Sustainability of the Summer Olympic Games

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Sustainability of the Summer Olympic Games

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Petar-Krešimir Miladin

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Održivost ljetnih Olimpijskih igara

Master thesis

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Zagreb, September 2021

Sustainability of the Summer Olympic Games

The Olympic Games are the dream of many athletes. By performing, and especially by winning an Olympic medal, athletes make history. Unfortunately, in the last couple of decades this sporting mega-event has come into trouble. Due to high costs and pollution, the number of cities and states wanting to host has decreased as has the popularity of the games themselves. In response to the bad situation in which the Olympic Games find themselves, the International Olympic Committee (IOC), as the owner and organizer of the Games, decided to make moves that would improve the situation. In response to the bad situation in which the Olympic Games find themselves, the IOC, as the owner and organizer of the Games, decided to make moves that would improve the situation. The aim of this thesis is to present and analyze the current state of sustainability of the Summer Olympics, how this situation came about and what are the plans of the IOC for the future game in terms of sustainability. The thesis will also try to find out through the simulation method whether it is possible to hold sustainable Olympic Games based on the IOC strategy. For the sake of better simulation and analysis, only the Summer editions of the Olympic Games will be covered in the thesis

Keywords: Summer Olympic Games, IOC, Sustainability, Sustainable Development

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"I plead with you, never give up on hope, never doubt, never tire, and never become discouraged. Be not afraid." —Pope John Paul II

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1. INTRODUCTION

Sports mega-events are always the subject of economists' interest due to their specifics. There are many definitions of mega-events: “Mega-events are ambulatory occasions of a fixed duration that (a) attract a large number of visitors, (b) have large, mediated reach, (c) come with large costs and (d) have large impacts on the built environment and the population”.[1] “Major one-time or recurring events of limited duration, which serve to enhance the awareness, appeal and profitability of a tourism destination in the short and/or long terms. Such events rely for their success on uniqueness, status, or timely significance to create interest and attract attention”.[2] Sports mega-events as can be seen from the definition, and the literature are defined and differentiated from other sports events by common features. Firstly, they attract many foreign guests and gain great media interest, secondly, they are limited by location, thirdly they appear irregularly or frequently and fourthly they represent an extraordinary effort for the organizer. The Olympics are arguably the biggest sporting mega-event. Therefore, they demand the most attention and the most interest. That is why they are the topic of this thesis. For easier analysis and obtaining clean results, this master's thesis is dedicated only to the Summer Olympics. In addition to being the largest sports mega-event, the Olympic Games differ from other mega-events in that they bring together many athletes competing in different arenas, which requires special organizational effort and high cost.

The Olympic Games also bring together the largest number of athletes in one place compared to other events. The Olympics last relatively longer than other mega-events (16 days) although not the longest (e.g., the FIFA World Cup lasts exactly a month).
The biggest problem of all mega-events, and thus of the Olympic Games, is sustainability. To better explain the problem, sustainability needs to be defined. One of the most cited definitions of sustainable development is: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs“ [3] . Looking at the history of the Olympic Games, it can be concluded that it is very questionable how much they met the above definition. This thesis will try to answer the questions of whether

[1] Müller, M. (2015). What makes an event a mega-event? Definitions and sizes. Leisure studies, 34(6), 627-642.
[2] Hall, C. M. (1989). The definition and analysis of hallmark tourist events. GeoJournal, 19(3), 263-268.
[3] Brundtland, G. (1987). Report of the World Commission on Environment and Development: Our Common Future. United Nations General Assembly Document A/42/427.

the Summer Olympics are sustainable, if not, can they be? The thesis will present historical data and projections for the future, data and simulations will be compared and analysed. At the end of the paper, the results will be summarized, and the conclusion will be made

2. CURRENT STATE OF THE SUMMER OLYMPIC GAMES SUSTAINABILITY

2.1. Analysis of the historical data of The Summer Olympic games

The history of the Games dates to ancient times and has its roots in Greece in the Peloponnese, around 3000 years ago. Sports competitions organized in Olympia were held every four years and took the name of the Olympic Games. It is not known precisely when they started, but the date of 776 BC[4]. AD is often cited in written sources. The exact reasons for the birth of the Games remain unknown today because history mixes with mythology. The period of four years separating the editions of these ancient Games was called "Olympiad" and was used at the time of the data system: time did not pass in years, but in Olympiads. In 1894, Pierre de Coubertin launched his renovation project for the Olympic Games and in 1896 the first Games of the modern era took place in Athens. From then until today, the Summer Olympics are held every four years with exceptions during the World Wars and the Covid pandemic[5] The Organizing Committee of the Olympic Games of the city that is hosting the Games oversees organizing the Olympic Games. The Games are organized in cooperation with the bodies of the International Olympic Committee, which also selects the city hosting the Olympic Games.

Before the host city is selected, all candidate cities submit their candidacies on tens of thousands of pages. These candidacies are reviewed and refined through a host selection process that takes several years. In the end, at the session of the International Olympic Committee, the host of the Olympic Games is chosen for a certain edition. Under the new rules agreed by the Olympic Committee, the method of selection was changed in 2019 for the 2032 Games[6]. The changes came as a result of the IOC's efforts to make future games more sustainable than previous ones. The most important changes are that from now on the entire region can run for the host, unlike so far when only cities were allowed. Hosts are encouraged to use as much of their existing infrastructure as possible, and financial, environmental and sociological sustainability is increasingly sought. Future Host Commissions (winter and summer) have also been formed,

[4] Christesen, P. (2010). Whence 776? The origin of the date for the first Olympiad. Sport in the cultures of the ancient world: new perspectives. London, 13-34.
[5] Young, D. C. and Abrahams, Harold Maurice (2021, July 16). Olympic Games. Encyclopaedia Britannica. https://www.britannica.com/sports/Olympic-Games (2021, August 10)
[6] The IOC. (2019, June 26). Evolution of the revolution: IOC transforms future Olympic Games elections. Retrieved from: https://olympics.com/ioc/news/evolution-of-the-revolution-ioc-transforms-future-olympic-games-elections (2021, August 10.)

which will, in direct talks with the candidates' representatives, look for the best solution for hosting the Olympic Games, as well as other competitions under the jurisdiction of the IOC[7]. The sustainability problem did not arise overnight.

For a long time, the Olympic Committee turned a blind eye to the problems the hosts had with the negative consequences of organizing the Olympic Games[8]. Perhaps the most resonant example of a post-Olympic cataclysm is Montreal 1976. Montreal was the financial centre of Canada in the early 70's, it was also a city of culture, nightlife, entertainment. At the same time, terrorist attacks took place in Montreal and it was deeply divided between the Canadian authorities and the pro-French separatists. In the 1969 at the Host Selection Meeting in Amsterdam, Montreal defeated the candidacies of Los Angeles and Moscow (which will host the next two games) in two rounds of voting. After winning the Montreal bid won, the games were presented by Mayor Jean Drapeau as one stage in the development of the city and how they would be modestly organized. The construction phase went very badly, apart from the fact that corruption scandals piled up in the years after the Games, the construction was marked by numerous strikes which led to the fact that not all facilities were fully built for the Olympic Games. In the end, the total bill for the Olympics jumped from the projected 120 million Canadian dollars to 1,600,000,000 Canadian dollars. Which is an increase of over 13 times.

Debt that has accumulated due to increased costs has been repaid for as long as 30 years. Poor governance of the city during the preparations for the Olympic Games led to a change of government in the elections afterwards. Pro-French separatists came to power who, with their way of governing the city and the threat of secession from Canada, drove the financial sector from Montreal to Toronto, which became Canada's new financial centre. All this made it difficult to repay the debts. Another problem was the Olympic Stadium, which struggled for a long time with a sliding roof that never came to life in full. For most of the time till today, the stadium doesn't even have a permanent tenant. Today only Montreal CF (MLS club) plays some games in the stadium. But even those games still brought some positive things for the city. Most other sports facilities are used or repurposed. As for example the hall for bikers is today a natural history museum (Montreal Biodome). Fortunately, Montreal eventually paid of the debt made

[7] The IOC. Sustainability. Retrieved from: https://olympics.com/ioc/sustainability
[8] Mangan, J. A., & Dyreson, M. (Eds.). (2013). Olympic legacies: Intended and unintended: Political, cultural, economic and educational. Routledge. (2021, August 10)

for the organization of the Olympic games, and even today it is still the cultural and artistic centre of Canada.[9]

Picture 1: Olympic park Montreal in 1976

Source: The true value of Montreal's Olympic Park. Retrieved from: https://parcolympique.qc.ca/en/news/2018/09/the-true-value-of-montreals-olympic-park/ (2021, August 14)

Picture 2: Biodome Montreal

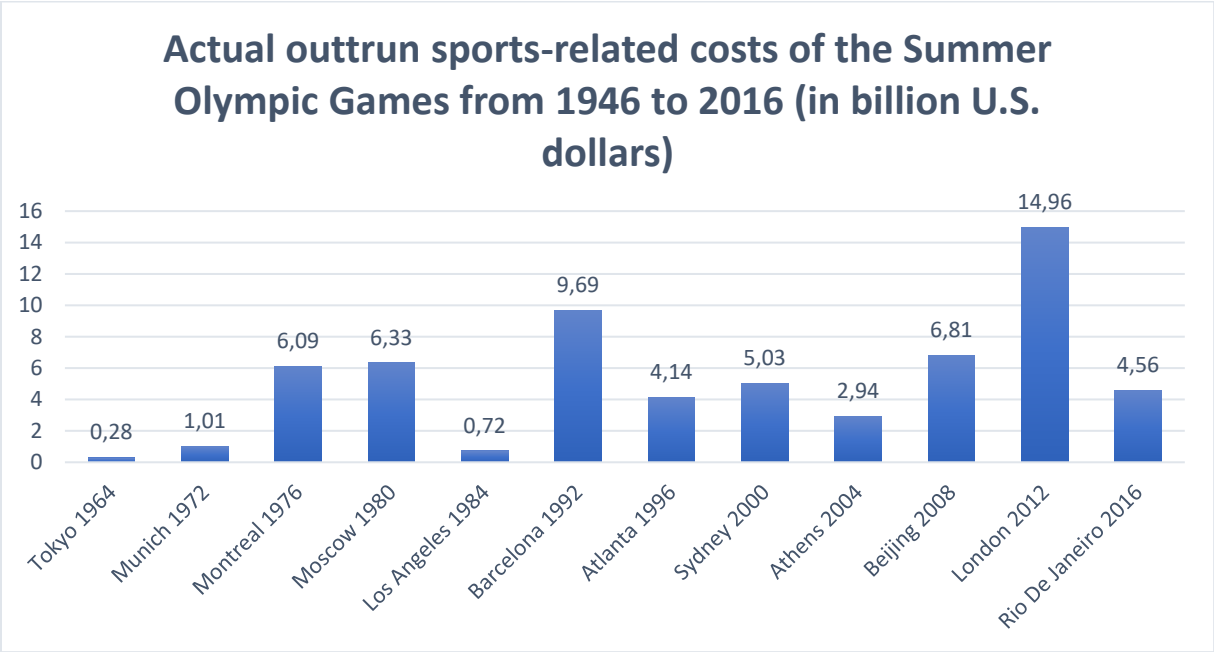
Source: Biodome Montreal. Retrieved from: https://parcolympique.qc.ca/en/news/2018/09/the-true-value-of-montreals-olympic-park/ (2021, August 14)

It is not only in Montreal that the budget for the organization of the Olympic Games has been exceeded. In fact, the budget was almost always exceeded. The original budget for the London

[9] Todd, J. (2016., July 6). The 40-year hangover: how the 1976 Olympics nearly broke Montreal. The Guardian. Retrieved from: https://www.theguardian.com/cities/2016/jul/06/40-year-hangover-1976-olympic-games-broke-montreal-canada (2021, August 10)

Olympics at the time of the candidacy was £ 2.4 billion. In the end, the games cost £ 8.9 billion. When it comes to the cost of the Olympic Games, the official budget mainly refers only to direct costs: sports arenas, the Olympic village, insurance, organization costs ... There are also considerable costs that are not directly related to the games, especially to the supporting infrastructure such as the construction of a highway to Sochi for the 2018 winter Olympics or a new terminal Beijing Airport for the 2008 Olympic games.[10] Thus, the costs shown can vary greatly from the actual ones that ultimately are paid by the local population. Although it should be considered that at least part of the total infrastructure always remains in use after the Olympic Games or is repurposed. Through new directives, the International Olympic Committee is trying to increase the share of infrastructure that will continue to be used after the Games.[11]

Figure 1: Cost of the Summer Olympics from 1984 to 2016



Source: Statista Research Department. (2016). Actual outturn sports-related costs of the Summer Olympic Games from 1964 to 2016 (in billion U.S. dollars). Statista. Retrieved from: https://www.statista.com/statistics/632762/summer-olympic-games-sports-related-costs/ (2021, August 14)

The above graph shows the official costs of the Summer Olympics adjusted for inflation. The first thing to see is the sudden jump of 1976 in Montreal at the games that were mentioned as disastrous for the city. From then until today, the games in Los Angeles alone have cost less

[10] Owen, J. G. (2005). Estimating the cost and benefit of hosting Olympic Games: what can Beijing expect from its 2008 Games. The industrial geographer

[11] Short, J. R. (2018). Hosting the Olympic Games: the real costs for cities. Routledge.

than $ 2 000 000 000, more precisely $ 720 000 000. They were specific in many ways, more information on that edition of the games is lower in the thesis. As already stated, it is very questionable how costs were recorded, which is partly the reason for so many differences in costs. Differences in costs are also affected by the price of labour and materials. So, the games in London cost the most, twice as much as those in Beijing and even almost three times more than those in Rio. Although the absolute cost is higher, it is likely that the London Games, relative to GDP, cost the people of London less than the people of Rio and Beijing. Regardless of the differences, a certain growth trend over the years can be seen. Cost growth is conditioned by several factors.

