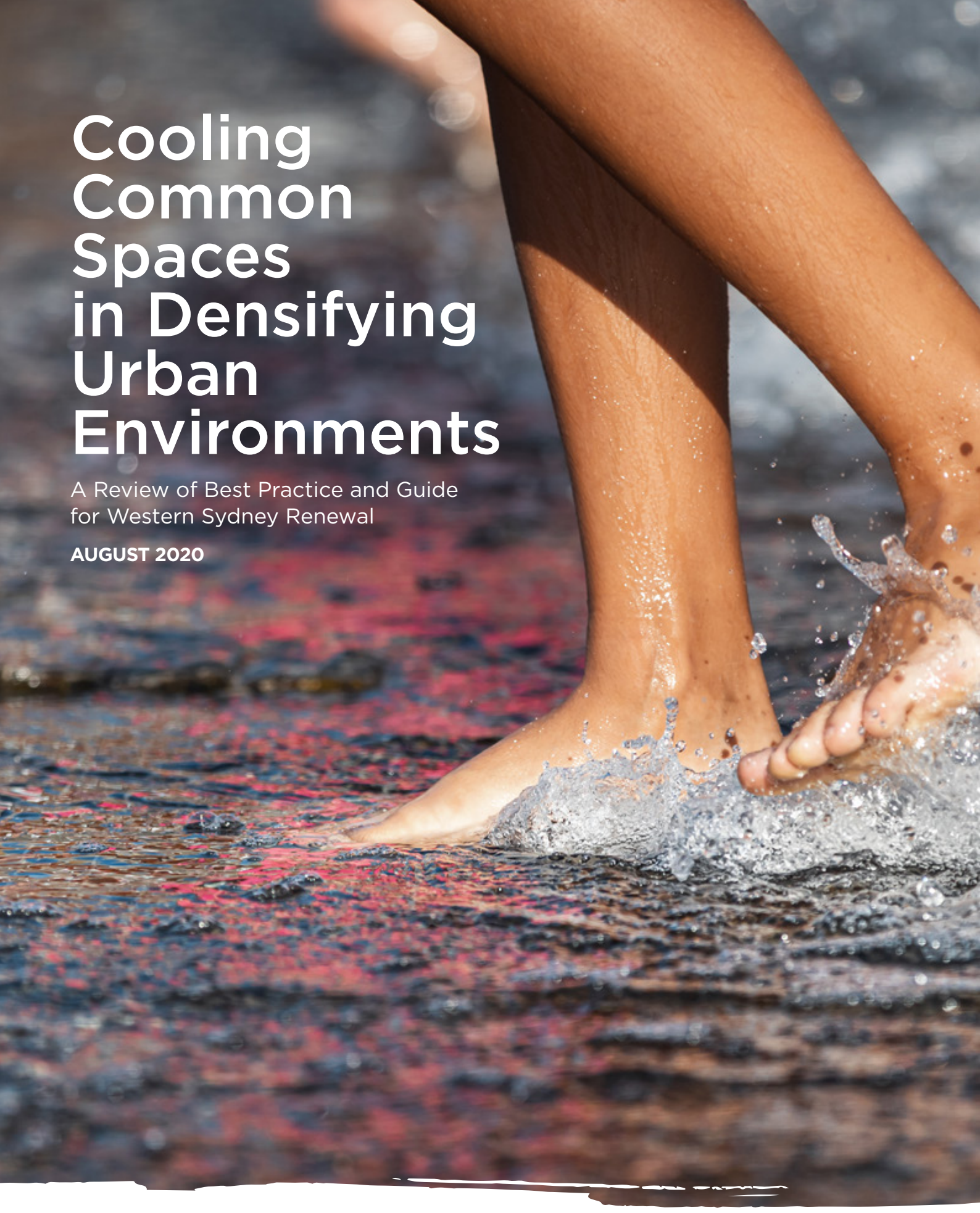

Cooling Common Spaces in Densifying Urban Environments

A Review of Best Practice and Guide for Western Sydney Renewal

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LANDCOM

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Preface

This independent research was funded through the Landcom Roundtable. The Roundtable was established to drive innovative approaches to urban research where government, academia and industry work in genuine collaboration. This research was funded to find innovative ways to improve liveability under extreme urban heat.

Landcom notes the findings as a contribution to the ongoing exploration of ways to leverage patterns in natural, built and social environments to enhance liveability in hot cities, but does not endorse specific conclusions.

Contents

Executive Summary

In Australia, we are looking toward 50 degree summer days in our capital cities by mid-century (Lewis et al., 2017; IPCC, 2018). Increasing urban heat is a particular concern for Western Sydney, as the locus of population growth and economic activity moves west, creating a demand for new housing, infrastructure and services.

This situation requires an intergenerational mindset and new tools and resources for thinking through the compounding social and environmental implications of increasing heat, population and building density in Australia's third largest economy.

Landcom is engaged in developing neighbourhood precincts in Sydney that create more affordable and sustainable communities, including in Western Sydney, where the urban heat island effect is adversely affecting liveability, and where the influence of the built environment on community health and well-being is particularly magnified. Funded by the Landcom Roundtable and aligned with Landcom's Sustainable Places Strategy, this research aims to support Landcom and its stakeholders in making planning and design decisions that recognise this influence.

Planning and developing healthy and inclusive neighbourhoods to accommodate rapid population growth is critically important. However, new environmental and social conditions demand innovation

in planning and design processes, and new sensitivities in relation to what people want and need from their neighbourhoods in the much warmer Sydney of the future. While climate-controlled environments are an important part of the picture, the challenge is to design shared urban environments that facilitate comfortable mobility and sociality. From our perspective, these qualities are what make living in a city worthwhile.

Learning from international examples of what has worked well in practice, we identify key design patterns that improve how communities can live in a hot city. Our context is the commons – those spaces, practices, resources and knowledges shared by a community, and that a community depends on for a sense of cohesiveness and well-being. It is on the quality of the commons that perceptions of liveability across environmental wellness, social connectedness, accessibility and safety, often stand or fall.

Designing with an intergenerational mindset requires those with a shared stake in maintaining healthy and inclusive neighbourhoods to have a sense of extended responsibility for design decisions, which continue to resonate past the point of occupancy. Our research identifies patterns at the planning, delivery and post-occupancy (or lived in) stages of a development, which outline material and social strategies that are required for optimum liveability. These patterns expose and support aspects of community life that are compromised by increasing urban heat and the retreat into private air conditioned environments, which is rapidly becoming a design and social norm.

Patterns for cool commons are not discreet, but are a result of interactions between the natural and built environment and rhythms of social life, that recur over time. A wide, shaded walk-way furnished with seating and water stations and connecting residential environments to public transport networks or shops, affords walkability and sociality for diverse members of the community. However, since a pattern such as ‘Shaded Pedestrian Linkage’ is distributed across space and time, as it is activated by pedestrians, it is not ‘owned’ or cared for by a single entity. We claim the commons should be the focus of strategies for cooling the city but, as the historic commons economist Elinor Ostrom describes, they require protection and maintenance on an intergenerational basis.

This research takes up the challenge of promoting a new approach to thinking about urban liveability in warming cities, with two principles at its core. First, asking how open space can be planned for ‘coolth’ defined as the experience of feeling manageably comfortable in a hot city; and second, how coolth can be connected with sociality.

This research has two outputs. The first, this Report, contains background material and an Appendix of the presentations and workshops held over the course of this project, which made up our methodology. This Report underpins and informs the second and key output, the Cooling the Commons Pattern Deck. The deck is conceived as a prototype decision-making resource for planners, developers, community liaison officers, council workers and the communities they serve. It is envisaged that the pattern deck will be ‘resonance tested’ with stakeholder groups facilitated by the research team, with feedback from these groups incorporated into the patterns on an ongoing basis (outside the scope of the current research). While currently in a prototype form, we argue that the pattern deck represents the sorts of strategies and resources now needed to ensure liveability in new and renewing neighbourhoods in Greater Western Sydney, into the future.

1. Introduction

Increasing Temperatures and Climate Change Impacts: Contextual Trends

According to the Australian Bureau of Meteorology (BoM) and CSIRO, the average air temperature globally has warmed over 1° Celsius on the authority of records dating back to 1850, and each of the four decades preceding 2020 has shown a consistent increase in temperature (Fig. 1).

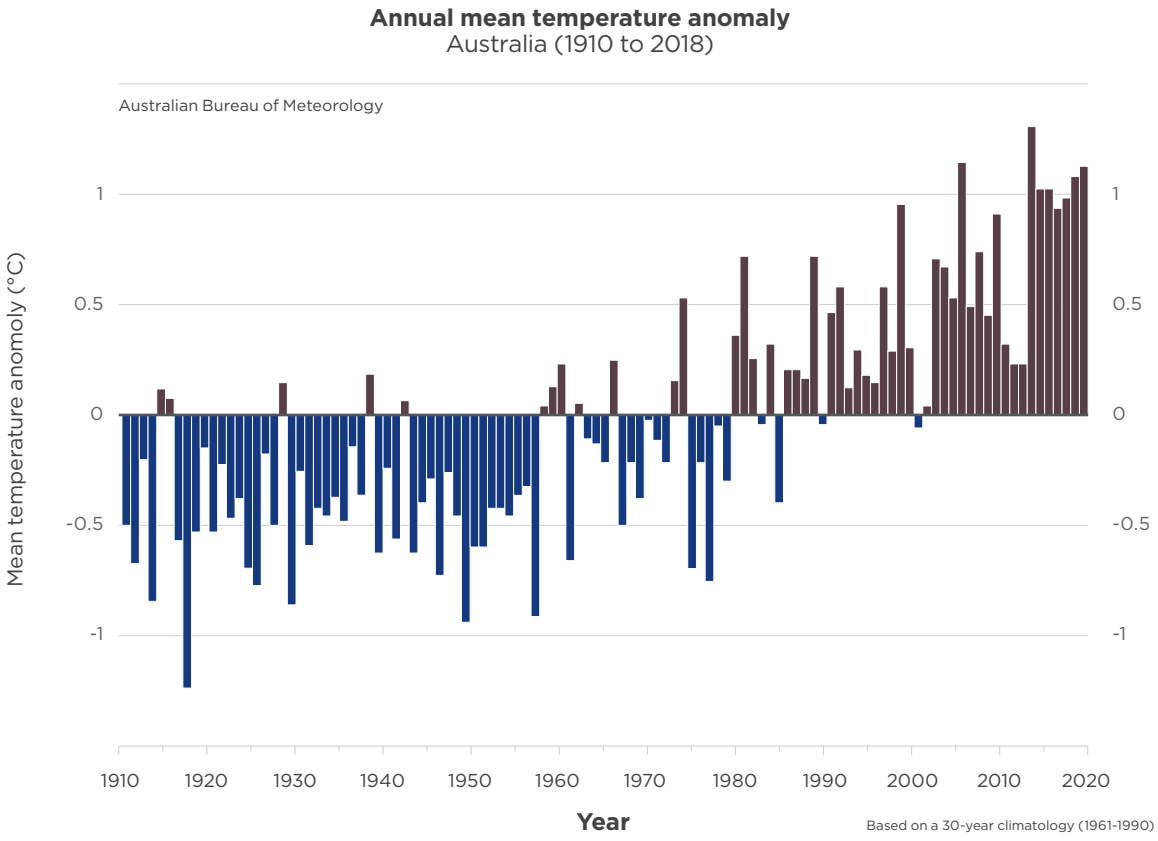

Figure 1: Annual mean temperature anomalies. Source: BoM http://www.bom.gov.au/climate/change/#tabs=Tracker&tracker=timeseries

There has been a corresponding rise in global sea levels, which show a similar acceleration to the increase in air temperature. 2018 was Australia's third warmest year on record, with the annual national mean temperature 1.14°Celsius above average, and the months of January, February, March, April, July, October and November consistently above average across the country (BoM, 2019). With a rise in temperatures, there has also been a corresponding increase in the frequency of drought, extreme weather events and bushfires. The whole of NSW was declared in drought during 2018, and water restrictions in Sydney, which have not been seen since the Millennium drought in the 2000s, were announced in mid-2019. This marks the current drought as historically significant, alongside recorded droughts dating back to the Federation drought at the turn of last century.

There has also been a rise in the number of extreme heat days. Western Sydney already experiences temperatures 6-10° higher over the summer months than do areas of the city situated on the coast. According to a study into extreme heat and its impact on Western Sydney, the number of days in Western Sydney with temperatures spiking over 35°C, are also increasing (Ogge et al., 2018; Greater Sydney Commission [GSC], 2019). The Ogge et al. study projects that by 2090, the number of days could exceed 52 per year, with some parts of Western Sydney, such as Richmond experiencing extreme heat days for up to 67 days a year (Fig. 2). It is predicted that both Sydney and Melbourne will need to prepare for summer days of 50 degrees Celsius well before mid-century under current policy settings (Lewis, 2017; Intergovernmental Panel on Climate Change [IPCC], 2018).

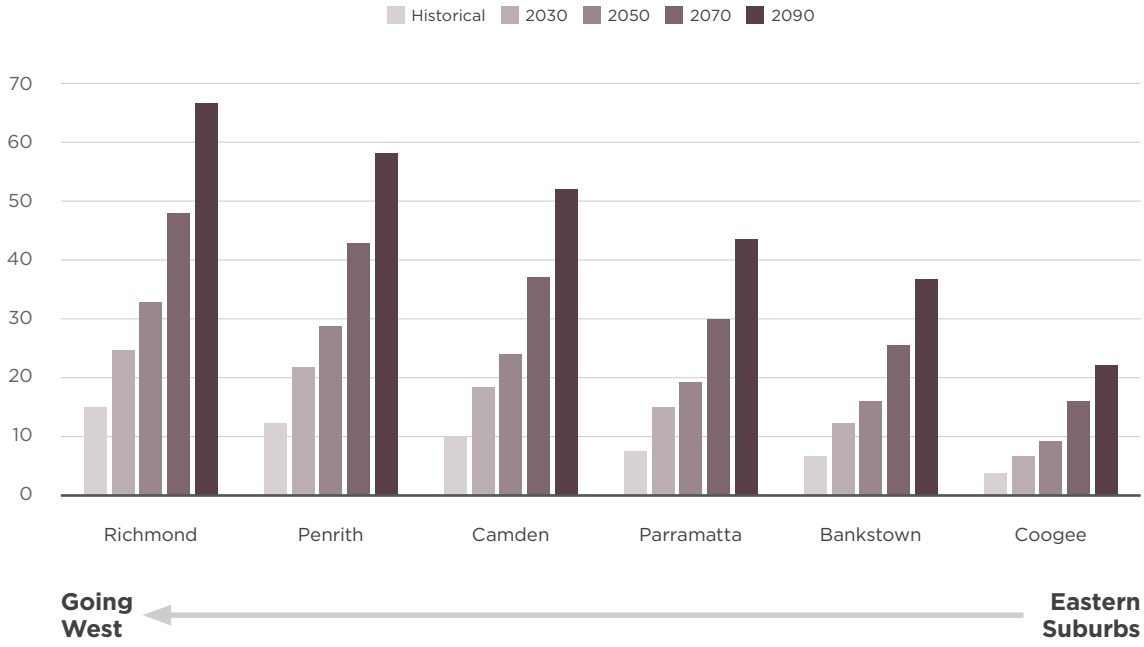

Figure 2: Days over 35 degrees in selected locations (current policy scenario) Source: Ogge et al., 2018

In Australia, heatwaves have been identified as causing far more deaths than all other natural hazards combined (Coates et al., 2014; Tofa & Gissing, 2017), with the elderly, the very young and disadvantaged people most severely affected GSC, 2018; Xu et al., 2012). The NSW Department of Environment and Heritage predicts that new urban developments, which are replacing forested areas and grasslands in the north-west and south-west of Sydney, are likely to experience a significant increase in the number of extreme heat days by 2070 (NSW-DoE&H, 2015). New and planned infrastructure including the Western Sydney Airport through the Western Sydney Aerotropolis Project (NSW-DoE&P, 2018a), and the Sydney Metro and Sydney Light Rail Projects, are set to accelerate population growth in the region in the coming decades. Consonant with these developments, the Greater Sydney Region Plan envisions distributed urban growth over three cities – Sydney, Parramatta and Penrith (NSW-DoE&P, 2018b). Existing local climate patterns and topography dictate that these growing precincts have higher cooling requirements than other parts of Sydney (Sydney Water, 2017). Together, these trends indicate a pressing need to respond to a future scenario of increased heat related stress and negative impacts on every aspect of biological life, including humans.

Focusing on Heat Related Impacts

Extreme heat has been found to have a direct impact on human health and mortality (Fernandez Milan & Creutzig, 2015; Hatvani-Kovacs et al., 2016; Hatvani-Kovacs & Boland, 2015). Heatwaves lead to increased sickness and mortality among flora and fauna, and simultaneously cause outbreaks of pests and invasive species (Hoffmann et al., 2019). In Australia, an analysis of a heatwave in 2011 indicated large scale impacts that included tree die-off, coral bleaching, mass casualties among terrestrial bird species, a decline in breeding success in marine penguins and outbreaks of wood-boring insects across 300,000 square kilometres on both land and ocean (Ruthrof et al., 2018).

The increase in heat related events has serious consequences for people living in Australia, which will be exacerbated by population growth. The projections for population growth in Australia are from 24 million at present to 40 million by the year 2050. By 2036, the population of NSW will reach approximately 10 million (NSW-DoE&P, 2018c) and by 2056, up to 12 million. This increase in population implies greater housing demands, with the number of dwelling units exceeding 4.2 million by 2036. Large scale infrastructure investment and planning, such as the Future Transport Strategy 2056 planned by the NSW government, includes: completion of the Western Harbour Tunnel and Beaches Link, Stage 1 of the F6 extension and completion of the north-south rail link in Western Sydney among other interventions. Similarly, the planned Aerotropolis in Western Sydney means significant growth in population and employment and subsequent urbanisation within the region. Each of these interventions planned over the next few decades have direct consequences on housing and infrastructure demands, related to accelerated growth in population.

The median age of people in New South Wales in 2016 was 38 years. Of this, the two groups most vulnerable to heat related impacts, namely children (aged 0–14 years) made up 18.5% of the population, while people aged 65 years and over made up 16.3% of the population. Western Sydney's population is already growing faster than the national average, and this rate is expected to increase dramatically over the next 20 years. As one example, the Camden Local Government Area is expected to experience a 178% increase in population by 2036. Over the same period,

a 206% proportional increase is expected in those aged over 85 years, and a 93% increase in those aged 65–84 (GSC, 2018).

Across different urban contexts, risks identified with respect to urban heat events include: decrease in indoor comfort, increase in energy demands for cooling, changing patterns of biological and social life, decrease in water quality across different sources, damage to infrastructure due to overheating and to utilities as a result of evaporation and deformation of materials as well as UV radiation damage (Klok & Kluck, 2018). The formation of ground level ozone as a result of rising heat and air pollutants, as well as particulate matter, has a range of severe health impacts (Dean & Green, 2018), with air quality-related mortality in Sydney projected to rise as a result of climate change (Physick et al., 2014). Other changes in biological and social patterns include an increase in sedentary behaviour, social isolation and a dependence on artificially cooled indoor environments for humans (Mellick Lopes et al., 2019). For both flora and fauna, growth and reproductive cycles are impacted as well as hydration and nutritional levels.

Klok and Kluck (2018) identify five impact clusters – health, open space, liveability, water and infrastructure. Their study highlights the need to look at the impacts of extreme heat events at the local level and clarify the 'owners' of the heat risks or quite simply, the people who are at the greatest risk.

Both the impact of global warming and the urban heat island effect contribute to the development of urban heatwaves. O'Malley et al. (2014) argue that densely spaced buildings with high thermal masses and the replacement of vegetation with heat-absorbent surfaces create urban canyons that trap radiating heat, which when combined with anthropogenic heat emissions and the usage of low-albedo building materials, all contribute to the urban heat island effect. Unstructured or haphazard urban morphology planning is common in areas of rapid urbanisation (Lee et al., 2015). Building types that block and reduce the circulation of wind and outdoor ventilation further exacerbate these issues.

According to Hatvani-Kovacs and Boland (2015), residents in highly urbanised areas suffer as a direct consequence of increased temperatures, a situation that is exacerbated by the additional impact of the urban heat island effect and a lack of adaptative capacity within cities. Given the high degree of urbanisation in Australia and rapid urban development, this impact is critical. While the health impact of urban heat has been documented extensively, there is comparatively less emphasis on research related to the non-fatal risks of urban heat, including segregation, sedentariness, reduced public space use, increased dependence on air-conditioning and artificial cooling mechanisms. All of these consequences do, however, impact wellbeing and a perception of liveability – including noticeable differences in people's daily health due to changes in behaviour (Thomas et al., 2014).

The increased demand for air-conditioning and climate-controlled indoor environments contribute to urban heat island effects through a dependency on fossil fuels and energy consumption, and the release of heated air into the immediate urban environment. Thermal standardisation of indoor environments can reduce human capacities to tolerate increased temperatures (Mellick Lopes et al., 2019). Air-conditioning has for these reasons been called a 'maladaptive' response to extreme conditions, masking our localised, experiential and culturally diverse relationships with the weather (Strengers & Maller, 2017). Newer housing typologies emerging in Australia are designed for indoor air-conditioning as the primary means of delivering thermal comfort,

further compounding the problem of urban heat and compromising human capacities to adapt to changing climatic conditions.

Landcom undertakes a Healthy & Inclusive Places Survey each year to better understand how residents perceive quality of life in their neighbourhoods. Access to transport and walkability, social connectedness, physical and mental health and safety are some of the key indicators for measuring quality of life and personal wellbeing (Landcom, 2019). Each of these key elements of quality of life is likely to be influenced by rising temperatures.

As Figure 3 illustrates, urban heat impacts on the everyday experience of cities, affecting the viability of public infrastructures, depleting health and placing pressure on health infrastructures, affecting access to and use of open space, making cities less comfortable to inhabit and impacting water quality and demand. These multiple effects of urban heat on daily life are likely to grow as heat increases in the future. Responding to these challenges will require adaptations to all aspects of urban design and living.

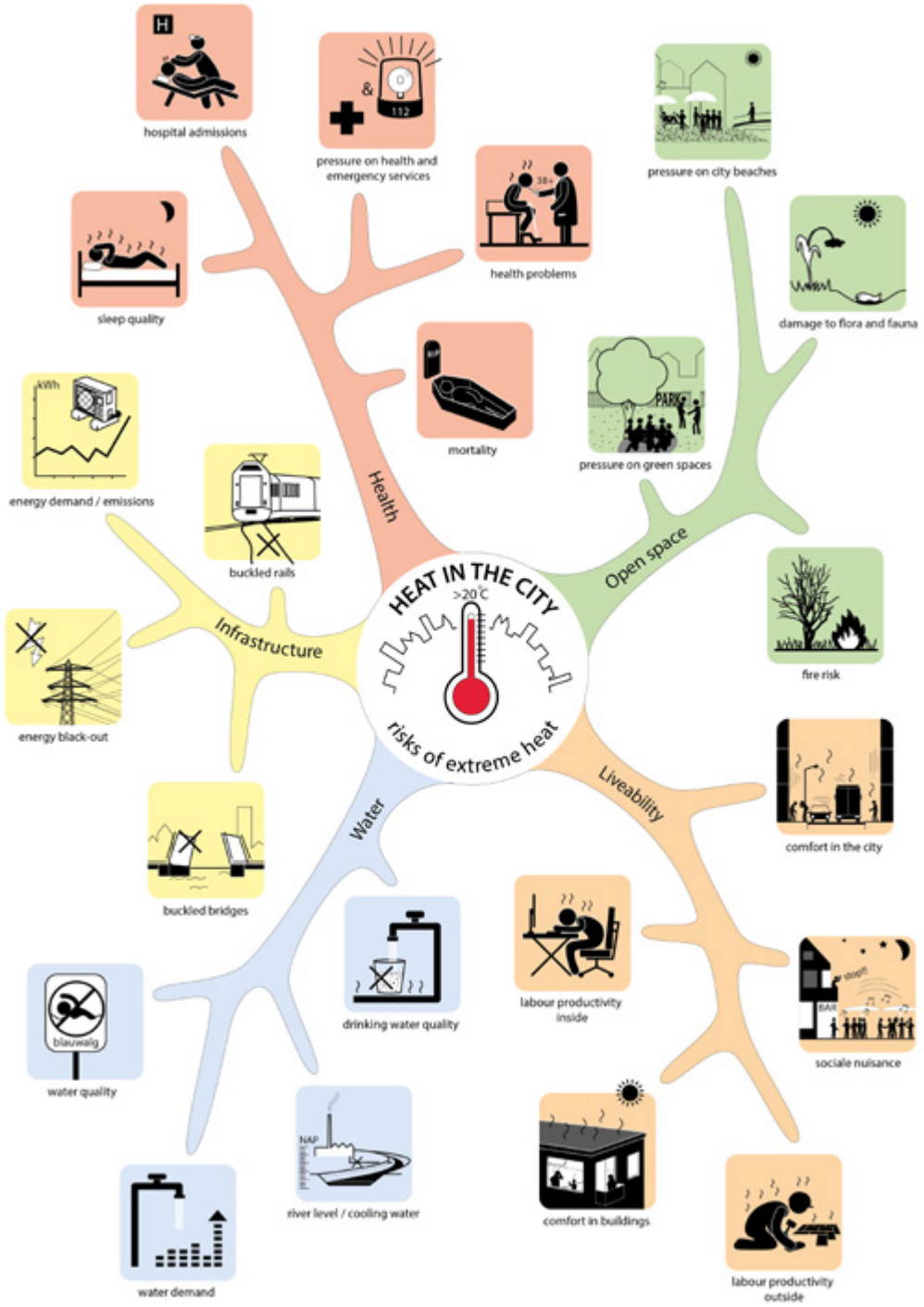

Figure 3: Risks of extreme heat. Source: Klok and Kluck 2018.
See also: https://www.hittebestendigestad.nl/mindmap/ which is used by municipalities in the Netherlands to understand local heat impacts

The present report addresses urban liveability and shared common space. It takes up the challenge of promoting a new approach to thinking about urban design in warming cities, with two principles at its core. First, asking how open space can be planned for 'coolth'[1]; and second, how coolth can be connected with sociality. We argue that technology driven solutions are insufficient to drive change. Instead there is need for a combination of material, social and institutional strategies. We propose 'cool commons' as a new design approach and framework for evaluating and defending the availability of coolth in warming cities.

