

RESEARCH ARTICLE

The risk of large-scale sports events and its prevention: based on the perspective of urban ecological environment protection

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The hosting of large-scale sports events not only brings significant economic benefits and cultural influence to cities and countries, promotes the construction and sustainable development of urban ecological environment, but also brings certain risks to the urban ecological environment. However, research on the issue of risk is still relatively inadequate. This paper uses the method of literature research and empirical analysis, through consulting relevant literature and data, analyzes the relationship between large-scale sports events and urban ecological environment and the risks brought by the urban ecological environment, and puts forward the corresponding preventive measures. It is found that the relationship between large-scale sports events and urban ecological environment is very important, and the two influence and promote each other. However, the hosting of large-scale sports events may lead to problems such as water pollution, soil pollution, noise pollution and air pollution, and also consume a lot of resources and energy. In order to reduce the risk brought by large-scale sports events to the urban ecological environment, we should take measures such as comprehensive management, scientific planning, supervision and management, so as to protect the urban ecological environment and promote its sustainable development. Finally, taking the 2008 Beijing Olympic Games as an example, this paper analyzes the scientific practice of promoting urban ecological environment protection by large-scale sports events. The purpose of this study is to provide reference for preventing the risk brought by large-scale sports events to urban ecological environment, and also provide important theoretical and practical significance for the sustainable development of large-scale sports events.

Keywords: large-scale sports events; urban ecological environment; environmental protection; risk challenges; preventive measures.

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Introduction

Large-scale sports events refer to large-scale and influential sports events, usually attracting hundreds of millions of spectators and participants around the world. They bring significant economic gains and cultural influence to cities and countries [1, 2]. As an important cultural and sports activity, large-scale sports events have a wide range of participants and viewers, and also have a great impact on the ecological environment of the host city.

The impact of large-scale sports events on urban ecological environment is complex, both positive and negative [3]. While large-scale sports events bring economic benefits to the city, attract more tourists and business opportunities, due to the influx of a large number of people and the construction of sports venues and facilities, it may cause pressure on the city's traffic, garbage disposal, energy consumption, land use and other aspects, resulting in the destruction and waste of land and ecological resources, and have an adverse impact on the urban ecological

environment [4]. With the improvement of environmental protection awareness and the prominence of urban ecological environment problems, how to reduce the risk of large-scale sports events on the premise of ensuring the smooth progress of urban ecological environment has become an important social issue. Therefore, it is of great practical significance to carry out research on the risk challenges and preventive measures brought by large-scale sports events to urban ecological environment.

This paper aims to analyze the relationship between large-scale sports events and urban ecological environment, explore the risks and challenges brought by large-scale sports events to urban ecological environment, and further put forward the corresponding preventive measures. This study is helpful to improve the environmental protection awareness and practice of managers and residents, provide reference for preventing the risks brought by large-scale sports events to the urban ecological environment, and promote the sustainable development of cities. In addition, with the continuous hosting of large-scale sports events, relevant research also has important theoretical reference and practical guidance significance.

Materials and Methods

This paper adopts the method of combining literature research and empirical analysis, analyzes the risks and characteristics brought by large-scale sports events to urban ecological environment by consulting relevant literature and data, and puts forward corresponding preventive measures according to different risk factors. First of all, through literature research, literature related to the risks brought by large-scale sports events to urban ecological environment is collected, and relevant research status and development trend at home and abroad are understood. Secondly, the basic information and relevant data of large-scale sports events are obtained through field visits,

questionnaires, and data collection. Then, statistical methods are used to analyze and process the data, and the degree and influencing factors of risk brought by large-scale sports events to urban ecological environment are discussed. Then, through the comprehensive analysis of relevant theories and empirical data, the risk and challenge brought by large-scale sports events to urban ecological environment, including pollution, noise, land use change and so on, are deeply discussed. At the same time, on the basis of fully understanding the risks brought by large-scale sports events to the urban ecological environment, the corresponding preventive measures are proposed, including measures in environmental protection technology, management system, policies and regulations, so as to reduce the risks and negative impacts of large-scale sports events to the urban ecological environment. Finally, according to the research results, the conclusion is summarized, and the corresponding suggestions are put forward to provide reference for preventing the risks brought by large-scale sports events to the urban ecological environment.

