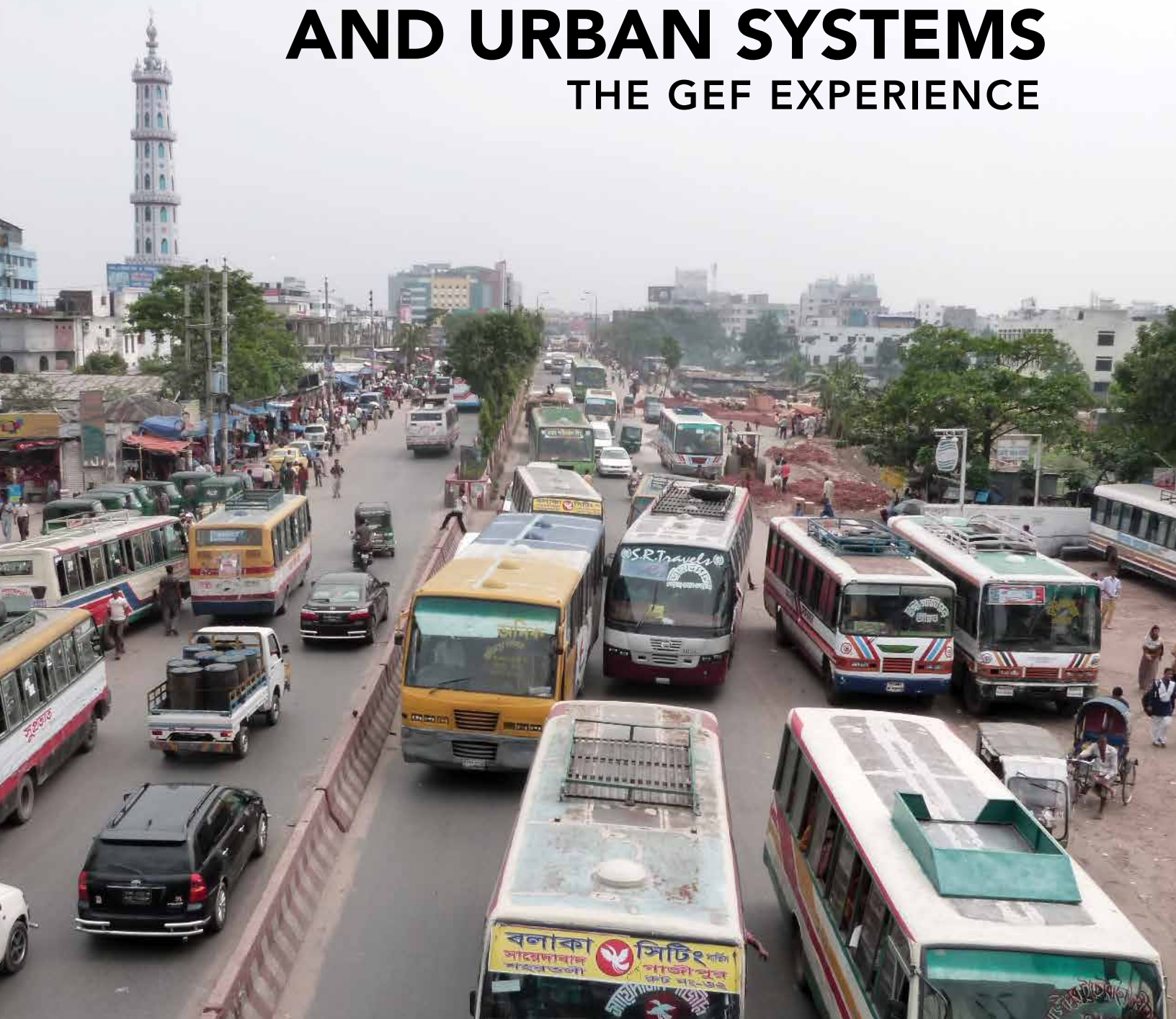




GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

INVESTING IN SUSTAINABLE TRANSPORT AND URBAN SYSTEMS THE GEF EXPERIENCE



Foreword

City landscape in Tianjin, China



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Global energy use for transport grows annually in parallel with economic growth. Global environmental challenges in the transport sector are daunting, with transportation-related greenhouse gas emissions growing more than in other sectors, a trend likely to continue and accelerate in the future.

The Global Environment Facility (GEF) catalyzes transformational change by supporting sustainable transport, which reduces greenhouse gas emissions. These investments also pay dividends at the local level. For example, the GEF works with stakeholders to expand clean public transport choices that reduce local air pollution and traffic congestion. These projects improve access to affordable and efficient transport and public infrastructure for the local communities and citizens. Co-benefits make GEF interventions more attractive in countries and regions where local problems are as important as global ones.

The GEF has built an investment portfolio that addresses emissions from the transport sector in developing and transition countries. The portfolio includes 50 projects worldwide, with US\$293 million committed and an additional \$3.2 billion leveraged in co-financing from national governments and elsewhere. GEF projects are under way in 90 cities around the world, creating a sustained impact in the transport sector and making a positive contribution in the lives of people every day.