Cool Commons

Studies indicate (Hatvani-Kovacs & Boland, 2015) that while retrofitting existing urban environments and adaptation strategies have great potential in reducing heat related stress, these remain under-exploited due to lack of awareness, entrenched and path-dependent planning practices (Matthews et al., 2015), and assumptions about community preferences.

The Western Sydney District Plan (GSC, 2018) outlines a 20 year plan to manage economic, social and environmental aspects of an urbanising district, describing the extension of urban tree canopies and retention of water within the landscape as its key interventions to mitigate the urban heat island effect. Though critically important, these interventions are not enough to counteract the long-reaching impact of rising temperatures in rapidly transforming urban environments. Equally insufficient are technology-driven solutions, which tend to 'stand alone' in discourse about sustainable cities. Our position is that a combination of material, social and institutional strategies are required to support adaptation, including community-led adaptive practices (Mellick Lopes et al., 2019). Rather than pursuing thermal comfort and building performance, we agree with Strengers and Maller (2011) who argue it might be more helpful to aim for tolerable and manageable conditions, which are more in line with the goals of climate adaptation.

For cities to be vibrant, pedestrian friendly, accessible and safe, cooling strategies that are dependent on large scale governance and policy interventions, such as increasing green space in Sydney (Bun et al., 2018), need to be complemented with multiple community based approaches that direct the equitable use, access, care and management of coolth in the city.

'Cool commons' represent this complementary approach, viewing the city not as a collection of private spaces, but as an environment for convivial social life. The design challenge is to integrate opportunities for respite or coolth across the city, for example, in public spaces that are accessible to all. Commons are defined as 'places, resources, practices and knowledges shared (and cared for) by a community' (Gibson-Graham et al., 2013). The term 'commons' is frequently associated with distant places and times — the fields and forests of feudal Europe prior to their enclosure. While Elinor Ostrom's (2015) work demonstrates the ability of communities to manage common-pool depletable resources for hundreds of years, contemporary commons theorists point out that many material and immaterial resources are effectively accessed, used and maintained by communities every day, including knowledge, services and software. Indeed, in the case of open source software, the value of the digital commons increases as the community uses them both by continually improving the base code or by extending applications (Kostakis, et al., 2015).

1 We favour the term 'coolth' as it draws attention to the experience of feeling cool or at least manageably comfortable in a heated atmosphere, which is subject to a diversity of experiences and changing conditions.

A cool commons, as we develop the concept here, is something that permits access to and use of the city's shared outdoor spaces in tolerable and manageable comfort during the warmer months. The qualities of coolth are not single properties, but a result of patterns in the urban environment's natural, built, and social features. For precisely this reason, responsibility for maintaining coolth would also need to be widely distributed—involving developers and local government, but also the community of residents that live with and use it on an intergenerational basis. This form of sociable coolth demands a mobilisation of collective social practice and governance.

The commons-logic emphasises community wide access, use, care and benefit, and challenges those responsible for planning and designing urban places to put this at the centre of their practices. Rather than assuming new urban design and technologies will drive urban coolth, the commons framework (Gibson-Graham et al., 2013) provides a series of principles against which spaces and practices can be evaluated.

To be a commons:

- access to property must be shared and wide
- use of property must be negotiated by a community (understood as all who use it, which will vary according to different properties)
- benefits from property must be distributed to the community and possibly beyond
- care for property must be performed by community members
- responsibility for property must be assumed by community members (Gibson-Graham et al., 2013, p.132).

To be a cool commons:

- access to places, resources, practices and knowledges that enable coolth must be shared and wide (accessible to all)
- use of places, resources, practices and knowledges that enable coolth must be negotiated by a community (including internal negotiations and those with asset owners and/or managers)
- benefits from places, resources, practices and knowledges that enable coolth must be distributed to the community and possibly beyond
- care for places, resources, practices and knowledges that enable coolth must be performed by community members and other relevant stakeholders
- responsibility for places, resources, practices and knowledges that enable coolth must be assumed by community members and other relevant stakeholders.

The cool commons framework suggests a way of relating to and evaluating the coolth provided through urban spaces. It also provides a framework that allows us to see vulnerabilities. For example, asking questions about use and benefit highlights how some private spaces, like shopping centres or restaurants, can exclude people needing respite from the heat (for example, by requiring that they buy something); while questions about care and responsibility highlight how parks and other public amenities can be neglected or altered in ways that diminish their capacity to cool. Cool commons challenge planners, developers, council workers and others responsible for shaping and maintaining the city, to ask: who has access to coolth in a city, and is that coolth equitably distributed?

Patterns offer a coherent design language to help expose and tangibly describe cool commons. They help us to identify how cool commons are diminished by incremental changes in the built environment, and also how they might be reinforced throughout the development pathway, and beyond.

Patterns for Cooling the Commons

Together with the Pattern Deck, this Report aims to provide planners, developers, community liaison officers, council workers and the communities they serve, with a resource for planning, designing and maintaining cool commons. Our use of the pattern format is informed by the influential work of architect, mathematician and design theorist Christopher Alexander (1977). Alexander et al. (1977, p. xiii), write:

> **When you build a thing you cannot merely build that thing in isolation, but must also repair the world around it, and within it, so that the larger world at that one place becomes more coherent, and more whole; and the thing which you make takes its place in the web of nature, as you make.**

In 1977 Alexander, along with his students, devised A Pattern Language – an extremely influential volume that describes enduring patterns that recur in architecture and urban design and which together compose a coherent and socially connected city (Alexander et al., 1977). Each of the 253 patterns are arranged in a network that is described as a language of patterns, and is based on hierarchical relationships between individual patterns. Itself influenced by early developments in computing, A Pattern Language has gone on to have a far-reaching influence beyond architecture and urban design, for example, in information systems and project management (Wolfgang, 1994) and more recently in design for social innovation and sustainability (Manzini & Jégou, 2003; Jégou & Manzini, 2008).

As the above quote suggests, each pattern in A Pattern Language is relationally connected and nested into other patterns, from the macro level of the urban plan, to the meso level of the built form and the micro level of the personal domain, such as represented by a pathway, outdoor room or balcony. Each pattern frames a connection between designed form and social practices (recurrent social performances) showing how these are always articulated in living examples, a process that inherently trusts situated, place-based knowledge (Helfrich & Bollier, 2019). In relation to Alexander's pattern 'six-foot balcony' for example, Nikos Salingaros (2000, p.158) writes: Many social patterns of family life, such as sitting around a table; eating a meal; children playing with toys on the floor; growing plants in large pots; outdoor cooking on a charcoal grill; and so on, can occur on a balcony only if it is at least 6ft (2m) deep. When a balcony is made too narrow so as to follow some arbitrary design canon or simply to be cheap (which satisfies internally consistent criteria), it fails to connect to the above social patterns.

Balconies are complex amenities. From a design perspective, they provide private open space for residents, act as an 'acoustic protection device' and support improved natural and/or cross ventilation (Omrani et al. 2017). The innovation in Alexander's work is this insight into the connection between built form and social practices, which lends each of the patterns in the language both coherence and a loose, adaptable and transferable quality. The process of naming is also a way of defending certain patterns, for it becomes possible to discern how these are challenged or compromised by a changing city. For example, a balcony not wide enough to be used in these ways, may force balcony-type activities inside, and reshape these activities to better fit indoor environments.

Te Brömmelstroet et al. (2018, p.4), write: 'The perceived quality of the deeper balconies was that of a connective tissue linking life inside the building to life outside, a quality entirely lacking from the shallow 'glued planks' of narrow balconies.'

The move indoors has been identified as a significant urban trend, with estimates that we are now spending 90% of our time indoors, or in cars, and in enclosed environments which are often considered suboptimal for human health and wellbeing (Wakefield-Rann & Fam, 2018). Salingaros (2000) also observes a significant set of formal and spatial patterns related to automobile networks, which have suppressed and in some cases erased pedestrian patterns. In our previous study on how people are coping with the heat in Penrith, we found pedestrian accessibility was challenged by a number of disincentives, including a lack of public transport and numerous car parks and roads breaking up walkways and amplifying summer heat in a 'car centric' and shadeless city (Mellick Lopes et al., 2016). We found that the removal of what we term 'infrastructure of care' (Mellick Lopes et al., 2019) – essential infrastructures and public furnishings that enable access to public water, shade, shelter and amenities – was chipping away at civic life in some of Sydney's hottest environments. Such infrastructures of care make mobility possible for people with diverse needs and abilities, including children on bikes, parents with prams, the elderly and physically challenged. One of our patterns, the Shaded Pedestrian Linkage, emphasises the importance of active transport linkages in local environments during the master planning stage, and throughout a staged development. This priority is gaining traction as 'walkable neighbourhoods' are increasingly understood as a fundamental feature of a liveable and resilient city (Resilient Sydney,

2018; GSC, 2019). However, while the concept of walkability has entered common parlance, strategic action plans and design visions, it is, in many parts of Western Sydney at least, an 'aspirational commons' rather than a reality (Mellick Lopes et al., 2016).

The values of the past and the present may create conflicts in path-dependent processes and need to be negotiated on an ongoing basis. This is particularly the case in areas of renewal, where legacies of past design decision-making continue to impinge on and constrain the possibilities of the present.

In our work we use the pattern language in two ways. First, to identify existing patterns that directly or indirectly diminish cool commons; and second, to identify existing and new patterns that are consistent with the ideal of cool commons.

In recognition of the complexity of change, our patterns are divided into 'ideal' patterns, which might be associated with a Greenfield site and 'remedial' patterns, which might support the remediation of an existing site. This research has shown, however, that even a Greenfield site is already 'pre-settled' in some respects, mapped out in advance in strategic or structure plans, therefore strongly influencing an overall master plan outcome. Thus, in addition to spatial design considerations, we have also tried to address some of the process-based challenges and opportunities in planning for cool commons.

In developing our patterns, we learn from Alexander that they are not prescriptions or design principles, but rather configurations based on living examples that might emerge organically or be intentionally designed. In the latter case, this is intentional design that is sensitised to those living configurations and the relation between material and social elements that compose them – that is, a commons.

A brief example will serve to illustrate. Bede Spillane Reserve in Croydon, NSW was an occasional transit zone in a barely used pocket park adjacent to a club carpark and sports field. In social planning parlance, this was a 'space' not a 'place'. The local council championed its transformation into what is now a popular off-leash dog park; fencing it off, providing a water station, appropriate signage and a web presence. Now a place of convivial social life, particularly in the morning and early evening, the community enjoy, take responsibility for, share in the benefits and contribute to the care of the park, furnishing it with dog bowls, play equipment, and activating it further with events via a public social media group. This is a place that is completely contrary to the 'if it's not bolted down, it will be stolen' sensibility that pervades many public urban environments. Based on prior living examples, the pattern 'dog park' is known for these commoning benefits and is now a designated feature of the design of many urban parks.

Before

After

Figure 4: Bede Spillane Reserve 'before' and 'after' commoning
Photos: from the project image bank, collected by the research team during site visits.

While urban heat can make the most apparently benign settings increasingly hostile (and we identify some of these settings below in section 4. Old Patterns), we claim that built environments and material infrastructures can, with appropriate forethought and planning, be far better allies in assisting people to common places, resources, practices and knowledges in low, medium or high density scenarios.

Our prototype pattern deck represents patterns across the planning, delivery and post-occupancy stages of a development.

Some of these are currently feasible and implementable. Others would require innovations in process, from master planning through to community engagement and ongoing governance. What we present is a prototype that sets a design agenda for commons-based cooling in new and renewing neighbourhood precincts in Inner and Western Sydney.

2. Approach and Methodology

Learning from international examples of what has worked well in practice, the aim of this research was to identify key design patterns that support communities to live well in a hot city.

Our context is the commons – those spaces, practices, resources and knowledges shared by a community, and that a community depends on for a sense of cohesiveness and well-being. If commons are understood as resources shared amongst a community, commoning refers to the social practices and protocols or 'rules' that make a commons (Linebaugh 2008; Gibson-Graham et al., 2013; Ostrom 2015). Our charter was to supplement well-established technical knowledges about thermal comfort in interior spaces and 'green infrastructure' in exterior spaces, with information about how people move in and through the city and are able to gather, rest, play, socialise, care for others and so on, in common spaces, in spite of the heat.

The key research question informing this research is:

What are the design features and resources that enable cool commoning, and what are the features that detract from this?

We responded to this question across three stages as detailed below, with findings from each stage workshopped with stakeholders. We conducted a comprehensive review of international literature, analysing cases for patterns; conducted preliminary observations of four Landcom development sites; led two student projects involving further site visits; ran participatory workshops with Landcom staff and finally synthesised our findings into our prototype pattern deck.

Stage 1	Literature Review	Team Workshops and Preliminary Site Visits
Stage 2	Student Project 1	Landcom Greenfield Site Visit: Presentation + Partner Feedback Partner Workshop 1: Master planning for Cool Commons
	Student Project 2	Landcom Brownfield Site Visit Presentation + Partner Feedback
Stage 3	Patterns for Cool Commons	Partner Workshop 2: Prototype Pattern Deck for feedback
Outputs	Cooling Common Spaces Report + Deck	Launch

Literature

The first stage of this research involved a comprehensive international literature review that sought 'best practice' case studies related to cooling common spaces, connecting designed form and social practices, as well as getting a sense of the landscape of existing strategies and action plans. While the research identifies key cases, such as those referenced in this report and in the patterns, it was a challenge to find examples that were real, and not 'aspirational'. The literature demonstrated several clusters and a significant gap. Extensive bodies of technical literature on urban vegetation, shade, wind and water in outdoor environments and energy-efficient indoor cooling, as well as design guidelines were identified. There was also a significant body of literature on commoning, community engagement and governance. However, the literature connecting these clusters in the domain of social practices was much smaller and required us to apply our analytical tools to discern our own field of literature relevant to cooling the commons. Using the 'Commons Identikit' and the 'Intergenerational Yardstick', as well as a theory of social practices (detailed below) we gleaned findings from across the clusters and created our own connections.

The collection of key cases, images, diagrams, reports and research papers referenced in this Report and throughout the pattern deck are the result of this analysis.[2]

It is a significant finding of this literature review that technical, theoretical or strategic studies on how to cool cities are more common than those that describe how built forms and spaces are lived. We need more work in the post-occupancy space to better enable our collective capacity to learn from how things have worked in practice, how people have adapted to changes and participated in adaptation, and what has been learned from failures (see pattern Post-Occupancy Learning, Appendix 1).

2 Please note: the key international literature underpinning our patterns is asterisked in the Reference List.

Analytical Tools: Commoning, Social Practices and an Intergenerational Mindset

We used three analytical tools to understand the literature and the sites we visited as part of this project. Two important analytical tools informing our approach are derived from the work on J.K. Gibson-Graham, Stephen Healy and Jenny Cameron, in their 2013 book Take back the economy: an ethical guide for transforming our communities. This has been a key resource for our collaborative work over the last five years.

The first of these, the Commons Identi-kit, provides a lens through which to analyse cases and raise questions regarding the commoning of spaces, practices, resources and knowledges.

Commons Identi-Kit

Access	Use	Benefit	Care	Responsibility	Property
Shared and wide	Negotiated by a community	Widely distributed to community members (and beyond)	Performed by community members	Assumed by community members	Any form of ownership (private, state, or open access)

Figure 5: Commons Identi-kit. Adapted from source: Gibson-Graham et al., 2013.

The second, the **Commons Yardstick**, is a device that allows us to record our relationship to commons over time – three generations back (the span of living memory) and seven generations forward. Introducing a temporal logic was extremely relevant to our study as built forms, natural forms and social practices have highly divergent temporalities, and as we were naturally focusing on 'new' and 'renewing' neighbourhoods, the forward-looking orientation of a planning perspective was key in delineating our patterns. In addition to the forward view however, we were also observing current conditions from the perspective of planning practices of the past, to understand how these had evolved and continue to shape urban life in the present. Appropriate time planning in densifying urban environments helps prepare for change and impact. For example, urban morphologies that can enhance natural ventilation need to be planned ahead of time and maintained through staged development; the diverse growth times and lifespans of trees considered, and preservation and succession plans made.

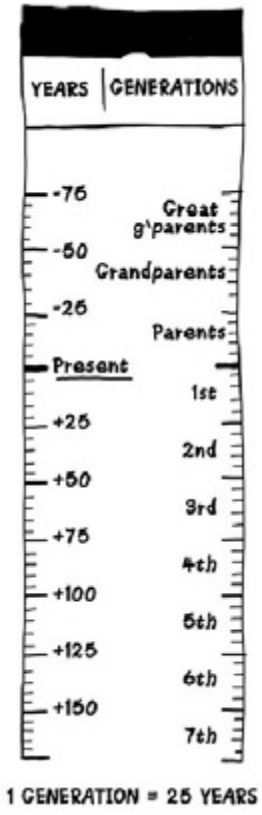

Figure 6: A Commons Yardstick. Source: Gibson-Graham et al., 2013.

Master planning for the future will also need to account for extreme temperatures and conditions such as ensuring the 'passive survivability' of cooling refuges[3].

Finally, we used an analytical tool derived from the theory of social practice, which is gaining traction in diverse fields of applied knowledge such as design, planning, public relations and governance. In contrast to conventional emphases on either individual psychology (attitude-behaviour-choice [ABC]) or technological 'fix' (Weinberg, 1994) as a basis of social change, this approach focuses on the interaction of materials (built forms, infrastructures and resources), meanings ('common sense', values and language) and skills (capacities, knowledges and know-how) that enable people to get things done.

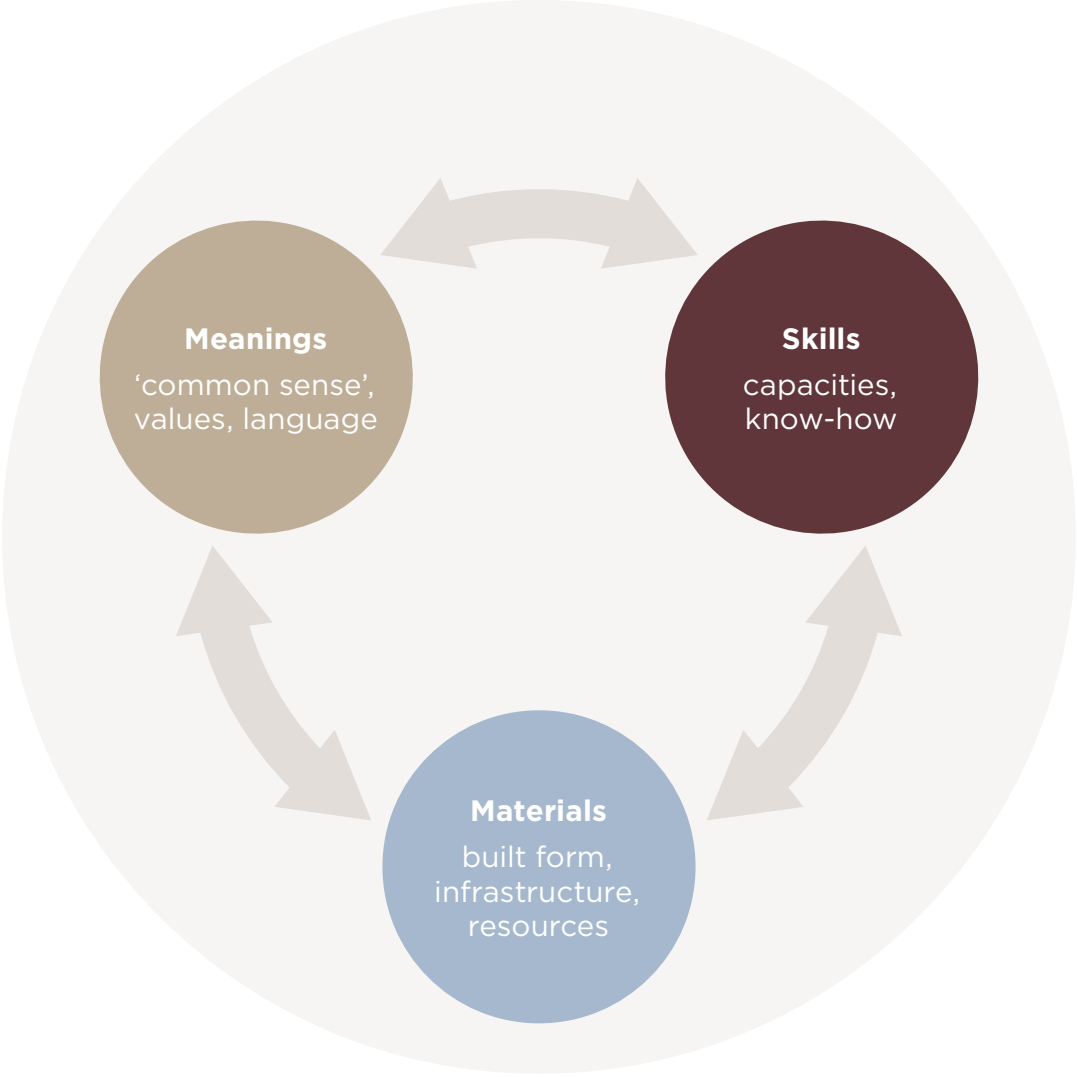

Figure 7: a social practice snap shot, which doubles as an analytical tool. Adapted from Scott et al., 2012, p. 283

3 'Passive survivability' refers to the need for buildings and cities to be able to maintain critical life-supporting conditions in the event of extended loss of power, fuel or water, including liveable thermal conditions (Wilson, 2006).

Social practices are recurrent forms of 'social performance' (Schatzki, 1996; Reckwitz, 2002, p.251) that may be intermittent, occasional or intensively regular, and that take shape through the integration of embodied, social and contextual elements. From a social practice perspective, 'thermal comfort' is performed rather than achieved, and differs according to culture, place and time (Shove, 2003; Roberts & Henwood, 2019). While social practices are performed by individuals in distinctive ways, people learn from observing each other, including improvisations and 'work arounds'. 'New' practices become standardised or normalised through sharing (Scott et al., 2012). In the recurring life of a practice, many of the interactions between people, environments and infrastructures can be quite unconscious, until something occurs to interrupt the practice, such as the removal of 'infrastructures of care' discussed earlier. Therefore, identifying the elements of a practice through careful observation, and discerning what new elements might be required to preserve, maintain or transition practices, was highly applicable to our study.

