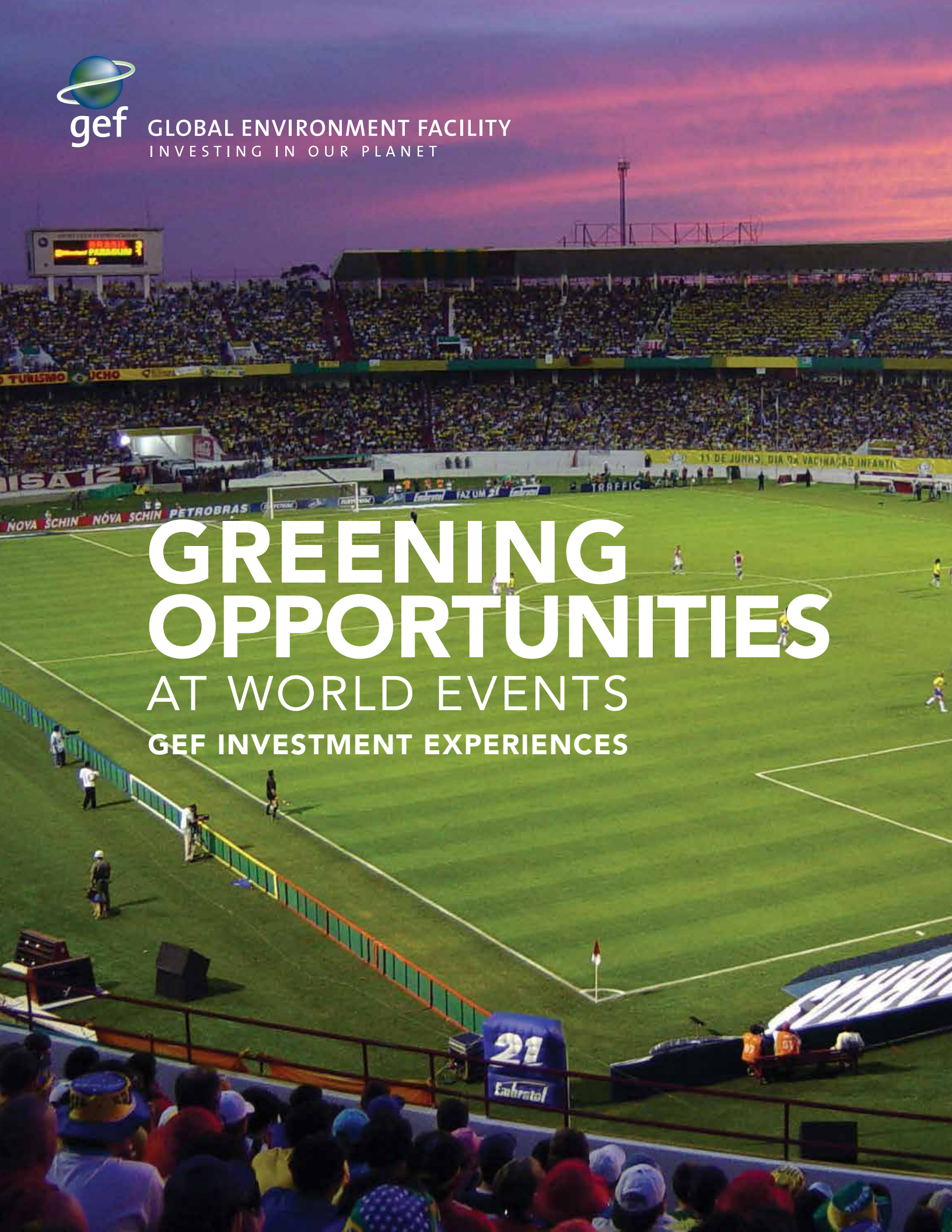
GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET



GREENING OPPORTUNITIES
AT WORLD EVENTS
GEF INVESTMENT EXPERIENCES

Foreword

Dr. Naoko Ishii
CEO and Chairperson
Global Environment Facility

Major events hosted by developing countries and transition economies—like the 2013 Summer Universiade, the 2014 Winter Olympics, and the 2018 FIFA World Cup, all to take place in Russia; the 2010 FIFA World Cup in South Africa; the 2008 Summer Olympics and World Expo 2010 in China; and the 2010 Commonwealth Games in India—provide a global stage to showcase environmentally sound technologies and practices. The need for new infrastructure to support an influx of millions of people in a sustainable manner gives host cities an incentive to use new technologies and practices to reduce emissions and use energy more efficiently, even after the event is over. The use of these technologies and practices in front of a global audience, meanwhile, promotes adoption of cleaner, more efficient energy technologies by other cities and countries across the world.

