

Green Olympics and Carbon Neutrality

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Abstract

The Beijing 2022 Winter Olympic Games embodies the Sustainable Development Goals (SDGs). China claims that it has created a green Olympic game that achieves carbon neutrality. This article aims to find the measures taken in the Beijing 2022 Olympics and the effects of those measures, by researching official documents, international standards, and scientific outcomes. This article has found out that technologies used in Beijing 2022 Olympics, including renewable energy, carbon dioxide refrigerant, and green construction processes, help the Olympics become sustainable. The long-term effects of taking those measures, including the improved air quality and the transformed Shougang Steel Plant that has become a park, the venue for Big Gas, and a model of sustainable urban planning, are then discussed in the paper. This article reveals how China achieved carbon neutrality, and it can be used as a reference for other cities for holding Green Olympic Games in the future.

Keywords

Sustainable Development; Carbon Neutrality; Olympics; Urban Regeneration; Green Buildings & Construction.

1. Introduction

Carbon neutrality is a major part of sustainable development. China, the host country of the 2022 Winter Olympics, had announced that it would achieve carbon neutrality in 2060. The Winter Olympics was the first time for China to simulate carbon neutrality. As a developing country, China had caused serious pollution to the environment. The Chinese government has decided to change, especially during the Olympics, which would be “green, inclusive, open and clean”. From detailed design to overall planning, from simple instructions to advanced technology, the Winter Olympics reduced carbon emission and reached carbon neutrality. Measures that were taken during the Olympics, such as reusing venues, exploiting renewable energy, following Green Building Standard during the construction, and using carbon dioxide refrigerant, help this Olympic to achieve carbon neutrality and to create long-term effects, such as the improved air quality and the renovated Shougang mill, turn China into a sustainable-developed country and show the world a model for sustainable Olympics.

2. Measures for Green Olympics

2.1. Reusing Venues

An important decision made by the Beijing Olympics Committee is to maximize the use of existing venues. As the world's first dual-Olympics city, old venues in the 2008 Beijing Olympics are valuable legacies. Among all the venues in downtown Beijing to be used for competition, only one was newly built, which is the National Speed Skating Oval [2]. Other venues are all reused, which saves the ecological and economical cost of building a new one. For example, the National Aquatic Center, which was a swimming pool in 2008, has been transformed into a curling rink. The Wukesong Sports Stadium, which was a basketball court in 2008, has been transformed into an ice hockey rink [1]. People do not have to hire new workers, use new

construction materials, and occupy new lands for construction, which means that the process of manufacturing construction materials and the fuel for powering construction machines are saved. Thus, a lot of ecological footprints are reduced in the construction of venues. The reusing of venues plays a great role to achieve carbon neutrality.

2.2. Green Buildings

The newly-built buildings are “green”. The design and construction of all new ice sports venues and Olympic villages follow the 3-star standards Green Building Evaluation, and the new snow sports venues follow the 3-star standards of the Evaluation Standard for Green Snow Sports Venues [1]. The environmental impacts to the surrounding site and solid waste management during the construction are both factors for the evaluation [5]. As a comprehensive assessment, green buildings consume little energy with small environmental damages. The widely used materials that insulate heat from the outside environment make venues become ultra-low energy consumption buildings.

2.3. Renewable Energy

Using renewable energy widely in the Olympics is important technology progress. Twenty-five percent of all power for Olympic venues came from alternative energy sources like sun and wind. Athletes' showers are heated by solar power. Street lights lining Olympic areas use photovoltaic cells [3]. New wind turbines are installed at places that have rich wind, and a flexible DC power grid is constructed to bring the electricity generated by wind and sun to venues in the capital city [2]. It is the first time in the history of the Olympics to source entirely renewable electricity for all the venues [4]. Renewable energy, which means energy that can be recycled and would not be used up, includes wind energy, solar energy, biomass energy, and wave power. Scientists have estimated that fossil fuels would be used up in one hundred years. People need to find new energy that can replace traditional fossil fuels for the next generations to live, which is the goal of sustainable development. The Olympics shows that humans can live with renewable energy, which is a big approach since it reassures the concern that people will have no energy after hundreds of years. Also, the widespread use of renewable energy reduces carbon emissions greatly. Building wind plants indeed requires carbon, but the large amount of electricity generated by wind plants does not produce any carbon and pollution, which is much better than coal factories.

2.4. Carbon Dioxide Refrigerant

The 2022 Beijing Olympics is also the first Olympics to use carbon dioxide as a refrigerant to make ice in the skating venues, which helps attain carbon neutrality greatly. Traditionally, people use synthetic hydro-fluorocarbon refrigerants to make ice. However, hydro-fluorocarbon is detrimental to the ozone layer that protects the earth's surface from intense sunlight. Carbon dioxide has fewer negative effects. When people are making ice by using carbon dioxide, they exert pressure on it first to turn the carbon dioxide into a solid-state. After that, the solid carbon dioxide would absorb heat around it and melt quickly. When it is absorbing heat, the temperature of the surrounding will decrease quickly and water can freeze to become ice. Using carbon dioxide does not waste carbon, but saves it since it needs to collect carbon from the environment. According to the experiment, it helps save up to 26,000 tons of carbon [4].

3. Long-Term Effects

3.1. Improved Air Quality

Olympics is not only a sports competition, and it brings sustainability to Beijing. Beijing has improved its air quality greatly after the 2022 Olympics: The air quality in 2008 improved 20

percent over 2021 [3], and Beijing in 2021 reported the lowest average concentration of PM_{2.5} since records began in 2013 [4]. The widely used renewable energy and green building technology contribute to this result. Most renewable energies, such as wind, solar, and hydrogen, do not produce toxic gases. The practice of using those technologies in the Olympics showed other industries how to use renewable energy, and has started a boom of new energy in Beijing: buses have started using hydrogen as the fuel. This widely used renewable energy reduced toxic gas in the atmosphere and improved Beijing's air quality.

3.2. Urban Regeneration

Beijing, the once industrial city, has transformed into a commercial city during the last decade (2010~2020). This change is made by shutting down polluting factories, including the Shougang Steel Mill. The 2022 Beijing Olympics gave those remains of old factories new functions. The old Shougang steel mill has been reconstructed and becomes a Big Gas venue, which is a new landmark in Beijing, as part of the drive of urban renewal [1]. This type of urban regeneration activates the dilapidated industrial remains in Beijing and invents a new idea for Urban Planning. China shows that its industry has changed from heavy metal production to advanced technology invention through these urban regenerations. The industrial revitalization, ecological restoration, and vigor rejuvenation in Shougang are allusions to Beijing, where has to awaken from the old period and stepped into a new era.

4. Conclusion

The strategies used during the Olympics, such as using existing venues, renewable energy, and carbon dioxide refrigerant, make the Beijing 2022 Olympics be green and help Beijing to become a sustainable-developed city with high air quality and renovated urban areas. Beijing 2022 Olympic has become a model for future Olympics on the topic of sustainability, and it showed that carbon neutrality is possible. A new requirement for the Olympics has been pointed out: green.

References

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