The first is logically an increase in the number of sports. From Tokyo in 1964 to Rio 2016, the number of sports increased from 19 to 28, and at the first modern Olympics in Athens in 1896, there were 9 sports.[12] Increasing the number of sports means higher costs of organizing competitions, but also building additional capacity for people and new sports arenas. Thus, the organizers in Rio had to build a temporary hall "Future Arena" of as many as 12,000 seats for a handball tournament that in 1964 was not an Olympic sport. That hall was made in such a way that after the dismantling, the materials for its construction were used for the construction of four schools. Unfortunately, due to poor management, no schools were built after the dismantling.[13]

Another reason for the trend of increasing costs is the ego of the hosts, if you look at the list of hosts not only the Olympics but also other international mega-events, the host countries and cities are those in economic boom and want to express themselves by organizing big events. So, every year the new host tries to present himself in the best possible light compared to the past, which is why he spends more than the last one.

The winner's curse also acts as an additional catalyst. "The winner's curse is a tendency for the winning bid in an auction to exceed the intrinsic value or true worth of an item."[14] The winner's course is seen by the fact that in the desire to win in the bid against other major candidate cities, winning candidates often overestimate the benefits and underestimate the cost of organizing the

[12] Young, D. C. and Abrahams, Harold Maurice (2021, July 16). Olympic Games. Encyclopaedia Britannica. https://www.britannica.com/sports/Olympic-Games (2021, August 10)
[13] Dhres, W. and Lajolo M. (2017. October 08) After the Flame. ESPN. Retrieved from: http://www.espn.com/espn/feature/story/_/id/20292414/the-reality-post-olympic-rio
[14] https://www.investopedia.com/terms/w/winnerscurse.asp (2021, August 14)

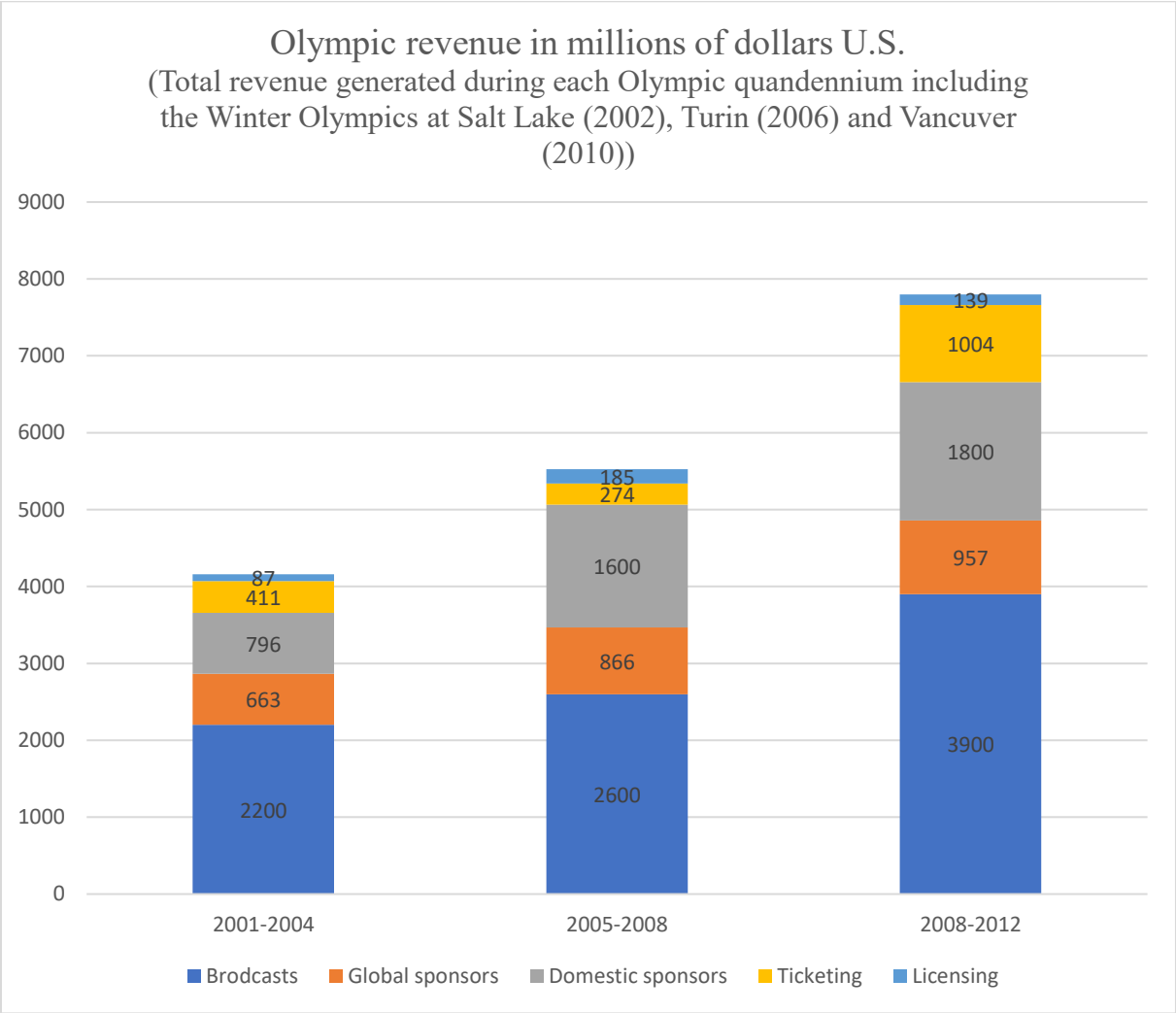
Olympic Games, just to win the vote. This is later seen in the fact that original planned budgets for organizing the Olympic Games are often broken.[15]

Another reason for increased costs of organizing the Olympic Games is the development of technology. Numerous sports have introduced technological innovations to make them more interesting, but also fairer. An example of this is the use of Hawkeye technology in tennis. The average Hawkeye set costs between $ 60,000 and $ 70,000.[16] At the 2012 Olympics, tennis was played at Wimbledon using six Hawk-eye systems.[17] Luckily for the organizers, Wimbledon already had a system in place, but Rio was building its own new tennis park for the games, and it's to be assumed that he they had to buy new Hawkeye systems or at least rent them out.[18]
In addition to tennis, the Hawk-eye system was used in 19 other sports in London, and volleyball and badminton joined in Rio.[19]

The last reason the cost of the Olympics has risen over the years is globalization. With the progress of globalization, various influences have emerged that have positively and negatively affected the Olympic Games. On the cost side, however, it was quite negative. Due to the larger number of countries, the Olympic Games must invest more money in the organization (more journalists, more delegations, more athletes ...). The threat of terrorism has increased which has affected higher insurance costs. Also, with the increase of human rights and equality, the number of disciplines that made games more expensive increased. For example, in 1964 in Tokyo, all team sports except volleyball had only a men's tournament, today everyone has a men's women's tournament. There is also solidarity with all continents who now always have guaranteed places on every Olympic arena, this is to help sports in developing countries especially from South America and Africa.[20]

[15] Leeds M., Von Allmen P and Matheson V. (2014) "The Economics of Sports"
[16] Wong, Y. (2015, June) Low-cost Tennis Line Call System with Four Webcams, retrieved from: https://web.stanford.edu/class/cs231a/prev_projects_2016/final_report_v2.pdf
[17] Potts M. and Bullimore E. (2021) Wimbledon 2021: How does Hawk-Eye work? Is Hawk-Eye accurate? Radiotimes. Retrieved from: https://www.radiotimes.com/tv/sport/tennis/wimbledon-2021-hawk-eye/ (2021, August 14)
[18] Belen, N. (2018, May 3) Rio's Olympic Park in Barra Opens Tennis Courts to Public. The Rio Times. Retrieved from: https://riotimesonline.com/brazil-news/rio-business/rios-olympic-park-in-barra-opens-tennis-courts-to-public/ (2021, July 15)
[19] Hawkeye innovations official site. (2021, July) Multi-sport events. Retrieved from: https://www.hawkeyeinnovations.com/sports/multi-sports (2021, July 15)
[20] Fort R. (2010) "Sports Economics" (3rd Edition)

Figure 2: Olympic revenue for three Olympic cycles from 2001 to 2012



Source: Cannon, G. (2012, August). Olympics revenue since 2000. ResearchGate. Retrieved from: https://www.researchgate.net/figure/Olympics-revenue-since-2000-Since-2000-the-revenue-of-the-Olympics-has-soared-away-way_fig1_316148136 (2021, August 14)

The graph above shows the revenue structure for three Olympic cycles. It should be noted that one Olympic cycle includes one winter and one summer Olympic Games. Also listed above are the total revenues of both the host city's organizing committee and the International Olympic Committee. The host city is entitled to income from tickets, licensing and domestic sponsors. The money from international sponsors and TV rights goes to the IOC, which later returns one third to the city to the OCOG of the host.[21] According to the figure, London earned over 3,000,000,000 $ combined. This covers just over one fifth of the direct costs of organizing games.[22]

[21] Leeds M., Von Allmen P and Matheson V. (2014) "The Economics of Sports"

[22] Gold, J. R., & Gold, M. M. (2015, March). Sustainability, legacy and the 2012 London Games. In Routledge handbook of sport and legacy: Meeting the challenge of major sports events.

What the organizers are counting on as another source of income is the earnings from the Olympic legacy. “Olympic legacy includes the long-term benefits that the Olympic Games create for the host city, its people, and the Olympic Movement before, during and long after the Olympic Games. “[23] . The overall long-term economic effects of the Olympic legacy are difficult to calculate. But it is possible to present some indicators.[24] One of the roughest indicators of the city's economic legacy is an increase in the city's GDP. Thus, Atlanta received an increase of 5,000,000,000 dollars after the Olympic Games, and Sydney is estimated somewhere between 6,000,000,000 and 7,000,000,000 dollars of Australian[25]

One of the main generators of this increased economic activity is the construction sector, because it gets a boost in constructing all the sports and non-sports infrastructure needed to hold the Olympic Games.

The 1964 Tokyo Games, which became the first Olympic Games in Asia, brought various benefits to Japan. Facilities that are architecturally and commercially valuable, such as Yoyogi Stadium and Japan Budokan, Yoyogi Park (former site of Athletes' Village) is now a large-scale green area in the city centre. Infrastructure that supported high economic growth such as the Tokaido Shinkansen and the Tokyo Metropolitan Expressway were built for the Olympic games also.[26] In addition, the games brought development of the media industry infrastructure, the world's first live TV broadcast using international satellites. The legacy of the 1964 Tokyo Games was great, but in retrospect it is unclear whether there was a modern sustainability perspective, such as consideration for the environment and diversity.

[23] The IOC. Olympic legacy. Retrieved from: https://olympics.com/ioc/olympic-legacy (2021, July 15)
[24] Andreff W. and Szymanski S. (2013) “Handbook on the Economics of Sport”
[25] The IOC. Olympic legacy. Retrieved from: https://olympics.com/ioc/olympic-legacy (2021, July 15)
[26] The IOC. (2002, October 9) Tokyo 1964 - Japan showcases rebirth and resilience. Retrieved from: https://olympics.com/ioc/news/tokyo-1964-japan-showcases-rebirth-and-resilience (2021, July 15)

Picture 3: Yoyogi National Stadium

Source: The IOC. (2020, November 19). The Yoyogi National Stadium. Retrieved from: https://olympics.com/ioc/legacy/tokyo-1964/yoyogi-national-stadium. (2021, September 12)

The International Olympic Committee advertises the increase in tourism activities as a strong positive economic effect of the Olympic legacy. In Atlanta around 6,000 hotel rooms were built in 1996. That meant an increase of 9.3 percent. In Barcelona the number of hotel rooms rose by as much as 38 percent between 1990 and 1992. [27]

An important perspective is that before environmental issues were the main issues of sustainability, but now the mainstream approach is to tackle environmental, social, and economic issues in a well-balanced manner. For example, economic effects and job creation through holding events, promotion of diversity in recruiting human resources, fair trade that protects the environment of developing country production areas and supports living, facilities for anyone regardless of age or physical disability and the improvement of accessibility that allows users to use products and services without any problems.

At the 2012 London Games, efforts were centred around the East London area, where many immigrants were economically stagnant, with the aim of "creating a sustainable legacy", and a

[27] The IOC. Olympic legacy. Retrieved from: https://olympics.com/ioc/olympic-legacy (2021, July 15)

sustainable event with the acquisition of ISO 20121 certification. The operation has become reliable from the perspective of a third party.[28]

Following the Olympic Games in Rio, according to the IOC, the Games have helped Rio improve in many ways. The committee started several educational programs in the city. Women were trained in design and quality control for working at the games. At the same time, long-term projects were started to further promote women and young people. Young trainees were given the opportunity to take part in courses and gain their first job experience during the games. The interest in the volunteer positions was also positive. Around 50,000 volunteers got the coveted places, over 200,000 people from all over the world had applied. The infrastructure in the city was improved as planned.[29]

Today 63% of Rio's population have access to transportation. In 2009 it was still 18 percent. A new bus network was opened that covers around 150 km. The rapid transit network was also expanded. This makes journeys between the different parts of the city easier and reduces the journey time. The port area of Porto Maravilha was completely redesigned and developed into one of the most popular places in Rio during the Olympic Games. The modernization was carried out by private investors. Even today, the area, which was called Olympic Boulevard during the Games, attracts large numbers of visitors. A new tram also leads there. Tourism was also able to benefit from the games new hotels were built in Rio. In addition, 6.6 million tourists came to Brazil in 2016, which means an increase of almost 5%. The expansion in all these areas created around 16,000 new jobs in tourism, transport and administration.

The big problem is the sports facilities. The longer they stand around without use, the more costs they cause. So far none of the planned projects have been implemented. The stadiums in the Olympic Park in Barra are empty and deserted. Nobody found themselves to implement the conversion plans in schools and training centres. The apartments in the Olympic Village do not find any interested parties either. They are far too expensive for the locals and the wealthy show no interest. [30]

[28] Gold, J. R., & Gold, M. M. (2015, March). Sustainability, legacy and the 2012 London Games. In Routledge handbook of sport and legacy: Meeting the challenge of major sports events

[29] Müller, M., Wolfe, S. D., Gaffney, C., Gogishvili, D., Hug, M., & Leick, A. (2021). An evaluation of the sustainability of the Olympic Games. Nature sustainability

[30] Weiler, Joseph, and Arun Mohan. (2010) "The Olympic Games and the triple bottom line of sustainability: Opportunities and challenges."