The Global Environment Facility (GEF) has invested more than US$38 million and leveraged more than $556 million to develop, demonstrate, and implement environmentally sound technologies and initiatives at world events. Our partner institutions have expressed that this work is vitally important to the sustainable development of developing countries and transition economies. It is our hope that the following pages will help readers gain a better understanding of our efforts in this area, and will inspire new enthusiasm, new invention, and many more successes.

Large-scale international exhibitions and sporting events convene diverse groups of people from across the globe in one place to witness innovation, experience other cultures, exchange ideas, negotiate agreements, and cheer on the world's best performers. Host countries and cities spend years planning and preparing for such events, building venues and accommodations, ensuring adequate transportation, and expanding water and power systems. By encouraging tourism and investment in infrastructure, these events can significantly stimulate host-nation economies and provide opportunities to create environmentally positive infrastructure that pays dividends long after the events have concluded.

Developing countries and transition economies are taking innovative steps to address the challenges of hosting world events in a sustainable way, as this brochure highlights. Such preparations assume an added significance, given that these countries are projected to account for 90 percent of population growth, 70 percent of the increase in economic output, and 90 percent of energy demand growth over the period from 2010 to 2035. Developing countries and transition economies are, moreover, expected to produce 64 percent of the world's energy-related carbon dioxide equivalent emissions growth (International Energy Agency 2011). If not carefully planned, the preparation and execution of world events can produce significant emissions in addition to these projected aggregate levels.

By including low-emission transportation, renewable energy technologies, and greening initiatives in the planning and execution of world events, greenhouse gas emissions associated with them can be reduced substantially. Demonstrations at world events, moreover, help host countries and representatives of participating nations understand the real-world benefits and logistics of embracing environmentally sound technologies and management practices. These events can serve, therefore, as a launching point for facilitating transfer and adoption of greener practices in other parts of the country.

Introduction

With the goal of addressing climate change, the Global Environment Facility (GEF) has been at the forefront of financing the transfer of environmentally sound technologies to developing countries and transition economies for more than 20 years. World events, such as the Olympics, provide a unique opportunity to demonstrate projects focusing on this goal to a national and even a global audience, increasing a given project's chance for success.

Developing countries and transition economies have the potential to contribute substantially to the world's carbon footprint, but also to significantly reduce their contribution as they grow. As an operating financial entity of the United Nations Framework Convention on Climate Change (UNFCCC), the GEF leverages funding from donor nations to support projects in these countries and economies related to climate change. In addition, as a financial mechanism for other environmental treaties, such as the Convention on Biological Diversity, the United Nations Convention to Combat Desertification, and the Stockholm Convention on Persistent Organic Pollutants, the GEF leverages donor funding to carry out projects in developing countries and transition economies related to biodiversity, international waters, land degradation, the ozone layer, and persistent organic pollutants. These projects benefit the global environment, linking local, national, and global environmental challenges and promoting sustainable livelihoods.

The GEF provides support through ten GEF Agencies such as the World Bank, the International Finance Corporation (IFC), the United Nations Development Programme (UNDP), and the United Nations Environment Programme (UNEP) in the form of investment grants, partial loan guarantees, and special-purpose funds such as loan loss reserve funds, revolving funds, and equity funds. The GEF's support has been praised for combining investment funding with technical assistance and for developing and introducing new financial mechanisms and pilot projects, which often have overcome high transaction costs and initial risks.

The purpose of this brochure is to show how world events have been made "green" by GEF support through investing in low-emission transportation, renewable energy technologies and greening initiatives. This has been done by showcasing these technologies and initiatives at world events in front of a global audience. The experiences from these events have catalyzed additional greening in other cities and countries across the world.

World Events

The GEF-supported projects demonstrate and promote environmentally sound technologies and practices at world events.

