Experiencing and Responding to Everyday Weather in Darwin, Australia: The Important Role of Tolerance

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ABSTRACT

Climates are changing, yet the everyday implications for societies and cultures are unclear. Until recently, weather and climate (change) have been largely represented quantitatively and discussed at broad spatial and social scales. Qualitative weather research is helping to reconnect weather with its diverse local meanings and to explain how climate change may alter future representational and behavioral understands of weather (herein called ''weather-relations'') in the hope of furthering climate change action. Responding to the need for greater research into weather-relations, particularly in industrialized urban areas, this paper examines the role of weather in everyday life in tropical Darwin, Australia. It identifies a willingness among participants to stay ''weather-connected'' despite challenging weather conditions and access to air conditioning. This willingness is driven by desires to remain acclimatized in order to enhance positive weather sensations, retain outdoor lifestyles, and reduce financial and environmental costs associated with resource-intensive technologies. In delving into weather adjustment strategies that facilitate weather-connectedness along with possible climate change implications, greater potential for weather-relations research is recognized. By drawing attention to weather experiences and understandings alongside resource efficient weather responses, this paper uncovered a substantial capacity among participants to respond sustainably to environmental change. These capacities are the outcome of adjustment practices relating to food, clothing, laundering, physical and outdoor activities, and domestic comfort and a previously unrecognized coping strategy—expressions of tolerance. Findings suggest that by recognizing and fostering existing adjustment capabilities of societies and cultures and the local values that afford their reproduction, communities would be better placed to adapt to future climate change.

1. Introduction: Reconnecting weather with human experience

On a daily basis, societies and cultures will experience climate change as extreme weather events and variations in weather patterns (IPCC 2013). Yet, how the latter will transpire in everyday life is not well understood due to a lack of knowledge of societies' and cultures' relationship with weather. The term ''weather-relations'' is used in this paper to encompass both how local weather is understood and meaning ascribed (representational understandings) and how weather is physically experienced and responded to (behavioral understandings; Strauss and Orlove 2003a). However, to date, scientific and political discourses have predominantly discussed weather, climate, and climate change quantitatively, drawing on explanations from the natural sciences (Hulme 2008). In the last decade, more qualitative research has been incorporated into weather and climate (change) dialogues. But its early exclusion has been problematic. Weather and climate observations and predictions have become decultured through a process of purification, wherein

> a rainstorm which offers an African farmer the visceral experience of wind, dust, thunder, lightning, rain—and all the ensuing social, cultural and economic signifiers of these phenomena—is reduced to a number, say 17.8 mm. (Hulme 2008, p. 7)

While standardizing and homogenizing climate (change) provides a sense of governability, control, and a shared universal dilemma, the lack of social and cultural understanding, particularly in the absence of tangible implications arising from changed weather patterns, has limited the applicability of climate research outputs and in turn climate change responses (Head and

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Gibson 2012; O'Brien 2011; O'Brien and Wolf 2010; Tadaki et al. 2014).

The urgency for climate change response has been exacerbated further by the large amount of time individuals spend indoors, increasingly within air-conditioned spaces. This is problematic on multiple levels. First, accelerating air conditioning dependence is consuming substantial energy resources and contributing to greater climate change (Li et al. 2012). Second, prolonged durations spent indoors, particularly in thermally monotonous spaces, is reportedly causing individuals to become indifferent to local weather (Hitchings 2010), where weather engagements have become virtual rather than experienced (Rayner 2003). This lack of weather exposure is creating "human weakening," whereby individuals are no longer able to cope with weather variation, relying on resource-consuming devices for warmth and cooling (Hitchings 2011, p. 174). This is particularly the case where vernacular resource-independent strategies for keeping comfortable are exercised less often (Hajat et al. 2010). To understand persisting connections and redress disconnections between human experience and weather, it is imperative now more than ever to examine how societies and cultures relate to weather.

To date, weather-relations research has documented how societies and cultures have successfully adapted to changed weather parameters in the past (Behringer 2010; Meyer 2000; Nicholls 2005) and illustrated the various everyday roles weather currently plays in communities with strong weather connection (see, e.g., Ingold and Kurttila 2000; Paolisso 2003; Rantala et al. 2011). Importantly, research has demonstrated how weather-relations differ with geographic, personal, social, and cultural contexts (Strauss and Orlove 2003b). Concepts such as weather connectedness also have poignant psychological dimensions and roots (Stewart 2009) that are not explored in this paper. The research reported here uses weather-relations as a broad cultural lens that focuses on everyday life.

Most weather-related studies, however, have focused on single weather elements that dominate or characterize a region, including rain (Vannini et al. 2012), wind (Low and Hsu 2007), and snow (Gorman-Murray 2010; Hall and Endfield 2016). While limited to one aspect of weather, these studies have still been valuable in reconnecting weather with its social and cultural meanings. They also help us begin to understand how climate change may play out differently between and within communities. Nevertheless, there is a significant need not only to expand knowledge on weather-relations where weather is approached holistically, but also to focus attention toward cities and other urban areas, particularly in industrialized areas of the world. These are important places to consider as urban areas hold over half of the world's population (United Nations 2014) and industrialized societies are ever more dependent on technology, such as the air conditioner, car, tumble dryer, microwave, refrigerator, computer, and mobile phone. Such technologies afford new urban rhythms by minimizing everyday disruptions presented by the weather (Gram-Hanssen 2008; Shove 2003; Trentmann 2009). Indications of weather-relations in urban regions of industrialized countries are, however, evident from research focused on temperature that has been driven by the necessity to reduce energy consumption and temperature-related morbidity and mortality (Chappells and Shove 2005; Strengers and Maller 2011). Few of these studies, however, have considered spaces beyond the internal home space, shopping mall, and workplace [for exceptions, see Cooper (2008) and Fuller and Bulkeley (2013)]. While temperature-related studies are pertinent to global warming discussions, climate change will involve more than thermal extremes. Climate change will be experienced through daily changes in weather patterns, including wind, rain, storms, humidity, and cloud cover. To understand potential implications from these changes, research first needs to understand how weather, in all its various local forms, influences daily life.

