Ready or Not: On the Climate Vulnerability of Sport Organizations

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Dedication

To Mom, who believed this was possible before I did.

Abstract

Since the 1970s, North America has experienced warmer and wetter winters, and more frequent extreme weather events such as hurricanes and heat waves. These climate shifts have carried consequences for the business and performance of sport at all levels, such as event cancellations, decreased participation rates, and facility damages. In the format of three articles, this dissertation examines sport organizations' climate vulnerability. The first article (Chapter 2) reviews the extant literature on sport and the natural environment, advances two sport-specific constructs for climate vulnerability: climate impacts on organizations (CIO) and organizational climate capacity (OCC), and proposed a framework that graphically represents the various states of vulnerability an organization may face based on the organization's exposure to hazards, sensitivity to hazards, and capacity to respond. The second article (Chapter 3) presents a qualitative study using 16 semi-structured interviews with sport practitioners whose organizations have recently faced climate hazards, to determine dimensions for OCC. Findings revealed the dimensions of OCC are infrastructural resources, natural resources, planning and development resources, human resources, financial resources, and network and relationship resources. These dimensions bear resemblance to the dimensions of organizational capacity and adaptive capacity, adopting five dimensions from organizational capacity and the natural environment focus of adaptive capacity. In the third article (Chapter 4), the construct of OCC is operationalized beyond a set of dimensions into a list of 77 indicators, organized by dimensions. This list of indicators was developed through an online Delphi study involving 25 academic experts in sport management, and represents an important step in rendering the construct more applicable and understandable for sport managers.

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Chapter 1: Introduction & Overview

Since the 1970s, North America has experienced warmer and wetter winters, and more frequent extreme weather events such as hurricanes and heat waves in summer (Easterling et al., 2017). These climate shifts have carried consequences for the business and performance of sport at all levels, such as event cancellations (Gibson, Kaplanidou & Kang, 2012), decreased participation rates (Gössling, Scott, Hall, Ceron, & Dubois, 2012; Scott & Lemieux, 2010) and facility damages (e.g. Longmire, 2018a, 2018b). While climate-related challenges are being reported in the media, they are largely ignored in the sport management literature (with few exceptions, noted in Chapter 2, section 2.2.1).

In 2018, the concept of climate vulnerability was adopted from natural resource sciences and policy studies into sport management (Orr & Inoue, 2019). Climate vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes (IPCC, 2014). This concept lends itself to frameworks and measurements for determining actual and future risks. The concept also contributes to planning adaptation (managing for change) and mitigation (reduction of negative impacts through emission reductions) efforts for climate hazards at the organizational level.

Chapter 2, titled 'Sport vs climate: Introducing the Climate Vulnerability of Sport Organizations framework', reviews the extant literature on sport and the natural environment and identifies a dearth of research on the impacts of environmental change on sport. To address this, the concept of climate vulnerability was adopted from the natural resources literature and policy studies to explain the scope and severity of

climate-related impacts. The theoretical contribution of Chapter 2 is a review of the concept of climate vulnerability, and an introduction to two sport-specific constructs: climate impacts on organizations (CIO) and organizational climate capacity (OCC). The paper also contributes a graphical representation of the various states of vulnerability an organization may face, based on the assumption that not all organizations will be affected by climate change in the same way, if at all. Chapter 2 doubles as Article 1 for this three-article thesis, and has been published in *Sport Management Review*.

As mentioned, Chapter 2 offers a conceptual level advancement of the concept of climate vulnerability in sport, and two supporting constructs (i.e. CIO and OCC). Subsequently, propositions about constructs must be empirically developed at the operational level. This is oft accomplished using indicators to measure (or estimate a measurement) for the constructs (Hamann, Schiemann, Bellora-Bienengräber, & Güenther, 2013). Indicators are scores or quantified records (Edwards & Bagozzi, 2000). The link between the conceptual and operational (i.e. indicators) levels is critical to the sound advancement of new theory. Only when this link is established can empirical findings at the operational level be used to test theoretical propositions involving unobservables at the conceptual level.

A construct is a term that researchers use to describe phenomena that are unobservable (Edwards & Bagozzi, 2000). Consequently, both constructs presented in Chapter 2 (CIO and OCC) are subject to ‘‘the problem of unobservables’’ (Godfrey & Hill, 1995, p. 519) in academic research. This problem is best described using the predictive validity framework which includes two levels: a conceptual level and an operational level (Bisbe, Batista-Foguet, & Chenhall, 2007). At the conceptual level,

theories offer explanations of phenomena using propositions about constructs and the relationships that link them (Doherty, 2013). After Chapter 2 offers a conceptual level advancement of the concept of climate vulnerability in sport, and two supporting constructs (i.e. CIO and OCC), propositions supporting each construct were empirically developed at the operational level. The link between the conceptual and operational (i.e. indicators) levels is critical to the sound advancement of new theory. Only when this link is rigorously established can empirical findings at the operational level (i.e. a scale or measurement tool) be used to test theoretical propositions involving unobservables. Chapter 3 extends the conceptualization of OCC into a set of dimensions, while Chapter 4 operationalizes the dimensions of OCC into indicators, thereby meeting both levels of the predictive validity framework.

Chapter 3 reviews the extant literature on organizational capacity (e.g. Doherty, Misener & Cuskelly, 2014; Hall, Andrukow, Barr, Brock, de Wit, & Embuldeniya, 2003; Misener & Doherty, 2009, 2013; Pillar & Doherty, 2016; Sharpe, 2006; Wicker & Breuer, 2011; Wicker & Hallman, 2013), and adaptive capacity (Adger, 2006; Hinkel, 2011; Smit & Wandel, 2006; Turner et al., 2003) to identify initial themes and commonalities in definitions and dimensions of these two constructs (i.e. organizational capacity and adaptive capacity). Then, semi-structured interviews with purposefully-sampled sport practitioners were conducted to provide the empirical data from which a set of six dimensions for OCC is established. These dimensions are infrastructural resources, natural resources, planning and development resources, human resources, financial resources, and network and relationship resources.

Using the dimensions of OCC established in Chapter 3, Chapter 4 presents a web-based consensus-seeking study (i.e. Delphi Method; Hsu & Sandford, 2007) to identify indicators for OCC. A sample of sport management and natural resource scholars proposed, evaluated, and reached consensus on a list of indicators via three-round iterative process conducted online. The sampled panelists included academics who have published on organizational capacity, adaptive capacity, or sport and the natural environment. Specifically, those who agreed to answer a series of questionnaires over multiple rounds until a consensus was found were included in the study. The result of this study was a list of 77 indicators, organized along the six dimensions of OCC.

The conclusion of this three-article dissertation (Chapter 5) is a presentation of the implications of the resulting climate vulnerability of sport organizations (CVSO) framework and OCC indicators, with discussion of their potential for use as support tools for organizational learning in the context of climate change. A discussion of future opportunities to develop OCC and CIO research, and challenges associated with this work, is included.

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Chapter 2: Sport Versus Climate: Introducing the Climate Vulnerability of Sport Organizations Framework

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Summary

Climate change presents a significant and growing challenge to the sport industry, especially outdoor and winter sports. The authors present a conceptual framework that elucidates the varying states of climate vulnerability a sport organization may face, so practitioners may better understand the risks of climate change. The authors developed the Climate Vulnerability of Sport Organizations (CVSO) framework by building on—and linking—concepts of climate vulnerability, exposure, sensitivity, and adaptive capacity in the context of sport organizations. By placing potential impact on one axis and organizational climate capacity on the other, the authors present four quadrants representing four types of climate vulnerability: the Problem State, the Redundant State, the Responsive State, and the Fortified State. Positioning organizations within the CVSO framework facilitates a better understanding of the effort and resources needed to address climate-related risks. Though not all sport organizations will be equally impacted by climate change, all must be prepared to identify the risks to their organizations.

Keywords
Adaptation, Climate change, Sustainability, Vulnerability, Organizational capacity

2.1 Introduction

Some of the most memorable images of the 2010 Vancouver Olympics were weather-related: rain and green mountains in the middle of winter. During the first days of the event, under the scrutiny of global media, organizers sourced snow from neighboring areas so the freestyle ski and snowboard events could be held in Vancouver (Goldenburg, 2010). This makeshift solution was costly and inefficient, but not uncommon. The problem of insufficient snow has become so ubiquitous in winter sport events that it is hardly surprising when events get canceled due to warm weather. Recent examples include the January 2017 cancellations of the American Birkebeiner Challenge, North America's largest cross-country skiing event, and the cancellation of the St. Moritz Para Alpine Skiing World Cup in Switzerland in December 2017. The acceleration of undesirable climate conditions for events is not unique to winter sports: organizers canceled the 2017 Cycle Oregon, a prominent Pacific Northwest cycling event, because of the forest fires that ravaged California, Oregon, and Washington State. Later that year, organizers canceled the Rock'n'Roll Marathon in Montreal because of unseasonably hot temperatures and high humidity in late September. Each cancellation carried economic and social consequences for the sport organizations and the communities in which they operate (Govind, 2018). Despite the growing awareness of climate change and the related actions taken around the world (Hunt & Watkiss, 2011), most sport organizations remain ill-equipped to proactively assess and manage the risks of the climate challenge.

The potential consequences of climate change for sport organizations include lowered revenues (Kay & Vamplew, 2006), damage and destruction of facilities

(Elsasser & Burki, 2002), event delays and cancelations (Fairley, Ruhanen & Lovegrove, 2015; Filo, Cuskelly & Wicker, 2015), and an overall decline in interest in a sport (Dawson, Scott & Havitz, 2013). Examples of such consequences include the Major League Baseball and National Football League cancelations during Hurricane Harvey in 2017 (Winkler, 2017) and the Australian Open delays in 2014 due to high temperatures (Govind, 2018). Given these climate-related effects, it is important for sport managers to understand the potential impacts of climate change on their organizations. In addition, beyond simply engendering understanding the potential impacts, discussions about climate change must include an acknowledgement of people's capacity for response in order to avoid being disempowering and patronizing (Wisner & Fordham, 2014). Many sport organizations are dynamic entities with considerable agency to change their circumstances and operations. Conceptualizing the adaptive capacity of sport organizations is therefore necessary for a holistic understanding of climate vulnerability in this context.

The relationship between sport and the natural environment is bidirectional. In one direction, sport organizations impact the natural environment through, for example, waste production (Chard & Mallen, 2012; Trendafilova, Babiak, & Heinze, 2013). In the other direction, the environment impacts sport by providing natural resources such as fields of play and weather conditions (Kay & Vamplew, 2006). Consequently, if the conditions of the natural environment change, sport events will be impacted, along with the associated sport organizations. Yet this latter direction and subsequent effects of the sport–natural environment relationship remains underexplored in the sport management literature. This lack of conceptualization is problematic because the natural environment

offers a central resource to sport organizations, either directly (e.g., as a field of play) or indirectly (e.g., through the provision of water and oil to power and maintain sport facilities). As the examples of event cancellations indicate, utility of the natural environment for sports is no longer a given. The increasing speed and severity of climate change (Pearce, Brown, Nerlich, & Koteyko, 2015) presents a need for sport organizations to monitor and manage the natural environment from which they derive key resources with some degree of urgency.

This paper serves a twofold purpose: first, to identify and define key constructs that address the relationship between sport and the natural environment; and second, to advance a conceptual framework that elucidates the varying states of climate vulnerability a sport organization may face, so risks may be better understood and managed by practitioners. The key contribution of this paper is a conceptual illustration of the relationship between climate change and sport organizations, accomplished by focusing on the interaction of climate change impacts and organizational climate capacity.

2.2 Literature review

2.2.1 Sport and the natural environment

Since the 1990s, sport management scholars have explored ways the sport industry impacts the natural environment. They have done so through the lenses of sport sustainability (Kellison & Hong, 2015; Mallen, Adams, Stevens, & Thompson, 2010; Mallen & Chard, 2012; Mallen, Stevens, Adams, & McRoberts 2010; Sartore-Baldwin & McCullough, 2018), corporate social responsibility (Casper, Pfahl, & McSherry,

2012; Ioakimidis, Stergioulas & Tripolitsioti, 2006; Inoue & Kent, 2012a, 2012b; Trendafilova, Babiak, & Heinze, 2013), and sport industry influence on pro-environmental behaviors (Casper, Pfahl, & McCullough, 2017; Chard & Mallen, 2012; Dolf & Teehan, 2015; Kellison & Kim, 2014; McCullough, 2011; McCullough & Cunningham, 2013). However, this literature addresses only half of the sport–environment relationship. The natural environment also has an impact on sports. For example, skiing relies on tenable snow conditions, pond hockey requires a certain depth and strength of ice, and sailing is most competitive in windy conditions. It follows, then, that if conditions of the natural environment change, sport will be impacted in terms of both opportunities to participate and consume sport (supply) and interest in participating and consuming (demand). Environmental change will carry subsequent implications for marketing, financing, and sustaining sport organizations.

The academic disciplines of tourism, recreation, and leisure have taken great steps in identifying this issue and creating frameworks to understand it in the context of their respective domains (Gössling, Scott, Hall, Ceron, & Dubois 2012; Scott, 2006, 2011; Wells, Ponting, & Peattie, 2011). Because of the sport industry's unique characteristics (Gyōri & Balogh, 2017), such as the central roles of managing competition (Trail, Anderson, & Fink, 2000) and spectatorship (Funk & James, 2001; James, Walker, & Kuminka, 2009), sport management also requires discipline-specific frameworks and strategies for assessing and managing climate change impacts.

To date, there have been only nine publications in the sport management literature that explicitly discuss the natural environment's impact on sport (Fairley, Ruhanen & Lovegrove, 2015; Filo, Cuskelly & Wicker, 2015; Leopkey & Parent, 2009;

Mallen & Chard, 2011; Petrass, 2016; Phillips & Turner, 2014; Ponting & O'Brien, 2015; Salome & Van Bottenburg, 2012; Watanabe, Wicker & Yan, 2017). We identified these articles through a keyword-based literature review among the nine journals listed as "General Sport Management Literature" on the North American Society for Sport Management (NASSM) website (NASSM, 2015). Keywords were *environment*, *climate*, *green*, *sustainable*, and derivatives thereof (e.g., *environmentalism*, *climate change*, *greening*, and *sustainability*). We retained only those articles that discuss a relationship between the natural environment and sport, and specifically, impacts of the natural environment on sport.

Of the nine publications, only two dealt with climate change response and resilience: Fairley et al. (2015) presented a case study on the management implications of deteriorating ice conditions that are rendering pond hockey tournaments impossible, and Filo et al. (2015) discussed resilience and recovery of sport clubs in the aftermath of disasters. These two articles offered empirical evidence of the impacts of climate; however, neither offered a conceptualization for *how* climate (and specifically, climate change) impacts sport. The dearth of research related to climate change in sport management may be due to the fact that scientists only reached consensus on climate change in 2001 (Oreskes, 2005). Nonetheless, this gap has left sport management practitioners largely underequipped to address the growing challenge of climate change, as evidenced by the many event cancellations in 2017 that resulted in net economic and opportunity losses.

In the following sections, we introduce the concepts of climate change and climate vulnerability, with close attention paid to key dimensions of climate

vulnerability: exposure to climate hazards, sensitivity to climate hazards, and adaptive capacity.

2.2.2 Climate change

The Intergovernmental Panel on Climate Change defines climate change as "any change in climate over time whether due to natural variability or as a result of human activity" (Pielke, 2004, p. 515). For several decades, the definition of climate change has been a topic of contentious debate, due to political and scientific uncertainty over the role that humans play in the changing climate. Scholars have generally accepted this particular definition, as it acknowledges both human-induced and natural variability in climate (Pielke, 2004). In the early 2000s, the scientific community reached a consensus on the existence and observability of climate change (Oreskes, 2005). The causes, speed, severity, and implications of climate change remain salient topics of research in nearly every discipline (Gilmore, 2017; Moss et al. 2010; Stern, 2008).

A 2004 report by the United Nations International Strategy for Disaster Reduction (UNISDR) separates climate change risk into two related concepts: hazard (geographic location, intensity, and probability of negative occurrence) and vulnerability (susceptibility to experience the hazard, and capacity to respond or recover). Hazard cannot be addressed through primary research in the discipline of sport management, because such research requires intimate knowledge of climate prediction models, geography, and natural resource science that is best addressed by specialists in those disciplines. In contrast, vulnerability is well within the scope of sport scholars' expertise and is an important area for future research within the discipline of sport management. Research on vulnerability centers on the interaction of external forces (e.g., rainfall,

temperature, political environment) and internal forces (e.g., knowledge, resources), both of which are accessible and measurable by sport managers. Additionally, climate vulnerability offers insights into the management actions that can reduce overall climate risk.

2.2.3 Climate vulnerability

The concept of vulnerability originated in natural resource research, but researchers have expanded it to denote the degrees and points of weaknesses and exposure to threats in fields as diverse as ecology, public health, political science, and agriculture (Fussel, 2007). Researchers define and theorize vulnerability differently across disciplines. For instance, applied scientists use the term descriptively, while social scientists and management scholars tend to use the term within explanatory models (O'Brien, Eriksen, Schjolen & Nygaard, 2004; Fussel, 2007). Sport management scholars apply the concept of vulnerability to describe financial weakness (Cordery, Sim & Baskerville, 2013), shortcomings of performance regimes (Sam & Macris, 2014), and issues relating to abuse and harassment against women, queer, and disabled populations in sport organizations (Kirby, Demers & Parent, 2008)—but not yet to climate or environment. This research examines another application of the concept of vulnerability in sport management: climate vulnerability.

The UNISDR framework and the natural resources and policy literatures conceptualize climate vulnerability as a function of (a) potential impact of climate change and (b) adaptive capacity (Adger, 2006; Turner et al., 2003; Weis, Agostini, Roth, Gilmer, Schill, Knowles & Blyther, 2016). Potential impact is the scope and severity of impact that climate change hazards will have on a given unit of observation.

The Intergovernmental Panel for Climate Change (IPCC) breaks down the concept of potential impact into two constructs: *exposure* (which measures the probability of facing the climate hazard) and sensitivity (which refers to the potential severity of the damages and disruptions due to climate hazards; IPCC, 2001). Exposure and sensitivity are further defined below, followed by a definition and description of adaptive capacity.

Exposure is the likelihood of the observational unit experiencing a negative impact or hazard (Smit & Wandel, 2006), which in the case of climate vulnerability refers to any climate change-related hazard such as extreme heat, flooding, drought, hurricane, and so on. Exposure is best illustrated as a response to the question: what is the probability of experiencing climate hazards? Sensitivity, meanwhile, refers to the internal or external physical, social, and economic features of an observational unit that influence its sensitivity to climate change (Smit & Wandel, 2006). The natural resources literature addresses sensitivity using the following question: to what degree would the natural or social system be directly or indirectly affected by the climate hazard? (Hinkel, 2011; Smit & Wandel, 2006, Wisner & Fordham, 2014). By these definitions, exposure and sensitivity are inextricably linked as complimentary factors of vulnerability, with the former explaining the likelihood experiencing climate hazards, and the latter detailing the scope and severity of damages caused by those hazards. Sensitivity and exposure relate to adaptive capacity: many of the features of an observational unit that determine its sensitivity are similar to—or indeed the same as—the features that constrain a system's adaptive capacity (Smit & Wandel, 2006).

The IPCC (2001, p. 982) defined adaptive capacity as "the ability of a system to adjust to climate change (including climate variability and extremes), to moderate

potential damages, to take advantage of opportunities, or to cope with the consequences" (see also Brooks, Adger & Kelly, 2005). It is a concept derived from the term adaptation, which originated in the natural sciences to describe the shifts in behavioral or genetic characteristics that enable living beings or systems to cope with change (Smit & Wandel, 2006). The common purposes of adaptive capacity research are to assess the extent to which potential impacts of climate change can be offset by adaptation to the impact (Parry, 2002), and to determine the relative adaptive capacity of different geographical or political units (e.g., countries, cities, neighborhoods; Brooks et al., 2005). The most common application of adaptive capacity research is to determine where systems can best direct their efforts to reduce overall vulnerability.

There remains no consensus for a universal model of the relationships among climate vulnerability, adaptive capacity, and the potential impacts of climate change (Hinkel, 2011). Exposure and sensitivity, as two constructs of potential impacts of climate change, and adaptive capacity, are applied differently across disciplines, as the relative weighting of exposure and sensitivity, and the scope of adaptive capacity, vary by discipline (Smit & Wandel, 2006). Regardless of context, however, environmental and social forces determine exposure and sensitivity, and the social, cultural, political, and economic circumstances of the observational unit influence adaptive capacity (Smit & Wandel, 2006). Additionally, climate vulnerability may be linked to other forms of vulnerability, including economic or social vulnerability. However, the possible relationships between climate vulnerability and economic vulnerability or social vulnerability remain unstudied in the context of sport, tourism, or recreation.

The most common critique of vulnerability research is that the measures used to analyze exposure, sensitivity, and vulnerability are too broad and unspecific; hence they have low generalizability and lack specific applications (Hinkel, 2011). Indeed, vulnerability is a theoretical concept that eludes the possibility of precise measurement, given that it is not an observable phenomenon (Hinkel, 2011; Moss et al., 2001). Still, the IPCC estimates vulnerability through the use of statistical models (IPCC, 2001). Understanding and operationalizing the concept of climate vulnerability is critical, as it denotes a pressing risk for society. We advance a framework to address climate vulnerability in a way specific to sport organizations, to be both industry-relative and directly applicable.