FIGURE 1 PROFILE OF GEF-SUPPORTED PROJECTS AT WORLD EVENTS

2013 Summer Universiade-Kazan, Russia

GEF Funding: US$5.4 million
Co-financing: $158 million
several million participants
CO_2eq 2–3.9 million tonnes

2008 Summer Olympics–Beijing, China
Electric and Fuel Cell Buses

GEF Funding: $6.8 million
Co-financing: $22.4 million
8 million participants
CO_2eq 765 tonnes (for the demonstration part of the project only)

2014 Winter Olympics–Sochi, Russia
Greening Strategy and Action Plan

GEF Funding: $955,000
Co-financing: $2 million
8 million participants
CO_2eq 2.3 million tonnes

World Expo 2010–Shanghai, China
Fuel Cell Buses

GEF Funding: $5.8 million
Co-financing: $12.6 million
70 million participants
CO_2eq 245 tonnes (based on 6 buses, for the demonstration part of the project only)

2010 Commonwealth Games–Delhi, India
Low-Carbon Campaign

GEF Funding: $950,000
Co-financing: $2.7 million
several million participants
CO_2eq 15,000 tonnes (planting program)

2010 FIFA World Cup–seven cities, South Africa
Sustainable Public Transportation

GEF Funding: $11 million
Co-financing: $329 million
3 million participants
CO_2eq 423,000 tonnes (over 10 years)

2013 RUSSIA SUMMER UNIVERSIADE AND 2018 FIFA WORLD CUP

REDUCING GREENHOUSE GAS EMISSIONS FROM ROAD TRANSPORT IN RUSSIA'S MEDIUM-SIZED CITIES

In 2009, Russia became the country with the largest vehicle population in Europe, overtaking Germany. Vehicle fuel efficiency has marginally improved with the sustained growth of the automotive market. However, due to wide use of less-efficient vehicles, including new ones manufactured domestically and imported used ones, vehicle energy intensity in Russia is higher than in all other countries in the European Union.

Project Title:	Reducing GHG Emissions from Road Transport in Russia's Medium-sized Cities
GEF Agency:	UNDP
GEF Financing:	$5,400,000
Co-financing:	$158,136,000
Dates of Implementation:	2012–2017

Objective

The objective of the project is to reduce GHG emissions from urban transport systems in medium-sized Russian cities through the sustainable integrated transport planning, promotion of a long-term shift to more efficient and less polluting forms of transport, and demonstration of sustainable low-GHG transport technologies.

Outcomes

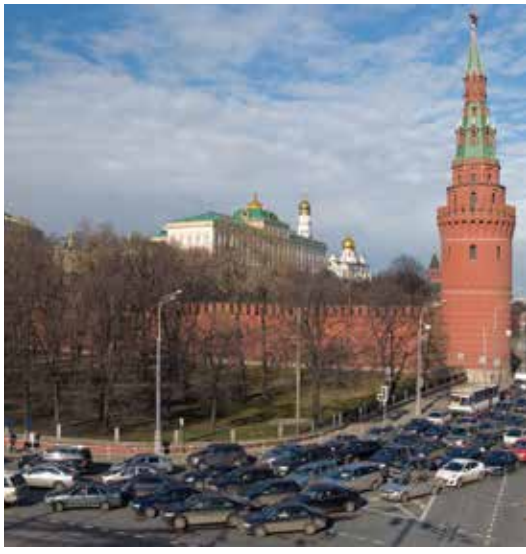
The expected outcomes of the project include:

- Integrated land-use and transport planning;
- Enforcement of more rigorous fuel efficiency and emissions standards;
- Increased market share of efficient cars;
- Increased use of public transport by thirty percent;
- Decreased time spent in traffic jams by twenty percent; and
- Successfully replicated transport planning and traffic management models in three Russian cities.

Because over 70 percent of Russia's population resides in cities, energy consumption in the transportation sector is concentrated in urban areas. With the growth of the automotive market, urban traffic loads are expected to exceed road capacities in many cities, exacerbating urban traffic congestion.

The GEF is leveraging funding for a project to reduce greenhouse gas (GHG) emissions from urban transport systems in medium-sized Russian cities. Approaches of the project include sustainable integrated transport planning, shifting from less efficient and more polluting transportation modes to more efficient and less polluting ones, and demonstration of sustainable low-GHG transport technologies.

The GEF project will support Kazan to prepare its Sustainable Urban Transport (SUT) system. Kazan is the city where the 2013 Summer Universiade will be held. The SUT system will also be used for the 2018 Fédération Internationale de Football Association (FIFA) World Cup to be held in the city. The project will enable the city to gradually reduce the use of private cars and encourage the use of more fuel-efficient cars.



2008 SUMMER OLYMPICS–BEIJING, CHINA

ELECTRIC AND FUEL CELL BUSES

China's economic growth sparked an increase in automotive fleets. Vehicle sales in China grew from 2.4 million in 2001, 5.6 million in 2005, and 7.2 million in 2006 (IPCC 2007). At the same time, the global transport sector's emissions were growing rapidly, reaching 6.4 Giga tonne (Gt) CO_2 eq in 2006 or 23 percent of the world's energy-related CO_2 eq emissions (IEA 2008). With this background of economic development, vehicle population growth, and increased GHG emissions, China hosted 2010 Summer Olympics in Beijing.

