

## **The Legacy of the Olympic Games: A Review**

Much has been written about the legacies of Olympic Games but there have been little efforts to synthesize current knowledge. This has led to inconsistencies in defining, contextualising and measuring these legacies. The literature review described in this paper provides an overview over research on the legacy of the Olympic Games from 1908 to 2016 that was published in peer-reviewed journals between 1984 and 2017. The analysis reveals a significant increase of literature dealing with Olympic legacy since 2008. It turns out that considerably more studies relate to the legacy of Summer Olympic Games than of Winter Games. Regarding the six different facets of legacy of the framework that was employed, 'urban development' and 'beliefs and behaviour' have been scrutinized much more often than the other four. Regarding the methodologies used in legacy studies there is a dominance of commentary articles and a lack of adequate empirical research. This leads to a number of implications for future studies, which are discussed in the paper.

Keywords: Olympic Games; facets of legacy; impact; mega-events; literature review

## **Introduction**

The concept of sport mega-event legacy has been emerging during the last decades (Misener, Darcy, Legg & Gilbert, 2013; Preuss, 2015), however there is still a lack of agreement on its definition, conceptualization and measurement techniques. When looking back into history, it shows that the first use of the word ‘legacy’ dates back to the 1956 Melbourne Olympic Games (N.N., 1965). In 1991, the Organising Committee for the Olympic Games 1996 in Atlanta included the goal ‘to leave a positive physical and spiritual legacy’ (ACOG, 1997) in its mission statement and the candidature for the 2004 Athens Olympic Games entitled a brochure presenting its project: ‘A legacy for Olympism’ (ABC, 1997). In 2000, the International Olympic Committee (IOC) modified its Charter to address the importance of legacy and included the following mission: ‘To promote a positive legacy from the Olympic Games to the host cities and host countries’ (IOC, 2015, p. 19). The Olympic Games 2012 in London have become known as ‘the Legacy Games’ and legacy is also a part of the IOC Agenda 2020. Furthermore, legacy is an integral part of the new bidding process for the Winter Olympic Games in 2026, which starts with an assistance phase during which the IOC supports and consults potential bidding cities on several topics including legacy. These are just some milestones to emphasize the growing interest in legacy from a practical perspective. From an academic perspective, we can observe a similar development starting with the first international symposium dealing with legacy in 1987 in Seoul. In 2002, an International Symposium on Olympic legacy was organized by the IOC and just recently, the 9<sup>th</sup> International Sport Business Symposium entitled ‘Olympic Winter Games and Legacy’ took place during the Winter Olympic Games in Pyeongchang (KOR).

Since the hosting of sport mega-events requires large expenditures, cities bidding for or hosting such events are under increasing pressure to justify these expenditures by creating a positive legacy for their residents. During recent years, it became obvious that residents do

not see or believe in these positive legacies, which resulted in public opposition. Many cities had to withdraw their bids or their bidding plans after a failed referendum (e.g. Innsbruck (AUT) in 2017, Graubünden (SUI) in 2017, Hamburg (GER) in 2015 and Munich (GER) in 2013 – to just name a few). Also in academia, it is questioned if past Olympic Games have left a valuable legacy (e.g. Coakley & Souza, 2013; Whitson & Horne, 2006) or if the alleged legacy can actually be traced ‘back to the several-week period of the games or the prior construction’ (Zimbalist, 2015, p. 127).

This highlights the need for generally accepted legacy evaluation tools to assess and measure the legacy of Olympic Games and other large events. In a first step, however, a comprehensive overview over past research on the legacy of Olympic Games is called for to enable future research to build on this foundation.

Although there has been considerable effort to research and evaluate the legacy of sport mega-events, only few attempts have been made to comprehensively summarize the extensive research in this field. Up to date, there are five reviews related to the legacy of sport events. McCartney et al. (2010) systematically reviewed the health and socioeconomic impacts of major multi-sport events between 1978 and 2008. Li and Jago (2013) evaluated economic impacts of major sports events by conducting a meta analysis. Another meta analysis from Weed (2009) aims at reviewing research related to tourism impacts. The systematic review from Weed et al. (2015) focusses on physical activity. Gaudette, Roullet and Lefebvre (2017) conducted a systematic review on Winter Olympic Games, urban impacts and tourism-related impacts. As can be seen by the topics of these studies and will be further discussed in the following chapter, the term ‘impact’ describes a related concept and is frequently used interchangeably with the term ‘legacy’.

These past works provide important knowledge to the legacy debate. However, all of them either focus on impacts or on one particular legacy theme. Therefore, they can only

provide limited information regarding the diversity of legacy. Consequently, research looking at event legacy from a broader perspective by taking all its relevant facets into account is missing. This paper aims at filling this void in relation to Olympic Games' legacies by analyzing past publications in peer-reviewed journals based on the legacy framework recently published by Preuss (2018). Additionally, we examine how authors measured legacy in their studies by reviewing the methodologies used. Against the backdrop of the strengths and weaknesses of previous studies, it is possible to identify research gaps and derive directions for future research, which is one desired goal of literature reviews (Hart, 2018).

In a study on event legacy a focus on Olympic Games is advisable since the Games are the largest multi-sport event in the world and transform cities in a way no other sport mega-event does. Other events like the FIFA World Cup are hosted in many different cities, which is why these cities do not undergo comparable transitions. Another reason for the focus of this study is the importance legacy has gained in the bidding process for Olympic Games, which makes it an important topic for the IOC, National Olympic Committees (NOCs) and every city and nation interested in staging the event. Consequently, this study should yield insights of high scientific and practical relevance.