Results and discussion

The relationship between large-scale sports events and urban ecological environment

The relationship between large-scale sports events and urban ecological environment is very important. Clarifying the relationship between the two can not only successfully host large-scale sports events, protect urban ecological environment, improve the level of urban sustainable development, but also help to promote the image of the city and promote urban green development (Figure 1). Let's first analyze the bidirectional impact of major sports events on urban ecological environment. The positive impact of large-scale sports events on urban ecological environment is multifaceted, and its real significance lies in driving the construction and sustainable development of urban ecological environment through the promotion of sports events [5]. First of all, use

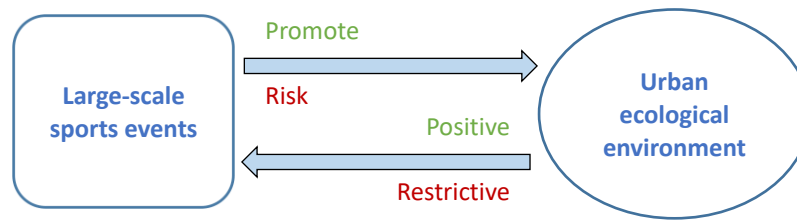


Figure 1. The relationship between large-scale sports events and urban ecological environment.

the time before and after the race to strengthen the urban ecological environment regulation. Before hosting large-scale sports events, host cities usually carry out environmental remediation work, including road cleaning, garbage disposal, landscaping, *etc.*, which can help improve the urban ecological environment. Secondly, large-scale sports events can promote the construction of urban public transport, reduce private car travel, relieve urban traffic pressure, thereby reducing air and noise pollution, and improve the urban ecological environment. Third, hosting large-scale sports events requires a lot of energy and water resources, so host cities usually take some measures to save energy and water resources, as well as reduce wastewater and exhaust emissions, so as to have a positive impact on the urban ecological environment. Fourth, large-scale sports events can also promote environmental awareness and action in cities, promote the concept of sustainable development, and encourage more people to participate in the cause of environmental protection. Although large-scale sports events have a positive impact on the urban ecological environment, there are also some problems. First, the impact of venue construction on urban ecological environment. Large sports events require the construction of large stadiums and supporting facilities, which often consume a lot of land, water, and energy. In addition, during the construction process, noise, pollution, and other problems will also have an impact on the surrounding urban ecological environment. The second is the traffic pressure brought by the event. Large sports events attract many

spectators and media to participate in and report, which will cause greater pressure on urban traffic. Dense traffic flow and emission of pollutants may have adverse effects on urban ecological environment. Third, the problem of garbage disposal. The amount of garbage generated during large-scale sports events is huge, and how to clean up and dispose of garbage in time is an important issue [6]. If not handled properly, it will cause serious pollution of the surrounding environment. Fourth, the impact of the event on the natural ecosystem. Some large-scale sports events may require the occupation of nature reserves or wildlife habitats, which can easily cause damage to the local ecosystem. Therefore, we should give full consideration to the protection of urban ecological environment when hosting large-scale sports events and reduce the adverse impact on urban ecological environment as much as possible. At the same time, reasonable planning of traffic, improving the ability of garbage disposal and strengthening the protection of natural ecosystems are also the key to effectively controlling the impact of large-scale sports events on the urban ecological environment [7].

Then we analyze the impact of urban ecological environment protection on the organization of large-scale sports events. The protection of urban ecological environment has an important impact on the hosting of large-scale sports events [8]. Only under the premise of protecting the urban ecological environment can the healthy development and sustainable development of large-scale sports events be realized. First of all, to protect the health of participants and