To help encourage the use of lower-emission public transportation, the GEF leveraged funding for two projects that demonstrated electric buses that were powered solely by lithium-ion batteries at the Beijing Olympics. These buses use a rechargeable battery to power an electric motor and motor controller, rather than a gasoline or diesel engine, resulting in minimal emissions.

The Beijing Municipal Environmental Protection Bureau demonstrated the feasibility of using 50 of these buses at the Olympics (three directly financed by the GEF) and conducted an outreach program to encourage the acceleration of the development and deployment of clean vehicle technologies throughout China. The outreach program also raised awareness among athletes, the media, and the general public about global environmental issues and how individuals could help reduce their negative impact on the environment.

After the project, Beijing continued to use buses powered by lithium-ion batteries to transport passengers. China also launched a "10 city, 1,000 buses" initiative to encourage the adoption and development of alternative fuel buses across the country. This initiative called for more than ten of China's large cities, including Shanghai, Beijing, Chongqing, Shenzhen, Wuhan and Zhuzhou, to put 1,000 alternative fuel vehicles on the streets over the last four years. In doing so, these cities contributed to the national goal of having ten percent of China's domestic vehicles use low carbon emission technologies. In this regard, the demonstration of fuel cell buses began in Beijing by the procurement and operation of six fuel cell buses, three financed by the GEF and three co-financed by partners. The pilot was later extended to the Shanghai World EXPO 2010.

Title of Project 1:	Demonstration of Fuel Cell Bus Commercialization in China (Phase 1)
GEF Agency:	UNDP
GEF Financing:	$5,815,000
Co-financing:	$10,116,000
Dates of Implementation:	November 2002–November 2004

Title of Project 2:	Promoting Clean Electric Buses for the Beijing Olympics
GEF Agency:	UNDP
GEF Financing:	$1,000,000
Co-financing:	$12,300,000
Dates of Implementation:	July 2008–December 2008

Objective

The object of the two projects was to support the Chinese efforts in greening the 2008 Olympic Games in Beijing through the demonstration of electric buses solely powered by lithium-ion batteries (hydrogen fuel cell technology).

Outcomes

The outcomes of the project included:

- Improved air quality at the Olympics venues and surroundings;
- Three hydrogen fuel cell buses and one hydrogen refueling station directly financed by the GEF;
- Completed outreach program to encourage the acceleration of the development and deployment of clean vehicle technologies throughout China;
- Raised awareness of athletes, the media, and the general public about global environmental issues; and
- Continued use of lower-emission public transportation buses to transport passengers in Beijing.

WORLD EXPO 2010—SHANGHAI, CHINA

FUEL CELL BUSES AND EXHIBIT

Since 1851, the World Exposition, or the World's Fair, has brought together countries from around the globe to showcase cultural experience and demonstrate technological innovation. Shanghai served as the first developing country to host a registered World Expo 2010 with the theme "Better City, Better Life." During the 184 days of the Expo, 70 million visitors from 192 countries visited the many exhibition pavilions and events to explore the full potential of urban life in the 21st century.

Project Title:	Demonstration of Fuel Cell Bus Commercialization in China, Phase II- Part 2
GEF Agency:	UNDP
GEF Financing:	$5,767,000
Co-financing:	$12,858,000
Dates of Implementation:	2007—2011

Objective

The objective of this project was to demonstrate the operational viability of hydrogen fuel cell buses and their refueling infrastructure under Chinese conditions.

Outcome

The outcomes of the project included:

- Three fuel cell buses and one hydrogen refueling station operational in Shanghai;
- Knowledge accumulated, available and accessible for advancing commercialization of hydrogen fuel cell bus technology and hydrogen refueling stations; and,
- Awareness promoted among stakeholders and creation of an enabling environment for fuel cell bus expansion in China.

In China, rapid economic growth has been accompanied by accelerated urbanization. The average annual rate of population growth in urban areas during the 1990s (2.9 percent per year) was over seven times the rate in rural areas; today, approximately 50 percent of Chinese residents live in cities. This rapid urbanization has increased demand for public transport services—the demand for buses in China is expected to grow at an average rate of five percent per year between 2000 and 2030, to 108,000 buses in 2030. This growth has the potential to increase emissions, as lower-emission alternatives are cost prohibitive to cities in China's transitioning economy.