The paper is structured as follows: In the next section, we first define legacy and introduce the legacy analytical scheme, which provides the theoretical framework for our research. The section thereafter serves to outline our method before we present our results. Afterwards, follows a discussion including desirable directions for future research. We conclude with a section on limitations and an outlook.

## **Theoretical Background**

### *Definition of legacy*

Although the literature and media attention devoted to mega-event legacy have grown considerably over the last decade, there are still inconsistencies in the definition and conceptualization of legacy: '[T]he term mega-event legacy has acquired different meanings in different fields to different people' (Kassens-Noor, Wilson, Müller, Maharaj & Huntoon, 2015, p. 3). Andranovich and Burbank (2011, p. 824) also state that 'there is no formula for determining "the Olympic legacy".' Thomson, Schlenker and Schulenkorf (2013) provide a review of literature seeking to define legacy, finding a total of 14 definitions.

Generally, there is consensus that legacy is a long-term change (Getz, 1991, 2005; Hiller, 2000; Preuss, 2003, 2007), yet there is no exact time frame determining when a legacy should be called a legacy. Chappelet (2012) proposes to make a clear distinction between short- or medium-term legacy (one or two years after the Games) and long-term legacy (one or two decades after the Games). However, this distinction has not prevailed.

A commonly accepted general definition is that sport mega-event legacy is 'all planned and unplanned, positive and negative, tangible and intangible structures created for and by a sport event that remain longer than the event itself' (Preuss, 2007, p. 211). This definition is probably one of the most cited today (Grix, Brannagan & Wynne, 2017), and many studies rely on it (e.g. Dawson & Jöns, 2018; Dickson, Benson & Blackman, 2011; Karadakis, Kaplanidou & Karlis, 2016; Misener, Darcy Legg & Gilbert, 2013). Our review also takes this definition as a basis.

According to this definition, structural changes are fundamental for legacy. Structural changes last longer than the Olympic Games and offer permanent and ongoing opportunities for action. They are the result of a shift or change in the basic ways that a social, economic or

natural system operates. Thus, legacy usually exceeds short-term effects of a mega-event (e.g. worldwide media interest), which may fade soon after the event.

When dealing with legacy, similar concepts like ‘impact’ or ‘leveraging’ are encountered. Especially ‘impact’ is often used interchangeably (Li & McCabe, 2013). But the term rather describes a short-term impulse caused by a mega-event that may not last or may not create a lasting opportunity for action. Also, when evaluating event impacts, some authors differentiate between short-term and long-term impacts to clarify whether they refer to short-term or long-term changes (e.g. Jago, Dwyer, Lipman, Lill & Vorster, 2010, Zimbalist, 2015). Other authors do not use this differentiation. Consequently, sometimes studies relating to impact scrutinize effects that are understood as legacy in this paper.

The notion of ‘leveraging’ means proactively applying strategies and tactics that can be implemented prior to and during an event in order to optimize desired event outcomes (Chalip, 2004). This means that leveraging can influence but does not constitute an event’s legacy.

Due to the proximity and frequent interchangeable use of impact, leveraging and legacy in scientific literature, all three expressions have been included as search terms in the literature search described later on. But only papers matching the legacy-definition outlined above were included in further analysis.

### ***Conceptual framework***

Mega-events account for various legacies in many different areas. Many researchers have tried to conceptualize these legacies (for an overview see Preuss (2015, p. 4)) but no generally accepted academic framework for analyzing legacy exists so far. For this review, we draw on the framework recently published by Preuss (2018) and already adopted by the IOC in its new strategic approach on legacy (IOC, 2017, p. 30). There are two reasons for

this. First, this framework presents a new approach for measuring the legacy of a sport mega-event. It was developed by analyzing the shortcomings, logics and concepts in legacy literature and expands existing frameworks and knowledge (Preuss, 2018). Thus, the framework has a sound scientific background and should enable researchers to do a comprehensive evaluation of legacy. Second, the IOC as well as future candidate and host cities will use this framework. As a result, the framework will not only gain high recognition in legacy research but also in the practical management of events (especially Olympic Games) and their legacies. As it is an important goal of this review to not only broaden academic knowledge but to also make a practical contribution, using this framework as analytical frame is thus a logical choice.

Figure 1 shows that the legacy framework starts with the city's vision, which has to comply with the Olympic vision. The vision is the focal point of the Olympic Games planning process. Each activity initiated for the Olympic Games should go along with the vision. The vision must ensure that the city will not only create structures that are needed for the Games but also in the aftermath, thus aiming at a positive legacy. However, as there are always conflicts of interests, a positive legacy for one stakeholder can be negative for another one. This needs to be considered during the planning process. The vision must therefore be designed by the host city to ensure maximum stakeholder benefits. It has to meet the expectations of the (local) society, the NOC and the national government. Also, the vision's compliance with the expectations of the Olympic Movement has to be assured.

[Insert Figure 1 about here]

Once the Olympic Games are awarded to a city, the city, the government, private investors and the local Organizing Committee start to change the location. A structural change can

include infrastructure, but also intangible structures (such as up-skilling or networking).

There are different types of such changes. First of all, there are those changes in the city that are required to stage the Olympic Games, for instance building sporting venues, athlete accommodation or transportation networks. Furthermore, there are changes that are undertaken to maximize the planned legacies associated with the delivery of the event (leveraging effect). Finally, there are all changes, which are part of the city development but are not really required to stage Olympic Games. They often result from the political choice of using the event as an engine for urban development or to please society by means of extra projects.