spectators: The protection of urban ecological environment is very important for the hosting of large-scale sports events, because a large number of people during the event will have an impact on the air quality and noise pollution of the city. If the urban ecological environment cannot be protected, it will affect the health of participants and spectators, which is very unfavorable for hosting sports events. Secondly, improve the image and attractiveness of the city: Urban ecological environment protection can improve the overall quality and image of the city, and then increase the attractiveness of the city, so that it is more likely to successfully bid for and host large-scale sports events, such as the Olympic Games, World Cup, World Championships, etc. Third, promote urban economic development: Protecting the urban ecological environment is also crucial to the development of the urban economy. The cleaner and more beautiful the city, the more likely it is to attract more events, investment, and enterprises to settle in, thus promoting the economic development of the city. Fourth, promote the construction of ecological civilization: Protecting the urban ecological environment is the inevitable choice to promote the construction of ecological civilization, and more and more cities are actively developing green, low-carbon, circular economy, and other fields, which is very consistent with the hosting of sports events. By hosting green, environmentally friendly and sustainable large-scale sports events, the construction, and development of urban ecological civilization can be promoted, so as to achieve the goal of sustainable development. Fifth, improve the environmental awareness of participants and audiences: Hosting large-scale sports events can promote environmental protection knowledge and concepts to participants and audiences in various ways, improve their environmental awareness, and promote the implementation of environmental protection actions. Of course, urban ecological environmental protection may also have some reverse impact on large-scale sports events, in order to protect the urban environment, many cities may develop more

stringent environmental standards and requirements, such as requiring the use of more environmentally friendly venues, equipment and energy, which will increase the cost of the event. In the context of increasing environmental awareness, cities may limit the scale and quality of major sporting events, such as limiting the number of participants, narrowing the scope of the event, and reducing surrounding commercial activities, which will affect the attractiveness and influence of the event. Therefore, when hosting large-scale sports events, we should actively consider the issue of urban environmental protection, strengthen environmental awareness and environmental protection measures, in order to achieve a balance between environmental protection and the development of sports events.

The risks brought by large-scale sports events to urban ecological environment

The hosting of large-scale sports events may have certain risks and negative effects on the urban ecological environment [9]. For example, a large influx of people will lead to urban traffic jams, noise pollution and other problems. The construction of many buildings and venues will occupy a large amount of land resources, destroy the original natural environment, and increase the consumption of public resources such as water, electricity, and gas. The production of a large amount of garbage and waste will also have a negative impact on the urban environment and urban ecological environment [10]. Therefore, when planning and organizing large-scale sports events, it is necessary to take into account environmental protection and sustainable development and take effective measures to reduce the risk to the urban ecological environment (Figure 2).

(1) The possible risk of water pollution

During major sports events, the influx of tourists and vehicles can lead to an increase in water consumption in cities, as well as a large amount of wastewater and garbage. Wastewater and garbage contain harmful substances, such as heavy metals and chemicals, which will lead to

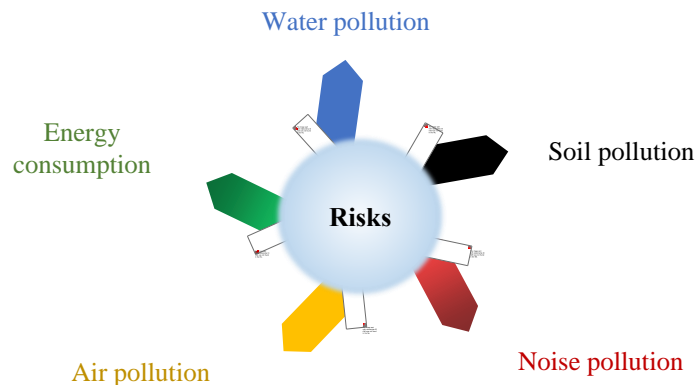


Figure 2. The risks of large-scale sports events to the urban ecological environment.

the deterioration of local water quality and have an adverse impact on the local urban ecological environment. The water pollution caused by large-scale sports events mainly includes the following four aspects. The first is the discharge of garbage and sewage: Large sports events usually attract a large number of people to watch the game, which will lead to busy catering, accommodation and other services in the surrounding area [11]. The resulting waste and wastewater both need to be treated, and if they are treated late or improperly, they may pollute the surrounding water resources. The second is venue construction and maintenance: Large-scale sports events usually require new or renovated venues, and the construction and maintenance of these buildings will also have an impact on the surrounding water environment. For example, construction sites may produce large amounts of wastewater and dust, while the maintenance of venues requires the use of various chemicals, which can pollute nearby water resources. The third is transportation: Large-scale sports events will bring a lot of transportation needs, including the transportation of spectators and athletes. The waste gas and wastewater produced in transportation may also cause pollution to the surrounding water environment. Fourth, lawn maintenance: Some large-scale sports events usually require a large area of lawn, and lawn maintenance also requires the use of various chemicals and fertilizers. These chemicals, if used

incorrectly, can contaminate surrounding water resources. Therefore, in order to protect the healthy and sustainable use of water resources, large-scale sports events should take water environmental protection into account in the planning and organization process and take corresponding measures to reduce the impact on water resources.