Transport is a driver of economic and social development worldwide. Sustainable transport is essential not only for environmental protection but for economic prosperity. Energy-efficient, low-carbon transport also contributes to energy security, which is increasingly vital to all countries. To bring about sustainable transport, the GEF continues to play a catalytic role in cooperation with our partners. As an innovator to generate global environmental benefits, the GEF also extends its support to environmentally-friendly urban design, which promotes energy-efficient, low-carbon cities with sustainable transport infrastructure.

This brochure presents GEF investments in sustainable transport and urban systems. The lessons we have learned, and the success stories that have resulted from our investments, can be replicated all over the world. I hope readers gain an insight into what we do now, and what we expect to accomplish, in sustainable transport and urban systems with our partners.



Introduction



Cars, trucks, buses, trains, ships and airplanes—the world relies on transportation to fuel its economic growth and development. People travel to jobs, materials are delivered to manufacturing sites, and goods can make it to market. Transport is an important ingredient of economic and social development.

Expanding global transport has, until now, gone hand-in-hand with increases in greenhouse gas (GHG) emissions. Conventional technologies and transport modes emit substantial amounts of carbon dioxide (CO₂), making the transport sector a key contributor to human-induced global climate change. Indeed, over the past decade, GHG emissions from the transport sector have increased faster than emissions from any other sector. To meaningfully address global climate change, there is a need for transformation of transport policies and practices worldwide.

Since its pilot phase, the Global Environment Facility (GEF) has worked to develop sustainable transport projects, which are conducive to environmental protection, economic growth and energy security. The GEF's initial programmatic commitment to sustainable transport, adopted as part of GEF-2¹ (1998–2002), has grown into a leading focus in the current GEF portfolio. As of July 2012, the GEF has funded 50 urban transport projects² in 43 countries worldwide. A review of the results to date shows that these projects have had a direct and cost-effective impact on reducing GHG emissions.

This brochure summarizes the unprecedented challenges and opportunities in the transport sector, followed by GEF's strategy and achievements for sustainable transport and urban systems.



Sustainable Transport and Urban Systems Challenges and Opportunities

Challenges in the Transport Sector

The International Energy Agency (IEA) estimates that the transport sector produced emissions of 6.5 gigatonnes (Gt) CO₂, or 23 percent of world energy-related CO₂ emissions (IEA 2011a) as shown in Figure 1. Road transport accounts for about three-fourths of the CO₂ emissions in the sector. The growth of this sector's emissions is strongly linked to the increasing number of cars worldwide. The world auto fleet is swiftly growing, particularly in emerging economies. The World Business Council for Sustainable Development/Sustainable Mobility Project (WBCSD/SMP) reference case projection indicates that the number of light-duty vehicles worldwide will continue to grow to about 1.3 billion by 2030 and to just over two billion by 2050, which is almost three times the present level (WBCSD 2004) as shown in Figure 2. Nearly all of this increase will be in the developing world.

The IEA also projects that oil demand (excluding biofuels) will rise from 87 million barrels per day (MBPD) in 2010 to 99 MBPD in 2035; all of the net increase in oil demand is attributed to the transport sector in emerging economies³ where economic growth is pushing up demand for personal mobility and freight (IEA 2011b).

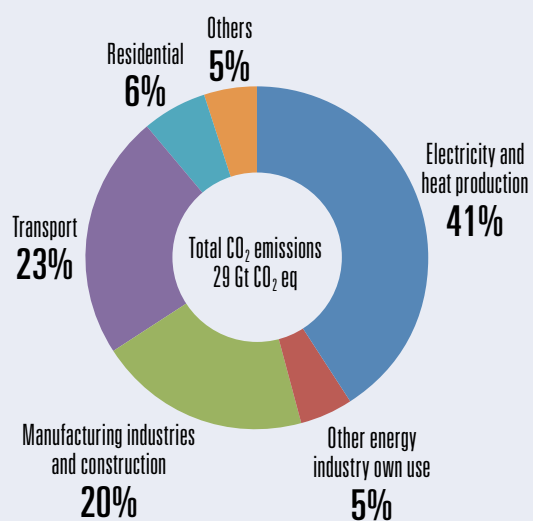
This trend is related to rapid urbanization across the globe. According to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (IPCC 2007), about 75 percent of people in the industrialized world and 40 percent in the developing world now live in urban areas. At the same time, cities have been spreading out faster than they have grown in population, with rapid growth in suburban areas and the rise of "edge cities" in

In Kathmandu, Nepal, cars, two-wheelers and pedestrians intermingle.



