Mega-events and triple-baseline (un)sustainability

Sven Daniel Wolfe[1], David Gogishvili[2], Martin Müller[2]
[1]ETH Zürich, [2]University of Lausanne

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Abstract

In the face of the climate crisis and societal pressure, mega-event organizers and their international rights holders increasingly promote their sustainable credentials. Sustainability is now a commonplace term in mega-events, from the introduction of an environmental dimension into the planning of the 2000 Summer Olympic Games in Sydney, to the varying definitions of sustainability baked into the guiding principles of the IOC and the strategic documents of FIFA and many others. Concurrently, there is a burgeoning academic literature that investigates organizers' claims of sustainability in terms of greenwashing, economic damage, unsupportable economic burdens, and damage to the social fabric of host cities. While illuminating the state-of-the-art in the extant literature on mega-events and sustainability, this chapter also identifies research gaps and suggests avenues for future research. These include calls for more coherent conceptual definitions of sustainability in order to establish comparisons across events in the post-Games period and a broadening of the conceptual umbrella so that studies on gentrification, legal exception, urban development and more might be analyzed from the perspective of (un)sustainability. Ultimately, the chapter advocates for a triple-baseline understanding of sustainability predicated on environmental, social, and economic dimensions.

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Introduction: The greening of the Games

Global sport and sustainability have become inseparable. The roots of this relationship are generally traced back to the Earth Summit – the 1992 United Nations Conference on Environment and Development. At this conference, representatives discussed how sport could advance environmental sustainability and sustainable development, leading to the involvement of the Olympic Movement and number of global conferences on sports and the environment (International Olympic Committee, 2011).

Thereafter, so the story told by the International Olympic Committee (IOC) goes, the IOC led the charge to "green the Games," amending the Olympic charter to include support for environmental protection and sustainable development (International Olympic Committee, 2021b). Further, with the adoption of the Olympic Movement's Agenda 21 in 1999, the IOC integrated sustainability principles into the organization and implementation of the Games (International Olympic Committee, 1999). These institutional changes resulted in the increasingly environmentally-conscious Games in Lillehammer 1994, Nagano 1998, and Sydney 2000, and the Olympics have been sustainable – or at least working towards sustainability - ever since (International Olympic Committee, 2014). Other mega-event owners soon followed suit, with FIFA striving to organize the Football World Cup around sustainable principles and joining various climate and sustainable development initiatives spearheaded by the United Nations (FIFA, 2018b). Similarly, UEFA touted its commitments to sustainable planning and implementation (UEFA, 2021), and the Commonwealth Games Foundation emphasized sustainable cities and communities as part of its strategic priorities, harmonizing with the framework of the United Nation Sustainable Development Goals (CGF, 2022). Thus, from a certain perspective, the modern era of mega-events can be understood as one of increasing concern with sustainability.

Much academic scholarship, however, provides a different story: mega-event organizers are reluctant to change and mega-events themselves are persistently destructive to their host societies in a variety of dimensions, and to greater or lesser degrees. This alternative view begins from environmental protests against the destruction of forests for the 1932 Winter Olympics in Lake Placid, which failed to enact meaningful changes to organizing practices for most of the 20th century (Gold & Gold, 2015). In the 1960s and 1970s, the growing attention to the natural environment among mainstream Western publics led to a referendum to withdraw Denver from the 1976 Winter Olympics due to concerns about ecological destruction (Lenskyj, 2000). Despite IOC President Juan Antonio Samaranch declaring the environment as the third pillar of Olympism in 1994, reforms were slow and inconsistent, with different hosts producing a variety of successes and failures, while institutional change was led largely by local organizers and civil society (Hayes & Karamichas, 2011).