(2) Possible risk of soil pollution

The hosting of large-scale sports events requires large areas for temporary buildings, parking lots and sports venues, which makes the depletion of local land resources serious. In addition, large-scale sports events often require land formation and renovation, which also has an impact on land resources. At the same time, a large amount of garbage and waste will be generated during the event, which, if not effectively treated, will cause pollution to the local soil, thus making the land unable to carry out normal agricultural or other production activities, and have a negative impact on the local economy and society. The risk challenges of large-scale sports events on soil pollution mainly include the following aspects: First, the waste on the ground. Many large sports events have many spectators, especially outdoor sports events such as football matches and marathons, and the audience is gathered in the open Spaces around the venues. Some visitors will throw food bags, beverage bottles and other garbage on the ground, which may also contain chemicals and other pollutants, which will lead to

soil pollution over a long period of time. The second is the pollution in the process of venue construction and construction. The construction of the stadium requires full excavation and filling of the soil, and in many cases various chemicals, building materials, *etc.*, will be used, which will affect the soil [12]. In addition, the disposal of construction waste will also pollute the soil. The third is the maintenance and use of venue facilities. The venue requires regular maintenance and maintenance, which can result in some chemicals or waste materials getting into the soil [13]. The fourth is the transportation and lifestyle of athletes and spectators. During large sports events, athletes and spectators mostly need to use transportation to reach the competition venues, and the exhaust gases and pollutants emitted on the road may affect the soil. In addition, due to the large number of people, many viewers will eat and stay in nearby restaurants, hotels and other places, and the wastewater discharge of these places will also affect the soil. Therefore, the soil pollution of large-scale sports events is caused by many aspects, and this pollution is difficult to avoid. We need to take measures to reduce its negative impact on the environment.

(3) Risk of noise pollution

During large-scale sports events, the noise generated by the sound system inside and outside the stadium, the cheers of the audience, the honking of vehicles, *etc.*, will directly interfere with the surrounding environment, resulting in people's normal rest and study being affected, and have an adverse impact on the local urban ecological environment. The noise pollution caused by large-scale sports events mainly comes from the following aspects: First, venues and facilities. Large sports venues often use facilities such as loudspeakers during games, turning the volume up to a high level so that athletes and spectators can hear the commands and sound effects, and these loud sound systems can cause serious noise interference and pollution to the surrounding environment and residents. The second is the audience and fans. Large sports events attract many spectators and

fans to watch the game, they will shout, shout, whistle and beat musical instruments and other sounds during the game, these sounds will cause great noise interference and pollution to the surrounding environment and residents. Third, temporary buildings and parking lots. In order to meet the needs of large-scale sports events, it is often necessary to build a large number of temporary buildings and parking lots, which will bring a certain amount of noise pollution during the construction and transportation process, and at the same time, there will be a large number of vehicles and personnel entering and leaving the parking lot during the game, which will also produce noise. The fourth is the athletes and coaches. During the event, athletes and coaches often live and train in the stadium or nearby hotels and other places, they will also make a certain sound, causing a certain noise interference and pollution to the surrounding environment and residents. Therefore, the noise pollution generated by large-scale sports events is multi-faceted, and scientific management and control measures need to be taken to ensure the health and safety of the surrounding environment and residents [14].

(4) Risk of air pollution

During major sports events, many tourists and vehicles pour into the city, resulting in increased emissions from motor vehicles, which leads to higher concentrations of harmful gases in the air. Especially during the event, because of the frequent use of crowded transportation such as subway and bus, improper management will further aggravate the air pollution problem. The risk and challenge of large-scale sports events to air pollution are very complex, including the following aspects: First, traffic pollution: Large-scale sports events usually attract many people to watch the game, which leads to many vehicles and vehicles around the game venue. The exhaust gas and exhaust from these vehicles will seriously affect the surrounding air quality and aggravate air pollution. The second is energy consumption: Large sports events need a lot of energy to maintain the normal progress of the game, such as lighting, sound, display, and other