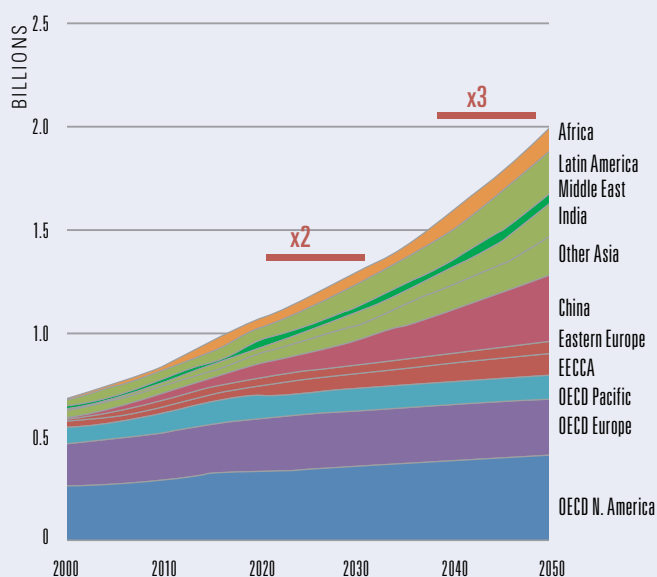
Train station in Mumbai, India

FIGURE 1 GLOBAL CO₂ EMISSIONS FROM FUEL COMBUSTION BY SECTOR



Source: IEA 2011.

FIGURE 2 TOTAL STOCK OF LIGHT-DUTY VEHICLES BY REGIONS OF THE WORLD



Source: WBCSD 2004.

the outer suburbs. This decentralization or “sprawl” creates a growing demand for access to transportation. With growing urbanization, the United Nations estimates that, by the middle of this century, seven out of every 10 people on the planet will be living in urban areas (UN-HABITAT 2012).

As economic growth and urbanization increase demand, the supply of transport services will have to increase rapidly to meet those demands. The IEA projects that, given current trends, transport energy use and CO₂ eq (carbon dioxide equivalent) emissions will increase by nearly 50 percent by 2030 and more than 80 percent by 2050 (IEA 2009).

Opportunities for the Future

Decoupling the expected growth in transportation from corresponding increases in GHG emissions presents a clear challenge to the international community. Innovative new technologies and policies, at scale, will be required. Fortunately, many promising technologies and strategies are already available to reduce or even eventually reverse the growth of GHG emissions (IPCC 2007). The Global Energy Assessment (GEA) suggests that a major transformation of transportation is possible over the next 30 to 40 years by improving vehicle designs, infrastructure, fuels, and behavior (GEA 2012).

In developing countries, there is tremendous demand for low-GHG transport technologies. For example, the second synthesis report of the United Nations Framework Convention on Climate Change (UNFCCC 2009)⁴ documents that most developing countries included transportation in their technology needs assessments (TNAs) as one of the sectors with substantial GHG emissions and high potential to reduce emissions. Technologies needed in the transport sector include vehicles that emit fewer GHGs, high-efficiency motors, the production and use of biofuels, the upgrading of transport infrastructures, the improvement of road and railway construction, geographic information systems (GIS) and traffic control systems.

In general, there are three ways to address growing GHG emissions in the transport sector: **avoid** the need to travel by car, **shift** travel to a more efficient mode, and **improve** the energy efficiency of car travel. This is called the “Avoid, Shift and Improve (ASI)” strategy. Examples of each follow.

Avoid demand for car travel

Avoiding or reducing travel or the demand to travel by car is quite feasible by, for example, better urban design, congestion pricing and parking policies. From a long-term perspective, GHG emissions can be reduced by shaping the design of cities and lowering motorization so that local clusters of economic activities require less car-centered mobility. Planning and policy to restrain light vehicles and increase land-use density lead not only to reduced GHG emissions, but also to reduced pollution, traffic congestion, oil use, and infrastructure expenditures, and are generally consistent with social equity goals as well (IPCC 2007).

Shift travel to more efficient modes

Greenhouse gas emissions can be considerably reduced by offering strong and optimized public transport, integrating transit with efficient land use, enhancing non-motorized transport (NMT) such as walking and cycling, and encouraging mini-cars and electric two-wheelers. Around the world, bus rapid transit (BRT), which gives exclusive right of way lanes to buses, is gaining attention as a cost-effective complement to light rail transit (LRT) and as an improvement over conventional bus service. In addition to reducing transport emissions, public transport like BRT carries the social benefit of increasing the mobility of people without access to cars.

Transport demand management (TDM) improves road performance by controlling and reducing traffic volumes. TDM is particularly appropriate in developing country cities because of its low costs, multiple benefits, and potential to reduce reliance on motorized transport (IPCC 2007). In many cases, effective TDM during the early stages of development can avoid the problems that result when communities become too automobile-dependent. Early avoidance of these problems can help support a developing country's economic, social, and environmental objectives (Gwilliam et al. 2004).

Improve energy efficiency of travel

Improving vehicle energy efficiency offers an excellent opportunity for GHG mitigation. The IPCC has determined that carbon emissions from ‘new’ light-duty road vehicles could be reduced by up to 50 percent by 2030 compared to currently produced models (IPCC 2007). How the significant increase in vehicle demand in developing countries will be met in the coming decades is crucial. Total GHG emissions will differ significantly



Traffic congestion in Hanoi, Vietnam

depending on whether these demands are met by energy-efficient transport modes and vehicles or, for example, by old used cars. In the medium- and longer-term, electric and fuel-cell vehicles could play important roles⁵ in those efforts, though their market penetration is currently small.