Generally, the structural changes occurring due to the Games can be assigned to six different and not overlapping facets of legacy (Figure 1):

- (1) Urban development: for instance, new roads, enhanced, public transportation, new or renovated buildings and hotels, sporting venues or airports , but also displacements and evictions occurring due to construction activities.
- (2) Environmental enhancement: e.g., wastewater treatment, renewable energies, water efficiency, eco-friendly buildings and venues, revitalization of destroyed biotopes, but also negative ‘enhancements’ like destruction of nature.
- (3) Policy and governance: for example, new policies and governance systems/mechanisms, e.g. improved or diminished human rights, greater or less freedom of press/speech, ambush marketing legislation.
- (4) Skills, knowledge and networks such as skills acquired through bidding for and hosting the event (hard and soft skills), knowledge created or shared (e.g. how to organize a sports mega-event or how to profit from it in a criminal way), new networks developed through being part of the event.



(5) Intellectual property: for example, intellectual properties leading to innovation or added or decreased brand value, inventions made for or because of the Olympic Games.

(6) Beliefs and behavior like new or changed beliefs regarding the image of a city or country (both positive and negative); behavioral changes, for instance in terms of service quality, use of public transportation, sport participation (which could be influenced in a positive or negative way).

It has to be emphasized that the framework uses a bottom-up logic. This means that it considers the primary structures created or demolished for/by the event and classifies these structures as different facets of legacy. This is also why the framework does not incorporate an ‘economic legacy’ even though economic effects are very interesting for virtually all hosts and the IOC as well. However, according to the framework described here, economic costs and benefits do not constitute a legacy but rather stem from the structural changes that constitute the different legacies of the Games. These changes in turn affect the host city/region/country and lead to economic benefits or costs (among other things).

## **Research Method**

### ***Literature review***

Literature reviews have a range of purposes. For instance, they can provide an extensive overview over the current state of research by synthesizing key findings in a field of study (Könecké, Primke & Simon, 2016). They can describe, evaluate and critique a large number of sources, and demonstrate how work in that realm evolved. Literature reviews are also useful to identify the main methodologies and data collection tools, which have been used (Hart, 2018). Moreover, literature reviews help to distinguish ‘what has been done from what

needs to be done' (ibid, p. 31), thus they set directions for future research agendas. Taking this and the above-mentioned conceptual framework as a backdrop, we pose the following research intentions for this review:

- (1) One aim is to generally outline how legacy research has developed since the first studies in the field.
- (2) Furthermore, the review should specifically show how the different facets of legacy outlined by Preuss (2018) and IOC (2017) have been analyzed in past research.
- (3) In line with Hart's (2018) claim, we finally want to identify methodological approaches and research designs that have been used to evaluate Olympic legacy in the past.

The execution of the review is based on some of the methodologic guidelines for review papers suggested by Weed (1997). Following his suggestions, the review includes a clearly stated purpose, a detailed description of search methods and inclusion criteria (ibid).

### *Selection of papers*

Since there is a rich abundance of literature on the legacy of Olympic Games, it was decided to limit this review to publications in scientific journals incorporating a peer-review process as a quality threshold. Before starting the search process, selection criteria were defined that would guarantee the inclusion of all studies relevant to our research interest. All inclusion criteria and the rationale behind each one are outlined in Table 1.

[Insert Table 1 about here]

To retrieve a baseline sample of potentially relevant literature, we started our search with two bibliography lists from the Olympic Studies Centre in Lausanne since the center can be

considered one of the world's primary sources of reference for Olympic knowledge (IOC, 2016). When reviewing the studies from the lists, each reference list was scanned for further significant sources. This resulted in a total of 119 sources.

To supplement these initial findings, the Web of Science academic database was searched, because it is a multidisciplinary database with over 90 million records. Variants of the following search terms were used: 'Olympics' and 'Olympic Games' combined with ('and') 'legacy', 'legacies', 'impact', 'leverage' and 'leveraging'. As stated before, the search terms impact and leveraging were added because they refer to related concepts and are often used interchangeably.

If studies used the term impact, it was checked if the paper dealt with structural changes related to the Olympic Games (which led to its inclusion). Accordingly, studies dealing with 'leveraging' were analyzed regarding their compatibility with our legacy definition. The Web of Science academic database search added 203 papers. Eleven further papers could not be included in the following analysis because they were irretrievable. Altogether, the search process yielded 322 publication which met our inclusion criteria and could be analyzed in detail.

### *Analysis*

After the collection process, a content analysis was conducted. Upon determination of the authorship and publication date, a mixture of line-by-line and open coding was used to identify first relevant aspects of each publication (Charmaz, 2014). Through this process, the different facets of legacy described in the papers as well as contextual factors were identified and an initial coding scheme was developed, which was then discussed and refined by the authors before it was used to fully analyze the sample. If applicable, the methodology of the study was reviewed.

Finally, a critical narrative synthesis was conducted because this method is appropriate to synthesize quantitative and qualitative studies (Goldsmith, Bankhead & Austoker, 2007). The synthesis aimed at considering those aspects of legacy, which relate to the facets of the analytical scheme, the measurement of legacy and causality, i.e. if there is a causal link between the event and the legacies.

## **Results**

### ***Trends by year and Games edition***

Figure 2 shows the number of publications for each year. As can be seen, the oldest paper dates back to 1984 and the interest in the topic experienced a surge in 2008 and has been at a comparably high level ever since.

[Insert Figure 2 about here]

To examine trends by Games edition, the papers were grouped by the Games edition to which they refer (Table 2). It turned out that the Summer Games in London in 2012 were given the greatest attention with 104 papers, followed by Beijing (2008) with 51. The Winter Games to which most publications referred were those in Vancouver (2010) with 22 papers followed by Sochi (2014) and Torino (2006) with 12 each. Overall, 69% of the publications examine Summer Games, 18% address the legacy of Winter Games, which reveals a considerable difference in attention. 16% of the papers do not refer to any Games edition in particular but deal with the concept of legacy in a conceptual or general manner.<sup>1</sup>

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<sup>1</sup> Total is greater than 100% due to some studies targeting Summer and Winter Games.