Today is in an era where sustainability must be considered when hosting events and creating legacy.

2.2. Expected results for the upcoming Olympic games

In the thesis, the games in Tokyo will be categorized as the future because the research started before the end of the game and all the final data has not been released yet for the 2020 Olympics. The host is determined for the next four Olympic Games: Tokyo 2021, Paris 2024, Los Angeles 2028. The Tokyo Games were supposed to take place in 2020, but due to the Covid pandemic, they took place in 2021. According to initial data, the games in Tokyo cost 15,400,000,000 $. Which makes them the most expensive games up to date. There are some premature figures according to which this cost could rise to as much as 20,000,000,000 $ it should be noted that the initial budget was set at 7,400,000,000 $.[31] Which would mean exceeding by almost as much as three times the original budget. However, there are objective reasons for exceeding the costs. First, the Covid pandemic that delayed the game is estimated to have cost Tokyo about 2,800,000,000 $.[32] Fortunately for the organizers, who cleverly planned the Olympics in that perspective, the games were insured against a pandemic case so that part of the cost that incurred should be completely reimbursed.[33] On the other hand, although the COVID pandemic justifies part of the cost increase, it does not justify enough. In the table below you can see the cost of some capital projects needed to host the Olympics for the last four games. The costs are expressed in millions of dollars.

[31] Gale A., Inada M. & Bachman R, the (2021, July 20) Olympics Are Turning Into a $20 Billion Bust for Japan. Wall Street Journal. Retrieved from: https://www.wsj.com/articles/the-2021-olympics-are-turning-into-a-20-billion-bust-for-japan-11626790720 (2021, August 23)

[32] Cervantes, A. (2021, July 23) The Tokyo Olympics' Staggering Price Tag and Where It Stands in History. Wall Street Journal. Retrieved from: https://www.wsj.com/articles/the-tokyo-olympics-staggering-price-tag-and-where-it-stands-in-history-11627049612 (2021, August 23)

[33] Cohn C. & Zainab Hussain N. (2001 January 27) Insurer's face 'mind-blowingly' large loss if Olympics cancelled. Reuters. Retrieved from: https://www.reuters.com/article/us-olympics-insurance-idUSKBN29W1OL (2021, August 23)

Table 1: Cost of sports infrastructure by games

in USD 000 000

Type of objects	Tokyo	Rio	London	Beijing
Olympic stadium	1430	629	755	423
Aquatics Centre	521	50	542	140
Gymnastics Centre	190	220	976	95
Big indoor sport arena	320	300	63	500

only adapted objects

constructed not depending on Olympic games

Sources: Cervantes, A. (2021, July 23) The Tokyo Olympics' Staggering Price Tag and Where It Stands in History. Wall Street Journal. Retrieved from: https://www.wsj.com/articles/the-tokyo-olympics-staggering-price-tag-and-where-it-stands-in-history-11627049612 (2021, August 20); Zimbalist, A. (Ed.). (2017). Rio 2016: Olympic Myths, Hard Realities. Washington, D.C.: Brookings Institution Press., 2021; Gold, J. R., & Gold, M. M. (2015, March). Sustainability, legacy and the 2012 London Games. In Routledge handbook of sport and legacy: Meeting the challenge of major sports events; Preuß, H., Andreff, W., Weitzmann, M., & Springer Fachmedien Wiesbaden GmbH. (2019). Cost and revenue overruns of the Olympic Games 2000-2018.

It should be noted in the table that the new national stadium in Rio was not built but renovated. Also, a large hall in London and Rio were built recently before the games, but not with the sole intention for the Olympics. The table shows that the average cost of construction of sports venue in Tokyo was above average then the last four games.

The stadium was a giant difference in costs on the Tokyo side. To add on the Tokyo Olympic stadium is currently the fourth most expensive stadium in the world[34][35], and the most expensive in Asia. It's very interesting that the 2028 Games will be opened at the currently most expensive stadium in the world, the Los Angeles Stadium at Hollywood Park, known as SoFi Stadium. Looking further in the future, Paris 2024 will try not to repeat the mistakes of their predecessors regarding the control of the budget. When revealing its candidacy for the hosting of the Olympic Games in 2024, Paris had presented as an argument the fact of being able to organize this event for a total amount of just 6,200,000,000 euros[36]. Since that candidacy won, Paris is going to become the second city to host the Summer Olympics for the third time in 100 years. In the

[34] Design buildnetwork. (2021, May 6) The world's most expensive stadiums: Top Ten. Design buildnetwork Retrieved from: https://www.designbuild-network.com/features/the-worlds-most-expensive-stadiums-top-ten/ (2021, August 23)

[35] The National Post Staff. (2021, July 21). The money games: An eye-popping look at the cost of the Tokyo Olympics. Retrieved from: https://nationalpost.com/sports/olympics/the-money-games-an-eye-popping-look-at-the-cost-of-the-tokyo-olympics (2021, August 23)

[36] Sage, A. (2015, February 12) Paris mulling potential 6.2 billion euro bid for 2024 Games. Reuters. Retrieved from: https://www.reuters.com/article/csports-us-olympics-paris-idCAKBN0LG1UZ20150212 (2021, August 23)

meantime, the Paris 2024 budget has been revised and has seen an increase. Till September 2021, it has climbed and is around 6,800,000,000 euros[37].

To avoid financial disasters like those in Athens or Sydney, the IOC now pays close attention to certain budget points when looking at the candidacy for the Games. Thus, IOC today encourages that the candidate cities reuse existing infrastructures or the construction of temporary sports venues at a maximum rate.

In Paris, the 2024 Olympic Games will rely 95% on existing or temporary infrastructure. The biggest and most expensive temporary venues that are going to be constructed are an aquatic centre, which will be built next to the Stade de France and an indoor basketball arena. The Olympic Village will be the most expensive single construction for the games.

The Olympics must imperatively be held from July 26th to August 11th, 2024. They were brought back by a week from the original date for organizational reasons. This's important to emphasize that in the light of the COVID 19 pandemic and possible delays in construction.
For the games two entities were created to ensure optimal organization: The Games Organizing Committee Paris 2024 (OCOG) and the "La Société de livraison des ouvrages olympiques" (SOLIDEO). The OCOG's mission is to organize and finance all the expenses relating to the organization of the event. The budget allocated to this committee is 3,880,000,000 euros. Some of predetermined costs are:
Infrastructures and sites: 700 million euros
Security: 200 million euros
Human resources: 530 million euros

All these expenses will be financed by ticketing, the sale of promotional items for the Games, as well as a contribution from the International Olympic Committee of 1,500,000,000 euros. The other organization created for the 2024 Olympics is the Solideo[38]. Solideo is organization that is responsible for financing and delivering the infrastructure for the Games. With a budget of around 3,000,0000,000 euros, Solideo's most important projects are to develop the Olympic

[37] AFP (2020, July 8) Paris 2024 budget to be 'studied' by end of year. France24. Retrieved from: https://www.france24.com/en/20200708-paris-2024-budget-to-be-studied-by-end-of-year (2021, August 23)
[38] Sherfferd, N, (2021, January 3) Solideo acquires land for construction of Paris 2024 Media Village, Inside the games, retrieved from: https://www.insidethegames.biz/articles/1102626/solideo-paris-2024-media-village (2021, August 23)

village and build two sports facilities for the Games: an aquatic centre with a diving pool and a permanent water polo pool and intermediate level sports hall with 7,500 seats.[39]

Picture 4: Planned sporting venues at Place the Concorde for the 2024 Summer Olympic Games

Source: The IOC. (2020, March 3). IOC Executive Board approves Paris 2024 venue proposal. Retrieved from: https://olympics.com/ioc/news/ioc-executive-board-approves-paris-2024-venue-proposal (2021, September 12)

Los Angeles will host the 2028 Olympics for the third time after 1932 and 1984, and this time, like the first two, Los Angeles won the bid technically without an opponent. In 2017, after only Paris and Los Angeles remained the only candidates to host the 2024 Games, an agreement was reached between the cities and the IOC to give Paris the 2024 games and Los Angeles four years later.

The first two Olympic Games held in Los Angeles were remembered as economically viable and extremely sustainable, which gives reasons for optimism to the organizers of LA28 (Olympic Games in Los Angeles 2028).

The 1984 games were particularly impressive in terms of organization. The 1984 Games selection was the first choice after the 1976 Games and the Montreal financial disaster. After Tehran withdrew from the race, Los Angeles remained the only candidate. In such a situation,

[39] Paris 2024. (2021). Official site, retrieved from: https://www.paris2024.org/en/ (2021, August 23)

Los Angeles was able to communicate and negotiate directly with the IOC about game venues and the organization of the games. Which helped him a lot in reducing costs. For example, USC dormitories were used as Olympic Village, and only two new facilities were built for the games: a velodrome and a new aquatics centre.[40]

The 1984 Games were the first not to be funded by the government. They are funded mostly by corporate sponsorship money, public fundraising and, for the first time in history, a TV broadcasting contract ($ 225,000,000). The Games ended up costing $ 546,000,000, which is extremely affordable and commendable, but what's even more commendable is that the Games ended in profit of $ 232,500,000. Part of that money went to the LA84 Foundation, which funds the sports needs of young people and is still active today.[41]

OCOG Los Angeles 2028, which is responsible for organizing the Games, wants to replicate the success of its fellow predecessors from the same city in organizing financially sustainable games. This is exceptionally highlighted in their PR campaigns on social media where it is emphasized that LA is a city that "knows how to do it" and how they concentrate not on what they will build but on what they have.[42]

More details about the way the OCOG means to organize the games can be read in the game plan. Namely, Los Angeles does not plan to build any new permanent sports arena. The only necessary construction that will take place will be in the form of temporary facilities. Such as placing additional grandstands and swimming pools on Dedeaux Field where water sports competitions should be held or putting up prefabricated grandstands on the Santa Monica beach for beach volleyball, surfing, 3x3 basketball and skateboarding.[43]

There are eleven professional teams and several large universities in the area where the games will be held, which together with their sports programs guarantee the long-term use and sustainability of all facilities in L.A. That's also the reason for such a well-developed existing sports infrastructure. Athletes and their teams will be housed in UCLA University resident

[40] Walker, A. (2014, June 2). How L.A.'s 1984 Summer Olympics Became the Most Successful Games Ever. Gizmodo. Retrieved from: https://gizmodo.com/how-l-a-s-1984-summer-olympics-became-the-most-success-1516228102 (2021, August 12)
[41] Lange A., (2018, May 17). Lessons from LA's 1984 Summer Olympics. Curbed, Retrieved from: https://archive.curbed.com/2018/5/17/17359086/olympics-2028-los-angeles-1984 (2021, August 12)
[42] Los Angeles 2028. (2021). Official site. Retrieved from: https://la28.org/ (2021, August 12)
[43] Los Angeles 2028. (2021). Official site. Retrieved from: https://la28.org/ (2021, August 12)

units.[44] The UCLA Dorm has recently been renovated and upgraded so even today it could meet all the requirements prescribed for the Olympic Village.

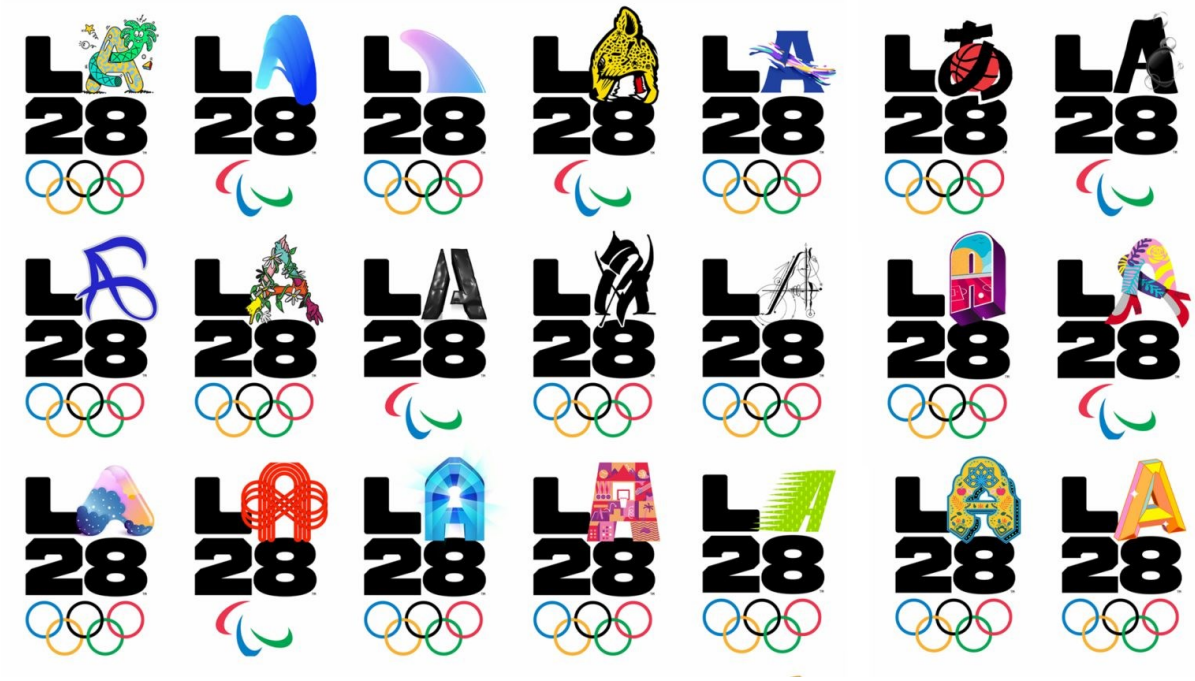
The 2028 Games are planned to be fully funded from private sources modelled on those of 1984. $ 618,000,000 is planned for the event of an unexpected cost or disaster as was the case in Tokyo 2020 with COVID.

The organizers indicate that the games will be extremely socially aware. the organizational committee plans to invest $ 160,000,000 as donation for children's sports facilities and programs. When organizing the games, care will be taken not to harm the rich diversified culture of Los Angeles. OCOG will also promote the rights of all minorities and the games will serve as a platform to promote positive change in society and the environment. Organizers want the legacy of the Olympics to be more in events than in infrastructure.