The GEF leveraged funding for a project to catalyze the cost reduction and encourage the adoption of energy-efficient fuel cell buses for public transit in Chinese cities. This pilot project, which began with a demonstration at the Olympics in Beijing, entered its second demonstration phase at the World Expo 2010 in Shanghai.

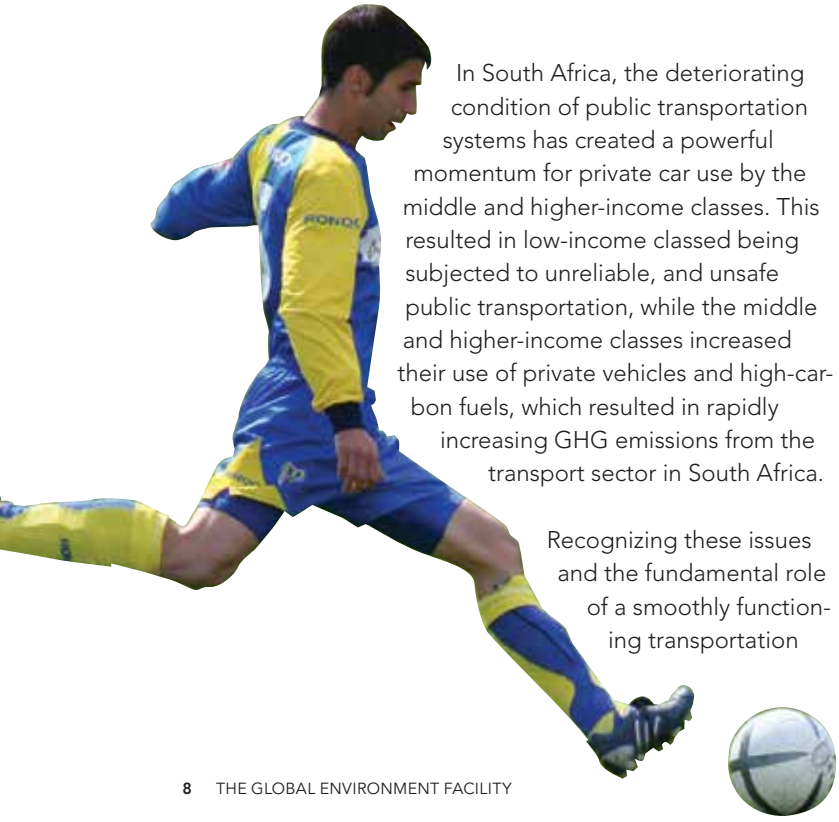
As a part of this second phase of the project, six hydrogen-powered fuel cell buses served the fleet of zero-emission buses shuttling visitors along the main bus route at the Expo. These green, hi-tech, and energy-efficient vehicles served as vivid examples of how cities can become greener and provide better lives for their citizens. This demonstration and other sustainable transport solutions were showcased in a GEF exhibit at the Expo called "The Green Line", which displayed information on the GEF's work in climate change. The fuel cell bus demonstration project will be reproduced in additional Chinese cities in an effort to mainstream sustainable transport.

2010 FIFA WORLD CUP–SOUTH AFRICA

SUSTAINABLE PUBLIC TRANSPORTATION

Occurring every four years since 1930, the World Cup brings 32 teams from the FIFA and fans from around the world to one host nation for a month-long tournament. South Africa successfully hosted the 2010 World Cup, welcoming more than 3 million fans to attend matches at venues in nine different cities.

The 2010 FIFA World Cup had the largest estimated carbon footprint of any major event that had a goal to be climate neutral (zero emission practices)—an estimated 0.9 Mt CO_2 eq, with an additional 1.9 Mt CO_2 eq and 0.34 Mt CO_2 eq emitted by international travel and accommodation, respectively (Norad 2009). The estimated 0.9 Mt CO_2 eq was more than eight times the estimated footprint of the 2006 World Cup in Germany, due in large part to the greater distances between matches and the lack of high-speed light rails to transport spectators from venue to venue (Norad 2009). These issues resulted in greater reliance on planes, passenger cars, or small buses, which produced higher levels of emissions.



In South Africa, the deteriorating condition of public transportation systems has created a powerful momentum for private car use by the middle and higher-income classes. This resulted in low-income classed being subjected to unreliable, and unsafe public transportation, while the middle and higher-income classes increased their use of private vehicles and high-carbon fuels, which resulted in rapidly increasing GHG emissions from the transport sector in South Africa.