### *Facets of legacy*

The two facets that have by far been addressed most frequently are beliefs and behavior (36%) and urban development (36%). As Table 2 indicates, both have been looked into for almost every Games edition since 1908. Policy and governance (11%), skills, knowledge and networks (11%), environment enhancement (10%) as well as intellectual property (5%) have been scrutinized far less often.<sup>2</sup> 8% of the publications could not be assigned to one of the six facets. Since the framework is based on a bottom-up approach, this is especially true of studies that measure event outcomes in a top-down manner (e.g. general economic or employment effects) because it is unclear which facet(s) they refer to.

[Insert Table 2 about here]

In a next step, we will analyze the different facets of legacy in more detail.

### *Beliefs and behavior*

The facet of beliefs and behavior has been studied most often by researchers. Studies that deal with legacies regarding beliefs mostly investigate if or how the image of the city or nation changed after hosting the Olympic Games. 42% of these studies report a positive impact on the image either nationally and/or internationally. The improved image is supposed to enable cities and countries to attract more tourists in the aftermath (Li & McCabe, 2013). Another 50% of the studies found no impact on the image, whereas 8% showed that the image of the city or nation deteriorated.

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<sup>2</sup> Total greater than 100% due to some papers dealing with multiple facets.

Other studies in this facet investigate the perceptions of host or non-host residents towards Games' legacies. 33% of the studies reveal that positive perceptions are outweighing the negative ones and another 33% show that respondents perceived legacies rather negatively than positively. For the remaining 33% results were mixed, i.e. perceptions of positive and negative legacy-effects are balanced. However, it must be added that the data collection for these studies was usually conducted shortly after the event. But since the legacy-definition does not specify an exact period after which a structural change becomes a legacy, this aspect did not constitute an exclusion criterion.

Studies focusing on behavioral changes usually analyze if Olympic Games account for a legacy of increased physical activity. We found 24 studies dealing with a legacy of increased physical activity just for the Games in London, i.e. 52% of the studies in this facet. Generally, the Games are often considered an effective means to increase physical activity. Weed et al. (2015) conducted a systematic review on this issue. The review concludes, however, that there is no empirical evidence for an enhanced physical activity due to hosting the Olympic Games. Also, many studies are struggling with data quality. Most of these studies conducted a secondary analysis of quantitative data, which leads to validity and reliability problems (Henry, 2016; Veal, Toohey & Frawley, 2012) since data were not specifically designated for the task of assessing increased physical activity. Additionally, these studies are cross sectional rather than longitudinal. Examples are the Active People Survey and the Taking Part Survey for the London Games (Carmichael, Grix & Marqués, 2013) or the National Physical Activity Survey and the Exercise, Recreation and Sport Survey for the Sydney Games (Veal, Toohey & Frawley, 2012). Thus, it is not possible to trace changes in individual patterns.

Other studies in this field claim that people became more welcoming and more open to foreign visitors due to the Olympic Games (Singh & Zhou, 2016, Xing & Chalip, 2012). However, empirical evidence for this assertion is missing.

### *Urban development*

Urban development has been the second most addressed facet in the studies. As can be seen in Table 2, it was considered for all but two Olympic Games since 1908. Studies analyzing urban development mostly deal with transport legacies as well as sporting venues built for the Olympic Games. Regarding transport legacies, Kassens-Noor (2012) mentions six categories for the Games between 1992 and 2012 and argues that transport legacies are similar for all host cities. Her categories are: 1) airport improvement, 2) new and revitalized parks, 3) new high-capacity transport modes, 4) additional road capacity, 5) advanced intelligent transport systems, and 6) new or improved airport-city-center connection (ibid, p. 394). The results of this review confirm these categories for many other Games editions. However, Gratton & Preuss (2008) point out that legacies are city-specific. Especially regarding early Olympic Games some of Kassens-Noor's categories cannot be found due to the smaller size of the Games.

Generally, the change in urban development has tended to increase over time as the Olympic Games have grown in size. This development often caused problems for the cities since the potential for lasting vast urban changes had not been sufficiently considered in advance. Furthermore, capacities of roads or public transportation are at times gauged to handle crowds during the Games but do not meet the requirements of the host city residents afterwards.

Besides these transport legacies, new sporting infrastructure as well as new housing facilities are detected as main legacies in this facet. However, both fields are discussed controversially. In terms of housing, for instance, legacies were mainly created by

transforming Olympic Villages to urban districts. Yet, construction works for Olympic Games also incurred resettlements and loss of housing (e.g. deLisle, 2009; Wang, Bao & Lin, 2015).

During the history of the contemporary Olympic Games, no city could host the event without building new sporting venues. However, for most of the host cities, starting with the Melbourne Games in 1956, problems concerning the use of the venues after the Olympic Games were found (Essex & Chalkley, 1998). Our analysis identified six cities to which a rather negative sporting legacy was attributed, i.e. venues built for the Games remained empty or underused after the Games (Sochi 2014, Torino 2006, Nagano 1998, Sarajevo 1984 (venues also destroyed by the war), Grenoble 1968, Melbourne 1956) (e.g. Azzali, 2016; Nakamura & Suzuki, 2017). For other hosts controversial information exists (Beijing 2008, Montreal 1976) or problems with the sporting legacy (venues were underused at first but became popular over time) were reported (Athens 2004, Sydney 2000) (e.g. Kasimati, 2015; Searle, 2012). However, empirical data to support these evaluations are missing as well as methods to measure if a venue's post-Games use is successful or not.