The games will try to achieve as little harm as possible to the environment and use the latest technological solutions to reduce the ecological footprint of games.[45] One of the biggest problems of organizing games in Los Angeles will be transportation. Los Angeles is one of the largest cities in the world, and the city is known for its large traffic jams. To avoid traffic jams during the games, a "twenty-eight by 28" initiative was launched by Mayor Eric Garcetti. The goal of this initiative is to complete 28 key infrastructure transport projects by 2028. All of them were already in the plan, but the deadline for completion of the initiative was moved to the beginning of the Olympic Games.[46]

[44] Volker, L. (2021, July 30). Q&A: Brence Culp and Nurit Katz on the Sustainability Vision for LA28. Metropolis. Retrieved from: https://metropolismag.com/viewpoints/brence-culp-nurit-katz-sustainability-la28/ (2021, August 18)
[45] Los Angeles 2028. (2021). Official site. Retrieved from: https://la28.org/ (2021, August 12)
[46] Chiland, E. (2018, December 4). How is Metro going to finish 28 projects in 10 years? Curbed. Retrieved from: https://la.curbed.com/2018/12/4/18124452/metro-los-angeles-2028-olympics-plan-budget (2021, August 12)

Picture 5: Los Angeles 2028 Summer Olympic Games logos



Source: Well done marketing. (2020, October 20). Make your mark: L.A. 2028 unveils dynamic Olympics logo. Retrieved from: https://www.welldonemarketing.com/2020/10/make-your-mark-l-a-2028-unveils-dynamic-olympics-logo/ (2021, September 10)

The latest games assigned to host are Brisbane 2032., they will be the 3rd Olympic Games organized in Australia, the previous two were held in Melbourne and Sydney. The games should take place from July 23 to August 8, 2032. The hosting of the Games was officially voted on June 21, 2021 just before the start of the Games in Tokyo. During the election meeting, after the report of the working group, there was a vote for or against the allocation of games to the Brisbane unlike in previous years when the IOC members were choosing between alternate candidate bids.

Of the 80 members with voting rights, 72 voted in favour, 5 against and 3 were abstentions for Brisbane. These are the first games selected according to the new procedure. According to the propositions, competitions in 28 sports on 32 arenas will take place in 2032. These are games that will get a significant regional context for the first time as 21 of the 32 venues will be in Brisbane, seven on the Gold Coast city and four on the Sunshine Coast city. What will further bring to the regionality element of the competition is that in 2032 there will be more than one centralized village: Brisbane's main Olympic Village and smaller villages will be in Gold Cost,

Koorablyn and Sunshine Coast, all with a plan to boost the development of the entire Queensland state.[47]

84% of all infrastructure needed for the games has already been built or will be made temporarily. It should be noted that part of the already built infrastructure will be modernized or expanded, such as the main stadium of The Brisbane Cricket Ground "Gabba". The Gabba will be refurbished, and capacity expanded from 42,000 to 50,000 for the cost of 1,000,0000,000 dollars Australian. What should be emphasized is that although 84% of the existing construction is a high rate for games, it is still lower than the planned Los Angeles 100% and Paris 95% for the games in 2024 and 2028.

The biggest investments in sports facilities will probably be a water centre, a basketball hall and a boxing and gymnastics hall. The initial budget of the games is set at $ 4,500,000.000. In addition, the governments of Australia, Queensland and Brisbane will have to invest heavily in the Transportation infrastructure. Although most of the transport infrastructure that will be built for the Olympic Games was planned, the deadlines will be moved so that everything can be done by the start of the Olympic Games. It should be noted that by 2041, population growth in the area of the Games is expected to increase by 1,500,000 since 2021.[48]

As for the benefits of the Olympics, advisors and the government are usually very optimistic. KPMG predicts an economic benefit of $ 8,100,000,000. Of that $ 4,600,000,000 from tourism and exchange and 3,500,000,000 from social improvements. According to Prime Minister Scott Morrison, on the other hand, the games are predicted to bring in about $18,000,000,000 in social and economic benefits to Australia.[49] In addition, by the KPMG research, the 2032 Games are predicted to generate 91,600 full-time equivalent employment in Queensland and 122,900 across the country. It will be seen if this prediction will stand the test of time[50].

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[47] Queensland government (2021). Queensland to host the Brisbane 2032 Olympic and Paralympic Games. Retrieved from: https://www.qld.gov.au/about/Brisbane2032 (2021, August 12)

[48] O'Keane, T. (2021, July 22). Brisbane's infrastructure plan for 2032 Olympic Games. Roads and infrastructure. Retrieved from: https://roadsonline.com.au/brisbanes-infrastructure-plan-for-2032-olympic-games/ (2021, August 21)

[49] Nothling, L. (2021, July 21) Brisbane's 2032 Olympic Games venues will be a mix of new and old. Here's how it will look. Abc. Retrieved from: https://www.abc.net.au/news/2021-07-22/qld-brisbane-olympic-infrastructure-2032-games/100311674 (2021, August 21)

[50] 41. KPMG Australia, department of Tourism, Innovation and Sport. (2021, June). Brisbane 2032 Olympic and Paralympic Games Preliminary economic, social and environmental analysis. Retrieved from: https://www.premiers.qld.gov.au/publications/categories/reports/assets/2032-qld-games-economic-analysis-summary-report-final.pdf (2021, August 21)

When Brisbane was selected as the “preferred host” in February 2021, members of the German Candidacy Committee complained that the new method of selection was non-transparent. That reaction came with frustration because their candidate Rhein-Ruhr region was not selected for the “preferred host”. They claim that their candidacy was better in many parameters the Brisbane and that it represented a better and sustainable solution for the Olympic Games. [51]

Picture 6: The Brisbane Cricket Ground

Source: Australian stadiums. Retrieved from: https://www.austadiums.com/stadiums/gabba. (2021, September 2021)

The Rhien-Ruhr city is an idea and project of 14 municipalities in the Rhein-Ruhr region to host the Olympic Games. That project has become an official bid in front of the German Olympic Committee for the 2032 games. Due to its content, and the fact that for a while it was known as a favourite to win the host status, it should be looked like an example what a truly regionally organized Olympic Games might look like. The region is hosting the 2025 Summer World Universiade, based on this competition, although much smaller than the Summer Olympics, due to similarity it will be possible to see the practical feasibility of regional games.[52]

[51] 5. Australian Associated Press (2021, February 26). German officials bemoan 'non-transparency' of 2032 Olympics bid selection. The Guardian. Retrieved from: https://www.theguardian.com/sport/2021/feb/26/german-officials-bemoan-non-transparency-of-2032-olympics-bid-selection (2021, August 21)

[52] FISU, International University Sports Federation. (2021). FISU reveals the 2025 FISU World University Games host for both winter and summer editions. FISU official site. Retrieved from: https://www.fisu.net/news/summer-

The Rhein-Ruhr region is in the west of Germany. It was built around the mouth of the Ruhr river into the Rhine river. Most of the region where the games would take place consists of 14 municipalities: Bonn, Aachen, Leverkusen, Dusseldorf, Cologne, Monchengladbach, Dortmund, Duisburg, Essen, Bochum, Krefeld, Oberhausen, Gelsenkirchen and Recklinghausen.[53]

It is noted that sailing competitions would take place in Kiel, which is 430 kilometres away from the Rhein Ruhr region and is located on the North Sea. With over 11,000,000 residents, Rhein Ruhr is EU's third biggest metropolitan region by population after London and Paris. All competitions (except sailing and surfing) would be held in a radius of 60 kilometres.[54] Which is a smaller area than Los Angeles, Paris and Tokyo.

Although smaller, the area is better connected than those three as each of the 14 cities has its own transport network and there is a developed intercity transport network including rails, motorways and river transport. In terms of connectivity with the rest of the world, one of the densest rails and highway networks in the world passes through the region. Which is supported by the fact that over 2,000,000 people are away from the region in 6 or less hours by train.

More distant tourists who need to travel by plane, can use one of two large international airports: Dusseldorf (DUS), Cologne / Bonn (CGN) and a smaller international airport in Dortmund (DTM). Within 220 kilometres of the regions brink, there are large international airports in Amsterdam (AMS), Frankfurt (FRA) and Brussels (BRU)[55].

It was not necessary to determine the exact location of the International Broadcasting Centre (IBC), the Media Press Centre (MPS) and the Olympic Village at the achieved stage of the IOC interview. However, the organizers wrote in the plan that the exposition and convention spaces and halls in the region could serve as a potential location for IBC and MPS. Due to the high culture of fairs in Germany, most cities have a highly developed fair and exhibition space, and the larger ones are big enough to temporarily host IBC and MPC. Rhein Ruhr has over 700,000

fisu-world-university-games/fisu-reveals-the-2025-fisu-world-university-games-host-for-both-winter-and-summer-editions/ (2021, August 21)

[53] Rhein-Ruhr City 2032. (2021). Concept for Olympic and Paralympic Games in the Rhine-Ruhr Metropolitan Region. Rhein-Ruhr City official site. Retrieved from: https://www.rheinruhrcity.com/en (2021, August 21)

[54] Athletic Interest. (2020, April 9) How Germany Is Rethinking the Olympics, Youtube. Retrieved from: https://www.youtube.com/watch?v=WNrNrU9TnOc&t=5s(2021, August 21)

[55] Airport Council International ACI (2021) Official site. ACI. Retrieved from: https://www.aci-europe.org/ (2021, August 21)

m2 of exhibition space which is more than Tokyo (100,000), Paris (470,000) and Los Angeles (68,000) combined.[56]

The Olympic Village is also not specified. But organizers noted that 500,000 students are studying in the Ruhr-Rhein region, their needs could easily fill the Olympic Village after the games. Olympic village should be built, according to the rules, for 17,500 guests. Also State North Rhine-Westphalia, the last 10 years has recorded population growth at an average growth rate of 0.23%,[57] and Cologne alone is predicted to increase by 100,000 inhabitants by the start of the Games since the 2020[58], indicating that the Olympic Village could, after the Games, easy maintain either as a dormitory or as accommodation for young families both with equal efficiency.

On the side of long-term usability of sports arenas, the organizers are well covered. Although Rhein-Ruhr has as many as five stadiums with a capacity of over 45,000 (as needed for the Olympic Stadium), none has an athletics track. Therefore, the plan was to build a central stadium, it was to be made according to one of three scenarios:

1. Build a stadium in cooperation with a major football club in the area and after the Olympics adapt it for football
2. Build a temporary stadium
3. Build a smaller stadium that would later be expanded only for the Olympic Games. The smaller version would later be used for athletic competitions and matches of the German national team and would be under the management of the state[59]

The advantage of the regional approach is that each of the 14 cities has at least one arena of that will be in use during the games and tenanted by local clubs before and after the games. There are 19,000 local amateur and professional sports clubs in the Rhein Ruhr area with a total of 5,000,000 members. Half of the citizens are members of a sports club. For that reason, region

[56] Rhein-Ruhr City 2032. (2021). Concept for Olympic and Paralympic Games in the Rhine-Ruhr Metropolitan Region. Rhein-Ruhr City official site. Retrieved from: https://www.rheinruhrcity.com/en (2021, August 21)

[57] City population. (2021). Nordrhein-Westfalen. Retrieved from: https://www.citypopulation.de/en/germany/admin/05__nordrhein_westfalen/ (2021, August 21)

[58] World Population Review. (2021). Cologne population 2021. Retrieved from: https://worldpopulationreview.com/world-cities/cologne-population (2021, August 21)

[59] Stadium DB. (2019, December 12). 2032 Olympics: What should be the main stadium for Rhine-Ruhr? Stadium DB. Retrieved from: http://stadiumdb.com/news/2019/12/2032_olympics_what_should_be_the_main_stadium_for_rhineruhr (2021, August 21)

has already 24 indoor arenas with the capacity of at least 3,000, nine with at least 5,000, and five with more than 10,000.[60]

The social sustainability of games can be seen in the plan. Namely, the bid received the support of as much as 70% of the population.[61] Organizers would not expect a big imprint on the social side. Since it is an area that celebrates multiculturalism and is extremely related to sports. The region has also decided to invest in tourism, thus facilitating the social impression of a mega-event such as the Olympic Games.[62]

The organizers also planned to leave as little environmental damage as possible in the event of organizing the Olympic Games. In the region there is a large plant for the ecological production of lithium that is used in electric car batteries.[63] Additionally the German government has one of the strictest recycling laws. The organizers also wanted to continue Las Angeles's plan to have "disposable plastic games".[64] The developed network of electric transport and river transport, which will reduce the amount of exhaust gases, also helps to reduce pollution.

[60] Rhein-Ruhr City 2032. (2021). Concept for Olympic and Paralympic Games in the Rhine-Ruhr Metropolitan Region. Rhein-Ruhr City official site. Retrieved from: https://www.rheinruhrcity.com/en (2021, August 21)
[61] Rhein-Ruhr City 2032. (2021). Concept for Olympic and Paralympic Games in the Rhine-Ruhr Metropolitan Region. Rhein-Ruhr City official site. Retrieved from: https://www.rheinruhrcity.com/en (2021, August 21)
[62] Ruhr region official page. (2021). Living in the Ruhr region. Retrieved from: https://www.welcome.ruhr/en/the-ruhr-region/living/ (2021, August 21)
[63] Nienaber, M. (2021, April 28) Analysis: Can the Rhine's white gold power Germany's green e-car race? Reuters. Retrieved from: https://www.reuters.com/business/sustainable-business/can-rhines-white-gold-power-germanys-green-e-car-race-2021-04-28/ (2021, August 21)
[64] Los Angeles 2028. (2021). Official site. Retrieved from: https://la28.org/ (2021, August 21)

3. EVALUATION OF THE FUTURE SUSTAINABLE SUMMER OLYMPICS GAMES

3.1. The IOC sustainability goals, and strategy

In order to better understand the IOC's goals and strategies for sustainability, official documents about sustainability should be presented. One of the most important is "Agenda 2020". Following his election in September 2013, IOC President Thomas Bach unveiled Olympic "Agenda 2020", a strategic plan for the future of the Olympic Movement.[65]

After a year of open, honest, and extensive debate and discussion, "Agenda 2020" released on November 18, 2014 as a result of that discussion. Thousands of comments from members of the Olympic Movement and public have resulted in the 40 recommendations that sum up Olympic Agenda 2020. At the 127th IOC Session in Monaco on the 8th and 9th of December 2014, the IOC membership accepted the recommendations unanimously. The goal of this initiative was to „safeguard the Olympic values and strengthen the role of sport in society. "[66] Credibility, sustainability and youth are marked as three pillars on which the future of the Olympic movement will be built. The most important recommendations for the organization of the Olympic games and sustainability of them are shown in the table below.