From this perspective, it was public outcry against the environmental damage of the 1992 Winter Olympics in Albertville that pressured the IOC to embark upon environmental reforms, rather than organizers taking the initiative (Cantelon & Letters, 2000). Then, the 1994 Winter Olympics in Lillehammer were the first to include formal environmental planning procedures, providing a model for subsequent hosts (Caratti & Ferraguto, 2011). Consequently, the 1998 Winter Games in Nagano were the first where the IOC articulated an environmental protection policy, though in the end these moves were more rhetorical than substantive, and the Games were criticized for greenwashing (Kietlinski, 2021). Similarly, the so-called "Green Games" in Sydney 2000 were oriented on the environmental rehabilitation of the host site and set a high bar for future organizers, but also were accused of enacting an insincere corporate environmentalism (Freestone & Gunasekara, 2007; Lenskyj, 1998). Later mega-events followed a similar pattern, where local organizers increasingly promised sustainable Games, but outcomes typically fell far short of these goals (Boykoff & Mascarenhas, 2016; Death, 2011; Karamichas, 2013; Müller, 2015b).

Even though these two stories present what could be considered irreconcilable perspectives, a broader view reveals that they both display the growing prevalence of green or sustainable discourses in the hosting of mega-events. Indeed, it is inconceivable now to imagine discussing the planning or impacts of mega-events without including sustainability in some form. The problem is that there is little consensus regarding the terms commonly used in these discussions. This chapter attempts to bring clarity to this situation by identifying and unpacking the most prominent usages of the contested notion of sustainability within the mega-events literature.

Legacy and Sustainability: what is the difference?

Scholarship on mega-events continues to bloom across a variety of disciplines, including leisure and tourism studies, human geography, urban planning, political science, sociology, and more. In general, there is a tendency in these literatures to conduct research primarily during the years of mega-event preparation, while work taking stock of the aftereffects of hosting is comparatively rare. During the pre-event period of plentiful research, much work is dedicated to the buzzword *legacy,* a fuzzy and often contradictory term that refers broadly to the host city's post-event situation (Horne, 2011; MacAloon, 2008).

For organizers and supporters, legacy is seen as a net positive. Here, mega-events are said to leave long-lasting benefits in their wake, including improved infrastructures, a polished global image, and boosted economic fortunes. Legacy in this sense is enshrined as a fundamental principle of the Olympic movement and is included in the IOC's planning processes and recent reforms (International Olympic Committee, 2013, 2018). As owners of the Football World Cup, FIFA treat legacy somewhat differently, framing it as an issue of environmental sustainability and as a job training program for the host society's youth (FIFA, 2018a, 2021). The BIE (Bureau International des Expositions, owners of the International Expo) treat legacy more as global diplomacy engaged through international cooperation, dialogue, and education – all nested within an urban and economic development program for the host (Loscertales, 2012). Organizers of smaller mega-events like the Commonwealth Games and the UEFA European Football Championship work along similar lines, touting legacy as a synonym for beneficence. Overall, organizers and authorities tend to use the legacy buzzword to legitimate the costs and interventions associated with hosting.

Within the academic literature, there are a number of surveys that cover different usages of legacy. Leopkey and Parent (2012) conducted a survey on Olympic legacy, highlighting the absence of ex-post analyses and calling for more detailed examinations of what actually happens on the ground after a mega-event. Holt and Ruta (2015) edited a handbook on legacy divided into categories on governance, urbanization, social and cultural aspects, human capital, and political and image issues. One of the takeaways is the lack of conceptual coherence in legacy-oriented research, as well as the significant gaps in empirical work and a need for more comparative research. Koenigstorfer et al (2019) provided the most recent survey, systematically reviewing 238 peer-reviewed legacy studies and determining that, overall, the literature tends to ignore event specifics; to focus only on economic or social matters; to neglect important stakeholders; and to work within timeframes that are too short (Koenigstorfer et al., 2019, p. 731).

