

Ecological modernization in 2018 PyeongChang Winter Games

The elitist and unjust environmental performance

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Introduction

Since the International Olympic Committee (IOC) included the “environment” as the third pillar of the Olympic Movement in 1994, the Olympic Games have become a novel site in which the international policy agenda of environmental sustainability has engaged with national environmental policies through the hosting of the event. Such was the case when South Korea (hereafter, Korea) hosted the 2018 PyeongChang Winter Olympics. Since the beginning of 2000, Korea had ranked sixth highest in greenhouse gas (GHG) emissions, following China, the USA, India, Japan, and Germany. Far worse, Korea has recorded the world’s highest increased rate of carbon emissions over 20 years: from 1990 to 2010, emissions increased 146%, far higher than the next highest offenders, Chile (125%), Turkey (109%), and Israel (103%) (GHG Statistics of Korea, 2015). Thus, from the bidding stage, the Korean Government sought to align its bid with issues of environmental awareness by framing the Games as a pathway to sustainability for PyeongChang and Korea more broadly.

When the 2018 Winter Games were awarded to PyeongChang, a Sustainability Team was organized in 2013, and the team, in turn, recommended and adopted ecological modernization strategies for sustainable development of and through the Games. The sustainable development strategies were organized under five central themes, and two among the five themes—Low Carbon Green Olympics and Stewardship of Nature—were environmental concerns. This chapter pays attention to the two environmental themes in the Korean Government’s sustainability goals and discusses how those were implemented through the Games. Further, it investigates the current intersection of Korea’s promise of environmentally sustainable development through Olympic hosting and the international policy agenda of climate crisis, while also discussing the challenges and tensions that remain within the local context.

Olympic-led environmental sustainability in Korea

The focus on environmental sustainability by the Korean Government and the PyeongChang Organizing Committee for the 2018 Olympic and Paralympic Winter Games (POCOG) was critical in winning the bid to host the Games (Preuss, 2013). The environmental discourse throughout the bidding process drew upon ideas, rhetoric, and strategies of ecological modernization (Kim & Chung, 2018), as the IOC recommended adherence to the standards and principles of eco-modernist environmental sustainability (see Gaffney, 2013; Karamichas, 2013; Wilson & Millington, 2013). Ecological modernization (EM) views environmental degradation caused by capitalism as an inevitable but treatable part of the development process (e.g., Buttel, 2000; Mol & Sonnenfeld, 2000; Mol & Spaargaren, 2002). Thus, EM simultaneously promotes a commitment to economic growth as well as sustainable improvements in environmental practices with the help of science and technology.

The Korean government and POCOG's EM-centered commitments to environmental sustainability were articulated in their two environmental goals—Low Carbon Green Olympics and Stewardship of the Nature. In 2009, then-President Lee Myung-bak declared that Korea would voluntarily reduce GHG emissions by 30% before 2020. POCOG also announced efforts to assist the government by minimizing the carbon footprint of the Games, so the country could meet its national and international targets for the reduction of GHGs. The government—first under Lee, then Park—seized upon a Green Growth initiative based on the idea that ecologically friendly development would enhance Korea's international image, protect the environment, and boost its economy simultaneously (Green Growth Committee, 2009; Ha & Yoon, 2010). Following the PyeongChang Games' first theme of environmental sustainability, the Korean Government named the green growth initiative as a Low-Carbon Green Growth Project (*Jeo Tanso Noxsak Seongjang Jeong Chak*) and introduced various financial incentives for corporations to improve their environmental policies (e.g., an emissions trading scheme).

Low-carbon green Olympics

Reducing carbon emissions was a top priority in Korea's approach to environmental sustainability at the PyeongChang Olympic Games. In order to realize the low-carbon Olympics, the POCOG established seven tasks: (1) reduce and offset GHG emissions, (2) build green transportation, (3) design and construct sustainable venues, (4) use renewable energy, (5) practice green procurement, (6) foster environmental awareness, and (7) communicate with stakeholders (POCOG, 2017, pp. 50–65). Each are discussed here.