2.3 Conceptualizing climate vulnerability in sport

Researchers can address climate vulnerability in sport at several levels: the industry level, the institutional level, the organizational level, and the individual level. We explore climate vulnerability at the organizational level using the conceptual revision methodology detailed by MacInnis (2011). This methodology involves adopting and rewriting or reconfiguring an existing concept to suit the particularities of the discipline where the concept is adopted (MacInnis, 2011). Contributions made through conceptual revision explain the need for the revision and the relative benefits of the new work compared with previous literature (MacInnis, 2011). In this case, we borrow the concepts of climate change, climate vulnerability, exposure, sensitivity, and adaptive capacity from the domain of natural resource and policy research, and adapt each concept to suit the needs and interests of sport management scholars. Table 1 includes

all definitions before and after revision. The result is a conceptual framework that applies the constructs of potential impact and adaptive capacity to the sport organization context. As described in Section 3.1, when we revised potential impact and adaptive capacity for the sport context, they became climate impacts on organization and organizational climate capacity.

Table 2.1 Definitions for Climate Vulnerability among Sport Organizations

Construct name	Definition based on Intergovernmental Panel on Climate Change Third Assessment Report (2001b)	Revised construct name	Revised definition for Climate Vulnerability of Sport Organizations framework
Climate vulnerability	"The degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes" (p. 388).	(no name change)	(no definition change)
Potential Impact	"All impacts that may occur given a projected change in climate, without considering adaptation" (p. 375)	Climate impact on organizations (CIO)	The probability and consequences of climate change impacts affecting the sport organization, as the organization presently exists and operates.
Exposure	"The nature and degree to which a system is exposed to significant climatic variations" (p. 373).	(no name change)	The susceptibility of the sport organization to experience climate hazards.
Sensitivity	"The degree to which a system is affected… by climate-related stimuli. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of	(no name change)	The severity of climate change-related consequences for the sport organization.

	temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to *sea-level rise*)" (p. 384).		
Adaptive Capacity	"The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences" (p. 365).	Organizational climate capacity (OCC)	A sport organization's capacity to accommodate changes in climate with minimal disruptions or additional costs.

Following the revision of the key concepts involved in climate vulnerability, delineation (MacInnis, 2011) was used to depict the relationships between CIO and OCC. Delineation involves "detailing, articulating, charting, describing, or depicting an entity" (MacInnis, 2011, p. 144). Delineation requires an articulation and explanation of ideas and relationships, but emphasizes generalities and abstractions; researchers tease out the details through subsequent empirical research (MacInnis, 2011). The delineation process for this paper resulted in a new discipline-specific framework that illustrates the various states of climate vulnerability for sport organizations. The framework, including a discussion of its features and limitations, is shown in Section 3.2 and Section 4.

2.3.1 Revising potential impact and adaptive capacity

Initially defined and conceptualized as the scope and severity of negative impacts on an observational unit, and thus a hazard requiring mitigation (Hinkel, 2011), we revised potential impact for the context of sport organizations to CIO (climate impact on organization). CIO encompasses the probability and consequences of climate change impacts affecting a given sport organization as the organization presently exists and

operates, and is the aggregate of exposure and sensitivity. In addition, CIO does not take adaptive capacity into consideration, but rather solely describes potential negative impacts on the organization. The implication for practice is that managers should mitigate and reduce CIO.

The particular climate change hazards of concern may include warmer weather, higher or lower precipitation, higher or lower winds, storms and extreme weather, drought, and changing tides (IPCC, 2014). These hazards are specific to the geographic area in which a sport takes place, the environmental demands of the sport; the existing organizational infrastructure; and the severity of the lost opportunities, revenues, and reputation due to climate hazards. In assessing CIO, the probability and consequences of the hazard are considered at the time the assessment takes place. As such, potential future developments of the organization cannot be considered when assessing CIO; rather these would be included in a revised future assessment. The present operations, products, relationships, and potential losses are the only considerations in CIO; adaptive capacity, which includes future projections, is assessed separately as discussed below.

Sensitivity, the first factor informing CIO, denotes how severe the impact would be for an organization if climate change worsened. In traditional vulnerability research, observational units commonly consist of nations and other political entities (Smit & Wandel, 2006), wherein the mission of leaders is to serve the people and provide for the prosperity and wellbeing of people and space. In contrast, the mission of a sport organization likely includes successful seasonal operations aimed at turning profits and serving a specific subset of the community (Higham & Hinch, 2002; Smith & Steward, 2010), and giving stakeholders (e.g., athletes, staff, spectators, suppliers, sponsors)

access to a sport that may have very particular demands on the natural environment such as the need for ice in hockey, or wind for sailing.

Sensitivity in the context of sport organizations should therefore consider the climate sensitivity of each of the following: athlete experiences, staff experiences (including coaches and administrators), spectator experiences, finances (revenues and expenses), facilities and equipment, supply chains, partnerships and sponsorships, outreach (including marketing and public relations), and type of sport played.

Exposure, the second factor of CIO, denotes the susceptibility of the organization to experience climate hazards. It is determined by both geographic and organizational indicators (Adger, 2006; Smit & Wandel, 2006). Geographic indicators relate to current climate conditions and forecasted climate conditions in the region where the organization operates, and organizational indicators entail the degree to which the organization is reliant on stability and on specific climate conditions.

Examples of geographic indicators for exposure include latitude, altitude, average precipitation, wind, and recent storm activity (Hinkel, 2011). This information can generally be found on government-run climate and environment websites, such as Environment Canada, the National Centers for Environmental Information in the United States, Meteo France, and the World Meteorological Organization. Additional resources exist to examine projected storm activity and climate change, such as the report *States at Risk: Climate Preparedness Report Card* (Yu et al., 2015). Examples of the organizational indicators for exposure include the degree to which sport organizations rely on stable weather as well as their extent of use of natural spaces (e.g., golf courses, ski mountains, frozen ponds, trails; Verbos & Brownlee, 2017).

The concept of adaptive capacity is borrowed from natural resource and policy research and is revised based on literature dealing with organizational capacity for change **(**Heckman, Steger & Dowling, 2016; Judge & Douglas, 2009; Judge & Elenkov, 2005). The resulting concept of organizational climate capacity is specific to sport organizations in the context of climate change. OCC is defined as the awareness, skill, know-how, and resourcefulness that allow organizations to adapt their operations to new threats and to proactively develop new capabilities to insulate the organization from potential future threats (Judge & Elenkov, 2005). Based on this definition, OCC refers to the sport organization's capacity to accommodate changes in climate with minimal disruptions or additional costs.

Management researchers conceptualize adaptive capacity as positive (Engle, 2011) and consider organizational capacity a strategic necessity for the 21st century (Judge & Douglas, 2009), OCC is both positive and imperative for sport organizations. Thus, organizations should seek to improve and increase their adaptive capacity as a key strategy for mitigating climate vulnerability. OCC is influenced by social, political, economic, and infrastructural forces, some of which are internal to the organization and some of which are not.

OCC is conceptualized similarly to organizational capacity in the literature of both management science and sport management (e.g., Doherty, Misener & Cuskelly, 2014; Edwards, 2015; Judge & Douglas, 2009). In particular, previous researchers who focused on organizational capacity in sport, specifically in the contexts of nonprofit sport organizations (Balduck, Lucidarme, Marlier & Willem, 2015; Doherty et al., 2014; Misener & Doherty, 2009, 2013; Wicker & Breuer, 2013) and sport for development

(Svensson & Hambrick, 2016), measured organizational capacity based on dimensions such as human resources (e.g., experience and knowledge), financial resources (e.g., income and financial stability), infrastructure, cultural resources, and external relationships (Doherty & Misener, 2014; Wicker & Breuer, 2013). These dimensions can be adapted for the assessment of OCC to reflect the unique challenges of climate change, including infrastructure and operations; environmental technology; human resources; financial and other core resources; and networks and external relationships.

Some indicators of OCC may include type of facility and status of facility maintenance (for infrastructure and operations); storm readiness (for environmental technology); experience with recent storms and staff knowledge about extreme weather and natural disaster recovery (for human resources); access to finances for climate preparedness initiatives such as staff trainings, renovations, and storm recovery efforts (for financial resources); and networks that include climate specialists or climate organizations, and political support for climate initiatives (for networks and external resources). Given that OCC can only be determined based on the specific CIO of the organization, we conceptualize CIO as exogenous to OCC.

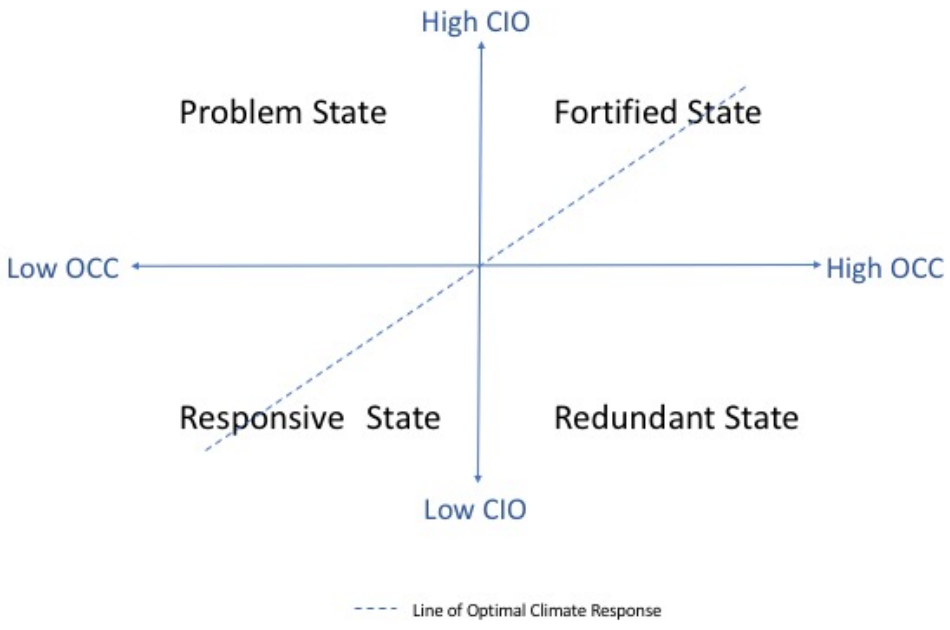
2.3.2 Delineating climate vulnerability in sport

If climate vulnerability is a function of potential impact and adaptive capacity, as discussed in the natural resource and in policy literature (Fussel, 2007; Hinkel, 2011), then CIO and OCC are likely related to each other and to the assessment of climate vulnerability of sport organizations. CIO and OCC exist concurrently within each organization, and can be low or high, on a continuum. High CIO would mean that exposure is high and sensitivity is severe, reflecting many climate-related risks and high

potential for the organization to experience disruption and loss as a result of climate change. Low CIO indicates low exposure and sensitivity, suggesting relative stability where climate change does not present a high risk to the organization. High OCC indicates a sport organization's high ability to assess and respond to climate impacts on the organization based on available resources, knowledge, and experience. Low OCC suggests a lack of resources, knowledge, and experience needed to respond to the climate impacts on the organization.

Assuming the climate vulnerability of sport organizations is a function of climate impacts and organizations' adaptive capacity, then a bi-dimensional framework can be drawn with OCC on the *x* axis and CIO on the *y* axis (Figure 2.1). The resulting framework is the Climate Vulnerability of Sport Organizations framework, discussed in the next section.

Figure 2.1 Climate Vulnerability of Sport Organizations (CVSO) Framework



2.4 The Climate Vulnerability of Sport Organizations Framework

The CVSO framework reflects the reality that there are no exceptions to climate risk; it is always present, to varying degrees (as indicated by the open arrows on the axes in Figure 2.1). However, given the agency of sport organizations to respond to risks (Cuskelly, 1989**)**, the CVSO includes constructs that are controllable (OCC and CIO's sensitivity factor).

The CVSO is not focused on CIO or OCC as singular constructs, but rather on the interaction between the two. Thus, the focus of the framework is the four quadrants, not the axes. The purpose of the CVSO is to offer insights into the types of climate vulnerability that sport organizations may face (represented by the quadrants), and the resulting management implications. This framework is intended to inform researchers of the risk that climate change presents to sport, and to inspire research on *how* organizations can minimize their vulnerability. The descriptions of each quadrant and the implications of the framework are discussed below.

2.4.1 Problem state

The worst-case scenario for an organization is to have high potential impact and low organizational climate capacity, which we refer to as the Problem State. The Problem State is the state of gravest climate vulnerability, and sport organizations in this state are at risk for disruptions, damages, and losses due to climate hazards. An example of an organization in this quadrant is Hume Tennis and Community Club, located in Melbourne, Australia. The extreme heat conditions at the 2014, 2016 and 2018 Australian Open events held in Melbourne suggest that this region of Southern Australia, and the sport of tennis specifically, will be a test case for climate change and summer

sport (Govind, 2018). Melbourne is likely to face the impacts of shifts in temperature, heightened UV strength, prolonged drought, and other climate-related changes that will prevent tennis from being played, or at least significantly alter the experience for athletes, staff, and spectators (Chalmers & Jay, 2018; Murphy & Timbal, 2007; Smith, Reid, Kovalchik, Woods & Duffield, 2018). Each of these changes could be devastating. To compound the high exposure and sensitivity, a tennis facility that operates entirely in the high-impact space may also have little capacity to change their circumstances, for example by funding new infrastructure to buffer the vulnerability (Doherty et al., 2014). The climate vulnerability of this organization is therefore high.

Another example of an organization in the Problem State is the iconic Idatarod sled dog race, an annual event in Anchorage, Alaska. This region has faced significant shifts in precipitation patterns and temperature in recent years, forcing the organization to move the event's start line further north in 2015 (Hagenstad, Burakowski & Hill, 2018; Stubberud & Ruud, 2017). However, moving the start line further North is untenable, without compromising the distance of the course, or participation and interest due to lack of access. Indeed, even a move to an alternate location may not be sufficient to keep climate risks at bay: in the coming years the whole region of southern Alaska is expecting higher temperatures that would make sledding unsafe and a long-distance race event untenable (Stubberud & Ruud, 2017; Yu et al., 2015).

In the Problem State, the organization faces high climate risk, so managers will be under pressure to lessen their sensitivity and exposure or increase their capacity. Within the Problem State, the management goal is to move into the Responsive or Fortified State, wherein organizations are adequately adaptable.

2.4.2 Redundant state

The best-case scenario for an organization, seemingly, is to have low CIO and high OCC (the Redundant State), as climate change would then present a negligible concern. However, this scenario is only ideal if the organization has unlimited resources and few constraints to spending. Given the law of scarcity, this is not the best quadrant for managers to strategically aim for, as it means spending more resources on addressing climate vulnerability than is necessary (i.e., implementing more adaptive measures than are needed to meet the immediate climate impacts, such as building storm gutters in the desert).

A better use of limited resources would be to match an organization's adaptive capacity to the level of potential impact, such that organizations expend a sufficient amount of resources for the organization to be responsive and adaptable in the face of climate change, without exceeding those needs and wasting resources on unnecessary additional responses. Thus, the ideal scenario, given limited resources, is to be in the Responsive State or the Fortified State.

2.4.3 Responsive state

An organization in the Responsive State experiences low climate impacts and has low organizational climate capacity. Organizations in this state have matched their OCC to the current CIO and are thus responsive to current climate risks, making this the most efficient scenario. In this state, managers must be vigilant and conduct regular assessments of OCC to ensure that any changes to the climate are matched with adequate changes to OCC. An example of an organization in the Responsive State is an outdoor sport facility in a moderate climate region that is relatively stable, meaning that

it is expected to face few storms and little flux in temperature, and to see little change to climate conditions in coming years. One such example is Heinz Field, home of the Pittsburgh Steelers, an outdoor facility in a relatively consistent climate zone, especially during the fall season when the facility is operational as a football field (IPCC, 2014; Yu et al., 2015). Another would be Memorial Stadium at the University of North Dakota, which is also in a region largely unaffected by climate change during the fall college football season, as most of the severe consequences of climate change in this area occur in summer and winter (IPCC, 2014; Yu et al., 2015). The operations of these facilities experience limited exposure and have little sensitivity, considering that football can be usually played in heat and rain and spectators will still attend. Thus, little climate preparedness (i.e., OCC) is required, especially for the main operational season (Yu et al., 2015). Low CIO does not exclude the possibility that these organizations may experience some impacts of climate change such as lowered attendance from out-of-town fans who may experience severe weather conditions, complications with team travel, and game schedule changes to accommodate other teams from regions that are more susceptible. However, for the most part, these organizations' main operations, namely hosting football games, are likely to be insulated from the worst possible impacts of climate change.

2.4.4 Fortified state

When an organization faces high CIO and has high OCC, the organization is in the Fortified State. Organizations in this state devote significant resources to improve preparedness and responsiveness toward current potential impacts and future potential impacts that may become more severe or more likely to occur. In this state,

organizations must demonstrate innovation and proactivity, requiring targeted management approaches. An example of an organization in the Fortified State is the Miami Marlins, who operate in a high-risk region for hurricanes and torrential rains that negatively impact baseball games (IPCC, 2014). In response to this high CIO, the Marlins have developed high OCC, including building a hurricane-resistant stadium (completed in 2012; Gould, Vega, & Sheppard, 2012) and training their operations and events staff in storm-response protocol. The organization's facility and storm-response protocols were pretested in 2008 by engineers (Gould et al., 2012), then tested again by Hurricane Irma in 2017, when they withstood the storm with minimal superficial damage to the roof and no flooding or water damage **(**Frisaro, 2017).

2.4.5 Classifying an organization into a state

The classification of an organization into one of the four states reflects its sensitivity, exposure, and adaptive capacity. As noted, some examples of indicators for climate change impacts (sensitivity and exposure) include the type of sport played, degree to which sport organizations rely on stable weather, the use of natural spaces (e.g., golf courses, ski mountains, frozen ponds, trails; Verbos & Brownlee, 2017), precipitation patterns, and frequency of extreme weather events (Hinkel, 2011). Some indicators of adaptive capacity include experience and knowledge (human resources), income and financial stability (financial resources), infrastructure, cultural resources, and external relationships (Doherty et al., 2014). In instances where the climate change impacts are greater than the adaptive capacity, the organization is at risk and falls in the Problem State. When adaptive capacity outweighs the climate change impacts, the organization is relatively safe and can be classified in the Redundant State. When the

climate change impact and adaptive capacity are relatively equal, the organization is either in the Responsive State (low CIO, low OCC) or the Fortified State (high CIO, high OCC). There exists, theoretically, a line that runs through the CVSO and cuts diagonally across the Responsive and Fortified States, representing the perfect match of climate impact with adaptive capacity. This is the *Line of Optimal Climate Response* and can be used diagnostically to assess climate vulnerability (dotted line in Figure 2.1).

2.4.6 Shifting between states

The CVSO framework presents a benefit for managers by confirming their agency regarding climate vulnerability. The fact of climate change does not automatically predestine sport organizations to negative consequences. However, as indicated by the discussion and examples above, climate change does present a set of actual and potential risks for organizations that should be assessed and addressed, where appropriate. The expected application of this framework is thus to assist sport organizations with identifying their points of vulnerability and directing their efforts towards those areas with the biggest exposure, greatest sensitivity, or least capacity. Management actions may shift an organization's position in this framework, meaning that managers have the capacity to influence the outcomes of climate change for their organization.

For example, managers can shift on organization from the Problem State to the Fortified State, as in the case of Buck Hill ski mountain in Minnesota. In the winter of 2012-13, Buck Hill experienced low snowfall and consequently had to close the ski area a few weeks earlier than usual. This resulted in significant financial and social losses for the mountain, a competitive disadvantage for the athletes who train at the mountain

regularly, and a decrease in winter tourism in the region. In response, the managers at Buck Hill invested in over four acres worth of artificial snow sheets (Daher, 2016). This innovation allows Buck Hill to operate year-round, offering skiing and snowboarding regardless of climate conditions (Buck Hill, n.d.). Further, the managers opted to diversify the venue's offerings by hosting mountain biking events the following summer, ushering in a new segment of the sport industry and a set of secondary operations. In two years, the mountain developed a high OCC using new infrastructure, new environmental technologies (snowmaking and artificial landscaping), and new operations that have low potential climate impact.

Given the potential for organizations to shift in the CVSO framework, the concept of organizational learning is useful to explore the process through which organizations can understand their climate vulnerability, increase their OCC, and mitigate their CIO. Organizational learning is defined as the process by which individuals participate in collective discourse and training that advances organizational knowledge and experience (Popova-Nowak & Cseh, 2015). The first step in organizational learning is knowledge acquisition (Huber, 1991), and in this respect, the CVSO framework provides new insights into the types of climate vulnerability faced by sport organizations, with the aim of increased awareness among sport management scholars and practitioners regarding climate change risks for this industry. A full exploration of the organizational learning process is beyond the scope of the present paper; however, this is an avenue for future research.

2.5 Implications and future research

The theoretical implications of this paper are manifold. First, we take steps to bridge risk concepts with organizational capacity concepts within the context of sport and climate change by placing the constructs of potential impact and adaptive capacity on a shared framework. This application of organizational capacity extends its use in the sport management literature by Doherty et al. (2014) and Edwards (2015) by considering capacity in a new context: environment. We also integrate a more recent understanding of organizational capacity by examining it in relation to climate impacts, and extending it as a variable influencing vulnerability.