equipment need a lot of power supply. The generation of these energy sources will lead to many harmful gases such as carbon dioxide emissions, further aggravating air pollution. The third is garbage disposal: Large sports events usually produce a lot of garbage, such as food packaging, beverage bottles and so on. If these wastes are not treated in time, they will affect the surrounding environment and the air, and even cause harmful substances such as odor and bacteria. Land use and building construction: Large sporting events require many stadiums, parking lots and other facilities, which require a lot of land and building construction. These activities will damage the surrounding natural environment, such as trees and grass, and further indirectly increase air pollution. Therefore, large sports events have a serious impact on the surrounding environment and air, and we should be aware of this and take actions to reduce the impact of air pollution.

(5) Risk of energy consumption

Large-scale sports events require a large amount of energy consumption, such as electricity and gas, which may have adverse effects on the environment, resources, and society [15]. First of all, big sporting events require a lot of energy to keep the game going. These energy sources include electricity, gas and oil, and their generation and consumption have a direct impact on the environment. For example, large sports events require a large number of lighting, sound, and display equipment, the use of these equipment will lead to a large amount of energy consumption. If these devices are not properly managed, they will waste a lot of energy, which will exacerbate the damage to the environment and the depletion of resources. Secondly, it may affect the normal life and work of local residents. In the case of local energy shortage, the energy demand of large-scale sports events will exert greater pressure on the local energy supply and bring adverse effects to society. For example, in some areas, the energy supply has been unable to meet the needs of local residents, people have begun to save energy actions, but once a large sports event is held, venues, lighting and other

energy consumption increased significantly, it is likely to make the local energy supply shortage situation, thus affecting the normal life and work of local residents. In addition, due to the substantial increase in energy demand, some criminals may obtain energy through illegal means, thus bringing adverse effects to society. Therefore, in the hosting of large-scale sports events, it is necessary to fully consider the local energy situation and take corresponding measures to reduce the consumption and impact of local energy. For example, energy consumption can be reduced by promoting renewable energy sources and adopting energy-saving equipment, such as solar and wind power. The time and venue of the event can be reasonably arranged to avoid the energy demand during the peak period at the same time; It can strengthen energy management, improve energy utilization efficiency, and avoid energy waste. Only in this way can we effectively reduce the pressure of large-scale sports events on local energy supply and achieve sustainable development [10].

Prevention measures of urban ecological environment risk brought by large-scale sports events

The risk brought by large-scale sports events to urban ecological environment cannot be ignored, so a series of preventive measures should be taken to reduce its impact on the environment [16]. It can be effectively prevented through a series of measures such as comprehensive management, scientific planning, supervision and management, and legal protection (Figure 3).

(1) Development of comprehensive environmental management plans

It is very important to develop a comprehensive management plan before hosting large-scale sports events [17]. This plan should include the assessment and planning of the surrounding environment of the event venue to ensure that the construction and use of the venue meet the environmental protection requirements. In addition, the emission of pollutants such as noise, waste gas and wastewater also needs to be

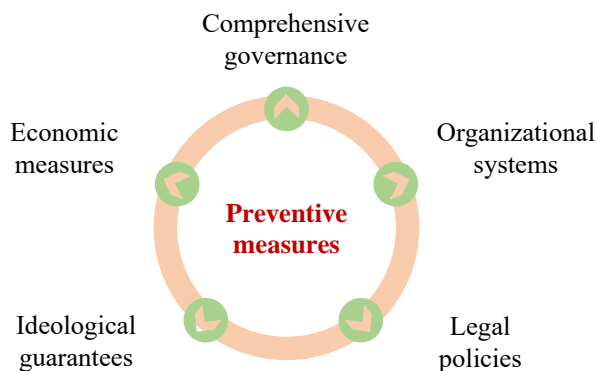


Figure 3. Risk prevention measures.

controlled to ensure that environmental quality is not affected. In terms of garbage disposal and green construction, adequate planning and organization are also needed to reduce environmental pollution and improve the quality of the urban ecological environment. In addition, in order to ensure the coordination and operability of various measures, the governance plan should be developed with the participation of professional environmental protection agencies and experts in related fields. According to the scale and characteristics of the event, they can provide targeted technical and management measures to make the program more feasible and effective. Through the implementation of these measures, we can protect the urban ecological environment to the maximum extent and achieve sustainable development goals while safeguarding large-scale sports events.