Reduce and offset GHG emissions

In its pre-Games' sustainability report, POCOG pledged that the PyeongChang Olympics would be the first Winter Games to go beyond "zero emissions" and aim for O₂ Plus¹ by reducing and offsetting GHG emissions (equivalent to 1,596,000 tons of CO₂). POCOG set about realizing the O₂ Plus vision by establishing a Certified Emission Reduction (CER) program that promotes public donations for carbon credits, afforestation, and creating carbon offset funds. By December 2017, POCOG had received 93.1 million tons of carbon credits from seven private companies and public institutions, including Solvay Korea² and KangWon Wind Power, as well as the Korea District Heating Corporation. POCOG also opened the PyeongChang Sustainability Website, which provided real-time information on the state of the environment and greenhouse gas emissions. The website—a first for an Olympics—provided detailed information on GHG emissions, air quality, indoor air quality, and water quality. The Environment & Greenhouse Gas Information System on the website converted energy usage in real time to GHG emissions and confirmed carbon emissions and reductions in real time throughout the Olympic competition.

Build green transportation

For the Olympic Games, Korea built low-carbon transport systems such as the high-speed railway between WonJu and GangNeung, and introduced eco-friendly vehicles (e.g., electric and hydrogen vehicles) throughout the venues along with emissions monitoring systems. The high-speed railway that connected Incheon International Airport with PyeongChang and GangNeung via Seoul was meant to improve visitors' accessibility to Olympic venues as well reduce the carbon footprint by reducing the number of gasoline vehicles on the road during the Games. POCOG estimated that if 420,000 visitors chose to use the WonJu-GangNeung express railroad instead of personal vehicles, it would reduce GHG emissions by 6,654 tons (POCOG, 2017, p. 56). POCOG also used eco-friendly vehicles and set up charging stations with the help of the Korea Electric Power Corporation (KEPCO). KEPCO provided an additional 150 electric vehicles, 24 charging stations, and 15 hydrogen-powered vehicles, maintained in collaboration with public and private actors such as the Ministry of Trade, Industry and Energy, GangWon Province, and Hyundai Motor Company. According to POCOG, these transportation systems will reduce carbon dioxide emissions by 404,000 tons, which could offset 133,500 tons of carbon dioxide, or 84% of the projected emissions from the Games. In addition, POCOG introduced environmentally friendly methods of snow removal instead of using sodium chloride, which often causes ecological damage.

Design and construct sustainable venues

To prepare for the Games, POCOG constructed six new venues and refurbished six others in three regions of the province: PyeongChang and JeongSeon counties and GangNeung city. For those new facilities, POCOG encouraged builders to reduce carbon emissions from heavy equipment and use green products in construction. The six newly built stadiums—the Olympic Sliding Center, GangNeung Oval, GangNeung Ice Arena, GangNeung Hockey Center, KwanDong Hockey Center, and the JeongSeon Alpine Center—received Green Building Certification (GBC) and Energy Efficiency Certification awards. The GBC is based on the Green Standard for Energy and Environmental Design (G-SEED). This system—a rating tool for buildings that consume less energy and reduce pollution—was developed by the Korean Ministry of Land, Infrastructure, and Transport and the Ministry of Environment. The two certifications which are awarded by the Korean Government promote facilities that generate and use renewable energy (e.g., sunlight, solar, and geothermal heat), save energy (e.g., with green roofs, insulation, and airtight doors and windows), conserve water (with cisterns to collect rainfall and water circulation systems to heat and cool buildings), and preserve ecological wetlands and permeable blocks.

Use renewable energy

The POCOG mandate to use renewable energy sources meant heavy investment in geothermal, solar, wind, hydroelectricity, and hydrogen energy. The six newly constructed competition venues accommodated solar and geothermal generation facilities. Solar power was used to generate electricity, and geothermal energy heated the water supply. Wind turbines were also installed in the new stadiums. About 12% (around 4,564 kW per day) of the stadiums' energy needs were supplied through green-generated energy³ (POCOG, 2017, p. 61). POCOG also extended its promises to include using renewable energy to power the three host cities (PyeongChang, GangNeung, and JeongSeon) during the Olympic Games (altogether, an estimated 243 MW per day). Specifically, the three counties and city produced 143.4 MW of power from 73 wind turbines, and 30 new power plants were added to the plant to secure a total of 59.65 MW. A total of 48 generators were planned to be completed before the opening ceremony of the Olympic Games. If the corresponding 44.7 MW had been secured, the power consumption would have exceeded 243 MW.

Practice green procurement

In an effort to promote sustainable consumption, POCOG followed the *Green Procurement Guideline* and the *Guideline for Selection of Eco-friendly Sponsors* when it selected corporate partners and sponsors. Based on the

guidelines, POCOG encouraged related companies to enter into a voluntary agreement which prompts the use of low-carbon materials in venue construction or to use construction equipment generating low carbon. Further, in sponsor selection POCOG prioritized ISO14064-1-certified⁴ companies and other companies that manufactured and supplied green products.