From a policy perspective, fuel economy regulations, taxes, and subsidies can be effective in promoting vehicle efficiency improvements. Changes in driving practices can also reduce fuel consumption of vehicles. Road vehicle efficiency could be improved by 5 to 20 percent through strategies such as eco-driving styles, increased load factors, improved maintenance, in-vehicle technological aids, more efficient replacement tires, reduced idling, and better traffic management and route choice (IPCC 2007).

These ASI approaches to controlling GHG emissions—avoiding demand for car travel, shifting travel to more efficient travel modes, and improving energy efficiency of travel—encompass a large range of possible cost-effective mitigation options for the transport sector. The best choice of options varies by technologies, geography, natural resources, policy framework and myriad other factors. The local economy, geography, population, and culture all influence the feasibility and effectiveness of each option. Policies and measures must be tailored to

local conditions by carefully assessing the existing situation and consulting with relevant stakeholders. It is also important to support new measures with appropriate legal frameworks, training, capacity building, and public awareness campaigns.

In addition to reducing GHG emissions, these changes will bring about other benefits, including reduction of local air pollutants, mitigation of traffic congestion, and improved access to affordable and efficient transport modes. These co-benefits are attractive to local policymakers, practitioners, and other stakeholders. Local air pollutants and GHGs have a common source in motorized traffic, which may also create congestion, noise and accidents. By addressing these issues simultaneously through climate change mitigation efforts, the development and climate agendas can be integrated, potentially offering large cost reductions, as well as reductions of health and ecosystem risks.⁶ For example, the Institute for Global Environmental Strategies (IGES) estimates that 1 tonne of CO₂ reduction in constructing BRT lines is accompanied by the reduction of 5.8 tonnes of nitrogen oxides (NO_x) and 1.5 tonnes of particulate matter (PM) (IGES 2011). Actions taken to reduce GHG emissions from transport can also generate co-benefits for economic development and energy security.

GEF's Strategy on Transport and Urban Systems

As an operational entity of the financial mechanism of the UNFCCC, the GEF has supported a variety of mitigation efforts in developing countries over the past 21 years in close cooperation with recipient countries and GEF Agencies. Sustainable urban transport projects have been one of the main pillars in the climate change mitigation portfolio.

In the GEF-5 replenishment cycle (2010–2014), promoting “energy efficient, low-carbon transport and urban systems” is one of the key objectives in the climate change mitigation (CCM) focal area. This objective builds on prior GEF sustainable urban transport programs, expanding the scope to include integrated approaches to promoting energy-efficient low-carbon cities. The GEF-5 Climate Change Mitigation Results Framework articulates this transport objective along with key expected outcomes and core outputs, as shown in Table 1.

The GEF-5 intervention strategies include land-use and transport planning, public transit systems, energy efficiency improvement of the fleet, efficient traffic control and management, transport demand management, and non-motorized transport. Technology options in the transport sector, such as promoting clean low-carbon vehicles, may be considered in countries where significant GHG emissions reduction as well as local development and environmental benefits can be achieved. Table 2 illustrates potential initiatives under the GEF-5 transport framework developed by the GEF Scientific and Technical Advisory Panel (STAP)⁷.

Compared to prior GEF investments, the GEF-5 focus is on transport with an expanded scope to address urban systems. Comprehensive interventions through integration of transport, energy, water, and housing sector activities are encouraged.

TABLE 1 GEF-5 CLIMATE CHANGE MITIGATION RESULTS FRAMEWORK ON SUSTAINABLE TRANSPORT AND URBAN SYSTEMS

Objectives	Key Expected Outcomes	Core Outputs
Promote energy efficient, low-carbon transport and urban systems	<ul style="list-style-type: none"> Sustainable transport and urban policy and regulatory frameworks adopted and implemented Indicator: Number of cities adopting sustainable transport and urban policies and regulations Increased investment in less-GHG intensive transport and urban systems Indicator: Volume of investment mobilized GHG emissions avoided Indicator: Tonnes of CO₂ eq 	<ul style="list-style-type: none"> Cities adopting low-carbon programs Investment mobilized Energy savings achieved