### *Policy and governance*

Legacies that belong to the facet of policy and governance have played a minor role in research until today. The analysis reveals that such legacies are mainly city-specific. Nevertheless, some parallels exist. Most of the studies in this facet deal with the London 2012 Olympic Games; more precisely with policies aimed at increasing sport participation in the UK. For Beijing 2008, national policies on the management of sport have been adjusted (Jinxia & Mangan, 2008). Policies that are not sport-related belong to areas like security (e.g. Molnar, 2015; Rekow, 2016), environment (e.g. Müller, 2015) or food (e.g. Daothong & Stubbs, 2014; Gratton, Preuss & Liu, 2015). Some examples here are the implementation of the 'Games Security Plan' for Rio 2016, the implementation of new emission standards in



Beijing or the sustainable food policies of the London Games, which have been adopted by other events.

For some policies, lasting positive results are described, such as the homeless protocol established for the Sydney Olympic Games that provides long-term legal protection for homeless people (Minnaert, 2012). There are, however, policies that entail negative consequences like legislation for environmental protection that was relaxed for the Sochi Games, resulting in a negative environmental legacy (Müller, 2015). But in most cases the actual consequences of this facet of legacy remain unclear because only the establishment of a policy is mentioned without discussing the resulting effects.

#### *Skills, knowledge and networks*

This facet comprises legacies in terms of new partnerships and networks, both on a national (London 2012, Vancouver 2010, Athens 2004, Torino 2006, (e.g. Gilmore, 2014; Sant, Mason & Hinch, 2014; Panagiotopoulou, 2014)) and international level (Beijing 2008, Seoul 1988 (Cho & Bairner, 2012; Singh & Zhou, 2016)). Furthermore, cities and people can benefit from new skills (e.g., English-language skills or professional skills) as well as shared knowledge and productivity (London 2012, Sydney 2000, Nagano, 1998).

The legacy of the expertise to bid for and host future (mega-)events is reported for only two Olympic Games editions (Beijing 2008 and Torino 2006 (Giulianotti, 2015; Ferrari & Guala, 2015)). It can be expected that other Host Cities benefitted from this experience, but no corresponding studies were found.

Regarding volunteering and its legacy, the studies included in this review provide mixed results. For Beijing 2008 as well as for Athens 2004 a volunteering legacy, i.e. people are more willing to volunteer after the Games, is reported but not measured (Luo & Huang, 2013; Panagiotopoulou, 2014). For Sydney, results are mixed (Fairley, Gardiner & Filo,

2016) whereas for two other Games editions (2012 and 2010) a volunteering legacy was denied (Benson, Dickson, Terwiel & Blackman, 2014; Koutrou, Pappous, Johnson, 2016).

In terms of education, two countries (Greece and Russia) have started to implement new study courses (Azzali, 2016; Georgiadis, 2016). However, there is no information on how these courses have evolved and how successful they are.

### *Environment enhancement*

Legacies in the facet of environment enhancement have gained some importance in the academic field since the Beijing Olympic Games (see Table 2). Beforehand, this facet has only been looked into very scarcely. For Beijing various measures have been taken to improve the air quality in the city. However, these measures only led to short-term improvements (e.g. Chen, Jin, Kumar & Shi, 2013; Zhang, Zhong & Yi, 2016). Measures to create environmental legacies that are reported for several Games editions consist of building and installing wastewater treatment facilities (London 2012, Beijing 2008, and Tokyo 1964) (e.g. Zhao, Ching & Chan, 2016) and sewage systems (Athens 2004, Barcelona 1992) (e.g. Essex & Chalkley, 1998; Georgiadis & Theodorikakos, 2015). Further important legacies occurred through the regeneration and restoration of waterways and water systems (London 2012, Beijing 2008, Sydney 2000, Seoul 1988, Tokyo 1964) (e.g. Nicholls, 2014; Searle, 2012; Tagsold, 2010). Cities also undertook measures to develop and improve the water supply system (Tokyo 1964, Rome 1960) (e.g. Chalkley & Essex, 1999) or reduce water consumption (London 2012, Vancouver 2010) (e.g. Daothong & Stubbs, 2014). Other cities were able to reduce greenhouse gas emission through the renewing of their bus fleet (Rio de Janeiro 2016, Beijing 2008) (e.g. Lindau, Petzhold, Tavares & Facchini, 2016). Furthermore, cities built energy efficient and eco-friendly buildings and venues to reduce carbon emissions (Beijing 2008, Vancouver 2010, Sydney 2000, Lillehammer 1994) (e.g. Essex & Chalkley, 2004; Zhao, Ching & Chan, 2016). However, the consequences of these measures are often

limited since they were installed for only one suburb, the Olympic Village or some venues (Searle, 2012). Additionally, empirical evidence for the consequences, hence the actual effects of the structures that have been created, is lacking.

For two Games editions, environmental damage caused by construction works for the Olympic Games is reported (Rio de Janeiro 2016 and Sochi 2014) (Kassens-Noor, Gaffney, Messina & Philipps, 2016; Müller, 2015).

### *Intellectual property*

Legacies in the field of intellectual property are only addressed by few studies. There are two reasons for this. First and foremost, legacies in the facet of intellectual property are not as easily recognizable as most other legacies (e.g. stadia). Second, every Games edition in recent years was required to create legacies in terms of urban development to meet the IOC standards, whereas the development of intellectual property was frequently not a major aspect in the bidding process.

Some of the legacies described in the reviewed literature concern sport-related intellectual property developed for the Olympic Games and the sporting industry. An example is the sponsorship model developed by the organizing committee of the 1984-Games in Los Angeles which was essentially used by every Olympic organizing committee afterwards (Wenn, 2015). The majority of studies, however, deals with legacies of intellectual property related to other industries. An example is the new ISO 20121 standard developed by London 2012 to ensure and improve sustainability of the event as well as event related activities (Daothong & Stubbs, 2014).