Foster environmental awareness

POCOG established several programs that raised environmental awareness. The committee produced and distributed (upon request, since February 2016) approximately 20,000 leaflets to elementary schools, with educational materials on environmentalism and the Winter Games (*Environmental Trip to PyeongChang Winter Olympics*).

Communicate with stakeholders

POCOG communicated with various stakeholders to achieve its green goals: the International Olympic Committee/International Paralympic Committee, National Olympic Committee/National Paralympic Committee, National Assembly/Government, local communities, sponsors, and partners, suppliers, and spectators and citizens. For the public–private communication program, the Committee on Environment and a Green Management Council were established and operated as public agencies to communicate government environmental goals. In return, private stakeholders among the Olympic sponsors (e.g., LG, POSCO, Daelim Construction & Petrochemical Company, and Samsung) promised to help to achieve the government’s environmental goals in the Olympics, their tactics including an intelligent traffic system, energy saving technologies, smart highways, renewable energy, and socially engineered behavioral changes.

Stewardship of nature

GangWon Province, where the three Olympic cities are located, has been largely defined by its preserved natural resources and cultural heritage. The government and POCOG recognized the environmental significance of the area and the potential impact of an Olympic Games. Mountains and forests account for 84% of the total land area in the province, hence the region is often referred to as the “lungs of Korea.” Thus, stewardship of nature was the other priority of POCOG’s environmental sustainability program, which spoke of “ecological restoration of the regions and maintaining biodiversity ... management of the atmosphere, noise, waste, and water quality ...” (POCOG, 2017, p. 67). To achieve this environmental goal, POCOG established five action plans to: (1) conserve biodiversity, (2) restore ecology, (3)

manage air quality and noise, (4) manage waste, and (5) manage water quality and sewage treatment (POCOG, 2017, pp. 66–79).

Biodiversity

The Korean Government adopted the United Nations Convention on Biological Diversity (CBD)⁵ in May 2014, and as a signatory and ratified member, established the Third National Biodiversity Strategy and Action Plan to fulfill its domestic obligations. The Korean Government carried out this domestic obligation by hosting the *12th Conference on Biological Diversity* in September 2014 in the Olympic city, PyeongChang, and the meeting adopted the PyeongChang Road Map, which addresses ways to achieve biodiversity through technology cooperation, funding, and strengthening the capacity of developing countries (UN CBD, 2014). In Korea, the issue of biodiversity was brought to the forefront during construction of the Alpine Ski venue on Mt. Gariwang. Local non-governmental organizations (NGOs) raised serious questions about the economic and environmental costs of constructing such a venue on the mountain. The NGOs held a series of anti-development press conferences, public debates, and protests. They also launched a petition against development that received strong support internationally. Due to the concerns that were raised, POCOG and the local government of GangWon Province awarded a contract to a private company to perform the environmental impact assessment on the downhill venue. Instead of building separate facilities for the men's and women's downhill courses, the PyeongChang Winter Olympics combined the two courses—a first in Olympic history. The courses were combined to avoid seven major vegetation habitats that contain protected species. The starting point in the venue was lowered from the peak, Jung-bong, to Ha-bong on Mt. Gariwang, which reduced deforestation by 25 hectares.

Ecology

Along with conserving biodiversity, POCOG committed to preservation of the local ecosystem, and when that was not possible, environmental restoration and repopulation. This included securing endangered wildlife, topsoil preservation by creating alternative forests and landscapes near the venues, restoring streams that had been diverted and creating ecological exploration trails, and creating alternative protection areas. Specifically, POCOG restored 174 hectares of forests beyond the area of 156 hectares promised in its bid commitment. From 2015 to 2016, 9.3 billion South Korean won (hereafter, won) were invested in forest restoration and creation of scenic and replacement forests. When GangWon Province constructed a venue, it collected the topsoil (10,886 m²) during the construction period, and the remaining

5969 m² were stored underground to be used for successful restoration of the ecosystem. Endangered animals (e.g., long-horned beetles, Manchurian trout, long-tailed gorals, and Korean rat snakes) were reintroduced to the areas. Further, prior to the construction of the JeongSeon Alpine Center on Mt. Gariwang, 272 trees (including Mongolian oaks, castor aralias, and yews) and rare herbaceous plants (including alpine leek, white woodland peony, wake-robin, and Korean anemone) were removed and transplanted to 54 sites.