Responding to the need to expand weather-relations research, particularly in industrialized urban regions, this paper contributes results from an ethnography of weather in Darwin, a tropical city in Australia's north. To do so, the following section first introduces Darwin and its weather, climate, and culture. From here, the serial diary/photograph approach used with 16 local residents to generate insight into the role of weather in everyday life in Darwin is discussed. Section 3 explores weather-relations in Darwin. It draws attention to changing experiences of weather throughout the year and the challenges and rewards of remaining "weather-connected." The section also examines how weather is, and may be in future, implicated in aspects such as the design and use of domestic properties, laundering practices, clothing and food choices, outdoor and physical activities, and local understandings of sweat and the need for mental and physical tolerance. The ability of participants to move with the weather and its changes, with limited reliance on resource-intensive technologies, leads to a discussion in section 4 on the potential capacity of weather-relations research to inform adaptation discussions and opportunities.

2. Capturing weather-relations in tropical Darwin

a. Darwin climate: Present and future

Darwin is a coastal city, located in the tropical region of Australia's Northern Territory. Its temperatures are

relatively stable year round, with daily mean maxima ranging from 30.6°C in June and July to 33.3°C across October and November (BoM 2015). Darwin is classed as "tropical savannah," having two distinct seasons, the Wet and Dry, which depict the substantial variation in rainfall throughout the year (BoM 2008). In addition, local indigenous cultures and residents recognize a third distinct season[1]: the Build-Up, a period of high temperatures and relative humidity (around 70%–80%; BoM 2015) between the Dry and Wet. As a tropical city, Darwin is no stranger to cyclones during the Build-Up and Wet seasons. Since its establishment in 1869, cyclones have demolished the city on three occasions: 1897, 1937, and 1974. The most recent, Cyclone Tracy, killed 65 residents and the infrastructural devastation called for the largest mass evacuation in Australia's history, redistributing around 33 000 residents and leaving just over 10 600 people to rebuild the city (Northern Territory Library 1999). While Darwin's resident numbers have recovered and maintain a steady but slow growth (now over 120 500 people; ABS 2013), Cyclone Tracy changed many aspects of Darwin life, including its architecture (Parish 2007; Rothwell 2007).

According to Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) and their predictions for Australia's monsoonal north region (based on IPCC projections; Moise et al. 2015, 4–5), there is a medium to very high confidence that Darwin in the future will experience warmer temperatures (between 1.3° and 5.1°C by 2090), an increased frequency of hot days and warm spells, and an increased intensity in heavy rainfall and tropical cyclones. There are also suggestions (low confidence) that Darwin will experience changes in rainfall (either an increase or decrease), a decrease in relative humidity by 2090 (shown in some models), and changes to wind speed: decreases during the Dry and increases during the Build-Up and Wet.

As a study area, Darwin offers an opportunity to positively expand on weather-relations research in a number of ways. First and foremost, in a context of global warming, Darwin's tropical climate gives insight into how societies and cultures live (or at least cope) with warm conditions. Given the Northern Territory's high domestic air-conditioning ownership rate (94%; ABS 2011), Darwin also contributes to growing research on the spread of comfort technologies and westernized trends (see Hitchings 2011). Furthermore, while Darwin's temperatures are warm, they are relatively stable year-round, which facilitates inquiry into the role of other weather elements, such as wind and rain, in everyday life.

b. *Capturing weather experiences and responses—Methodological approach*

To begin to understand Darwin weather-relations, this study documented the weather experiences and responses of 16 participants. A serial daily diary/photograph approach was adopted in order to overcome concerns surrounding the ability of participants to accurately recall seemingly mundane and omnipresent weather experiences among everyday practices (see de Vet 2013). The approach was conducted with participants for one week each during Build-Up, Wet, and Dry periods, spanning a 9-month period between 2010 and 2011. Through this approach, weather was discussed with participants as a compilation of elements and the everyday as a plethora of practices. The diary and photographs allowed participants to document how the weather made them feel and how it influenced their everyday practices and tasks, including but not limited to those relating to work, leisure, household chores, food, transport, and domestic comfort.

The diary/photograph task was explained both verbally and through a methods information sheet. During each of the three research weeks, participants were asked to spend around 20 minutes each day on a diary entry, aiming to complete half a computer page (or equivalent) of writing. Most participants used a computer-based diary, but a few opted for a more traditional paper and pen approach. The methods information sheet posed questions participants could reflect upon during the day and while diary writing. Questions focused on weather conditions, physical sensations, plans for the day (a list of example practices and tasks were given), and any weather-prompted changes to planned activities. Example answers were provided.

Photographs were explained as a visual method of communicating objects or situations difficult or cumbersome to express in words, or to emphasize important parts of their day. Participants were asked to carry a camera around with them during each research week whenever practical. For those who did not have access to a digital camera, a disposable camera was provided. Only participants with a disposable camera had limited photograph numbers (24 exposures per week). To place photographs in context, a description was requested for each, specifying the time and day, the subject, and why it was taken. To keep track of photographs, a pocket-sized notebook was provided to all participants. For those with disposable cameras who were unable to revisit their photographs, the notebook was encouraged. In total, 252 diary entries and 543 photographs were collected.

Participants were recruited through Internet and newspaper advertising and by word of mouth. While 16

[1] Indigenous cultures recognize a number of other seasons (see Webb 1997).

participants were recruited initially, the number of active participants during each research week declined to 15 in the Wet and 13 in the Dry. Reasons for dropouts or missed submissions included illness, holidays, and moving out of the area. A gift card was presented to all participants regardless of the stage when they completed their involvement.