Also, legacies of intellectual property are usually only mentioned briefly in the studies (sometimes just in one sentence) and play a minor role. Kidd (2013), for instance, describes that for Barcelona 1992 the judges' chairs in swimming, table tennis, tennis and badminton as well as equipment stands and carts in other sports were reconfigured by designers. He further

mentions that these designs have become international standard but does not provide any more details.

### *Methods used to study Olympic Games' legacy*

Of the studies in our sample, 38% are of theoretical nature, 62% empirical. As can be seen in Figure 3, a total of 6% of the papers looked at legacy conceptually by trying to develop new approaches for measuring or contextualizing the concept. The remainder of the theoretical contributions (32% of the total sample) is narrative in nature. All other publications are empirical works (177 in total). Most of these use secondary data to assess Olympic legacies (18%). Studies which are based on primary data mostly employ a qualitative approach (15%), primarily by using different types of interviews. Another major part of the empirical studies is based on surveys (13%).

[Insert Figure 3 about here]

In a next step, we examined (if applicable) how many of the empirical studies use a top-down and how many a bottom-up approach for measuring legacy. The analysis shows that 56% of empirical studies are bottom-up and 44% top-down, i.e. 74 and 58 papers<sup>3</sup>, respectively.

We further analyzed the time span considered by researchers in legacy studies. For this, we looked at the time of data collection for studies working with primary data (n=104). If the data collection was carried out over a period of several months, we used the average

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<sup>3</sup> Total smaller than number of empirical papers since not every empirical publications aims at measuring legacy.

value in our calculation.<sup>4</sup> On average, the data collection started 16.14 months prior to the Games (SD=19.52 months, with a range from 0 to 72 months). This average was calculated for studies that only collected data before the Games and studies making comparisons of values collected before and after the event. For the latter, only pre-event data collection was considered for this part of the calculation. The average time of post-Games data collection was 26.77 months after the event (SD=41.54 months, with a range from 0 (directly after the Games) to 210 months). This value was calculated for studies that exclusively used data collected after the Olympics as well as for studies comparing pre- and post-Games figures. For the latter, only data collected after the event were considered. If we take a closer look, it shows that there are very few studies measuring legacy more than five years after the event (9 studies) while the majority of studies measures legacy rather shortly afterwards (i.e. one year or less) (31 studies).

## **Discussion**

The legacy of Olympic Games has gained considerable attention as a topic for both, researchers and practitioners. This is why the aim of this review was to provide an overview over papers on the topic that have been published in peer-reviewed journals. The results can be summed up as follows:

First, the review showed that publications on the legacy of Olympic Games have considerably increased as of 2008, which is in line with the observation that the topic has gained considerable importance over the last years. Furthermore, it became clear that researchers focus stronger on Summer Games. A possible explanation is that the Summer

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<sup>4</sup> Example: If data collection started 12 months prior to the event and lasted 6 months, it was included as 9 months prior to the event.

Games are larger than the Winter editions, which is why they generally receive more recognition. However, Winter Games also account for many different legacies. Yet, when considering only tangible legacies, the analysis showed that the legacy of winter sport venues is often more problematic than for summer sports facilities. Venues required for Winter Games, e.g. ski jumps or bobsleigh runs, are very specific and only used by very few athletes practicing these sports. These venues often remain ‘white elephants’ after the event and are considered a negative consequence of the Games. Bearing in mind that almost all of the failed public referenda were connected to Winter Games (Könecke & de Nooij, 2017), it can be assumed that the perception of their legacy is rather problematic. Consequently, more studies evaluating the legacies of Olympic Winter Games seem to be called for.

Second, the facets of beliefs and behavior as well as urban development received high attention whereas other facets remained relatively under-researched. There are two reasons for this. The first reason is that cities interested in hosting the event promise positive legacies for their residents in order to justify high expenses. These legacies often are urban development, improved international image and recognition or increased physical activity. For the London Olympic Games, for instance, one of the five legacy targets was to introduce an additional one million people into regular sport participation. Consequently, research was aimed at checking if these promises were fulfilled or not. The second reason is that structural changes in terms of urban development are tangible and thus easier to detect and to describe than intangible legacies. Consequently, future studies should also take other facets into account.

Third, most studies fail to really measure legacy and there is limited empirical evidence for legacies (Li & McCabe, 2013). Dickson, Benson & Blackman (2011) also noted that there is a dominance of commentary sources ‘compared with the paucity of substantive empirical research in respect of pre, during and, in particular, post-event research’ (p. 292). A

large proportion of the papers included in this review is of theoretical nature, which is problematic since they only describe legacies but do not measure them and are consequently susceptible to being biased. Moreover, the real value of the legacies frequently remains uncertain since studies only describe what has been built/achieved by the Olympic Games but do not evaluate the subsequent use/utility/outcome of it. Consequently, future research should yield more sound empirical studies (also see the next paragraph).

Fourth, when considering the existing empirical papers, significant weaknesses became obvious. Studies trying to measure legacies (especially intangible legacies) in an objective, reliable and valid manner are lacking. Most of the empirical publications employed qualitative interviews with comparably few data sets, which might not have been representative. Quantitative studies often had low response rates and used small sample sizes. Consequently, these samples might also not have been representative of the respective population. But reliable empirical data is of central importance in legacy-research. Regarding the evaluation of sporting venues, for instance, our review revealed inconsistencies. For some venues, frequency of use remains unclear, which is also true of their general value for the society. Therefore, we propose the development and use of objective indicators that can reflect and operationalize structural changes and their outcomes. For measuring and evaluating infrastructural legacies, some indicators could be established (e.g. Kassens-Noor, 2015). So far, such indicators have not been used in empirical studies and therefore, their informational value is still uncertain. Thus, empirical studies should aim at assessing existing indicators.