TABLE 2 EXAMPLES OF POTENTIAL INITIATIVES UNDER THE GEF-5 TRANSPORT FRAMEWORK

		Barrier removal	Catalytic	Innovative
Avoid	Passenger	<ul style="list-style-type: none"> Parking policies Fuel subsidies, vehicle registration fees Promote quota system for passenger vehicle operating licenses 	<ul style="list-style-type: none"> Implement road pricing/congestion charging Transit Oriented Development Optimize demand and supply of public transport system and route re-organization 	<ul style="list-style-type: none"> Develop and pilot test compact, mixed land use in cities
	Freight	<ul style="list-style-type: none"> User charges Awareness on opportunities to reduce emissions through integrated industrial and transport planning 	<ul style="list-style-type: none"> Mixed land-use development plans Reverse logistics Development of logistics platforms 	<ul style="list-style-type: none"> Develop and pilot test compact, mixed land use in cities
Shift	Passenger	<ul style="list-style-type: none"> Parking policies Enabling policies and regulatory frameworks for private sector participation 	<ul style="list-style-type: none"> BRT schemes Urban rail schemes Optimization of conventional bus systems Bike and pedestrian infrastructure 	<ul style="list-style-type: none"> Low/Zero Emission Zones Performance assessment schemes for urban transport systems
	Freight	<ul style="list-style-type: none"> Development of comprehensive long-term vision for freight and logistics infrastructure 	<ul style="list-style-type: none"> Investment in rail and inland waterway transport infrastructure 	<ul style="list-style-type: none"> Intermodal freight logistics schemes
Improve	Passenger	<ul style="list-style-type: none"> Fuel Economy standards for light-duty vehicles Speed limits 	<ul style="list-style-type: none"> Second-generation bio-fuels Low-resistance road surfaces 	<ul style="list-style-type: none"> Charging infrastructure for electric vehicles Intelligent Transport System (ITS)
	Freight	<ul style="list-style-type: none"> Fuel economy standards for heavy-duty vehicles Speed limits 	<ul style="list-style-type: none"> Improving load factors of vehicles Second-generation bio-fuels Low-resistance road surfaces 	<ul style="list-style-type: none"> Aerodynamic design of trucks and low-rolling-resistance tires Multi-modal infrastructure

Source: GEF-STAP 2010a

Measuring and quantifying global environmental benefits is an important basis for choosing the best sets of interventions in implementing CCM projects. At GEF's request, the STAP developed the manual "Calculating Greenhouse Gas Benefits of GEF Transportation Projects"

to provide a consistent methodology designed specifically for projects in the transport sector (GEF-STAP 2010b). The methodology provides uniformity in the assumptions and calculations used to estimate the GHG impact over a diverse array of potential transport projects.



GEF's Investments in Sustainable Transport and Urban Systems

Portfolio Overview

This section presents GEF's investments in sustainable transport and urban systems. From its pilot phase to the present (as of July 1, 2012), the GEF has supported 50 projects focused on actions to reduce GHG emissions from the transport sector primarily in urban systems. Asia has had the largest share, with 22 projects, as shown in Figure 3.

The GEF has allocated \$292.5 million to sustainable urban transport projects, with an average of \$5.9 million per project, as shown in Table 3. This funding has been supplemented by approximately \$3.2 billion in co-financing. This co-financing ratio of 1 to 10.8 is higher than the GEF average, as urban transport projects often require large-scale investments to develop infrastructure (see Figure 4). Overall funding for transport activities has increased since GEF-2.

Project documents indicate a direct GHG emissions reduction of 66.9 megatonnes (Mt) CO₂ eq combined from all GEF transport projects, and an expected indirect reduction of 124.7 Mt CO₂ eq. The average cost-effectiveness of GEF funding, for projects with estimated GHG emissions reductions, is around \$3.6/t CO₂ eq (direct reductions only).

To date, the United Nations Development Programme (UNDP) and the World Bank have carried out the largest number of GEF urban transport project, as shown in Table 4. The UNDP, World Bank and United Nations Environment Programme (UNEP) have implemented 19, 18 and eight projects, respectively. One project is implemented jointly by the World Bank and UNDP.

FIGURE 3 REGIONAL DISTRIBUTION OF THE GEF PORTFOLIO IN SUSTAINABLE URBAN TRANSPORT (1991–2012)