Participant demographics were diverse, with variations in age (from 25 to mid-60s), duration of residency in Darwin (from 6 months to 34 years), occupation, household composition, and home ownership status. Despite Greater Darwin's high indigenous population (10%), no participant identified as being of Aboriginal and/or Torres Strait Islander origin. While the small participant sample cannot be considered representative of Darwin's population, the highly detailed data generated a substantive insight into everyday weather-relations in Darwin.

Narrative analysis was applied to data, which was coded using qualitative analysis software (NVivo 9). To avoid prescribing data themes, data were coded in three ways: weather condition, experience, and practice. Photographs were analyzed by content, focusing on subject, visible weather conditions, the presence (or absence) of weather-related objects, and the physical appearance of objects and participants (such as the presence of sweat). These notes were coded in the same manner as diaries.

On completing coding, classifications were systematically summarized to determine significant trends and issues. Summarizing codes, rather than drawing on data familiarity, was thought necessary due to the large volume of data and the need to differentiate between participants, research weeks, practices, and weather conditions. Working from data familiarity was thought unreliable, as eloquently expressed, humorous, intriguing, or quintessential accounts were likely to overshadow banal but more common experiences. No reliability checks, in the form of coding by a different researcher, were performed, as the author had undertaken all the fieldwork herself. The following section explores three notable areas in participants' accounts of how weather 1) made them feel and was perceived in the context of Darwin's climate, 2) was incorporated into daily life and local culture, and 3) was accommodated in daily practices. Quotes are used in the following sections as exemplars of these wider trends.

3. Darwin weather-relations

a. Experiences and perceptions of weather

> I think the weather plays a significant part of living in Darwin. With its location in the Wet–Dry tropics we witness every year the cycle of drenching rains and then months-long ''drought.'' I'd say the positive aspects of Darwin's weather outweigh the negative, a ratio of 70:30. Like many things, we can't have the glory and wonder without the pain; the warmth, sunshine, clear skies, fantastic lightning shows during thunderstorms and thriving growth of gardens and the bush on the one hand and the debilitating conditions of an unrelenting Build-Up of high humidity and high minimums and maximum temperatures and no rain bringing relief.
>
> (Sarah, Dry)

Most participants' experiences of Darwin weather were similar to those of Sarah. Each season bought a new ensemble of weather elements, which produced or relieved daily physical, mental and practical challenges. Characteristically, the Build-Up research week was less than comfortable and practically difficult, not only due to heat but, of equal importance, to high humidity. During this time, participants appreciated rain, wind, and cloud cover—''Finally, relief from the heat. It's not a big storm (yet!) just a light shower ... my body feels alive and refreshed again'' (Jenny). The second research week began like any other during the Wet season—warm and humid, with welcomed overcast skies and diurnal bouts of rain. Two days in, cyclone conditions that were less familiar to participants (but not entirely foreign) brought unnerving high winds and unrelenting rain and flooding. By the end of this research week, participants became ''so over the rain!'' (Anne) and sought uncommon ''winter-style'' practices for keeping warm. The Dry season research week, with its lower temperatures and humidity, generally compensated for difficulties encountered throughout the year [although an unexpected cold snap left some feeling ''freezing cold'' (Indre)]. These comparatively perfect conditions influenced participants' perception of Darwin as ''the most liveable city'' (Jenny) with a ''fantastic climate'' (Guy) that was a ''well-kept secret'' (Jane).

As participants' accounts suggest, living in tropical Darwin was not simply about enduring hot conditions, although it did help. All participants had an affinity for warmer temperatures 25°C or higher—temperatures above internationally quantified ''comfort'' levels (19°–25°C; see de Vet 2017). These preferences reflect those from comparable climates (Indraganti 2010; Lin 2009). Darwin's normal 30° to 34°C daily annual maximum range was considered by most participants as ''warm,'' generally comfortable or manageable. Conditions referred to as less than comfortable or uncomfortably ''hot'' described lingering temperatures otherwise described as warm but accompanied by high humidity.

These conditions were intensified by the absence of a breeze, wind, cloud cover rain, and/or overnight thermal reprieve. Conversely, during the documented cold snaps, days when maximum temperatures only reached 28°C were considered ''chilly'' [for a detailed discussion on weather perceptions in Darwin, including definitions of ''comfort,'' see de Vet (2017)]. However, like warm conditions, ''cold'' weather perceptions were not dependent on temperature alone, but rather on an intersection of elements at differing intensities and durations.

b. *Weather integrations in daily life: Remaining weather-connected and acclimatized*

For participants, weather was not a backdrop to daily life, but an integral part of their day. Despite frequent less than comfortable or impractical weather conditions, most participants did not avoid outdoor or physically arduous activities, nor did they depend on energy-intensive technologies (specifically air conditioners and tumble dryers). Rather, participants chose to remain weather-connected, working with and around the weather through the use of vernacular adjustment strategies (i.e., local culturally informed responses to weather). In a similar vein, Vannini et al. (2012) propose a process of ''weathering.'' Drawing on Tim Ingold's concept of ''dwelling,'' they suggest that ''to weather'' is to recognize, reflect on, and interpret sensations, and ''learn to dwell within it [the weather]'' (p. 367). They explain ''To weather means to subject oneself to the elements, to undergo exposure to challenges, to somehow adapt, ... Dwelling with weather is a skillful practice . . . . We dress in accordance with it, plan the day by weather forecasts and reports, or simply by looking to the sky or feeling the temperature.'' (Vannini et al. 2012, p. 368).

Remaining weather-connected, particularly during physically and mentally arduous conditions, was perceived as a tropical necessity for remaining acclimatized. In medical terms, acclimatization refers to adaptations occurring over days, weeks, and months, both physiological (including an increased capacity to sweat) and behavioral (e.g., knowing how to stay hydrated and sun protected) (Parsons 2009). By remaining acclimatized, participants were able to enjoy tropical weather expressions (at least to some degree), move easily between spaces without discomfort, relish tropical outdoor lifestyles, and avoid or reduce the financial and environmental costs of resource-consumptive technologies.