There is another strand of academic literature on legacy as a theoretical category, with much debate about what the term means and how it can be measured, as well as a good amount of criticism. To facilitate comparison between disparate mega-events, Horne (2014)

conceptualized legacies along four dimensions: *tangible*, *intangible*, *universal,* and *selective*. Similarly, Chappelet (2019) offered a four-part metric to analyze inputs, outputs, objectives, and outcomes. Grix et al (2017) advanced a framework of five overlapping elements: economic, urban regeneration, national pride, increased participation in sport, and international prestige. Preuss has developed elaborate, multi-stage frameworks to measure legacy, which he defined as "any outcomes that affect people and/or space caused by structural changes that stem from the Olympic Games" (Preuss, 2015, 2019, p. 106). There are also a number of scholars who criticize the usage of legacy as a cynical strategy to disguise the negative impacts of hosting, such as oversized constructions, social exclusions, and high costs (Boykoff & Mascarenhas, 2016; Cohen & Watt, 2017; Gaffney, 2016a; Lenskyj, 2008; O'Bonsawin, 2010).

There has also been a concomitant increase in the usage of *sustainability*, originally intended as a catch-all term to indicate precautions taken for the care of the natural environment. Critical scholarship has deconstructed the myths of hosting ecologically-sound mega-events, however (Gaffney, 2013; Hall, 2012). Recently, organizers and policymakers have moved away from an ecological focus ("*green*") towards a broader notion of development (framed as *"sustainability"*), starting from the 2010 Winter Olympics in Vancouver (Müller, 2015b). In this light, sustainable has also been used as an adjective, indicating that the mega-event has been planned with foresight, whether in terms of the environment, urban development, the city's tourism strategy, or merely a broad understanding of outcomes overall (Pentifallo & VanWynsberghe, 2012; Raco, 2015; Weaver et al., 2021; Ziakas, 2015). Thus, if legacy is about aftereffects, then sustainability is about preparation, and organizers use the term to demonstrate that the event is being prepared with caution and respect – both to the natural environment but also to the host city and society more generally. Nevertheless, sustainability (like legacy) suffers from a lack of conceptual consensus. Overall both terms are used by organizers and authorities to legitimize mega-events to the host population, and though the concepts are often poorly defined, and are often interchangably, they are distinct.

Notably, legacy is not codified through international standards or norms, while sustainability is often – though not always – presented in the context of global treaties and standards, such as the United Nations Sustainable Development Goals (United Nations, 2015) or the Global

Reporting Initiative Standards (GRI, 2021). With Agenda 2030, the United Nations has formally linked sport not to sustainability per se, but to *sustainable development*, which they frame in terms of peace, tolerance, respect, empowerment, health, education, and social inclusion (United Nations, 2015). This institutionalization has led to mega-event organizers encoding sustainability into their planning and operations through numerous reform documents and progress reports (FIFA, 2015, 2020; International Olympic Committee, 2018, 2021a). One of the challenges, however, is that there is no agreed-upon definition of sustainability, leaving different organizations free to use the term however they wish. FIFA, for instance, published a sustainability strategy that included their understanding of legacy (FIFA, 2015), whereas the IOC employs distinct sustainability and legacy staff, organizing separate teams with different responsibilities. Moreover, the IOC published strategic documents that outline separate approaches to sustainability and to legacy (International Olympic Committee, 2017a, 2017b). Other organizations work similarly, engaging the notion of sustainability in ways that, more often than not, project themselves in a flattering light – a process more commonly known as greenwashing (Boykoff & Mascarenhas, 2016; Death, 2011).

Meanings of sustainability in academic research

Since sustainability has been used in a variety of different ways, this chapter endeavors to identify the dominant trends in the extant literature. It does so through a qualitative review of mega-events scholarship oriented on the multifarious usages of sustainability. Aside from documents from mega-event owners, the author team gathered 60 academic articles on mega-events and sustainability. These were collected in two phases, starting from the literature we gathered for our longitudinal study where we detailed the declining sustainability of mega-events from 1992-2020 (Müller, Wolfe, Gaffney, et al., 2021). This study was predicated on a tripartite understanding of ecological, economic, and social definitions of sustainability, for which we gathered a large amount of relevant literature. This body of literature was then augmented with a new Google Scholar search for: "Mega-event[s]," "Olympic[s]," "World Cup," and "Sustainab*." This secondary search was aimed at filling in gaps that the author team may have previously overlooked. The resulting corpus was then read and coded in qualitative data analysis software according to which definitions of sustainability were employed in each article. These codings were then analyzed as a whole in order to understand the variety of ways that the term "sustainable" can be used in reference

to mega-events. Collection and coding were accomplished based on our subjective expertise on the topic and should not be considered representative, though the choices and processes were discussed as a team to reach consensus and we consider the results a fair overview of the state-of-the-art in the literature. This coding also allowed for the creation of a diagram, shown in Figure 1, of the predominant meanings of sustainability within the selected mega-events literature.