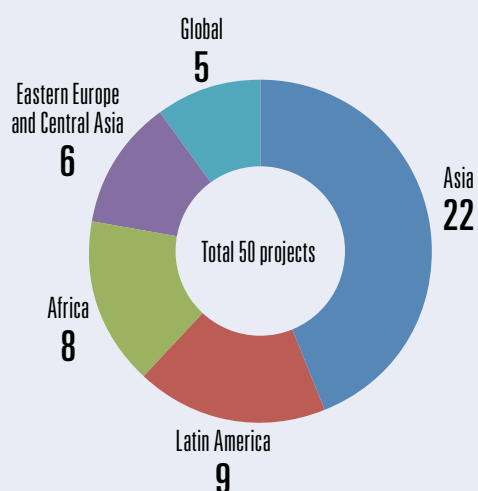


FIGURE 4 TREND OF SUSTAINABLE URBAN TRANSPORT PROJECT CO-FINANCING RATIO

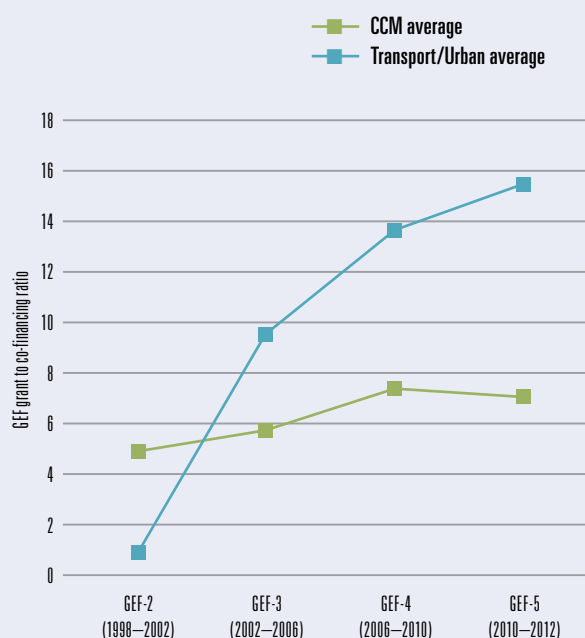


TABLE 3 FINANCING OF SUSTAINABLE URBAN TRANSPORT PROJECTS

Pilot Phase	Number of projects	GEF financing (\$ millions)	Co-financing (\$ millions)
GEF-2 (1998–2002)	8	33.1	30.3
GEF-3 (2002–2006)	13	88.9	847.5
GEF-4 (2006–2010)	21	116.2	1,588.8
GEF-5 (2010–2012)	6	45.3	700.6
Total	50	292.5	3,169.1

TABLE 4 APPROVED SUSTAINABLE URBAN TRANSPORT PROJECTS BY THE GEF AGENCIES (1991–2012)

	Number of projects	GEF financing (\$ millions)	Co-financing (\$ millions)
ADB	3	9.2	276.4
IDB	1	3.4	16.2
UNDP	19	84.8	581.4
UNEP	8	16.8	212.4
World Bank	18	152.9	1,730.0
World Bank/UNDP	1	25.4	352.7
Total	50	292.5	3,169.1

Types of Interventions

Most of the GEF transport and urban projects can be grouped into three general categories: (i) technology solutions; (ii) improvements in urban transport systems; and (iii) integrated urban systems. While early GEF's investments focused on technology solutions, the recent emphasis has shifted to comprehensive and integrated strategy options at the urban level.

Technology solutions

Technology solutions "improve" energy efficiency of travel by making engines and transmissions more efficient. As longer-term options, advanced vehicles (electric vehicles, plug-in hybrid electric vehicles, and fuel-cell vehicles) can improve energy efficiency and enable use of low-carbon fuels. Alternative fuels such as biofuels can reduce carbon in transport systems as well.

In China and Brazil, the GEF partnered with UNDP to develop a portfolio of fuel-cell bus (FCB) projects. The Chinese experience to date has been positive, as described in Box A. In Brazil, the FCB project was implemented from 2001 to 2010. Elsewhere, Egypt is testing hybrid buses. In GEF-funded projects, these technology demonstrations are supplemented with policy components, market development, and public awareness campaigns to help establish sustainable transport systems.

The UNEP has developed a global project on FCBs as well as one on sustainable liquid biofuel production. While the former examines global fuel cell market trends, suggesting where market interventions could be beneficial in the future, the latter aims to identify and fully assess innovative, cost-effective, and sustainable systems for the production of liquid biofuels for transportation.

Urban transport systems

The GEF projects featuring urban transport systems constitute the main pillar of the GEF sustainable transport portfolio. These projects "avoid" the demand to travel by car and/or "shift" travel to a more efficient mode. They also "improve" energy efficiency of travel through better traffic management and route choice. Most GEF projects in this category combine these three functions, including the following components:

- A comprehensive strategy that integrates sustainable transport policy into overall urban planning policies. This includes planning for investments in public transport and non-motorized transport infrastructure and reorganizing transport networks.

- A TDM plan to manage the use of private vehicles. This often includes parking policies, designation of pedestrian areas, car sharing, and non-motorized transport campaigns. Congestion pricing policies may also be included in a TDM plan.
- Large investments in public transport infrastructure (mainly for bus rapid transit systems or dedicated bus lanes, but also for rail-based public transport) and non-motorized transport infrastructure. These investments partially account for the high cost of transport projects. They also lead to the largest direct GHG reductions. Projects emphasize the connection between the public transport network and the non-motorized transport network, with the latter feeding the public transport system.
- Improvements to the public transport fleet by employing technology that improves energy efficiency and reduces GHG emissions. Public transport fleets are also improved through the use of hybrid or electric buses.
- Design of a national policy framework to disseminate and scale up the lessons and solutions tested in targeted cities, and to build the capacities of local institutions through training, information sharing, and engagement of relevant stakeholders.

Local authorities (municipalities, metropolitan authorities) are heavily involved in these projects, as they are often responsible for local urban planning and transport investments. Moreover, local lessons are disseminated country-wide through capacity building activities, development of information centers, and other activities.