Key to remaining acclimatized was avoiding prolonged exposure to domestic air conditioning—a strategy unchanged since Williamson et al.'s (1989) and Auliciems and de Dear's (1986) earlier Darwin studies, and noted from other hot and humid regions of Australia (see Erlandson et al. 2003). While 13 of the 16 participants had access to air conditioners at home, 11 restricted their air conditioner use to bedtime and/or for brief afternoon periods during the Build-Up. Only two participants, Cameron and Geoff, ran their air conditioner nearly continuously during the Build-Up. Cameron depended on his air conditioner due to the design of his home (discussed below), while Geoff relied on his for comfort. Geoff only experienced ''comfort'' in air-conditioned spaces, including his home where the air conditioner was set to a conservative 27°C. He had lived in Darwin for six months and, once he encountered the Build-Up, his constant discomfort outside air-conditioned spaces contributed to his decision to move back to Australia's temperate south. Although no correlation was found between participants' duration of residency and their ability to enjoy or cope with Darwin's heat and humidity, Geoff's constant discomfort could be explained through an incomplete acclimatization process. While Geoff may have needed more time to acclimatize, his activities were not always aligned with the weather (see discussions on food, physical and outdoor activity, and tolerance).

The remainder of this paper outlines the adjustment strategies participants used to respond to the weather, including the weather-appropriate (re)structuring of practices and tasks. The practices and tasks discussed below were prominent in participant contributions. Implications posed by air conditioning are inextricably complex, introducing other sets of practices that respond to controlled environmental conditions. Practices within these spaces require detailed conversations around differing thermal expectations (including those both indoor and outdoor and between individuals, workplaces, and cultures), building and air-conditioning standards, and more. For this reason, practices relating to transport and office work have not been included, as both were heavily entwined with air conditioner use.

c. *Adjustment strategies and future change*

Participants stayed weather-connected by remaining mindful of the weather as they found comfort at home, laundered, dressed, ate, drank, gardened, spent time outdoors, and exercised. The following explores how considerations of the weather allowed participants to undertake these practices and tasks in a comfortable, practical, safe, and/or enjoyable manner. The last part of this section discusses two approaches to weather, 1) acceptance of sweat (a cultural understanding) and 2) expressions of tolerance (a response strategy, which recurrently appeared across practices and tasks facilitating weather-connectedness). For the most part, discussion will center on participant accounts from the Build-Up when weather conditions were most challenging, weather-connections

were clearly articulated, and research data were richest [for more detail on the latter, see de Vet (2013)].

1) DOMESTIC COMFORT AND CLIMATE-APPROPRIATE PROPERTY DESIGNS: GARDENS, OUTDOOR LIVING SPACES, INDOOR ARCHITECTURAL FEATURES

At home, a space where participants spent much of their time, property design influenced how weather was experienced as well as the need and opportunity to respond. Beginning with outdoor features, all participants had vegetation surrounding the property and/or up against the house. This conventional feature was valued for its ability to reduce direct sunlight on the house and keep the property cool. The provision of shade was particularly important for outdoor living spaces—a feature common among nine participants. Verandahs and patios, both with and without roofs, offered alternative living spaces exposed to different weather elements: "17:00 . . . breeze still blowing, so it is pleasant on the verandah, but the direction of the breeze does not really flow into the house" (Sarah). For many, these spaces became outdoor living rooms, fitted with daily necessities, such as tables (for dining and work), lights, fans, lounges, external power points, shade cloths, and decorations.

Indoors, a number of architectural features were appreciated for their ability to passively cool the house: louvered windows, fly screens, curtains, light-colored walls, high ceilings, timbered or tiled floors, open plan living, and climate-appropriate foundations (e.g., elevated structures or earth-coupled concrete slabs). The most valued cooling strategy came from fans, which are a low-resource-intensive technical adjustment: "Ceiling fans are a wonderful addition to life in Darwin. This town must have been a less pleasant place to live before the days of artificial air at a flick of the switch" (Ben). Fans were integral to participants' everyday living, so much so that participants felt it was important to document fan settings in their diaries, described variously as "lowest," "low," "mid-range," "two-of-three," "highest," "flat-out," and "off" (the last being a "winter" warming practice).

Only one participant found fans and other passive cooling strategies to be of little use. Cameron's house was constructed post–Cyclone Tracy when building mandates changed. A common response to these regulations, which required domestic structures to withstand category 4 cyclones (along with the increasing influence of southern Australian architectural styles), was the fabrication of cheaply built "concrete boxes, utterly reliant on air-conditioning" (Cameron, Build-Up) that had small windows less likely to be penetrated in a storm (Cyclone Testing Station 2009; Luckman 2010; Parish 2007; Rothwell 2007). Cameron felt his cyclone-resilient "bunker" was built at the expense of natural ventilation, a substantial deficit both due to financial running costs and in terms of Darwin's outdoor lifestyle culture.

Similarly, economic and social consequences have been recorded in Manila, as Nipa huts made from bamboo have been replaced by concrete constructions that withstand cyclone events and are cheaper to build and maintain. As a result, lower-socioeconomic households spend large proportions of their income on running fans, which barely breathe reprieve into the home (Sahakian and Steinberger 2011). While it is difficult to argue against safety, environmental consequences and quality of life need to be considered in domestic designs. Balance needs to be achieved between the structural integrity and the resource consumption required to regulate internal conditions. This compromise is not only necessary for reasons of comfort and lifestyle, but to intercept the downward spiral of demand for comfort, energy consumption and associated emissions, intensification of cyclonic events, and need for cyclone-resilient housing. Urban planners, governments, and homeowners need to tap into existing undervalued cooling solutions (see also Cândido et al. 2010), such as garden shade and outdoor living spaces, which avoid contributing to greater climate change (see also Cooper 2008). Options such as outdoor living spaces may not only provide relief from warming temperatures, but also provide benefits in light of potential future weather changes, such as increases in wind speeds during the Build-Up.

