World Federation of Engineering Organisations

The Committee on Engineering and the Environment

Meeting the Olympic and Environmental Challenges

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"The Vancouver Games also will be remembered for being environmentally friendly and building lasting infrastructure legacies that will deliver future benefits."

By Darrel Danyluk, P.Eng.

Darrel Danyluk chairs the WFEO Standing Committee on Engineering and the Environment (CEE).

Earlier this year, millions of eyes around the world turned to Vancouver as the Canadian city and nearby Whistler hosted the Winter Olympic and Paralympic Games.

It was appropriate that attention focus on athletic competitions. However, the Games also will be remembered for being environmentally friendly and building lasting infrastructure legacies that will deliver future benefits. That aligns with one of the six themes of the World Federation of Engineering Organizations' Standing Committee on Engineering and the Environment. CEE/WFEO Theme 1 focuses on responding to the environmental impacts of Olympic Games. This commitment did not start with the recent Winter Games, as seen in articles in this newsletter by Eng. Spyros Papagrigoriou, the Vice Chairman CEE/WFEO and Task Force Leader for Theme 1, and by Professor Jiming Hao, who writes about mitigating air pollution at the 2008 Summer Games in Beijing.

2010 Olympic Speed Skating Oval

Additional information will be available on the May 26 WFEO-CEE Technical Webinar on "Engineering and Impacts of Civil Infrastructure for Major Sporting Events: The Olympic Games Experience." You can also read more in the Sustainability Reports prepared by the Vancouver Olympic Organizing Committee, available at http://www.vancouver2010.com/more-2010-information/sustainability/reports-and-resources/sustainability-report/

The Olympics are just one area where the CEE maintains watching briefs and provides input to multilateral organizations. Your attention is drawn to two upcoming events.

CEE/WFEO will be present from May 1–11 at the UN Commission on Sustainable Development Meeting No. 18 in New York. CEE/WFEO will deliver a side event on May 4 on "Transport Efficiency and Waste Avoidance – Input for Policy Makers." Engineering insight can increase policy-maker's awareness about the importance of modes of transport and their infrastructures in curbing losses during food transfers. Efficient and effective infrastructures – specifically the three pillars of physical, economic and social infrastructures – are fundamental to sustainability. At the side event, experts from the CEE/WFEO, International Council of Scientific Unions and the American Association of Engineering Societies' International Activities Committee will outline inter-linkages between transport infrastructure and social and economic infrastructures, as well as identify opportunities to reduce/reuse waste.

At the Framework Convention on Climate Change (May 31 – June 11) in Bonn, Germany, the CEE/WFEO side event is titled "Infrastructure Climate Risk Assessment: Principles and Applications." It will present principles of infrastructure climate risk assessment, application and summary results of case studies of infrastructure using a climate risk protocol – followed by discussion to work with the concepts of infrastructure components and climate parameters to determine climate risk.

As with Olympic athletic success, CEE/WFEO has found environmental results demand persistence and on-going commitment.

Theme 1: Environmental Impacts of Major Engineering Projects for Sporting Events (Olympic Games)

By Eng. Spyros Papagrigoriou

Eng. Spyros Papagrigoriou is Vice Chairman of CEE/WFEO and a member of the Technical Chamber of Greece.

The idea of assessing the impact of Olympic Games from an engineering perspective was originally proposed by Greece after the 2004 Olympic Games. The idea was to develop an engineering strategy in planning and designing infrastructure for the Games to enable the assessment of the environmental impacts and how the Games can be a good opportunity to improve the (human and natural) environment as well as the engineering performance of infrastructure to safeguard sustainability and a better quality of life.

The Task Group programme was first presented at the WFEO/CEE meeting in Brasilia in December 2008. Following that, a Task Group, consisting of senior engineers who were involved in planning and constructing major engineering projects for Olympic Games, has been formed by contacting countries that have hosted Summer and/or Winter Olympic Games. The process involved an international workshop (May 2009 Athens meeting of representatives of Olympic Cities Beijing, Athens, Sydney and Barcelona) and webinars among the Task Group members to exchange information and experiences, and document them. It also included communication and outreach activities to create awareness of opportunities and long-term infrastructure legacies that are intrinsic to large-scale Olympic sporting events by focusing on the post-games era and the best utilization of the infrastructure. During the 2009 Kuwait meeting, a detailed Interim Report was presented by WFEO/CEE members and discussed.