Air and noise

To manage air quality and reduce noise pollution inside and outside the host region, POCOG designated Low Emission Areas around the venues, and Green Buffer Zones within the Olympic villages. The venues were smoke-free zones, to ensure clean air.

Waste

Minimizing waste was managed by providing recycling bins. For collecting recyclable waste, POCOG signed an agreement with the Korea Circulation Resource Distribution Support Center. The government also let a contract to a third-party service provider, and the provider collected the waste through the Albaro System,⁶ an integrated information system for managing the generation, transportation, and disposal of construction waste. The program issues certificates to each disposer, carrier, and processor. Recyclable garbage was collected from stadiums and athletic villages and taken to the distribution center by the service providers. There, the recyclables were separated into six categories: paper, glass, cans, PET bottles, plastic, and Styrofoam. The Ministry of Environment Korea monitored the transport and treatment processes on a real-time basis using the electronic waste management system.

Water and sewage

GangWon Province and municipalities ran water quality monitoring and reuse systems in the venues. In addition, POCOG consolidated sewage treatment facilities and management systems in the region. To secure the necessary clean water, water reuse systems with a total storage capacity of 2,377 tons were installed in the four venues (GangNeung Oval, GangNeung Ice Arena, GangNeung Hockey Center, and KwanDong Hockey Center). After the water was treated, water quality was tested on a regular basis, then it was used for irrigation around the buildings. Further, water saving components were installed in faucets, toilets, and showers to reduce water use. POCOG also collaborated with Coca-Cola Korea and the World Wide Fund for Nature to launch the Integrated Water Resources Management Project.

Wastewater emissions, especially snow removal chemicals and deicers, were a major concern. POCOG, along with the Ministry of Environment Korea, purchased eco-friendly snow removal chemicals with low or zero-chloride contents and halted the supply of calcium chloride and salt to the market.

Tensions between global environmental concerns and local practices

With its emphasis on environmental sustainability, the Games have resulted in advancing and modernizing Korean environmental policy and action plans with an EM ethos. The Korean Government's greening efforts for a low-carbon Games and stewardship of nature were similar to the IOC's environmental sustainability indicators, yet the Korean Government's prioritization and implementation tasks were different. In March 2005, the IOC and its Sport and Environment Commission updated eight environmental issues and sustainability indicators in the Olympics that are based on the agenda of the United Nations Environment Programme: biodiversity conservation, ecosystems protection, land use and landscape, pollution, resource and waste management, health and safety, nuisances, and safeguarding of cultural heritage. Korea's firm engagement with the international sustainability agenda and its consideration of local environmental conditions transformed the focus and practices in these areas. However, in the post-Olympic period the harmful environmental effects of hosting have come to light and indicate that the government and POCOG maintained poor records about sustainability efforts, that there were strong differences of opinion among key stakeholders, and negative consequences on the environment of building for the Games.

Business-as-usual in sports and its impact on the local environment

Gaps between what was said and done by the government and POCOG appeared soon after the Games started. The most visible and serious report was from the alpine ski slopes on Mt. Gariwang. Prior to the Olympic Games, NGOs criticized the potentially massive deforestation, soil erosion, loss of soil stability, and destruction and modification of natural ecosystems. In response, POCOG strengthened its restoration plan. However, *Yonhap News* (2018) reported that the restoration plan was unrealistic and already failing when the Games began. On February 21, 2018, one news report described it this way:

The soil layer, which was promised to use for restoration, was buried in the slope as it was hard to use for restoration. The existing topsoil that was left to be used for restoration was stacked in such a way that the soil's vitality could not be maintained. GangWon Province and

construction companies said they only followed the guidelines of the Ministry of Environment and the Ministry of Forestry's consultation regarding the management of transplanting trees and topsoil. The implementation and monitoring of the environmental impact assessment during the venue construction was totally insufficient. The two ministries did not manage the construction carefully They did not understand the ecological damage [caused by the construction of the ski slopes].