Second, we present interdisciplinary concepts from natural resources, geography, management, and sport management, which Doherty (2011) has suggested is the necessary approach to address gaps in the literature relating to complex issues such as climate change. We contribute to interdisciplinary work in sport management by highlighting the utility of MacInnis's (2011) revision and delineation methods for not only borrowing theories from other disciplines, but blending theories from diverse disciplines.

Moreover, we add to the broader management literature that focuses on addressing grand societal challenges (Berrone, Gelabert, Massa-Saluzzo, & Rousseau, 2016; George, Howard-Grenville, Joshi & Tihanyi, 2016; Howard-Grenville, Buckle, Hoskins, & George, 2014). The interdisciplinary and grand challenge orientation will make it possible for the CVSO framework to support a wide array of socially relevant research in sport management, and will facilitate cooperation between sport management scholars and those from other disciplines. At the same time, this framework benefits

specific research on sport organizations, as it is based on constructs of climate vulnerability adapted for sport organizations: climate impacts on organizations and organizational climate capacity.

For practitioners, an operationalization of this framework could entail a climate-specific risk assessment that would be indispensable for sport managers to proactively address the climate risks associated with their operations. This framework can aid in the risk assessment of climate-change related hazards and assist mangers in determining how highly to prioritize this risk, and how many resources to dedicate to addressing climate vulnerability. For instance, an organization could use this framework to consider what types of impacts it might face regarding climate change (e.g., increased precipitation, extreme heat, rising sea level) and what capacities they possess to respond and act (e.g., moving indoors, relocating, establishing more robust rain plans, increasing availability of water to rehydrate athletes in extreme heat). By considering both the potential impacts and climate capacity, organizations can assess their climate vulnerability and determine what types of actions should be taken to improve. Familiarizing the staff of an organization with the CVSO framework through this paper would be a step towards organizational learning, as reading contributes to knowledge acquisition (Huber, 1991), and awareness is part of adaptive capacity.

A limitation of our framework is that it does not explore the possibility of a directional or causal relationship between CIO and OCC. Previous researchers have suggested that vulnerability can be represented by the following equation: vulnerability = potential impact – adaptive capacity (Brooks et al., 2005; Smit & Wandel, 2006).

However, this may not be true for the adapted constructs of CIO and OCC, or it may be more complicated in the sport context.

Another limitation of the CVSO framework is that it is static, whereas climate change and organizational climate capacity are both dynamic, changing regularly and sometimes unpredictably. Therefore, this framework derives its utility from regular reassessment of the organization's CIO and OCC, and repositioning on the framework to track progress towards the line of optimal response; organizations must periodically reassess the potential impacts of climate change and adaptive capacity. This periodic reassessment might involve revisiting analysis of the indicators mentioned in section 3.1 to see if any changes in precipitation, winds, natural disasters, finances, facilities, human capital, experience with recent storms or natural hazards, or other related factors have shifted the organization's OCC or CIO. As such an assessment likely requires substantial knowledge and experience, sport organizations may benefit from working with agencies, nonprofit organizations, and research institutions that specialize in climate change assessments to determine their exposure, sensitivity, and adaptive capacity.

This framework remains untested; it is a reconceptualization of existing concepts adopted from natural resource science, geography, and policy research, among others. The precise dimensions and operationalization of each construct (CIO and OCC) should be discussed and refined in future research to render this framework more useful to managers. For instance, as with previous sport management research that developed measures of a newly proposed concept (e.g., Uhrich & Benkenstein, 2010), a Delphi study could be conducted with experts in related areas (e.g., sport sustainability, environmental management, climate science) to identify a comprehensive list of

indicators for CIO and OCC. Subsequently, an index consisting of the identified indicators could be administered via a survey to a sample of managers in sports that are likely to be susceptible to climate change, such as baseball and skiing, to refine the scale and determine its reliability and validity. The resultant index, validated through the initial survey data, can be then implemented with a range of sport organizations and events that operate in various contexts to obtain further evidence to increase its accessibility and usefulness to sport managers.

In addition to the development of an index, the CVSO framework lends itself to future research in many other ways. For instance, case studies can be conducted to illustrate the utility of the framework to inform response strategies of sport organizations that need to address climate change, such as the 2020 Tokyo Olympics and Paralympics and their efforts to develop a response strategy for extreme heat conditions (The Japan Times, 2018). Future studies might also use organizational learning theories (Popova-Nowak & Cseh, 2015) and qualitative methods, such as action research (Chalip, 1997) to determine precisely how organizations can shift between states. Organizations that are classified into the Problem State are best suited to action research studies that explore the process of shifting between states, as there is the greatest urgency to improve OCC and lower CIO. As the observational unit of this research is sport organizations, future research might also explore the applicability of this framework to climate vulnerability at the individual, institutional, or industry levels.

If climate change progresses in scope and severity as predicted, resources are needed to assist sport managers in the assessment of and response to climate risks. The valence of this paper lies in its conceptualization of the climate vulnerability of sport

organizations and its potential to inspire future research and interest in this domain. Climate change will not impact all organizations equally, and some may barely notice any effect. However, it is important for organization to have the tools to identify the risks and understand their vulnerabilities.

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Chapter 3: Organizational climate capacity: Identifying dimensions

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Summary

Although sport organizations are facing increasing climate hazards such as wildfires, floods, and extreme heat events because of climate change, few resources exist to guide climate response among sport organizations. To address this gap, this research aimed to uncover dimensions for organizational climate capacity (OCC), which refers to a sport organization's capacity to accommodate changes in climate with minimal disruptions or additional costs. Interviews among leaders at 15 sport organizations that recently faced a climate hazard revealed six dimensions make up OCC: infrastructural resources, human resources, financial resources, network and relationship resources, process and development resources, and natural resources. With consideration for the natural-resource-based view of the firm and organizational capacity, the uniqueness and utility of OCC is discussed and managerial implications are presented.

Keywords: organizational capacity, climate change, risk, qualitative research

3.1 Introduction

The scientific community has reached a near-consensus on the increased pace and complexity of climate change (IPCC, 2018). The potential risks of climate change are more evident than the possible responses. For example, the median temperature of the planet has increased over 1.2 degrees Celsius from pre-industrial levels (World Meteorological Organization, 2016), causing ice caps to melt, water levels to rise, biomes to shift geographically, and an increase in the frequency and severity of storm activity (IPCC, 2014). Climate change is creating new environmental conditions to which actors, such as individuals, organizations, communities and nations, must respond. The managerial and policy challenge, therefore, is to learn how to respond.

The sport industry is no exception. Already, sport organizations are experiencing facility damages due to storms (Castillo, 2018; Winkler, 2017), event delays and cancelations because of unseasonable conditions (Fairley, Ruhanen & Lovegrove, 2015; Orr & Schneider, 2018), and increased incidence of heat-related illness (Smith, Reid, Kovalchik, Wood & Duffield, 2018), among other issues. Responses to these climate-related challenges may include mitigation of potential and actual losses, and maximization of new opportunities; however, the specification and measurement of an organization's capacity to respond to climate change-related hazards is complex. Further and importantly, the sport sector benefits from widespread interest and media attention (Smith & Steward, 2010) and has a proven capacity to influence public opinion on the environment (Casper, Pfahl & McCullough, 2017; Inoue & Kent, 2012). As such, it has been argued that the sport sector has a responsibility and opportunity to leverage their

social position to educate the public about climate change (Sartore-Baldwin & McCullough, 2018; United Nations Climate Change, 2018).

The Intergovernmental Panel on Climate Change (IPCC, 2014) applies the concept of climate vulnerability to explain the degree to which an individual, organization, or social system, is susceptible to adverse effects of climate change. Organizations will have different climate vulnerabilities, that is, varying degrees of exposure and sensitivity to climate change-related hazards, as well as differing capacities to respond (Berkhout, 2011). The concept of vulnerability has two complementary constructs: potential impacts and adaptive capacity (Hinkel, 2011; Smit & Wandel, 2006). Potential impact refers to the sum of all potential consequences of current or future climate hazards, without considering adaptation. Adaptive capacity is the ability of a system to moderate those potential damages, take advantage of opportunities, and cope with the consequences of climate (Smit & Wandel, 2006). Adaptive capacity is theorized as having a negative correlation to overall climate vulnerability, such that increasing one's capacity will reduce its vulnerability to climate hazards. Given that actors are so different, understanding the climate vulnerabilities of each presents an analytical challenge.

To address this challenge, Orr and Inoue (2019) revised the constructs of adaptive capacity and potential impact to suit the context of sport organizations. The new constructs that emerged were organizational climate capacity (OCC) for adaptive capacity and climate impacts on organizations (CIO) for potential impact. These new constructs respond to the critique of broadness and unclear boundaries from previous vulnerability research (Tonmoy, El-Zein & Hinkel, 2014) by proposing the sport

organization as the unit of observation, accompanied by unit-specific constructs. As OCC is more controllable than CIO and relates closely to existing concepts in sport management such as organizational capacity, identifying its definition and dimensionality represents an opportune entry-point to advancing this line of research. OCC refers to "a sport organization's capacity to accommodate changes in climate with minimal disruptions or additional costs" (Orr & Inoue, 2019, p.455).

Except for a few studies that focused on managing internal change processes (Amis et al. 2004; Cunningham, 2006), capacity to cope with change is under-researched in sport. Similarly, very little is known about sport organizations' capacity to cope with and adapt to exogenous change such as economic downturns, climate change, and rapid technological shifts (Judge & Elenkov, 2005). To address this gap and inform a holistic understanding of organizational capacity to adapt to climate change (i.e. OCC), a review of adaptive capacity literature within natural resource science and policy is appropriate.

This paper advances climate vulnerability research in sport by identifying dimensions of organizational climate capacity and unearthing the resource priorities within each dimension. In so doing, this paper extends organizational capacity research in sport to include consideration of a previously-overlooked exogenous stimuli (climate change), and adopting the natural resource-based view (NRBV) of the firm as a new theoretical lens. Further and importantly, the sampled organizations in this study represent a diverse array of organizations: for profit and non-profit, professional sport and amateur sport, winter sport and summer sport, team sport and individual sport. As a result, this paper also contributes to the organizational capacity literature by extending the scope of reference beyond the realms of nonprofit, sport-for-development, and

community sport. Theoretically, this article elucidates the divergence between OCC and existing capacity frameworks, including organizational capacity and adaptive capacity.

3.2 Literature Review

3.2.1 The resource-based view and the natural resource-based view

The resource-based view (RBV) is a theoretical framework that maintains an organization can bundle and leverage its internal resources and capabilities in such a way that promotes performance (Wernerfelt, 1984). The extension to this argument is that the role of managers is to obtain, organize, and use resources strategically to sustain the organization and facilitate progress toward the organization's mission (Judge & Elenkov, 2005). In this framework, *resources* are the expertise and experience of employees, and things a firm possesses, such as physical, financial, and information assets. *Capabilities* are actions an organization can perform, using its resources (Karim & Mitchell, 2000; Winter, 2000). Capabilities can be static (e.g., repeated routines and behaviors) or dynamic (e.g., change processes, systems of organizational learning, innovative capabilities) (Judge & Elenkov, 2005).

However, the RBV theory is limited by failing to consider the external environment and contextual factors that may influence organizational capacity (Acedo, Barroso, & Galan, 2006; Hart, 1995; Hart & Dowell, 2011). As Hart and Dowell (2011) aptly remarked: the RBV "marked a return to the roots of strategic thinking by placing the emphasis back on the firm's own decisions and competencies rather than on its environment" (p.1465). As a result, internal resources including leadership capacity and

operational capacity enjoy more attention than capacities that capture organizations' responses to their external environment.

An alternative to the RBV exists: the natural resource-based view (NRBV). The NRBV builds on the RBV to include the important relationship between an organization and its environment. In developing the NRBV, Hart (1995) suggested "it is likely that strategy and competitive advantage in the coming years will be rooted in capabilities that facilitate environmentally sustainable economic activity" (p. 991). In Hart's (1995) early works, the focus of NRBV was placed on the impacts of organizations on the natural environment, ignoring the reverse relationship (i.e. impacts of the changing environment on the organization). Given the current challenge of climate change, however, Hart's prediction has materialized. Sustainability in our era involves both the adoption of sustainable practices to protect and preserve the natural environment and adaptation to the changing environment (Brown, 2011).

This paper argues the NRBV presents an apt frame for examining organizational climate capacity, as the construct is focused on resources, cognizant of internal resources and capabilities, but also externally-oriented. The NRBV also, by its eco-centric approach, provides an opportunity to assess aspects of the natural environment (e.g. weather, reliability of environmental conditions, frequency and severity of storms) as key considerations for organizational climate capacity.

3.2.2 Organizational capacity

Organizational capacity refers to the ability of an organization to meet its mission and sustain itself over the long term (Linnell, 2003). Capacity was introduced to the management literature in the 1950s and has enjoyed steady research interest since

(Buchanan et al. 1999; Heckmann, Steger & Dowling, 2016), most notably in education management (Cosner, 2009; Toma, 2010) and healthcare management research (Meyer, Davis & Mays, 2012; Miller, Bedney & Guenther-Grey, 2003). Developed empirically and conceptually, organizational capacity is a multidimensional, multidisciplinary, context-sensitive concept (Christensen & Gazley, 2008).

Definitions of organizational capacity vary, but typically include one or more of the following capacities: 1) anticipating and influencing change; 2) making informed, intelligent decisions; 3) implementing the decisions; 4) attracting and absorbing resources; 5) managing resources; and 6) evaluating progress to guide future action (Christensen & Gazley, 2008; Honadle, 1981; Judge & Douglas, 2009). Combined, these represent the broad scope of organizational capacity as a whole-organization concept, encompassing all resources, actors, and actions of the observational unit. Importantly, all conceptualizations of organizational capacity include at least one dimension related to each of the following: financial resources, social capital, human resources, organizational structure, and external relations (e.g. partnerships, business environment).

The most significant advances in the measurement of organizational capacity have emerged from private firms such as McKinsey and Company (2001) and the Marguerite Casey Foundation. Each of these organizations operationalized the concept of organizational capacity into tools comprising over a hundred indicators, organized into dimensions. The United Nations Development Program has developed the most extensive measurement and benchmarking systems for organizational capacity, though these are operationalized as one subset of broader capacity measurement that begins at the micro scale (individual capacity) and extends to the macro scale (national capacity).

Notably, few measures of organizational capacity have been empirically validated (Judge & Elenkov, 2005).

Although theorists agree that environment influences capacity (Judge & Elenkov, 2005), the literature has focused more on internal dynamics of organizations, placing less emphasis on the influence of the external environment for understanding organizational knowledge and change processes and outcomes. This can be explained in part by the common invocation of the RBV in organizational capacity research (Judge & Elenkov, 2005).

3.2.3 Organizational capacity research in sport management

The sport management literature generally accepts Hall et al.'s (2003) definition of organizational capacity: the ability of an organization to muster and strategically utilize the capital needed to fulfill its mission. This definition bears striking resemblance to the Linell (2003) definition used in management, emphasizing capital (i.e. resources) as the core of capacity. Further, sport research has advanced similar dimensions for capacity to the general management literature (Judge & Elenkov, 2005). However, sport researchers emphasize the context-relativity of capacity frameworks and measurement, as empirical research consistently shows capacity varies significantly based on organization type, industry, and socio-political and economic circumstances (Robinson & Minkin, 2011; Stouten, Rousseau & De Cremer, 2018; Swierzy, Wicker, & Breuer, 2017).

In sport management capacity research, the most common set of dimensions referenced is Hall et al.'s (2003) which includes three resource dimensions: human ,

financial, and structural, the latter of which can be subdivided into three sub-dimensions: relationships and networks, infrastructure and process, and planning and development capacity. Each of these dimensions and sub-dimensions is defined and exemplified below.

In Hall et al.'s (2003) framework, organizational capacity is influenced by the natural environment (including constraints and facilitators) and the social environment (i.e. public support, policy, legal environment). Though Hall et al.'s (2003) framework was developed for use in non-profit and voluntary sector, the content is consistent with organizational capacity frameworks developed in business, education, health management, and other sectors (e.g. Christensen & Gazley, 2008; Eisinger, 2002; Fredericksen and London, 2000; Schuh & Leviton, 2006; Vinzant and Vinzant, 1996). The dimensions in Hall et al.'s (2003) framework reflect the RBV and the scope of capacity as a whole-organization concept.

The first dimension of Hall et. al's (2003) framework is human resources, described as "the ability to deploy human capital [...] within the organization" (Hall et al., 2003, p. 5). The organization's staff, paid and unpaid (volunteers), and their knowledge, experience, attitudes and behaviors are all considered human resources (Doherty et al., 2014; Misener & Doherty, 2009). Possible measures of human resources include: number of staff, total years of experience, types of training, professional development opportunities, and the presence of a dedicated human resources staff or department (Millar & Doherty, 2016, 2018; Misener & Doherty, 2009, 2013; Svensson et al. 2018; Svensson, Hancock & Hums, 2017).

Financial resources include revenues, expenses, material assets, liabilities, and the ability of the organization to develop and employ financial resources to produce desired outcomes (Hall et al. 2003). Revenue sources and assets differ from one organization to the next (Doherty et al., 2014; Fredericksen and London 2000; Hall et al. 2003, 2004; Schuh and Leviton 2006) as organizations have different purposes for money (e.g. a charity and a bank use and plan their finances differently). Definitions for this dimension specify that financial resources include all current and developing resources, so in addition to the various forms of financial assets, all activities related to fund development (creating new revenue streams or increasing profitability of revenue streams) must be considered (Bowman, 2011; Misener & Doherty, 2009).

The third overarching dimension is structural resources, which encapsulates several subgroups of resources: networks, infrastructure and process, and planning and development. The dimension of network resources reflects the notion that organizations do not exist in a bubble; their success is embedded in broader social, political and economic systems (Adger, 2003; Judge & Elenkov, 2005). Further, as open systems, organizations often cultivate and sustain relationships in the form of partnerships, sponsorships, supplier agreements, or competitive relationships with other organizations to supplement the internal capacities of the organization (Allison, 2001; Misener & Doherty, 2009; Svensson et al. 2018; Whittle et al. 2012).

The fourth dimension of Hall et al.'s (2013) organizational capacity framework is infrastructure and process, which refers to the physical space, equipment, systems (e.g. technology, databases), and organizational culture. In the sport context, this dimension includes, for example, the facility's facility features and accessibility, internal

and external communications, and the culture of collaboration or individualism in the organization (Doherty et al. 2014; Wicker & Breuer, 2011). Given the centrality of infrastructural improvements, or repairs, in responses to environmental change (Smit & Wandel, 2006), and the importance of process in change efforts (Amis, Slack & Hinings, 2004), this dimension will be included in the organizational climate capacity framework.

The last dimension in Hall et al.'s (2003) framework is planning and development, which is "the ability to develop and implement efforts aimed to improve organizational practices" (Svensson, Hancock & Hums, 2017, p. 2061). Strategic planning, the practice of writing mission and vision statements, the measurement of progress, and the ability to implement plans, are all examples of planning and development capacity. Planning and development is a dimension directly involved in change efforts (Judge & Elenkov, 2005) and thus a necessary component of organizational climate capacity.

3.2.4 Adaptive capacity

Adaptive capacity is a concept invoked in climate vulnerability research to describe "the ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences" (IPCC, 2001, p. 982; see also Brooks, Adger & Kelly, 2005). Research into adaptive capacity seeks to identify and understand relationships between social and biophysical systems, such that response mechanisms to climate change can be created (Adger, 2003, Lockwood, Raymond, Oczkowski, & Morrison, 2015). Thus, the common purpose of adaptive capacity research is to

determine where systems can best direct their efforts to reduce overall climate vulnerability (Parry, 2002; Brooks et al. 2005; Hinkel, 2011).

Adaptive capacity has been assessed at the global (IPCC, 2014, 2018), national (e.g. Yu et al. 2015), city (Balicia, Wright & van der Meulen, 2012; Hunt & Watkiss, 2011; de Sherbinin, Schiller & Pulsipher, 2007), and community (Kelly & Adger, 2000; Hahn, Riederer & Foster, 2009) levels using various indices and scales (Barnett, Lambert & Fry, 2008). The concept has also been applied to animals, plants, and other species (Midgley, Hannah, Millar, Rutherford & Powrie, 2008; Pacifici et al. 2015). In disciplines adjacent to sport management, such as recreation and tourism, efforts have been made to measure the adaptive capacity of nordic skiers (Landauer, Sievanen & Neuvonen, 2015), alpine ski facilities (e.g. Dawson, Scott & Havitz, 2013), and beach tourism sites (Perch-Nielsen, 2010). These studies have concluded that not all organizations, sites, and groups are impacted by climate change in the same way, nor do they have the same ability or willingness to respond.

As organizations are multidimensional and climate change hazards are diverse, adaptive capacity in organizations has been conceptualized as multidimensional (Lockwood et al. 2015; Adger, 2003). For instance, Lockwood et al. (2015) propose four dimensions to adaptive capacity: 1) social capital (referring to local networks, trust in government, reciprocity), 2) human, financial and physical capital (including features of the natural environment), 3) management approach, and 4) governance. Evidently, there are similarities between the dimensions of adaptive capacity and dimensions of organizational capacity.

Measures of adaptive capacity, which are typically included in broader vulnerability assessments, have been critiqued for the vagueness of items (Barnett et al. 2015), and for attempting to cover an observational unit too broadly with too few items (limited content validity; Tonmoy et al. 2014). Additionally, existing measurement tools are inaccessible to sport managers as they are laden with jargon (Hinkel, 2011) and require specialized knowledge in environmental science and climate change that sport scholars and managers are unlikely to have.