Table 2: Notable recommendations for sustainability from "Agenda 2020"

Number	Name	Summary
1	Shape the bidding process as an invitation	Allow host cities to relocate some sport events outside the host cities in the service of sustainability. Provide counselling for potential candidates to better prepare the bid. Encourage candidates to demonstrate the utilization of existing infrastructure.
2	Evaluate bid cities by assessing key opportunities and risks	Include a new candidate evaluation criterion: The Athlete's Experience. Defining two budgets for the Olympics; one for operating expenses and direct income from them, the other for long-

[65] The IOC. Olympic Agenda 2020. Retrieved from: https://olympics.com/ioc/olympic-agenda-2020 (2021, August 24)
[66] The IOC. Olympic Agenda 2020. Retrieved from: https://olympics.com/ioc/olympic-agenda-2020 (2021, August 24)

		term investments and direct income from them. Positively grade high percentage of utilization of existing and temporary infrastructure. Highly evaluate the utilization rate of existing infrastructure.
3	Reduce the cost of bidding	Reduce entertainment and presentation costs. IOC members will be paid by the IOC for travel and accommodation to assess candidates. Other reductions in the cost of candidacy.
4	Include sustainability in all aspects of the Olympic Games	Create a sustainability strategy that would assist future organizers in developing their sustainability measures. Communicate directly advices to organizing committees in sustainability management. Track games legacy after the games.
5	Include sustainability within the Olympic Movement's daily operations	Assist and encourage all IOC members and other IOC associates to increase sustainability in their operations. Introduce more sustainability into the day-to-day work of the entire IOC. Cooperate with United Nations Environment Programme (UNEP). in all areas, especially to create sustainability standards.
6	Cooperate closely with other sports event organisers	Establish cooperation with the International World Games Association (IWGA) regarding the composition of the sports program. Establish cooperation with the International Masters Games Association (IMGA) to make the International Masters Games held in Olympic cities for better sustainability via the reuse of the infrastructure built for the Olympic Games. Establish a sports initiation program as an element of the Youth Olympic Games (YOG) and Olympic Games to strengthen youth involvement and host benefits.
9	Set a framework for the Olympic programme	Limit the number of staff at the Olympic Games. For the Summer Games: 10, 5000 athletes, 5,000 accredited trainings and 310 events.

10	Move from a sport-based to an event-based programme	Allow hosts to suggest several sports or disciplines for that edition of the Olympic Games. Noting that the staff limit is not exceeded.
12	Reduce the cost and reinforce the flexibility of Olympic Games management	Introduce new transparent procedures for cost reduction. Uniform solutions that would lead to cost reductions in highly specified Olympic areas.
13	Maximise synergies with Olympic Movement stakeholders	Reallocate as much of the organization of sports competitions to international federations in charge of their respective sport.
27	Comply with basic principles of good governance	Mandatory introduction of a self-evaluation system for all organizers of the Olympic Games or Youth Olympic Games. Support all practices of good governance.
29	Increase transparency	IOC obligates to prepare and audit financial statements each year for the IOC and every member, even if not required by law.
32	Strengthen ethics	Revise the code of ethics. In order to get more transparency, good governance and accountability in all the affairs of the Olympic Committee.

Source: The IOC. Agenda 2020. Olympic Agenda 2020. Retrieved from: https://olympics.com/ioc/olympic-agenda-2020 (2021, August 20)

Looking at all the recommendations together, several conclusions can be drawn. The first is that the Olympic Committee is trying to rekindle interest in the Olympics. Negative financial reports of the last decades of games and great damage to the environment and people's daily lives have negatively affected the number of cities interested in the Olympics.

The number of official bids for the Summer Olympic Games has dropped from eleven in 2004 to only two for the 2024 Games.[67] In the last few biddings it happened more often that a city was to run for the hosting of the Olympics and then give up due to great pressure from the local public.[68] Pressure happened because the public doesn't want to take on the potentially large

[67] Walt, V. (2021, May 22). The biggest Olympics hurdle: Finding host cities. Fortune. Retrieved from: https://fortune.com/2021/05/22/the-biggest-olympics-hurdle-finding-host-cities/ (2021, July 7)
[68] Dunai, M. (2017, February 22). Hungary to withdraw Budapest's 2024 Olympic bid: government. Reuters. Retrieved from: https://www.reuters.com/article/us-olympics-2024-budapest-idUSKBN1610YO (2021, July 7)

debts that may arise from organizing the Olympic Games. Another aggravating factor is the growing number of ex-post scientific papers proving the harmfulness of organizing such a mega-event. It has also become the rule that the benefits of the Olympics in ex-ante research have been exaggerated to please the public. Which has led to a declined confidence in ex-ante researched that presented the benefits of the Olympic Games for the host.[69]

Another reason for the creation of "2020 Agenda" was the growing rumours about corruption in the IOC, mostly related to the selection of the hosts for the Olympic Games.[70] Even the last two games have had corruption scandals related to host selection.

Sergio Cabral, the former governor of Rio de Janeiro admitted to paying $2,000,000 to purchase votes in order to guarantee his city's selection as the 2016 Olympic Games host. He informed a judge that the money was sent to Lamine Diack, the former president of the International Association of Athletics Federations (IAAF), and used to purchase up to nine votes.[71] That same Lamine Diack found himself in an affair again over the Tokyo Games. He allegedly received a bribe from Haruyuki Takahashi, a Tokyo businessman close to the Japanese government, according to Reuters. Although the trial is still in court in France, he allegedly received a Seiko watch worth 43,000 dollars in addition to bribe in the cash. It is further mentioned that Haruyuki called the board members bribed by him cheap.[72] The Sochi Games were also smeared by corruption scandals over the rigging of executive jobs between civil servants and their partners.[73]

The third catalyst for change was the decline or stagnation of the popularity of the Olympics, and especially the disinterest of young people[74]. The games in Tokyo experienced an even

[69] Leeds M., Von Allmen P and Matheson V. (2014) "The Economics of Sports"
[70] Young, D. C. and Abrahams, Harold Maurice (2021, July 16). Olympic Games. Encyclopaedia Britannica. https://www.britannica.com/sports/Olympic-Games (2021, August 10)
[71] Viga Gaier, R. (2019, July 5) Former Rio de Janeiro governor tells judge he paid $2 million bribe to host 2016 Olympics. Reuters. Retrieved from: https://www.reuters.com/article/us-brazil-corruption-olympics-idUSKCN1U0029 (2021, August 13)
[72] Slodkowski A., Layne N., Saito M. and Miyazaki A. (2020, March 31) Exclusive: Japan businessman paid $8.2 million by Tokyo Olympics bid lobbied figure at center of French corruption probe. Retrieved from: https://www.reuters.com/article/us-olympics-2020-lobbying-exclusive-idUSKBN21I0CX (2021, August 12)
[73] Müller, M., Wolfe, S. D., Gaffney, C., Gogishvili, D., Hug, M., & Leick, A. (2021). An evaluation of the sustainability of the Olympic Games. Nature sustainability
[74] Chang, C. (2016, August 17). How the Olympics Lost Millennials. New Republic. Retrieved from: https://newrepublic.com/article/136096/olympics-lost-millennials (2021, August 12)

steeper drop in TV ratings.[75] While the decline in ratings could be justified by COVID and playing sports in front of empty audiences, the fact is that ratings have been declining for years.[76]

The fourth and final reason for the changes is growing global environmental concerns. Pollution has brought the planet to a "five to midnight" and it is high time for change. Such a situation was recognized by the IOC and, like all world established organizations and associations, they decided that they must do something about it.

In this context, the recommendations from the 2020 agenda should be considered. For the issue of little interest in hosting the Olympic Games, the most important are recommendations 1, 2, 3, 4 and 5. Recommendations 6, 9, 10, 12, 13 and 29 are also there to encourage change. All recommendations are based on the principle of reducing costs pressure on the host. In case the recommendations result in better financial results for the host cities, the IOC hopes to increase the number of bids for the Olympic Games in the future.

Recommendations 2, 27, 29 and 32 are aimed at combating corruption. This is an attempt to make it clear that the IOC has taken seriously the controversies that have arisen within the organization regarding corruption. These recommendations seek to reduce the potential for corruption and make business more transparent.

Recommendations 6 and 10 are mostly target the popularization of games among young people and the return of ratings to the level of the previous ones, although all recommendations are indirectly aimed at that problem. The Olympic Committee is trying to increase interest among younger spectators by adding new sports and disciplines, especially those related to the host culture. For example, sports that debuted in Tokyo and will continue to be part of the Olympic programme in the editions to come are skateboarding, surfing and sport climbing. While Karate, Softball and Baseball were edition exclusive sports[77]. By giving hosts the freedom to choose a

[75] Coster, H. (2021, July 30). Analysis: Why TV audiences are tuning out the Tokyo Olympic Games. Reuters. Retrieved from: https://www.reuters.com/lifestyle/sports/why-tv-audiences-are-tuning-out-tokyo-olympic-games-2021-07-30/ (2021, August 21)
[76] Porter, R. (2021, July 22). Tokyo Olympics: How Far Will NBC's TV Ratings Fall? Hollywood Reporter. Retrieved from: https://www.hollywoodreporter.com/tv/tv-news/tokyo-olympics-tv-ratings-preview-1234985186/ (2021, August 21)
[77] Giambalvo, E. (2021, July 20). What to know about the new Olympic sports debuting in Tokyo. Washington Post. Retrieved from: https://www.washingtonpost.com/sports/olympics/2021/07/20/new-olympic-sports/ (2021, August 21)

few sports that mark them as a guest at the games, a testing ground is created to survey public opinion about that sport and whether it can be a useful part of the games in the future. The collaboration with IMG and WGA will also bring some sort of survey on new potential Olympic sports.

Other measures have the overall effect of increasing ratings as the public has become aware of sustainability at all levels, so greater concern about these issues will create a positive image of the public. It is also interesting how recommendation 1 was used by Paris for the 2024 Games. Namely, surfing, a sport that debuted in Tokyo, will be exported to Tahiti in 2024, and the organizers expect that such a move will contribute to the attractiveness of the games.[78]

Through recommendations 1, 4, 5, 9, 10 and 27 the IOC is trying to reduce the ecological footprint of games. The Olympic Games have become a major polluter, with ecosystem disruption through excessive construction, the entire process from candidacy to the very organization, transportation and execution of the Games pollutes the environment. Although it is impossible to reduce pollution completely with the current technology, it is very possible to reduce it and manage it properly.

It should be noted that through all 40 recommendations, there are solutions to these problems, but also and other problems that the International Olympic Committee went through. But these four issues are of great importance for the sustainability of games.
From March 10 to 12, 2021, the 137th session of the International Olympic Committee was remotely held. The closing report of the 2020 agenda was voted on, as well as the new "Agenda 2020 + 5".[79]

Agenda 2020 was perceived and adopted as a great success by the IOC. The report on each recommendation was made separately by the special committee, and only a few were marked as partly achieved, while the rest were at least mostly achieved.[80] To be exact, executive board

[78] Paris 2024. (2021). Official site, retrieved from: https://www.paris2024.org/en/ (2021, August 21)
[79] The IOC. 137th IOC session. Retrieved from: https://olympics.com/ioc/137th-ioc-session (2021, August 21)
[80] The IOC. "Agenda 2020" closing report. Retrieved from: https://stillmed.olympics.com/media/Document%20Library/OlympicOrg/IOC/What-We-Do/Olympic-agenda/Olympic-Agenda-2020-Closing-report.pdf (2021, August 21)

has stated that 88% of the recommendations have been achieved.[81] The executive board also concluded that although the closing report is being submitted, that the agenda is a living process that will continue.

Recommendations 4 and 9 are only two recommendations of the above highlighted that are considered to have been only mostly achieved, all other are considered achieved by the IOC. Recommendation 4 "Include sustainability in all aspects of the Olympic Games" has been mostly achieved because the Games in Tokyo have not adapted the IOC legacy strategic approach in 100%. The plans are for the Games in Paris to be first with the 100% adaption of the plan. Further steps to make the Olympic games completely environmentally positive in the future have been made.[82]

The 9th recommendation: "Set a framework for the Olympic programme" is taken in a gradual approach. Although the organizing committees of the host cities have been given permission to add new disciplines and sports appropriate to the host for their games. The number of athletes in Tokyo was within the planned and set for Paris as well. What has not yet managed to put within the framework yet is the number of coaches and additional staff that was exceeded by 25% at the last Winter Games, the Olympic Committee will continue to work on this problem.[83] After the conclusion of the 2020 agenda, the Olympic Committee unanimously supported the new document "Agenda 2020 + 5". "Agenda 2020 + 5" is a logical continuation of "Agenda 2020", which aims to deepen and expand it on all important topics for the IOC. The document also sets out the direction in which the IOC will move for the next 5 years. The document is composed of 15 new recommendations. The default deadline for their achievement is 2025.[84] For the issue of sustainability, the most important recommendations are highlighted in the table below.