The key social practice we focus on in this study is commoning. In order to common the dog park for example, people need certain material resources (fencing, water, signage) dog management (skills) and knowledge of social values and etiquette (meanings) to optimise the benefit of the shared experience of using the park on an ongoing basis. If one or other of these dimensions is absent, the capacity to common the park might be compromised.

Student Projects

In keeping with the Landcom Roundtable Agreement, we involved two student cohorts across two universities in this project. Students were introduced to the tools and in the tradition of Alexander's 'walkabouts', which ensure urban spaces are well-designed at a human scale (Salingaros, 2018), conducted walking site analyses where they noticed and recorded patterns in the physical environment related to the practices of a diversity of community members.

Student Project 1, coordinated by Associate Professor Louise Crabtree, involved over 40 Masters of Planning, Engineering, Social Sciences and Research students from Western Sydney University. Students visited one of Landcom's greenfield sites, Macarthur Heights (City of Campbelltown) on October 3, 2018 and were briefed by the site's Development Manager, who introduced them to the site's staged development and fielded their questions. Student groups then conducted a site assessment of Macarthur Heights, evaluating how one of six specific themes – walking routes, public transport, universal access, cycling, women's safety, and child-friendliness – would interact with community strategies for keeping cool on hot days.

Following their site visit, student groups worked intensively to develop presentations of their findings of the intersections and conflicts between their theme and strategies for community cooling. These were then presented to members of the Cooling the Commons research team and Landcom staff, in addition to their peers.

The presentations generated a stimulating discussion between the students and Landcom staff, regarding the practicalities of achieving better planning outcomes.

Students provided critical insights into how commons may be designed and delivered by developers, however as public-space commons are council owned and managed assets, forward thinking and collaboration during the visioning stages of a project is required.

Key Outcomes of Student Project 1: insights and questions

- prototyped a consultative process for 'thinking-with' different stakeholders
- engaged in a useful conversation about responsibility and 'handover' and how to do it so as to sustain commons over time – e.g. enabling community access to spaces earmarked for future development (meanwhile uses)
- discussed how to establish and maintain an ethic of commoning while physical and social infrastructure is under development
- considered how human resources such as community development officers could promote commoning.

The 2018 student cohort was invited to provide feedback on the site in 2019, via consultation.

The students were performing in some senses the role of an imaginary community of commoners, mediating what was possible in the current context. Their points of discussion pertaining to the stewarding of a development and management of the commons, proved important in developing the patterns (see Appendix 1), and in framing expanded communication and liaison roles.

Student Project 2 was coordinated by Professor Cameron Tonkinwise at UTS. It involved 28 undergraduate and postgraduate students drawn from a range of design disciplines including fashion design and visual communications. Designers are adept at pattern recognition, as they inductively extrapolate general conditions and principles from specific examples. These students were tasked with identifying patterns to facilitate practices of cool commoning in a high density context. Using our prototype pattern template (see Appendix 1) students visited Green Square town centre (City of Sydney) on February 8 and February 15, 2019, to identify old patterns and opportunities to support commons-based cooling. Building on the clues they gathered during the site visits and research of related examples, student groups developed proto-patterns of cool commoning, which they presented to an audience of their peers, Landcom staff and Cooling the Commons researchers, and received feedback on the feasibility of their patterns.

The students' careful observations provided insights into the everyday impediments to commoning in high density environments. Their creative proposals showed how small, well-placed interventions could support cool commoning, but also how these would depend on allied innovations in the role of community liaison officers, site managers and other stakeholders in the hand-over and post-occupancy phases.

Workshops

The Cooling the Commons team held two participatory workshops with Landcom staff over the course of the project. The first, held on November 7, 2018 focused on Master Planning for Cool Commons and used Macarthur Gardens North as a case study. We shared a case from our literature review and introduced the Commons Yardstick to support planning for the 'long now', particularly in relation to urban morphologies that promote the channelling and circulation of cooling breezes and equitable access to shade.

Macarthur Gardens North, still at the master planning stage, is a 'greenfield' site for which Landcom will seek a Green Building Council of Australia (GBCA) Green Star Communities sustainability certification. The master plan review and discussions with the development team provided valuable insight into how aspirational design vision can be constrained by planning requirements, and meeting the increased demand for housing. Frameworks like the Green Building Council of Australia's Green Star accreditation can assist the development industry in balancing these objectives.

The Macarthur Gardens North project site sits between the established Macarthur Heights project, and the Macarthur train station. During the site visit, students considered the benefits of meanwhile uses for sites such as Macarthur Gardens North, providing a temporary commons for locals until the project is developed. In the final part of the workshop, two scenarios were presented for participants to work on. The first sought ideas on how to common a naturally ventilated high rise building; the second on how to common a night-time park. The Workshop 1 materials are included as Appendix 2.

In the second workshop held on March 1, 2019 we introduced Alexander's pattern language and our design approach centred on social practices as recurring interactions between people and things. We talked through our draft commons-based patterns for cooling, and invited feedback on when and how these patterns could be used at a project like Macarthur Gardens North. This workshop demonstrated a great enthusiasm for the pattern approach, but also concerns over the divisions of responsibility for several of the patterns that are not squarely within the control of developers. Some of these, such as Cool Slopes (see pattern, Appendix 1) were unanimously supported, whereas others such as Multi-use Community Centre revealed challenges for practical application. This demonstrated a requirement for us to further understand the complex 'levers' within the planning process, which we attempt to lay out in the next section of this Report.

The review by industry professionals provided confidence that the pattern of Post-Occupancy Learning can facilitate commoning in new and renewing developments. Further details about the feedback received is included with the materials from the workshop (Appendix 3).

Figure 8: A participant considers 'pathways' and 'blockers' for planning patterns during Workshop 2.
Photo: Stephen Healy.

Cool Master Planning: the case of Stuttgart

During Workshop 1, we introduced participants to the case of Stuttgart, the so-called 'coolest city in the world' (Rehan, 2014). This case provides us with an example of how intergenerational climate planning practices can support commons-based cooling on an ongoing basis.

The city of Stuttgart has a mild temperate climate with warm summers and low wind speeds, which contribute to poor air quality. The design of the city exploits natural wind patterns and dense vegetation to help keep the city cool and well-ventilated. While Stuttgart has a much milder climate than Sydney, we share some features including settlement in a heat trapping basin, which also hinders the dispersal of pollution in weak wind situations. This geography provided the impetus for urban heat management and long term climate planning that we can learn from.

During the 1930s in Stuttgart, the new discipline of urban climatology identified the importance of flow channels guiding mountain air though the landscape, which combatted hazardous urban microclimates associated with environmentally-derived illnesses and vitamin D deficiency. The city's 'fresh air corridors' exerted significant influence on future urban planning projects, most recently to address the urban heat island effect (Climate-ADAPT Platform, 2016).

Figure 9: Fresh air corridor in Stuttgart. Source: Urban Climate Stuttgart

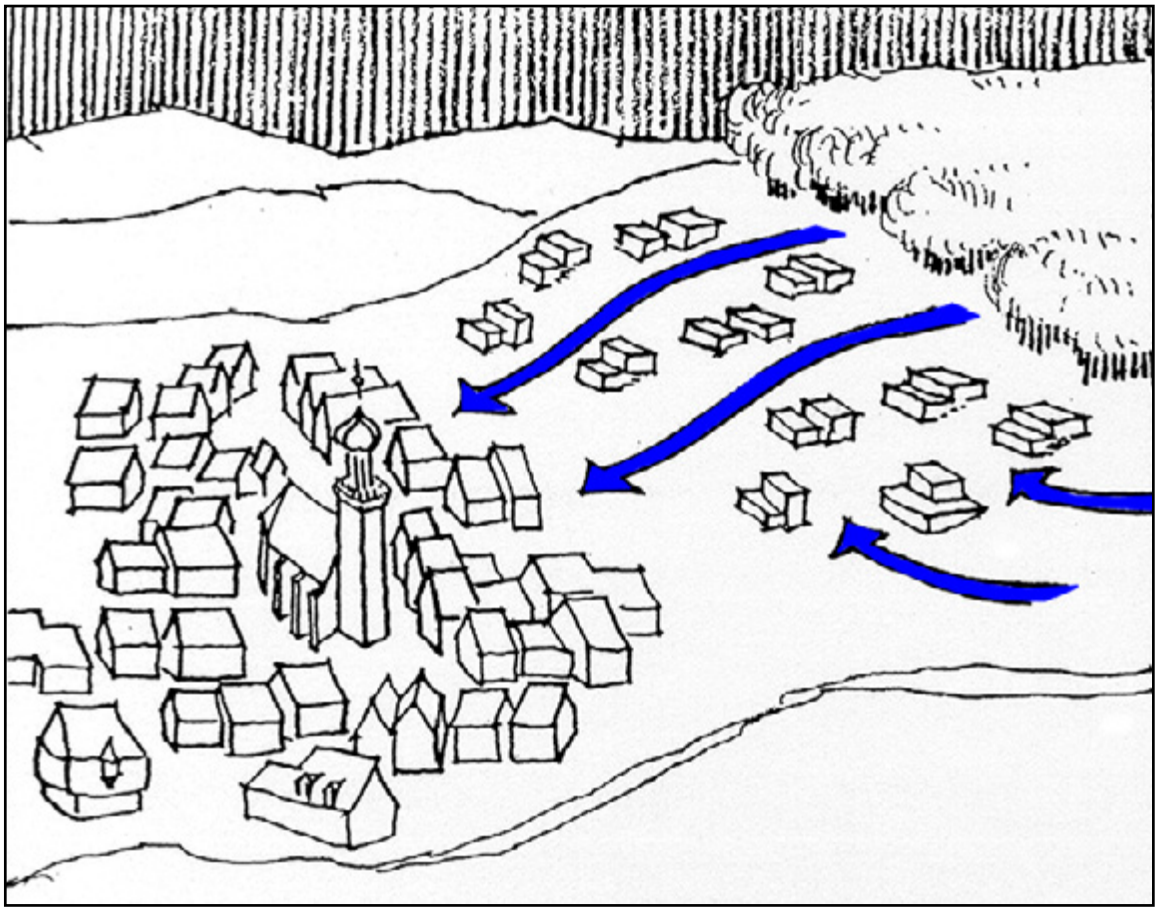

Figure 10: The Green U. Source: Urban Climate Stuttgart. Permeable hillside development. Source: Ministry of Economy, Work and Housing of Baden-Württemberg

Climate projections for the city predict a 2° Celsius rise in temperature between the years 2017-2100, indicating a need to plan for a greater number of hot days. In anticipation of these futures, the Office of Environmental Protection in Stuttgart created a detailed climate analysis for the city as part of a Climate Atlas. This atlas, first released in 2008, forms the basis for all climate related planning in the region. Together with a previously released Climate Booklet for Urban Development, cities and municipalities in the region are directed to incorporate climate data in their spatial planning and developmental controls. These are structured within the German National Building Code (Kazmierczak & Carter, 2010). Stuttgart is thus an illustration of a comprehensive long-term planning, land-use and developmental approach to climate considerations.

Stuttgart provides an example of effective long term planning and modes of governance that ensure cool commons are protected into the future.

Key points:

- For over 80 years, Stuttgart has monitored local climate conditions and their relation to urban development, and since the 1970s has produced an open-access Local Area Climate Atlas which monitors air hygiene and noise monthly, emphasising public interest in atmospheric commons;
- A Local Environmental Office produces the Climate Atlas and evaluates the effect of planning on the local environment on an ongoing basis; takes care to preserve open areas and increase vegetation in dense areas of the city;
- The city has green ventilation corridors flanked by trees that connect hills to the city centre; and construction bans at strategic locations, such as on the slopes, that would block these corridors;
- The 'Green U' provides a continuous parkland linkage throughout the city; and
- Strategic and bespoke planning of green infrastructure focuses on improving linkages between homes and sites of employment, including:
  - a major cycle path (The Neckar Cycle), which proceeds along the river connecting to other urban centres and is a major tourist attraction
  - all large trees are protected in the city centre (once trunks reach a certain circumference they can't be removed and development has to take place around them).

(Ministry of Economy, Work and Housing of Baden-Württemberg, 2012).

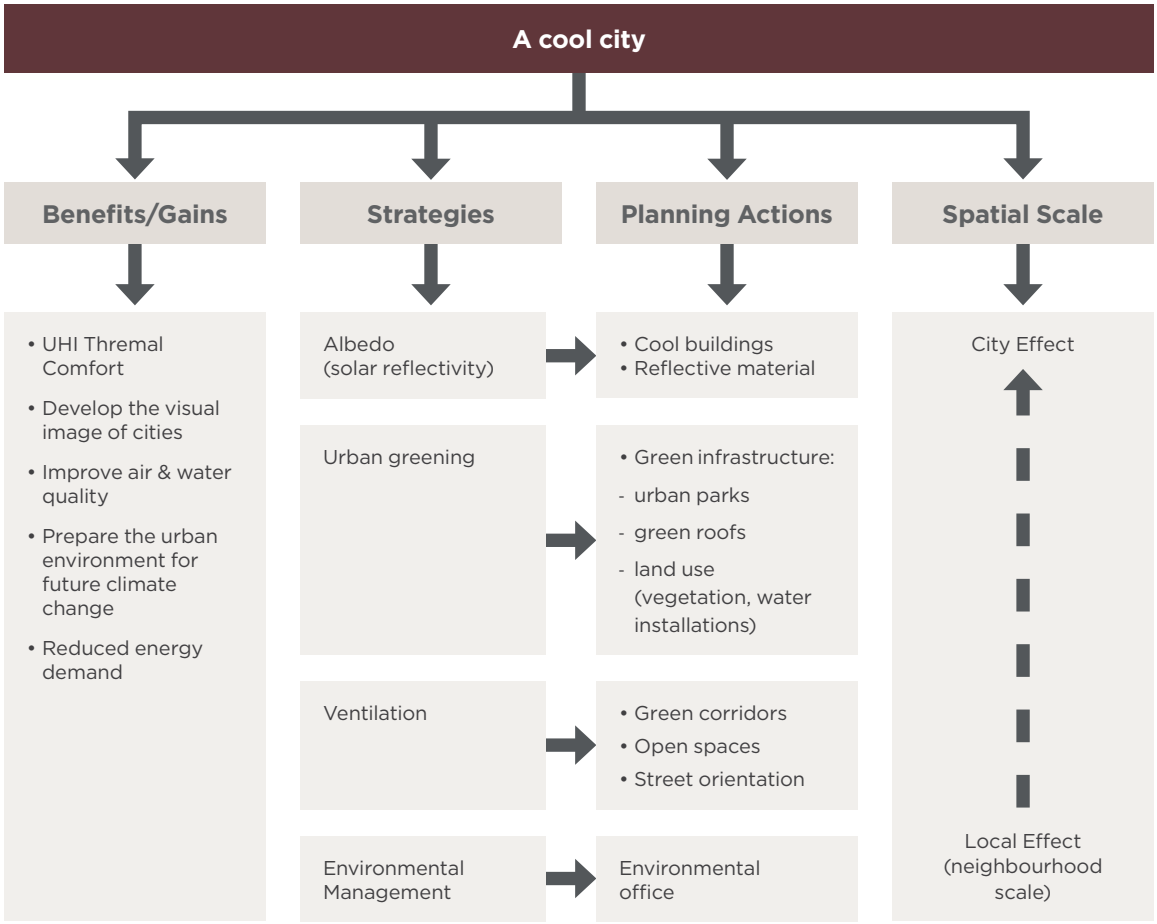

Figure 11: A cool city framework. Adapted from source: Rehan, 2014.

3. Where do the Patterns Fit in the Development Process?

Each pattern in the Cooling the Commons Pattern Deck aligns with the typical stages of a development project. There are three broad stages where the Cooling the Commons patterns fit: the Planning Stage; the Delivery Stage; the Handover and Post-occupancy Stage.

The Planning Stage is the longest phase for developers and their stakeholders. This stage is where the patterns for coolth are primarily related to material concerns and where ideal patterns for greenfield sites integrating passive design strategies for climate adaptation, might be set up. This stage is the most critical, not only in terms of its influence and responsibility, but also in terms of its scope and potential for impact.

Planning is followed by the Delivery Stage, where civil works and construction overlaps with the initial sales and settlement within the new development. This stage offers the opportunity to both influence purchaser decisions (for example, about building form and materials) and to introduce patterns of engagement within the community and other stakeholders. It is the stage where commoning can be promoted and supported, and community governance arrangements introduced.

Finally, the post-settlement or Post-occupancy Stage begins when private lots and the public domain are handed over. Developers have relatively less ability to influence this phase as they no longer have operational control of a site, nevertheless it is critical to delivering and maintaining cool commons. It is during this phase that most residents have moved in and the community is largely established. It is this stage where through continued engagement, commoning practices may be sustained.

Within the pattern deck, each stage will be addressed with cooling patterns that may be incorporated through design, maintenance and management, communication and liaison, community governance and other processes.

General Development Process

In this section we outline the typical planning process and how the three sets of patterns are aligned via the indicated stage.

Stage	Tasks
Planning	Project Identification
	Project Visioning
	Project Planning
Delivery	Project Construction
	Sales and settlements
Post-Occupancy	Site Handover
	Project Reviews

Figure 12 Typical urban development stages

Developers are typically engaged with four kinds of stakeholders:

- government
- community and business
- industry and professional
- internal.

For each stage; planning, delivery and post-occupancy, stakeholders perform different roles. These include:

- obtaining planning and zoning permissions, sales and construction authorisations, and clearances for implementation. Stakeholders involved at this stage are central for the successful integration of planning patterns for coolth
- partnerships and collaborations between government and public stakeholders
- community users – these are the residents who purchase and occupy the housing and are the central stakeholders in terms of realizing post-occupancy patterns, as well as site visitors.

Understanding the different roles played by stakeholders and developers is an important aspect of aligning different cooling patterns in terms of how they may be implemented and sustained.

Government Stakeholders

The primary government stakeholders, partners and authorities for developers in NSW include the following:

- the NSW Department of Planning, Industry and Environment (DPIE), which is central for approvals and providing guidance on different policies and plans in place for NSW. DPIE also sets targets on housing provision, environmental guidelines and other planning protocols. It also plays a role in the facilitation of community level governance through raising awareness about policy and planning frameworks in place. The former Office of Environment and Heritage, which played an important role with respect to open spaces, interventions in heritage areas, national parks, and for vegetation management and water resource management, was merged into this new Department
- Aboriginal Housing Office, Crown Lands, Land and Housing Corporation, Office of Strategic Lands, Sydney Olympic Park Authority and Landcom within the DPIE Housing and Property Group (See: https:// www.dpie.nsw.gov.au/our- work/housing-and-property)
- other partners include Transport for NSW, Greater Sydney Commission, and of course local councils.

Community and Business Stakeholders

Developers need to engage with different communities at different stages of their projects. An indicative list includes the following:

- existing local communities around project areas and selected sites during the planning and implementation phases, specifically during the creation of the master plan
- residents, visitors and workers in and around project areas during the delivery and post-occupancy stages
- community groups and special interest groups, resident actions groups, advocacy groups, representatives of culturally and linguistically diverse people and other members of the general public as well as businesses are consulted at various stages.

An example of how this can be approached is provided by Landcom's Join in Framework[4].

Non-Profits and Local Initiatives

Developers may also engage with non-profits, social enterprises or other organisations to deliver community initiatives.

This may not be a requirement for all new or redevelopments, and is largely subject to developer corporate responsibility initiatives. Some examples by Landcom include:

- for prospective buyers: Macarthur Heights Sustainability Rebate
- for new residents: Welcome Program, Community Development Program, Macarthur Centre for Sustainable Living Play Group
- for training and upskilling: Supply Chain Sustainability School, VET in Schools program, Skills Exchange program
- other future plans include Compost Revolution, Live Life Get Active, National Theatre for Young People and the Welcome Dinner Project which are in various stages of development.

4 For an overview, see: https://www.landcom.com.au/approach/stakeholder-engagement/

4. Old Patterns

We define Old Patterns as reproduced 'solutions' of the past, which are challenged by new social and environmental conditions and emergent values. The patterns we identify below can be remediated, rethought or even eliminated if we are to develop healthy and inclusive neighbourhoods for the future.

Old Patterns constrain the emergence of patterns for cool commons, and interventions both human (for example, at the point where purchasers may be influenced by the economic, environmental and social impacts of their choices) and material (a range of building types and materials that support coolth), are needed to curtail their reproduction.

A good example of an old pattern was identified in research led by Sebastian Pfautsch at Western Sydney University, which focused on the heat implications of soft fall and other materials in children's playgrounds and outdoor play spaces. This widely specified material, synonymous with outdoor play, was developed as a solution to childhood injuries (largely a result of play equipment installed on asphalt playgrounds – a previous old pattern). However, soft fall was found to reach temperatures of 74 degrees on a typical summer day in Western Sydney (Blick, 2018).

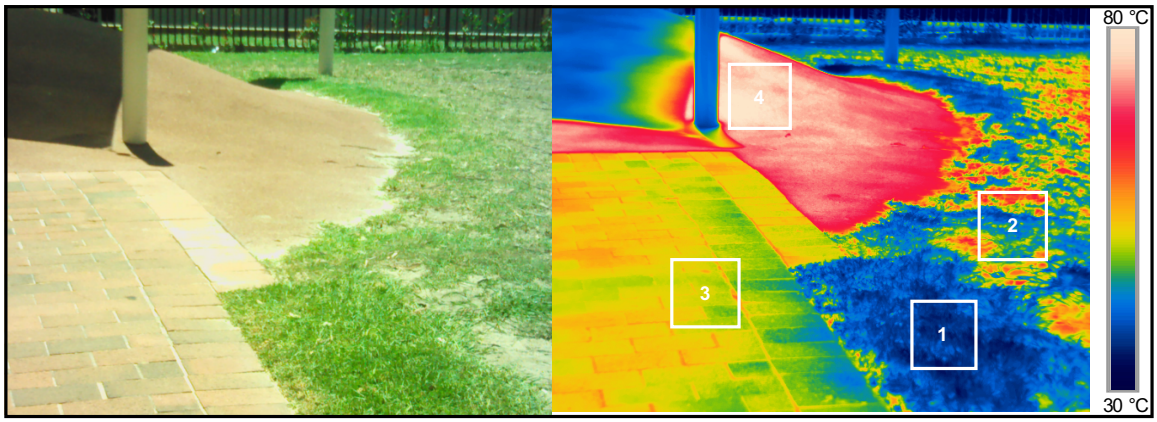

Figure 13: Material matters: Surface temperatures on a typical summer day (January 18 2018) in a Western Sydney early learning centre. Left: normal view; right: infrared view (surface temperatures are colour-coded). Average temperatures for 1. thick grass: 39°C; 2. patchy grass: 51°C; 3. red bricks: 53°C; 4. Unshaded soft fall: 74°C. Photo by Sebastian Pfautsch. Reproduced with permission.

Indeed, in our pilot Cooling the Commons study (Mellick Lopes et al., 2016) children were routinely kept inside after 9 am on hot days, as the outdoor play spaces they had available to them were rendered uninhabitable. This is a problem at the level of the physical body but also of the mind, with implications for children's capacity to learn, including learning about nature, in nature. A thermally manageable, accessible and healthy outdoor play space is crucial for supporting children's social, physical and cognitive development (Mellick Lopes, et al. 2018; Madden et al., 2018).

There are many more designed 'micro-climates' that unintentionally amplify, exacerbate and trap heat in urban contexts. Given our longer, hotter summers, it is important to intervene in the reproduction of old patterns to safeguard air ventilation and micro-climate at the site level. It is also important to identify the likely impacts of climate change on structures and materials in the long term (see Appendix 4).

This information needs to be shared with new home buyers at the appropriate time (e.g. the Delivery stage) and in the appropriate form (e.g. a demonstration home tour), so they can make more informed decisions about the thermal characteristics of the building types, materials and colours they select.

Tree removal to make way for development is another old pattern. Trees create an important microclimate of coolth in the city. As programs like the 202020 Vision plan and other tree planting programs demonstrate (GSC, 2019), we need far more trees in cities as their benefits in relation to cool and convivial urban spaces are profound and multiple. Tree removal for new developments as well as for street widening or infrastructure need to be avoided where possible as every tree that is removed, even if replaced, represents a loss potentially of decades of shade, amenity and habitat.

A child growing up in a densifying urban environment is likely to be spending a significant amount of time in an air conditioned childcare centre with a small outdoor play space and with more soft fall than natural groundcover, let alone mature trees. In this context, children might need to be introduced to local trees, which are likely also to be quite young, so they can form a relationship with them and the other living things that call them home. Public tree adoption is one way the value of trees might be maintained for current and future residents, and is an important form of post-occupancy learning (see pattern, Appendix 1).