To make adaptive capacity measurement more accessible to sport managers, Orr and Inoue (2019) adapted the construct of adaptive capacity to the context of sport organizations. The revised construct is organizational climate capacity (OCC), which refers to "a sport organization's capacity to accommodate changes in climate with minimal disruptions or additional costs" (Orr & Inoue, 2019, p.455). OCC represents a marriage of adaptive capacity and organizational capacity, adopting the natural resource focus of adaptive capacity, and the observational unit of organizational capacity.

The new construct of OCC has the same theoretical relationship to overall vulnerability as adaptive capacity. That is, OCC is negatively correlated to overall vulnerability (Orr & Inoue, 2019). Further, OCC is conceptualized as existing on a spectrum of low to high, indicating that all organizations have at least some capacity to respond to climate hazards, even if minimal, but the degree to which they can respond will vary. High OCC imparts resilience to the organization, such that the organization is likely to maintain its key functions despite adverse climate impacts (Folke 2006).

The revised construct of OCC addresses the critiques of subject broadness and vagueness in previous vulnerability assessment research (Barnett et al. 2015). Further, in

adopting the NRBV as a lens through which to examine OCC, the limitations of both the adaptive capacity and organizational capacity literatures become clear. Specifically, the adaptive capacity literature acknowledges the natural environment as a central organizing factor, but is conceptualized too broadly to adequately address the unique circumstances of sport organizations. The organizational capacity literature, on the other hand, addresses the organization as its observational unit, but ignores the natural environment. The present study seeks to reconcile these gaps in the literature by soliciting the perspectives and experiences of sport managers who have recently experienced a climate-change related hazard, such as shorter winters, wildfires, and worsening storm activity. To address the gaps in the literature, the study is guided by the following research questions:

Research question 1: What are OCC dimensions?
Research question 2: How are the dimensions conceptualized among sport managers?
Research question 3: How do these dimensions compare to the dimensions of organizational capacity?

The experiences of managers are important as first-hand knowledge of adaptation efforts and response to climate change will ensure OCC conceptualizations are aligned with current practice.

3.3 Methodology

3.3.1 Study Design

This study applied a phenomenology approach (Teherani, Martimianakis, Stefors-Hayes, Wadhwa & Varpio, 2015) and employed semi-structured interviews with sport managers. Questions were developed from a thorough literature review of organizational capacity in sport management and adaptive capacity literature in climate vulnerability research. This approach allowed participants the freedom to express their perception and thoughts, and share their experiences, while being guided by the interviewer to cover the research questions (Fyall & Shipway, 2012; Rowley, 2012).

3.3.2 Sample

Sixteen interviewees were identified through a combination of purposeful sampling strategies (Suri, 2011). Using more than one sampling strategy allows researchers to select evidence that adequately addresses the purpose of the study (Suri, 2011) and meet standards of data sufficiency and saturation (Paterson, Thorne, Canam & Jillings, 2001), whilst using time and resources efficiently. In this research, intensity sampling was applied, which is a selection of cases that are information-rich and chosen specifically to be insightful and comprehensive examples of the phenomenon of interest (Robinson, 2014). Intensity sampling, in this case, was used to identify sport organizations that "manifest sufficient intensity to illuminate the nature of success or failure, but not at the extreme" (Patton, 2002, p. 234). Specifically, organizations that have experienced climate hazards within the past two years, including natural disasters, extreme heat, extended periods of drought, and so on, and that have made efforts to adapt were identified on news media platforms. Using the Google News search engine, terms such as 'natural disaster + sport', 'low snow + sport', and 'climate change + sport'

produced hundreds of articles reporting climate-related challenges and adaptation among sport organizations.

From the long list of sampled organizations, maximum variation sampling was used to choose cases for inclusion in the study. Maximum variation sampling is a strategy aimed at identifying key dimensions of variation and then selecting cases that vary from each other as much as possible (Suri, 2011). Points of variation included geographic region, type of climate hazard, sport, type of organization (public, non-profit, private), and organization size. Diversity in the sample lends to the transferability of the method and the generalizability of the study's findings (Suri, 2011).

Next, respondents within each organization were identified using criterion sampling, which involved reviewing and studying "cases that meet some predetermined criterion of importance" (Patton, 2002, p. 238). For this study, the criterion of a respondent was personal experience mitigating, managing, or coping with a climate hazard in their role with their current employer, preferably in a leadership role. In one case, this resulted in more than one respondent. Respondents were identified by contacting the organization via email and phone, and asking for the most appropriate respondent(s). Ultimately, 20 organizations were retained in the sample.

Table 3.1 Interview respondents

Marker	Case	Title	Organization type	Level of sport	Sport
R1	1	Director of Operations	Public, nonprofit	Amateur	XC Skiing
R2	2	Assistant AD for Facilities & Events	Athletics department, DI	Collegiate	Multi-sport
R3	2	Assoc. AD for Athletic Training	Athletics department, DI	Collegiate	Multi-sport
R4	3	Head Coach	Athletics department, DII	Collegiate	Rowing

R5	4	Director of Facility and Event Operations	Athletics department, DI	Collegiate	Volleyball
R6	5	Owner	Private, for profit	Amateur	Ski & snowboard
R7	6	Executive Director	Private, nonprofit	Amateur	Running
R8	7	Executive Director	Private, for profit	Professional	Tennis
R9	8	Director of Operations	Athletics department, DII	Collegiate	Basketball
R10	9	Executive Director	Private, nonprofit	Amateur	XC Skiing
R11	10	VP Ballpark Operations	Private, for profit	Professional	Baseball
R12	11	Director of Ballpark Operations	Private, for profit	Professional	Baseball
R13	12	Director of Facility Operations	Private, for profit	Professional	Basketball
R14	13	Senior Assoc. AD for Facilities, Operations and Events	Athletics department, DI	Collegiate	Multi-sport
R15	14	Executive Director and Head Coach	Private, for profit	Amateur	Mountain Biking
R16	15	Director of Golf	Private, for profit	Amateur & Collegiate	Golf

Of the 20 organizations contacted for an interview, 15 responded and one or more organizational leaders participated in the study, for a total of 16 respondents (see Table 1). The sample includes winter and summer sport organizations and a distribution of organization types: sport event organizations (n = 4), sport facilities (n = 4), professional sport franchises (n = 3), and NCAA Division 1 college athletics departments (n = 5). Each organization had experienced a climate hazard in the 12 months prior to the interview. This sample offers broad scope regarding organizational type, extending the

sport management capacity literature by including professional and private sport organizations.

3.3.3 Data collection

Participants were sent a pre-interview e-mail offering information about the researcher and the research questions, as well as a statement about confidentiality and consent. An interview protocol was developed based on the dimensions of adaptive capacity and organizational capacity to ensure all theoretical aspects of OCC are addressed in the interviews. Specifically, interviewees were asked to discuss their organization's experience with climate hazards, and how their organization has responded. Then, follow-up questions solicited more specific responses related to each of the possible dimensions of OCC identified in the literature review (e.g., financial resources, human resources), to ascertain if and how theses dimensions were pertinent to the organization's climate management and response (see interview protocol in Appendix).

3.3.4 Analysis

Interview recordings were transcribed verbatim. Following recommended qualitative analysis protocols (Emerson, Fretz & Shaw, 2011; Stone-Sunstein & Chiseri-Strater, 2007), the first round of analysis was guided by the following questions: How do [the interviewees] discuss, characterize, and understand these terms? What assumptions are made? What surprised me about the responses? What intrigued me about the responses? These questions encourage the researchers to consider their own assumptions, positionality, and first impressions about the data. Then, a thematic analysis was conducted using NVivo software (Leech & *O*nwuegbuzie, 2011) *to* identify

and examine patterns in the data (Creswell, 2013) based on some predetermined themes (i.e. dimensions of organizational capacity, adaptive capacity). Thematic analysis is widely accepted as an efficient and flexible way of coding qualitative information (Braun & Clarke, 2006). The thematic analysis was subsequently peer checked by two qualitative researchers, who then peer-debriefed their findings with the author to establish a common understanding of the findings, and to establish credibility (Nowell, Norris, White & Moules, 2017). As an additional measure of establishing credibility, the findings were confirmed through member-checking of the results with three interviewees (Creswell & Miller, 2000; Nowell et al. 2017). To improve transferability, we include descriptions of each code in Table 3.2 and detailed descriptions of the findings below (Nowell, 2017).

Table 3.2 Codebook for Interview Analysis

Code	Description
Network and relationship resources	Any direct or implied reference to relationships with parties external to the organization, that are cultivated and sustained. These generally include: partnerships, sponsorships, suppliers, governing bodies, or competitive relationships with other organizations.
Financial resources	Any direct or implied reference to financial resources including revenues, expenses, material assets, liabilities, insurance, and the ability of the organization to develop and employ financial resources to produce desired outcomes.
Human resources	Any direct or implied reference to the ability of an organization to develop and deploy human capital. The organization's staff, paid and unpaid (volunteers), and their knowledge, experience, attitudes and behaviors are all considered human resources. This includes professional athletes who are considered 'assets' to organizations.
Infrastructural resources	Any direct or implied reference to to the physical space, equipment, systems (e.g. technology, databases), and organizational culture (i.e. customs, values). This dimension includes, for example, the facility's features and accessibility, internal and external communications, and the culture of collaboration or individualism.
Natural resources	Any direct or implied reference to all direct resources of the natural environmental, such as clean air, fresh grass, natural landscapes, natural shade cover. This does not refer to climate hazards (e.g.

	natural disasters, rain storms, etc.)
Planning and development resources	Any direct or implied references to strategic planning, the ability to implement plans, and measurement of progress. This also includes an organization's policies and protocols.

3.4 Findings

3.4.1 Dimensions of OCC

Consistent with previous literature on organizational capacity in sport (Pillar & Doherty, 2016; Svensson et al. 2018; Swierzy et al. 2017), all five dimensions of Hall et. al.'s (2003) framework for organizational capacity were identified and discussed. This suggests the general conceptualization of organizational capacity is mostly applicable to OCC. However, one important departure from the dimensions of Hall et al.'s framework is the inclusion of natural resources in discussions about which resources are important for responding and adapting to climate hazards. Further and importantly, the descriptions and focus of each resource dimension was different in discussions of OCC than in the general organizational capacity literature. The similarities and differences in how resource dimensions are applied in the context of OCC are discussed, along with a review of implications.

3.4.2 Conceptualizing the dimensions of OCC

3.4.2.1 Human Resources

Human resources were identified by each interviewee as important for responding to climate hazards and adapting to future conditions. References to human resources were most commonly discussed in relation to staff and volunteers' knowledge and awareness of climate change, the natural environment, and the landscape within

which their organization operates. For example, one respondent highlighted the knowledge aspect of human resources being particularly important: “you have to have a knowledgeable staff, and a great operations personnel that has got to be on top of it and understand that challenge” (R13).

Interestingly, unlike previous research on organizational capacity (Misener & Doherty, 2009; Sharpe, 2006) that found the availability or number of employees and volunteers as an important factor in overall capacity, there was no mention of the size of the organization’s workforce being a concern or a factor in OCC. Rather, respondents discussed their organizations being focused was on improving and expanding knowledge and awareness of existing employees and volunteers through trainings, and through external consultants where appropriate (which is also part of the networks dimension of OCC). One manager expressed this clearly:

> we're obviously not experts on this and so we're looking to the experts in the meteorology and science community, and the athletic training community, to tell us what we should be expecting and what the impacts will be for athletes. So, we're always learning and trying to get better information and better science to back up our decisions. (R8)

Another component of human resources that was mentioned frequently was buy-in from the leadership of the organization for the adaptation process. Many respondents suggested that if stakeholders, especially internal stakeholders such as managers, were unsupportive of making change, it would be very difficult to move forward with new training, new policy, new infrastructure, and so on. The importance of stakeholder buy-in, was elucidated by a winter sport leader:

> The other key part of this whole change process is making sure we have all the right people on board. We know we have a problem, we identified that first, and now we have to get everybody on board with the shift. The last thing you need in a change process is people who feel left behind. So it has to be about the future, and it has to be about the benefits for everybody, and you need to have your key stakeholders involved in the process. (R6).

In many ways, these descriptions of what's important regarding human resources are similar to extant organizational capacity research (Misener & Doherty, 2009; Wicker & Breuer, 2011, 2013): there is an emphasis on knowledge and awareness, training, and buy-in from leadership for change processes. But the absence of discussion on number of employees is a departure from traditional organizational capacity research. The responses on human resources emphasized that for OCC, the quality of human resources in an organization is most important, rather than the quantity.

3.4.2.2 Financial Resources

Financial resources refer to the revenues, expenses, material assets, liabilities, and the ability of the organization to develop and employ financial resources to produce desired outcomes. Every respondent highlighted the importance of adequate financial resources for undertaking major adaptation efforts at the organizational level. This included funding for new trainings, funding for new equipment or infrastructure, or funding to support an in-depth assessment of potential climate hazards. Interestingly, all but three respondents identified that the necessary financial resources were lacking: "if

you need to do something quickly, the issue is that you've got to have the money to do it, you've got to have the resources to do it" (R13).

In some cases, the organizations were relying on operational funds or contingency funds to pay for important adaptation initiatives. For instance, an administrator at a university athletics department that experienced significant facility damages following the 2018 hurricane season, and needed repairs and new stormproof infrastructure to capture flooding explained that funding for construction "would have been from the capital expenditure account and it was part of a contingency and repairs budget" (R9). Fortunately, some organizations in the sample had adequate funding in their operating budgets to support adaptation initiatives: "It comes out of the... we call it ballpark operations or game operations, sort of the same budgets. Some of those are in our expense areas. But some of those expenses are a little larger and need more" (R11). As this respondent suggests, operating funds were not always sufficient.

When additional or new funding was needed, new sources of financial resources were being created through fundraising and capital campaigns, or re-budgeting. As one winter sport manager discussed:

> For new tech and new snowmaking machines, we've been fundraising and asking our participants if they're willing to pay more to fund these things, and we've been getting a good response from them. And then there's an endowment for [the organization] that we started last year, a general development fund. And so we've been spending a lot of time developing that in the last year and its now just under a million dollars, which is a lot of money, but not enough to comfortably invest in the technology we'd need to invest in. (R1)

In many ways, the financial resources dimension is discussed similarly in organizational capacity literature and this OCC study. For instance, sufficient funding is the primary consideration in measuring this resource area, and finances can be built through capital campaigns, fundraising, increase sales, or loans (Balduck, Lucidarme, Marlier & Willem, 2014; Wicker & Breuer, 2011, 2013). However, an interesting departure from organizational capacity framing of financial resources is the need for additional funding beyond general operational funds, to respond to the challenges presented by climate hazards. In other words, having the funds to operate under 'business as usual' circumstances, which were described by Doherty, Misener and Cuskelly (2014) as including stable revenues, stable expenses, alternate sources of revenues, and fiscal responsibility, are not enough to operate under the changing circumstances of the natural environment. So, more money is needed, or at least, more money must be allocated to climate response and adaptation for an organization to have strong OCC.

Beyond the internal human and financial resources of an organization, and as emphasized by the importance of securing buy-in from all stakeholders, respondents discussed the importance of the business and legislative environment, and the importance of networks, for OCC.

3.4.2.3 Structural Resources: Networks & Relationships

Networks and relationships refer to relationships with parties external to the organization, that are cultivated and sustained. These generally include: partnerships, sponsorships, suppliers, governing bodies, or competitive relationships with other organizations. As discussed in the previous sections, often expertise on climate change is

sought from outside the organization. Further, in some cases, funding support is sought from outside the organization, particularly in the case of fundraising campaigns and capital campaigns.

Aside from funding and expertise, respondents explained that sport organizations often require approval from their sport governing bodies for their adaptation efforts. For instance, if an organization wants to change a policy related to permissible heat, rain and storm activity, or event cancelations, these must be cleared with the governing body: "The decision-making basically includes baseball operations, so me, and the General Manager, and the President. Those are the three entities. And then we have to get approval from [the league]" (R11). In other instances, adaptation efforts are mandated by governing bodies, in the form of new policies, new procedures, new infrastructure, or new trainings. One respondent explained that consistency is expected within a league or a series of events: "Ultimately, if the [league] or [event series] set a standard, it's not hard for us to follow suit. The more complicated decisions come when we're doing something different from what the main tours are doing" (R8). Sometimes the expectation of consistency for policies and procedures spans across leagues: "I think our outdoor facility standard is the same across the board as recognized by the NCAA. The NFL and the MLS are very similar. All the field sport try to be consistent" (R5). In many ways, organizations are limited by their governing bodies in the sense that organizations must comply with minimum standards, get approval for new initiatives or efforts, and must endeavor to have consistent policies and procedures with others in their league or series. For these reasons, having a supportive and forward-thinking governing body is an important resource for sport organizations as it relates to organizational climate capacity.

Another stakeholder in sport, particularly high level amateur and professional sport, is the media (Naraine, Schenk & Parent, 2016). Relations with the media, and media support for climate-related organizational changes, are a critical component of OCC. One event organizer discussed the importance of revenues from media broadcasting rights and highlighted that due to their influence, the media can place pressure on organizations to continue play despite potentially dangerous conditions. This is best exemplified by a tennis event that was pressured to reduce the duration and number of breaks in hot conditions: "from a business standpoint, the media wanted to be covering games that were fast, so having breaks isn't good for the media rights holders" (R8). When there are delays or disruptions due to weather or climate hazards, one respondent indicated that the media partners get upset: "We have even had games in the [league] with broadcasting, and they are giving us so much money to produce the games, and then we've actually had to call it off 72 hours prior to the game when they see any inclement weather or delays that could screw up their broadcast. And that really pisses them off" (R5). The pressure placed on organizations by the media to run on schedule, in the predetermined venues, can create friction with competing interests of preserving the athletes' and fans' health and ensuring the safe operations of the facility. As a result, having flexible media contracts that recognize the risks associated with climate hazards (e.g. droughts, floods, extreme heat, etc.) is an important relational resource for sport organizations.

These two focal points of the findings in the external networks and relationships dimension are unique to OCC compared to previous organizational capacity research, given previous research focused predominantly on sport-for-development, non-profit,

and community sport organizations (Svensson et al. 2018, Svensson & Hambrick, 2016; Millar & Doherty, 2016, 2018; Misener & Doherty, 2009, 2013). In this study, the media strongly influenced college sport (especially, football and basketball events), professional sport, and large event organizations. Consequently, this aspect of networks is unique to OCC compared to previous research on organizational capacity among nonprofit and community sport organizations, that did not place emphasis on the media as this was not an important stakeholder in the operations of those organizations.

3.4.2.4 Structural Resources: Infrastructure & Process

Infrastructural resources refer to the built space, equipment, systems (e.g. technology, databases), and organizational culture. This dimension includes, for example, the facility's features and accessibility, internal and external communications, and the culture of collaboration or individualism. Infrastructure was the resource each respondent identified most readily and most often. Overall, concern over having appropriate facilities, with adequate heating or cooling systems, water removal systems, and equipment to manage the challenges of the changing climate (e.g. snow maintenance technology, storm radars, etc.) was paramount.

Some respondents addressed this resource by describing the limitations of their current (or former) infrastructure: "For years, I mean, we had tents that were collapsing from too much snow" (R10). A respondent who operates an indoor venue that has experienced storms in increasing frequency and severity over the last couple years noted "our arena was originally built in 1975, and I don't know what you knew in 1975 but at the time, we weren't thinking about shelters or emergency scenarios" (R9). The poor

design of sport facilities from decades past was not an unusual finding. One golf course manager expressed a similar issue: “the 1996 course that was here at [the course] is a different course in terms of its design, in terms of its water shedding capabilities, its drainage. All kinds of course features are different now, by design, in 2018 than they were in 1996. Consequently, some of the flooding potential was mitigated by the 2018 redesign” (R16). In explaining what they were lacking in infrastructure, they were articulating the importance and value of good infrastructure that can handle to climatic and environmental challenges, as a critical resource for OCC.

In other cases, respondents discussed the changes to infrastructure that had taken place since they last experienced a climate hazard. One professional baseball organization experiencing heat waves that impact fan experiences purchased new air conditioning equipment: “back in 2010 or 2011 we purchased some swamp coolers as well. Well the brand name is Portacool, you can look these things up, they're basically outdoor air conditioners. And we’ve recently added more of them” (R12). Another organization focused their attention on restructuring the competition schedules to accommodate the climatic change and make the most of existing infrastructure: “we're now really working hard on adjusting our scheduling and finding ways to get more games into the stadiums where there are retractable roofs” (R8). By stressing the focus on infrastructural improvements and upgrades, respondents indicated the importance of infrastructure as a resource of OCC, and the change processes that underscore these infrastructural upgrades.

This dimension is discussed in much the same terms as it is for organizational capacity, however, respondents discussed infrastructure and processes only in relation to

environmental challenges. This offered focus where, in the case of organizational capacity, the scope of this dimension may be so broad that certain processes, such as damage repair processes for facility damage, or infrastructural components, such as air quality monitors, get missed.