Integrated urban systems

This is a new investment strategy with the aim of addressing urban systems as a whole. An example of this category is the World Bank project in China titled "China: Green Energy Schemes for Low-Carbon City in Shanghai." This project aims to develop green energy schemes for low-carbon cities and pilot them in Shanghai, with a focus in the Changning District. The project focuses on four components: (1) green buildings, including retrofitting existing buildings and piloting new near zero-emission buildings (including smart metering); (2) low-carbon energy mix, including on-site distributed generation from renewable energy and natural gas and purchase of green electricity; (3) green transport with a focus on electric buses; and (4) integrating green energy schemes to achieve low-carbon objectives. As of January 2013, the project is undergoing preparations for GEF CEO endorsement.

Interventions by Region

The GEF supports sustainable transport and urban projects in 90 cities around the world with a combined population of 277 million, as shown in Figure 5. Together, these projects constitute a comprehensive sustainable urban transport program. Highlights of GEF interventions by region are presented below:

Asia

In Asia, 22 projects have been developed and/or implemented. These projects cover 46 cities with a combined 180 million inhabitants. This is the largest sustainable urban transport portfolio in the GEF. It includes two large projects in China and India.

The Chinese Urban Transport Partnership Program covers 14 large and five small cities throughout the country. The Sustainable Transport Project in India encompasses six cities. The Pakistan Sustainable Transport Project involves the cities of Islamabad, Rawalpindi, and Lahore.

Furthermore, it is notable that the Asian Development Bank (ADB) launched the transport program titled the “Asian Sustainable Transport and Urban Development Program (ASTUD)” in 2011, as summarized in Box B.

Latin America

In Latin America, 10 projects have been developed and/or implemented. These projects cover 20 cities with a combined 53 million inhabitants. This is the second largest sustainable urban transport portfolio in the GEF.

Of the 10 projects in Latin America, two are regional. “Promoting Sustainable Transport in Latin America” involves three cities in Chile, Guatemala, and Panama. “Latin America Regional Sustainable Transport and Air Quality Project” involves 11 cities in Argentina, Brazil,

and Mexico (see Box C).

Africa

In Africa, eight projects have been developed and/or implemented. These projects cover 18 cities with a combined 40 million inhabitants. The portfolio for Africa is expected to grow in the coming years.

A South African project addressed seven host cities of the 2010 World Cup. In West Africa, the cities of Accra and Kumasi (Ghana) (see Box D), Ouagadougou (Burkina-Faso), and Lagos and Kano (Nigeria) implement transport projects.

Eastern Europe and Central Asia

In Eastern Europe and Central Asia, six projects cover six cities. These six cities represent 4.4 million inhabitants. There are comprehensive strategy projects in Gdansk (Poland), Bratislava (Slovak Republic), Belgrade (Serbia), and Dushanbe (Tajikistan).

In Kazan and Kaliningrad (Russian Federation), pilot activities are under preparation to increase the use of low-carbon modes of transport and improve urban mobility.

Global

The GEF is taking additional steps to expand the scope of its assistance and to be more comprehensive in its approach. For example, the GEF has co-sponsored the Global Fuel Economy Initiative Project, which promotes policy reforms to improve fuel economy of light-duty vehicles.

FIGURE 5 CITIES WITH GEF TRANSPORT AND URBAN SYSTEMS PROJECT





TABLE 5 CITIES WITH GEF TRANSPORT AND URBAN SYSTEMS PROJECTS BY REGION

	Number of countries covered	Number of cities covered	Population of the cities (million)
Africa	10	18	40
Asia	11	46	180
Eastern Europe and Central Asia	5	6	4
Latin America	10	20	53
Total	36	90	277



Fuel cell buses in operation, Beijing, China

BOX A DEMONSTRATION OF FUEL CELL BUSES (FCBs)—COMMERCIALIZATION IN CHINA

GEF Agency: UNDP

GEF Funding: \$12.6 million

Co-Financing: \$35.3 million

Dates of Implementation: 2002–2006 (Part I), 2007–2011 (Part II)

Background

China's 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. About 30 percent of Chinese people live in cities. The demand for public transport is growing at an estimated rate of four percent per year. Buses account for an estimated 75 percent of urban public transport passenger volume.

The demand for buses in China is expected to grow at an average rate of five percent per year between 2000 and 2030, which would result in 720,000 buses needed in 2030. The demand for new buses (counting replacement and new markets) in 2030 under this scenario would be some 108,000 buses per year. This creates a sizeable potential market for FCBs.

Project Overview

The project aimed to reduce costs of FCBs for public transit in the Chinese cities of Beijing and Shanghai, while stimulating technology transfer by supporting pilot demonstrations of FCBs and their fueling infrastructure. The public transport companies of these two cities operated a total of nine FCBs.

The first stage of the project included gathering up-to-date information on FCB technologies, selecting FCB systems, and purchasing the first three buses. These buses were launched during the Fourth International Clean Vehicle Technology Conference Exhibition, held in Beijing in November 2005.

The second stage of the project supported FCB commercialization and dissemination, focusing on FCB hybrid technology. The results of the pilot are expected to promote and replicate FCBs as a commercially viable transport alternative for cities sharing similar environmental characteristics and conditions.