(*Yonhap News*, 2018)

Along with the topsoil loss and poor management of soil layers for restoration, the news report described a series of damages in Mt. Gariwang that includes the withering of hardwoods and conifers caused by disturbances to the ecosystem (e.g., the disturbance of underground water flow) and unnecessary logging for convenience of construction companies. Thus, while local stakeholders were key contributors to such environmental harm, Olympic standards also contributed to POCOG's failure to meet its sustainability promises. Mt. Gariwang was chosen as the location for the Alpine Speed Venue because it was the only mountain in the area that met the international requirements for Olympic competition (height, length, elevation, and fall). A group of experts proposed alternatives due to Mt. Gariwang's unique and rich ecosystems and the difficulties restoration might pose. The international authorities rejected the alternatives. Green Korea United, a Korean environmental NGO, began criticizing the decision when the venue was in the planning stages:

Based on the Olympic standards for alpine ski competitions, a venue with an elevation of 800 to 1,100 meters is required. To meet this standard [elevation that is directly connected to height of a mountain], that means a mountain of 2,000 meters or higher. Even Mt. Gariwang, at the height of 1,561 meters, did not measure up to the slopes at the 18th Nagano Winter Olympic Games to the 23rd Sochi: Nagano's downhill slope was at 2,696 meters in height; 2002 Salt Lake City's was 2,917 meters; and 2006 Torino's was 2,823 meters. Eventually, excessive deforestation is required in order to meet the 800-meter altitude difference [by building ground up high with an embankment] claimed by the International Ski Federation.

(Green Korea United, 2015b, p. 34)

The mountainous terrain in Korea is distinct from other Asian, North American, and European countries where the international standards of alpine ski competitions were set. Guided by the International Ski Federation, POCOG managed to build a stadium that met these standards, although local NGOs called it an environmental crime. Thus, while sports communities are making

changes in response to climate change (e.g., corporate social responsibility projects), international sports institutions like the IOC are subscribing to a “business as usual” approach that promotes one-size-fits-all standards which can ultimately cause environmental damage, as they did in PyeongChang.

These tensions between the sustainability promises of the IOC and their practical application have been discussed in the academic literature on the topic. Hosting Olympic events stimulates economic growth, improves transportation infrastructure and cultural facilities, and enhances global recognition and prestige, according to Essex and Chalkley (2004). While those intangibles are well-known Olympic legacies among many scholars, others such as Lenskyj (2008) and Boykoff (2014) have argued that the benefits of hosting an Olympic Games are not economically sustainable. Similarly, Giulianotti, Armstrong, Hales, and Hobbs (2015, p. 103) have called the Olympic Games a neo-liberal festival of capitalism “organized to advance private, commercial, and free-market interests ... through vast public spending on facilities, infrastructure, and wider regeneration policies in urban spaces.” Rather than benefitting the local economies of host countries, the Games benefit only the IOC and large transnational sponsors, thereby escalating global and local inequalities and leaving the environmental damage for local residents to clean up.

In this regard, the economic outcomes of Olympic hosting are often prioritized over their environmental impacts. For example, the promise to promote the PyeongChang area as the Asian hub of winter sports is a typical economic model of development through sport mega-events. The urban planning and economic revitalization surrounding the Olympic project increased the private sector’s capital investment in the province. The emphasis on economic growth and development through sport, however, overshadowed ecologically sound development. In the process of building the winter sports belt, trees, flora, and fauna were transplanted along with residents, who made up the local labor force for agricultural, forestry, mining, and manufacturing concerns. The environmental consequences took a back seat to the promise of building a lasting sport-tourism destination, and as previous Olympic Games have demonstrated, local residents often suffered the after-effects, such as pollution, dangerous chemicals, and damaged land. This echoes Mangan’s (2008) review of post-Olympic legacies that are unfulfilled, Terret’s (2008) case study of the 1992 Albertville Games, and Beder’s (1999) criticism of the environmental destruction of the local community that emerged during and right after Australia’s Olympic bid.

Environmental overconsumption and the unjust burden on locals

During the Olympic Games, resources are often overconsumed and products that cause environmental damage are introduced into the local ecosystem. In

Korea, reported overconsumption included water (from rivers, lakes, and the ground), chemical contaminants (icing, deicing chemicals, and explosive and toxic ammonia/methane [CH₄] used on bobsled and luge tracks), land, energy, and more (Green Korea United, 2015a). Water exhaustion is a particular threat, not only to the surrounding ecology, but also to the local community and industry in PyeongChang and beyond. Local environmental groups reported that an excessive amount of water was used to make ice and artificial snow in the various venues during preparations for the Games. When groundwater is overconsumed, the problems may extend beyond an immediate shortage of water for drinking or agricultural needs. Rocks may sink, lowering the water table even further and making it difficult for agricultural concerns to obtain the water they need for crops. NGOs urged the municipalities to prepare alternatives for the excessive water use during the Olympic Games.