3.4.2.5 Structural Resources: Planning & Development

Planning and development resources include activities and capacities such as strategic planning, the ability to implement plans, and measurement of progress. This also includes the organization's policies and protocols. Unsurprisingly, given the exogenous changes in the natural environment that impacted operations of the sport organizations in this sample, the policies and procedures associated with climatic response were described as being important for each organization. A ripe example is the heat policy implemented at university athletic facilities: "a policy where during football season, fans can bring their own reusable water bottle and get free water. These policies are important because they're small and they don't cost us much, but they're a good step in the right direction and they keep people comfortable" (R5). In this case, the typical policy of no outside food or beverages is waived for water bottles, to provide for patron safety. Other examples include contingency plans for outdoor winter events, however, as one winter sport event director pointed out, unless plans are tested, their utility in practice remains unknown:

> While we'd had some minimal back-up contingency plans, we didn't by any means have real plans because they hadn't been tested and really thought through, because we didn't have to. We still today haven't really had the chance to test all our contingencies, which in many ways is a good thing because it

> means we've had strong seasons in 2018 and 2019, so we still don't now know for sure that they'll work. (R10)

In many instances, like the last example, organizers expressed concern for the lack of thorough planning involved in policy development, and the lack of testing. For instance, organizations typically reported that policies exist for storms, such as lightning protocols and rain delay policies, but don't include responses for the possible flooding implications. In other cases, respondents explained that some climate hazards don't have any dedicated policies at all, such as wildfires and no-snow winters. One indoor professional sport facility in Northern California compared their rain policies and wildfire policies:

> We have a whole procedure with our engineers, we have a whole standard operating SOP for when it is pouring down rain and we have a show in here. The SOP basically lays out the 12 steps that we have to do to ensure that we are okay. But no, we don't have that for smoke or for wildfires. We should, based on our experience last year. (R13)

In each case, the relative low cost of implementing contingency plans and heat and weather policies was offered as a reason for their widespread adoption, compared to new infrastructure.

3.4.2.6 Natural Resources

The NRBV of the firm demands attention be paid to the natural environment and the conditions within which an organization operates (Hart & Dowell, 2011). Consistent with this perspective, in the interviews, there is abundant evidence that natural resources

are an important consideration for OCC. In the context of OCC, natural resources refers to resources, eco system services, and environmental conditions beyond the control of the organization, but for which the organization must be prepared, and on which operations may depend. For instance, one golf course explained the natural resource on which the sport depends (the green) was compromised by a series of tropical storms: “In some cases, a week after or greater, the grass fields were closed because there was all kinds of rock and debris that had been placed on top of those. They were covered in mud” (R16) and as a result, playing was untenable. For a professional baseball organization, unseasonable conditions in April led to challenges with snow, ice, and slush:

> I'll use our best case scenario to illustrate what I'm saying. Right now, there's a ton of snow in the bowl. But it's ok because it hasn't been there all winter. What's really bad is when there's a lot of snow that melts and then refreezes and then melts and freezes again. So when it comes time to clear the seating bowl, dealing with just snow is fine, we can have a whole winter's worth, and that's all good so long as it's not layers of ice and slush and snow. If it's a slow melt and we had a lot of ice building up, we have to start clearing snow earlier and expose that ice as much as we can, and then hope that we have some daylight that can take care of melting the ice for us (R12).

In this case, not only is the natural environment creating the problem (the snow and ice), it’s also providing the solution (heat from the sun).

In many respects, the natural resources dimension is the organizing dimension of organizational climate capacity. It is this dimension that is front-of-mind for respondents

as they recalled climate hazards and the natural resources on which their organizations rely, but which the organization took for granted before the hazard. The inclusion of natural resources is the key differentiator between organizational climate capacity and organizational capacity, an entirely new and unique addition to the set of resources considered in capacity research in sport.

3.4.2.7 Overlap between dimensions

Based on the findings, it is clear there is considerably interplay among the resource dimensions. For instance, for a nature-based sport (Howe, 2010) such as mountain biking or canoeing, the basic infrastructure needed for the activity are natural resources. While each sport requires equipment (e.g. bicycle, canoe) that could be clearly classified as infrastructural resources, the field of play (e.g. trail, lake) is itself a natural resource. This same field of play may be adapted or altered by equipment such as trail blazing equipment or course markers (infrastructural resources). In another example, the individuals that work within an organization are human resources, and their individual attitudes and behaviors are human resources, but their collective organized actions (e.g. writing a mission statement that reflects their values), becomes organizational culture which is a soft infrastructural resource.

Additionally, it was discovered that some resources are precursors and preconditions to others. For instance, planning and development resources are reliant on strong human resources. Respondents explained that if an organization doesn't have a high level of awareness of climate change, or poor training on the types of challenges they may face, it's very hard to write protocols and policies and to have these approved by upper management. One respondent addressed this in relation to heat-related illnesses

in university athletics: “it's really about being aware of the big picture and being aware of the key challenges you are facing, and learning, and then finding creative ways to improve your bottom line and operations despite those challenges” (R14). In another example, new or improved infrastructure requires adequate financial resources:

> We got all new equipment that got included in our capital project for the year, so that's a big one for us. Obviously, I don't think anybody's going to turn that down, but buying that equipment- it's expensive. And so, the next round of the capital budget for this year is going to reflect some of that concern and some of those new costs. (R13)

Importantly, in this sample, no two organizations discussed overlap among resources in the same ways.

3.5 Discussion

This research uncovered that six dimensions make up OCC: infrastructural resources, human resources, financial resources, network and relationship resources, process and development resources, and natural resources. These six dimensions represent the five dimensions of organizational capacity (Hall et al. 2003; Misener & Doherty, 2009, 2013; Millar & Doherty, 2016, 2018) plus natural resources. The unique addition of natural resources reflects the adoption of the NRBV as a theoretical lens and is among the key differentiators between OCC and organizational capacity.

The second differentiator between OCC and organizational capacity revealed in this study is that different aspects of each resource dimension are emphasized in each (Svenssion & Hambrick, 2016; Millar & Doherty, 2018). This is important as it implies organizations focus on a set of specific interests and priorities when it comes to OCC:

they are interested in protecting assets, maintaining stability, and upgrading policies and infrastructure to meet the demands of a changing environment. The priorities organizations expressed when discussing OCC were, as the name OCC suggests, expressly focused on the dynamic natural environment and capacity to respond to unforeseeable and potentially dangerous and expensive hazards, rather than meeting financial objectives, growing the organization, and conducting day-to-day business as usual, as would be the case with organizational capacity. Therefore, OCC is a more suitable construct to address climate hazards than organizational capacity. In other words, the adoption of a unique construct (i.e. OCC) to address the unique challenges of climate change, is appropriate based on the findings of the interviews.

OCC also derives its uniqueness from its specificity (i.e. the construct is specific to climate), which raised unique points of emphasis within each resource dimension. Specifically, respondents consistently pointed to the quality of resources in each dimension being more important than quantity of resources. For instance, within human resources, organizational leaders were more concerned with having employees that were aware of climate change and trained in climate response plans, rather than having a high number of employees. In financial resources, leaders identified contingency funds and adequate insurance that covers climatic events, not overall revenues or debt to equity ratio. It was highlighted by respondents that if funds aren't allocated specifically to climate response, the capacity to respond to climate events is low. This kind of specificity in the responses, propelled by the specificity of the construct itself, carries the important managerial implication of being useful for guiding managers in climate-related decision-making. Studies have consistently shown that when constructs are too

broad, vague, or nonspecific, they fail to serve practitioners (Hinkel, 2011; Tonmoy et al. 2014) and conversely, that context- and problem-specific constructs have high utility (Eriksson & Sundelius, 2005). Considering most sport managers are not trained in natural resource management, environmental science, or disaster management (McCullough, Orr & Kellison, in press), constructs such as OCC will be useful in orienting planning and response, particularly when developed into assessment tools or planning frameworks. Further, as climate hazards are continuing to present managerial challenges to sport organizations (Dingle & Stewart, 2018; McCullough et al., in press), it is likely specific constructs such as OCC will be increasingly needed.

Importantly, not every organization emphasized the same aspects of each dimension. For instance, the non-profit Nordic ski organization was more focused on natural resources (especially, predictability of weather year over year, and sufficient cold temperatures for lakes to ice over), planning and development (especially, scheduling of trail maintenance), and human resources (especially, volunteers), while the professional basketball franchise was interested in infrastructure (especially, smoke detectors, facility design and emergency exits, and air handling units), and financial resources (especially, contingency funds for natural disasters). Clearly, organizations will have different capacities to develop their resources and will place different degrees of importance on each dimension of resources. While this sample was too small to tease out the intricacies of which resource dimensions are most salient for each organization type, future research might explore how various types of organizations prioritize resource dimensions in OCC.

This study also revealed considerable overlap and interplay between the resource dimensions of OCC. This finding is important as it underscores the importance of considering all dimensions of OCC rather than assessing one dimension in isolation from others. Given the available data, it was impossible to glean further insight into the patterns of overlap and interplay among the dimensions except to show that among the organizations in this sample, each organization's dimensions overlapped in unique ways. Future research might examine the overlap and interdependence among resource dimensions to establish patterns or to confirm this study's finding that each organization's case is unique. This would be an important research inquiry and might aid in the development of OCC-building strategies for managers, particularly if patterns were established based on sport or organization type (i.e. non-profit, for-profit, public). For instance, if it were discovered that infrastructural resources rely strongly on financial resources, managers might prioritize building their financial resources in the first instance, such that they might improve infrastructural resources later. In the absence of such a study, managers should consider all resources together; using the dimensions as a guide to ensure all possible aspects of OCC are captured in their assessment.

The findings offer abundant evidence supporting the importance of natural resources as a driver of concern, a resource dimension, and a frame for OCC. Hence, the NRBV was validated as a more useful theoretical frame than the resource-based view of the firm for the examination of OCC. As such, more than 20 years following its initial proposal (Hart, 1995), the NRBV may have a consequential role to play in advancing managerial research related to assessing and responding to climate hazards.

The practical implication of this research is that sport managers ought to assess their organization's capacities in all six resource dimensions, together, lest they miss important aspects of OCC. Further and importantly, organizations should not assume that having the capacity to meet 'business as usual' needs will be sufficient to meet the demands of future climate scenarios. Building an understanding of the climate crisis and its implications for the organization was highlighted as the first and easiest resource area to strengthen: if the organization is aware of- and understands- the risks of climate change and the potential hazards they'll face, they can preemptively begin reinforcing their other resources such that they are not faced with massive financial layouts or structural changes in the case of a hazard.

3.6 Limitations and Suggestions for Future Research

As the sample reflects organizations that have experienced a climate hazard, this sample is likely a group of responsive organizations toward the natural environment, not proactive. I say likely as its possible some of the organizations were proactive in their climate management before experiencing the hazard, however, interviews were conducted after the hazard and during or after the recovery efforts. The selection of responsive organizations afforded a better opportunity to gain insight into the various dimensions of OCC, as respondents experienced climate hazard relatively recently and thus, the experience was fresh in their memories. However, this sampling strategy may have influenced the findings, in the sense that the sampled organizations have higher degrees of exposure to climate hazards and thus, higher awareness. Future work my replicate this study with organizations that are not directly affected by a climate hazard,

focusing instead on those indirectly impacted, such as the visiting teams whose events were canceled or postponed as a result of the hazard, or neighboring facilities that experienced the hazard but were not negatively impacted. This type of research may lead to more nuanced understanding of which dimensions are important to managers with varying levels of awareness and experience dealing with climate hazards.

Another possible limitation of this study is the timing of interviews. Interviews were conducted within 2 years of the climate hazard and thus a longer-term outlook may be useful. In many cases, change processes were still ongoing. Longitudinal data ought to be considered in future studies to explore the outcomes of change processes and perceptions of successful or unsuccessful initiatives, perhaps through a replication study in 5-10 years.

Further, the initial sampling was met with some non-response, though this was minimized by a pre-interview email (Rowley, 2012). Interestingly, many respondents noted that they have been contacted for interviews on this topic by the media but typically don't respond because they don't want to appear 'closed for business' (R6) or 'too compromised' (R11), and the topic of climate change can be 'too political' (R4). These same rationales may apply to some of the organizations who did not participate in the study, perhaps even more so. This would be an important and relevant question for future research to unpack as organizations continue to be impacted by climate-related hazards and challenges, and change necessitates awareness.

A future extension of this study might include a wider breadth of sports, or a focus on one sport that is likely to experience fast and significant impacts of climate change, such as hockey or surfing (Kay & Vamplew, 2006). In this study, efforts were

made to include a range of sports with different environmental demands and varied internal resources (in terms of organization size, type, sophistication of facilities, etc.), however it is possible some particularities of sports not included in the study, such as pool maintenance concerns for swimmers or surf conditions for surfing, may have been missed. This work must be continued and extended to grasp OCC-building efforts in all sport organization types, as all will be affected by climate change albeit in different ways.

Finally, future research might apply stakeholder theory to understand the actors involved in the capacity-building process: who are the stakeholders that participate in the capacity-building process, or don't; and who needs to be involved for a OCC-building process to be successful? Given the importance of management buy-in for OCC-building processes to begin and advance, as evidenced in this study, these questions may help sport in the face of changing climate.

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Chapter 4: Finding consensus on indicators for organizational climate capacity

Summary

As climate change presents organizations with unpredictable challenges, including damages, losses, and cancelations resulting from climate hazards, research into climate vulnerability and response in the sport sector is urgently needed. This study used a consensus-seeking method to identify indicators for organizational climate capacity (OCC). The three-round iterative process resulted in a list of 77 indicators organized into six dimensions: infrastructural resources, natural resources, planning and development resources, human resources, financial resources, and network and relationship resources. The highest importance and representativeness scores were associated with the planning and development dimension, indicating the salience of proactive approaches, planning frameworks, goal setting, measurement and monitoring of progress toward goals, and worst-case-scenario planning for overall OCC. The list of indicators can serve as a prompt for managers to assess their OCC and begin the process of developing and strengthening this type of capacity.

Keywords: organizational climate capacity, Delphi, indicators, climate change

4.1 Introduction

The 21st century presents organizations with pronounced increases in the pace and complexity of exogenous change (Judge & Douglas, 2009; Truyens, De Bosscher, Sotiriadou, Heyndels & Westerbeek, 2016), that is, changes external to the organization that affect the organization's capacity to achieve its mission. Examples of such changes include the processes of rapid commercialization (i.e. attaching all organizational activities and decision-making to financial considerations; Heckmann, Steger & Dowling, 2016) and increased competition, with new economies growing globally (Mahony & Howard, 2001; Smith & Steward, 2010). It is unsurprising that managing change is an important managerial task. However, few exogenous changes have been as unpredictable, and commanded as much attention and action from policy makers, governments, advocacy agents, scholars, and organizations, as climate change (Judge & Douglas, 2009; IPCC, 2018). And yet, climate change has attracted little attention in sport management literature.

In sport management, scholars have conducted empirical studies to understand the impact of sport activities on the natural environment and how this might be reduced (i.e. Inoue & Kent, 2012; Mallen, Stevens, Adams & Roberts, 2010; McCullough, 2013; McCullough & Cunningham, 2011). Sport practitioners have also responded to climate change by launching initiatives such as zero-waste buildings (Casper, Pfahl, & McSherry, 2012), and incentivizing car-pooling and green transport options (Chard & Mallen, 2012; Dolf & Teehan, 2015). However, much remains unknown regarding climate change and its relation to sport. In particular, the impacts of climate change on sport organizations is under-researched (Orr & Inoue, 2019).

A commonly accepted definition of climate change comes from the Intergovernmental Panel on Climate Change: "any change in climate over time whether due to natural variability or as a result of human activity" (Pielke, 2004, p. 515). This definition is broadly accepted as it recognizes both human-induced and natural variability (Pielke, 2004). Sport events, and the organizations responsible for hosting them, have experienced damages, losses, delays, and cancelations due to climate change (Dingle & Stewart, 2018; Orr & Inoue, 2019; Orr & Schneider, 2018), though the details of these occurrences, such as the scope of damage and path to recovery, remain under-researched (McCullough, Orr & Kellison, 2019). Recent examples include the cancelation and rerouting of the 2018 Ride to Conquer Cancer events in Alberta and British Columbia, respectively, due to forest fires (Dormer, 2018; Luymes, 2018); canoe races cancelled across the U.S. Midwest in 2018 because of high water levels in rivers (Graham, 2018; Sarkauskas, 2018; Sharos, 2018); and significant damages to Scottish golf courses by eroding coastlines (Longmire, 2018).

These incidents highlight the importance of understanding how sport organizations are affected by climate change, and what capacities they must develop to effectively respond to changes. Organizational climate capacity (OCC), a construct of climate vulnerability, may be a useful lens through which to address these concerns (Fussel, 2007; Hinkel, 2011; Orr & Inoue, 2019). OCC refers to a sport organization's capacity to accommodate changes in climate with minimal disruptions or additional costs (Orr & Inoue, 2019). As OCC is the most controllable factor of climate vulnerability, its assessment is a critical first step in managing and mitigating the potential losses or disruptions caused by climate change (Orr, 2019).

Yet, there is a dearth of resources for organizations to self-assess their capacities regarding climate variables or other external variables. Per the adage 'what gets measured gets managed', it is important that measurement tools be available for assessing the capacity of organizations to respond to climate change. Thus, the purpose of this study is to develop, through a consensus-building method, a list of indicators to assess OCC that might assist managers with the application of this construct to strategic planning and risk assessment activities. To begin, a review of literature on climate vulnerability and OCC will set the frame of reference for the development of such a list.

4.2 Literature review

4.2.1 Climate risk and vulnerability

The United Nations International Strategy for Disaster Reduction (UNISDR) presents climate risk as a function of hazards (the type, intensity, and probability of negative occurrence) and vulnerability (susceptibility to experience a hazard, and capacity to respond or recover) (UNISDR, 2004). Given the relative uncontrollability of hazards by sport organizations, this paper is centered on vulnerability.

Most commonly, climate vulnerability has been measured using sets of indicators (Barnett, Lambert & Fry, 2008; Tonmoy, El-Zein & Hinkel, 2014). As vulnerability refers to risk and potential for loss in various forms, vulnerability indicators are useful as they identify thresholds and benchmarks of acceptable change (Alwang, Siegel, and Jorgensen, 2001). Sets of indicators must consider scope of the observational unit, specification of the types of environmental change to be included, how exposure is determined, how the observational unit functions, and what determines coping capacity

in the observational unit (Barnett, Lambert & Fry, 2008; Villa & McLeod, 2002). For this reason, many vulnerability indices and scales have been criticized for being too broad and too vague, or for failing to consider the unique dynamics of the environment-human relationship that influence vulnerability of each social unit (Hinkel, 2011; Tonmoy et al., 2014).

Climate vulnerability was first introduced to the sport management literature by Orr and Inoue (2018) in the climate vulnerability of sport organizations (CVSO) framework. By revising the definitions of adaptive capacity and potential impacts to suit the particularities of the sport industry and the organizational context, Orr and Inoue (2018) advanced two constructs for the CVSO: climate impacts on organizations (CIO) and OCC (Figure 2.1). CIO refers to the probability and consequences of climate change impacts affecting the sport organization, as the organization presently exists and operates. OCC reflects a sport organization's capacity to accommodate changes in the natural environment with minimal disruptions or additional costs. A current limitation of the CVSO framework is that it has not been operationalized nor empirically tested. Thus, a gap exists regarding the measurement of the two constructs CIO and OCC, and positioning organizations within the CVSO framework. As OCC is more controllable than CIO, and more closely aligned with existing sport management research, specifically organizational capacity work (Millar & Doherty 2016, 2018; Misener & Doherty, 2009, 2012), its operationalization is achievable within the sport management discipline. Further, OCC has an empirically established set of dimensions (Orr, 2019), so this study extends understandings of OCC by identifying indicators for its measurement and creating an instrument that organizations might use to estimate their OCC.

4.2.2 Organizational capacity

Organizational capacity is the ability of an organization to grow, cope with change, and meet their mission. Capacity has been a cornerstone of management research since its inception (Buchanan et al. 1999; Heckmann, Steger & Dowling, 2016). Though inconsistently defined, organizational capacity typically refers to having the necessary resources and abilities to produce a desired outcome, and has been conceptualized as having several dimensions including financial resources, knowledge and human capital, infrastructure, networks, and so on (Connolly & Lukas, 2002).

Within sport management, the study of organizational capacity is popular (e.g., Amis, Slack, & Hinings, 2002, 2004; Doherty & Connelly, 2019; Hinings, Thibault, Slack, & Kikulis, 1996; Kikulis, 2000; Kikulis, Slack, & Hinings, 1992, 1995a, 1995b; Misener & Doherty, 2009, 2013; Millar & Doherty, 2016, 2018). Organizational capacity has been studied in the context of sport for development and peace (e.g. Svensson, Andersson & Fauk, 2018; Svensson & Hambrick, 2016); organizational performance (Newland & Kellett, 2012; Phillips & Newland, 2014; Wicker & Breuer, 2013); national governing bodies and clubs (e.g. Bayle & Robinson, 2007; Nowy, Wicker, Feiler & Breuer, 2015); community sport clubs (Doherty & Connelly, 2019; Millar & Doherty, 2016, 2018) and the resources that provide a competitive advantage (e.g. Robinson & Minikin, 2012).

The output of organizational capacity studies within the sport management literature is impressive. It includes, for example, the Readiness Assessment Tool (RAT; Robinson & Minikin, 2011, 2012) which evaluates the level of organizational development, and the *organizational resources* and *first-order capabilities* (ORFOC)

inventory (Truyens, De Bosscher & Sotiriadou, 2016) which measures the resources needed for organizations to meet their operational targets. In each study of organizational capacity within sport, regardless of context, research has borne out the notion that not all organizations are alike, or have the same resources or capacity to fulfill their mission (Stouten, Rousseau & De Cremer, 2018). Consensus exists regarding the multi-dimensionality of organizational capacity, though the precise dimensions remain contested (Swierzy, Wicker & Breuer, 2017).