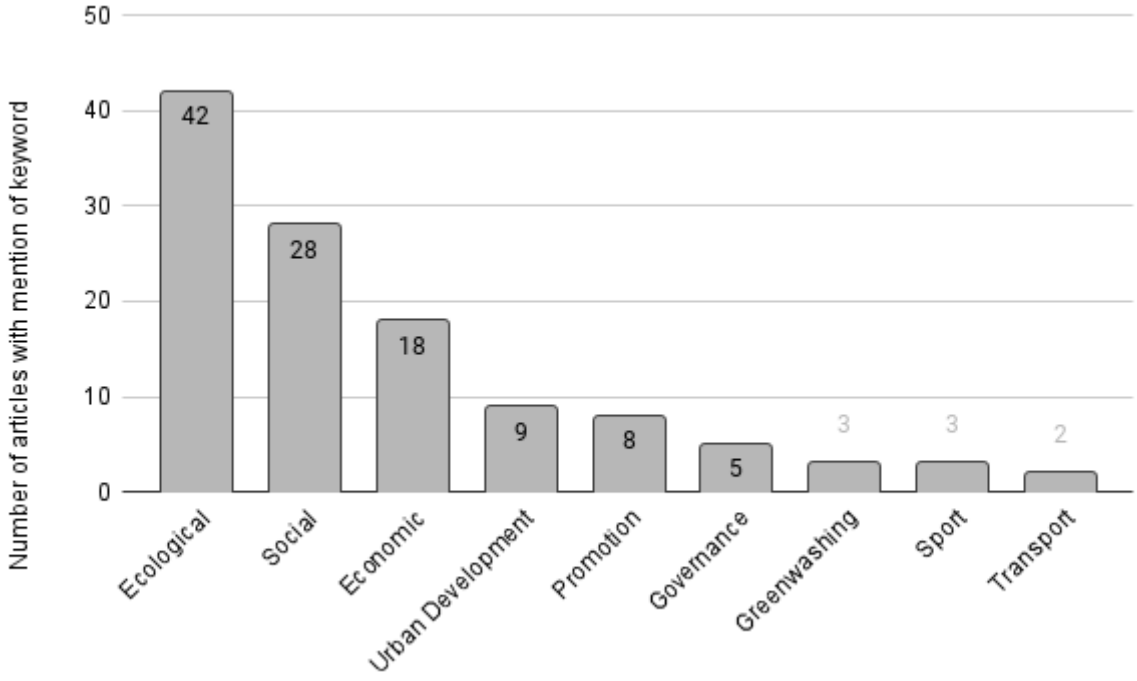

Figure 1: Predominant meanings of the term "sustainability" within a selection of 60 academic articles on mega-events

As shown, the majority of the articles refer to ecological sustainability, but work on the social and economic understandings of sustainability is also common. Other usages, such as “sustainable urban development” or “promotion of sustainability” were markedly rarer. Many documents employed multiple, overlapping understandings of the term, and as such were coded multiple times. This allowed the creation of a co-occurrence table, shown in Figure 2, that displays the number of documents in which any two usages of the term overlap.