Recognizing these issues and the fundamental role of a smoothly functioning transportation

Project Title:	Sustainable Public Transport and Sport: A 2010 Opportunity
GEF Agency:	UNDP
GEF Financing:	$10,973,000
Co-financing:	$328,494,000
Dates of Implementation:	2008—2011

Objective

The objective of this project was to promote safe, reliable, efficient, coordinated and integrated urban passenger system in South Africa.

Outcomes

The outcomes of the project included:

- Improved transport systems in five 2010 venue cities;
- Strengthened capacity and increased knowledge to plan, manage, and implement sustainable transportation options;
- Developed sustainable transportation planning options;
- Assessed the potential of alternative transport technologies and fuels; and
- Assessed sustainable transportation options in the selected World Cup venue cities.

system for the 2010 FIFA World Cup, the GEF leveraged funding to help improve and promote environmentally sound public transport in South Africa. This project, implemented by the South African Department of Transport, included support for improvements in urban transport service and systems, improvements in coordinated and integrated transport planning, and and strengthened technical capacity with the South African transport sector.

The project used the 2010 FIFA World Cup planning window as a catalyst for change to achieve fundamental, appropriate improvements to the South African public transport and land-use planning system. Achievements included transport system improvements in seven venue cities—Johannesburg, Nelson Mandela Bay, Mbombela, Polokwane, Mangaung, Rustenburg, and Cape Town—and strengthened capacity and increased knowledge to plan, manage, and implement sustainable transportation options.

2010 COMMONWEALTH GAMES–DELHI, INDIA

LOW-CARBON CAMPAIGN

The 2010 Commonwealth Games, which started in October, were held in the city of Delhi for a duration of two weeks. Several million people attended the largest multi-sport event conducted in India, and many more millions of people observed through media sources. Organizers of the games were committed to hosting a sustainable event, which included taking the environment into consideration when constructing and renovating venues. Building the environmentally sound Thyagaraj Stadium was one of the many reasons the Delhi games were recognized as the first-ever "Green Commonwealth Games".

India emitted around 1.5 billion tonnes of CO_2 eq in 2009—a figure expected to increase by an average of 2.1 percent per year through 2030 (Boden, Marland, and Andres 2009; EIA 2009). With a population growing to new heights—over 1.2 billion people to date—encouraging public adoption of affordable lower-emission technologies and practices has proven difficult.

To help reduce India's future emissions, the GEF leveraged funding for a campaign to encourage citizens, athletes, and visitors to adopt environmentally sound technologies and practices. This low-carbon campaign, developed by the Commonwealth Games Organizing Committee, the Government of National Capital Territory Delhi, the Ministry of Environment and Forests, and the Government of India, was launched at the 2010 Commonwealth Games.

One of the projects supported by the campaign was a tree-planting program, in which residents received support to plant trees in their communities. Overall, the campaign promoted low-carbon practices to the residents, athletes, visitors, and media who attended the 2010 Commonwealth Games. Using the venue as a way to reach a large audience, organizers replicated 10 such tree-planting programs across India. As a result of the GEF project, Commonwealth Game participants, Delhi residents, and visitors took steps to reduce their personal carbon footprints.

Project Title:	Low Carbon Campaign for Commonwealth Games 2010 Delhi
GEF Agency:	UNDP
GEF Financing:	$950,000
Co-financing:	$2,650,000
Dates of Implementation:	2010–2012

Objective

The objective of the project was to develop and promote a low carbon campaign for the 2010 Commonwealth Games as a means of inducing a behavioral change amongst citizens, athletes and visitors for the adoption of environmentally sustainable practices.

Outcomes

The outcomes of the project included:

- Created awareness among public, athletes, visitors and media on low carbon practices;
- Enhanced awareness among the children/students of schools and colleges on low carbon practices;
- Ten tree-planting programs replicated all over the country;
- Five cities implemented low carbon activities/programs as a result of this project;
- Commonwealth games participants, New Delhi residents, and visitors started to take steps to reduce their carbon footprints;
- Enhanced public image of the GEF as a global entity to support environmentally sustainable development; and
- Developed guidelines for 'greening' future sporting events for the country.

2014 WINTER OLYMPICS–SOCHI, RUSSIA

GREENING STRATEGY AND ACTION PLAN

An estimated 1.2 million people will attend the Sochi XXII Winter Olympics in February 2014 to watch the world's best winter athletes compete. To prepare for the Olympics, Sochi is constructing 11 athletic venues divided into two clusters along the coastline and in the mountains. The city is also building a new railway to travel the 48 km between the venue clusters, and is planning to add other methods of transportation, new power infrastructure, and accommodations.