Industrial deicing chemicals (e.g., calcium chloride, industrial salt) that cause environmental damage were also overconsumed. Even though POCOG and the province promised and put forth efforts to use eco-friendly deicers, the unusually low temperature and heavy snow in the region coupled with the increased cost and inefficiency of environmentally safe deicers led to the use of the more dangerous chemicals such as industrial deicers. By way of comparison, the price of industrial calcium chloride is 180 won per kilogram, but an eco-friendly deicer costs 350 won per kilogram. Further, despite the higher cost, the performance was poor or slow, therefore local governments reported that they used industrial deicers at the risk of environmental problems (*Yonhap News*, 2016). The unaffordable resources and overconsumed chemicals were thus contributing factors to environmental damage.

Preuss (2013) contended that the financial shortcomings and the event organizer's lack of serious interest in the environment impeded the production of a green Games. However, this investigation simplifies environmental performance in sport as a matter of budget and awareness, and ignores the structural problems that arise between the international sports organization and the host countries. Korea was not an isolated case. Similar experiences have emerged from previous Winter Games. For example, Timsheva (2001) investigated the environmental legacy of the 1992 Albertville Winter Games in France and reported exhaust pollution, deforestation, and erosion of the alpine mountains following construction of the biathlon and ski racing tracks. Findling and Pelle (1996) also found the 1992 Games left a "legacy of pollution and environmental injury" because of the poisonous ammonia use in the bobsled and luge venue. Similarly, massive deforestation, pollution, destruction of the ecosystem, and other environmental problems were reported following the 1998 Nagano Winter Games (Ezawa, 2015). These recurring problems indicate that such issues

are not contextually confined to a host nation, but rather endemic to Olympic hosting itself.

Although sufficient green and renewable energy was produced for the Olympic Games, according to POCOG, it is unclear if the clean energy resources continue to be generated for the local communities. Kim (2018), an energy welfare expert, contends that the supply of heating and cooking gas used by locals is indicative of the energy welfare of the rural and mountainous regions of Korea. He finds that energy welfare in the mountainous PyeongChang area is poorer than in other parts of Korea; however, all of the newly built energy infrastructure in the province for the Olympic Games would not enhance local energy welfare without further costs. The infrastructure was for large commercial venues, and the conversion from industrial to household energy demands time and an immense budget. Kim (2018) argues that although the post-Olympic infrastructure will be maintained partly by the local taxpayers, it is unclear whether the residents will benefit from the energy infrastructure. Thus, the overconsumption and the lack of sustainable plans have unjustly imposed long-term burdens—environmental, economic, and social—on residents.

Economic calculation of nature and market actors' self-regulation

The dominant global environmental discourse prioritizes reducing GHG emissions as an urgent action in response to climate change. POCOG's claim of achieving an O₂ Plus Games through the carbon emission trading scheme was an economic calculation to solve environmental problems. Scholars argue that carbon offsets are a new form of commodification and regulation of nature through environmental governance under neoliberalism (e.g., Bridge, 2002; Gibbs, 2006; Bumps & Liverman, 2008). In particular, Bumps and Liverman (2008) identify the ways in which carbon offsets create new commodities and markets that connect the global North and South, corporations and consumers, environmental groups and transnational institutions, and science and markets. By emphasizing the inequalities of environmental economic geography, these scholars criticize carbon offsets as:

sloppy definitions of additionality and development benefits, for neo-colonial practices of unequal exchange and the dispossession of rights in selling cheap credits to the North obtained from projects in the South, and for the lack of transparency and participatory governance.

(Bumps & Liverman, 2008, p. 148)

Through this lens, the PyeongChang Games' achievement of "zero" carbon emissions through carbon trading and donations by corporate partners is ambiguous and misleading.

Further, the economic calculation of nature and the environment around the Olympic Games is problematic, especially when reflexivity in environmental performance relies on self-regulation among the market actors. The technocratic aspects of ecological modernization discourse refer to the translation of social and moral ecological issues into marketplace issues. Hajer (1996) coined the term “technicization” to refer to the eco-modernists’ use of scientific discourse to solve environmental problems through innovations and investment. Ecological modernization engages in various initiatives to address environmental problems while boosting the environmental industry sector (OECD, 2007, p. 43). The Korean Government and POCOG’s eco-industrial innovations, with the support of green science and technology, flourished during the Games, especially in transportation, venue construction, and energy generation. With environmental promises and plans to optimize these innovations for the Winter Olympics, the government established amicable relationships with market players such as LG, Samsung, POSCO, DaeLim Construction & Petrochemical Company, and DaeJung Precision Co., Ltd., with some obtaining patents for green technologies invented for the Games. For example, the Korean Government signed a turnkey contract⁷ with DaeLim Construction & Petrochemical Company to construct the Alpensia Sliding Center. The company then developed cutting-edge and eco-friendly (reduced construction periods radically, and thus contributed to less GHG emissions) sledding tracks and earned international patents. The turnkey contract had the merit of unifying the responsibilities and taking advantage of the new technologies possessed by the construction company. However, it included a fatal disadvantage—the contractor could make arbitrary decisions, as it was responsible for evaluating the environmental impact and gathering opinions from the residents. Indeed, the company was caught engaging in large-scale woodcutting in the preserved green lands for the convenience of construction; as a result, the PyeongChang county office sued it (*Sisaweek*, 2014). While technocrats within the private sector have implemented the scientific management of wildlife and natural resources to achieve optimal economic yields, it nevertheless undermines the local environment.