2) LAUNDERING

Despite living in a climate with a distinct Wet season, participants' primary method of drying clothes was by air drying. In fact, only two participants owned a tumble dryer, resorting to the device during the extreme rain events of Tropical Cyclone Carlos (the Wet). Motivations to avoid tumble dryers were attributed to cost, "to both our pockets and the environment," (Trudy) and were made possible through strategic and opportunistic washing regimes. Regimes were tactical, matching predicted durations of "drying weather" with load numbers and the material, size, and thickness of items washed. While such regimes required diligent weather responses, most participants had become attuned to drying conditions:

> The sun pokes its head out and I am straight on the job with a load of washing, amazing between the showers and bringing the washing in and out, I get most of it dry.
>
> (Kathleen, Build-Up)

While outdoor drying during ideal weather conditions was most efficient, undercover and/or indoor clothes

FIG. 1. Cameron's photograph highlights both the importance and simplicity of undercover clotheslines.

lines, described as "a must have in the tropics" (Cameron), offered a wet-weather backup, avoiding "worry about drying and getting them off the line in between storms" (Trudy). Four participants also had fans hanging over indoor lines to decrease drying times. The importance of sheltered clotheslines was highlighted by multiple participant photographs, which also demonstrated the simplicity and ad hoc nature of some structures, often constructed in carports (Fig. 1). During the Dry, the need to orchestrate laundering around the weather was no longer necessary as clothing was always left feeling "crisp," adding to the relaxed Dry season atmosphere.

While participants had strategies for air-drying laundry during the Wet season, they also had low expectations for "dry" clothing. During this time, inescapable dampness throughout the house reached into wardrobes. A tumble dryer would have completely dried clothing, but exposure to continual humid and damp conditions would have reversed the process. For this reason, participants' laundering practices may be unique to Darwin and other locations with prolonged humid and wet weather. However, these practices may be under threat if air-conditioned houses become the norm, and spaces for air-drying become restricted by dense city living with reduced secure outdoor drying spaces, and building strata regulations[2] that prevent clothes drying on balconies (Global Access Partners 2012).

As the city of Darwin grows, it is essential that secure outdoor and undercover clotheslines remain available, be they in, under, or above dwellings, including balconies. Undercover drying spaces and reduced expectations for dry clothing will be particularly important to avoiding tumble dryer dependence in future, as climate change projections predict an increase in heavy rainfall events constricting drying opportunities and prolonging dampness in and around the home.

3) CLOTHING CHOICES

Changing into appropriate clothing throughout the day was an important adjustment strategy if participants had not done so already. Consideration was given to clothing fabrics, such as the need for "lots of cotton" (Jane), as "it is cool for this climate" (Ben), where "pure synthetics should be avoided" (Cameron). Participants were also mindful of clothing coverage if leaving the house, finding balance between minimal coverage, socially acceptable presentation, and sun protection. Throughout the day during the Build-Up, t-shirts, shorts, and open-toed shoes were standard, as were sarongs or light dresses for females. These ensembles were worn in different public and private spaces, although acceptable levels of clothing were notably lower in the home:

> I wear as little as possible while I'm inside the house; at night I need to draw the curtains so passers-by can't see me against the light, but during the day I'm invisible to outsiders.
>
> (Trudy, Build-Up)

> 09:20 got home [after shopping], it is very hot outside and after bringing shopping in I lose my skirt, which was too hot, I am much more comfortable now . . . The beauty of living in our own space is that wearing less and little is possible.
>
> (Bernadette, Build-Up)

For most of the year light and cool clothing were ideal, but a number of factors limited choice. These factors included the need for protective clothing while conducting outdoor work, and the availability of clean clothes. When clean clothes ran out, participants resorted to their "wintery" clothing, reserved for Dry and Wet season cold snaps. Items included closed-in shoes, jeans, and dark-colored, fitted, and/or long-sleeved clothing.

While the routine selection of weather-appropriate clothing was an essential practice in Darwin, clothing as an adjustment strategy in tropical regions has had little regard in adaptation literature. Hwang et al.'s (2009) work from Taiwan found that clothing as a personal adjustment strategy was ranked low as people had already dressed appropriately for the day. Cultural

[2] Building strata regulations are regulations that apply to common property of allotted buildings, such as apartment blocks.

research has reported that taken-for-granted weather-appropriate cultural clothing is being compromised in tropical regions by the spread of western clothing fashions and air conditioning in places such as Singapore (Hitchings and Lee 2008) and the Philippines (Sahakian and Steinberger 2011). The disregard for weather-appropriate clothing immediately changes weather experiences. Longer, heavier, tighter, and more insulating western attire, including jeans and acrylic fabrics, increases sensitivity to warm and/or humid weather, creating greater demand for air conditioning. Hitchings and Lee (2008) and Sahakian and Steinberger (2011) have documented how weather conditions once considered warm or hot and humid have become ''unbearable'' and avoided as a result of air conditioning and westernized fashions. Such drastic cultural transformations have not yet infiltrated local Darwin culture, but signs are visible in the popularization of western corporate attire (i.e., suit and tie; see de Vet 2011).

Darwin temperatures will continue to warm, but it is crucial that changes to local clothing practices do not induce and/or amplify climate change. Threats to current sustainable practices need to be addressed. Options may include emulating successful strategies that promote appropriate attire, such as Japan's ''Super Cool-Biz'' program that saw government officials lead by example, doing away with traditional business suits during the warmer months and donning weather-appropriate garments. Participants' accounts suggest that Darwin residents still have a strong capacity to make personal weather adjustments through clothing, but this strong capacity needs to be fostered and closely monitored.