People can also contribute to the care of trees by watching out for signs of insect infestation in their crucial first five years, without necessarily needing to become expert arborists.

Hogg and Armstrong (2019) identify a number of important measures to protect Sydney's trees that require changes in State and Local government planning processes in light of urban heat. They argue that comprehensive urban canopy audits should include measures such as a time line of years of growth, estimation of carbon sequestration, branching patterns, layers and depth of canopy, and seasonal change. They also identify a number of concerns about tree offset requirements, such as location and lack of provision for tree maintenance in the first 5-10 years of growth. Following the Government Architect's draft Greener Places Policy (2017), Hogg and Armstrong (2019) argue that green infrastructure is essential infrastructure and should be recognised as an asset class with equal standing to buildings, roads and services (2019, p.3).

In the following section we detail some key old patterns that impede cool commons. Aside from urban morphology and site planning, these are predominantly at the scale of the human urban experience.

Uncommoning new urban spaces

Urban morphology that ignores wind and solar patterns leads to heat gain, trapping of radiation and overall contribution to amplifying the urban heat island effect. Adverse effects on natural air are experienced at pedestrian level when the space between buildings is less than half the building width. Careful planning is required to avoid heat trapping and wind tunnels in densifying contexts.

Figure 14: Urban canyons trap heat. Source: Hunter Block et al. 2012

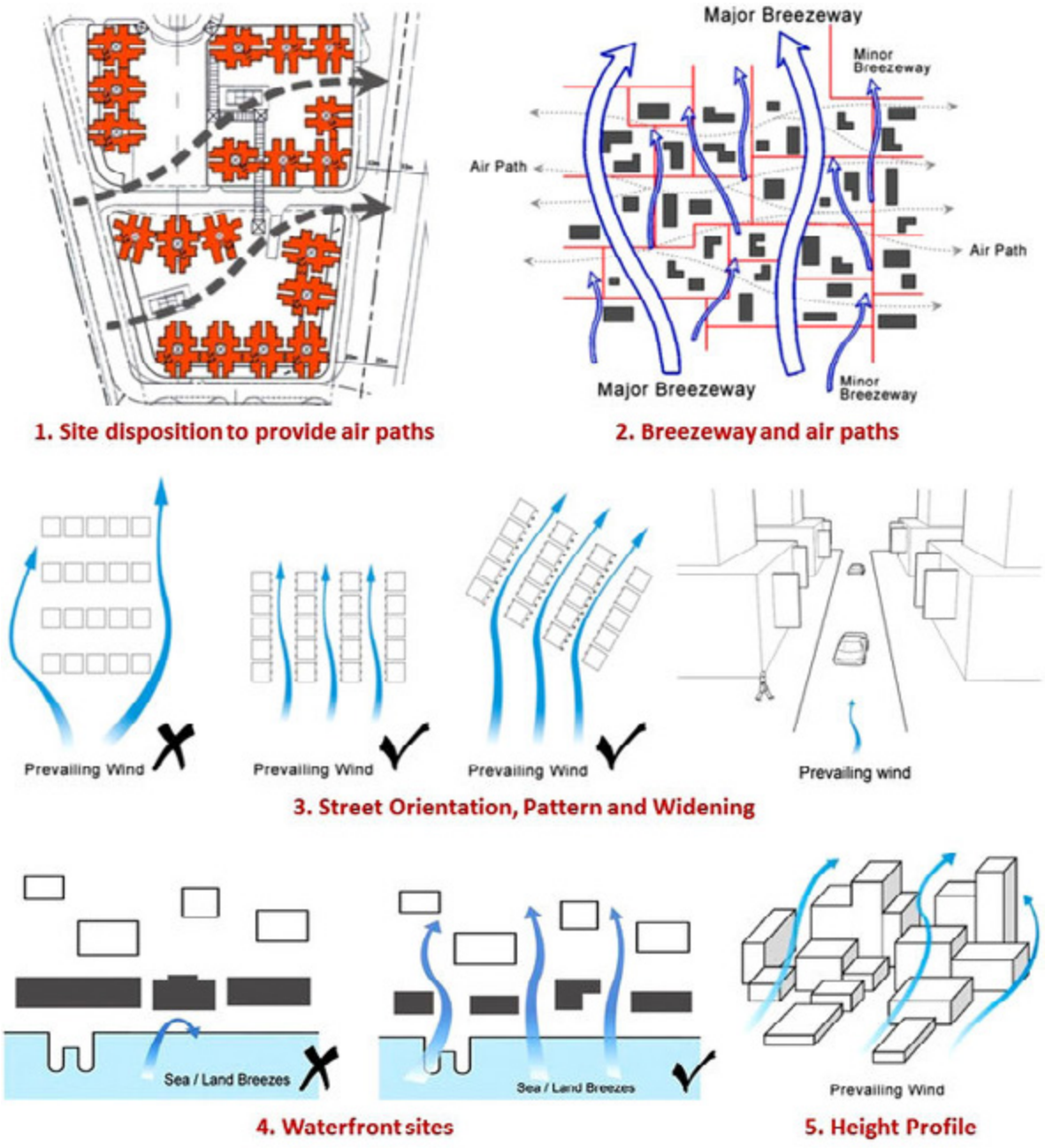

Figure 15: Poorly planned building morphology can impede airflow. Source: Planning Department of Hong Kong, 2019.

Major road widening and increased load due to development of new release areas, locks in transport modes for the future. **Removal of trees** for road widening results in heat loads and dangerous glare for road users. **Mature tree felling** in existing community centres results in decades of shade loss, habitat loss, reduced noise attenuation, aesthetic degradation and more.

Figure 16: Privileging major roads – clearing the way for M4 widening at Strathfield involved the removal of urban forest planted after the building of the F4 in the early 1980s. Photo: Cathy Jones. Reproduced with permission. https://strathfieldheritage.org/2017/01/31/m4-motorway-history/

Figure 17: An avenue of mature trees in St Marys Western Sydney, planted in 1988, is marked for removal. Photo: from the project image bank, collected by the research team during site visits.

Figure 18: The same street after tree removal. Amenable shade has been lost, seating is in the direct sun and the new paving is slippery when wet. Photo: from the project image bank, collected by the research team during site visits.

Site planning constraints, favoured housing typologies and road standards can lead to inadequate space for the deep soil and area needed for street tree and garden shade planting.

Figure 19: Overdevelopment of lots; inadequate area for street planting. Source: https://www.giveadam.org.au/over-development

Figure 20: New detached homes under construction with insulation material in the foreground. Photo: from the project image bank, collected by the research team during site visits.

Figure 21: Repeating the pattern. Source: https://harcourts.com.au/

Default material and colour choices that might have once seemed benign or even desirable, need to be rethought in light of urban heat.

Figure 22: Black top roads and predominance of dark grey roofs absorb heat and increase the demand for air-conditioning in buildings without passive ventilation. Photo: from the project image bank, collected by the research team during site visits.

Figure 23: Unshaded rubber soft fall has been found to reach temperatures of 74 degrees on a typical summer day. Even with shade, common playground materials like soft fall and astroturf are hotter than natural groundcover (Blick, 2018).

A **lack of shade** and **dry grass** creates inhospitable, visually and materially degraded outdoor environments.

Figure 24: Appropriate shade would have protected this play equipment from the damaging effects of UV and a degraded visual appearance, prolonging its useful life. Photo: from the project image bank, collected by the research team during site visits.

Figure 25: Appropriate groundcover? A visual barometer of drought – dying grass on dry slopes. Photo: from the project image bank, collected by the research team during site visits.

Figure 26: A shadeless amphitheatre. Photo: from the project image bank, collected by the research team during site visits.

Default **poor passive thermal building design**, locks in dependence on air-conditioning and cars.

Figure 27: Impervious, unshaded dark surfaces, unshaded narrow balcony, spaces designed for car rather than pedestrian access. Photo: from the project image bank, collected by the research team during site visits.

Figure 28: Building to the edge of lot, minimal setbacks, no space for shade trees. Photo: from the project image bank, collected by the research team during site visits.

The primacy of the car from another angle – **lack of shade, access and connectivity** for pedestrians.

Figure 29: Lack of universal access; paths that do not connect to destinations.
Photo: from the project image bank, collected by the research team during site visits.

Inaccessible water features, **hot water and unshaded water**.

Figure 30: Water features in hot environments should be more accessible and invite interaction.
Photo: from the project image bank, collected by the research team during site visits.

Figure 31: Unshaded water fountains get hot in the sun and are unpleasant to drink from. Photo: from the project image bank, collected by the research team during site visits.

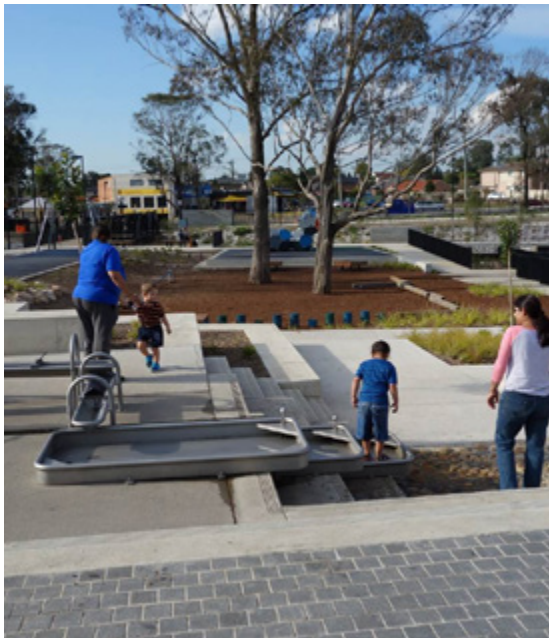

Figure 32: Blacktown water play at Francis Park. Unshaded water play areas with little close shade for people to retreat to. Operational hours of many water play areas delegitimate and deter night use. Photo: from the project image bank, collected by the research team during site visits.

Impervious, **unshaded public spaces**.

Figure 33: Paved plazas remain the primary pattern for urban public spaces.
Photo: from the project image bank, collected by the research team during site visits.

Figure 34: Western Sydney University Parramatta City campus with trees chosen for the maintenance of sight lines, rather than the provision of shade. Photo: from the project image bank, collected by the research team during site visits.

The Old Patterns represented here are visual indices of familiar environments that inhibit cool commons. They are patterns by virtue of their continued reproduction in new urban contexts. This points to another old pattern at the level of planning: in spite of efforts to improve outcomes, there is a fundamental aversion to change in planning and development practices.

In researching barriers to the uptake of green infrastructure by spatial planners internationally, Matthews et al. (2015) identify institutional path dependence in planning and design decision-making as the most significant barrier. This research found it was not a lack of understanding of the benefits or vital importance of green infrastructure that was holding planners back, but rather a lack of imagination and experience with the change scenario, as well as a lack of capacity to deal with novel problems. If we are not going to pave surfaces for example, but rather cover them with permeable, living vegetation, what needs and issues will emerge and how will these be managed? For green infrastructure to be recognised as an asset class with equal standing to buildings, roads and services (Hogg & Armstrong 2019, p.3), much more attention will need to be given to adapting planning, development and governance systems to be more responsive, so that they promote rather than continue to limit the transformation of urban commons. As Matthews (et al., 2015, p.162) write 'the uptake of best practice may … depend upon the dissemination of new ideas, clear communication strategies, effective demonstration projects and the ability to creatively overcome the inertia that may be present in planning systems'. Our research argues that there are communication and liaison learning opportunities from the delivery and post-occupancy development stages, which can improve the adaptive capacity of planning for future development projects.

Night-time Commoning

As the heat of the day dissipates, commons can provide a haven to entice local communities to step outside into the cool of the night and in case it's too hot to sleep. Inviting spaces and community events can help to combat the entrenched 'common sense' view that 'people don't like to use parks at night'; a view reinforced by many municipal park closing hours across the city.

For example, a night-time park dedicated to star-gazing, such as Main Ridge Park at Macarthur Heights, can invite night-time use. This park and the structures in it compose an art installation called Gates of Light, which is linked to the activities of the nearby observatory as 'a place of learning and discovery', and was designed in response to feedback from the community, Macarthur Astronomical Society and Aboriginal elders.

Figure 35: Main Ridge Park at night. An art installation by Khaled Sabsabi (2014). Source: https://www.macarthuradvertiser.com.au/story/2620322/stunning-lights-illuminate-macarthur-heights/#slide=1

The activation of night-time commons are most successful when they provide signage, other communications and activation events to legitimise and raise awareness amongst the local community of the opportunities to use these spaces at night. This is important as unlike our regional neighbours, night-time commoning of urban spaces is unusual in Australia. The integration of other coolth patterns, such as providing shade and water, would broaden the utility of such spaces for all-day use (see pattern Night-time Commons, Appendix 1).

In the last part of this Report, we discuss forms of governance that underpin our patterns for the Delivery stage in the development pathway, as well as the Post-Occupancy stage that follows settlement. These exceed current practice but will, we argue, be critical for supporting local residents to enact commons-based cooling in the near and long-term future.

5. Post-Occupancy: Living Commons

Collaborative Governance

In our prototype Cooling the Commons Pattern Deck, we recommend patterns at the Planning and Delivery stages of the development pathway, as well as make recommendations to support cool commoning in the post-occupancy or 'lived-in' stage, to both facilitate continuous learning and to ensure:

- access to places, resources, practices and knowledges that enable coolth are shared and wide (accessible to all)
- use of places, resources, practices and knowledges that enable coolth are negotiated by a community (including with asset owners and/or managers)
- benefits from places, resources, practices and knowledges that enable coolth are distributed to the community and possibly beyond
- care for places, resources, practices and knowledges that enable coolth are performed by community members and other relevant stakeholders
- responsibility for places, resources, practices and knowledges that enable coolth are assumed by community members and other relevant stakeholders.

Anticipatory and adaptive forms of governance show potential in co-designing solutions for services to cater for changing

climatic conditions. However, these forms of governance require openness and participation, and greater coordination among different governance structures (Boyd & Juhola, 2015; Ansell & Gash, 2008). They work on principles of responding to and anticipating impacts, including climate impacts, and focus on processes of co-production and collaboration on the premise that incremental change may be insufficient to achieve sustainability goals (Wamsler & Raggers, 2018). Bringing diverse stakeholders into genuine collaboration allows for latent knowledges to be drawn on in the face of systemic stress or shock, and requires a focus on generating trust, commitment, and shared understanding (Ansell & Gash, 2008).

According to Wamsler and Brink (2014), individual practices will not be sufficient in order to adapt to climactic extremes. Rather, flexibility and inclusivity at individual, household and community levels will need to work in tandem in order to maximise adaptation to changing climates. These may include measures such as improving learning mechanisms, encouraging existing coping mechanisms and offering new strategies.

In order to participate in collaborative governance practices, new community members will need to be made aware of and introduced to these practices. Effective communication and liaison is therefore crucial in supporting community governance arrangements. The provision of dedicated 'third spaces' (Ray Oldenburg) for 'joint and shared use' (GSC, 2019) are also important. A Multi-use Community Centre for example could function as a community health centre and a cooling refuge on extreme heat days, as well as housing community governance activities.

In addition to technical strategies for mitigating urban heat stress, social strategies such as raising awareness, disseminating information (about forecasts for example), communicating and monitoring are critical. These are activities that local residents could readily participate in if appropriately equipped; enabling an agile response to heat exposure and rising temperatures (Leal Filho et al., 2017).

In what follows, we turn once more to learn from the international community about living forms of governance that take a commons-based approach to both anticipate and respond to a much warmer world.

A city level Heat Action Plan was initiated in the city of Ahmedabad, India in 2015 (Gopal, 2016). This plan was successful in reducing heat-related deaths by employing a range of modest cost-effective strategies, including simple communications issued to the general public through multiple media channels. The plans were issued in close coordination with agencies such as the Indian Meteorological Department and dramatically reduced heat related deaths in the area. Heat Action Plans are now issued at country, state and city levels in various parts of India annually, at least two months in advance of the summer season. The plans include communication and warning systems and advisories, as well as the provision of temporary infrastructures for shelter, shade and potable water.

Weather preparedness plans are most effective if designed to be enacted at the community level. Most in Australia are familiar with strategies to prepare for flood and fire, but equally necessary are plans to prepare for extreme heat; this is an important form of adaptive governance. Rather than generic measures and checklists designed to help individual households to fend for themselves, a community Heat Preparedness Plan requires people to assess where the vulnerable members of their community are, where the cool refuges are (for example, Multi-use

Community Centres, Community Libraries or private homes), and plan to bring these together on hot days. This might involve the design of a purposive social network that is activated on the basis of certain indicators such as weather forecasts.

An important precedent here is Akama et al.'s (2014) work on bushfire preparedness, in which the researchers worked with communities to identify and visualise social bonds, bridges, and links to support people to think as a community with a common concern during times of emergency. Such an approach makes an important contribution to supporting the adaptive capacity of communities living in extreme conditions (Akama et al., 2014). The capacity to mobilise community responses to quickly deal with heat emergencies and the longer-term task of developing and maintaining the bio-physical infrastructures that allow for appropriate thermal governance, require a different relationship between government and civil society. Indeed, both seem to suggest the need for social innovations that expand the capacities of citizens and government at all scales.

Peer to Peer Dynamics and a Partner State

The concept of the 'partner state' and Peer to Peer (P2P) dynamics offers an entry point into reconsidering how cool commons might be governed. Many of our patterns that reimagine relationships between 'land use' and what it means to common the use of the land, draw upon this adaptive thinking. P2P is a direct 'person to person' dynamic that operates in multiple communities and is based on an orientation towards the commons in the creation of goods and services (P2P Group, 2018). The characteristics of P2P are based on universal access, participatory production and governance, and are flexible enough to be applied in various contexts, including in the creation and use of coolth in the city. Several successful case examples of the P2P model exist that promote the co-production of knowledge systems and governance structures to foster sustainability and resilience. The P2P model includes the concept of the Partner State Approach, which is based on a truly participatory politics, envisioned as a 'cluster of policies and ideas whose mission is to

empower direct social value creation, and to focus on the protection of the commons sphere' (Kostakis & Bauwens, 2014)[5]. This model emphasises the need to create things that citizens feel free to common, which need to be supported by the state, including the provision of the material resources and mechanisms that enable this commoning to take place. The P2P model could support the role of developers as an intermediary between different stakeholders selling and managing land, and the future community.

While less prevalent in the Australian context, an international analogue can be seen in the Petaluma Homes development in California, USA, a cohousing development providing affordable housing. This created a challenge, in that cohousing requires the future resident community to be centrally involved in design, while fair housing law requires that residents be selected from a wait list via a lottery process once the homes are ready to occupy. This meant that there was a likely disconnect between the individuals involved in development and the final residents living in the development. Hence the architects, who were specialists in cohousing development, realised there was a need to maintain continuity across the development and occupancy phases. Consequently, they lobbied for funds to employ an individual to facilitate the design process, then carry the knowledge base of the project across the lottery process and introduce any new residents to the history, ethos, and design concerns of their homes, the community, and the overall site.

This issue of facilitation across design and occupancy also highlights the relevance of community-based planning entities that operate beyond the scale of single design sites; for example, community land trusts (USA and UK) or community development corporations (USA). A profound example is the Dudley Street Neighbourhood Initiative (DSNI), a 2,000+ member organisation in Dudley, Boston, that has the power of veto over development on any block of land held by the city in a prescribed area, and whose community-based development guidelines and vision have been adopted by the city. While DSNI members might never live in homes developed on city land, they collectively carry the unique development history of the neighbourhood in their individual and organisational memory and have the power to steer development on that basis. As a result, DSNI has overseen hundreds of development applications by the city that are in line with guidelines laid down by community and acts as a source of local knowledge that has fed into collaborative development processes with the city for close to three decades. In such instances, DSNI acts as a proxy for future residents in development processes, especially where future residents are already living in the broader Dudley region and may therefore already be voting members of DSNI. Consideration of how to enable a facilitator across development and occupancy with regards to commons-based cooling may require similar approaches.

5 In Ghent and Bologna this idea has been encoded into law through the formal adoption of a partner state approach, where the goal is to foster and support the development of urban commons. See for example: http://commonstransition.org/commons-transition-plan-city-ghent/

A Sense of Community

A comprehensive study (Kim & Kaplan, 2004) comparing two residential neighbourhoods in California, USA established clear links between designed outdoor spaces for community interaction and a stronger sense of community. The first case, Kentlands, was designed according to New Urbanist Principles that focus on complex urban layouts, pedestrian linkages, outdoor community spaces and a mix of uses, while the second case Orchard Village was based on modernist principles of neighbourhood design. Comparisons were made along four identified dimensions: community attachment; community identity; social interaction; and pedestrianism. In each dimension, it became clear that the way a community was planned – including aspects of pedestrian activity, such as footpaths, parks and benches as well as a focus on shared spaces and community activity was critical in fostering a sense of community among residents. (Peer Production, 2018).

The affordances of the material environment are crucial. However, a sense of agency to intervene in a place does not necessarily come with the built environment. People need to be welcomed and oriented in a social setting; these are significant dimensions of commoning. One of the lessons of a social practices approach to understanding how people inhabit cities is that practices develop their own entrenched qualities over time. As we discovered in our previous research with residents coping with the heat in some of the hottest and inhospitably designed areas of Sydney, it is not a matter of 'build it and they will come' (Mellick Lopes et al., 2016). A bike path alone will not encourage kids who have not learned to ride a bike, and have developed an attachment to other more passive forms of recreation, to start riding. The skills, sociality and meaning are missing, even if the infrastructure is available. Meaningful inclusion in design and development processes offers a

way to activate a community of commoners, however, this must be sustained over time in new and renewing neighbourhoods.

In the two to three years after a development's completion, people responsible for community development and liaison provide critical social infrastructure to support commoning, and need to be appropriately resourced to do this important work if commons-based cooling strategies are to become more widely practiced. The Delivery and Post-Occupancy stage patterns address some of the key initiatives and actions that a community facilitator would need to champion as part of a welcome and orientation strategy. Introducing new residents to the idea of commoning, the physical commons and commoning resources, as well as to the community of commoners and partners with which the developer has formed agreements, could provide a valuable dimension of this strategy. It is on the basis of interpersonal communications that new or unfamiliar commons such as a night time park designed for stargazing, might be introduced.

It is an extraordinarily significant job, to carry the knowledge of how to live in a place across different generations of residents, let alone to design on the strength of this knowledge. Emerging or renewed models of development that include future residents in design processes are yielding interesting outcomes with regards to innovation and efficiency in housing design and pricing. These include greater ratios of outdoor to indoor spaces, more greenery, and a heightened focus on shared, quality outdoor spaces. Local examples include the vastly over-subscribed Nightingale model (with a waiting list of 8,000 individuals) while there are various international examples of relevant organisational models (eg., cooperatives and community land trusts) and design orientations (eg., cohousing and Baugruppen). All of these offer design, development, and/or governance forms that enable greater resident participation and which as a result, deliver greater diversity in terms of built form and a higher amenity of outdoor and shared spaces.

These offer much food for thought with regard to how the development industry might replicate or enable collaborative development processes for multiple outcomes, including the creation and management of community-based knowledges, practices, and spaces of cooling.

Figure 36: Central Gardens Nature Reserve Merrylands West. Photo: Helen Armstrong

Conclusion

In this Report, we have attempted to outline a design approach that leverages patterns in natural, built and social environments to bring the creation of commons-based cooling front and centre in built environment futures.

The futures we imagine are designed for movement and sociality. There are other adaptive responses available to us, including remaining on the present path, which emphasises life indoors and technically delivered coolth. Remaining on that path confines us to a single and highly risky response to a hot climate, with ever increasing reliance on air-conditioning as the basis for thermal comfort.

In our view, there is an already discernible alternative, one that builds upon patterns derived from living examples that name, support and protect coolth into the future. In this project however, we have observed a gap between aspiration and actuality, and are of the view that we will not get where we need to go unless planning processes themselves embrace innovation. There are numerous promising signs and starting points in design visions for liveability that are gaining in resonance, including for example 'walkability' (Landcom, 2019; Resilient Sydney, 2018; GSC, 2019) and increased 'joint and shared use' of infrastructures and facilities (GSC, 2018). These now require urgent and substantive focus in relation to the already-existing momentum of patterns and practices, particularly in new urban growth areas where the city is not emerging organically, but rather is being planned from the ground up.