The case of PyeongChang demonstrates that ecologically ignorant economic interests hinder the diffusion of environmental innovations. Ecological modernization critics (e.g., York & Rosa, 2003) also question whether green consumption through technological advances alone can achieve resource conservation and better environmental protection, particularly if left to businesses to self-regulate. As York and Rosa have pointed out, it is difficult to expect self-reflexivity on environmental performance when feasibility is emphasized within the context of affordable (cheap) technology and maximum profit-making. Similarly, this challenge occurred in PyeongChang’s case when reflexivity in environmental performance was left up to the business sector. As discussed earlier, DaeLim

Company, an official business partner with POCOG, destroyed preserved lands and forests for the sake of convenience and reduced costs in venue construction (Sisaweek, 2014). The capitalist logic of choice can be easily contrasted to the reflexive act of choosing a more environmentally friendly practice.

An esthetic-oriented, elitist model of sustainability

The Korean Government's environmental policies and institutional reforms before and during the Olympic Games are what Karamichas (2013, p. 133) termed the "eco-modernist institutional amendment." The ecological modernization paradigms in PyeongChang's Olympic Games advanced environmental reform, promoted the use of green production and recycled material, and improved policing of environmental performance. The eco-modernist institutional amendments and bureaucratic restructuring followed the vitalization plan for the local economy. That plan was problematic, as local economic development often took precedence over environmental protection. This led to the implementation of a weak model of sustainability. While the strong model of sustainability insists that we should conserve and enhance our natural capital stocks and live on the income generated by them, the weak model of sustainability holds the position that we can lose natural capital if we substitute the equivalent "human capital" (e.g., scientific invention, technological innovation of resources and others) (Agyeman, 2013).

PyeongChang's weak model of environmental sustainability appears to be largely rhetorical and esthetic. Besides the emphasis on economic development, POCOG's environmental promises to conserve biodiversity and restore ecology proved to be nothing but talk. The total activities during the Olympic preparation period, especially from 2015 to 2016, consisted of afforestation (278 hectares), street tree planting (63 hectares), and scenic forestation (629 hectares) (POCOG, 2017, p. 71), which focused on esthetics rather than restoration of the damaged ecology. This esthetic restoration and lack of long-term, reflexive afforestation plans lead to weak environmental sustainability. As for the esthetic environmental performance, Lubbers (2002) contends that the goal of corporate-driven environmental works prioritizes the appearance of environmental-friendliness, which he calls "green capitalism." Each element of green science and eco-friendly technologies (e.g., carbon offsets, G-SEED-certified stadiums, and intelligent energy systems) is not only dominated and organized by corporations and capital mathematically, but each is also repeating the old patterns of urban-centered interests that marginalize locals and the needs of their communities.

POCOG's ecological modernization paradigms also facilitate the top-down style of environmental policy and governance. Rajkopal (2014)

describes the policy approach of ecological modernization as expert-oriented and science-based, and one that has become an effective source of social control in modern societies; both governments and other authorities use it to give credence to controversial decisions. Similarly, Feinstein and Kirchgasser (2015) argue that the public are often uninformed about science and excluded from formulating science-based environmental policies. Wilson and Millington (2013, p. 131) also draw attention to ecological modernization's emphasis on science and engineering in solving sustainability challenges, because it often appears to be the "only" viable response. These ecological modernization approaches downplay the value of qualitative accounts of knowledge, neglect local knowledge and civic science, and jeopardize democratic political practices. The top-down and knowledge-intensive environmental paradigm also overlooks ecological and social injustices.