The most widely accepted dimensions of organizational capacity are Hall et al.'s (2003): human resources, financial resources, infrastructure resources, planning and development resources, and network and relationship resources. In this conceptualization, human resources are all resources associated with human labor and capital, including leadership, and the ability of an organization to develop and deploy human capital. Financial resources include revenues, expenses, material assets, liabilities, and the ability of the organization to develop and employ financial resources to produce desired outcomes. Infrastructural resources are defined as the built space, equipment, systems (e.g. technology, databases), and organizational culture. Planning and development resources include activities and capacities such as strategic planning, the ability to implement plans, and measurement of progress. Networks and relationships refer to relationships with parties external to the organization, that are cultivated and sustained, including partnerships, sponsorships, suppliers, governing bodies, or competitors (Hall et al. 2003; Doherty & Cuskelly, 2019).

The most recent advance in organizational capacity research, unrelated to climate change, is Doherty and Cuskelly's (2019) Community Sport Capacity Scale, developed

to measure the elements of capacity in community sport clubs. This instrument, as the name suggests, is specific to community sport organizations which are typically small and volunteer-run, with no paid administrative staff, nor paid coaches. The scale includes items in five dimensions of organizational capacity: human resources, financial resources, infrastructure resources, planning resources, and external relationship resources (Cuskelly & Doherty, 2019). It was discovered that human resources (especially sufficient volunteers) and infrastructural resources (especially access to facilities) were important to overall capacity, while financial, relationship and network resources were moderately related to capacity (Cuskelly & Doherty, 2019). The instrument reveals which resources are most important, and least important, to club capacity. However, it lacks some precision (i.e. some items contain only one word that could have many meanings, such as 'formalization' in infrastructural resource dimension, and 'strategy' in the planning resource dimension) and fails to include any natural resources.

Organizational capacity research is based on the resource-based view (RBV) which posits an organization can manage its resources in such a way that promotes performance (Wernerfelt, 1984). However, the RBV has been criticized for focusing too strongly on the social, institutional, and infrastructural resources of an organization, ignoring the natural resources that provide critical bio services to organizations (Berkhout, 2011). In the 1990s, management scholars proposed an extension to RBV called natural-resource based view (NRBV; Hart, 1995), to include water and energy, land cover, air quality, geography, and other natural resources critical to a firm's operations, and framed sustainable practices as integral to long-term prosperity. As sport

is dependent on the natural environment for critical natural resources (Orr & Inoue, 2018; Dingle & Stewart, 2018), the NRBV is perhaps a more appropriate theory from which to draw conceptualizations of capacity in this context. And yet, organizational capacity research has yet to fully embrace natural resources.

The lack of consideration for the natural environment in organizational capacity research stands in contrast to the concept of adaptive capacity (Siders, 2019) in the climate vulnerability literature. This concept focuses on capacity, but differs from organizational capacity in two important ways. First, adaptive capacity puts the natural environment at the center of the measure of capacity (Adger, 2003; Berkhout, 2011). Second, adaptive capacity does not specify an observational unit so it can be applied to different social and natural contexts (Siders, 2019). As such, while the two concepts are similar, there are important conceptual and measurement gaps in each that the other fills.

4.2.3 Organizational climate capacity

The result of combining adaptive capacity and organizational capacity is organizational climate capacity (OCC), which is a new construct advanced by Orr and Inoue (2019) to capture a sport organization's capacity to accommodate changes in climate with minimal disruptions or additional costs. OCC extends organizational capacity to include the natural environment, adopting the NRBV (Hart, 1995; Hart & Dowell, 2011), referring to "a sport organization's capacity to accommodate changes in climate with minimal disruptions or additional costs" (Orr & Inoue, 2019, p.455). OCC is conceptualized as having multiple dimensions: human resources, infrastructural and process resources, planning and development resources, network resources, financial resources, and natural resources (Orr, 2019). These dimensions were established by

borrowing and adapting from previous research on organizational capacity among sport organizations (e.g. Doherty, Misener & Cuskelly, 2014; Hall, Andrukow, Barr, Brock, de Wit, & Embuldeniya, 2003) and adaptive capacity literature (Adger, 2003), and through consultation with sport practitioners (Orr, 2019). Specifically, Orr (2019) interviewed senior-level sport managers working in organizations that have experienced recent climate hazards (i.e. wild fire, tropical cyclone) and recovery and adaptation efforts. The interview transcripts were then coded for dimensions that make up organizational climate capacity.

In establishing the dimensions for OCC, Orr (2019) highlighted certain unique features of OCC: namely, its specificity toward climate hazards, which permits a more targeted manner of addressing points of strength and weakness, and its focus on quality of resources rather than quantity. For instance, results from Orr's (2019) research revealed that that amount of money in a contingency fund (i.e. a budget line reserved for unexpected and emergency expenses) was more important to OCC than overall revenues and profits, and that having one highly-trained climate champion, or climate committee, within an organization is more important than the total number of available staff or volunteers. Based on results of this past study, it is expected that not all dimensions contribute to OCC in the same ways, however these are yet unrefined. As such, the operationalization of OCC into a set of indicators may provide important insights into the contributions of each dimensions to overall OCC, and may assist managers with the application of this construct to their strategic planning and risk assessment activities. The research question guiding this study is: What indicators do academic experts perceive as important and relevant to each dimension of OCC?

4.3 Methods

4.3.1 Study design

This study comprised a three-round Delphi study administered to a panel of 25 academic experts in organizational capacity, the natural environment, or adaptation, in the context of sport management. The Delphi method makes use of questionnaires and an iterative feedback method to communicate between experts on a given topic and find consensus on a question (Hsu & Sandford, 2007a). The method is a series of expert consultations, organized into multiple rounds. In each round, panelists respond to a questionnaire on a given topic and offer suggestions for edits. The questionnaires are then returned to the researcher who edits, analyzes, and returns the questionnaire to the participant for the next round, with a statement of a position of the group (i.e. showing the mean values for each indicator from the previous round). Panelists might use this information to change their position to align more closely with the group, or move further away from the group's position, or maintain their position. This exchange is repeated once more to conclude the three-round method and bring the group of anonymous panelists closer to consensus on the topic (Ludwig, 1994). Should consensus not be met after three rounds, indicated by low standard deviation scores, the iterative process can be repeated until retention thresholds are met and standard deviation scores are low. The result of the Delphi process is a consensus on a set of statements or conclusions on the topic (Hsu & Sandford, 2007a), or at least a majority agreement on the conclusions; though thresholds for agreement vary (Young & Ross, 2000). In the sport management literature, Delphi studies have been used to determine best practices for environmental sustainability in sport facility management (Mallen, Adams, Stevens

& Thomson, 2010), factors affecting the design and delivery of sport for health programs among refugees (Anderson,' Dixon,' Oshiro,' Wicker, Cunningham & Heere, 2018), the evolution of the North American Society for Sport Management (Bowers, Green & Seidfried, 2014), among others.

The Delphi method is useful for obtaining expert opinion on an issue or topic for which we lack knowledge (Van Dijk, 1990). The advantages of this method are the ability to anonymize respondents, systematize a feedback process, and interpret the data from each round using various statistical methods (Hsu & Sandford, 2007a). These characteristics reduce issues of influence and bias common in group interaction settings such as focus groups (Dalkey, 1969). These advantages are important to this study as several subjective decisions must be made regarding what constitutes capacity in an organization in the context of climate change (Barnett, Lambert & Fry, 2008). This method facilitates consultation with several experts with varying experiences and perspectives on the topic of organizational capacity and climate change. Thus, the frame of reference will be wide and the subjectivity of the resulting indicators reduced.

4.3.2 Study sample

An initial purposeful sample of 44 academic experts were invited to participate in an online, adapted three-round Delphi study (Hsu & Sandford, 2007a**)**. A purposeful sample is appropriate, as participating in a Delphi requires a high level of knowledge in the subject matter of the study (Richie, Lewis, McNaughton Nicholls & Ormston, 2013), so a random sample may not provide the expertise needed. The sample was drawn from experts in North America, Europe, and Oceania.

The expertise of the invited participants ranged from academic specialists in sport management and like-disciplines such as recreation, leisure, tourism, and management. Specifically, scholars whose work relates to the sport-environment nexus, and organizational capacity were targeted for participation. The purposeful sampling involved compiling a bibliography of publications on sport and the environment, cross-checking the bibliography with three experts in the field to ensure none were missed, then inviting all scholars who have published on this topic as a first or corresponding author.

Prior to participant recruitment and data collection, approval was obtained from the appropriate internal review board. The recruitment process involved identifying possible participants through a purposeful sampling process. Criteria for involvement included expertise in the subject matter, based on previous publications, time and willingness to complete the study, and communication skills (Adler & Ziglio, 1996; Anderson et al. 2018). Each expert I identified was invited via recruitment email two weeks before the start of the study. As the whole Delphi process took place online, and communications for the study were conducted via email, an email-based recruitment was appropriate. The recruitment email solicited 25 responses, who indicated their willingness to participate. These 25 experts were included in the study. There is no consensus on the number of respondents needed to complete a Delphi (Davidson, 2013). However, the sample size is within the range of previous Delphi studies using academic experts within the sport management discipline, which had sample sizes between 17 and 31 (Anderson et al. 2018; Mallen et al. 2010).

The resulting panel consisted of 16 men and 9 women, and five countries were represented: 13 participants were from the U.S., seven were from Canada, three were from Australia, and one was from Germany, and one from the Netherlands. All respondents had earned doctorate degrees. Nine panelists were in departments specializing in sport studies (i.e., kinesiology, human kinetics, physical education), seven panelists belonged to natural resources departments (i.e. sustainability studies, natural resource management, parks management), five panelists were in business schools, and four were members of interdisciplinary departments.

4.3.3 Pilot

Ahead of survey distribution, the online survey was piloted with a sample of 5 doctoral candidates in sport management to ensure readability of the questions. This step also served to test that email distribution methods and the survey platform worked efficiently.

4.3.4 First Round

The first round of the Delphi study was a survey of open-ended questions. In this round, participants were presented with definitions for OCC and each of its dimensions, and were asked to reflect on possible indicators for each dimension. This first round served as a form of anonymous group 'brainstorming', to identify as many indicators as possible (a long list) (Davidson, 2013).

The survey was administered online using Qualtrics, distributed by email, and was open for 10 days. Each panelist received a unique link to the survey. Following Dillman (2007), a pre-notice email preceded the distribution by three business days. Participants had the opportunity to navigate away from the page and return at their

leisure, providing an opportunity to reflect on the responses and submit later. Reminder emails were sent three days before the close of the survey, and on the final day of the survey, to remind participants to submit their responses (Dillman, 2007). Incomplete responses were automatically submitted at the close of the survey. In all, 24 of 25 participants completed the first round (96% response rate). The last panelist answered all the questions but did not hit 'submit', so these were ultimately recorded as a partial response, and retained.

The data from the first round 1 was aggregated into a long list of items for each dimension that includes all responses from all parties. This long list was aggregated using the following method: where there was overlap or similarity between proposed indicators, these were aggregated into one indicator using terminology that encompassed all aspects of the initial proposal (Hsu & Sandford, 2007a). For example, one respondent proposed 'use of solar, wind and thermal energy sources' and another proposed 'adoption of renewable energy sources'. These proposed indicators are essentially the same, and thus, including both would be redundant. I compiled a list of the similar and overlapping proposed indicators, with a neutral or encompassing phrasing. For the example above, I summarized these as 'use of renewable energy sources'. Then, the full list of initial proposed indicators, pairings of similar indicators, and the proposed summary indicators were presented to an external researcher, who is a professor of sport management and familiar with Delphi method. The external researcher and I peer-debriefed to ensure the proposed phrasing adequately encompassed all proposed indicators (Lub, 2015). The results of this process can be found in the first column of Appendix 2.

4.3.5 Second Round

The long list of indicators developed in the first round of the Delphi study was refined in the second round (Davidson, 2013). The second round was closed-response, and consisted of a quantitative survey that asked respondents to indicate the representativeness of each item to the dimension (on a scale of 1-3, with 1 being 'Not representative of x', 2 being 'Somewhat representative of x', and 3 being 'Clearly representative of x'), and to indicate the importance of each item within the dimension (on a scale of 1-5, with 1 being 'Very unimportant' and 5 being 'Very Important'). The rating system used in this round of the study is consistent with the recommendations for a second round of a Delphi study (Dalkey, 1972; Hsu & Sandford, 2007a, b; Okoli & Pawlowski, 2003), and procedures for assessing the content validity of items in a scale outlined by Mackenzie, Podsakoff and Podsakoff (2011).

The survey was administered online using Qualtrics, distributed by email, and was open for 10 days. Like the first round, the second round allowed respondents to save their answers and close the survey without submitting, so they could leave the page and return at their leisure. This afforded the panelists the opportunity to closely consider their responses, and served as a strategy for survey-response maximization (Goyder, 2019). In all, 21 respondents completed the second round for an 84% response rate.

The data from the second round was analyzed with the purpose of refining the list of items within each dimension. Items that have an average importance score of below 3 (out of 5) (Mackenzie et al., 2011) and an average representativeness score of below 2 (out of 3) were excluded from further analysis (Mackenzie et al., 2011). Additionally, participants were provided space to offer comments or recommendations

for minor edits to item wording or structure, as a form of member-checking (Creswell & Miller, 2000; Davidson, 2013).

4.3.6 Third Round

Once the results of the second round were confirmed, the revised list of indicators was shared with the panelists, including the mean importance and representativeness scores for each item, and their own score from the previous round. The purpose of this third round is to explore the content validity of the indicators retained after the second round. Panelists were offered the opportunity to change their score, based on the mean scores presented, should they so choose. This process fulfilled Mackenzie et al.'s (2011) recommendations for formally specifying the measurement model (list of indicators).

Like the previous two rounds, this third round of the study was conducted online using Qualtrics, distributed by email with unique links, and was open for 10 days. Again, the settings were set such that panelists could close and reopen the survey without submitting, to allow time for closer consideration of responses.

Following this third round of data collection, the same elimination thresholds as the second round were applied and indicators that did not meet the thresholds were eliminated. Once the three rounds were complete and the edits suggested in round 3 were considered, the final set of indicators were determined by the items that maintained high importance and representative scores (Hsu & Sandford, 2007a, b); that is, what is left over.

4.4 Results

Following the first round of the Delphi, 413 unique indicators were proposed across the six resource dimensions. Once duplicates and overlapping indicators were aggregated, 121 indicators remained. The resulting breakdown was 29 indicators for infrastructural resources (initially 107); 18 indicators for natural resources (initially 60); 16 indicators for process and development (initially 84); 19 indicators for human resources (initially 76); 18 indicators for financial resources (initially 57); and 21 indicators for network and relationship resources (initially 21). The full results of each round can be found in Appendix 3.

During the first round, the responses for three dimensions (planning and development resources, infrastructural resources, and human resources) included at least one comment related to the overlapping nature of the dimensions. For example, in the planning and development resources dimension, one panelist wrote: “Going back to organizational culture, if you do not have leaders at the top, I'm not sure how much strategic planning can help.” The overlap between dimensions was expected and makes sense: while human resources refers to the specific individuals working in the organization and their expertise, including the expertise and leadership qualities of management, organizational culture was included as an indicator in infrastructure (as soft infrastructure, consistent with previous research; Millar & Doherty, 2016, 2018). Responses offered by the other panelists provided sufficient data to compile a long list of indicators for each dimension.

Moreover, in the first round, two responses in the natural resources dimension indicated uncertainty about the dimension. One respondent wrote: “sorry, I don't

understand this dimension; not sure how natural resources might HELP an organization respond to hazards and challenges." Another respondent's comment echoed this sentiment: "I don't really understand what you're after here?" This is understandable and expected: many experts included in the study were selected for their expertise in organizational capacity (not specific to environment). Considering that prevailing organizational capacity frameworks (Hall et al. 2003, Misener & Doherty, 2009, 2013; Millar & Doherty, 2016, 2018) exclude natural resources, it is reasonable to expect these may not have been previously considered by some respondents, leading to confusion surrounding this question. However, considering 23 panelists provided responses to the question, sufficient data was produced to extract a long-list of suggestions.

In the second round, before items falling below retention thresholds were excluded, the planning and development resources dimension received the highest mean importance and representativeness scores (4.19 and 2.50, respectively). Lowest mean scores were found in the network and relationship resources dimension (3.43 for importance, 2.02 for representativeness), and human resources (3.45 for importance, 1.90 for representativeness). In all, 37 indicators were eliminated after the second round for failure to meet the retention thresholds for representativeness (23 indicators), or both representativeness and importance (14 indicators). Broken down by dimension, 12 indicators were eliminated from infrastructural resources (leaving 17), 11 from human resources (leaving 8), 6 from financial resources (leaving 12), and 8 from network and relationship resources (leaving 13). No indicators were eliminated from natural resources, nor planning and development resources, indicating the strongest scores were

found in these dimensions. After eliminations, the list of indicators was shortened by 33%.

The degree of consensus in round 2 can be traced through the range of standard deviations, which was 0.37 to 0.81 for representativeness scores, and 0.49 to 1.30 for importance scores. Considering the range for representativeness is 3, and the range of importance is 5, these standard deviations indicate no consensus was found for indicators in the round 2. Across the dimensions, standard deviations were similar in the second round (Table 4.1). While standard deviation scores alone do not indicate the importance of any one-trend statement, it is an integral concept of the Delphi methodology used to demonstrate the degree of consensus among the experts in the panel (Young & Ross, 2000). Low standard deviation scores indicate that importance and representativeness scores were less dispersed around the mean scores, therefore showing a higher level of agreement among panelists (Hsu & Sandford, 2007a).

Table 4.1 Mean scores and standard deviations by resource dimension, rounds 2 and 3

	Round 2				Round 3			
Resource dimension	Mean representa-tiveness score	SD	Mean importance score	SD	Mean representa-tiveness score	SD	Mean importance score	SD
Infrastructural	2.1	0.61	3.53	0.95	2.2	0.27	3.91	0.43
Natural	2.35	0.62	3.89	0.97	2.28	0.32	4.13	0.69
Planning and development	2.5	0.54	4.19	0.79	2.65	0.14	4.34	0.25
Human	1.9	0.59	3.45	0.93	2.62	0.21	4.33	0.33
Financial	2.19	0.65	3.9	0.92	2.29	0.24	4.13	0.33
Network	2.02	0.67	3.43	1.02	2.1	0.26	4.05	0.28

By the third round, consensus grew stronger, evidenced by smaller standard deviations for both representativeness and importance scores for every indicator. Perfect consensus ($SD = 0$) was found in the representativeness scores for 21 indicators, and importance scores for 9 indicators, meaning none of the experts changed their scores to be different from the average from the previous round. A total of 8 indicators enjoyed perfect consensus across both representativeness and importance scores.

Also in the third round, 6 indicators scored 5 for importance and 3 for representativeness, the strongest possible result. Four indicators with perfect scores for importance and representativeness were from the planning and development dimension: 1) degree of proactivity toward environmental awareness and response, 2) use of planning frameworks for climate assessment and planning, 3) reporting system for progress toward climate plans and goals, 4) routine goal-setting related to environmental responsibility and climate action. The other two indicators with perfect scores for importance and representativeness were in the human resources dimension: 5) buy-in by leadership members for climate and environmental management, and 6) appropriate and sufficient trainings on climate and environmental management.

Following the third round, 7 indicators were eliminated for failure to meet thresholds for representativeness (6) or importance (1), resulting in a final list of 77 indicators. The breakdown of indicators retained after round 3 was 16 for infrastructural resources, 17 for natural resources, 16 for planning and development resources, 8 for human resources, 12 for financial resources, and 13 for network and relationship resources (Table 4.2). Notably, only one indicator was eliminated from the planning and development resource dimension throughout the whole study, and no indicators were

eliminated from the natural resources dimension, indicating consistently high importance and representativeness scores in these dimensions .