A new imagination of the commons, encompassing intergenerationally focused master planning, development controls and preservation orders, enduring community liaison and governance, stewardship of place and post-occupancy learning, as well as the material resources to support these activities, is required. Re-imagining the commons involves the creation of opportunities to initiate considered change, including the activation of new collaborative arrangements between stakeholders who have the institutional know-how and capacity to support the redirection of built environment futures in a rapidly warming world.

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Appendices

Appendix 1
Cooling the Commons Pattern Deck Sample

Appendix 2
Landcom Workshop 1 (November 7, 2018)

Appendix 3
Landcom Workshop 2 (February 10, 2019)

Appendix 4
Building System Design: Material Lifespans

Appendix 5
Cooling the Commons Media 2018 - 2019

Appendix 1 - Cooling the Commons Pattern Deck Sample

Introduction

This research has identified 44 patterns that support the creation of cool commons and are presented below. They are categorised according to the development stages of planning, delivery and post occupancy stages of development.

The efficacy of these patterns has also been classified as ideal or remedial. For more information on the use of these key terms, see Approach and Methodology p.20.

A total of five sample patterns across the identified development stages have been refined and presented within. The remaining patterns are outside the scope of this funded research project. They will be independently finalised by University of Technology and Western Sydney University, and made available online.

Pattern template

Pattern Name

Context:
[Planning or Delivery or Post-occupancy] - [Remedial or Ideal]

Description:
[What, why, where, and how the pattern relates to cooling. What are the metrics for success? If known, how much cooling can be expected.]

[Insert images of archetypal examples of the pattern, with captions describing the feature being illustrated]

[Insert images of archetypal examples of the pattern, with captions describing the feature being illustrated]

Conditions:

Enablers:

- [What are the existing or future conditions enabling or constraining this pattern?]

Constraints:

Commoning Analysis:

Access: [who can and cannot access or participate in the common]

Use: [who would typically negotiate the access and use of the common]

Benefit: [who is the beneficiary of the common, does it disadvantage anyone]

Care: [who maintains the common]

Responsibility: [who governs the common, has the policies or insurance etc.]

Property: [who owns the common, land and improvements, or intellectual property if they are different entities]

Commoning concern: [what are potential unintended consequences of the common; how will the constraints play out in practice]

Related Patterns:
[List patterns which are related to this one.]

References and Resources:
[Include research, papers, journals, websites, community groups which support the pattern.]

List of Patterns (patterns in bold are presented within this appendix)

	Pattern (sample patterns)	Stage	Type
1	Site Planning for Coolth	Planning	Ideal
2	**Cool Slopes – A Pattern of Contours**	**Planning**	**Ideal**
3	Urban – Rural Fingers	Planning	Ideal
4	Patchwork for Accessible Coolth	Planning	Ideal
5	Endangered Forest Communities	Planning	Ideal
6	Establishing Site Forests	Planning	Ideal
7	Keyline Planning for Trees	Planning	Ideal
8	Managing Onsite Water	Planning	Ideal
9	Street-Plaza Trees	Planning	Ideal
10	Selecting Shade Trees	Planning	Remedial/Ideal
11	Memorial Walk	Planning	Ideal
12	Activity Pockets to Outdoor Room	Planning	Ideal
13	Multiuse Community Centre	Planning	Ideal
14	**Accessible Water Planning**	**Planning**	**Remedial/Ideal**
15	Shaded Pedestrian Linkage Planning	Planning	Remedial/Ideal
16	Devices for a Cool Park	Planning	Ideal
17	Bird Bath	Planning	Ideal
18	Community Library	Planning	Ideal
19	Subcultural Boundaries	Planning	Ideal
20	**Temporary Use of Public Space**	**Planning**	**Remedial**
21	Shade structures	Planning	Remedial
22	Sensory Devices	Planning/ Delivery	Ideal

23	Street Parties and Fetes	Planning/Delivery	Ideal
24	Caring for Trees	Planning/Delivery/ Post-occupancy	Remedial/ Ideal
25	Outdoor Cooking	Planning/Post-occupancy	Ideal
26	Private Garden Trees	Planning / Post-occupancy	Remedial/Ideal
27	Gathering Outdoors	Planning/Post-occupancy	Remedial
28	Walking School Bus	Delivery	Ideal
29	Cycle Club	Delivery	Ideal
30	Signage	Delivery	Remedial
31	Misting Devices	Delivery	Ideal
32	Mobile Playvan	Delivery	Ideal
33	**The Night-time Commons**	**Delivery**	**Remedial**
34	Car Share Delivery Ideal	Delivery	Ideal
35	Heat Preparedness Plan	Delivery	Ideal
36	Cool Refuge	Delivery	Ideal
37	Welcome Protocol	Delivery	Ideal
38	Bushcare Groups	Post-occupancy	Ideal
39	Trial live-in Protocol	Post-occupancy	Ideal
40	Web of Public Transportation	Post-occupancy	Ideal
41	Community Governance	Post-occupancy	Ideal
42	Succession Planting	Post-occupancy	Ideal
43	**Industry Initiated Post-Occupancy Learning**	**Post-occupancy**	**Remedial**
44	Community Initiated Post-Occupancy Learning	Post-occupancy	Remedial

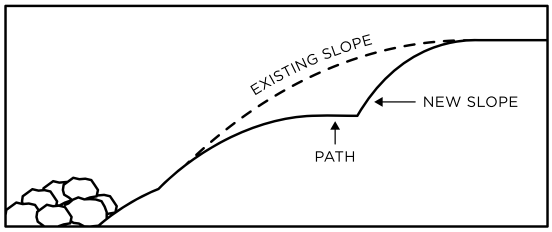
The following pages present five patterns from this list. The rest will be published in the form of a website by University of Technology and Western Sydney University and are beyond the scope of this research project.

Sample patterns

Cool Slopes – A Pattern of Contours

Context:
Planning Phase - Ideal Pattern

Description:
It is possible to manipulate the shape of a site to create sheltered cool pockets and areas for respite or pathways:



Cool slopes are commons that provide coolth for people walking or running through a community, or seeking respite around the community. They would typically have the greatest benefit either side of midday. Open space that slopes to creeks or lakes is ideal for the insertion of cool features such as cool banks, shade trees, grass mounds and paths.

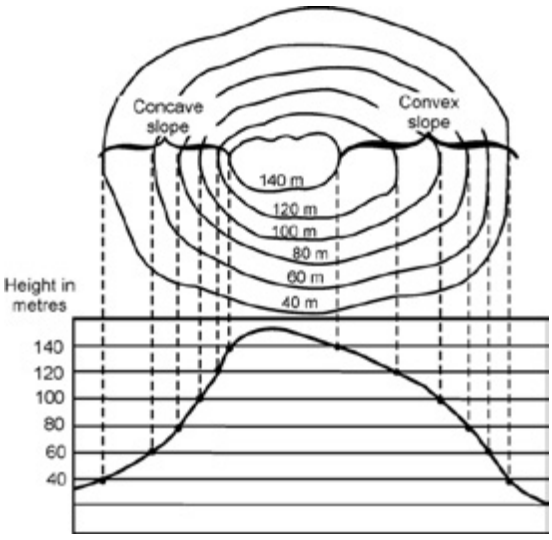
To create these cool commons, site planning should map the pre-development landform and slopes to take advantage of existing contours; sun (e.g. southern sides), wind and rainfall patterns; soil types and drainage.

This requires a fine grain analysis of site contours, so that the existing site gets regraded to create these pockets of coolth where practical. The resultant mounding can be used to contain services such as underground rain water storage tanks.

Successful application of this pattern will yield complete shade for when the pocket is most commonly used.

The Great Serpent Mound in Adams County, Ohio dates to 1070 CE
Source: https://commons.wikimedia.org/wiki/Category:Serpent_Mound

Kienast sculpture garden in Austria. Photo: Helen Armstrong



A concave and convex slope
https://www.jobilize.com/course/section/geography-reading-contour-patterns-on-a-topographic-map-by-openstax

Conditions:

Enablers:

- Local Environment Plans developed by local government require areas of open space for common recreational use.
- Integrating cool slopes, mounds or pockets within the ground modelling can add to the amenity. Innovative approaches can be explored in community workshops to enable civic participation in the design of cool slopes.

Constraints:

- Open space has to allow for multiple recreation uses. Open space planning often allocates flat land, so playing fields become the dominant use. This precludes ground remodelling in an open space context.
- Mounding will have to be created with consideration of ecological and hydrological impacts.

Commoning Analysis:

Access: High consideration of accessibility for all abilities should be considered when applying cool slopes, and wherever possible the principles of Universal Design applied.

Use: Passive recreation, integration into playspaces, urban design features, active transport pathways.

Benefit: Increased amenity in public open space and improved walkability due to increased shade and cooler spaces.

Care: Minimal care would be required by the community as the land owners would likely maintain this common as part of the broader open space maintenance.

Responsibility: The landowner would have ultimate responsibility but the community would be required to use the common in a responsible manner.

Ownership: Local government, development agency.

Staging of construction activities at strategic locations may be required to sustain access to cool commons through the development process.

Related Patterns:
Site Planning for Coolth; Managing On-Site Water; Selecting Trees for Shade

References and Resources:
Hack, G. (2018) *Site Planning: International Practice*, Cambridge, Mass: The MIT Press.

Yoemans, P. A. (1971). *The City Forest: The Keyline Plan for the Human Environment Revolution*, Retrieved from: www.soilandhealth.org

Accessible Water Planning

Context:
Planning Phase - Remedial Pattern

Description:
Accessible Water is a pattern that promotes the integration of water for play, drinking and cooling into the public domain, to enhance space cooling effects through evapotranspiration and personal cooling through contact with water. In low humidity, peak ambient temperatures can be reduced by three to eight degrees Celcius (Guide to Urban Cooling Strategies).

It might be in the form of splash pools or small rills and misting. It is an important infrastructure of care, enabling people to move comfortably out and about on hot days or nights and a way to enhance the quality of outdoor play spaces, particularly during summer. It requires thought about how people move through the city and where and when they seek to gather, as well as the nature of the space where the water is made available, so as not to create any harm to people. For example, water play spaces should meet the NSW Everyone Can Play guideline.

Accessible Water is an addition to swimming pools and Water Sensitive Urban Design features that are important for retaining water in the environment.

Measure of success for these public spaces include maintaining full accessibility and operational up-time, and also maximising attendance.

Marrickville water play, Steel Park. A river-side park surrounded by poplar trees. Photo: SDC Engineering http://www.sdcengineering.com.au/marrickville-water-play-park/

Bordeaux mirror (Miroir d'Eau) on a hot evening.
Photo: Katherine Gibson

Fiona Foley Lotus Line water sculpture, Redfern Park. Combines access, art and recognition of the social and cultural importance of Redfern Park. Photo: Helen Armstrong

Fiona Foley Lotus Line water sculpture, Redfern Park.
Photo: Helen Armstrong

Central Gardens Nature Reserve Merrylands West.
Photo: Helen Armstrong

Darling Quarter water play activated at night. Photo: @darlingquarter

Conditions:

Enablers:

- Strong community support for accessible water across different delivery modes.
- Cooling and liveability city plans (e.g. Penrith City Council, 2015; Parramatta Ways Walking Strategy, 2017) and academic research (Mellick Lopes et al 2016; Mellick Lopes et al 2019) signal accessible water as a key consideration to enhance community cooling, participation in the commons, and urban walkability.

Constraints:

- Drought conditions may limit water for play.
- Usability and toxicity of still water needs to be assessed and meet safety guidelines.
- Material and finishes selection must consider slip and trip hazards.
- Risks of ultraviolet radiation and sunburns if shade is not available will need to be actively managed by those responsible for the common.Opening hours of most parks and water play areas currently limit evening use.
- The community may have varying comfort with delineating human, animal or shared use of the common.

Commoning Analysis:

Accessible water is a key infrastructure of care to support commoning.

Access: Designing for equitable access is an important consideration, and should apply Universal Design Principles wherever possible. Decisions will need to be made around the shared access with animals.

Use: This common would typically be enabled by the land or asset owner for improved amenity and would not need to be negotiated by the community.

Benefit: all residents, visitors, birds and animals.

Care: Shared between asset owner (i.e. maintenance, repair) and commoning community (monitoring).

Responsibility: While the asset owner would have a legal responsibility, the commoning community would be required to accept the risks associated with the use of the potentially dangerous common.

Ownership: The systems which ensure the safe operation of the infrastructure, along with the asset itself is typically owned by a local council.

A commoning concern will be tolerance for shared use, human and animal.

Related Patterns:

Patchwork for Accessible Coolth; Shade; Bird (and other) baths; Signage.

References and Resources:

Clarke, J. 2010. 'Living Waterscapes: The practice of water in everyday life', *Performance Research,* 15:4, 115-122

Coutts, A., Tapper, N., Beringer, J., Loughnan, M., Demuzere, M. 2012. 'Watering our cities: The capacity for Water Sensitive Urban Design to support urban cooling and improve human thermal comfort in the Australian context'. *Progress in Physical Geography* 37(1) 2–28

Miaux, S. & Garneau, J. 2016. 'The sports park and urban promenade in the 'quais de Bordeaux': An example of sports and recreation in urban planning', *Loisir et Société / Society and Leisure,* 39:1, 12-30.

Osmond, P. and Sharifi, E., 2017. 'Guide To Urban Cooling Strategies'. *Sydney: Low Carbon Living CRC.*

'Everyone Can Play', https://everyonecanplay.nsw.gov.au/, *New South Wales Department of Planning and Environment*

Temporary Use of Outdoor Public Space

Context:
Delivery Phase - Remedial Pattern

Description:
Temporary or 'meanwhile' use of outdoor public unused space or private space earmarked for future development, can provide opportunities for site activation which reduces the urban heat island effect through greening activities or providing public access to private cool spaces. Examples may include pop-up uses such as shops or markets that use cool materials or urban gardens. Existing car parks or vacant lots can provide a platform for improved local cooling, with interventions reducing the amount of impermeable low albedo hardscape.

Citizens as urban co-producers

Precedents for occupying urban spaces with temporary projects include the Paris-based Atelier d'Architecture Autogérée. Their 'ECOboxes' (pictured) are installed in different neighbourhoods as temporary platforms for participatory gardening and a mix of other social and cultural activities. Activities include workshops, talks, screenings, preparing and sharing meals. Another example is R-Urban, which is a network of closed local ecologies where participants only consume what is produced. Temporary urban gardening can encourage local capacity building and encourage new forms of collaborative governance. For example, a community negotiated the right to develop a yam plantation (pictured) on unused land for a three year period, agreeing to cover all costs including relevant insurances. The whole community was involved in the preparation, cultivation and harvesting of the crop which was then distributed among the community and to charity groups. When the land was needed by the governing institution, a new plantation was created temporarily elsewhere (Armstrong, 2016, p. 72).

Measure of success for this pattern includes reducing the ambient and surface temperature of unused land by increasing the quantum of permeable or shaded surfaces; the longevity of the access negotiated to maximise the temporary use, and the social return on investment generated during the term.

This pattern does not include temporary use of buildings as Cooling Refuges (see separate pattern).

ECObox: a "micro-device" for temporary urban transformation.
Source: http://www.urbantactics.org/projects/ecobox/ecobox.html

Brisbane Pacific Islander Mobile Yam Plantation.
(See Armstrong, 2016, p.72) Photo: Helen Armstrong

R-Urban project in Colombes on outskirts of Paris: Agrocité May 2012 and July 2013 Photos: Katherine Gibson

The Council-sponsored Mobile Playvan activates local parks once a week, creating an opportunity for children, parents and carers to socialise. Photo: Abby Mellick Lopes as part of the Out and About project, Sofoulis et al., 2008.

Sundays at the University of the Philippines Diliman Campus – all motor vehicles banned from the circuit road lined with mature trees. Photo: Katherine Gibson.

Conditions:

Enablers:

- Landowners wanting to maintain asset values during the construction phase of staged precincts through activation and placemaking, with the ability to provide temporary use development applications (or similar) to facilitate meanwhile uses for a term period.
- Community liaison officers and community representatives can actively encourage citizens in their neighbourhood to initiate new activities, and function as brokers for temporary use.

Constraints:

- Temporary use implies collaborative governance arrangements, which may need to be negotiated if not already in place and can take time.
- Protocols for temporary use will need to be worked out by the partners involved, to establish procedures and divisions of responsibility. These protocols, like the spaces themselves, will need to be adaptable and open to renegotiation as circumstances change. A temporary use handbook, provided as part of a 'welcome orientation', would support residents to understand protocols.
- Temporary use equipment and resources will need to be stored and managed. This might involve negotiating arrangements with local businesses, the local library or community centre.
- Political and logistical challenges may emerge should a community desire to transition from temporary to permanent use.

Commoning Analysis:
Access: Unrestricted access. The inclusion of newly arrived residents will need to be facilitated, and the space should maximise opportunity for Universal Design principles.

Use: The commoning community would negotiate any uses that facilitate the reduction in surface and ambient temperature, while improving public access to sites that are not being utilised or currently inaccessible.

Benefit: Community capacity building; convivial sociality directed into potentially positive new social practices.

Care: Community groups, body corporates, or other governance mechanisms utilised. For this common, the landowner would likely not provide any maintenance.

Responsibility: Community groups, body corporate, site visitors or contractors engaged by the commoning community.

Ownership: Developers or local government.

For some members of a community, for example shift workers, noise might be a commoning concern. A protocol of inclusiveness around planning events that may impact on others could address this concern.

Related Patterns:
Community Governance; Welcome Protocol; Street Parties and Fetes; Signage; Community Library; Night-time Commons.

References and Resources:
Armstrong, H. (2016). 'Marginal Landscapes iBook' https://www.researchgate.net/publication/309635130_Marginal_Landscapes

'Atelier L'Architecture Autogeree': http://www.urbantactics.org/projects/rurban/rurban.html

'Guide to Setting Up a Market on Council Land City of Sydney': https://www.cityofsydney.nsw.gov.au/__data/assets/pdf_file/0007/239992/8964_MarketGuide_COS_lr.pdf

'Precarious occupation agreement': https://urbact.eu/sites/default/files/media/refill_factsheet_01_-_precarious_occupation_agreement.pdf

'Temporary use funds': https://urbact.eu/sites/default/files/media/refill_final_publication.pdf

Sofoulis, Z., Armstrong, H., Bounds, M., Mellick Lopes, A., Andrews, T. (2008). *Out and About in Penrith. Universal Design and Cultural context: accessibility, diversity and recreational space in Penrith*. Centre for Cultural Research, UWS with Penrith City Council.

'Urban Design Collaborative Making Our Own Space': http://www.wearemoos.org/#intro

The Night-Time Commons

Context:
Delivery phase - Remedial Pattern

Description:
Parks and other public spaces can be important cool commons in the evenings, when the heat of the day starts to dissipate from the public domain and when it becomes cooler outside than in the home. Well-known examples of night-time commons include night markets, festivals and outdoor film screenings, all of which tend to be concentrated in urban centres. As our summers get longer and hotter, the principle of the night-time commons needs to be adopted more widely in an overall strategy of rethinking how we use our local environments.

This pattern explores night-time commoning as a cooling strategy. An important infrastructure that can be activated as night-time commons are public parks and swimming pools. These environments are already cool commons, but tend to close in the evenings, precisely at the time when they could best serve the community by providing a venue for socialising, swimming, dining or other community gatherings on a hot night.

Place-appropriate and engaging lighting is an important element in an overall cultural shift toward night-time commoning. It is an attractor for alternative park uses, to create ambience and promote safe wayfinding and play. An example is the Gates of Light art installation at Macarthur Heights, a park designed for stargazing. In addition to lighting, the activation of night-time commons are most successful when they provide signage, other communications and activation events to legitimise and raise awareness amongst the local community of the opportunities to use these spaces at night.

This is important as unlike Australia's regional neighbours, night-time commoning is unusual in Australia. This is where examples such as night markets, or community cookouts, can provide inspiration for activating parks at night.

A bridge underpass becomes a temporary location for a dance party. Photo: Roma Lopes

Bordeaux mirror (Miroir d'Eau) on a hot evening. Photo: Katherine Gibson

Gates of Light installation at Macarthur Heights. Photo: Landcom

Night-time film screenings are a highlight of summer in the city. Photo: Moonlight Cinemas

Conditions:

Enablers:

- Increasing urban heat and the dangers of UV radiation (the Cancer Council for example recommends staying out of the sun between 11am and 3pm) create a need to explore the use of outdoor public spaces at cooler times of the day.
- Night lighting, as well as provision of public drinking water and public amenities, are important supportive infrastructures.

Constraints:

- A challenge for night-time commoning might be that features of the day park, such as permanent shelter and shade fixtures, could create safety and visibility issues, and inhibit some night-time uses, such as star gazing.
- The impact of noise on surrounding residential neighbourhoods may also need to be addressed.

Commoning Analysis:

Access: The space used for this common is accessible in the same way that it would be during the day time and by the same people.

Use: Technical management could be entrusted by local government to community of commoners if the use is different to the typical daytime use.

Benefit: The common provides cool spots in open space to those people who have free time during the evenings.

Care: The site is maintained per the standard daytime program however the commoning community and any contractors (i.e. cinema, food trucks etc.) must manage additional wear and tear to the common.

Responsibility: The common is governed by the asset or land owner and the commoning community would need to regulate their own behaviour and safety.

Ownership: The ownership does not change from the day time structure.

A commoning concern related to the socially-activated night time space could be managing noise for surrounding residents not using the park (for example shift workers). If use involves cooking, this could also means issues with smells. This might be ameliorated with designing dedicated events for quieter usage or determining times for noisier events like markets or films by a community scheduling tool or poll. Night-time commons needs to be designed co-operatively with the communities who will use them to address these commoning concerns.

Related Patterns:

Signage; Temporary use; Outdoor cooking; Street Parties and Fetes.

References and Resources:

'Cities alive: lighting the urban night-time': https://www.arup.com/perspectives/cities-alive-lighting-the-urban-night-time

'New community lights up Macarthur': https://www.landcom.com.au/news/media/new-community-lights-up-macarthur/

Industry Initiated Post-Occupancy Learning

Context:
Post-occupancy Phase - Remedial Pattern

Description:
Post-occupancy studies led by developers, landowners or local authorities elicit feedback from the community and evaluate the satisfaction with a community's design, initiatives or interventions – as experienced by the users. This pattern emphasises the importance of learning from community or residents, which is critically important to create liveable and sustainable places by identifying emerging issues and opportunities for commoning, and feeding back into planning and delivery processes as a form of 'continuous improvement' and lifecycle planning.

The success of cooling commons (e.g. improvements in surface or ambient temperatures, or other measures of success) can be tracked through citizen science projects recording local weather and aspects of environmental change. This is a form of post-occupancy learning. Retaining collected data in an accessible location online or local physical location (e.g. library), and collaborating with partners such as Bureau of Meteorology, CSIRO or Collaborative Research Centres, would enable a deeper data set for place-based learning and identification of what local conditions create the greatest cooling outcomes.

An example of community-collected data would be an adopt-a-tree program, where residents 'adopt' a young local tree planted by council and take responsibility for monitoring its health as it grows and reporting that information back to the council.

An example off landowner initiated learning is the annual Landcom Healthy & Inclusive Places Survey (HIPS). HIPS is a post-occupancy survey that collects a range of focussed metrics as well as descriptions of a range of lived experiences from the community while a development is in delivery through to post occupancy phase. The results of the HIPS are shared with the community in addition to the Landcom business and development's project team to inform shifts or pivots in the community's delivery.

The flexibility of the HIPS is key to capturing appropriate information that can be used to drive positive changes to future stages of that Landcom community or inform how commons could be enabled at an entirely new Landcom development which is in the planning phase.

Measures of success for this pattern are maximising the number of responses to post-occupancy data collection, ensuring a representative sample for each community, tracking performance of metrics over time, and whether appropriate community feedback is incorporated into the development project.

Citizen science: Measuring hail stones (ABC, 2018)

Young trees in a new residential development.
Photo: Abby Mellick Lopes

Creative Mapping workshop identifying 'landmarks' in a known place and 'aspirational commons' (Armstrong, 2008; Mellick Lopes et al., 2016) can help to identify where unpleasant hotspots are located within a community based on lived experiences. Photos: Helen Armstrong

Where does my cat go?
Rusty the cat with GPS tracker (ABC, 2018) can identify where pets seek refuge on extreme heat days.

