 2005). An interesting comparison can be made between Poplar Lane as it was developing pre-earthquakes and the Retail Precinct. The pre-earthquake, 100-metre stretch of Poplar Lane from Tuam Street to Lichfield Street included bars and restaurants, specialist retail, art workshops, offices, residential accommodation and other hospitality functions, offering the diversity expected from cities. In contrast, the new precinct has a corporate 'quasi-mall' character that, as Carmona (2010, p 139) points out, generates 'a loss of authenticity and growth of "placelessness"'. The Retail Precinct is also shaping up to feature a more limited range of functions – essentially branded retail, restaurants and bars, and professional offices. The street frontages will be largely offices and retail that do not use the street space; therefore streets will be predominantly used for movement, not contributing to social spaces.

CERA (2015c) made the emerging courtyards a requirement to ensure the precincts incorporate outdoor space (Harvie, 2016). The way CERA describes these courtyards is aligned with what we have previously identified as retreat spaces:

> Courtyards are small open spaces typically located towards the interior of blocks and enclosed by buildings. Their small scale and inward location create sheltered and comfortable spaces which provide places of respite in the midst of the activity of the city. Their discreet locations make them places to be discovered; access is often via laneways or through existing buildings. In some instances, courtyards are privately managed and maintained but provide public access for most of the day. (CERA, 2015c, p 68)

However, the final sentence signals a significant shift in the character of these spaces – in terms of their ownership and control. Although we have not mapped all public open spaces, from the spaces identified in figure 2, only the ones highlighted in the 2010 map (figure 10a) were private. In the Blueprint (figure 10b), however, the spaces highlighted in red are private courtyards, while the orange areas are spaces that appear open but may not feel so as these new developments and precincts are adopting a variety of control and security strategies. Loukaitou-Sideris and Banerjee (1998) have two categories for space

(a) **(b)**

Figure 10: The shift, with the main green spaces and streets (green), predicted green spaces that may be semi-public (orange) and private courtyards (red). (Base maps: (a) CERA, 2010; and (b) CERA, 2012, used under CC BY 4.0 NZ and CC BY 3.0 NZ.)

control: hard and soft controls. Hard control is active control such as private security and closed-circuit television systems; soft control is passive control, such as solutions that discourage undesirable activities. Following all these changes, the future built form will occupy a smaller net footprint, and significant areas of internal courtyards will be created (see figure 10b).

Hard control has been widely adopted in the new courtyards. Figure 9 shows the relationship between the Awly building and the street, clearly demonstrating the control strategies adopted for security based on gates. Soft control has been suggested for some areas such as the East Frame (Fletcher Living, 2016; RNZ Live News, 2015) and the Justice and Emergency Services Precinct, which give 'hints' that the space is privately managed. Hence, although there are more courtyards, they are essentially *differential collective spaces,* which Scheerlinck and Schoonjans (2016, p 50) define as follows*:*

> The combination of these filter tactics defines the depth sequence: some are physical – like the steps, fence, doors and trees – while others need to be tested by their transparency or visual exposure. One can easily look over or through the fence and visually control the next territory, while in other cases this visual control is avoided explicitly. In this instance, the boundaries with territorial meaning are the fence with the gates and the internal separating door. These are the filter tactics that actually reduce the collective use of space. Each time someone crosses a territorial border, it means a reduction in accessibility, a selection of admitted or wanted users.

Drawing these threads together, the analysis highlights several important changes in the future character of open spaces in the central city of Christchurch. Green infrastructure is concentrated in the legacy area of the Avon corridor, and in selected other government-led projects. The main east–west and north–south public streets are likely to continue to be heavily shaded by buildings and open to the wind, with few setbacks along the building frontages. The microclimate of the public realm appears to have received little attention, and outdoor activity is likely to continue to be focused on areas that have 'legacy' qualities, such as the west-facing Oxford Terrace, as well as on the new internal courtyards within the private developments. The precinct model of development means that the functional diversity that was emerging in parts of pre-earthquake Christchurch is unlikely to be replicated in the central city; frontages are likely to be mono-functional and activity episodic. The ownership patterns of the new precincts also mean that many attractive courtyard spaces will be largely privately owned and controlled. Hence, while they will outwardly offer both retreat and social opportunities, these will be mediated through the economic functions of the surrounding buildings – high-end retail, hospitality, professional offices. A summary evaluation of the likely outcomes is *urban comfort lite*.