The Theme 1 Task Force leader is Eng. Spyros Papagrigoriou, Vice Chairman of CEE/WFEO and member of the Technical Chamber of Greece. Main contributors to the work carried out are: Eng. Zaffar Zuberi, Chairman, The Institution of Engineers, Pakistan; Eng. David Lapp, WFEO/CEE Secretariat, Canada; Eng. Paul Jowitt, United Kingdom; Eng. Michael Sanio, American Society of Civil Engineers, U.S.A.; Eng. Dr. Jiming Hao, Professor and Dean of The Institute of Environmental Science and Engineering, Tsinghua University, China. Contributors and participants in the May 2009 Athens meeting ("Impacts of Olympic Games in Beijing Athens Sydney Barcelona") were the Technical Chamber of Greece and Dr. George Kotzageorgis, ecologist, Greece.

The Main Aims of Theme 1 are:

- Enhancement of the opportunities of the host city and country to combine major city planning changes and new infrastructure with an environmental reform or upgrade in almost all spheres.
- Implementation of the principles of sustainable development to show the whole world that respect for the environment can and must accompany any major and rapid expansions of human-created systems.
- Tailoring of sport requirements to everyday city needs, so that the heavy cost burden of the organization can be better justified and more easily accepted.
- Exploitation of the power of the message to promote and proliferate the principles of sustainability, and to advance environmental standards for a better quality of life that is in harmony with nature. (Continued on next page.)

(Theme 1 continued from previous page)

The main areas of Environmental Interest identified are a) Energy Bioclimatic Design; b) Water Use and Management; c) Soil Waste Management; d) Air Quality; e) Physical Planning Post Games Era; f) Construction Materials; g) Natural Environment Green Areas; h) Environmental Awareness and Education; i) Adaptation to Climate Change and j) Incorporation of Innovation and High Technology. For each area of interest, the basic principles and parameters were set to identify the scope of relevant environmental issues. The roles of engineers in each area are elaborated below.


2010 Olympic Nordic Skiing Venue

The main Stakeholders involved are governments (central, regional or local); the international authority that awards the event (International Olympic Committee, in the case of the Olympic Games); the event's organising body; professional-scientific associations; NGOs and society.

The Methods identified for fulfilling the aims set are as follows:

- Setting Clear Environmental Objectives
- Collaboration between Stakeholders
- Dissemination of International Experience
- Compliance with Legislation
- Strategic Environmental Assessment
- Environmental Impact Assessment
- Monitoring
- Interim Assessment and Reporting
- Communication
- Environmental Evaluation Matrix (EEM)

The main actions to follow are a Theme1 Webinar (May 26, 2010), the elaboration and presentation of the Final Report, as well as the communication of the Final Report according to the WFEO rules and procedures.

WFEO-CEE and Related Upcoming Events

- May 1–11, 2010 New York, U.S.A – UN Commission on Sustainable Development – Meeting No. 18
- May 4, 2010 New York, U.S.A. – WFEO-CEE Side Event at UN-CSD 18: “Transport Efficiency and Waste Avoidance – Advice for Policy-Makers”
- May 26, 2010, WFEO-CEE Technical Webinar #2: “Engineering and Impacts of Civil Infrastructure for Major Sporting Events: The Olympic Games Experience” (See www.wfeo.net)
- May 31–June 11, 2010, Bonn, Germany – UN Framework Convention on Climate Change 32nd Meetings of UNFCCC Subsidiary Bodies
- June 11, 2010, Bonn, Germany – WFEO-CEE Side Event at UNFCCC 32nd Meetings of Subsidiary Bodies: “Infrastructure Climate Risk Assessment: Principles and Applications”
- June 21, 2010, WFEO-CEE Mid-Year Teleconference/Webinar
- Oct. 15, 2010, Buenos Aires, Argentina – WFEO-CEE Face-to-Face Meeting #3
- Oct 18–20, Buenos Aires, Argentina World Engineering Congress and Exhibition: Engineering 2010
- Nov. 29–Dec. 10, 2010, Cancún, Mexico – UNFCCC Conference of the Parties Meeting No. 16