4) Cooling down and keeping cool through food consumption and hydration

Like clothing, food and beverage selections closely emulated weather variations, changes clearly discernible during recorded cold snaps. During warm, humid, ''thirsty and hot'' (Sarah) Build-Up weather, most participants' choices were for ''light,'' ''cold,'' and ''fresh'' foods that avoided the use of room-warming ovens. These foods were characteristically cold in temperature, contained relatively few carbohydrates, and/or were small in portion. Meals included local seasonal fruit (like mangoes), frittatas, salads, fish, cereal, sandwiches, rice, and ''no cappuccinos.'' Cold drinks and plenty of fluids, specifically refrigerated water, were an unquestioned necessity. Conversely, during the Wet and Dry, ''in what feels like wintry weather'' (Trudy), participants craved hot foods with high carbohydrate content. It ''certainly seem[ed] the weather for'' (Sarah) foods such as toast, hot oats, stews, roast lamb, risottos, fried vegetables, and a ''hot dinner.'' During these relatively cooler periods, participants became acutely aware of how weather influenced their choices: ''My lunch time food choice was dictated by the exceptionally cold weather—roast lamb from the café'' (Eddy) and ''hot meals in this coolish weather are satisfying and warming'' (Sarah). Only one participant, Geoff, stated that his food choices were weather-independent. Geoff regularly consumed foods such as burgers and chips for lunch during the Build-Up, foods other participants would have considered ''wintry'' choices. Overall, accounts suggest that eating and drinking according to the weather was a simple and effective way of staying weather-connected. While ''wintery weather'' meals will potentially appear less frequently on household menus as weather warms over the few next decades, it is likely that participants' ability to keep cool and cool down through food and drink will continue.

5) Physical and outdoor activities

A primary strategy for moving with the weather was strategic activity scheduling and positioning. During the least comfortable time of the day during the Build-Up (usually between 10:00 a.m. and 4:00 p.m.), participants moderated tasks and moved indoors to cooler spaces and away from direct sunlight. Either side of this time, they took advantage of comfortable and practical conditions. Gardening was nearly always scheduled between 6 a.m. and 10 a.m. and after 4 p.m. Exercise times were similar, but often occurred predawn and postdusk as light was less prohibitive and movement avoided the onslaught of biting insects:

> 6:15 am: The day is already starting to warm up as we arrive at the beach although the sun is only just sneaking up over the horizon. We walk south along the beach, making the most of the shade there while it lasts.
>
> (Trudy, Build-Up)

To make the most of productive conditions, participants woke early throughout the week (around 6 a.m.), including weekends, with the exception of Geoff who woke at 9 a.m. each day.

Although gardening and exercise times appear to occur outside business hours, the 10 a.m. to 4 p.m. period was also avoided over the weekend and during the week by participants who were unemployed or worked part-time or flexible hours. As Bernadette noted, these temporal rhythms appeared to be a vernacular practice:

> 07:45 [Saturday] I went shopping . . . . The ideal plan with weather in mind would have been to work in the garden first thing, have a shower then go shopping BUT the supermarket gets crazy when everyone else does that, so I like to beat the rush.

(Bernadette, Build-Up)

For the eight participants whose occupation required outdoor work, activities such as lawn mowing, tour guiding, surveying, teaching, and interviews were also scheduled for cooler, less humid, and dry times of the day whenever possible. For nonregular and physically arduous tasks, participants scheduled these for more comfortable and practical times of the year.

While early morning and late afternoon provided predictable cooler temperatures, participants responded to a number of other conditions. Shade from shadows or cloud cover was found to be equally important to physical and outdoor activities as avoiding the heat of the day, not just for comfort, but sun safety:

> Given the sunny morning, it is not a good one for gardening. I decide I will spend this morning indoors and attend to some gardening late this afternoon when the area I want to weed is in shade.

(Ben, Build-Up; see also Trudy's extract above)

Relief from less than comfortable conditions also came in the form of a breeze or wind, and postrain conditions. These conditions often instigated physical and outdoor activities—"Finally, relief from the heat! Rain started falling here 15 min ago … the rain has stopped; I'm going to take that walk now" (Jenny). Participants took advantage of these less predictable but more comfortable or practical weather conditions, rescheduling and relocating tasks accordingly.

In future, remaining flexible to opportunities offered by relieving weather elements other than temperature will be important as relieving temperatures further polarize toward nondaylight hours. Undertaking outdoor activities predawn and postdusk may also need to be exploited further, avoiding biting and disease-carrying crepuscular insects, such as mosquitoes and midges, that may become more abundant and/or active for longer periods of the year (Jacups et al. 2008; Mellor et al. 2000). While these weather boundaries on physical and outdoor activities may appear limiting, alterations may not be dramatically different from current weather responses. If participants' physical and outdoor practices reflect broader local culture, findings suggest that Darwin residents possess some strong capabilities to respond to future environmental change.

6) Responding to weather with sweat and tolerance

Despite all efforts to move with weather, sweaty and/or less than comfortable weather conditions could not always be avoided throughout the day, particularly during the Build-Up. Rather than abandoning activities or sheltering in air-conditioned spaces, participants persisted with the assistance of relaxed social perceptions surrounding sweat and expressions of physical and mental tolerance. Accepting the presence of sweat, the body's thermoregulatory response to hot and humid sensations was crucial to the continuation of many practices and tasks. Compared with other studies, inclusive of those conducted in tropical climates (Hitchings and Lee 2008), participants showed relatively little concern over the appearance and smell of sweat. Emotions of disgust and shame, as documented by Waitt and Stanes (2015), were rarely recorded in participant contributions, despite numerous sweaty experiences. All participants perceived sweat as a normal bodily function appearing not only during physically arduous activities, but simply while doing nothing. The formation of sweat in response to high humidity levels, rather than simply an indication of uncomfortably hot temperatures, added to its acceptability. Sweat and sweat-producing weather were even described by participants as tolerable, comfortable, and enjoyable:

> 0830 I have been shovelling and raking and I am very sweaty and loving it (bit puffed though). … 16:00 time to clean kitchen and start dinner. It is cool now that it has rained, but it is still humid and although I am comfortable I am sweating profusely due to the humidity.

(Bernadette, Build-Up)

> Good to be in the field, though by mid-morning (10:15 am) I was hot and sweaty … but that is normal for this time of the year. … The air-conditioned meeting room for the afternoon was certainly a lot more comfortable than the morning in the field, though not as satisfying.