	Ecological Gr=42	Social Gr=28	Economic Gr=18	Urban Dev. Gr=9	Promotion Gr=8	Governance Gr=5	Greenwashing Gr=3	Sport Gr=3	Transport Gr=2
Ecological Gr=42		15	15	3	5	3	2	1	2
Social Gr=28	15		13	4	2	2	1	3	1
Economic Gr=18	15	13		1	3	2	1	1	1
Urban Dev. Gr=9	3	4	1		1	1	1	1	1
Promotion Gr=8	5	2	3	1		2	1	1	
Governance Gr=5	3	2	2	1	2		1	1	
Greenwashing Gr=3	2	1	1	1	1	1		1	
Sport Gr=3	1	3	1	1	1	1	1		
Transport Gr=2	2	1	1	1					

Figure 2: Co-occurrence table for coding on the meanings of the term "sustainability" in 60 academic articles on mega-events

As shown in Figure 2, there is strong overlap between ecological, social, and economic understandings of sustainability. The remainder of the chapter explores these three predominant codings in more depth. Ultimately, the chapter advocates for a triple-bottom line approach to understanding sustainability along environmental, social, and economic terms (Müller, Wolfe, Gaffney, et al., 2021; O'Brien & Chalip, 2008; Smith, 2009).

Environmental sustainability

The environmental or ecological dimension is the most straightforward understanding of sustainability. The first Olympics to consider the natural environment during planning were the Sapporo 1972 Winter Olympics, but ecological concerns were not formalized until the 1994 Winter Olympics in Lillehammer (Chappelet, 2008). Ever after, hosts have attempted to hold ecologically-sound mega-events largely through the inclusion of environmental impact assessments and other adjustments to planning practices, particularly during the bidding phases (Samuel & Stubbs, 2012). This has run in alongside a series of global conferences and intergovernmental activity related to sport and the environment, resulting in increasing formalization of the relationship between event organizers and ecological protection (FIFA, 2018b; International Olympic Committee, 2011).

Mega-events usually suffer from problems of competitive gigantism, however, in which each host must outdo the previous host in spectacular fashion. Striving to host environmentally-sound mega-events is no exception to this competitive tendency. Thus, the processes of

increasing institutional formalization combined with local organizers' competitive imperatives has produced mega-events that display progressively more environmental commitment, while actual results on the ground are more mixed (Pentifallo & VanWynsberghe, 2012). Thus, Sydney 2000's wholesale approach to environmental remediation and conservation set the bar for later hosts, despite the fact that many promised benefits did not materialize, and the Games were criticized for greenwashing (Chalkley & Essex, 1999; Lenskyj, 1998; Searle, 2012). Still, Sydney's results were better than in Athens 2004, where a well-defined environmental policy failed due to poor implementation in the pressures of the international spotlight (Karamichas, 2013; Tziralis et al., 2008a). The same pattern can be seen with the largely successful establishment and implementation of the Green Goal environmental plans for the 2006 Men's Football World Cup in Germany (Dolles & Söderman, 2010), as opposed to South Africa 2010, where fractured governance resulted in a greenwashed event that fell far short of its promise (Death, 2011).

Notable in these mega-events is the gap between rhetoric and reality that plagues mega-events worldwide, commonly found between the promises of organizers and the protests of the population (Horne, 2015). Here, however, this gap takes shape as ever-grander aspirations towards environmental sustainability contrasted against relentless ecological destruction. Thus, we see London 2012 hailed as the greenest Games up to that point, but the much-touted promises to offset carbon emissions were in reality abandoned (Horne & Whannel, 2016). Similarly, organizers claimed carbon neutrality for the Tokyo 2020/2021 Olympics, though critics note that this calculation exploited policy loopholes in the carbon credit market (McDonnell, 2021). Put simply, too often the pressures of turning a profit outweigh the attempts to leverage the mega-event to improve environmental performance and an ecological consciousness among the host population (Karamichas, 2012).

Greenwashing is a significant problem in examining the environmental aspects of mega-events. There are numerous competing definitions and debates regarding the notion of greenwashing, but here we mean how environmentally-friendly discourses are employed to mask negative environmental outcomes (de Freitas Netto et al., 2020). In this sense, greenwashing is a form of cynical image control, where *sustainability* is engaged as a language game (Holden et al., 2008), or a kind of "light green" behavior that engages discursively with

the natural environment, but not a “dark green” understanding of sustainability that would involve systemic change to thinking and practice (Lenskyj, 1998). Thus, during Vancouver 2010 there was a “sustainability smokescreen” to draw attention from the destruction of natural and human communities (O’Bonsawin, 2010, 2014). Similarly, the grandiose plans for sustainable development in London 2012 were in actuality hollowed out, instead oriented towards the capture of international capital flows (Hayes and Horne 2011). And in Rio 2016, ambitious plans to restore and protect the natural environment were, in the end, little more than a list of broken promises (Boykoff & Mascarenhas, 2016; Gaffney, 2013).