Table 4.2 Indicators for OCC, by dimension, after the final round

	Infrastructural resources
1	Degree of reliance on non-renewable energy sources
2	Use of renewable energy sources
3	Use of efficient heating, cooling and lighting systems (e.g. timers, sensors)
4	Three-way waste management systems (trash, recycling, compost)
5	Strong organizational resilience (capacity to bounce back from adversity)
6	Organizational culture of environmental consciousness and concern
7	Organizational track-record of conducting risk assessments
8	Durable and weather-proof construction materials and strategies in facility construction (e.g. storm-proofed, brick and steel)
9	Operational control of facilities (i.e. does the organization own the facility? have operational control?)
10	Ownership of artificial systems and technologies (e.g. snowmakers, irrigation systems)
11	Degree of reliance on artificial systems and technologies (e.g. snowmaking, irrigation systems)
12	Percentage of practices and games in climate-controlled settings (e.g. indoor, under roof cover, on artificial surfaces)
13	Degree of reliance on vehicles
14	Alternative transit options to the site
	Natural resources
15	Amount of land operated by the organization
16	Suitability of land for sport and physical activity
17	Durability of the landscape features (e.g. surface stability, runoff)
18	Amount of plants and other biotics that can withstand variety of conditions (e.g. drought resilience, high temperature variability)
19	Access to water (e.g. water rights and availability)
20	Water use (e.g. metered water systems)
21	Capacity to capture and reuse water
22	Availability of fresh air
23	Availability of natural shade and cover (i.e. tree canopy cover)
24	Use of indigenous plants and natural features in built facilities (e.g. green roof, living wall, natural-landscape parking area)
25	Stability of weather patterns from year-to-year
26	Sufficient cold and freezing temperatures for winter conditions (where appropriate)
27	Sufficient rainfall to keep biotics healthy, but not so much that flooding is an issue
28	% of natural facilities on site that require human interference to function (e.g. consistent repairs and maintenance, pest control)
29	% of supply chain partners that enjoy stable natural conditions
30	Degree to which the organization's operations negatively impact the natural resources in the immediate vicinity (e.g. air pollution, use of pesticides)

31	Investment in biodiversity (i.e. tree-planting, limiting destruction on site)
Planning and development resources	
32	Degree of proactivity toward environmental awareness and response
33	Use of planning frameworks for climate assessment and planning
34	Existence of a climate or environmental planning committee
35	Access to mid to long-range seasonal forecasts
36	Access to climate management standards and industry best-practices
37	Use of materiality assessments
38	Routine goal-setting related to environmental responsibility and climate action
39	Reporting system for progress toward climate plans and goals
40	Routine monitoring of all resources
41	Existence of policies and procedures for monitoring participant health in various environmental conditions (e.g. heat-related illness, exposure to extreme cold)
42	Existence of corporate policies to address climate change
43	Existence of corporate policies that specify adaptation plans or systems, with triggers that would initiate specific responses
44	Natural disaster plan
45	Emergency plans
46	Strong organizational governance systems
47	Environmental certifications obtained
Human resources	
48	Buy-in by leadership members for climate and environmental management
49	Number of staff with duties associated with climate and environment
50	Level of expertise and comfort addressing climate and environmental issues internally
51	A designated point-person for climate and environmental management
52	Strategic hiring plan born from climate scenario-planning processes
53	Appropriate and sufficient trainings on climate and environmental management
54	Involvement of employees at all levels in climate management trainings (e.g. executive, manager, staff)
Financial resources	
55	Regular financial planning
56	Annual financial budgets and statements
57	Amount of money spent annually on climate-related investments (e.g. new snowmakers, new air handlers that can siphon out smoke from wildfires)
58	Integration of climate and weather-response line into annual budget, regardless of whether it is used each year
59	Amount of money produced because of climate management practices? (e.g. extra open days due to snowmaking, irrigation, air conditioning)
60	Availability of contingency funding for unforeseen expenses
61	System of diversified financial partners that allow for flexibility in response to unforeseen climate events
62	Appropriate and diversified insurance plans that cover unforeseen climate events

63	Clear policies on refunds or returns for tickets, memberships, and facility use based on climate events
64	Availability of public funding for climate adaptation
65	Ability to secure loans and debt financing for climate-related expenses
Network resources	
66	Strong communication strategies with customers/clients
67	Environmental conscientiousness and concern of partner organizations
68	Statement regarding the organization's expectations of partners
69	Established relationships with climate advocacy groups
70	Established relationships with city and regional disaster response services
71	Scalability of existing sustainability-oriented partnership agreements (e.g. scaling a small initiative or a one-off partnership into routine practice)
72	Degree of support from sponsors for climate and environmental management
73	Degree of support from suppliers for climate and environmental management
74	Degree of support from governments for climate and environmental management
75	Degree of support from governing bodies (e.g. the league, the national Olympic committee, etc.) for climate and environmental management
76	Existence of MOUs focused on leveraging partnerships during climate events
77	Communication with other organizations facing similar climate challenges

4.5 Discussion

This consensus-seeking study leveraged a three-round iterative consultation with academic experts to establish a set of indicators for OCC. This process resulted in a 77-item list of indicators, after 44 were eliminated, organized into the six dimensions of OCC. This list provides an operationalization of OCC, confirming the importance of each of the six dimensions of the constructs (Orr, 2019), and illustrating the elements of capacity of greatest concern for addressing climate hazards and new environmental realities.

The present research is theoretically grounded in OCC (Orr & Inoue, 2019), which represents a marriage of adaptive capacity research (Adger, 2003; Berkhout, 2011; Brooks, Adger & Kelly, 2005) and organizational capacity research (Hall et al. 2003; Millar & Doherty, 2016, 2018; Doherty & Cuskelly, 2019). The list of indicators

advanced in this study offers clarity to this theoretical marriage, as there are indicators that are nearly identical to some organizational capacity measures (Doherty & Cuskelly, 2019), and others that reflect the natural resource-centric view of adaptive capacity (Berkhout, 2011). To illustrate, the indicators 'access to water', 'ability to secure loans and debt financing for climate-related expenses', and 'use of planning frameworks for climate assessment and planning' are similar to Sider's (2019) indicators for adaptive capacity: 'water resources' (p..26), 'credit lines or access to credit' (p.13) and 'integration of adaptation into routine planning efforts' (p. 29). The links to organizational capacity are equally evident in the parallels between this list of indicators for OCC, and those established by Doherty and Cuskelly (2019). Specifically, the OCC indicators 'regular financial planning' and 'annual financial budgets and statements' strongly resemble Doherty and Cuskelly's (2009) indicator 'fiscal responsibility' (p.8), and the OCC indicator 'buy-in by management' is similar to 'common focus' (p. 8). The unique theoretical contribution of OCC, as the present study illustrates, is the marriage of two similar but distinct constructs into one that suits the theoretical and practical problem of addressing climate change in the sport sector.

Notably, the indicators in OCC are more specific than organizational capacity or adaptive capacity indicators in their language, specifying what types of strategies, policies, relationships, expertise, funds, and infrastructure are needed for climate change, instead of just listing 'human capital' (Doherty & Cuskelly, 2009, p.8) or 'number of partnerships' (Siders, 2009, p.28). Empirical research has established that indicators must be specific, contextually grounded, and easily interpretable to have practical impact (Tonmoy et al. 2011). This research takes an important pragmatic step in the

development of a tool that can be widely applied for assessing OCC within sport organizations. Further, considering the topic of climate change is politically charged in North America (Hoffman, 2011), which may deter organizations from seeking external assistance with capacity assessments (Nyberg & Wright, 2012), a list of indicators that can be used by organizations internally, and without external consultation, is a potentially useful tool for advancing climate management in the sport sector. Further the adoption of this list of indicators by organizations may directly contribute to increased OCC, as building awareness and knowledge of risks is a critical first step in climate risk management (UNISDR, 2004). Awareness and knowledge are also reflected in the indicators for human resources and planning resources.

Interestingly, only four indicators in the list are explicitly related to sport. These include: 1) percentage of practices and games in climate-controlled settings; 2) suitability of land for sport and physical activity; 3) degree of support from sponsors for climate and environmental management; and 4) degree of support from governing bodies (e.g. the league, the national Olympic committee, etc.) for climate and environmental management. As a result, the list of indicators that emerged from this Delphi study may inadvertently be broader in its applicability than just sport organizations. For instance, if adopted in tourism, these four indicators might be dropped, or adapted (e.g. 'suitability of land for sport and physical activity' might become 'suitability of land for tourist activities and visits'). Future research might investigate the potential and actual adoption of this list of indicators by non-sport organizations.

The methodological benefit of conducting a Delphi study is the exposure of the OCC construct to thought leaders in the sport management academy, who may extend and refine the instrument in future. The method of working with experts in organizational capacity, adaptive capacity, and sport ecology research also inadvertently revealed some of the unique attributes of OCC. For example, in the second round, one respondent raised concerns about feeling unfit to participate based on expertise in organizational capacity, citing lack of knowledge in environment and climate management issues. This concern serves to highlight the uniqueness of OCC and its indicators compared to dominant conceptions of organizational capacity. Specifically, the natural resources component and the climate focus make this construct different from previous capacity research in sport (Doherty & Cuskelly, 2019). As this concern was anticipated ahead of the study, a wide range of expertise was intentionally included in the panel. The overall strong results in the natural resources dimension across rounds 2 and 3 (with only one indicator eliminated) provide additional support for the inclusion of this dimension and the salience of its indicators to overall OCC.

4.6 Limitations and Suggestions for Future Research

The length of the final list of indicators may be a limitation for its use, because it may be challenging for managers to collect all the information needed to assess its capacity in all six dimensions. However, each indicator represents information that should be available to managers internally, or through publically available resources such as the Intergovernmental Panel on Climate Change's Summary for Policy Makers (IPCC, 2018), the Climate Impact Lab's 'United States Impact Map' (impactlab.org/map), or NASA's 'Vital Signs' website (https://climate.nasa.gov/effects/). Importantly, little or no

expertise in climate change, or climate management, is necessary to read and understand this list of indicators, lending to its accessibility. To further increase the utility of this list and facilitate its adoption by non-academic audiences, future work may focus on the development of a user manual, developed in partnership with practitioners, to supplement the list of indicators.

A possible limitation of this study is the number of respondents. However, efforts were made to include all academics who have published on topics related to organizational capacity or adaptive capacity in sport, tourism, or recreation, as a first or corresponding author. As such, the 44 experts invited to participate was representative of a significant portion of the population of experts on this topic within academia. Further, this sample exceeds Hsu and Sandford's (2007a) recommendations of having a diversity of perspectives and at least seven panelists. Moreover, not all panelists completed all three rounds, which was expected as attrition has been cited as a major challenge in previous Delphi studies (Davidson, 2013). This limitation was addressed by contacting respondents early, offering a flexible online response method, and sending reminder emails three days before the close of each round, and on the last day of each round. It is also possible that the online delivery, the timeline, or the length of the survey contributed to attrition. However, the high response rates in each round (< 84%) suggest this was only a minor issue, and efforts were made to communicate regularly with panelists to provide reminders and positive feedback in each round.

Another limitation of the list is that some items remain vague, using phrasing like 'use of…" or 'degree of…', which could refer to partial use of a solution (e.g. installing sustainable lighting systems in part of the facility, such as inside the building)

or complete use (e.g. installing sustainable lighting throughout the whole premises, including parking areas and outdoor facilities). This phrasing was adopted as it was advanced in Round 1 of the Delphi and retained due to adequate 'importance' and 'representativeness' scores. While the phrasing is unlikely to be a deterrent among individual organizations, offering managers the opportunity to interpret for themselves the precise meaning of 'degree of' and 'use of', this may present a challenge for assessment across organizations. Future research may review and refine these items through interviews with managers who have adopted the list, to determine how managers interpret these items and adopt more precise language.

Future research may also evaluate the properties of the indicators. For example, an evaluation of the uptake of the list after a certain period of time post-implementation may allow for identification of items in need of further development. This type of longitudinal data may also offer insight into how the instrument is being used, and what delivery mechanisms may be most productive (i.e. a website, a PDF handout, an app) for disseminating the list to managers. It may also reveal sub-dimensions within each of the six dimensions. Additionally, follow-up studies may seek to establish validity and reliability of the indicators. This would serve to define the quantitative quality of each indicator, and the list overall. A confirmatory factor analysis approach (Jackson, Gillaspy & Purc-Stevenson, 2009), commonly adopted to empirically establish indices (Mackenzie, Podsakoff & Podsakoff, 2011), could be a valuable addition to OCC research, however, taboos surrounding climate conversations in the workplace may limit response rates, presenting a challenge for data collection.

4.7 Conclusion

The purpose of this study was to obtain subject matter expert consensus on a list of indicators for the six dimensions of OCC. The three-round iterative process resulted in an accepted list of 77 indicators organized into six dimensions: infrastructural resources, natural resources, planning and development resources, human resources, financial resources, and network and relationship resources. The highest importance and representativeness scores were associated with the planning and development dimension, indicating the salience of proactive approaches, planning frameworks, goal setting, measurement and monitoring of progress toward goals, and worst-case-scenario planning for overall OCC. The list developed from the results should serve as a prompt for researchers and practitioners to assess their OCC and begin the process of developing and strengthening OCC. Evaluating the implementation, use and measurement properties of the list is an obvious next step to refining the instrument. As challenges associated with climate change continue to manifest (IPCC, 2018), including for sport organizations (Orr & Inoue, 2019, Dingle & Stewart, 2018; McCullough, Orr & Kellison, in press), and resources for training managers on climate management issues are limited, the continued pursuit of frameworks and tools to assess and manage OCC remains important.

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Chapter 5. Conclusion

The importance of addressing climate change is well established (Berkhout, 2011; IPCC, 2014, 2018). Negative impacts of climate change, such as tropical cyclones, flooding, wildfires, extreme heat, shorter winters, among others, are affecting business in every sector (Damert & Baumgartner, 2018; Halldorsson & Kovacs, 2010; Zeng, Zhang, Zhou, Zhao & Chen, 2019), and are expected to continue (IPCC, 2018). The sport sector is no exception (McCullough, Orr & Kellison, 2019). In the two years it took to write this dissertation (2017-2019), numberless sporting organizations have experienced damages, delays, and cancelations due to climate change. For example, the famed California Campfire shut down sport events and damaged facilities across the state and into neighboring states, with impacts stretching far beyond the fire itself (Dutch, 2019; Thomas, 2018). Also in 2018, paddling events in the U.S. Midwest were canceled due to dangerous currents associated with flooding (Graham, 2018; Sarkauskas, 2018). In Qatar, increasingly hot summer temperatures (5 degrees Celsius higher, on average, than in 2008) have created dangerous playing conditions for sporting events (Mathewson, 2019), and unhealthy working conditions for the builders involved in the construction projects for FIFA World Cup 2022 (Kelly, McIntyre & Pattisson, 2019). Several major tennis competitions, including the U.S. Open and the Australian Open, are facing heat challenges, with fans and athletes suffering heat-related illnesses two years in a row (Taylor, 2019). Despite continued negative experiences with climate hazards, the sport sector remains underprepared to respond and adapt.

This dissertation addresses climate vulnerability in sport in three related articles. Chapter 2 reviewed the extant literature on climate vulnerability and sport ecology, and advanced organizational climate capacity (OCC) and climate impacts on organizations (CIO; Orr & Inoue, 2019) as sport-specific constructs for understanding climate vulnerability. The first article also articulates the ways OCC and CIO interact using the climate vulnerability of sport organizations (CVSO) framework. The CVSO results in four and types of climate vulnerability: the Problem State, the Redundant State, the Responsive State, and the Fortified State. Practitioners can position their organization within the CVSO framework to gain a better understanding of the effort and resources needed to address climate hazards.

The relative controllability of OCC, meaning the extent to which sport managers can influence and increase OCC, compared to CIO, made OCC more attractive to pursue as a next step in this dissertation. Given this, Chapter 3 continued the climate vulnerability conversation with a focus on identifying OCC dimensions. Interviews with organizational leaders who had experienced climate hazards revealed six OCC dimensions: infrastructural resources, natural resources, human resources, planning and development resources, financial resources, and network and relationship resources.

Chapter 4 used the dimensions of OCC to operationalize the construct through a consensus-seeking study with academic experts, and established a list of 77 OCC indicators. The indicators are contextually specific and written in jargon-free language, to facilitate adoption by practitioners (Tonmoy, El-Zein & Hinkel, 2014).

This dissertation introduces climate vulnerability frameworks and theories into the sport literature (McCullough, Orr & Kellison, in press). Further, the identification of

dimensions for OCC, and the operationalization of OCC into a set of indicators, serve to illustrate the differences between OCC and its parent constructs, organizational capacity and adaptive capacity. Specifically, OCC adopts the organizational lens of organizational capacity, reflected in five similar dimensions (infrastructural, human, financial, network, and planning resources; Hall, 2003; Cuskelly & Doherty, 2019), and some degree of resemblance between indicators. In addition, it borrows the environmental focus and change-orientation of adaptive capacity (Adger, 2003; Berkhout, 2011), reflected in the natural resources being included as a sixth dimension. As discussed in Chapter 4, the unique theoretical contribution of OCC is the marriage of two similar but distinct constructs into one that suits the theoretical and practical problem of addressing climate change in the sport sector.

Given the nascent status of climate vulnerability research in the sport management discipline, and the importance of climate research and solution-finding, considerable opportunities exist to further develop, refine, validate, and expand this work. For instance, one opportunity for future research lies in the validation of the list of indicators for OCC through quantitative survey-based research. Specifically, a confirmatory factor analysis (Jackson, Gillaspy & Purc-Stevenson, 2009) could be used to empirically establish the validity and reliability of the list of items (Mackenzie, Podsakoff & Podsakoff, 2011), At present, persistent non-response issues in climate research, which were experienced in this study, and perceptions of non-expertise on the topic of climate vulnerability (evidenced in Chapters 3 and 4 from both practitioners and academics) may hinder data collection on such studies. However, as sport organizations

continue to face climate hazards, awareness of these issues and availability of knowledgeable respondents for such a validation survey will grow.

Data collection challenges related to non-response and uncertainty with climate topics inspired side studies associated with this dissertation (sample abstract included in Appendix 3). One study, titled "On the Climate Hazards of Baseball and Skiing," was motivated by lack of climate awareness among managers regarding potential future hazards. Using the latest IPCC projections for mid- and end-of-century (IPCC, 2014), this article presents a method for leveraging secondary data (i.e. IPCC reports) to gain an understanding of CIO for sport organizations in baseball and cross-country skiing (submitted for publication in June 2019). Another study examines trends of non-response in climate change research in sport, and synthesizes theoretical explanations for non-response in climate change research ("We Don't Talk About That: Four Theories That Explain Non-Response in Climate Research in Management Studies," manuscript under development). These two examples illustrate the richness and diversity of potential research topics related to climate vulnerability in sport.

As stated in Chapter 3, the potential risks of climate change are more evident than the possible responses. Since the 1980s, geographers, natural resource scientists, climatologists, environmental scientists, and others have examined and predicted trends of climate change. Ample evidence details the risks and possible hazards. In the realm of policy research, the questions of whether and how to respond to climate change have been studied extensively since the 1990s. By comparison, the management sciences have precious few studies that examine climate change response (see Berkhout, 2011; Judge & Elenkov, 2005; Judge & Douglas, 2009; and Nyberg & Wright, 2019, as exceptions).

As for sport management, as detailed in Chapter 1, only a handful of studies prior to this dissertation research explored climate vulnerability and response in sport. And yet, opportunities to study climate hazards in sport abound. This dissertation adds to a small body of literature establishing climate vulnerability as an important and worthwhile research topic in sport management. Successful climate response among sport organizations depends in part on continued research and, more importantly, on the proliferation of resources, such as the list of indicators in Chapter 4. This represents a research agenda tantamount to several academics' full careers, and several more doctoral dissertations.

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Appendix 1: Interview Protocol for Chapter 3

Confirm position within the organization and appropriateness as interviewee (per criteria)

1. *As discussed in emails, I identified [insert name of org] as a potential respondent because of your recent experience with [insert climate hazard here]. I'd like to discuss that experience start-to-finish, and the efforts going into preparing for similar or different climate challenges in future. But first, I just want to know a bit about you.*
2. Can you tell me about your current role with [organization] and how you came to be in that role?
3. When [organization] faced [hazard], what was your responsibility, if any, in addressing or responding to that situation?

Identify experience with climate hazards

4. So, let's start ahead of the [hazard]: did your organization anticipate [the hazard]?
5. And before the [hazard], what assets, infrastructures, funds, staffing, trainings were in place to prepare for [the hazard]?
    a. (prompt on each point to ensure each is covered)
6. What was the immediate response to the [hazard]? Did the organization keep operating? Did the organization shut down or close temporarily?
7. What changes were made after the [hazard]? In terms of assets, knowledge, infrastructural changes, funds, staffing, etc.
    a. (prompt on each dimension of capacity to ensure the opportunity to address each, or to say that it wasn't important/relevant)

Categorize practices and assets that contribute to capacity

8. You've mentioned some assets and capacities that existed before the [hazard], such as (list examples), and others that have changed or been updated since, like (list examples). I'd like to just work through the list that I've written down and have you categorize them.
    a. (list all assets/capacities/items that were mentioned in the person's description of their climate hazard experience, and ask them to categorize them).
9. When it comes to addressing [hazard] or other climate challenges, what is the most important aspect of [dimension]? (repeat for each dimension)

General follow-ups

10. More generally, if you were to speak with a new facility manager or a new sport club owner, what would you suggest they focus on to become more responsive and prepared to face [hazard]?
11. What have you learned about managing climate hazards?
12. Do you think [organization] is more prepared to handle future hazards because of your experience with [original hazard]?

Appendix 2: Survey Questionnaire for Round 1 of Delphi Study

Indicators of Organizational Climate Capacity

Start of Block: Intro

1 Thank you for taking the time to participate in the Delphi Method study 'Identifying indicators for Organizational Climate Capacity'.

The purpose of this study is to identify indicators for organizational climate capacity (OCC) among sport organizations. This study will occur in three rounds. This first round (this one) is a set of six open-ended questions in which you'll be asked to reflect on which indicators might be appropriate to assess the OCC of sport organizations (a definition of OCC is provided on the next page.)

This survey is set up to allow you to leave the page and return at your leisure, until you click 'submit form'. The survey will be open for 10 days, and will close on October 25th, 2018. You will be sent a reminder email on October 23rd to remind you of the closing date.

This is Round 1, and the purpose is use this round for brainstorming. You will be presented with six resource areas and will be asked to input any ideas for indicators in each. Rounds 2 and 3 will be closed-answer surveys: you will be asked to consider the relative importance and fit of each indicator that emerges from the previous rounds. It is anticipated that Rounds 2 and 3 will take place in early November and late November-early December of 2019, respectively.