(Ben, Build-Up)

The shared experience of sweat among residents also contributed to relaxed social norms, particularly when among family or conducting physical and outdoor activities. However, the appropriateness of sweat had its limits, contingent upon spaces occupied and practices undertaken [also noted in Waitt (2014)]. As the extract below explains, sweat was less acceptable when commencing activities in close proximity to others for long durations away from home:

> Bike riding is always hot and sweaty in Darwin … . I find if I need to be going somewhere that I shower when I arrive if I am going to be spending time in close proximity to others. It's ok to make a quick excursion to the shops by bike … but if I am going to be spending all day in the

> office at work or socialising, a shower is essential at the destination given the sweaty outcome of bike riding. So bike riding works for me when going to work or the shops, but not for dancing. I travel by car to social events like dancing.
>
> (Ben, Build-Up)

Under these circumstances, sweat had to be managed through clothing changes, showers (up to four a day), and strategies that avoided sweat, such as alternate transport. Crucially, however, generating sweat once at an event was not seen as abhorrent, due to the general acceptance that tropical conditions cause the body to perspire.

In addition to relaxed perceptions of sweat, expressions of physical and mental tolerance were also viewed as a necessary approach to weather, aiding the continuation of activities and avoiding air conditioning. Tolerance often substituted for other adjustment strategies that would have hindered practice continuation, practicality, and enjoyment, or that were simply not worth the effort. For expressions of tolerance to be worthwhile and not simply uncomfortable experiences, benefits had to outweigh the levels of tolerance required. For example, Aidan continually walked his dogs under ''boiling hot'' midday conditions during the Build-Up to ''maintain fitness and be consistent with regular walking.'' By frequently tolerating less than comfortable conditions, participants also found a wider range of weather conditions manageable. This tolerance heightened the pleasures of relieving weather: ''we cannot have the glory and wonder without the pain'' (Sarah, the Dry).

However, tolerance had its limits. Geoff's account shows that a lack of tolerance and high air conditioner reliance may be a contributing factor in Darwin's high residential turnover (Taylor et al. 2014). Limits were evident in Jenny's account, where she became ill after working outside with colleagues in ''rain, hail, and shine.'' While expressions of tolerance were enabling, they also had boundaries.

While seemingly unpleasant to others, tolerance was perceived as part of living with and enjoying Darwin weather. The continuation of practices through the use of tolerance has also been noted in other studies. Nikolopoulou and Lykoudis (2006) recorded teenagers playing basketball in Athens 35.5°C heat for the love of the game; Cupples et al. (2007) found New Zealand residents kept themselves exposed to winter temperatures to preserve their masculine pioneering heritage; and Hitchings et al. (2015) noted that Wollongong residents underdress, reflecting cultural preferences for summer conditions. Expressions of tolerance have been recorded empirically, but as yet tolerance has not been recognized as a weather adjustment or coping strategy in its own right.

Relaxed social understanding and expectations surrounding both sweat and expressions of tolerance have played an important role in facilitating continued weather-connection, air-conditioner avoidance, and acclimatization. As temperatures are set to warm over the next decade, it will be essential that the social acceptance of sweat and expressions of tolerance not only continue, but are promoted. This is pertinent for not only Darwin and other warm, humid locations. The practice of tolerance could be usefully promoted in other areas in response to less-than-comfortable weather conditions, such as cold temperatures or high wind. Further cultural analysis of sweat and expressions of tolerance would be valuable, not only to highlight their benefits, implications, and health limitations, but also to understand points of friction and traction in their continuation in both the short and long term. While strengthening these strategies in the face of warming weather may appear strenuous, relief may also be on the horizon for Darwin with possible increases in wind speeds during the Build-Up and Wet seasons and decreases in humidity that may counterbalance sweaty and less-than-comfortable conditions to some degree.

4. Augmenting adaptation through everyday weather adjustment strategies

Despite decades of quantitative representations, weather is and will always be ''immediate, local, and personal'' (Sherratt 2005, p. 2). Darwin weather-relations show how weather is more than temperature forecasts at the end of morning news. Weather is omnipresent, experienced as entangled expressions of temperature humidity, wind, rain, cloud cover, and sunlight and their varying intensities and durations. In Darwin, these expressions are part of place, normalized features even as they defy international ''comfort'' parameters. They are interwoven in daily movements and decisions, informing the structure and restructure of the everyday. An afternoon breeze, postrain conditions, cloud cover, and/or longer shadows afford an opportunity to undertake physical and outdoor activities. A break in the rain is a signal to commence laundering. Lowered daily temperatures and humidity are a time for ''winter'' cooking, closed-in shoes, and fans to be switched off. High nighttime temperatures and humidity without rain or wind for reprieve provide a time to sit outdoors or under a fan or air conditioning. This ability to move with weather, particularly without artificial cooling, heightened the pleasures Darwin weather has to offer. Without these movements, as Geoff's account

indicates, weather engagements become difficult to endure, let alone enjoy.

Understanding these intricate weather-connections provides an opportunity to contemplate potential climate change. Climate change projections for Darwin suggests that physical and/or outdoor activities may shift further toward hours of darkness, that ''wintery'' foods and beverages will appear less frequently in household menus, that outdoor living spaces and fans will become increasingly valuable, and that expectations for and understandings around dry clothing, sweat, and expressions of tolerance may be tested. However, while these considerations offer local residents more tangible understandings of everyday climate change implications, they are absent in quantitative climate change models. As seen in this study, the way weather elements are experienced is dependent on the intensity and duration of others. For these reasons, Head (2017; see also Adger et al. 2007) suggests that in order to prepare for climate change, we will ''need to be able to live in uncertainty.'' But by no means does this suggest societies and cultures are unprepared; as this study has shown, individuals already have substantial capacity to move with change.