Conditions:

Enablers:

- Landcom's stated commitment to stakeholder engagement, continued learning and improvement in engagement practice, in the Join-in Protocol.
- Engagement Evaluation and Stakeholder Risk Framework.
- Landcom's Healthy & Inclusive Places Survey broadly captures 'satisfaction' with community elements that can include cooling commons specifically.
- Leveraging interest in citizen science for fine grain environmental monitoring through community development and placemaking initiatives.

Constraints:

For landowners that do not have a robust engagement framework:

- Existing approaches to community engagement oriented to: project delivery; forward planning or 'visioning'; short-term and front-end engagement events. Conversely, post-occupancy learning is about lived experience.
- Access to tools to measure and capture information, experiences and practices will need to be managed.
- Formalised pathways to loop post-occupancy learning back into project planning will need to be developed.

Commoning Analysis:

Access: Collection of contact information for local community members, in order to encourage their participation.

Use: Developers, councils and other community delivery agents with the ability to analyse datasets, and make future adjustments to community infrastructure or services.

Benefit: Greater insights into the lived or community experience of residents and users of a place.

Care: Privacy of data.

Responsibility: After seeking engagement feedback, it is important to loop back and share the data with participants.

Ownership: Clear terms and conditions of participating in post occupancy learning surveys or similar, is essential and will vary from project to project. Basic legal advice is recommended.

Related Patterns:
Community Library; Community Governance; Welcome Protocol; Multi-use Community Centre; Signage; Succession Planting.

References and Resources:
Citizen Science Urban Microclimate Project, www.citizensciencepproject.org.au

ABC. 2018. https://www.abc.net.au/news/2017-12-30/citizen-science-projects-you-can-do-this-summer/9279112

AHURI. 2018. *Housing for people with disability: evidence review of post occupancy evaluation instruments:* https://www.ahuri.edu.au/__data/assets/pdf_file/0023/18680/Housing-for-people-with-disability-evidence-review-of-post-occupancy-evaluation-instruments.pdf

(2008) Mellick Lopes, A., Gibson, K., Crabtree, L., Armstrong, H. (2016). *Cooling the Commons*. Institute for Culture and Society, Western Sydney University.

'Randwick City Council Adopt a Street Tree Program': http://www.randwick.nsw.gov.au/__data/assets/pdf_file/0017/23165/Adopt-a-Tree-Program.pdf

Armstrong, H. (2008) 'Creative Community Mapping', in Sofoulis, Z., Armstrong, H., Bounds, M., Lopes, A., & Andrews, T. (2008). *OUT & ABOUT IN PENRITH: Universal Design and Cultural Context: accessibility, diversity and recreational space in Penrith*, report for Penrith City Council and UWS, pp 30-45.

'IAP2 Australasia': iap2.org.au

'Intergenerate Living Lab': https://www.intergener8-livinglab.com *Institute for Culture and Society, Western Sydney University.*

'Landcom Join-in Engagement Charter, Protocol', Resources: www.landcom.com.au/approach/stakeholder-engagement

University of Westminster. 2006. 'Guide to Post Occupancy Evaluation. London, UK': *Higher Education Funding Council for England (HEFCE),* http://www.smg.ac.uk/documents/POEBrochureFinal06.pdf

Photo: Hermann Ruiz.

Appendix 2 - Workshop 1

NOVEMBER 7, 2018

Cooling the Commons

The Cooling the Commons Pattern Deck will assemble patterns for living well in a hot city: Recurring spaces, built forms, social and governance practices.

Stage 1: Review of Literature and Cases

Stage 2: Site visits and Student Projects 1 (Macarthur Heights) & 2 (Green Square)

Stage 3: Workshops to share outcomes and collaborate on Pattern Deck

What are 'the Commons'?

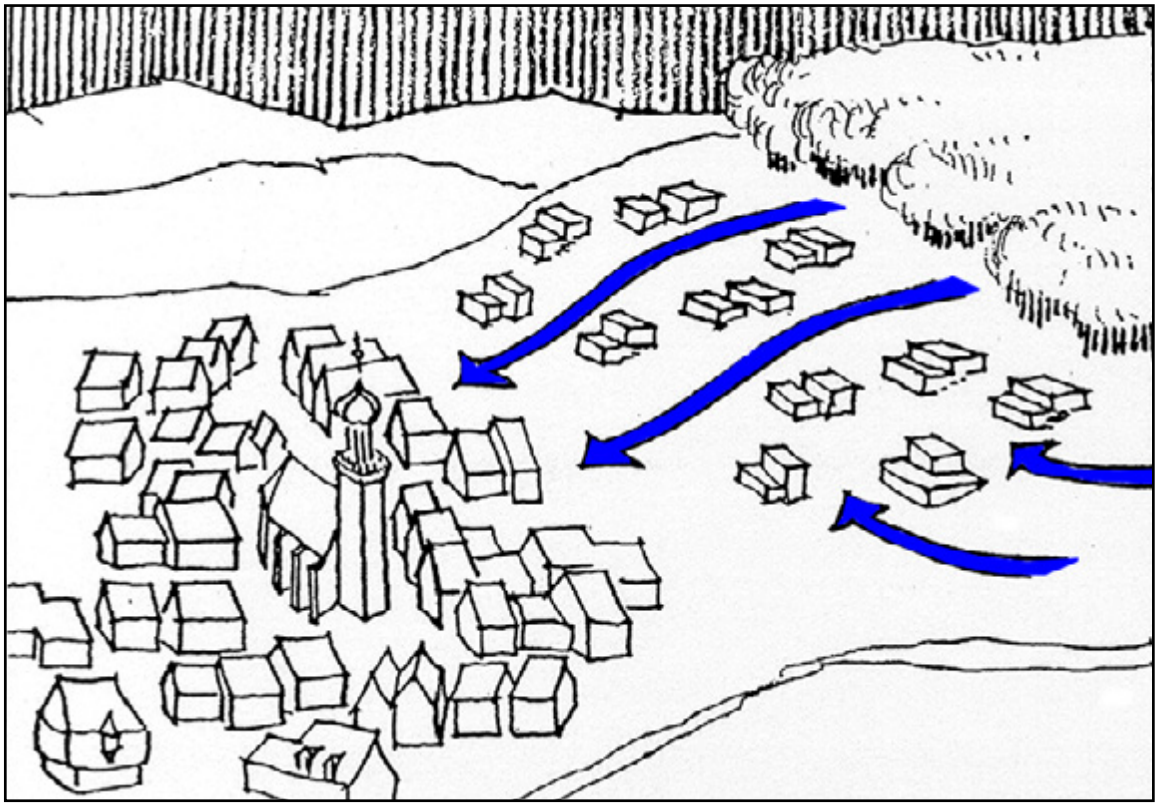
- Commons are places, resources, practices and knowledges shared (and cared for) by a community. (Gibson-Graham, Cameron & Healy, 2013)
- Commoning involves establishing patterns and conventions for...
  - Access
  - Use
  - Benefit
  - Care
  - Responsibility

...that take into account the wellbeing of others. (Gibson-Graham, Cameron & Healy, 2016)

Case study: Stuttgart, coolest city in the world

- Local Area Climate Atlas
- Local Environment Office
- Ventilation corridors
- Construction bans at strategic locations
- The ‘Green U’
- Green infrastructure investments
- Neckar river cycle path
- All large trees protected in city centre

The ‘Green U’. Source: Rehan, R. M. (2016)

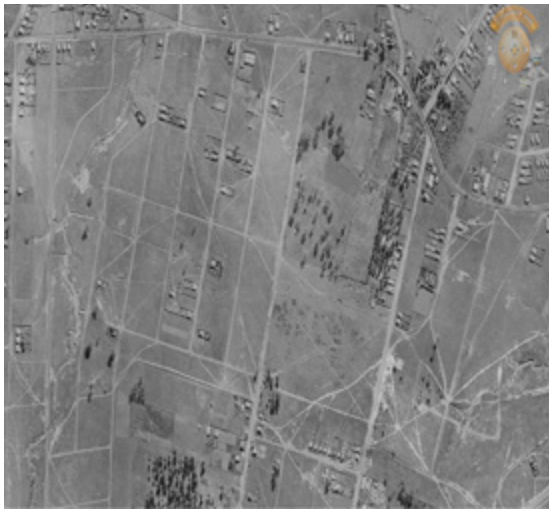


Permeable hillside development. Source: Rehan, R. M. (2016)

Designing in time

Broadway Sydney in 1943

Broadway Sydney today



Penrith in 1943

Penrith today

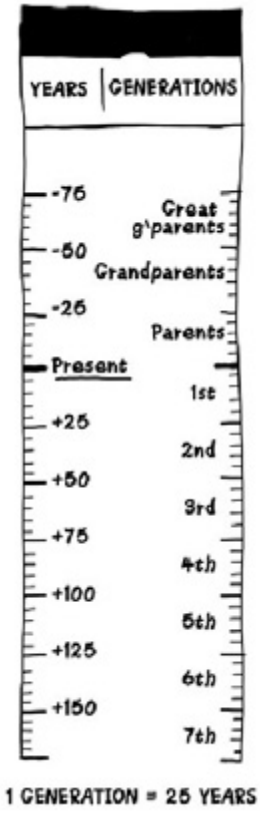
Source: https://six.nsw.gov.au

How would you define ‘now’?

‘Now’ is the period in which people feel they live and act and have responsibility... for many non-western cultures including Australian Aboriginal people, ‘now’ is (at least) seven generations back and forward (350 years)

Long Now Foundation

- A Commons Yardstick helps introduce a new ethic of designing in time.
- How can we design a plan to enable cool commoning for the long now?

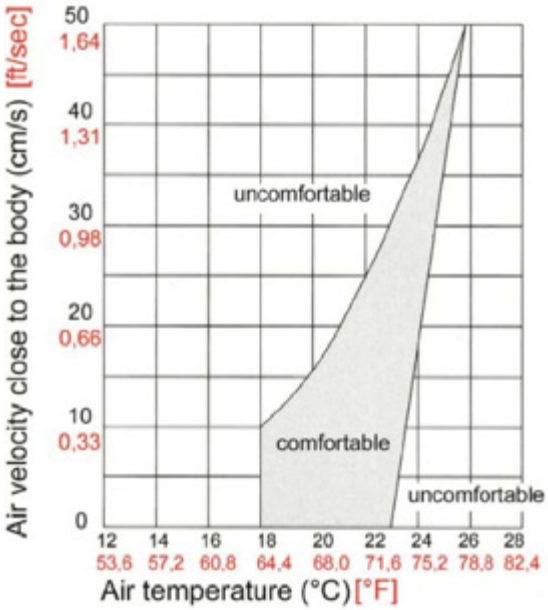


Commons Yardstick. Source: Gibson, K., Cameron, J. & Healy, St. (2016). Commoning as a postcapitalist politics.

Cooling the Commons

Commons Cooling Example:

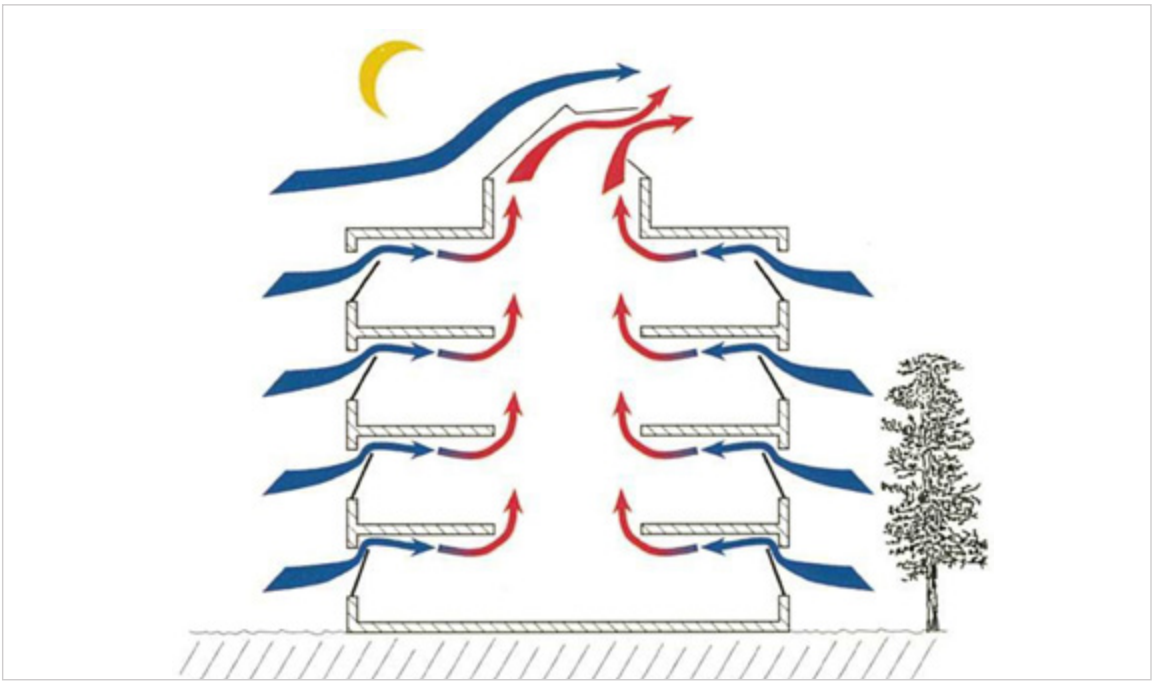
- Prevailing Wind
- Natural Ventilation
- Site Planning and
- Building Design

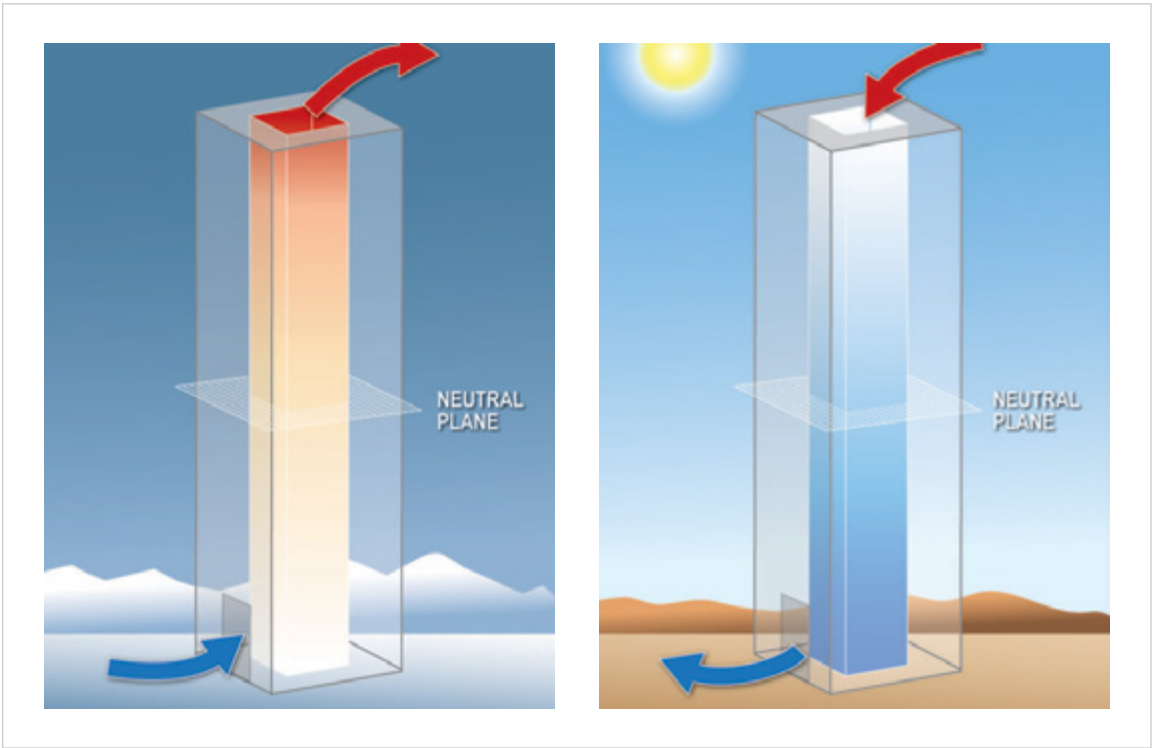


Comfort zone based on air velocity and temperature.
Source: Kang, B. & Lutz-Carillo, S. Indirect / Passive Air-Flow Systems, The University of Texas at Austin.

Prevailing Wind Natural Ventilation

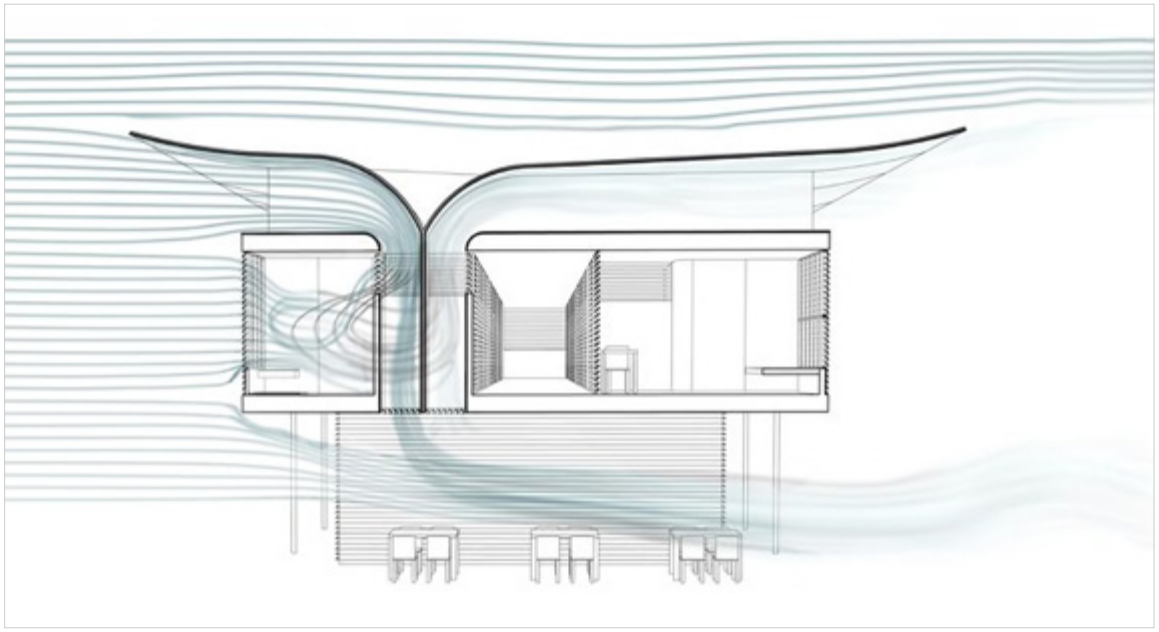
Stack effect



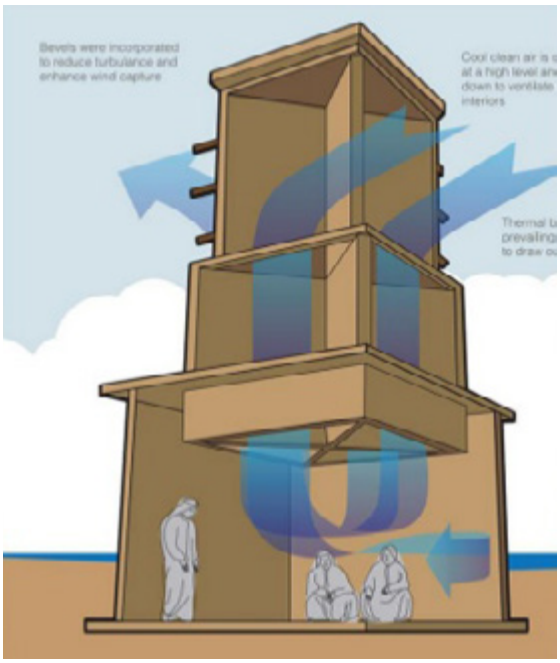


Source: https://www.cppwind.com/get-to-know-a-flow-feature-the-stack-effect/

Wind scoop

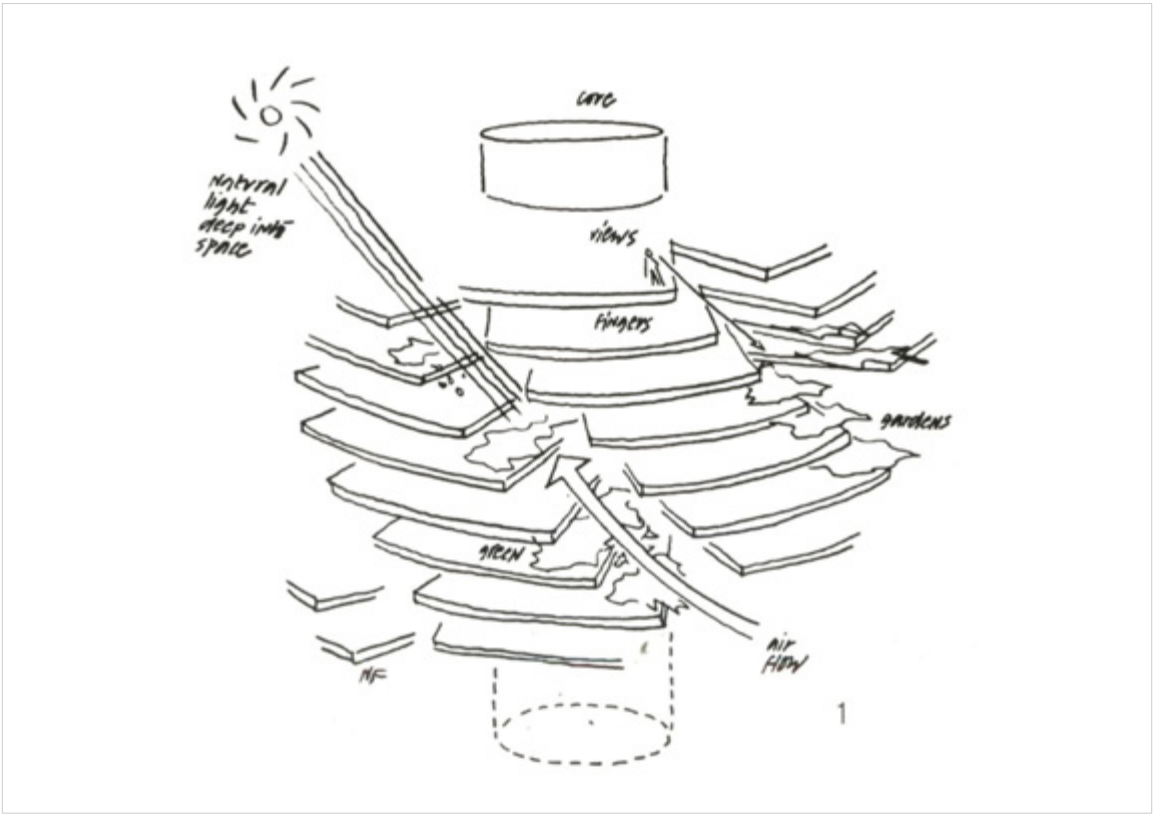


Source: Michler, A. (2011). Zoka Zola's Naturally Cooled Bamboo Hostel is a Giant Wind Scoop, inhabitat.com



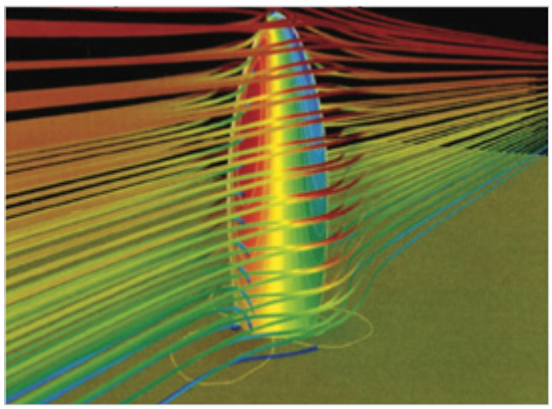
Source: https://www.irantour.tours/iran-blog/what-to-see-in-iran/windcatcher-the-engineering-masterpiece-of-the-desert-people.html

Wind acceleration to create pressure differentials



Atrium Diagram for the Spiral Ventilation Shaft.
Source: Kang, B. & Lutz-Carillo, S. Indirect / Passive Air-Flow Systems, The University of Texas at Austin.

The speed of the air moving around the building is increased as it moves around the cylindrical profile which creates higher pressure differentials, thus greater 'potential' for the use of natural ventilation. Computer simulations of air flow over a 3-D model were then used to fine tune the shape of the building.