Social sustainability

The social dimension of sustainability was developed by the United Nations Commission for Environment and Development in 1983, but it remains the least understood and least defined of the three dimensions. Often, the concept of sustainability is equated with ecology, enabling mega-event organizers to focus on the natural environment while avoiding other aspects. This opaqueness is also evident in the limited research done on social sustainability and the social impacts of mega-events worldwide (Holden et al., 2008; Minnaert, 2012; Smith, 2009).

Most scholars agree that the promised social benefits of mega-events are overestimated (Smith, 2009; VanWynsberghe et al., 2012). Still, when considering the social sustainability of mega-events, there is a distinction between infrastructural impacts (“hard”) and non-infrastructural impacts (“soft”) (Preuss, 2007). A hard outcome relates to housing or other forms of infrastructure due to changes in the transportation or sports sectors. Soft impacts include improvements in physical and mental health, employability, social capital, community cohesion, as well as improved pride of place through an improved host image (Mair et al., 2021; Smith, 2009). Often these changes benefit groups that are already in socially-advantageous positions, while those in need rarely profit. Furthermore, investments in the built environment can also cause eviction (Davis, 2011), gentrification (de Almeida & Bastos, 2016), and limit access to existing public infrastructure like parks (Smith, 2014). Among these two impact types, the soft outcomes are under-researched, largely because they are harder to document and quantify (Minnaert, 2012; VanWynsberghe et al., 2012).

It is important to analyze the Olympic Games and the FIFA Men's World Cup in their relation to social sustainability commitments, because their status as the most significant global sports events means that their standards are often used as a model for other mega-events. Social sustainability has not been included in the Olympic goals for many hosts, or if it has been included, there is a tendency only to focus on the hard, infrastructural improvements that were promised to trickle down to disadvantaged groups (Karamichas, 2012; Tziralis et al., 2008b). As sustainability claims have gained traction globally, they tend to be included in mega-event bids as well. Minnaert (2012) provides a historical overview of Olympic bids from 1996 to 2008, but only two of seven hosts of the Summer and Winter Olympics discussed social sustainability. The Atlanta 1996 bid was the first to mention social sustainability and inclusiveness, but the organizers were later criticized for not making substantial progress (Yarbrough, 2000). Sydney 2000 made more explicit commitments by integrating indigenous groups through a fair ticketing policy, improved homeless services, and investments in training and employment programs aimed at increasing the employability of disadvantaged groups. The success was limited since the generalized programs failed to reach those with multiple disadvantages (Minnaert, 2012, p. 369).

Among the soft legacies of mega-events, scholars consider the impacts on image and status, as these can positively influence local residents (Minnaert, 2012, p. 362). Despite extensive investments in urban infrastructure, three East Asian Olympic hosts - Tokyo 1964, Seoul 1988, and Beijing 2008 – were concerned mostly with "the framing of national identity and an international persona" (Horton & Saunders, 2012, p. 904). These cities hosted the Olympics at different historical points, but their approach toward national identity and global exposure was similar. Many hosts have tried to use mega-events for nation-building and improving their international outlook, including World Cups in South Africa 2010 (Cornelissen, 2014), Brazil 2014 (Almeida et al., 2014), Russia 2018 (Wolfe, 2020), and Qatar 2022 (Meza Talavera et al., 2019). For Qatar in particular, reports of human rights abuses of migrant workers are hampering organizers' hopes to portray the host in a positive light (Al Thani, 2021; Ganji, 2016).