(2) Strengthen scientific planning and construction supervision

Strengthening the effective supervision of the scientific planning and process of the construction of venues for large-scale sports events is one of the important measures to ensure environmental protection and sustainable development [18]. In order to achieve this goal, the following points should be considered: First, the sports venues should be scientifically planned and designed, and the environmentally friendly materials that meet the environmental protection standards should be

selected to ensure that the environmental performance of the venues meets the standards. Secondly, in terms of land use and soil quality, we must ensure that we meet environmental protection requirements and will not pollute the environment. Secondly, supervision should be strengthened in the construction process to avoid the impact of violations on the urban ecological environment. For example, strengthen the disposal and management of construction waste to avoid environmental pollution and damage. Finally, for the management of road traffic around the venues during the event, a comprehensive management measure is needed to alleviate traffic congestion and exhaust emissions and other problems. For example, the impact of traffic on the environment can be reduced by restricting the passage of vehicles, encouraging the use of public transport, and optimizing the organization of road traffic. In general, strengthening the planning and supervision of large-scale sports events venues is one of the important measures to ensure environmental protection and sustainable development, and it is also one of the conditions that sports events must be considered.

(3) Improvement of the legal and policy system

When hosting a large-scale sports event, relevant laws, regulations, and policies should be improved [19]. In addition to environmental protection, there is also a need to regulate safety, health, food, venue management and other

aspects. The formulation and implementation of these regulations and policies can ensure the smooth running of the event, and also protect the safety and health of the public. At the same time, the establishment of environmental protection reward and punishment mechanism can encourage people to actively participate in environmental protection and promote the improvement of social environmental awareness. Of course, in the implementation, it is also necessary to strengthen the supervision and management of environmental protection work, to ensure that the relevant responsible subjects perform their duties, and to punish the behavior of non-compliance with environmental regulations, in order to protect the health and sustainable development of the environment.

(4) Promoting environmental education and public participation

In addition to the preventive measures mentioned above, promoting environmental education and public participation is also one of the most important measures. Through publicity, education and community activities, the public can understand the impact of large-scale sports events on the urban ecological environment and the importance of various environmental protection measures. This can increase public awareness and participation in environmental protection, so as to jointly maintain the sustainable development of the urban ecological environment. In addition, through volunteer services and other forms, the public can also be encouraged to actively participate in environmental protection actions and contribute to the urban ecological environment. The participation and support of the public is very important during the hosting of major sports events because their behavior and attitude will have a direct or indirect impact on the urban environment. Therefore, we should make full use of various channels, continuously strengthen environmental education and public participation, and create a good atmosphere for jointly building ecological civilization.

(5) Improvement of environmental economic policies and establishment of diverse investment channels

In the process of hosting large-scale sports events, the improvement of environmental economic policies and diversified investment channels is of great significance to ensure the smooth progress and sustainable development of the events. To be specific, the following measures can be taken: First, a sound environmental economic policy system should be established, including the environmental cost accounting and management of energy consumption, waste discharge, transportation operations and other aspects during the event. At the same time, in order to encourage environmental innovation and practice, environmental incentive mechanisms and environmental innovation funds can be set up to promote more environmental protection measures to be applied in the event. Secondly, establish diversified investment channels, guide social capital to participate in the construction and operation of sports events, as well as the protection of urban ecological environment, and reduce the financial pressure on the government. For example, the public-private partnership (PPP) model can be used to attract the participation of social capital. In addition, it can also expand the financing channels of the sports industry through the issuance of sports industry bonds and the establishment of investment funds and promote the sustainable development of the sports industry [20]. Finally, for the environmental protection and sustainable development of large-scale sports events, the consensus and participation of the whole society need to be formed. The government, enterprises, media, the public and other parties should actively participate in the event and jointly promote environmental protection and sustainable development of the event. Only in this way can we ensure the virtuous circle of large-scale sports events and achieve a win-win situation for the environment, economy, and society.