[81] The IOC. IOC Executive Board proposes Olympic Agenda 2020+5 as the strategic roadmap to 2025. Retrieved from: https://olympics.com/ioc/news/ioc-executive-board-proposes-olympic-agenda-2020-plus-5-as-the-strategic-roadmap-to-2025 (2021, August 21)

[82] The IOC. "Agenda 2020" closing report. Retrieved from: https://stillmed.olympics.com/media/Document%20Library/OlympicOrg/IOC/What-We-Do/Olympic-agenda/Olympic-Agenda-2020-Closing-report.pdf (2021, August 21)

[83] The IOC. "Agenda 2020" closing report. Retrieved from: https://stillmed.olympics.com/media/Document%20Library/OlympicOrg/IOC/What-We-Do/Olympic-agenda/Olympic-Agenda-2020-Closing-report.pdf (2021, August 21)

[84] The IOC. IOC Executive Board proposes Olympic Agenda 2020+5 as the strategic roadmap to 2025. Retrieved from: https://olympics.com/ioc/news/ioc-executive-board-proposes-olympic-agenda-2020-plus-5-as-the-strategic-roadmap-to-2025 (2021, August 21)

Table 3: Notable recommendations for sustainability from "Agenda 2020+5"

Number	Name	Summary
2	Foster sustainable Olympic Games	Establishment and implementation of higher sustainability criteria in all aspects. Better management of the Olympic legacy. Establishment of a system for monitoring and controlling the consequences of the Olympic Games. Long-term use of the infrastructure of the Olympic Games. Looking for new ways to reduce the cost of the Olympics and optimize performance through the allocation of responsibilities among Olympic partners.
10	Strengthen the role of sport as an important enabler for the UN Sustainable Development Goals	Strengthen ties with the UN and its bodies to better manage and control sustainability in all aspects. Use sport as a driver of social sustainability. Encourage the construction of sustainable sports infrastructure in accordance with UN standards.
13	Continue to lead by example in corporate citizenship	Become a leader in sustainability. Reduce C02 emissions up to 30% by 2024. Secure a climate positive sustainable supply chain. Create an education sustainability program for IOC members, international federations and National Olympic committees. Use the Olympic movement as a voice for sustainability. Lead in human rights and equality movements.
15	Innovate revenue generation models	Work on expanding the digital platform and offering more content. Expanding the marketing offer for game sponsors. To the advantage of all Olympic stakeholders, create a centralized Olympic hospitality program. Increasing different ways of earning for all

		stakeholders, with an emphasis on athletes.

Source: The IOC. IOC Executive Board proposes Olympic Agenda 2020+5 as the strategic roadmap to 2025. Retrieved from: https://olympics.com/ioc/news/ioc-executive-board-proposes-olympic-agenda-2020-plus-5-as-the-strategic-roadmap-to-2025 (2021, August 20)

Based on the above recommendations, but also others in the document, some conclusions can be drawn. For a start, unlike Agenda 2020, this document is much more specific and precise regarding the recommendations. While the predecessor represented mostly only the direction in which the IOC should move with its recommendations, 2020+5 recommendations set more quantitative goals to be achieved in the coming period. Such an approach will help make it easier to assess results of the agenda in 2025. Secondly, which can be seen best from recommendation 15, the IOC accepts that there have indeed been problems for hosts and that a new way of redistributing income needs to be found in order to maintain interest in hosting the Olympics. Before "Agenda 2020+5", this issue has not been written about in such an open way.

The recommendations also read the need for safety of competitors and other participants. Security issues have arisen due to the COVID pandemic, but also due to the increasing violation of human rights. Sustainability is also conditioned by all the risks that may arise. Increased security in relation to current and future dangers requires that the organizers of the Olympic Games allocate more funds to security and insurance.[85]

The continuation of the turn towards digital technologies can also be seen. Mostly through offering more content to their partners, but also to the public through digital platforms. It is also interesting that in recommendation 9, it says that the Olympic Committee will: "Encourage the development of virtual sports and further engage with video gaming communities". This directly opens the door for the inclusion of physical virtual games in the program of the Olympic Games.

[85] Coffey, B. (2021, August 6). Olympics Insurance Costs to Skyrocket After Tokyo Near-Miss. Yahoo sports. Retrieved from: https://sports.yahoo.com/olympics-insurance-costs-skyrocket-tokyo-040118251.html (2021, August 22)

All this together is correlated with getting closer to young people, which was one of the main goals that led to the launch of Agenda 2020, and consequently helps the long-term sustainability of the games. In conclusion, the Olympic Committee continues to fight corruption and mismanagement through recommendations, and there is also a clear step forward in these areas.

An Important Decision for the sustainability of the organization of the Olympic Games should be singled out from the 134th IOC session 2019. On March 27, when the IOC Executive Board decided to establish a working group to make the candidacy process for hosting the Olympic Games more flexible, precise and more focused on dialogue. A working group, composed of five experts from IOC, but external from the Executive Board, with all members from different continents, was to compile a report by May 22 of that year with a list of proposed changes to the host bidding process.[86] At Executive Board meeting, the working group presented its work and proposed their changes. Following the discussion, it was agreed that the group would continue to work and prepare a final proposal to amend the rules on candidacy and selection to host the Olympic Games at the 134th Session of the IOC.[87] On June 26, the 134th session was held in Lausanne, Switzerland, where the historic changes regarding the candidacy and selection of the host of the Olympic Games were voted on.

Thomas Bach President of the IOC then stated: "This is the evolution of the Olympic Agenda 2020 revolution, as we must continue to keep up with the fast pace of change in our current world. Flexibility is a necessity to ensure good governance and to have sustainable Olympic Games in the future. We will do that while maintaining the magic of the Games, the fundamental principle of universality and our commitment to having athletes at the centre of everything we do."[88]

[86] The IOC. (2019, March 27). IOC increases revenue distribution to National Olympic Committees and International Federations after PyeongChang 2018. Retrieved from: https://olympics.com/ioc/news/ioc-increases-revenue-distribution-to-national-olympic-committees-and-international-federations-after-pyeongchang-2018. (2021, August 21)

[87] The IOC. (2019, May 22). Future Olympic Games elections to be more flexible. Retrieved from: https://olympics.com/ioc/news/future-olympic-games-elections-to-be-more-flexible. (2021, August 21)

[88] The IOC. (2019, June 26). Evolution of the revolution: IOC transforms future Olympic Games elections. Retrieved from: https://olympics.com/ioc/news/evolution-of-the-revolution-ioc-transforms-future-olympic-games-elections. (2021, August 21)

The statement also shows the impact of the 2020 agenda on the new procedure. The main goals the IOC achieved with the changes were:

1. Establishing an ongoing dialogue between the IOC and the candidates before, during and after the Olympic Games
2. Creating two future host commissions, one for the Summer Games, one for the Winter Games, which would reflect conversations, advise, monitor and help navigate interested cities, regions, states through the candidacy process.
3. Allowing members of the Olympic Committee who are not members of the Executive Committee to participate in the work of the Future host commissions.
4. Preserving the tradition, principles and values of the Olympic Games.
5. Defining the crucial points to guide the Commissions as such:
    - Games are based on editions
    - Host can now be cities, regions or countries
    - More contextual approach
    - More open and flexible attitude towards potential hosts' innovative proposals
    - Better and more sustainable time management.
    - Proactivity towards potential hosts

At the session, changes in the Olympic charter were voted in order to adjust to the newly adopted procedure. IOC has deleted or amended altogether: a pre-determined seven-year deadline for pre-game host selection, that the host must be a city before a region or state, that all competitions must be held in the city rather than adapting the game to the already usable existing infrastructure, all related to the current evaluation process in the work of future host commissions.

Thomas Bach also stressed that the desire to make games as flexible as possible does not mean that the goal is to completely geographically separate games: "This, on the other hand, does not change our vision, our request and our focus on having not only an Olympic Village, but to have an Olympic centre."[89] It should be noted that one of the main reasons for allowing games

[89] Young, R. (2019, June 27). IOC will now allow multiple countries, entire regions to host future Olympics. Yahoo sports. Retrieved from: https://sports.yahoo.com/international-olympics-committee-ioc-multiple-countries-bid-games-230733956.html (2021, August 21)

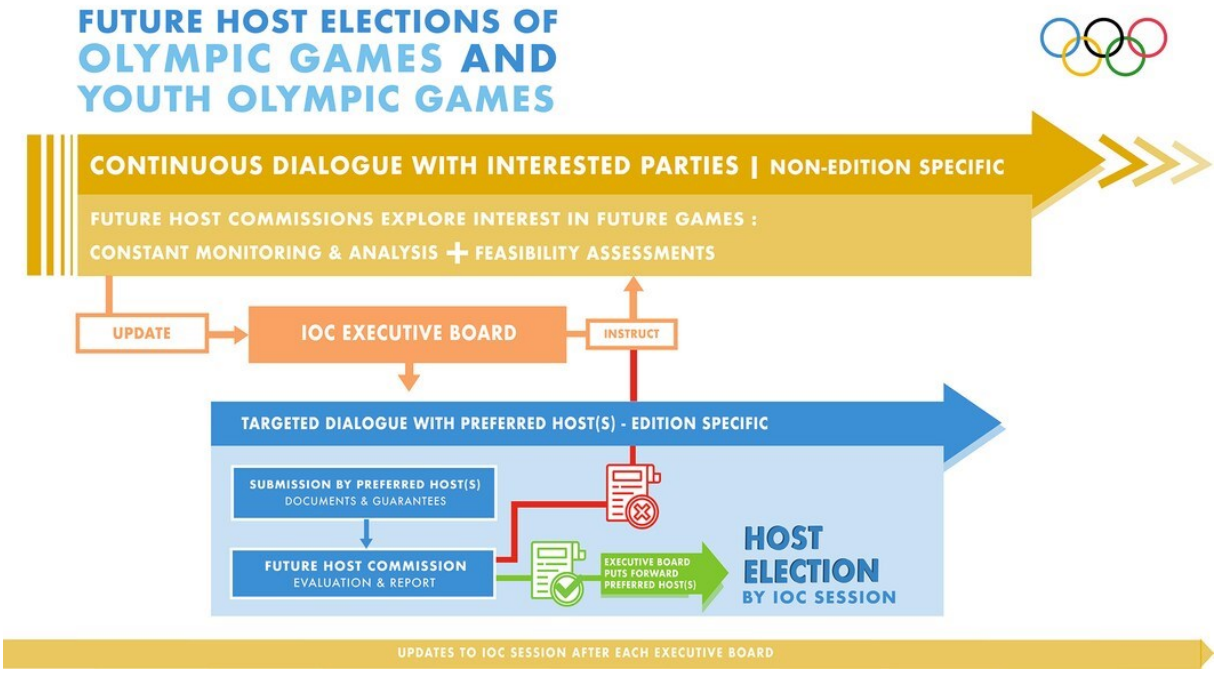
to be organized in regions or states is that very few cities are able to organize sustainable games on their own without large releases. This move has expanded the base of potential game hosts.

The move to extend the seven-year period from granting host status to the opening of the games is also very important. This avoids scenarios that occurred in Montreal and Athens when not all buildings were completed on time.[90] The longer term also helps the host to better prepare the infrastructure for use after the games. The longer deadline also allows the organizer to be better prepared for possible unexpected costs that would otherwise have to be paid more expensively in order to complete everything for the games.

Other moves where the level of communication between the IOC and the host is increasing, as well as the establishment of a future host commission are being done with the aim of constantly looking for new solutions that would make the games as sustainable as possible, without reducing the Olympic experience. At the meeting, the first games that will take place in several cities were confirmed at the same time. These are the Winter Olympics in Cortina and Milan in 2026. Which is an indication that there is a real possibility that fort the Summer Olympics in multiple cities or regions soon. Establishment of a future host commission, requests and changes in the procedure for selecting the hosts of the Olympic Games. The official IOC infographic is shown below.

[90] Bloor, S. (2014, August 13). Abandoned Athens Olympic 2004 venues, 10 years on – in pictures. The Guardian. Retrieved from: https://www.theguardian.com/sport/gallery/2014/aug/13/abandoned-athens-olympic-2004-venues-10-years-on-in-pictures (2021, August 22)

Picture 7: Future host commission procedure infographic



Source: The IOC. Future Host Election. Retrieved from: https://olympics.com/ioc/future-host-election (2021, August 22)

"The mission of the Future Host Commission for the Games of the Olympiad is to explore, create and oversee interest in future Games of the Olympiad and Summer Youth Olympic Games."[91] States at the official IOC site. Future Host Commission's exact tasks are advising all those interested in organizing the Olympic Games, reporting to the executive board regarding the candidacy status of potential hosts, maintaining neutrality, advising the executive board on proposing a preferred host.

There is no longer an exact time period before which the home will be allocated for specific Olympic Games before the opening. This will make it possible at any time to start optional talks by the potential host with the commission. The commission also has the task of adapting each game to the host as much as possible in order to achieve a higher level of sustainability. Interviews from expressions of interest to host allocation are conducted in three phases:

1. Informal exchange: Informative informal conversation and inquiry without obligations and investments.

[91] The IOC. Future Host Commission for The Games of The Olympiad. Retrieved from: https://olympics.com/ioc/future-host-commission-for-the-games-of-the-olympiad (2021, August 22)

2. Continuous dialogue: Creating a plan for a not edition specified Olympic Games by the respective National Olympic Committee. Without obligations and with support of the future host commission
3. Targeted dialogue: The Commission recognizes the candidate as a preferred host for a specific edition. Collaboration with the Commission on detailing the plan and putting in it for a vote before the IOC members.

The Future host commission constantly reports to the executive committee on progress and interviews with candidates. It makes its final recommendation based on a feasibility study, socio-economic opportunities, geopolitical stability, public support, compliance with IOC documents and guidelines, in particular the 2020 + 5 agenda. The first games to be awarded in this way are the 2032 Olympics in Brisbane.

Another important step in making the games as sustainable as possible was made by the IOC on February 6, 2018. At the 137th session of the board, the New Norm, a set of 118 reforms, was presented. The set of reforms was made based on six recommendations (1, 2, 3, 4, 12, 13) with the aim of defining exact measures to increase the flexibility of the hosts in organizing the Games and later to facilitate the maintenance of the Olympic legacy. The measures and actions of the document are related to three areas: candidacy, legacy and the then 7-year duration of the entire organization of the Olympic Games. It is also stated that by running these measures, the Tokyo Olympics have saved over 2,000,000,000 euros.[92]

One of the key sustainability documents within the Olympic Committee is the IOC's sustainability strategy. The document was approved by the Executive Board in December 2016 and updated in October 2017[93]. The document states that sustainability along with youth and credibility is one of the three pillars of the IOC.

The strategy was developed under the influence of "Agenda 2020", with special reference to recommendations 4 and 5 cited in Table 2. The document emphasizes that the Paris 2024 Games are the first in which the full implementation of the strategy is expected, as well as the recommendation of "Agenda 2020".