Conclusion

In this paper we have analysed and compared the status of urban comfort in pre-earthquake and post-earthquake central Christchurch, based on features that constitute the local concept of urban comfort – access to social activity and peaceful retreat spaces, the possibility of being in a comfortable microclimate and having contact with nature in the city (Tavares, 2015). The intent has been

to assess the rebuild of Christchurch as an experiment in integrating green infrastructure and compact city imperatives in urban design. We found that pre-earthquake Christchurch did not have many small public open spaces within the central area that offered any level of urban comfort. However, in the decade before the earthquakes a few examples emerged focused on mixed-use courtyards and lanes, such as Poplar Lane. The 2010–2011 earthquakes effectively swept the board clean, leaving the post-earthquake central city largely empty and full of opportunities. Transitional projects such as Re:START offered the potential to experiment with new solutions and highlighted the value of an active, sheltered and sunny public realm. The Blueprint appeared to offer larger areas of 'green' space and a more compact CBD, drawing on both established principles and public preferences.

However, with the adoption of the precinct model and its configuration of new development into large blocks with single ownership and a limited range of functions, neither established theories (Jacobs, 1992; Speck, 2012) nor lessons from the temporary sites appear to be coming forward strongly in the design and configuration of the new open spaces. While the number of courtyard spaces will increase, most of these are not public and, as Loukaitou-Sideris and Banerjee (1998) point out, the hard control of spaces makes them less accessible. Furthermore, the conventional outer edges of the new precincts do not appear to enhance the urban comfort of the adjoining public streets.

As Leo Hollis (2009, p 6) puts it, 'the city is not a rational, ordered place but a complex space that has more in common with natural organisms such as beehives or ant colonies'. A few modest changes to the strategy could have generated more satisfactory outcomes in terms of urban comfort, and hence better resolved green and compact urban principles. Specifically:

- microclimate design of the public realm should have been fundamental from the start (Brown, 2010);
- solar access to the street could have been improved with lower buildings or larger setbacks, particularly in the north side of east–west streets, and with greater use of building configurations to create wind shelter for the public realm as well as the private (Erell et al, 2011);
- a higher degree of mixed-use would create more active street frontages and urban diversity (Jacobs, 1992; Owen, 2009; Speck, 2012);
- courtyards and cross-block lanes could have been created as public rights of way and ensured a more inclusive and active public realm across the whole central city (Loukaitou-Sideris and Banerjee, 1998); and
- courtyards could be planned to better respond to both ecological purposes and on-foot mobility (Ahern, 2007).

Overall, despite the investment in iconic projects around the edge of the central city, the quality of the public realm in the central city itself appears to be compromised in favour of private development. Commercial developers are creating high-quality microclimates within their holdings, disconnected from the public spaces. The resulting streetscapes risk becoming a residual realm, corridors linking commercial buildings rather than focal points of activity (Jacobs,

1992). The compact city and green city ideals both argue that public life cannot be an afterthought, and public streets and open space should not be a means to service development but rather a focus of public life that defines the character of the wider urban setting. Regrettably, opportunities for achieving this vision in the Christchurch central city are slipping away, as both green and compact liveable city principles are subsumed by the hard logic of commercial imperatives.

Finally, we must note that this study was aimed at exploring the changes in the nature of the public spaces in the Christchurch central city during a period of rapid change. A limitation is the nature of the qualitative data analysed, which does not allow for an in-depth investigation isolating the features (or variables) such as sun, shading, wind, landscaping and connectivity. This more detailed analysis would be a useful future study, which could focus first on the changes in specific sites, and then project results for the general nature of the emerging city and its public spaces.

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