Practical case of ecological environment risk prevention in host city of large-scale sports



Figure 4. Three concepts of the 2008 Beijing Olympics Games.

events: Taking 2008 Beijing Olympic Games as an example

The 2008 Beijing Olympic Games advocated three major concepts of "Green Olympics, High-Tech Olympics, and People's Olympics" (Figure 4). Green Olympics means that in the process of hosting the Olympics, environmental protection and improvement should be promoted, and environmental pollution and resource consumption should be reduced [21]. The Beijing Olympic Games adopted a series of measures, such as implementing waste sorting, controlling motor vehicle pollution, promoting public transportation, *etc.*, to comprehensively promote the green hosting of the Olympics [22]. High-Tech Olympics means that in the process of hosting the Olympics, technology application and innovation should be strengthened to improve the level of competition and organization. The Beijing Olympic Games adopted high-tech methods, such as intelligent ticketing systems, high-speed network technology, wireless TV broadcasting, *etc.*, to bring more convenient and high-quality services to spectators and participating athletes. People's Olympics means that in the process of hosting the Olympics, humanistic spirit should be promoted, and the

cultural self-confidence of the country and nation should be demonstrated. The Beijing Olympic Games showcased various cultural activities, such as the opening ceremony, closing ceremony, cultural performances, *etc.*, to let the world better understand Chinese culture and history. These three concepts not only reflect the hosting philosophy of the Beijing Olympic Games, but also embody China's responsibility and contributions on the world stage. At the same time, these three concepts also provide important reference significance for future major events. The 2008 Beijing Olympic Games is a successful case, which has achieved significant results in urban ecological environment protection.

During the Beijing 2008 Olympic Games, government departments, grassroots organizations, and civil society vigorously carried out environmental protection and Green Olympics publicity activities [23]. The government has strengthened environmental law enforcement and supervision, and rectified enterprises that violate emissions of pollutants. Grassroots organizations and civil society groups actively organize volunteers to participate in

public welfare activities such as garbage classification and environmental cleanup. They have also held a series of green-themed events such as the Green Culture Festival and Low Carbon Living Exhibition to popularize environmental protection knowledge and raise public awareness of environmental protection. In addition, the Green Olympics publicity campaign was also carried out throughout society. Major media outlets published a large amount of environmental protection propaganda and reports, advocating that the public start from themselves and practice a green lifestyle. Some environmental violations were exposed, and high praise was given to the efforts made by the government and citizens in environmental protection. These reports created a good public opinion atmosphere for implementing the Green Olympics and improving the environmental quality, and further enhanced the overall social awareness of environmental protection. These reports created a good public opinion atmosphere for implementing the Green Olympics and improving the environmental quality, and further enhanced the overall social awareness of environmental protection. Through media propaganda, more people are made aware of the importance of protecting the environment, encouraging the public to actively participate in environmental protection actions and jointly promote the construction of ecological civilization. In addition, the media also gave full attention and recognition to environmentalists, volunteers, and others, further enhancing public support and confidence in the environmental cause. Overall, the environmental protection and Green Olympics publicity campaign of the Beijing 2008 Olympic Games received positive responses and widespread support from the entire society, laying a solid foundation for promoting environmental awareness and action throughout society.

To ensure that the environmental quality during the 2008 Olympic Games meets relevant requirements and achieve the goal of Green Olympics, in addition to the continuous environmental quality improvement work that

has been fully planned and implemented before the games, certain warning mechanisms, emergency plans and temporary control measures will be taken during the Olympic Games to prevent and handle various environmental exceedances and emergencies that may occur during the competitions. Strengthening the supervision of pollution sources and treatment facilities for water, air, noise, hazardous waste, and radiation sources, and strengthening the monitoring and prediction of environmental factors related to sports events, especially air quality. When necessary, temporary measures such as vehicle restrictions and enterprise production restrictions should be taken to reduce environmental pollution. Strengthen cooperation with surrounding areas to establish regional cooperation guarantee mechanisms for air, water, and other environmental protection [24].