Fifth, our review revealed that the time frame of legacy studies is often problematic. Data collection for empirical studies was mostly conducted shortly after the Games, at a time when it cannot be previewed which legacies will prevail for how long. Especially, studies aiming at measuring the effects of Olympic Games on a nation's image employ data collected

shortly before and/or after the event. However, such a time frame does not allow for assessing a nation branding legacy. We further showed that on average data collection for empirical studies started 16 months prior to the Games. However, measuring event legacy requires a baseline assessment to evaluate the changes. To measure sport participation, for instance, participation figures are necessary for the time before or when the city announces its bid. An accurate measurement cannot start during the bidding phase or shortly before the event. Consequently, we want to stress the need for more long-term studies comprising sound benchmarks.

Sixth, we showed that 56% of the studies used a bottom-up approach and 44% a top-down approach to measure legacy. Top-down approaches often use macro-data like, for instance, the Gross Domestic Product (GDP) and tourism statistics (e.g. Demir, Eliöz, Cebi & Yamak, 2015), national exports (e.g. Rose & Spiegel, 2011), house prices (e.g. Kontokosta, 2011) or employment data (Feddersen & Maennig, 2013). But some researchers argue that such macro-data are inappropriate to evaluate the legacy of an event because they are collected for far more general purposes (Weed, Coren & Fiore, 2009). They claim that it is not possible to isolate the effect of an event in such data, which is why a top-down approach would not be appropriate (Preuss, 2015). As can be seen from our data, 56% of the studies used a bottom-up approach to measure legacy, which means that primary data was collected specifically to measure the legacy of Olympic Games. Depending on the methodology, this approach also is prone to mistakes, for example, if longer time periods are looked into. Then it can be hard to rely on survey data as the respondents may not be able to give precise answers due to the long time span. Generally, both approaches have their place and their advocates and either way a sound methodology is called for. And specifically in long-term projects, combinations of both approaches should yield especially robust results.



## **Conclusion and Limitations**

The purpose of this paper was to review and describe the body of literature related to Olympic legacy and provide directions for future research. The results showed that legacy research has gained considerable interest among researchers in recent years. Although many studies try to measure the legacy of Olympic Games, empirical evidence is often missing and there still is room for improvement. These results alongside current developments like the new bidding process for the 2026 Olympic Winter Games highlight the need for more comprehensive assessments of legacy in all its facets and during the whole event lifecycle.

For this review, extensive attempts were made to identify a variety of studies dealing with the legacies of Olympic Games and methodological issues. However, our study has not included all scientific literature on the legacy of Olympic Games. Books, for instance, were not considered at all. It can also be assumed that the use of other databases would have yielded further works. Another limitation refers to the language of the studies. Only sources published in English were included in this review since English is the most common language in the scientific world. Yet, we are confident that our search strategy yielded most of the relevant literature.

Summing things up, this paper is – to our knowledge – the first review of such an extensive sample combining quantitative and qualitative analysis in order to offer new insights into peer-reviewed scientific journal papers on Olympic legacy. The review further provides a wide-ranging overview of legacy with all its facets. The findings can help researchers to better understand dominant themes and make further progress in this field and should assist practitioners involved in Olympic bidding processes and Games to better understand the legacies they are creating with their endeavors.

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Table 1. Inclusion criteria

<b><i>Inclusion criteria</i></b>	<b>Rationale</b>
Studies which were published in an academic journal with a peer review process	To ensure a certain quality of studies
Studies in English language	English is the dominant language in legacy research; ensures accessibility and comparability of results
Studies focusing on the legacy of a specific Olympic Games edition	The objective of this study is to capture the legacies of all Olympic Games
Studies focusing on the concept of legacy and methodological issues	To examine how the field and concept developed and capture studies that do not relate to a specific Games edition
Studies focusing on how to measure legacy	The objective of this study is to review and analyze the methods used

Table 2. Facets of legacy (Total number of papers included in the analysis: 322 – If a publication looks at more than one facet, it is listed for each one in the table.)

Games edition	Year of Games	Number of articles	Facets of legacy					
			urban development	environment enhancement	policy, governance	skills, knowledge & networks	intellectual property	beliefs and behavior
Rio de Janeiro	2016	11	6	2	1	0	0	5
Sochi*	2014	12	6	5	0	1	1	6
London	2012	104	33	11	15	9	3	46
Vancouver*	2010	22	4	1	5	4	3	15
Beijing	2008	51	16	7	5	4	0	24
Torino*	2006	12	6	0	1	2	0	5
Athens	2004	23	14	1	2	7	0	3
Salt Lake City*	2002	2	1	0	0	0	0	1
Sydney	2000	20	9	1	4	2	2	6
Nagano*	1998	3	2	0	1	1	0	0
Atlanta	1996	12	4	0	1	0	0	1
Lillehammer*	1994	1	1	0	0	1	0	0
Barcelona	1992	5	4	0	0	0	1	2
Albertville*	1992	2	1	1	0	0	0	1
Seoul	1988	10	3	0	2	1	0	5
Calgary*	1988	3	1	1	0	0	1	1
Los Angeles	1984	5	4	1	0	0	2	2
Sarajevo*	1984	1	1	0	0	0	0	0
Moscow	1980	1	0	0	0	1	0	1
Montreal	1976	2	1	0	2	1	2	1
Munich	1972	1	0	0	0	0	0	0
Tokyo	1964	6	4	2	1	2	0	2
Rome	1960	2	2	0	0	0	0	0
London	1948	2	1	0	0	1	0	1
Los Angeles	1932	1	1	1	0	0	0	1
London	1908	1	1	0	0	0	0	1
General		58	8	4	2	3	2	6
Total		373	134	38	42	40	17	136

