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Fellowship 2020

Climate change and the future of the Winter Olympic Games: athlete and coach perspectives.

Project Summary

The International Olympic Committee recognizes the risks climate change pose to the Games and its responsibility to lead on climate action. Winter is changing at the past Olympic Winter Games (OWG) locations and an important perspective to understand climate change risk is that of the athletes who put themselves at risk during these mega-sport events. A survey of 339 elite athletes and coaches from 20 countries was used to define fair and safe conditions for snow sports competitions. The frequency of unfair-unsafe conditions has increased over the last 50 years across the 21 OWG host locations. The probability of unfair-unsafe conditions increases under all future climate change scenarios. In a low emission scenario aligned to the Paris Climate Agreement, the number of climate reliable hosts remains almost unchanged throughout the twenty-first century (nine in mid-century, eight in late century). The geography of the OWG changes radically if global emissions remain on the trajectory of the last two decades, leaving only one reliable host city by the end of the century. Athletes expressed trepidation over the future of their sport and the need for the sporting world to be a powerful force to inspire and accelerate climate action.

Research Methods

An online survey (hosted on the University of Waterloo Qualtrics survey platform) with open- and close-ended questions was used to gain insight into climate preferences for competition from 339 elite international athletes and coaches from 20 countries in the following snow sports: Alpine Skiing, Nordic Skiing, Freestyle Skiing, Ski Jumping/Nordic Combined, Alpine Snowboarding, and Freestyle Snowboarding. Participants were asked to rank a series of climatic conditions (e.g. fog, fresh powder snow, chemically treated snow, icy surface, wind) and adaptation strategies (e.g. cancelled training runs, delayed start times), to identify the ideal temperature range for competition and thresholds that would define the unsafe and unfair conditions as well as open-ended questions on their experiences with and responses to climate change impacts to their sport.

Daily temperature and precipitation data from 1950–1969 and 2000–2019 was used to examine contemporary change, and create a contemporary baseline period for the future climate change scenarios. SkiSim2 models produced snow depth data, incorporating natural snowfall and advanced snowmaking capacity. Multi-model ensemble climate change scenarios (temperature and precipitation for the winter months of December–February) for each of the OWG host locations, which provided analysis of global climate models used to prepare simulations for the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (Taylor et al., 2012). A

mid- (2050s) and late- (2080s) century future are explored, under a low emission RCP 2.6 scenario, which is representative of a future consistent with success Paris Climate Agreement targets, and a high emission RCP 8.5 scenario, which is representative of a continuation of current global emission trajectory. These scenarios were then compared with athlete and coach qualitative results and used to develop four climate indicators of low snow, rain, wet snow and unacceptable temperatures.

Research Results

Average February daytime temperature of OWG host cities has steadily increased – from 0.4°C at Games held in the 1920s–1950s, to 3.1°C at Games during the 1960s–1990s, and 6.3°C in Games held in the twenty-first century (including the Beijing Games). Under the low emission pathway (RCP 2.6), February temperatures at the past host cities/ regions are projected to increase by an average of 1.9°C by the 2050s and 2.7°C by the 2080s, while under the high emission pathway (RCP 8.5), more substantive warming of 2.1°C (2050s) and 4.4°C (2080s) is projected. This is and will create conditions significantly higher than the ideal temperature range (-10°C to -1°C) identified by athletes and coaches

The fairest and safest conditions identified by coaches and athletes included hardpacked snow, injected surfaces, hard icy snow, and machine-made snow while unsafe conditions included fog, narrow snow coverage (around the edges of the racecourse or features), wind, and wet snow, followed by cancelled training runs and last-minute course alterations.

By mid-century, between nine and 12 locations (low and high emissions) are projected to have narrow snow conditions more often, and as many as seven have a greater than 50% probability of narrow snow (signifying much reduced natural snow). By late century, little additional change occurs in the low emission scenario, but a marked increase occurs in the high emission scenario with 15 of the 21 locations projected to have more than 50% probability of narrow snow (and seven with greater than 90% probability). Only one location in North America (Salt Lake City), Europe (Albertville), and Asia (Sapporo) retain a less than 10% probability of these types of unfair-unsafe conditions occurring each day in the high emission 2080s scenario.

Policy and Program Implications

With this improved knowledge of fair-safe competition requirements, the projected impact of climate change on the ability of previous OWG hosts to reliably deliver the growing snow sports programme is comparatively greater than the study by Scott et al. (2018), particularly under high emission scenarios (Figure 5). The new insights into conditions deemed safe-fair by elite snow sports athletes and their coaches also represent a contribution to advancing the codification of competition guidelines by international sports organizations more clearly, particularly with respect to warmer temperatures, snow conditions, and the responses of event organizers. Positively, under the low emission scenario that is aligned to a successful Paris

Climate Agreement, the number of reliable hosts remains almost unchanged throughout the twenty-first century (nine in the 2050s, eight in the 2080s). The high emission pathway results in a very reduced ability to reliably deliver fair and safe conditions, suggesting incentive for sport stakeholders to engage actively in climate action.

Calgary is significantly more resilient to climate risk than Vancouver, but other Canadian locations for training, competition and international events should be assessed for their climate viability.

In their survey comments, athletes and coaches emphasized that national and international sporting organizations, like the IOC, are the most responsible and influential in the sports community for leadership on climate change. The highly influential sporting community and its celebrity athletes are a potentially powerful force to unite, inspire, and accelerate change required for one of the most important societal transitions in history.

Next Steps

How can athletes, coaches, sporting organizations, events, venues, sponsors, equipment providers and other stakeholder respond both in terms of mitigating and adapting to the impacts of climate change in winter sport?

What implications will the loss of winter sport competition and training venues have on winter sport culture, participation, industry broadly?

How will climate change impact the equity and accessibility of winter sports as participants have to travel more, further, pay more to participate?

Are and how are the Winter Olympic Games, and winter sport athletes agents of change, able to use their roles to achieve the goals of the Sport for Climate Action?

Knowledge Translation

This research was published in Current Issues in Tourism in January 2022. This research received over 800 media pickups including author interviews with the New York Times, BBC, CBC, NBC, The Guardian and leading sports/climate outlets (Sports Illustrated, Climate Network) with a potential reach of 2.2 billion. Protect Our Winters Canada - a climate and sport organization - provided further social media engagement.

It would be helpful if Sport Canada, Alpine Canada Alpin, Canada Snowboard, Nordiq Canada and the provincial ski and snowboard associations received this research paper and were encouraged to engage in climate advocacy within their networks to lessen the impacts to their sports and participants. This could include engaging or divesting from carbon intensive sponsors, mitigating travel within their circuits, lobbying FIS and other sporting organizations or destinations for carbon neutral events, and engaging in local climate action and adaptation within communities.