During the 2008 Olympic Games, the government increased efforts to control polluted water bodies and implemented various measures, such as constructing urban rainwater collection systems, renovating sewage treatment plants, and strengthening the management of urban water supply networks to ensure that the quality of water environment meets the standards. First, the Chinese government is vigorously promoting water resources protection and utilization. Measures such as strengthening water resources management, implementing water price reform, promoting water conservation and reuse have fundamentally guaranteed the supply and utilization efficiency of water resources. Secondly, the Chinese government has increased efforts to control water pollution and promote water environment management and aquatic ecological restoration projects. For example, strong regulations and governance measures have been implemented to control pollution from industries such as chemical, pharmaceutical, and textile, which have reduced the discharge of pollutants. At the same time, measures have been taken to address pollution problems in urban water systems through restoration and recovery initiatives, such as using ecological

restoration, river greening, planning, and constructing landscape ecological parks, *etc.*, which have improved water quality. In summary, through the efforts of the Chinese government, Beijing achieved positive results in water environmental quality during the 2008 Olympics, providing people with a safer, healthier, and higher-quality water environment.

During the 2008 Olympic Games, the Chinese government took a series of measures to strengthen monitoring and forecasting of environmental factors, especially air quality related to the events. This was to ensure that the air quality of the competition venues and surrounding areas during the Olympics met international standards and guaranteed the health and safety of athletes and spectators. To achieve this goal, the Chinese government implemented several initiatives. Firstly, by installing a large number of air quality monitoring devices, real-time monitoring of the air quality in Olympic venues and surrounding areas was conducted, and air quality forecast information was promptly released. Secondly, measures such as restricting automobile traffic and limiting industrial production were implemented to reduce urban pollution emissions and improve air quality. In addition, for key pollution industries such as steel and chemical industries, the government also took strong measures to reduce pollutant emissions. This was achieved through the closure of high-polluting enterprises, strengthened pollution control measures, and promotion of clean production techniques. The implementation of these measures ensured that the air quality during the 2008 Olympic Games met international standards, guaranteeing the health and safety of athletes and spectators. At the same time, this also set an example for China's environmental protection efforts and promoted the popularization of environmental protection concepts.

During the 2008 Olympic Games, the Chinese government took a series of measures to control noise pollution [25]. These measures included implementing strict management measures on

noise pollution sources, such as restricting nighttime construction and controlling traffic noise; promoting wide tires to reduce noise generated by vehicles; and strengthening urban sanitation work to maintain cleanliness and quietness in the city. In addition, technical measures such as acoustic absorption materials and sound insulation facilities were adopted in the Olympic venues and surrounding areas to reduce the impact of activities such as competitions and training on local residents. The implementation of these measures not only reduces the impact of noise pollution on people's health, but also improves their comfort and satisfaction with the environment. In the future, as people's awareness of environmental protection continues to increase, we believe that these measures will be more widely applied and promoted.

During the 2008 Olympic Games, the Chinese government strengthened its supervision of related enterprises in terms of hazardous waste and radioactive sources and improved the disposal and management of hazardous waste and radioactive sources to ensure environmental safety and health [26]. First, the Chinese government strengthened the disposal and management of hazardous waste and radioactive sources and established a sound waste disposal and management system. Moreover, the government also strengthened the monitoring and testing of hazardous waste and radioactive sources to ensure that they do not pose any risk to the environment and human beings. At the same time, the government formulated strict laws and regulations to regulate the production, use, and disposal of hazardous waste and radioactive sources to ensure environmental safety and health. These measures effectively prevented environmental pollution and accidents, providing strong support for environmental protection during the Olympic Games. It's worth mentioning that these measures were not only for the duration of the Olympic Games, but also aimed at safeguarding people's lives and health, as a part of China's long-term environmental protection efforts.

Conclusion

Large-scale sports events have brought positive impacts on the urban ecological environment and promoted the construction and sustainable development of the urban ecological environment. However, there are also some risks in the urban ecological environment such as water, soil, air, energy, and so on [27]. Therefore, when hosting large-scale sports events, we should actively take countermeasures to reduce the risk to the urban ecological environment and protect the urban ecological environment to the maximum extent. At present, the research on the risks and challenges brought by large-scale sports events to the urban ecological environment and the preventive measures is not comprehensive and in-depth, and the relevant research and exploration need to be further strengthened. At the same time, the future should also pay more attention to the coordinated development of large-scale sports events and urban ecological environment, adopt a more scientific, green, and environmentally friendly way to host sports events, and create a healthier and more beautiful urban ecological environment for people.

Acknowledgements

This research was supported by Sichuan Provincial Key Research Base of Philosophy and Social Sciences: Tianfu Research Center of International Sports Events (Grant No. YJY2021B09).

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