When discussing social sustainability, some mega-event hosts focus on the sporting legacies of the event (VanWynsberghe et al., 2012), but the concept of legacy and sustainability has

become salient for sports communities only recently (Girginov & Hills, 2008, 2009). In the early 2000s, the federal government of Canada invested in a program to support professional athletes and improve their overall performance in preparation for Vancouver 2010 (Dowling & Smith, 2016). The program was successful as Canadian athletes were consistently in the top three in rankings and won a high number of gold medals (IOC, 2017, 2018). This social leveraging attempt can be considered one of the key factors contributing to the success of Canadian athletes (VanWynsberghe et al., 2012, p. 201). As part of its commitment to social sustainability, the government of British Columbia also introduced daily physical activity in public elementary and high schools. This was part of a larger municipal policy intended to promote local sustainability and to brand Vancouver internationally as a city with a high level of sustainability. Nevertheless, despite these accomplishments, there is a tendency for these mega-event-related health benefits to accrue to those already engaged in sport, rather than to those who are less active or those who are socially disadvantaged (Minnaert, 2012; Proni & Faustino, 2016; Smith, 2009).

Economic sustainability

It is often the economic imperative that motivates cities to host mega-events (Raj & Musgrave, 2009) and economic impacts are one of the most studied aspects of mega-events (Hall, 2012; Koba et al., 2019; Minnaert, 2012). This does not imply that the economic claims of the hosting cities or countries are realistic, however. The positive impacts of mega-events include job creation in local communities, tourism increases, and new economic opportunities thanks to increased attention (Raj & Musgrave, 2009). These positive effects are frequently outweighed by overspending on event infrastructure and their long-term use becomes problematic after the event (Smith, 2012).

The scholarly literature has discussed the increasing costs of mega-events as well. Flyvbjerg and Stewart (2016), who examined the costs of the Games over half a century, do not use the concept of sustainability in their work, but demonstrate the unsustainable economics of the Olympics and argue that they are the riskiest global megaprojects. Further, Flyvbjerg et al. (2021) claim that cost overruns are inevitable, suggesting that the IOC should hold Olympics in the same location repeatedly to allow capturing more income from venues after spending billions building them. The financial promises of mega-events have also been debunked by

the economist Andrew Zimbalist, who exposes the unsustainable economics of mega-events and argues that even when some benefits from mega-event hosting can be identified "they must be evaluated against not only the size of the financial investment in hosting but also the opportunity costs of land used and of the human talent committed to planning and implementing the games," (Zimbalist, 2015, p. 127).

One of the greatest concerns related to mega-events and their sustainability are *white elephants*: event infrastructure that puts a financial strain on host cities but is rarely used once the event has passed. White elephant infrastructure is one of the great dangers in hosting (Müller, 2015a), and has afflicted mega-events in Athens 2004 (Papanikolaou, 2013), South Africa 2010 (Drummond & Cronje, 2019), Brazil 2014 and 2016 (Gaffney, 2016a, 2016b), Sochi 2014 (Petersson & Vamling, 2016), and many more. Talavera et al. (2019) also address the after-event use of venues in the preparations for Qatar 2022. In accordance with Qatar National Vision 2030, organizers claim to consider how stadiums will be used after the event, but the lack of a football tradition in Qatar could lead to the development of costly white elephant venues once again.

Towards a triple-baseline standard

Given that every mega-event now makes strong claims to sustainability, it is more important than ever to be transparent about how we define and measure this contested concept (Chappelet, 2019; Zifkos, 2015). This chapter advocates for a triple-baseline understanding of sustainability predicated on environmental, social, and economic dimensions (Weiler & Mohan, 2010). Properly applied, the triple-baseline approach avoids a situation where claims can be made by focusing on one aspect of the sustainability equation at the expense of other aspects (Hall, 2012). The goal is to provide a more balanced understanding of sustainability while preventing a narrower usage based only on terms that might be employed to service a given political agenda. Thus, a triple-baseline approach means that environmental successes cannot be used to mask deleterious social or economic outcomes, and vice versa. The aim of this approach is fundamentally inclusive, ensuring that mega-events would be leveraged equitably for all (Sartore-Baldwin & McCullough, 2018; Ziakas, 2015). This is a moral position, grounded in an acknowledgement of finite planetary resources and the urgent imperative to change how mega-events are conducted (Edgar, 2020).