[92] The IOC. The New Norm: It's a Games changer. Retrieved from: https://olympics.com/ioc/news/the-new-norm-it-s-a-games-changer (2021, August 22)
[93] The IOC. Sustainability. Retrieved from: https://olympics.com/ioc/sustainability (2021, August 22)

The reason for this is that these are the first games selected for the host after the approval of "Agenda 2020", and for all Olympic Games until then only partial implementation is possible proportionally with respect to the completion phase. The strategy is aligned with and made in line with the UN 2030 Agenda for Sustainable Development and 17 Sustainable Development goals (SDG). The IOC found itself in 11 SDGs out of 17 in which it can contribute the most. "Most notable: health and well-being (SDG #3), quality education (SDG #4), gender equality (SDG #5), peace, justice and strong institutions (SDG #16) and partnerships for sustainability (SDG #17). „[94]

The IOC's sustainability strategy also applies to all IOC stakeholders and partners. The IOC implements its sustainability strategy through three spheres: as the leader of the Olympic Movement, as the owner of the Olympic Games, and as an organization. The IOC has identified five main areas of action where it plans to work most to increase sustainability: infrastructure and natural sites, sourcing and resource management, mobility, workforce and climate. Through these five areas the IOC has assigned itself eighteen objectives from three spheres of activity to complete by 2020. Five objectives as the leader of the Olympic movement, nine as an organization and five as the owner of the Olympic Games. These four are listed below:

- O10: Ensure sustainability is addressed as a strategic topic with cities as early as the invitation phase and throughout all phases of the Candidature Process.
- O11: Reinforce sustainability commitments in the Host City Contract so that bidding for and hosting an Olympic Games edition can act as a catalyst for sustainable development within the host city and region.
- O12: Strengthen support and monitoring of the OCOGs' implementation of sustainability-related bid commitments, Host City Contract requirements and IOC's recommendations, including through the provision of common methodologies and independent third-party assessments where appropriate.
- O13: Facilitate exchanges between Olympic Games stakeholders (e.g., OCOGs, national partners, host city authorities, TOP partners) and build strategic partnerships

[94] The IOC. (2018, April 13). The International Olympic Committee (IOC) Sustainability Strategy. Connect for Climate. Retrieved from: https://www.connect4climate.org/article/international-olympic-committee-ioc-sustainability-strategy-sport4climate (2021, August 22)

with relevant expert organizations to develop innovative sustainable solutions for planning and staging of the Olympic Games[95].

As this strategy was adopted before the decision to allow regions and states to run as hosts of the Games, as well as the decision to change the procedure for assigning hosts, the objectives have been adapted to the new rules.

The continuation of the strategy with new direct objectives for the period after 2020 has not yet been announced. The whole strategy refers to the period up to 2030 in order to be in line with the UN 'Agenda 2030. However, they are constantly being updated and reports on the fulfilment of its objectives are made periodically. The IOC has made a list of strategic intentions until 2030 for all five areas. The most impactful are:

- Use of existing infrastructure is maximised and temporary and demountable venues are used where no long-term venue legacy need exists or can be justified
- Adaptation to the consequences of climate change is considered in the planning of sports facilities and events
- Sites have a net positive impact on local communities
- Mobility solutions are environmentally and socially responsible

In accordance with the strategy, a new list of requirements required for the organization of the Olympic Games was adopted. The list is also related to five focus areas and shows the quantitative and qualitative standards that all candidates for all Olympic Games from the 2032 edition onwards will have to meet. The first host to be selected later to meet these requirements is Brisbane for the 2032 edition.[96]

[95] The IOC. Sustainability. Retrieved from: https://olympics.com/ioc/sustainability (2021, August 22)
[96] The IOC. Sustainability. Retrieved from: https://olympics.com/ioc/sustainability (2021, August 22)

Table 4: Requirements for candidate cities from the IOC's sustainability strategy

Infrastructure and natural sites	Sourcing and resource management	Mobility	Workforce	Climate
• Maximise use of existing facilities and temporary and demountable structures, and only develop new permanent facilities that offer long-term benefits for local communities and contribute to the development of sustainable cities • Prioritise the use of previously developed or degraded land over greenfield sites for the development of new venues and infrastructure, where these can provide sustainability benefits for the local community • Maintain conservation status for any natural or cultural protected areas utilised for the Olympic Games • Use recognised 'green building' standards appropriate to the country/region • Optimise environmental performance of Olympic venues (e.g. impacts on air, water, soil, biodiversity, climate and raw materials availability) • Avoid displacement of existing homes and businesses and adverse impacts on indigenous people and land rights; where unavoidable, consult and provide fair compensation and support, in accordance with local regulations	• Implement responsible sourcing practices for goods and services, including those from national sponsors and licensees • Implement effective processes to avoid waste production and to optimise the lifecycle of materials	Candidate cities and host cities to develop sustainable transport solutions as part of their Olympic Games project • OCOGs and host cities to maximise use of public transport and active travel modes at Olympic Games time • OCOGs and host cities to implement sustainable logistics solutions for movement of goods • OCOGs and host cities to promote sustainable tourism in host cities/regions	OCOGs to ensure that working conditions of employees and volunteers are safe and healthy, and that active lifestyles are promoted • OCOGs, host cities and host NOCs to take all necessary measures to ensure that development projects or other projects necessary for the organisation of Olympic Games comply with internationally-recognised standards and all international agreements, laws and regulations applicable in the Host Country with regard to working conditions • OCOGs to offer skills development opportunities for young professionals • OCOGs to promote gender equality and to have a local workforce that reflects the diversity of the host country	OCOGs and host cities to minimise the Olympic Games' carbon emissions11 • OCOGs to compensate their 'direct'/ 'owned' emissions12 • OCOGs and host cities to promote low carbon solutions for and through the Olympic Games in the host country • Candidate cities, OCOGs and host cities to take into account potential consequences of climate change when selecting Olympic Games locations

Source: The IOC. Sustainability. Retrieved from: https://olympics.com/ioc/sustainability (2021, August 22)

Following the sustainability strategy, the IOC issues a periodic sustainability report. In that document, the executive board announces the progress of its strategy and how it stands in the eighteen objectives it has set for itself for 2020. The final report came out in November 2019. Of the eighteen objectives in the report, sixteen were considered successfully completed, while

of the four placed before the IOC as the owner of the Olympic Games, all were considered executed with the following clarifications:

- O10 - Sustainability has been included in the documentation of the Olympic Games through documents, mostly through the set of reforms "New Norm". In accordance with the reforms, the classifications for the 2026 Winter Olympics and all later editions have been supplemented. The first meeting with the Australian Olympic Committee regarding the holding of the 2032 Olympic Games was also held, where sustainability was one of the main points of discussion.
- O11 – The Host city contract is fully in line with the IOC's sustainability strategy
- O12 - Plans and norms related to OCOGs related to environmental impact have been adopted. The OCOGs of future games began to apply them. The monitoring process is ongoing and continuing.
- O13 - Partnerships have been agreed on cooperation with UN organizations, but also other internationally recognized organizations relevant to the topic of sustainable development. Several measures have been taken with partners in Tokyo to increase the environmental sustainability of the 2020 Games.

This paragraph presents, summarizes and explains all recent important IOC documents related to the strategy and sustainability plans of the Summer Olympics.

3.2. Evaluation of the sustainability plans for the Summer Olympic Games

This paper will try to use simulation method to see if it is possible to organize sustainable Olympic Games. Through simulations, the thesis will try to see how significant financial, environmental and social impact the Olympic Games can leave under the new sustainability norms, rules and standards.

As seen through the paper, the complete impact of the Olympics on the environment, the economy and the daily life of the community is difficult to assess even years after games are closed, let alone through a simple simulation. However, using the information presentenced in this document and from the recent bidding procedure it is possible to obtain a rough estimate. It will only be able to see the exact results and success of all IOC actions to improve

sustainability years after the next few editions of the Olympic Games. It should be borne in mind that advances in technology in the future will make it possible to achieve greater sustainability and that it is to be expected that the IOC will adapt its strategy and other documents to new technologies. For example, it is to be expected that one day a condition will be set for the share of the vehicles with an electric drive used in public transport.[97]

Three potential hosts will be selected for the simulation. One international region, one region and one city. The area of Hungary, Austria, Slovakia and the Czech Republic, centred around the cities of Budapest, Bratislava, Vienna and Brno, was selected for the international region. In the paper, this area will be called further Central Europe, and potential games Central European games for simplicity. The US state of Florida was chosen for the region, and the city of Shanghai for the city. All three areas have been selected from different continents, and none have yet hosted the Olympic games (although some national federations have been hosts), to prove whether the IOC with the new rules may have narrowed the possibility for some parts of the world to no longer be able to meet the candidacy criteria.

The host countries that are selected those have a large enough GDP with GDP per capita in the host region or city to be able to bring out the games. The table below summarizes all simulated hosts and their baseline data, human development indicators, environmental indicators and technical requirements for hosting Olympic games.

Table 5: Simulation of potential hosts and their data

Name	Central Europe	Florida	Shanghai
Type	Intercountry region	State	City
Population	7 500 000	21 570 000	24 870 000
GDP per capita in area	27 500 $ (average)	43 535 $	22 560 $
Area	17 000	170 000	6 341

[97] World Bank. 2021. Electrification of Public Transport: A Case Study of the Shenzhen Bus Group. Mobility and Transport Connectivity. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/35935 License: CC BY 3.0 IGO." (2021, August 23)

GDP of host country	21,43 trillion $	0,95 trillion $	14, 34 trillion $
Type of government	Democracy	Democracy	Nonpartisan socialism
Notable memberships	UN, OECD, EU	UN, OECD, G7, NAFTA	UN, G20
Key Human Development Indicators			
Human development index UNDP	0,922 -0,854	0,926	0,761
Sustainable Development Goals	82,08-78,78	76,01	72,06
Human Rights Treaties Ratification	14-16	5	8
ILO Core Conventions Ratifications	8	2	4
Rule of Law Indicator	97,12-68,27	89,9	45,19
Poverty Index – World Bank	0%-1%	1%	5%
Gender Inequality Index	0,233-0,069	0,204	0,168
Environmental indicators			
Environmental performance - indexes	63,6-79,6	69,3	37,3
Share in renewables in power generation	12,61% - 33,63%	20%	27,32%
Paris Agreement ratification	Yes	Yes	Yes
C02 emissions per capita in kg	5,11 - 7,99	16,58	7,34
Ecological footprint per capita (hectares)	2,17-3,07	8,04	3,71
Existing sports infrastructure			
Olympic stadium	+	+	+
Number of indoor arenas over 5000 capacity	9	18	5
Number of indoor arenas over 10000 capacity	4	10	4
Two aquatics centres	+	+	+

Indoor velodrome	+	-	-
Sailing site	+	+	+
Surfing site	-	+	+
Radius outside host for the Football sites	350 km	On site	400 km
Golf course	+	+	+
Rowing/Canoe sprint	+	+	+
Two small stadiums for non-football venue	+	+	+
Olympic sized tennis club	-	+	+
MTB course	+	+	+
Other infrastructure			
Large international airports	2	3	2
Hotel Rooms	over 50 000	455 377	52 152
Total convention space	over 300 000	over 430 000	over 800 000
Largest convention centre space	130 000	190 000	400 000
Other numbers			
Number of students	over 500 000	2 692 160	over 540 000
Public transportation in area	Metro, Bus, Rail, Boat	Metro, Bus, Rail	Metro, Bus, Rail
Population growth rate	0,07%-0,98%	1,08%	2,82%
Large firs-tier professional teams	11	11	4
Amateur sport clubs and leagues	over 1200	2 972	651

Source: Author's research; UN data. Retrieved from: https://data.un.org/ (2021, August 28); Global Human Development Indicators, Retrieved from: http://hdr.undp.org/en/countries (2021, August 28); National Bureau of Statistics of China. Retrieved from: http://www.stats.gov.cn/english/ (2021, August 28); World Bank data. Retrieved from: https://data.worldbank.org/ (2021, August 28); International Energy Agency (IEA) Data and Statistics database. Retrieved from: https://www.iea.org/data-and-statistics?country=AUSTRALI&fuel=Electricity%20and%20heat&indicator=ETISharesInPowerGen (2021, August 28). UN Environment Programme. Retrieved from: https://www.unep.org/publications-data (2021, August 28); Eurostat. Retrieved from: https://ec.europa.eu/eurostat/en/. (2021, August 28); World Population Review. Retrieved from: https://worldpopulationreview.com/country-rankings/ecological-footprint-by-country. (2021, August 28); Airport Council International data centre. Retrieved from: https://aci.aero/data-centre (2021, August 28); UN World Tourism Organization. Retrieved from: https://www.unwto.org/tourism-statistics-data (2021, August 28).

The criteria were selected based on official IOC documents and based on experience with previous host selections.[98] One of the main criteria for hosting the Olympic Games is a positive public opinion, for the purposes of the simulation it will be assumed to have it.

It is assumed that if a host would meet all the conditions, rules and norms presented by the IOC, it is possible to organize a fully sustainable Olympic Games in that location. In case it is not possible to meet all the norms one should see how sustainable the games can be. Looking at the general data, all three hosts have enough population to host the Olympics (While there's no minimal condition, every edition of the Games in this century has been held in an area of at least 3 million population). Also, the GDP per capita of the local population everywhere is sufficient to organize the Olympic Games. For example, the 2016 GDP per capita was about $ 11,000, which is twice less than the one currently in Shanghai.[99]

The area of the candidates is large, the games in Central Europe and those in Florida would be in the largest host areas in the history of the Summer Olympic Games. Which is quite logical because they would be the first regions to host the Summer Olympics[100], but on the other hand, it bears problems with the distance of sports arenas and a centralized Olympic Village. This is a compromise that the IOC is very obviously willing to take, judging by its decisions in the near history. In order to reduce the cost of the games which was driven by accumulating many new buildings in a smaller area, whose long-term usability would be questionable. Although it should be noted that the area of Florida of 170,000 square meters is something that should be considered at the end of the analysis when assessing sustainability.