Russia is the fourth-largest CO_2 eq emitting country in the world after China, the United States and India, and the magnitude of Russia's GHG emissions changes as the strength of Russia's economy changes. The economic downturn after the break-up of the former Soviet Union caused emissions to fall by 34 percent between 1990 and 1998. Emissions increased by 2 percent in 1999 and 3 percent in 2000 due to the Russia's strong economic recovery, stimulated by the increase in world energy prices. Total CO_2 eq emissions remained fairly constant between 2001 and 2005. Because of the global financial crisis in the late 2000s, Russia's emissions dropped by 5 percent in 2009. However, emissions grew by 4 percent in 2010, Russia's second-highest annual increase since 1990. As a result, total CO_2 eq emissions from fossil fuel consumption in Russia dropped from 2.18 billion tonnes in 1990 to 1.58 billion tonnes in 2010, reducing by 27.4 percent (IEA 2012). There is an opportunity for Russia to develop ways to reduce its emissions without sacrificing economic development in preparation for the 2014 Winter Olympics.

The new construction and infrastructure improvements taking place in Sochi in preparation for the Olympics present a substantial opportunity for Russia to reduce its emissions output. With support from the GEF, the Ministry of Natural Resources and Environment of the Russian Federation will produce a Greening Strategy and Action Plan for the 2014 Olympics. The plan will factor in climate change initiatives early in the planning process to help set up a carbon-neutral event

Project Title:	Greening 2014 Sochi Olympics: A Strategy and Action Plan for the Greening Legacy
GEF Agency:	UNDP
GEF Financing:	$955,000
Co-financing:	$2,000,000
Dates of Implementation:	January 2011–December 2012

Objective

The objective of the project is to produce a Greening Strategy and Action Plan for the 2014 Winter Olympics in Sochi.

Outcomes

The outcomes of the project included:

- An action programme for introducing green standards for Sochi Olympics construction and further replication;
- An integrated strategy and action plan for energy efficiency;
- An action plan for reducing GHG emissions through increased application of renewable energy technologies at 2014 Olympics; and
- An integrated strategy and action plan for reducing GHG emissions from transport during preparations and convening of the Olympics Sochi Carbon Offsets Programme.

and unleash the potential for GHG emissions reduction during the games.

The project will include the development of greening recommendations and action plans for six sectors: green building standards, energy efficiency and power planning, renewable energy technologies, low-carbon transport, carbon offsets, public awareness, and advocacy. The action plans will be implemented during the planning phase and at the event to help ensure a carbon-neutral 2014 Winter Olympics, and encourage the future transfer of technologies to other cities in Russia.

Looking Ahead

The opportunities to encourage the adoption of environmentally sound technologies and practices in developing countries and transition economies are significant. World events serve as opportunities to showcase and raise awareness about innovative technologies and practices. Future GHG emission mitigation potential lies in a country's ability to incorporate these technologies and practices into its infrastructure in the long term.

An important component to ensuring successful adoption is careful upstream planning. The transportation project that will take place at the 2018 FIFA World Cup in Russia was approved in 2010, leaving time to effectively green the event in a sustainable way that will positively impact cities and citizens in Russia. The project in place for the 2014 Winter Olympics in Sochi will also provide the country with time to secure the investment plan and green the city's infrastructure.

Two other important events will take place in 2014 and 2016 in Brazil, when that country will host the world's two premier sporting events—the 2014 FIFA World Cup and the 2016 Olympic Games in Rio de Janeiro. The 2014 World Cup will be conducted in 12 Brazilian cities. Public works projects of approximately $52 billion are planned in order to develop the necessary infrastructure, including stadiums construction, urban transport systems, roads and highways, airports, electric power network expansion, telecommunications networks, water, and wastes. The 2016 Olympic Games in Rio de Janeiro will require extra investments of approximately $11 billion for the same purposes. With cooperation of international partners, the large sums of national capital required for the events will likely be invested in a more environment friendly manner.

The GEF has learned that by establishing projects like these well in advance and taking the time to plan, world events can act as a successful launch pad for technology adoption and transfer, putting in place the innovative technologies and practices that can have a substantial positive impact on climate change.

As of October 2012, the GEF has allocated more than $38 million and leveraged more than $556 million to develop, demonstrate, and implement environmentally sound technologies and initiatives for world events in developing countries. This leverage of funding provides the resources needed to incorporate advanced technologies during infrastructure building, effectively achieving more than any one organization that could achieve alone.