Environment and Major Sport Events: Experiences from the 2008 Beijing Olympics Games

By Jiming Hao

Jiming Hao is Professor and Dean of The Institute of Environmental Science and Engineering, Tsinghua University, China.

Beijing, China's capital, is one of the world's largest metropolises with a population of over 15 million and has more than three million vehicles. Beijing's air-quality problems were characterized historically by high concentrations of particulate matter and sulfur dioxide. In recent years, due to a rapid increase in vehicular emissions, ozone pollution has drawn increasing attention in Beijing. Despite the fact that the number of motor vehicles on Beijing's streets more than doubled from 2000 to 2007, the number of air-quality attainment days has been increasing every year (up from 177 days in 2000 to 246 days in 2007). This is due to many air-pollution control actions that were implemented in Beijing over the years. The actions include closure or relocation of high-polluting industrial facilities; phase-out of numerous coal-fired boilers and domestic stoves; control of wind-blown dust generated from construction sites; implementation of stricter vehicle emission standards, and replacement of older fleets of buses, passenger cars, and trucks with newer and cleaner fleets; and installation or upgrading of stack-emission-control devices for power plants. However, ambient concentrations of common pollutants measured before the 2008 Beijing Olympics were still above health-based standards and higher than typical levels measured in cities of developed countries.

Aggressive Measures Implemented

To improve air quality during the Olympics (Aug. 8-24, 2008), the Chinese government implemented a series of aggressive measures to reduce pollutant emissions in Beijing and surrounding areas for more than two months. From July 1 to Sept. 20, 2008, all vehicles that failed to meet the European No. I standards for exhaust emissions were banned from Beijing's roads. Mandatory restrictions were implemented from July 20 to Sept. 20 for personal vehicles, allowing them on roads only on alternate days depending on licence-plate numbers (odd-numbered vehicles on odd-numbered days and even-numbered vehicles on even-numbered days). As a result, traffic flows in Beijing urban areas were found to have declined by 22% during the Olympics. Power plants in Beijing were required to reduce emissions by 30% from their levels in June when they had already met the Chinese emission standard. Several heavily polluting factories were ordered to reduce operating capacities or to completely shut down during the Games. All construction activities were placed on hold. Emission controls on large industrial sources were also applied in surrounding provinces (e.g., Inner Mongolia, Shanxi, Hebei, Shandong) and in the City of Tianjin. Traffic restrictions similar to Beijing's were instituted in Tianjin during the Olympics.

Tsinghua University Studied Impact

The Tsinghua University research team estimated that as a result of all the emission-reduction measures, total emissions of NOx, SO_2, VOCs, PM10 were reduced from their levels during the same period in 2007 by 55%, 58%, 59%, and 61%, respectively. These emission reductions are directly reflected in markedly reduced ambient concentrations of common pollutants. Observations at monitoring sites by the Tsinghua University research team showed significant decreases in concentrations of PM2.5, CO, NOx, SO_2, and O_3 during August 2008, relative to August 2007. The relative reductions in their concentrations are 40%, 50%, 53%, 61%, and 26%, respectively. In addition to PM2.5, black carbon (BC) and total carbon (TC) in PM2.5 during the Games were lower by 37% and 45%, respectively, than their average levels before the Games. The mean daytime mixing ratio of O_3 was lower by about 15 ppbv, reduced to 50 ppbv, in August 2008. Studies have shown that the reduction in emissions of ozone precursors associated with the Olympic Games had a significant contribution to the observed decrease in air pollutants during August 2008, accounting for 80% of the pollution reduction in August 2008, verifying the effectiveness of the emission reduction measures implemented in Beijing during the Olympics.