\*Winter Games

Figure 1. Legacy analytical scheme (IOC, 2017, p. 30)

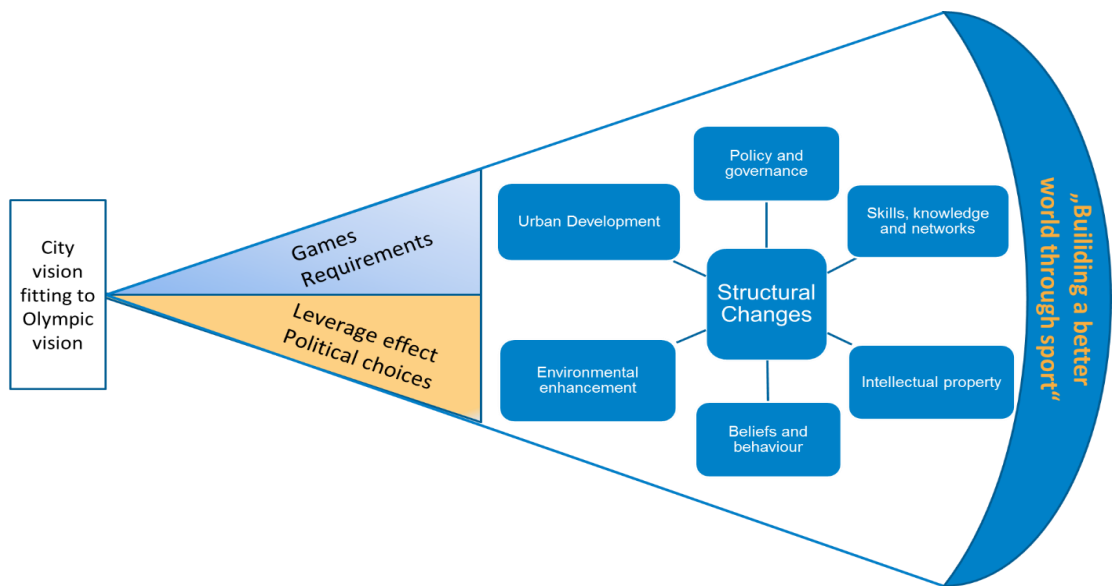


Figure 2. Number of articles published per year (total number of papers included in analysis: 322)

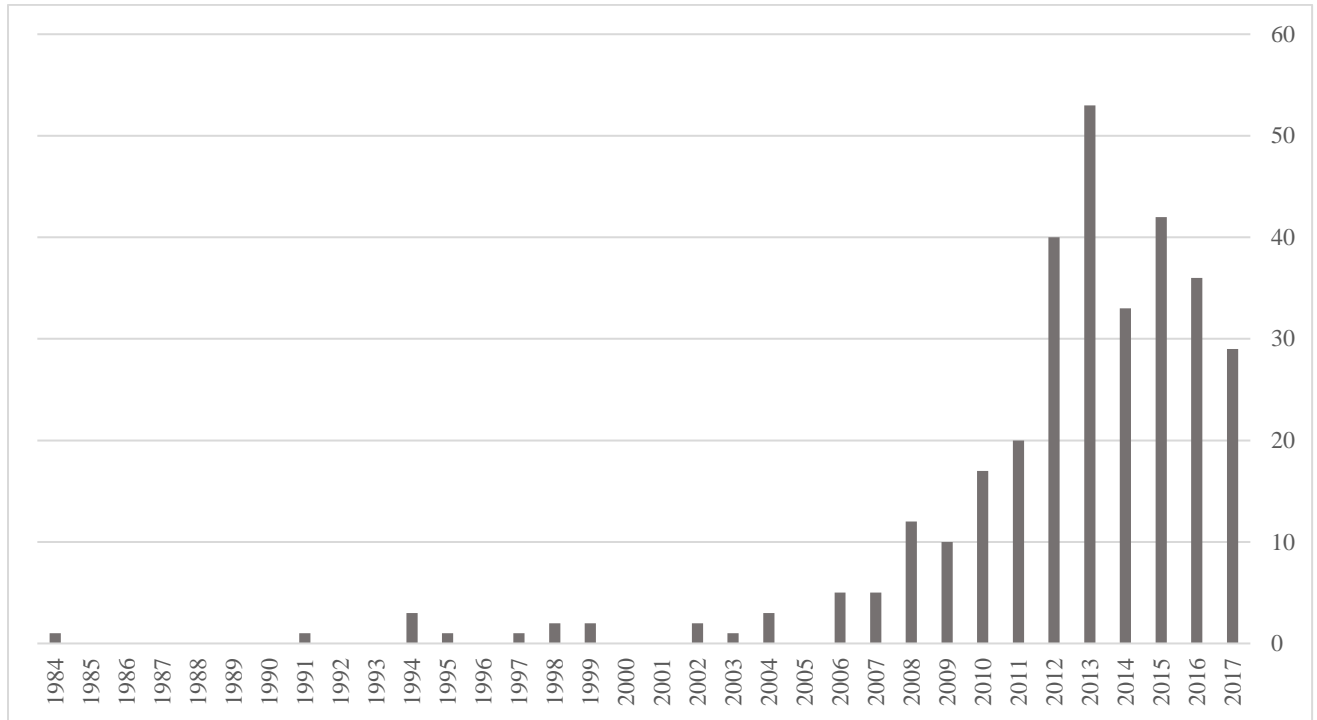


Figure 3. Methods used to study Olympic Games legacy (total number of papers included in analysis: 322)