Given that China and the USA are the two richest countries in the world, and the hosts of the Central Europe Games are members of the EU (although relatively small independent states), it can be concluded that the GDPs of these countries can withstand the economic blow of organizing games. There is a note, that it would be realistic to expect that games in Florida, like

[98] Leopkey, Becca, and Milena M. Parent. (2012) "Olympic Games legacy: From general benefits to sustainable long-term legacy."
[99] Instituto Brasileiro de Geografia e Estatística, (IBGE). Official site. Retrieved from: https://www.ibge.gov.br/en/home-eng.html (2021, August 23)
[100] Mangan, J. A., & Dyreson, M. (Eds.). (2013). Olympic legacies: Intended and unintended: Political, cultural, economic and educational. Routledge.

those in Los Angeles and Atlanta before, would probably try to be financed with private money.[101] All hosts are members of important international organizations, they are internationally recognized. Countries are politically stable and influential. China does not have a democracy, but that should not in itself be an exclusive factor. Especially since Beijing is hosting the 2022 Winter Games.

When looking at key indicators of human development. The hosts of the games in Florida and Central Europe have high and satisfactory indicators. On the other hand, indicators in China are average to below average. Of particular concern are the Rule of Law Indicator and the Poverty Index. As for the environmental index. Central Europe stands on average the best. Some of the four countries lag negatively (such as Austria with a low share of renewable energy production), but still stand above average. China and the United States are below average by most criteria. Particularly prohibitive and bad indicators are those from the USA for CO2 per capita in kg and Ecological footprint per capita, which are among the highest in the world. On the positive side, all host countries are signatories to the Paris Agreement and have committed themselves to improving environmental indicators.[102]

Regarding sports infrastructure, the International Olympic Committee requires as much of the existing or temporary infrastructure as possible. All three locations have at least one multi-functional stadium with over 50,000 spectators where the opening ceremony of the Olympic Games and athletics competitions could be held. As for indoor halls for Olympic purposes, there should be at least eight halls with a minimum capacity of 5,000, and at least 3 of minimum 10,000 capacity. It would be optimal for not too tight organization to have at least two more in each category. Although there are no official figures on the minimum capacity and number of halls, these figures were obtained by observing the program of the Olympic Games as well as the organization of previous games and plans for future games with a designated host. Florida easily meets the criteria for the number of indoor arenas, Central Europe barely satisfies (The largest Budapest New Arena is included, although it opens only at the end of 2021), but it should

[101] Porter, P. K., & Fletcher, D. (2008). The economic impact of the Olympic Games: Ex ante predictions and ex poste reality. Journal of sport management

[102] 70. The United Nations (UN). (2016, April 20). List of Parties that signed the Paris Agreement on 22 April. Retrieved from: https://www.un.org/sustainabledevelopment/blog/2016/04/parisagreementsingatures/ (2021, August 23)

be noted that there are plans for another hall in Vienna with a capacity of about 20,000 seats with whom it would be much easier to organize the Games[103]. Shanghai has a real problem with a small number of halls of adequate capacity. A possible solution is to use part of the exhibition space as temporary halls, which has been done throughout the history of the games, in addition it is planned by Paris and Los Angeles also. Another solution is the fact that Shanghai lacks halls for everyday functions and plans to build many halls, the first of which is a new eSports hall with a capacity of 6000.[104]

As for other sports infrastructure, it is almost impossible for any potential host to have all the necessary infrastructure already in place (except possibly some cities that have hosted the Olympic Games in the recent past). The most common infrastructure that had to be built in the previous hosts were large aquatics centre with at least 10 000 capacity and indoor Olympic size velodromes. Central Europe has both, the Danube Arena is one of the most modern and largest aquatics centres in the world. It currently has a capacity of 5,000 seats, but for the World Swimming Championships it had a temporarily expanded capacity to 12,500. Which is a big comparative advantage.[105] The Central European Games lack a surfing venue and a tennis club of sufficient size. Sailing is assumed to be allowed to use Lake Balaton as this was the case when Budapest was preparing to run for the 2024 Olympics. Tennis complex could be built in larger cities in the area due to the existence of tennis tournaments of the highest categories from which to obtain part of long-term sustainability, but also a large base of recreational players in the area.[106] The surfing competition can be held in Croatia at the famous surfing camp in Medulin, 400 kilometres away from Vienna. Another comparative advantage in terms of sports infrastructure Central European games is the already built modern Čunovo water sports centre in Bratislava. While large percentage of other infrastructure is existing, some of them would require partial renovation or temporary expansion of capacity.

[103] The Stadium business. (2020, February 5). Vienna opens design competition for new arena. The Stadium business official site. Retrieved from: https://www.thestadiumbusiness.com/2020/02/05/vienna-opens-design-competition-new-arena/ (2021, August 24)
[104] Malone, D. (2021, January 25). 6,000-seat eSports arena begins construction in Shanghai. BDC Network. Retrieved from: https://www.bdcnetwork.com/6000-seat-esports-arena-begins-construction-shanghai (2021, August 24)
[105] International Swimming Federation, (FINA). 17th FINA World Championships 2017. FINA official site. Retrieved from: https://www.fina.org/competitions/213/17th-fina-world-championships-2017 (2021, August 24)
[106] Lange D., (2021, January 28). The total number of tennis players across all European countries in 2018. The Statista. Retrieved from: https://www.statista.com/statistics/1088878/the-total-number-of-tennis-players-across-european-countries/ (2021, August 24)

Florida has almost all the infrastructure, mainly thanks to the highly developed collegiate sport in the USA. As Florida is home to some of the largest universities in America, it provides a large and wide selection of sports venues for the Olympics, in addition a lot of training halls during the Olympics for the athletes. This is also the biggest comparative advantage of Florida. On the other hand, there is a lack of Velodrome, which could be made prefabricated or later used for some other purpose in case of less interest in sports. Also, the entire football tournament can be held in the Florida area.

Shanghai lacks Velodrome, and as a megalopolis, it has all the other necessary sports infrastructure. The biggest advantage is the new rowing centre where the 2021 World Rowing Championships were to be held, which was cancelled due to COVID-19 outbroke.[107] There is also a comparative advantage Sheshan Golf Club, a golf course built in 2004. It is considered one of the best in the world and where the prestigious WGC-HSBC Champions tournament. The disadvantage of the location is the great distance required to organize a football tournament.

As for other infrastructure, all simulated hosts meet all minimum requirements. At least two major international airports (traffic in 2019 over 15,000,000 passengers). At least 50,000 hotel rooms, 200,000 m2 of convention space and one convention area of 100,000 m2 where the Main Press Centre (MPC) and the International Broadcast Centre (IBC) would be organized. There are also no exact quantitative conditions for these data, but they have been derived based on previous Games and other conditions required to host the Summer Olympic and Paralympic Games. [108]

There are also non-infrastructural conditions needed to make the Olympic Games more sustainable. The large number of students in the area helps in many ways, firstly it is a large base for gathering volunteers for the Olympic Games, secondly it helps to achieve a higher rate of sustainability of sports and transport infrastructure and thirdly with many students can fill

[107] World Rowing. 2021 World Rowing Championships. Retrieved from: https://worldrowing.com/event/2021-world-rowing-championships (2021, August 24)
[108] Gold, J. R., & Gold, M. M. (2015, March). Sustainability, legacy and the 2012 London Games. In Routledge handbook of sport and legacy: Meeting the challenge of major sports events.

the Olympic Village after the Games. Given that all hosts have at least 500,000 students during the year, Florida even 2,500,000 it can be considered a positive item.

An important item is the diverse and well-developed public transport that all potential hosts have in order escape traffic collapses during the games. The positive population growth rate that is present in all locations leaves space and a guarantee in filling in the content created as an Olympic legacy, especially during the potential conversion of the Olympic Village.

Many professional and amateur clubs in the area are necessary for a positive and long living Olympic Legacy, as well as the main prerequisite for sustainable Olympic Games. Central Europe and Florida also have more than enough clubs compared to previous hosts which opens an opportunity to make better use of the Olympic sports infrastructure after the Games. On the other hand, Shanghai has a smaller number of clubs, but it should be considered that with the strengthening of standards encouraged by rapid Chinese economic growth, the number of recreational athletes is also increasing. All locations have specifics:

- Central Europe:
    a) Advantages: Tradition and old cores of cities that would bring a special charm to games. Excellent transport connections between cities because three large transport corridors pass through them: the Baltic-Adriatic, the Rhine-Danube and the Orient-Mediterranean, which is why there is an excellent transport infrastructure that is constantly being renewed and upgraded. In addition to roads, cities are also well connected by road and rail, which enables cleaner traffic, especially in the future through the development of technologies. The collaboration of four host countries allows for a reduction in costs and risks per host. Given the four host cities, there are several potential occupants for built venues after the games.
    b) Disadvantages: The biggest drawback is the difference in development between countries, which can lead to incoherence during the organization. Another problem could be the fact that each city and region would have to have its own representatives on the organizing committee, which could lead to the inefficiency of the decision-making system. Although the cities are well connected, a large area could be a problem for the technical performance of the

games. Public support is questionable, given that Budapest's candidacy for the 2024 Games has been withdrawn for that reason.

c) Experience in organizing sports mega-events: 2008 UEFA Euro, 2020 UEFA Euro, 2023 UEFA Europa League Final, 2020 UEFA Supercup, 2005 IIHF World Championship, 2017 World Beach Volleyball Championship, 2019 FINA Swimming World Cup, 2023 World Athletics Championships, 2020 Czech Republic Grand Prix (Motorcycle), 2019 IIHF World Championship, 2021 ICF Canoe Slalom World Championships

- Florida:
    a) Advantages: Florida can leverage the dormitories of its largest universities for the Olympic Village which greatly facilitates sustainability. Due to the universities, it has many sports infrastructures. A big advantage is the tourist development of Florida, which is why it has many beds and even three large airports, which would easily withstand the influx of people on organizing the Olympic Games. Many professional clubs, but also hotel and entertainment resorts offer large capacities for the use of the Olympic legacy. They also offer a wide range of training facilities. The final big advantage is that all competitions could be held in the host state.
    b) Disadvantages: A very large area and outdated non-road traffic structure are the leading shortcomings of this host. Especially in terms of traffic development, as Florida has a very poorly developed rail network, and it is difficult to connect all parts of the state by boat[109]. Due to the large area, there could be major technical problems in the realization of the games as well as a loss of spirit of the games. Renovation of transport and other supporting infrastructure could increase the indirect costs of the games.
    c) Experience in organizing sports mega-events: 2020 NBA Bubble, MLS is Back Tournament, 17 Super Bowl, NBA All Star, MLB All Star, NHL All Star, Gold Cups, Copa America Centenario, 2026 Fifa World Cup
- Shanghai:
    a) Advantages: Smaller area than other simulated. Shanghai is a high-tech developed city with highly developed public transportation that is expanding

[109] Colon D. Florida's Public Transportation & How to Get Around Without a Car. Visit Florida. Retrieved from: https://www.visitflorida.com/travel-ideas/articles/visitor-services-florida-transportation-how-to-get-around-without-a-car/ (2021, August 24)

rapidly. It is the financial and university centre of China, with the busiest port in the world. The city has a huge convention centre with the largest single centre. Shanghai successfully organized Expo 2010, gaining know-how in organizing mega-events as well as a proven accompanying infrastructure for many visitors in a certain period. Shanghai also has extensive experience from many annual sports mega-events of the highest category.

b) Disadvantages: The biggest disadvantage of Shanghai is the lack of sports infrastructure for a lot of Olympic sports. It also has a relatively small number of sports clubs and professional clubs in the highest categories.

c) Experience in organizing sports mega-events: 2023 AFC Cup, 2019 FIBA Basketball World Cup, 2020 League of Legends World Championship, Shanghai Tennis Masters, WGC-HSBC Champions golf tournament, Chinese Grand Prix (F1)

4. CONCLUSION

The topic of sustainability has become very important in today's world. Due to long-term environmental pollution, humanity has found itself at a turning point in which it must secure the world from irreversible changes in the future. As part of the world community, the Olympic Games have not remained immune to the necessary changes. In addition to environmental sustainability as a result of global change, the IOC has been forced to work on social and financial sustainability of the Olympic Games. Due to the negative financial results of the Olympic Games, a decreasing number of candidates applied to organize the Olympic Games. Also because of the changes that the games left on society an increasing number of locals often held referendums to have their city that was already a candidate withdraw.

All these factors contributed to the IOC deciding to renovate games according to a more sustainable model. The most significant step towards this was the voting and implementation of “Agenda 2020”. Although initially the document was a set of 40 broad-minded recommendations, it later resulted in documents and decisions that reshape the Olympic Games in the host selection process. The most important of these is the “New Norm”, new commissions and procedures for selecting the hosts of the Olympic Games voted on 134th session of the IOC and “Agenda 2020 + 5” as the successor to “Agenda 2020”. The IOC believes that through decisions such as allowing the expansion of the Olympic Games from the city to a region, state or international region or seeking greater utilization of existing infrastructure for the Olympic Games can achieve a satisfactory level of sustainability at all three levels.

On paper it seems that if the Olympic Games were held according to the new instructions and rules, they could be sustainable on a high degree, within the limitations of today's technology. With progress of globally used greener technologies, especially in terms of transport and usability of recyclable material, it is possible to achieve a higher percentage of sustainability of the Olympic Games.

In this thesis, an attempt was made to see through simulation whether there are locations that would meet at least most of the IOC requirements for organizing the Summer Olympics.

Through this simulation it can be concluded that if all three simulated hosts (Central Europe, Florida and Shanghai) that are in different locations and different types of locations, can host mostly sustainable Summer Olympic Games. All three hosts can be mostly covered by existing and temporary infrastructure, which greatly reduces the environmental and social impact of the host as well as reducing costs. This can even lead to short-term and long-term profitable Olympic Games. In the end, it should be noted that the Florida region could be reduced in area without reducing sustainability as Shanghai could be extended to the local region and Central European games could add more nearby cities such as Krakow, Prague, Ljubljana or Zagreb to increase sustainability.

The IOC is left with the task of measuring the results of its sustainability strategy in the future and further adjusting the rules to find the ideal balance between sustainability and the splendour of the Olympic Games. The first and most important steps have been taken and now it needs to time to see the results.

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