There are substantial challenges to this work, however, including data availability, creating fair models, and questions about cultural compatibility. Regarding data availability, there are numerous available sources, including event owners, local organizing committees, government reports, academic articles, news media, and more (Gaffney et al., 2018). Data is not always easy to find, however, particularly when attempting longitudinal research. For its part, the IOC attempted to establish a systematic mechanism of measuring the impacts of hosting every Olympics, but only Vancouver 2010 completed the process and the program was subsequently abandoned (Vanwynsberghe, 2015). Currently, local organizing committees are responsible for generating impact reports (including on sustainability), but these can suffer from political pressures and conflict-of-interest problems. Ultimately, the problem for researchers is that data availability shapes the kind of research that can be done, and it is impossible to conduct a triple-baseline study if any of the dimensions is missing.

The next challenge with the triple-baseline approach is to balance the indicators appropriately. In our study on the sustainability of the Olympics over time, we built a triple-baseline model that included three indicators from each of the three dimensions (Müller, Wolfe, Gaffney, et al., 2021). These nine indicators allowed a definition of sustainable mega-events as "having a limited ecological and material footprint, enhancing social justice, and demonstrating economic efficiency," (Müller, Wolfe, Gaffney, et al., 2021, p. 341). The resulting model allowed a systematic and coherent comparison of the sustainability of the Olympic Games between 1992 and 2020 and revealed a decline in overall sustainability over time, despite wide-spread rhetoric to the contrary. The construction of the model, the data used to populate the model, and the database created to collect and organize the data in the first place are documented in the public realm to counteract data scarcity and general lack of transparency (Müller, Wolfe, Gogishvili, et al., 2021). This triple-bottom line approach should not be seen as the final word, but rather as an attempt to create a coherent definition of mega-event sustainability and to apply this definition transparently and longitudinally in order to identify trends over time. Even so, larger questions remain as to whether the notion of sustainability – created in the Global North and West – translates easily into other cultures and political-economic contexts.

Conclusion: Expanding the definition of sustainability

It is not possible to discuss mega-events without engaging sustainability at some level, but gaps remain in the literature, with important implications for cities and events. Much research focuses on single case studies rather than longitudinal work, and many cases are discussed at a particular time – before, during, or just after an event – while there is less information on long-term results. In this way, policymakers and boosters continually bid for and host mega-events without a clear understanding of the potential risks for cities and societies. Broken budgets and high opportunity costs are a near-certainty when hosting (Flyvbjerg et al., 2021), but more research is needed on the economic dimensions of sustainability. Additionally, there is a lack of longitudinal research on social sustainability in particular, paired with a dearth of work on social sustainability overall (Minnaert, 2012; Smith, 2009; Tassiopoulos & Johnson, 2009; VanWynsberghe et al., 2012). Some critical questions are rarely discussed, such as displacement (Davis, 2011), despite the fact that these are major issues that undermine the social sustainability of events. There is also a distinction between *sustainability* and *sustainable development*; the former focuses on long-term balance, while the latter prioritizes development and, often, developmentalism (Dirlik, 2014). Finally, given the urgency of the climate emergency, it is imperative to foreground the environmental sustainability of mega-events, particularly without greenwashing or other public relations exercises.

The triple-baseline approach to sustainability advocated here is grounded in an ethical commitment towards the natural environment, as well as equitable treatment to human communities, and responsible attitudes to financial health. Ultimately, a coherent, transportable, and tripartite definition of sustainability could be applied in a wider range of mega-events than is currently the case. Thus, triple-baseline sustainability could be used to explore previously under-researched aspects of mega-events, such as urban development, variegated gentrifications, environmental destruction, and legal exceptions. Future research should analyze a spectrum of mega-event impacts from a triple-baseline perspective of (un)sustainability and, in so doing, contribute to the creation of more sustainable mega-events for all.

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