While the dominant ecological modernization approach emphasizes stakeholder relationships and promotes interactions among diverse actors, the approach offers few insights into power relations among those stakeholders and abusive aspects of corporate partnerships. Further, the ecological modernization approach does not inform the actual capacity of NGO-monitored corporate participation in markets to redress environmental problems. These characteristics of ecological modernization also indicate a weak sustainability model. Boykoff and Mascarenhas (2016) criticize the IOC's Agenda 2020 as consisting of less than fully formed policies, believing that it will not convert sustainability principles into meaningful policies and performances that can bring environmental benefits to host cities of the Olympic Games.

Conclusion

The PyeongChang Winter Games, with its emphasis on a low-carbon footprint and stewardship of nature, were an opportunity for Korea to introduce international environmental standards and reform its environmental governance structure and policies through Olympic events. The Olympic-led environmental advancements in Korea focused mainly on reducing carbon emissions. The transportation, construction, and energy sectors applied green technologies and attempted to reduce emissions. POCOG created education programs for green awareness and stakeholder communication and undertook stewardship of biodiversity, ecology, air and noise pollution, waste, water and sewage. Environmental sustainability in and through the Olympics—under the promises of low-carbon emissions and green growth—failed to stimulate a reflexive and meaningful ecological reform for four main reasons. First, the business-as-usual model of the Olympic Games does not correspond to the environmental contexts of host cities and countries. Second, environmental overconsumption leaves an unjust burden on locals. Third, economic calculation of nature pays

selective attention to particular environmental issues, and there are limitations on self-reflection of environmental performance. Lastly, the weak model of sustainability prioritizes the appearance of eco-friendliness, which does not translate into long-term, meaningful environmental benefits.

The environmental hazards of the Winter Games will continue to have an enormous impact on low-income, energy-poor residents and farmers in the rural and mountainous areas of PyeongChang and Gangwon. PyeongChang's eco-modernist environmental policy, planning, and practice demonstrate a lack of justice and equity in terms of recognition, process, procedure, and outcome. Procedural justice is challenged by the sport business-as-usual Olympic festival's top-down approach of environmental governance that is driven by scientific and technocratic elites. Meaningful and beneficial ecological modernization through the Olympic Games cannot be solely shouldered by few elites or host nations/cities. The environmental risks associated with the Olympics are an international issue that needs to be addressed by the global community.

As an alternative to weak versus strong sustainability, some scholars advocate a *just sustainability* model and criticize the dominant, stewardship-focused orientation of environmental sustainability (see Dobson, 1999; Agyeman, 2005). Instead of the current orientation toward environmental sustainability, they advocate transformative or just sustainability that implies a paradigm shift which requires sustainability to take on a redistributive function. "The concept [of] sustainability emerged in large part from 'top-down' international processes and committees, governmental structures, think tanks, and international NGO networks," according to Agyeman (2005, p. 2). He contends that justice and equity must move to center stage in the discourse on sustainability. In order to address the unjust environmental burdens that social minorities often encounter, scholars suggest rethinking "environmental justice" as a concept and an approach, rather than "environmental sustainability." Agyeman's (2013) framework for just sustainability provides a justice- and equity-focused understanding of the term "sustainability" and urges a move beyond a simplified "green" discourse to one that recognizes the role of social and economic inequality in environmental disparities.

Notes

- 1 O₂ Plus was "the environmental vision suggested by POCOG to avoid, minimize and reduce environmental damage and GHG emissions from the PyeongChang 2018 Winter Olympic Games with the aim to achieve a low-carbon PyeongChang2018" (POCOG, 2015, p. 74). In practice, it refers to purchasing a considerably greater amount of carbon credits than the amount of carbon dioxide produced during the Olympics, resulting in the production of oxygen.
- 2 Solvay is a transnational corporation that manufactures advanced materials and specialty chemicals, addressing next-generation mobility and improving resource efficiency.

- 3 The rest of the energy sources (88%) were the usual fossil fuel-based and nuclear energy.
- 4 ISO 14064-1 details principles and requirements for designing, developing, managing, and reporting organization- or company-level GHG inventories.
- 5 CBD, informally known as the Biodiversity Convention, is a multilateral treaty, and Korea is a signatory and ratified state member among 196 parties. The main goals of the convention are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from genetic resources.
- 6 A real-time integrated information system that manages the entire process of waste discharge to disposal via the internet, which is also known as the Manifest System. It is one of the Korean regulatory systems for the waste trade and resource recycling.
- 7 A contract in which a company is given full responsibility to plan and build something clients must be able to use as soon as it is finished without needing to do any further work on it themselves.

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