Through its experience in greening world events, the GEF has learned how to use these international gatherings to make lasting positive changes in developing countries and transition economies—not only in physical infrastructure, but in the millions of minds who have the power to mitigate the negative human contribution to climate change.

ABBREVIATIONS AND ACRONYMS

CO_2 eq	Carbon Dioxide Equivalent
EU	European Union
FIFA	Fédération Internationale de Football Association
GEF	Global Environment Facility
GHG	Greenhouse Gas
IEA	International Energy Agency
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
MoU	Memorandum of Understanding
Mt	Megatonne or Mega Metric Ton
NGO	Non-Governmental Organization
SUT	Sustainable Urban Transport
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

UNITS OF MEASURE

Gt	Gigatonne
Mt	Megatonne or Mega Metric Ton

REFERENCES

Boden, T.A., G. Marland, and R.J. Andres. 2009. "Global, Regional, and National Fossil-Fuel CO_2 eq Emissions." Oak Ridge: Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy. http://cdiac.ornl.gov/trends/emis/tre_ind.html; http://cdiac.ornl.gov/trends/emis/tre_rus.html.

Department of Environmental Affairs and Tourism and the Norwegian Government (Norad). 2009. Feasibility Study for a Carbon Neutral 2010 FIFA World Cup in South Africa. Stockholm: Norad. http://www.norway.org.za/NR/rdonlyres/3E6BB1B1FD2743E58F5B0BEFBAE7D958/114457/ Feasibility StudyforaCarbonNeutral2010FIFAWorldCup.pdf.

Energy Information Administration (EIA). 2009. "Chapter 8: Energy-Related Carbon Dioxide Emissions." *International Energy Outlook 2009. Washington, D.C.: Energy Information Administration, U.S. Department of Energy.* http://www.eia.doe.gov/oiaf/ieo/emissions.html.

International Energy Agency (IEA). 2008. *World Energy Outlook 2008.* Paris, IEA.

International Energy Agency (IEA). 2012. *CO_2 Emissions from Fuel Combustion—IEA Statistics Highlights.* Paris, IEA.

Intergovernmental Panel on Climate Change (IPCC). 2007. IPCC Fourth Assessment Report. Working Group II Report "Mitigation of Climate Change."

PHOTOGRAPHY

cover: stock.xchng
Page 1: stock.xchng
Page 2: stock.xchng
Page 4: Asadov Architectural Studio
Page 4: Reuters
Page 4: Rama Lakshmi—The Washington Post
Page 4: www.shanghaidaily.com
Page 4: The Beijing Organizing Committee for the Games of the XXIX Olympiad
Page 5: shutterstock
Page 7: Bureau of Shanghai World Expo Coordination
Page 9: 2010 FIFA World Cup
Page 11: stock.xchng
Page 13: Sochi 2014 Organizing Committee
Page 14: stock.xchng

PRODUCTION CREDITS

Text: Dr. Ming Yang, Dr. Robert K. Dixon, Dr. Zhihong Zhang, Mr. Dimitrios Zevgolis and Ms. Tingting Tang

Review and Edits: Dr. Robert K. Dixon and Dr. Chizuru Aoki

Production Date: Revised January 2013
Design: Patricia Hord.Graphik Design
Printer: Professional Graphics Printing Co.
ISBN: 978-1-939339-54-6

ABOUT THE GEF

The Global Environment Facility unites 183 member governments—in partnership with international institutions, nongovernmental organizations, and the private sector—to address global environmental issues. As an independent financial organization, the GEF provides grants to developing countries and transition economies for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants. These projects benefit the global environment, linking local, national, and global environmental challenges and promoting sustainable livelihoods.

Since 1991, the GEF has achieved a strong track record with developing countries and countries with economies in transition, providing $11.5 billion in grants and leveraging $57 billion in co-financing for over 3,215 projects in over 165 countries. Through its Small Grants Programme (SGP), the GEF has also made more than 16,030 small grants directly to civil society and community based organizations, totaling $653.2 million.

The GEF partnership includes 10 Agencies: the UN Development Programme, the UN Environment Programme, the World Bank, the UN Food and Agriculture Organization, the UN Industrial Development Organization, the African Development Bank, the Asian Development Bank, the European Bank for Reconstruction and Development, the Inter-American Development Bank, and the International Fund for Agricultural Development. The Scientific and Technical Advisory Panel provides technical and scientific advice on the GEF's policies and projects.

www.theGEF.org

GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET