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Title: Possibility of local wood from a global perspective The Environmental Performance on Wooden Main Stadium of Tokyo 2020

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Abstract

Timber is a renewable and sustainable material which potentially plays a leading role in the development of a sustainable society. This is the rationale behind Japan passing the Act for Promotion of Use of Wood in Buildings, etc. to Contribute to the Realization of a Decarbonized Society in 2021. To promote timber utilization, the forestry and timber business sectors should cooperate with green consumers.

However, there are several challenges to address before such a cooperation can be achieved: illegal logging, vulnerable forest management, and related trade. FSC and PEFC have made substantial contributions by developing forest management schemes with supply chain certification. However, voluntary certification schemes have a cost bottleneck to become mainstream in the global timber supply chain.

The Woodmiles Forum, a Japanese private organization, argued that locality is an important factor in eliminating environmental risks. Firstly, it reduces the environmental impact of CO₂ emissions from the transportation process, which accounts for half the carbon footprint. Secondly, it reduces the cost of transporting long-distance environmental information, such as forest and legality certification.

Taking advantage of this accumulation, the Forum evaluated the new national stadium, which was the main venue for Tokyo 2020. The stadium is built of regional local timber from all over Japan. We compared the results of this evaluation with the evaluation of the facilities in London 2012.

The environmental significance of regional timber is that the transparency of the supply chain can be easily ensured. Additionally, the environmental load of the timber transportation process is small, and this is the focus of this study.

Keywords: Local Wood, Woodmiles, Tokyo 2020, Circular Economy, Climate Change

Introduction, scope and main objectives

To address the urgent threat of climate change, many countries are working under the Paris Agreement on the Climate Change Framework. However, as can be seen from Fig. 1, the Nationally Determined Contribution (NDC) submitted by each country is insufficient compared to their long-term targets under the agreement. Therefore, increased efforts are required to address this emergency.

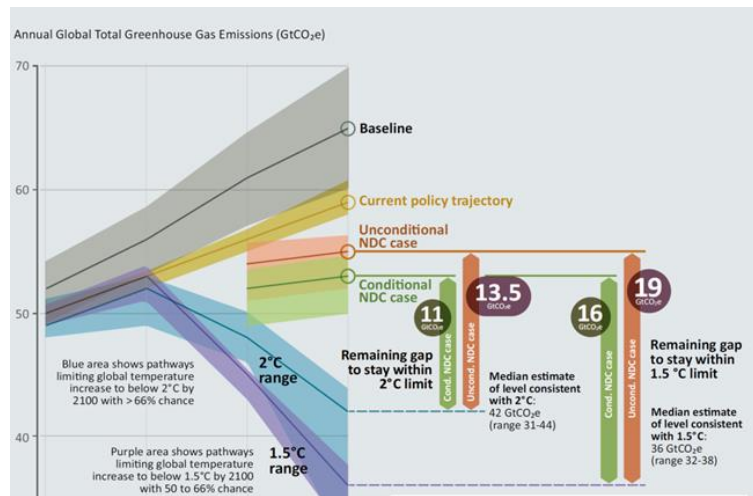


Fig. 1 Annual Global Total Greenhouse Gas Emissions (GtCO₂), (UNEP 2017)

In October 2021, “the Act for Promotion of Use of Wood in Buildings, etc. to Contribute to the Realization of a Decarbonized Society” was enacted by the unanimous parliament and came into effect. In January 2020, an article titled Buildings as a global carbon sink was published in Nature Sustainability magazine. In this way, it is becoming shared among government agencies and academic institutions that promoting the use of timber is an important issue for climate change.

However, risks such as illegal logging using timber are also shared. From this perspective, it has become important to discuss the environmental performance of wood utilization.

The Woodmiles Forum (WMF), a general incorporated association, has been studying the environmental performance of wood utilization. In the process, the organization has expanded to practice multi-faceted indicators such as Wood Miles (WM; distance from wood production area to consumption area) and other related indicators.

In 2021, the 2020 Tokyo Olympic and Paralympic Games (Tokyo 2020) was held. At the 2012 London Olympic and Paralympic Games (London 2012), the organizing committee declared that this event would create a legacy of sustainable activities in the future. To this end, attention has been focused on the sustainable procurement and construction of the Games. (LOCOG. 2007)

In this study, we evaluate the use of timber in the facilities built for Tokyo 2020 for their environmental performance and background, and compare them to the performance of the facilities built for London 2012. In addition, to evaluate the possibility of local timber from a global perspective, we examined the possibility of the legacy of a Tokyo 2020 venue centered on the use of regional timber (domestic timber) using Wood Miles (WM; distance from wood production area to consumption area) Indexes for the development of a recycling-oriented society.

Methodology/approach

We compared the standards for sustainability in the construction of competition venues of both London 2012 and Tokyo 2020 shown in Fig.2, and the environmental and social aspects of the wood used for the venues based on the setting process and performance requirements.

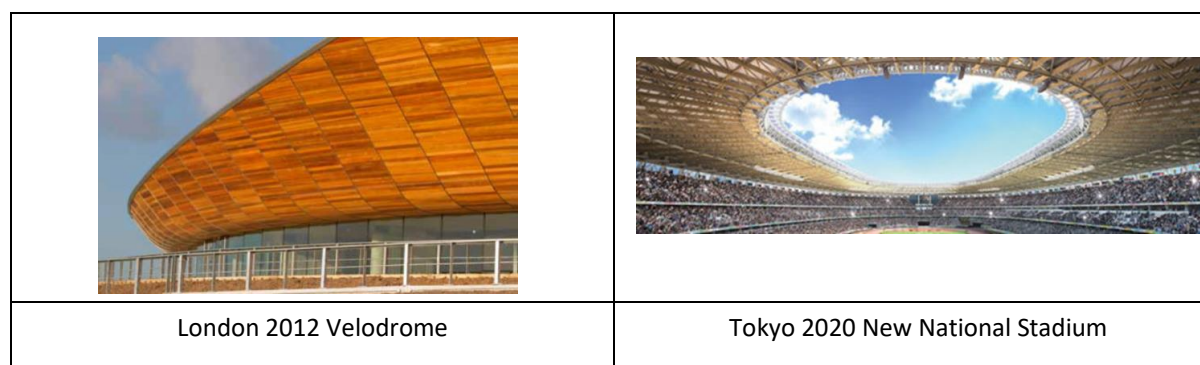


Fig. 2 Example of using wood from a stadium newly built in two Games

We also conducted interviews with stakeholders on the wood building materials used to construct the main facilities of both events, and reviewed the published materials. Depending on the facility and use, we clarified the amount of wood, tree species, production area, transportation/processing process, supply chain management method, etc.

We also compared the degree of environmental information disclosure of the two projects and analyzed the environmental performance of the venue facilities in Tokyo 2020 using the WM index developed by the WMF. Building Woodmileage CO₂ (BWMCO₂) are the CO₂ emissions equivalent to the energy expended in covering the WM according to the types of transportation used (road, rail, sea, etc.) for each form of timber (unprocessed or processed). It provides sufficient detail to allow this work to be replicated.

Results

1 The competition facilities of the two events and the wood used for their construction

In the timber procurement for the Olympic and Paralympic facilities, forest-certified timber has become widespread, and at London 2012, the venues were constructed with a certified timber ratio of approximately 95 to 100% of the total timber used. The joint efforts of two international trend forest certification systems, FSC and PEFC, were especially noteworthy in London.

London 2012 used wood from around the world, from the Russian Siberian Pine used for cycling tracks, to the Canadian Western Red Cedar used for the exterior walls.

Although the building specifications were not released, we classified the timber used and its history based on considerable online information on legacy (LOCOG. 2012).

For Tokyo 2020, there was a risk of facing strong criticism for neglecting sustainable supply chain management (LOCOG 2012), therefore, timber procurement was limited to the members of the Timber Suppliers Panel with forest certification, as was decided at the five meetings (TOGOC. 2020) of the "Working Team on Timber Utilization" established by the Cabinet Office. The timber used and its history are summarized in Table 1.

Table 1: Timber procurement status for construction of competition facilities for London 2012 and Tokyo 2020

	London 2012		Tokyo 2020	
		Resources		Resource
Name of the Facility	Facilities in the Olympic Park	<p>The Olympic Delivery Authority (ODA) : Innovation in timber supply for London 2012 western red cedar</p> <p>GOING GREEN FOR THE GAMES: LONDON OLYMPIC PARK BECOMES OFFICIALLY FSC® CERTIFIED</p> <p>https://ic.fsc.org/en/news-updates/id/8</p>	New National Stadium, Ariake Arena, Olympic Village Pledge Plaza, Ariake Gymnasium, etc.	Cabinet Office: 2020 Tokyo Working Team on Wood Utilization, etc. 5th Meeting Submission Materials
Volume of Timber	12500 m ³		Approximately 6000 m ³	
Transparency	67% FSC, 33% PEFC certified wood		Mostly FSC and SGEC certified timber (ratio unknown)	Related companies
Species	Siberian pine, Western red cedar		Sugi, Larch	
Sources	West Coast of Canada, Russia, Africa		Japan	2020 Tokyo Working Team on Wood Utilization, etc. 5th Meeting Submission Materials
Supplier	Timber Supplier Council Timber Supplier Council		Network of four timber suppliers	

2 Sustainable procurement standards related to wood

The procurement standards for timber at the two competitions are as follows: at London 2012, forest-certified timber was used, the legacy of the event was that FSC and PEFC jointly promoted certification. Consequent to the Games, the certified wood ratio in the UK market increased dramatically. Similarly, at Tokyo 2020, the procurement standard was forest-certified timber, with the additional requirement that the timber be procured domestically.

Table 2: Timber Procurement Standards for London 2012 and Tokyo 2020

	London 2012		Tokyo 2020	
	Contents	Rationale	Contents	Rationale
Reference literature	Sustainable Sourcing Code	London Organization of the Olympic Games and Paralympic Games (LOGPC)	Sustainable Procurement Code / Sustainable Wood Procurement Standards	Tokyo 2020 Organizing Committee
Contents	Legality, sustainability		Legality, sustainability/ Recommended to use domestic timber	
Confirmation method	FSC or equivalent means		FSC, SGEN and equivalent means	

3 WM evaluation of two buildings

We attempted to evaluate the WM of the timber used for the construction of the above-mentioned buildings at London 2012 and Tokyo 2020.

Table 3: Emissions from the transportation process of timber used for the construction of facilities for London 2012 and Tokyo 2020

Facility Name	London 2012 Games / Facilities in the Olympic Park	Tokyo 2020 Games / Overall Stadium (8 Facilities)
Harvest points	Canada, Russia, West Africa, etc.	Japan
Distance between upper and lower points	50 km	50 km
Lumber processing	Country of origin	Japan
Distance between upper and lower points	9000–500 km	559 km
Construction site	London Olympic Park	Tokyo metropolitan area
Total transportation distance	10,000–500 km	609 km
Unit CO ₂ emissions	249 kg/m ³	39.2 kg/m ³
Overall CO ₂ emissions a	2898 tons of CO ₂	276.3 tons of CO ₂
Total CO ₂ fixation b	7700 tons of CO ₂	2683 tons of CO ₂
a / b	38%	10%

As mentioned above, since the venues of London 2012 used wood from all over the world, the transportation distance is approximately 10,000 km. Assuming that greenhouse gases are transported from the place of origin

to the place of consumption, it is estimated that nearly 40% of greenhouse gases allocated to the timber of the buildings are released during transport. On the other hand, due to the use of domestic timber, it is estimated that the greenhouse gas emissions during timber are 10% of the fixed amount for the venues of Tokyo 2020.

Discussion

1 Evaluation of timber sustainability at Tokyo 2020

The issue of sustainably sourced wood in the construction of facilities for Tokyo 2020 has attracted much attention because the Japan National Stadium was built keeping in mind the main concept of "wood and green stadium" and the legacy of London 2012. The "Working Team on Wood Utilization at the 2020 Tokyo Olympic and Paralympic Games" was established, and careful consideration was granted by the government. Problems were identified regarding the history of imported concrete formwork on the way, and improvements were made, such as revising the timber procurement standards and expanding the scope to concrete formwork plywood. Environmental NGOs are not satisfied with the improvements made, but we expect that further discussions will proceed as the implementation content is fully disclosed in the future.

In the timber procurement policy, the first stipulation at Tokyo 2020 was that "suppliers should promote domestic forestry and demonstrate the multi-functionality of forests through it. Considering the contribution, domestic timber should be selected with priority". Therefore, most of the materials used for facility construction at Tokyo 2020 were procured from domestic suppliers. Though the purpose of inserting the above provisions is the "promotion of domestic forestry" and the local situation of revitalizing the Japanese economy is important, but as mentioned previously, the use of local materials reduces the environmental load of the Games.

2 Issues surrounding locality's contribution to the environment

As pointed out by the WMF, the use of regional materials reduces the environmental load of the transportation process, which accounts for half of the carbon footprint, and long-distance certification, such as forest certification and legality certification.

The forest certification process of Tokyo2020 was criticized for the sustainability of imported plywood used in plywood formwork for related facilities in Tokyo 2020 (Sakamoto 2019) (Rain forest action network 2018). "It is not enough to confirm that it is a certified wood product (for example, when importing timber from a high-risk tropical forest producing country), but it is necessary to confirm the origin of the raw material and the logging area." (FOE Japan 2017) has been pointed out.

The DD (Due Diligence) procedure to deal with this is introduced, but it supports the importance of shortening the transportation process by regional timber and simplifying the supply chain.

Conclusions/ wider implications of findings

As mentioned above, the environmental significance of regional timber is that the transparency of the supply chain can be easily ensured and that the environmental load of the timber transportation process is negligible. The former could not be fully discussed in this study, but the latter could be raised in an easy-to-understand manner.

There are certain aspects to be aware of when expanding this discussion in the future.

First, the administrative movement to promote domestic and prefectural timber may conflict with the national treatment of the WTO Convention. When discussing academically, it will be necessary to firmly proceed with the discussion from the perspective of the global trade order and the global environment that has been accumulated over many years.

Second, white and laminated wood, whose basic skeleton has been transported over 10,000 km from Europe, is often used when constructing a general house in Japan.

This is because the environmental burden of greenhouse gas emissions from fossil fuels from transport facilities that support long-distance transport is not reflected in the market. Tools, such as carbon taxes, may be in sight, but they will be an important topic when discussing sustainable forests and timber.

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