Air-flow simulation. Source: Kang, B. & Lutz-Carillo, S. Indirect /

Beware Wind Tunnels

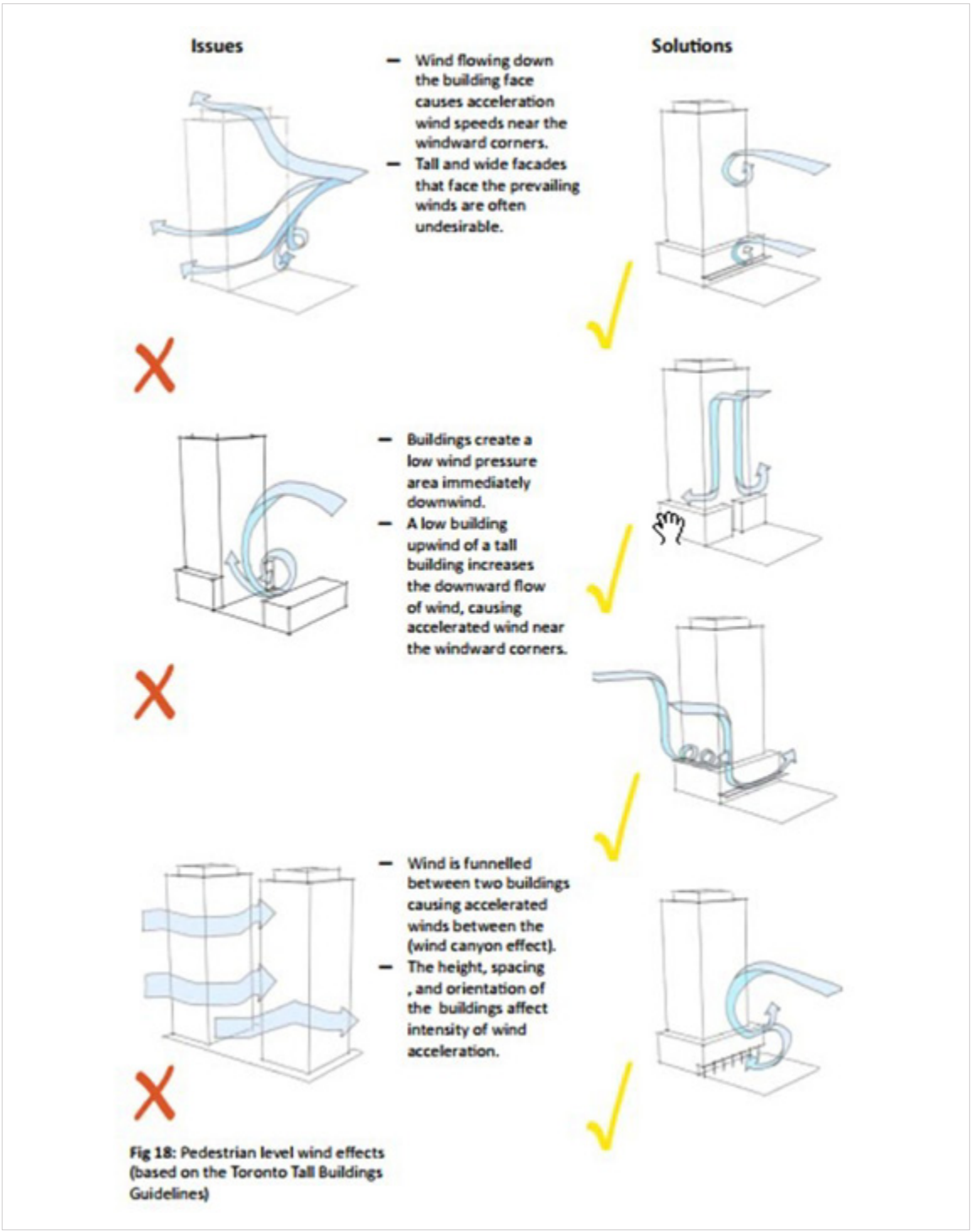
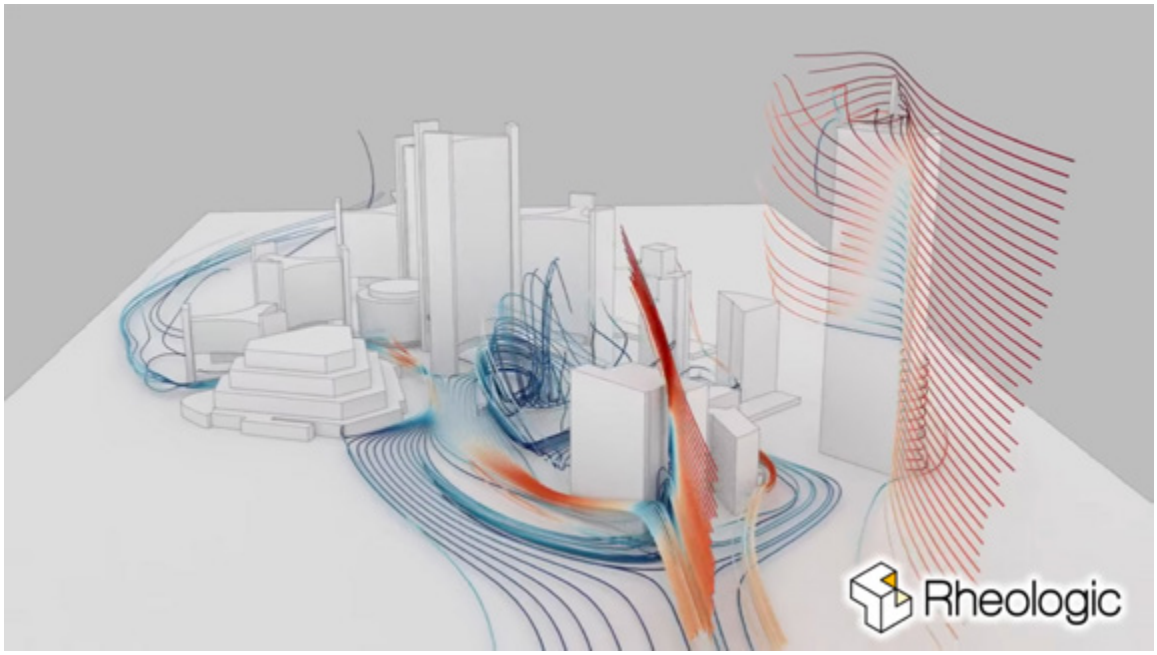


Fig 18: Pedestrian level wind effects (based on the Toronto Tall Buildings Guidelines)

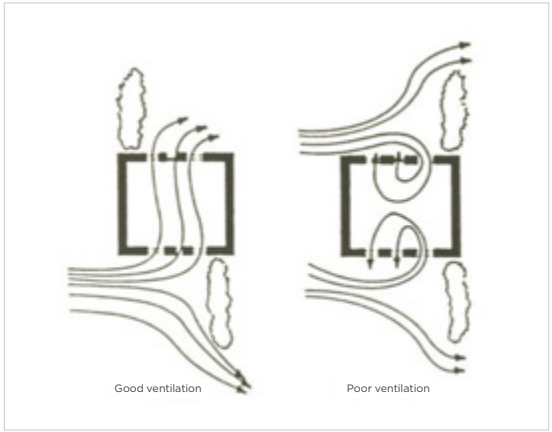
Source: Bristol City Council (2018). Urban Living SPD, Consultation draft.

Beware Wind Tunnels (cont'd)

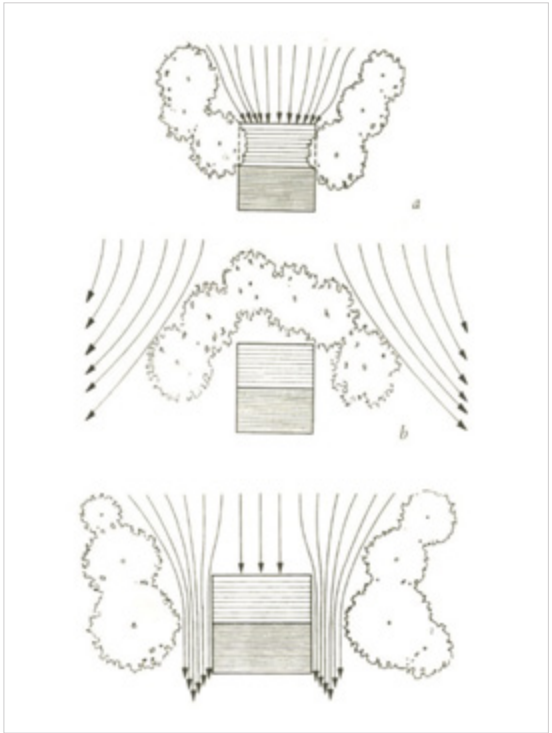


Source: https://rheologic.net/en/urban-wind-assessment

Commons Issues (from landscaping or proximal buildings)



The effect of hedge positioning on the airflow pattern through a building. Source: Kang, B. & Lutz-Carillo, S. Indirect / Passive Air-Flow Systems, The University of Texas at Austin.

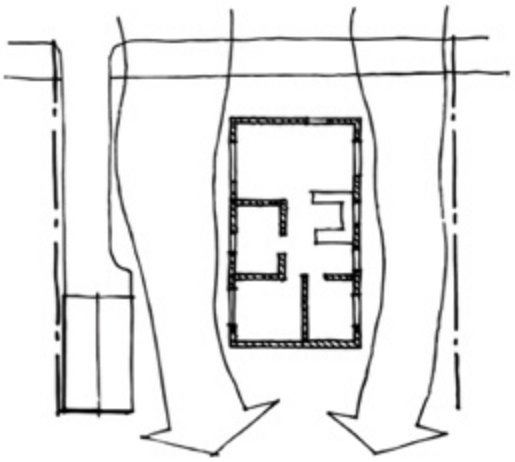


Narrowing of spacing between windbreaks and a building to accelerate the airflow. Source: Kang, B. & Lutz-Carillo, S. Indirect / Passive Air-Flow Systems, The University of Texas at Austin.

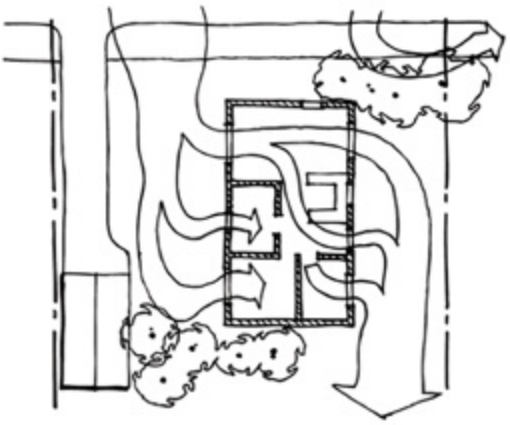
Commons Issues (from landscaping or proximal buildings) (cont'd)

Australian Government | YourHome
Australia's guide to environmentally sustainable homes

Introduction | Before you begin | Passive design | Materials | Energy | Water | Housing | Case



Prevailing breeze flows past house



Dense tree planting deflects breeze through house

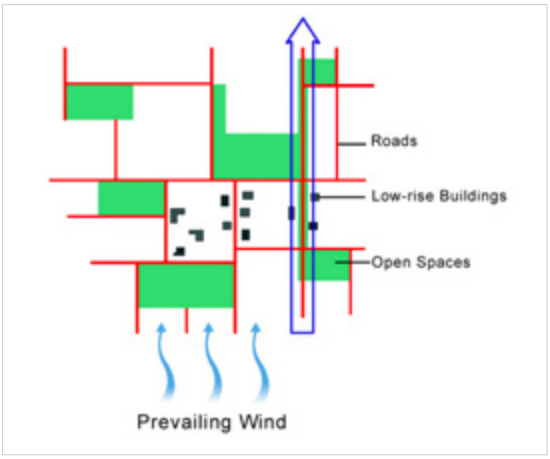
Source: Australian Home Builder Guide: https://www.yourhome.gov.au/passive-design/orientation

Hong Kong Planning Standards and Guidelines; Chapter 11: Urban Design Guidelines

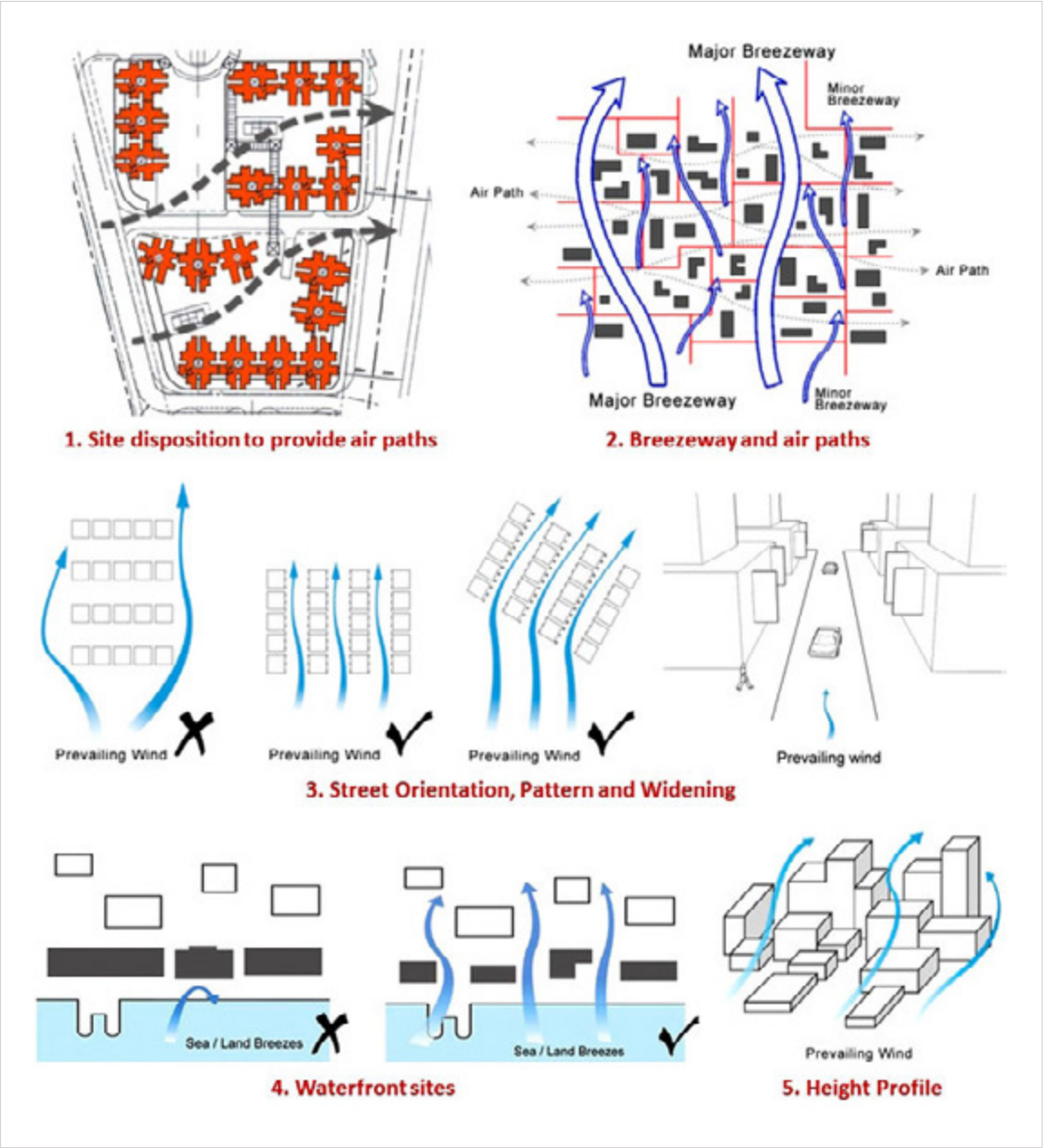
'Breezeways should be created in forms of major open ways, such as principal roads, inter-linked open spaces, amenity areas, non-building areas, building setbacks and low-rise building corridors, through the high-density/high-rise urban form. They should be aligned primarily along the prevailing wind direction routes, and as far as possible, to also preserve and funnel other natural air flows including sea and land breezes and valley winds, to the developed area'.

Source: Hong Kong Planning Standards and Guidelines.

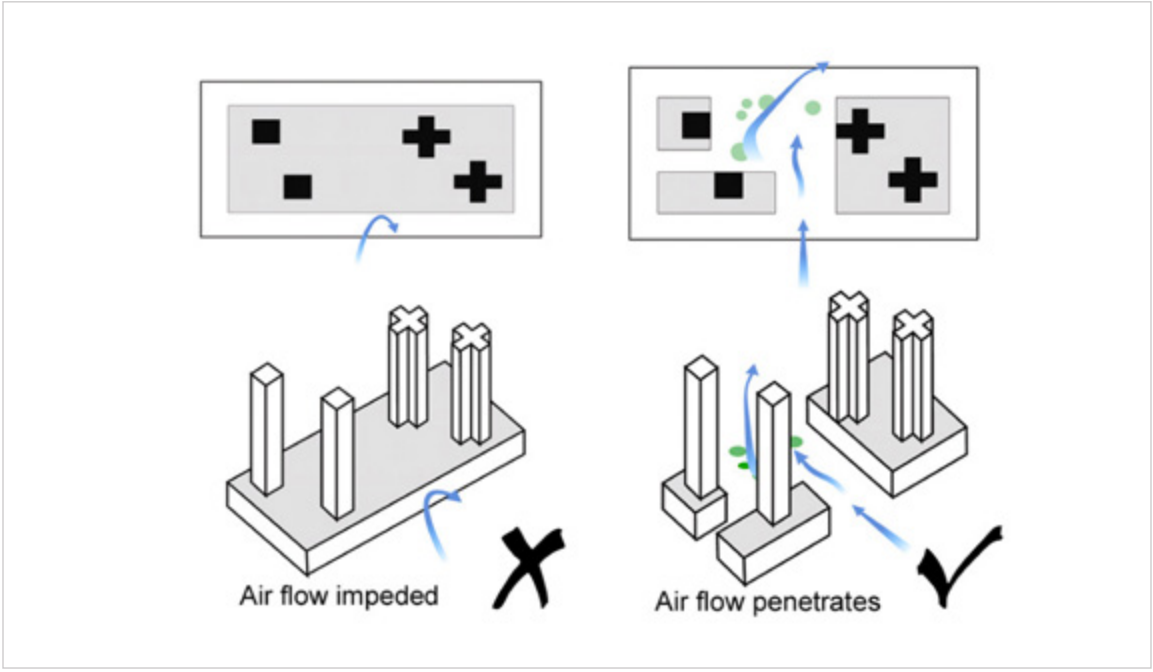
Major breezeways.
Source: Hong Kong Planning Standards and Guidelines.



Linkage of roads, open spaces and low-rise buildings to form breezeways. Source: Hong Kong Planning Standards and Guidelines.



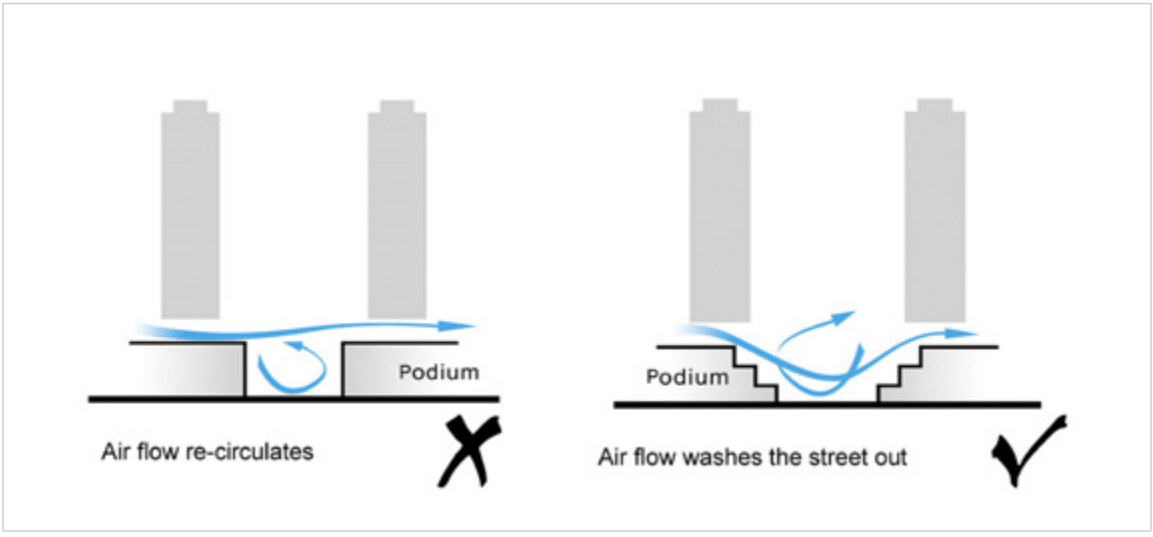
Qualitative guidelines in the Hong Kong Planning Standard and Guidelines for safeguarding air ventilation and microclimate at site level. Source: Planning Department of Hong Kong, 2019.



Reducing Site Coverage of the Podia to Allow More Open Space at Grade.
Source: Hong Kong Planning Standards and Guidelines.

'Where appropriate, a terraced podium design should be adopted to direct downward airflow to the pedestrian level (see [below])'.

Source: Hong Kong Planning Standards and Guidelines.



Terraced Podium Design. Source: Hong Kong Planning Standards and Guidelines.
Source: Hong Kong Planning Standards and Guidelines.

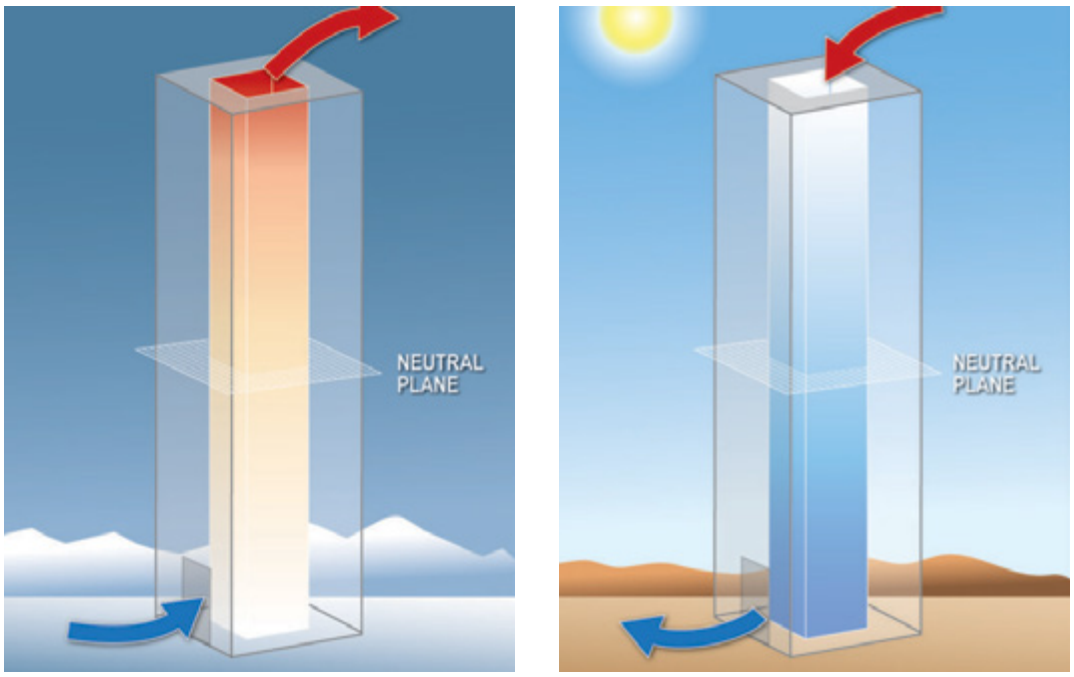
‘Projecting obstructions over breezeways/ air paths should be avoided to minimise wind blockage. For urban canyons, massive elevated road structures aligned by tall buildings which could create air stagnant spaces below should be avoided. Projecting signboards should be vertical type instead of horizontal type, especially in areas with high pedestrian activities (see [below])’.

‘Cool materials, which are characterised by high solar reflectivity and/or high emissivity, should be used in the pavements, streets and building façades to decrease absorption of solar radiation. For streets, the use of asphalt with a high percentage of white aggregates should be considered. Cool sinks like trees and water body should also be provided, where appropriate’.

Projecting Signboards should be Vertical Type instead of Horizontal Type
Source: Hong Kong Planning Standards and Guidelines.