Thank you again for your participation. Should you have any questions, please don't hesitate to contact Madeleine Orr at orrxx163@umn.edu.

Best,
Madeleine Orr
PhD Candidate in Sport Management
University of Minnesota

End of Block: Intro

Start of Block: Overview of Organizational Climate Capacity

2 **Organizational Climate Capacity (OCC)** is defined as the sport organization's capacity to accommodate changes in natural climate with minimal disruptions or additional costs. OCC is conceptualized as positive (Engle, 2011), and "the new and increasingly strategic imperative of the 21st century" (Judge & Douglas, 2009, p.645). Thus, organizations should seek to improve and increase their OCC, as a key strategy for

mitigating climate vulnerability. OCC is influenced by social, political, economic, and infrastructural forces, some of which are internal to the organization and others that are not.

The assessment of OCC will be based in the resource base view of the firm, which suggests an organization's capacity can be measured by its resources in a variety of dimensions (Judge & Elenkov, 2005). Based on previous research (Orr et al. under review), and consistent with the broader organizational capacity literature, the dimensions of OCC are: infrastructural resources; planning and development resources; human resources; financial resources; and external resources.

This first round of the study will ask you to propose indicators for each resource dimension. Indicators are items that we could point to, count, or otherwise measure that would help us assess how strong the organization's resources are in that dimension. For instance, previous research in management (not sport-specific) has proposed that one indicator for human resources be the number of employees or availability of expertise.

End of Block: Overview of Organizational Climate Capacity

Start of Block: Questionnaire

3 Please use this space to reflect on what indicators may be appropriate for assessing a sport organization's infrastructural resources.

In other words, what indicators could be used to assess the infrastructural resources that might help a sport organization to be more responsive and adaptable to climate hazards and environmental challenges?

Infrastructural resources are defined as the built space, equipment, systems (e.g. technology, databases), and organizational culture.

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4 Please use this space to reflect on what indicators may be appropriate for assessing a sport organization's available natural resources.

In other words, what indicators could be used to assess the natural resources that might help a sport organization to be more responsive and adaptable to climate hazards and environmental challenges?

For the purpose of this work, natural resources pertains to all direct resources and ecosystem services provided by the natural environmental. This includes natural products such as timber and oil, and ecosystem services such as clean air, fresh grass, natural landscapes, natural shade cover.

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5 Please use this space to reflect on what indicators may be appropriate for assessing a sport organization's planning and development resources.

In other words, what indicators could be used to assess the planning and development resources that might help a sport organization to be more responsive and adaptable to climate hazards and environmental challenges?

Planning and development resources include activities and capacities such as strategic planning, the ability to implement plans, and measurement of progress.

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6 Please use this space to reflect on what indicators may be appropriate for assessing a sport organization's human resources.

In other words, what indicators could be used to assess the human resources that might help a sport organization to be more responsive and adaptable to climate hazards and environmental challenges?

Human resources are all resources associated with human labor and capital, including the ability of an organization to develop and deploy human capital.

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7 Please use this space to reflect on what indicators may be appropriate for assessing a sport organization's financial resources.

In other words, what indicators could be used to assess the financial resources that might help a sport organization to be more responsive and adaptable to climate hazards and environmental challenges?

Financial resources include revenues, expenses, material assets, liabilities, and the ability of the organization to develop and employ financial resources to produce desired outcomes.

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8 Please use this space to reflect on what indicators may be appropriate for assessing a sport organization's network and relationship resources.

In other words, what indicators could be used to assess the network resources that might help a sport organization to be more responsive and adaptable to climate hazards and environmental challenges?

Networks and relationships refer to relationships with parties external to the organization, that are cultivated and sustained. These typically include: partnerships, sponsorships, suppliers, governing bodies, or competitive relationships with other organizations.

End of Block: Questionnaire

Start of Block: End

9 Thank you for taking the survey. This is the last page.

If you click the 'next' arrow, you will submit your responses.

If you would like to save these responses and submit later, you can close this browser now.

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Appendix 3: Results from the 1st, 2nd, and 3rd rounds of the Delphi Study

Table A3 Results from the 1st, 2nd, and 3rd rounds of Delphi Study

	Indicators proposed in Round 1	Round 2				Round 3			
		Mean representa-tiveness score	Std deviation	Mean importance score	Std deviation	Mean representa-tiveness score	Std deviation	Mean importance score	Std deviation
Infrastructural resources		**2.10**		**3.53**		**2.20**		**3.91**	
1	Degree of reliance on non-renewable energy sources	2.45	0.59	4.15	0.73	2.06	0.24	4.00	0.34
2	Use of renewable energy sources	2.65	0.48	4.45	0.67	3.00	0.00	4.18	0.38
3	Use of efficient heating, cooling and lighting systems (e.g. timers, sensors)	2.50	0.50	4.15	0.57	2.94	0.24	4.00	0.49
4	Three-way waste management systems (trash, recycling, compost)	2.37	0.67	3.79	1.00	2.00	0.34	3.59	0.97
5	Strong organizational resilience (capacity to bounce back from adversity)	2.37	0.81	4.16	0.87	2.18	0.38	4.18	0.38
6	organizational culture of environmental consciousness and concern	2.79	0.41	4.58	0.67	3.00	0.00	5.00	0.00
7	organizational research capacity	1.89	0.55	3.05	0.83	--	--	--	--
8	organizational track-record of conducting risk assessments	2.05	0.51	3.68	0.73	2.06	0.24	4.00	0.34
9	durable and weather-proof construction materials and strategies in facility	2.42	0.59	4.00	0.86	2.18	0.38	4.12	0.32

	construction (e.g. storm-proofed, brick and steel)								
10	Number of facilities	1.58	0.67	2.89	1.12	--	--	--	--
11	Age of facilities	1.95	0.39	3.37	0.93	--	--	--	--
12	Operational control of facilities (i.e. does the organization own the facility? have operational control?)	2.06	0.62	3.63	0.98	2.00	0.34	4.00	0.34
13	monetary value of facilities	1.58	0.67	2.79	0.95	--	--	--	--
14	Rate of built-structure deterioration	1.89	0.46	3.33	0.58	--	--	--	--
15	% of facilities that can be relocated	2.00	0.65	3.37	0.98	1.88	0.47	3.06	0.54
16	% of facilities that can be replaced	1.89	0.55	3.26	0.91	--	--	--	--
17	number of pieces of equipment	1.63	0.67	2.68	1.30	--	--	--	--
18	monetary value of equipment	1.58	0.59	2.53	1.04	--	--	--	--
19	% of equipment that can be relocated	1.89	0.64	3.11	1.12	--	--	--	--
20	% of equipment that can be replaced	1.79	0.61	2.84	1.04	--	--	--	--
21	technological infrastructure owned (e.g. databases, computer technology)	2.11	0.66	3.50	1.07	1.88	0.32	3.53	0.85
22	warning systems and monitoring capabilities (e.g. radars)	2.37	0.74	3.84	1.04	1.88	0.32	3.82	0.78
23	ownership of artificial systems and technologies (e.g. snowmakers, irrigation systems)	2.32	0.65	3.84	1.04	2.06	0.42	4.00	0.34
24	degree of reliance on artificial systems and technologies (e.g.	2.32	0.65	3.89	1.07	2.12	0.32	4.06	0.24

	snowmaking, irrigation systems)								
25	% of practices and games in climate-controlled settings (e.g. indoor, under roof cover, on artificial surfaces)	2.21	0.77	3.79	1.06	2.06	0.42	3.94	0.42
26	alternative use of space (e.g. conferences, off-season activities)	1.95	0.60	3.32	1.13	--	--	--	--
27	Number of vehicles owned or operated by the organization	1.95	0.76	3.21	1.10	--	--	--	--
28	Degree of reliance on vehicles	2.07	0.69	3.32	0.98	2.00	0.00	2.88	0.32
29	alternative transit options to the site	2.47	0.60	3.95	1.10	2.12	0.32	4.06	0.24
Natural resources		**2.35**		**3.89**		**2.28**		**4.13**	
30	Amount of land operated by the organization	2.22	0.63	3.78	0.97	2.06	0.24	3.76	0.64
31	Suitability of land for sport and physical activity	2.06	0.62	3.67	0.82	2.06	0.24	4.00	0.34
32	Durability of the landscape features (e.g. surface stability, runoff)	2.44	0.50	4.06	0.70	2.12	0.32	4.06	0.42
33	Amount of plants and other biotics that can withstand variety of conditions (e.g. drought resilience, high temperature variability)	2.33	0.75	3.83	1.17	2.29	0.46	4.24	0.64
34	Access to water (e.g. water rights and availability)	2.47	0.70	4.00	1.28	2.24	0.42	4.29	0.46
35	Water use (e.g. metered water systems)	2.56	0.50	4.06	0.85	3.00	0.00	4.24	0.42

36	Capacity to capture and reuse water	2.56	0.50	4.28	0.80	2.94	0.24	4.24	0.42
37	Availability of fresh air	2.39	0.76	4.00	1.15	2.00	0.34	4.24	0.42
38	Availability of natural sunlight (i.e. number of windows, daylight during working hours)	2.17	0.69	3.61	1.11	1.94	0.24	3.88	0.58
39	Availability of natural shade and cover (i.e. tree canopy cover)	2.28	0.45	3.72	0.87	2.06	0.42	4.00	0.59
40	Use of indigenous plants and natural features in built facilities (e.g. green roof, living wall, natural-landscape parking area)	2.17	0.69	3.67	1.05	2.06	0.24	3.94	0.42
41	Stability of weather patterns from year-to-year	2.22	0.71	3.72	1.10	2.18	0.51	4.12	0.47
42	Sufficient cold and freezing temperatures for winter conditions (where appropriate)	2.56	0.68	4.00	1.11	2.94	0.24	4.24	0.42
43	Sufficient rainfall to keep biotics healthy, but not so much that flooding is an issue	2.33	0.67	3.61	1.11	2.06	0.42	4.12	0.32
44	% of natural facilities on site that require human interference to function (e.g. consistent repairs and maintenance, pest control)	2.41	0.60	4.00	0.97	2.12	0.32	4.24	0.42
45	% of supply chain partners that enjoy stable natural conditions	2.11	0.46	3.72	0.65	2.06	0.24	4.06	0.24
46	Degree to which the organization's operations negatively impact the natural resources in the immediate	2.61	0.49	4.44	0.68	2.88	0.47	3.94	0.54

	vicinity (e.g. air pollution, use of pesticides)								
47	Investment in biodiversity (i.e. tree-planting, limiting destruction on site)	2.44	0.68	3.89	1.05	2.06	0.42	3.88	0.83
Planning and development resources		**2.50**		**4.19**		**2.65**		**4.34**	
48	Degree of proactivity toward environmental awareness and response	2.83	0.37	4.61	0.49	3.00	0.00	5.00	0.00
49	Use of planning frameworks for climate assessment and planning	2.78	0.42	4.56	0.60	3.00	0.00	5.00	0.00
50	Existence of a climate or environmental planning committee	2.67	0.47	4.39	0.68	2.94	0.24	4.12	0.32
51	Access to mid to long-range seasonal forecasts	2.22	0.71	3.67	1.15	2.12	0.47	4.12	0.58
52	Access to climate management standards and industry best-practices	2.33	0.67	3.83	1.01	2.06	0.42	4.00	0.00
53	Use of materiality assessments	2.06	0.52	3.56	0.90	2.00	0.00	3.88	0.32
54	Routine goal-setting related to environmental responsibility and climate action	2.83	0.37	4.61	0.59	3.00	0.00	5.00	0.00
55	Reporting system for progress toward climate plans and goals	2.72	0.45	4.56	0.60	3.00	0.00	5.00	0.00
56	Routine monitoring of all resources (e.g. regular use of this list of indicators, or similar tool)	2.61	0.49	4.28	0.73	3.00	0.00	4.06	0.24
57	Existence of policies and procedures for monitoring	2.44	0.60	4.17	0.90	2.12	0.32	4.18	0.38

	participant health in various environmental conditions (e.g. heat-related illness, exposure to extreme cold)								
58	Existence of corporate policies to address climate change	2.56	0.60	4.50	0.60	3.00	0.00	4.94	0.24
59	Existence of corporate policies that specify adaptation plans or systems, with triggers that would initiate specific responses	2.39	0.59	4.06	1.08	2.94	0.24	4.00	0.34
60	Natural disaster plan	2.56	0.60	4.44	0.76	3.00	0.00	4.12	0.32
61	Emergency plans	2.39	0.59	4.06	0.78	2.18	0.38	4.06	0.42
62	Strong organizational governance systems	2.50	0.60	4.33	0.67	3.00	0.00	4.00	0.34
63	Environmental certifications obtained	2.11	0.57	3.44	0.83	2.06	0.24	3.88	0.47
Human resources		**1.90**		**3.45**		**2.62**		**4.33**	
64	Buy-in by leadership members for climate and environmental management	2.76	0.42	4.56	0.60	3.00	0.00	5.00	0.00
65	Number of staff with duties associated with climate and environment	2.61	0.59	4.33	0.82	2.94	0.24	4.18	0.51
66	Level of expertise and comfort addressing climate and environmental issues internally	2.50	0.50	4.33	0.58	2.94	0.24	4.24	0.42
67	Degree of dependence on external expertise (e.g. outside firms, consultants) to address climate and environmental issues	2.06	0.62	3.67	0.82	1.94	0.24	3.94	0.54
68	Total number of employees	1.22	0.53	2.28	0.93	--	--	--	--

69	Diversity in the organization, at every level	1.82	0.62	2.94	0.97	--	--	--	--
70	Longevity of careers and policies to promote retention (i.e. incentives)	1.44	0.60	2.72	0.99	--	--	--	--
71	Flexible work schedules and patterns (i.e. works-from-home policies)	1.67	0.58	3.06	0.85	--	--	--	--
72	Individual resilience of employees (i.e. do they live in resilient housing, do they have reliable transit to work)	1.89	0.74	3.11	1.15	--	--	--	--
73	Overall employee satisfaction	1.89	0.74	3.22	1.36	--	--	--	--
74	A designated point-person for climate and environmental management	2.56	0.60	4.11	0.94	2.88	0.32	4.12	0.32
75	Availability of volunteers	1.44	0.50	2.67	0.94	--	--	--	--
76	Availability of flexible and temporary labor	1.39	0.49	2.61	1.06	--	--	--	--
77	Availability of skilled labor germane to organizational functions (i.e grounds management, flood control)	1.94	0.70	3.28	0.99	--	--	--	--
78	Strategic hiring plan born from climate scenario-planning processes	2.47	0.70	3.94	1.08	2.12	0.32	4.06	0.42
79	Appropriate and sufficient trainings on climate and environmental management	2.56	0.50	4.56	0.60	3.00	0.00	5.00	0.00
80	Involvement of employees at all levels in climate management	2.06	0.62	3.67	1.00	2.12	0.32	4.06	0.42

	trainings (e.g. executive, manager, staff)								
81	Inclusion of volunteers and temporary workers in trainings	1.78	0.53	3.22	0.92	--	--	--	--
82	Frequent review of emergency protocols for all employees	1.72	0.56	3.22	1.03	--	--	--	--
Financial resources		**2.19**		**3.90**		**2.29**		**4.13**	
83	Stable or growing revenues	1.89	0.66	3.72	0.93	--	--	--	--
84	Stable or predictable expenses	1.89	0.66	3.56	0.96	--	--	--	--
85	Healthy debt to equity ratio	1.89	0.66	3.61	0.76	--	--	--	--
86	Regular financial planning	2.22	0.79	4.17	1.01	2.00	0.00	4.06	0.24
87	Annual financial budgets and statements	2.00	0.82	3.83	1.17	2.00	0.00	3.94	0.24
88	Amount of money spent annually on climate-related investments (e.g. new snowmakers, new air handlers that can siphon out smoke from wildfires)	2.61	0.49	4.44	0.68	3.00	0.00	4.12	0.32
89	Integration of climate and weather-response line into annual budget, regardless of whether it is used each year	2.67	0.58	4.61	0.59	2.94	0.24	4.88	0.32
90	Amount of money produced as a result of climate management practices? (e.g. extra open days due to snowmaking, irrigation, air conditioning)	2.33	0.58	4.11	0.74	2.12	0.47	4.12	0.32
91	Consideration for ROI in budgeting practices	1.83	0.69	3.33	1.11	--	--	--	--

92	Prioritization of long-term profits in budgeting practices	1.83	0.60	3.28	0.93	--	--	--	--
93	Availability of contingency funding for unforeseen expenses	2.28	0.66	4.00	1.00	2.24	0.42	4.24	0.42
94	System of diversified financial partners that allow for flexibility in response to unforeseen climate events	2.44	0.60	4.22	0.71	2.06	0.24	4.06	0.24
95	Appropriate and diversified insurance plans that cover potential and unforeseen climate events	2.50	0.69	4.28	0.80	2.94	0.24	4.18	0.38
96	Clear policies on refunds or returns for tickets, memberships, and facility use based on climate events	2.44	0.60	4.17	0.76	2.12	0.32	4.06	0.42
97	Fundraising capacity	1.94	0.62	3.39	1.06	--	--	--	--
98	Availability of public funding for climate adaptation	2.11	0.57	3.78	1.03	2.12	0.47	3.88	0.47
99	Ability to secure loans and debt financing for climate-related expenses	2.28	0.65	3.72	1.10	2.06	0.24	4.12	0.32
100	Availability of sponsorship support for climate-related expenses (i.e. sponsor-branded snowmakers)	2.22	0.71	3.83	1.17	1.94	0.24	3.94	0.24
Network resources		**2.02**		**3.43**		**2.10**		**4.05**	
101	Satisfied customers	1.67	0.67	3.33	1.20	--	--	--	--
102	Strong communication strategies with customers/clients	2.06	0.78	3.67	1.25	2.00	0.34	4.00	0.34

103	Adaptable customer base (i.e. willingness to change consumption patterns to accommodate changes in climate)	2.24	0.64	3.65	1.08	1.94	0.24	3.94	0.24
104	Total number of partner organizations	1.50	0.60	2.72	1.04	--	--	--	--
105	Number of mutually-beneficial partnerships	1.67	0.67	3.00	1.00	--	--	--	--
106	Environmental conscientiousness and concern of partner organizations	2.39	0.68	4.00	0.82	2.00	0.00	4.00	0.00
107	Statement regarding the organization's expectations of partners	2.22	0.79	3.72	1.15	2.18	0.38	4.12	0.47
108	Established relationships with climate advocacy groups	2.22	0.71	3.78	0.97	2.06	0.24	4.06	0.24
109	Established relationships with city and regional disaster response services	2.50	0.60	4.00	0.75	2.94	0.24	4.06	0.24
110	Scalability of existing sustainability-oriented partnership agreements (e.g. scaling a small initiative or a one-off partnership into routine practice)	2.00	0.67	3.67	0.94	2.06	0.24	4.06	0.24
111	Degree of support from sponsors for climate and environmental management	2.22	0.79	3.67	1.15	2.00	0.34	4.00	0.34
112	Degree of support from suppliers for climate and environmental management	2.39	0.68	3.78	1.03	2.00	0.42	4.06	0.24

113	Degree of support from governments for climate and environmental management	2.11	0.81	3.50	1.30	2.06	0.42	4.18	0.38
114	Degree of support from governing bodies (e.g. the league, the national Olympic committee, etc.) for climate and environmental management	2.28	0.80	3.56	1.34	2.12	0.47	4.18	0.38
115	Availability of alternative partners	1.78	0.63	3.00	1.00	--	--	--	--
116	Existence of MOUs focused on leveraging partnerships during climate events	2.17	0.60	3.56	0.96	2.00	0.00	3.94	0.24
117	Shared resource plans with partners	1.78	0.53	3.11	0.81	--	--	--	--
118	Membership or season-pass partnership with similar organization (e.g. golf courses or tennis clubs in the same region sharing a membership or season pass system)	1.44	0.60	2.72	0.87	--	--	--	--
119	Communication with other organizations facing similar climate challenges	2.50	0.50	4.00	0.75	2.00	0.00	4.06	0.24
120	Frequency of social network assessments	1.61	0.59	2.67	1.00	--	--	--	--
121	Identification of under-utilized partnership opportunities	1.67	0.67	2.83	0.96	--	--	--	--

Appendix 4: Abstract from 'On the potential impacts of climate change on baseball and cross-country skiing'

Accepted for publication in *Managing Sport & Leisure* in January 2020

Abstract

The sport sector depends on the natural environment for critical resources such as energy, water, and in some cases, the field of play. As such, climate change will have implications for sport. Yet, the actual and potential deleterious effects of climate change on sport are under-researched; this review addresses that gap. Using projections of the IPCC's Fifth Assessment Report and known vulnerabilities of baseball and cross-country skiing, this review explores the potential climate hazards facing both sports by mid- and end of the century. Potential hazards for baseball include hotter summer temperatures, increased frequency and severity of wildfires and tropical cyclones, increased risk of coastal flooding. Cross-country skiing is likely to experience shorter, warmer winters, flooding, land cover changes due to forest fires, and rock slope failures. Based on the findings, baseball and cross-country skiing managers must begin assessing and responding to the impending hazards and associated risks to their sport. While this review method is exploratory, it introduces to the sport literature an important set of free climate-related resources and their potential utility for climate vulnerability assessments in the sport sector. This paper extends the literature on risk management and climate vulnerability in sport.

Keywords: climate change, risk, climate vulnerability, baseball, cross-country skiing