To date, climate change research, such as that assembled by the IPCC (Mimura et al. 2007), has acknowledged ''inherent'' social and cultural weather responses suited to local weather conditions. However, research into adaptation capacities has shown limited interest in understanding and learning from weather-relations. Current climate change responses increasingly rely on limited technological solutions (Chappells and Shove 2005) and overarching structures that are inflexible due to well-cemented systems and institutions, ''political short-termism,'' priorities for economic development and modernization, and conflicting or differing local and national values, agendas and government responsibilities (Adger and Barnett 2009; Ford et al. 2011, p. 333; Mimura et al. 2014). The effectiveness and limits of these adaptive options and capacities are assessed through approximate calculations, insights from past weather events, and/or monitoring over time (Mimura et al. 2014). In the short term, these approaches are important for reducing the impacts of extreme events. In the long term, however, such research reveals little about how individuals and communities currently relate to weather and how existing weather-connections could help respond to future change. As researchers wait for the next researchable disaster or notable change in weather to occur in order to assess adaptation capacities or evaluate calculations of top-down solutions, a missed opportunity is apparent, namely the examination of everyday responses to microscale climate change—the weather.

In this study, numerous inherent weather response strategies were identified, including weather-appropriate living spaces; selections of food, drink, and clothing; strategic scheduling and positioning of laundry and outdoor and physical activities; and use of fans. These were effective responses that were resource efficient and maintained acceptable levels of practice and task comfort, practicality, and safety. While individuals' weather responses may appear to occur at negligible social scales of analysis, they are important ''generative site[s] of creative possibilities'' (Head et al. 2013, p. 354). Small-scale adjustments hold ''enormous vernacular capacities . . . [and] documenting and cataloguing such capacities, and the skills and knowledge that underpin them, is an important research activity, as it adds to the menu of future options'' (Head 2016, p. 171). Communities need to be made aware and take ownership of their own internally generated adjustment capacities that, when valued and harnessed, can further strengthen their adaptation capacities. However, if vernacular strategies are insufficient if climate change is ''rapid or nonlinear'' and/or level change is higher than anticipated (Adger et al. 2012, p. 113; Adger and Barnett 2009), their documentation can assist in other ways. For communities faced with rapid changes in weather patterns, learning from other locations with similar weather expressions can facilitate transitional adaptation.

In addition to identifying adjustment strategies, directing the attention of adaptation research toward smaller social scales of analysis has further benefits. By understanding local context, including local weather perceptions and subjective nonmonetary values held by communities, important details required for the formulation or assessment of appropriate and effective climate change responses are made accessible (Hitchings et al. 2015; O'Brien and Wolf 2010). Contextual understanding also facilitates the identification of points of ''friction'' and ''traction'' in existing everyday vernacular practices, which anchor practices in place or which recognize the possibility for interception and change. Understanding these points can be used to leverage sustainable practices or help redress deep-seated unsustainable practices (Gibson et al. 2013; Head et al. 2013). In this study, participants' pursuits for weather-connectedness were important values or traction points that contextualized weather responses. They gave meaning and purpose to practices and tasks that often required individuals to forfeit some level of comfort or practicality, notably relaxed social expectations surrounding sweat and dry clothing and the need to express tolerance. However, these local values are being challenged or have been overturned by competing points of friction—growing national and global values related to fashionable and cheap house designs, expectations for

western corporate attire and standard business hours, western clothing fashions, and bodily presentations devoid of sweat and musty-smelling clothing. Acknowledging and intercepting these points of friction will be critical to continuing values of weather-connectedness and circumventing air conditioner reliance and the formation of weather indifferent societies and cultures.

As this study has shown, weather-relations research can offer more than qualitative understandings of weather and tangible climate change illustrations. There is substantial opportunity to augment adaptation capacities by recognizing and harnessing locally generated response capabilities to local environmental change. To do so, there must be continued research into weather-relations that, as undertaken in this study, draws attention to individuals' culturally informed and resource efficient everyday movements with weather. This "weather-ways" focus (de Vet 2014; Hulme 2015), which considers weather as a compilation of elements *and* the everyday as a plethora of practices and tasks, facilitates the documentation of weather experiences and perceptions, the contextualization and integration of weather into everyday life, vernacular weather adjustment strategies, including points of friction and traction implicated in the strengthening of environmentally sustainable responses, and insights into potential everyday weather-relations under future climate change. While this approach requires intensive empirical work, the holistic and intricate insight generated provides an avenue to strengthen adaptation capacities from the ground up.

5. Conclusions

Societies and cultures' disconnection with weather and climate change has occurred due not only to past quantitative weather representations that ignore the daily experiences of weather, but also to the increasing prevalence of technology. This paper contributes to qualitative understandings of weather and climate change, uncovering persisting weather-connections by examining the everyday experiences and responses to weather in Darwin. Findings demonstrate how weather experiences are dependent on the intensity and duration of multiple weather elements and perceived in relation to familiar conditions. While these conditions were often challenging, participants held strong desires to remain weather-connected in order to increase the breadth of conditions found tolerable and enjoyable, maintain outdoor lifestyles, and reduce the financial and environmental costs associated with air conditioners and tumble dryers. This local understanding and appreciation of weather rationalizes the daily adjustment strategies participants used to move with weather, strategies that are likely to continue into the future so long as contradictory values are restrained. The extensiveness of these strategies indicated that despite access to technology, many societies and cultures may still possess their own unique adjustment strategies to respond sustainably to environmental change. For Darwin participants, this included expressions of tolerance—a previously unrecognized weather adjustment or coping strategy. This paper has argued that these small-scale insights could augment adaptation capacities if acknowledged within adaptation discourses, enabled by research into weather-relations focused on individuals' culturally informed and resource efficient weather responses. This approach would not only facilitate the identification of sustainable vernacular practices, including unrecognized coping strategies, but also underline points of friction and traction that could be used to strengthen capacities. By acknowledging inherent vernacular weather adjustments, and valuing and supporting their continued practice, societies and cultures can make a significant contribution to their own adaptive capacities to future climate change.

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