Commons Issues re: Social Interaction?

Ways of affording collegiality without Rules and Surveillance



Source: https://www.cppwind.com/get-to-know-a-flow-feature-the-stack-effect/

Exercise 1. High Density Stack Building. How do we address commons issues in a high density building designed to channel wind and ventilation indoors? Ideas and issues from participants.

How to counter effects of sound and smell?

- Misting and spray outside
- Acoustic treatments, sound columns
- Educating inhabitants on how to use the building
- Governance needs to be considered.
- Smart building systems, data collection points, al-fresco dining as part of community activities
- Green roofs, green walls, shared atriums
- Taking activities outside the building, hybrid spaces, circulation spaces – cooking outside
- Monthly community cookout, alfresco dining supporting communal cooperation
- Multiple cooling spaces, thinking of interstitial spaces
- Shared kids' hot office for homework
- Induction process – welcome books
- Changing business model where yield reduces but access to common facilities increases - so there is more opportunity to play with the spaces.

Night-time Park

How can we common the night-time park?

- Access
- Use
- Benefit
- Care
- Responsibility

Source: https://www.macarthuradvertiser.com.au/story/2620322/stunning-lights-illuminate-macarthur-heights/#slide=1

Source: photo by Helen Armstrong

Exercise 2: Main Ridge Park. Can we common the night-time park? Ideas and issues from participants.

- Barbeques, semi-structured activity, sport type of activities, you want to avoid floodlight, different type of furniture, water feature, night music, focused on children to attract children, sound is important, tiles, flat surfaces for skating, skateboarding.
- Designing for children, night time movement, night market- food or dessert, ice-cream trucks, a grassroots kind of approach, an organic kind of event. Doing it intermittently - Could be triggered by temperature. An accessible water feature.
- Positioning it so residents are not disturbed. Wind features, you can set up a wind feature, integrate it with public art?
- What kind of community organisation could facilitate this? Is it possible to have different organisations support different events? Starting with astronomy society.
- Suggestions from community hard at the design stage. It evolves at the moving in stage?
- Issues of liability can be taken at community level as well?
- Community organiser also looks at cooling as a specific responsibility. If cooling is connected to social
- An App can be developed for the local community where temporary equipment can be set up on short notice, pop-up cinema
- Issues of maintenance since council needs to look at operational costs

Photo: Hermann Ruiz.

Appendix 3 - Workshop 2

FEBRUARY 10, 2019

TEAM: Abby Mellick Lopes, Katherine Gibson, Emma Power, Stephen Healy, Louise Crabtree and Vanicka Arora Institute for Culture and Society WSU; Helen Armstrong Landscape Architecture, QUT and Cameron Tonkinwise Design, UTS.

Cool Commons...

are places, resources, knowledges and protocols that support accessible comfort and mobility for diverse communities, who are, ideally, engaged in the ongoing care and regeneration of those commons.

Game Plan

Activity 1:
Your stories about the heat

Activity 2 :
Your stories about commons-based cooling

Presentation:
On patterns

Activity 3:
Seeing problem patterns

Presentation:
Team presents the patterns

Activity 4:
You tell us the Pathways and Blockers

Activity 5:
Where do the patterns fit?

Stories about the heat

When were you last too hot?

Cooling the kids, St Marys. Photo: Helen Armstrong

Privatised coolth

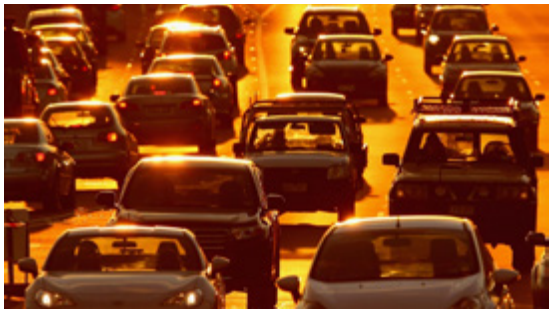
We spend **90%** of our time indoors, including in cars.

See *Human Ecology Review* Special Issue: Uncovering the Great Indoors

We are heading toward **50°C summer days** (that's air temperature, not surface temperature)

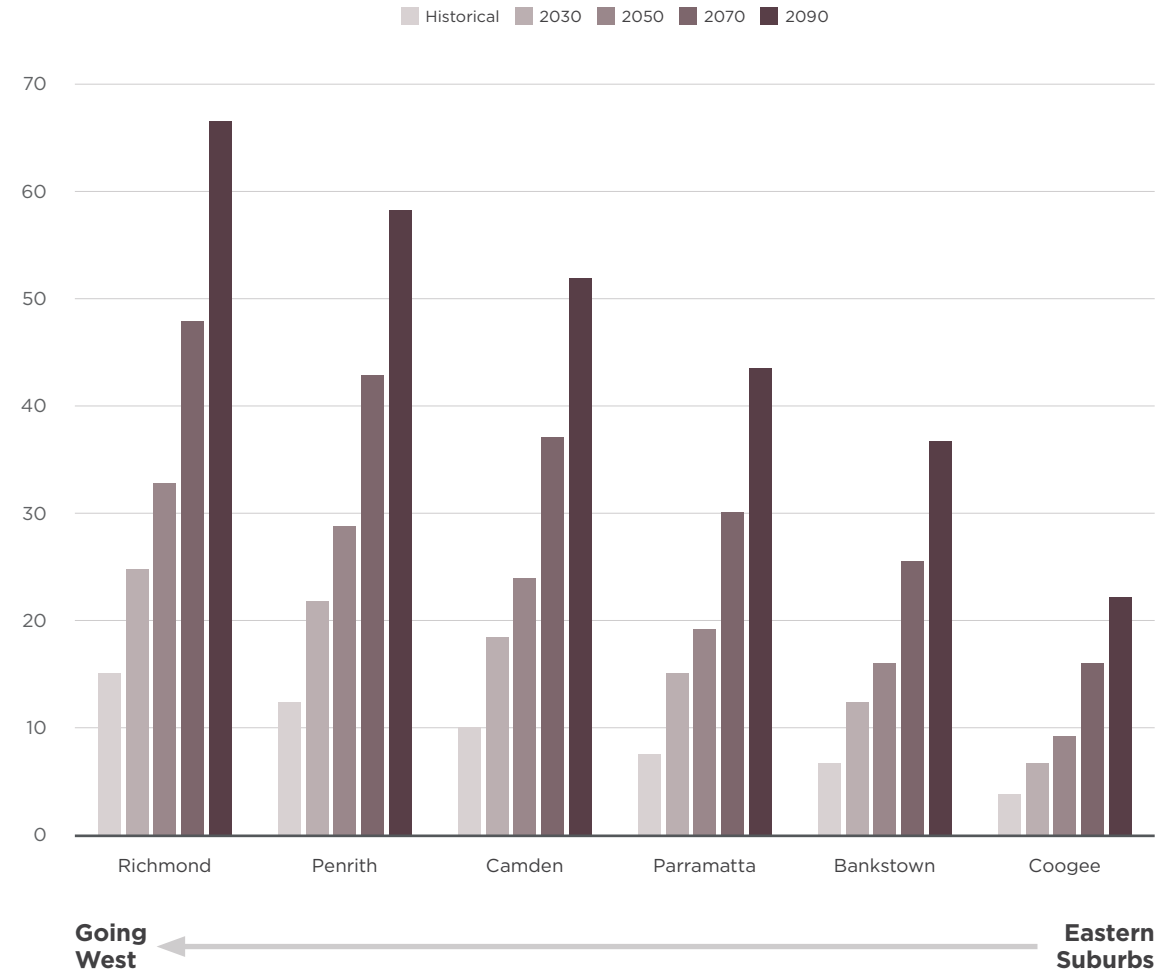
See Lewis et.al., *2017 Geophysical Research Letters*

Split-system air conditioning units on the façade of a residential high-rise in Kowloon, Hong Kong. Source: https://www.tugraz.at/en/tu-graz/services/news-stories/tu-graz-news/singleview/article/architektonische-loesungen-statt-klimaanlagen/



Sydney 'machine space'

Coming days over 35 degrees



Days over 35 degrees in selected locations (current policy scenario)
Source: Ogge et al., 2018

Diverse coolth & commons-based cooling

Tench Reserve, Penrith. Photo: Helen Armstrong

Bus shelter in Penrith. Source: CAPS study https://www.yoursaypenrith.com.au/25909/documents/72131

Photo: Abby Mellick Lopes

Source: Queenwood Sport's Twitter account.

Shaded pedstrian linkage. Photo: Abby Mellick Lopes

Patterns

- wider than Context-Specific Designs
- more concrete than Principles
- more than Rules-of-Thumb, less than Rules

Observed regular behaviours

- shared preferences
- social conventions, habits
- rituals

Lotus Line water sculpture by Fiona Foley
Photo: Helen Armstrong

Social Practices

Regularized constellations of

- places, things
- skills, know-how
- meanings, qualities

Source: https://www.randwick.nsw.gov.au/facilities-and-recreation/beaches-and-coast/beaches/coogee-beach

Affordances

The way things

- Attract
- Promise

particular kinds of interactions establishing a time-space nexus of

- Things
- Actions
- People

Source: https://m.indiamart.com/proddetail/ss-outdoor-designer-bench-14445065548.html

Designing patterns of coolth

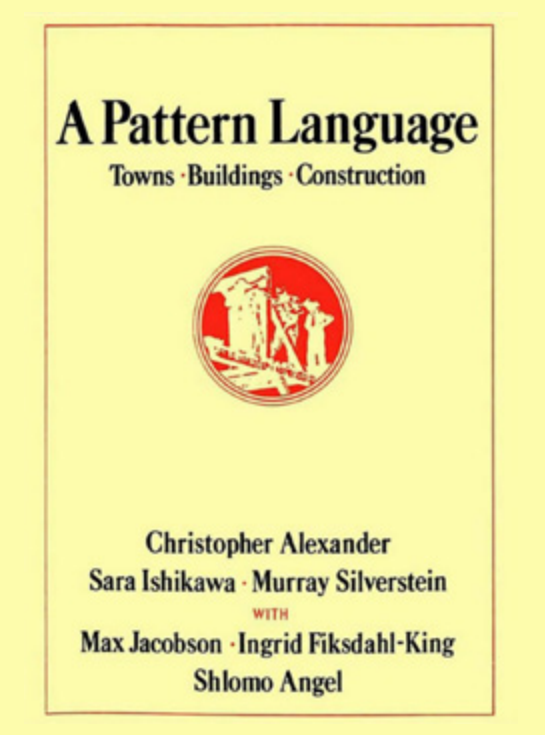
Designing things

Designing social practices

Nested patterns

Scale of Patterns

- Macro Urban Plan
- Meso Built Form
- Micro (Outdoor Rooms)



between the house clusters and work communities, allow the local road and path network to grow informally, piecemeal;

49. LOOPED LOCAL ROADS
50. T JUNCTIONS
51. GREEN STREETS
52. NETWORK OF PATHS AND CARS
53. MAIN GATEWAYS
54. ROAD CROSSING
55. RAISED WALK
56. BIKE PATHS AND RACKS
57. CHILDREN IN THE CITY

when the major parts of buildings and the outdoor areas have been given their rough shape, it is the right time to give more detailed attention to the paths and squares between the buildings;

119. ARCADES
120. PATHS AND GOALS
121. PATH SHAPE
122. BUILDING FRONTS
123. PEDESTRIAN DENSITY
124. ACTIVITY POCKETS
125. STAIR SEATS
126. SOMETHING ROUGHLY IN THE MIDDLE

1. INDEPENDENT REGIONS

within each region work toward those regional policies which will protect the land and mark the limits of the cities;

2. THE DISTRIBUTION OF TOWNS
3. CITY COUNTRY FINGERS
4. AGRICULTURAL VALLEYS
5. LACE OF COUNTRY STREETS
6. COUNTRY TOWNS
7. THE COUNTRYSIDE

give all the walls some depth, wherever there are to be alcoves, windows, shelves, closets, or seats;

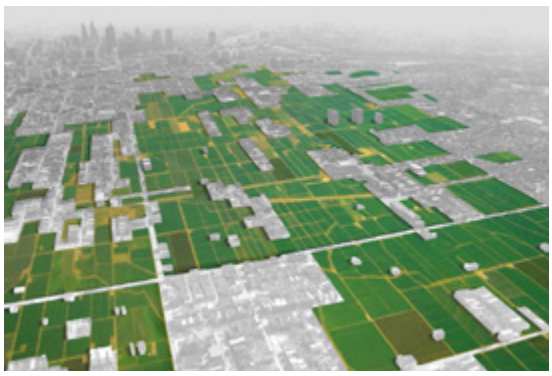
197. THICK WALLS
198. CLOSETS BETWEEN ROOMS
199. SUNNY COUNTER
200. OPEN SHELVES
201. WAIST-HIGH SHELF
202. BUILT-IN SEATS
203. CHILD CAVES
204. SECRET PLACE

The draft patterns

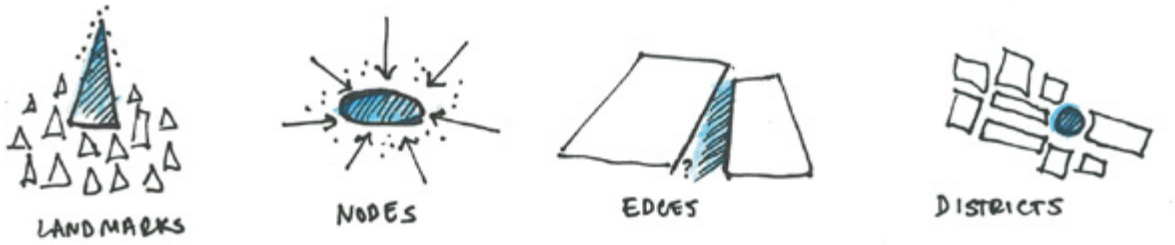
Source: Moonlight cinemas

Photo: Helen Armstrong

Source: https://www.cbc.ca/news/canada/ottawa/bayshore-park-community-oven-harvest-fair-1.3766293



Farmadelphia urban voids. Source: https://www.sightline.org/2009/07/17/filling-urban-voids-with-farms/



Source: Arup, Lighting in the urban age: https://www.arup.com/perspectives/publications/research/section/lighting-in-the-urban-age

Pathways and blockers

Good Idea!
Can be done now

What are the
Pathways?

What are the
Blockers?

Good idea!
Can't be done/
difficult to do

How can it
be done?

Describe
the blockers

What **artefacts** would
be needed to do it?

Appendix 4 - Building System Design: Material Lifespans

Building system design can be understood as designing in and with time. The durability and lifespan of different materials need to be taken into account during the design phase to ensure these are not diminished due to poor design.

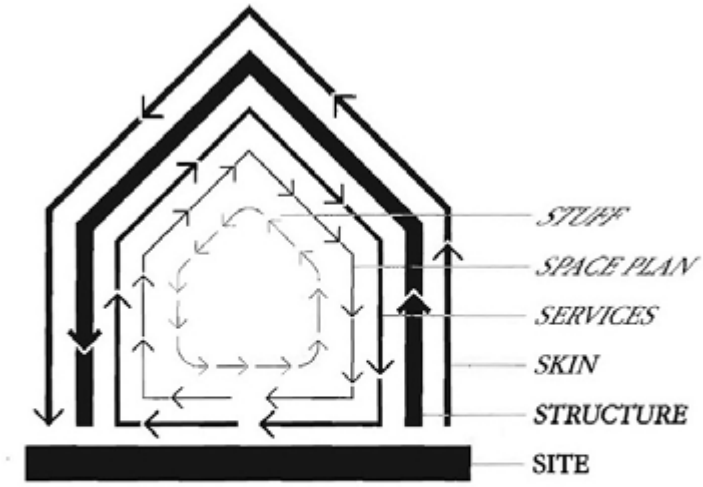
In addition, changed environmental conditions such as an increase in extreme weather over the expected life of a building needs to be considered, as light, heat, moisture and wind all effect the durability of materials. Implicit in the determination of material lifespans according to the Australian Building Codes Board (ABCB) is an expectation of regular maintenance and 'that there will be no unusual events such as a large earthquake' (ABCB, 2015, p.3). More subtle and incremental forms of damage should also be watched for and documented during a building's life. A detailed consideration of the impact of 'environmental agents' that may degrade a building, including those 'that will be relevant only after the product is in use' is required, and may modify the timeframes given below. This would include new composites and 'advanced cool materials' (Santamouris et al., 2011). For further information see Senate Report: Current and Future Impacts of Climate Change on Housing, Buildings and Infrastructure (Commonwealth of Australia, 2018).

According to the Australian Building Codes Board:

Expected Durability of residential building in Australia	50 years
Design life for components or sub systems readily accessible and economical to replace or repair	5 years
Design life for components or sub systems with moderate ease of access but difficult or costly to replace or repair	15 years
Design life for components or sub systems not accessible or not economical to replace or repair	50 years

Source: https://www.abcb.gov.au/Resources/Publications/Education-Training/Durability-in-Buildings-including-Plumbing-Installations

Reinforced Cement Concrete	50-100 years
Timber frames and timber products	Varies according to system and timber
Bricks and cement mortar	100 + years
Glass	20 -30 years
Metal roofing	30-50 years
Terracotta roofing	30-50 years
Asphalt	15-20 years
Metal cladding	10-15 years
Slate roofing	Composite: 30 years Natural: 100+ years
Paints and varnishes	3-7 years



SHEARING LAYERS OF CHANGE. Because of the different rates of change of its components, a building is always tearing itself apart.

'Shearing layers of change': a view of a building in time (Brand, 1994, p.13)

Reference: Brand, S. (1994). How Buildings learn: What happens after they're built. New York: Penguin

Appendix 5 - Cooling the Commons Media 2018 -2019

2019

Abby Mellick Lopes and Cameron Tonkinwise, 'Keeping the city cool isn't just about tree cover – it calls for a commons-based climate response', *The Conversation* 17 September.

2SER interviewed Dr Abby Mellick Lopes on the impact of increasing heat in western Sydney and the need for sustainable design solutions, 30 May.

Alternative Media Group covered the Rethinking the Urban Forest conference and quotes Dr Abby Mellick Lopes on urban heat and inequality, 29 May. City Hub quoted Dr Abby Mellick Lopes on dealing with increasing temperatures and how to 'cool the commons', 30 May.

Alternative Media Group mentioned that Dr Abby Mellick Lopes will speak on the heat island effect and mindful design practices at the Rethinking the Urban Forest Conference, 22 May.

Dr Abby Mellick Lopes was interviewed by **2SER** on the Cooling the Commons research, focusing on spatial inequalities in Sydney, 25 April.

ABC Radio National interviewed Dr Louise Crabtree about different ways of cooling the home, the effects of relying on air conditioning in the heat, and urban design solutions, 23 February.

702 ABC Sydney (syndicated nationally across the ABC radio broadcast network including 666 ABC Canberra, ABC Coffs Coast, 1233 ABC Newcastle, ABC Illawarra, 666 ABC Canberra, ABC New England North West, ABC Mid North Coast, ABC South East NSW, ABC Central Coast, ABC Riverina, ABC Central West NSW, ABC Western Plains, ABC Upper Hunter, ABC North Coast NSW) interviewed Dr Abby Mellick Lopes about helping urban areas cope with rising temperatures, 20 February.

Further coverage of the Institute for Culture and Society's Cooling the Commons research with Dr Louise Crabtree being interviewed by **The Sydney Morning Herald** on the effects of extreme heat and a reliance on air-conditioning to keep cool (also published in **The Age, The Canberra Times, Brisbane Times, WA Today,** *The Sun Herald*). 9 February.

SBS News, ABC News (republished on **WeatherZone), 4BC 1116 News Talk, Eagle FM, FIVEaa, 2SM, 2BH 567AM, Architecture & Design, The New Daily, Phys.org, The Fifth Estate, Pedestrian TV, Blue Mountains Gazette** and *The District Reporter* featured research from the Institute for Culture and Society's Cooling the Commons project with Dr Louise Crabtree discussing how rising urban heat, a reliance on air-conditioning and lack of cool public spaces are leading to social isolation and sedentary lifestyles, 24-4 February.

Dr Abby Mellick Lopes was quoted in **GetSydney** on the design of buildings and public space in relation to urban heat, 18 January.

Tips by Dr Abby Mellick Lopes and Dr Louise Crabtree on keeping cool in summer were published in the **Hawkesbury Gazette**, 9 January.

2018

Dr Abby Mellick Lopes was interviewed for **Domain's article** 'Ditch the Aircon: Finding a New Way to Keep Cool in Australia's Increasingly Sweaty Cities', 20 December. Also published on **Allhomes**.

Dr Abby Mellick Lopes discussed the importance of new ways of designing material and social environments that create comfort, neighbourliness and affordability in **Climate Control News**, 18 December.

Architecture & Design quoted Dr Abby Mellick Lopes on the effects of building and public space design on urban heat, 18 December.

Sydney Scoop quoted Dr Abby Mellick Lopes and Dr Louise Crabtree on the social impact of urban heat, sharing tips for keeping cool this summer, 17 December. Related coverage in **GetSTEM**, **GetSydney**, and **The Fence**.

Dr Abby Mellick Lopes and Professor Cameron Tonkinwise were interviewed for **The Fifth Estate** regarding how social and built environment strategies can help to cool the commons, 27 November. The article covers the Co.Lab 2018 gathering in Parramatta, hosted by Landcom and UrbanGrowth NSW Development Corporation.

Cooling the Commons Presentations and Publications

Mellick Lopes, A. and Healy, S. 'Cultivating the Habits of Coolth'. *City Habits Workshop*, Western Sydney University, Nov 6-7, 2019.

Mellick Lopes, A. and Tonkinwise, C. 'Cooling the Commons'. *Guest lecture in Thermal Architecture program at UTS*. August 20, 2019.

Mellick Lopes, A., Armstrong, H., Crabtree, L., Gibson, K., Healy, S., Power, E., Tonkinwise, C. 'Cooling the Commons. Rethinking the Urban Forest Cross-Sector Conference'. *Addison Road Community Centre*, Sydney, May 24.

(see sketch note of the panel this presentation was a part of, on page 110 of the report)

Crabtree L, Mellick Lopes A, Armstrong H, Gibson K, Healy S, Power E and Tonkinwise C (2019) 'Cooling the Commons'. *NSW Geography Teachers' Association Annual Conference – Innovation and Sustainability panel*, Sydney, April 2.

Healy, S. (2019). 'Diverse Economies, Design Futures and Unmaking Unsustainability'. Session: Design for Teaching Other Worlds. Theme: Engaging Change in Turbulent Times. *Meeting of the Society for Applied Anthropology*, Portland, Oregon, March. Podcast 20: https://www.appliedanthro.org/annual-meeting/podcast-project/2019-podcasts

Mellick Lopes, A., Healy, S., Power, E., Crabtree, L., Gibson, K. (2019), 'Infrastructures of care: opening up "home" as commons in a hot city', *Human Ecology Review*, vol.24, no.2.

[Cited in Healy, S. & Gibson-Graham, JK. (2019) Fred Block, capitalist illusions, and inhabiting postcapitalist desires. 'Environment and Planning A; Economy and Space'. 51(5), 1181-1185]

Crabtree, L., Mellick Lopes, A., Armstrong, H., Gibson, K., Healy, S., Power, E. and Tonkinwise, C. (2018) 'Cooling the Commons: A university-government collaboration on urban cooling'. *Routes to Sustainability Symposium – Cultures and Practices of Local Sustainability: Intersecting Multiple Footprints and the Environmental Humanities*, Chile, Dec 11-14.

Mellick Lopes, A., Healy, S., Armstrong, H., Crabtree, L., Gibson, K., Power, E. and Tonkinwise, C. (2018) 'Cooling the Commons'. *Co.Lab. Landcom and Urban Growth*, Parramatta, November 22.

Cooling the Commons coursework

Associate Professor Louise Crabtree coordinated Student Project 1 as part of the Master of Planning, Western Sydney University, Semester 2, 2018. Repeated in Semester 2, 2019.

Professor Cameron Tonkinwise coordinated Student Project 2 as an interdisciplinary design studio in the design program at UTS in February 1019, with guest presentations from Abby Mellick Lopes and Vanicka Arora.

Dr Abby Mellick Lopes developed a design brief entitled ‘Feel the Heat’ based on Cooling the Commons research, as part of the unit Social Design (Bachelor of Design [Visual Communications]) in Semester 1, 2019.

Addison Road Community Centre Organisation Presents
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