Complementing the GEF project, Beijing used three FCBs for the 2008 Olympic Games while, in Shanghai, six FCBs were demonstrated at the World Expo in 2010.



Traffic flow in Dhaka, Bangladesh

BOX B ASIAN SUSTAINABLE TRANSPORT AND URBAN DEVELOPMENT PROGRAM (ASTUD)

GEF Agency: ADB

GEF Funding: \$14.7 million

Co-Financing: \$988 million

Dates of Implementation: 2012–2017 (First tranche)

Background

In Asia, rapid urbanization and motorization are affecting the sustainability of transport and urban environments, and transport is emerging as the largest and fastest-growing sector of GHG emissions. In the cities of Asia, motor vehicle fleets are doubling every five to seven years, while emerging Asian countries are estimated to have added 35 million vehicles between 2006 and 2009. At present, less than half of the population in Asia lives in cities, but this is expected to change soon as a result of ongoing rapid urbanization. The rapid growth of urban populations is resulting in rapid expansion of cities, and in some cases in the development of new cities.

These trends are placing enormous strain on transport and mobility in urban areas. Road congestion already costs Asian economies an estimated two to five percent of GDP every year due to lost time and increased transport costs. Uncontrolled growth in urban road traffic and rising congestion are also compromising the health and safety of urban dwellers. The challenge is to avoid a car-led urban-sprawl development model and support a low-carbon development approach.

Project Overview

The ASTUD program aims to support Asian cities in realizing GHG reductions and local co-benefits through the integration of low-carbon transit infrastructure and transport services with transit-supportive low-carbon urban development.

The ASTUD program is a multi-year multi-country program that provides an umbrella framework for a range of projects in Asia, capturing synergies between projects and achieving broader impacts. The program starts with three countries (Bangladesh, Mongolia, and People's Republic of China) as the first tranche, and is expected to include other countries in future tranches. The program for the first tranche focuses on mitigation only, while future tranches may include adaptation. The outcomes and outputs of ASTUD have the potential to transform urban development for Asia as a whole.

In line with the Avoid-Shift-Improve framework, the ASTUD program has four components;

- AVOID: Reducing the need to travel by motorized modes;
- SHIFT: Shifting travelers to more environmentally-friendly modes;
- IMPROVE: Increasing the energy efficiency of the urban transport systems;
- KNOWLEDGE SHARING: Regional program on integrated approaches to transport and urban system development.

Building on the baseline programs, primarily investment in public transport systems such as BRT and metro, the GEF financing provides opportunities for maximizing and scaling up GHG emissions mitigation potential. About 14.8 Mt CO₂ eq of expected GHG reductions are directly attributable to program investments.



BOX C LATIN AMERICA REGIONAL SUSTAINABLE TRANSPORT AND AIR QUALITY PROJECT

GEF Agency: World Bank

GEF Funding: \$23.1 million

Co-Financing: \$58.5 million

Dates of Implementation: 2009–2012

Background

The transport sector is responsible for more than one-third of GHG emissions in Latin America. Because of increased motorization and vehicle use, it is the fastest-growing source of emissions in the region. At the same time, Latin American cities are rapidly growing. About 75 percent of Latin Americans currently live in urban areas, where most kilometers of vehicle travel occur. Urban transport, therefore, represents a key sector for long-term GHG mitigation efforts in the region.

Despite the rapid growth in vehicle numbers, most Latin American cities are not yet locked into absolute automobile dependence. The current car ownership level of 100 vehicles per 1,000 inhabitants is still low compared to international averages and thus provides a great opportunity for maintaining the current modal split. Moreover, population density is still low near city centers, which represents an opportunity for land-use planning orientated toward public transport.

Project Overview

The project is divided into a regional project and three country projects in Argentina, Brazil, and Mexico. The regional project focuses on capacity building (knowledge sharing, regional cooperation, and fostering of policies and guidelines). The country projects include technical assistance and pilot investments aimed at introducing and developing sustainable transport initiatives in 11 cities in the target countries. These actions are expected to provide valuable lessons to inform and help develop appropriate policies at the national level.

The project includes the following activities:

- Integration of land-use planning, transport, and environmental management
- Design and implementation of TDM measures to rationalize the use of private cars, and create incentives for more widespread use of public transport and non-motorized modes (car-free zones, car-free days, parking management plans, road-pricing schemes)
- Management of freight transport
- Improving public transport: pilot investments in public transport systems and/or improvement of the effectiveness and interconnectivity of those systems with other complementary modes of transport
- Developing non-motorized transport: pilot investments to better integrate walking and biking with current mass and public transport systems.

The project is expected to result in a direct reduction of 2.4 Mt CO₂ eq during the project timeframe.



Bike rack in Ghana

BOX D GHANA URBAN TRANSPORT PROJECT

GEF Agency: World Bank

GEF Funding: \$7.35 million

Co-Financing: \$83 million

Dates of Implementation: 2007–2012

Background

The population of Ghana is over 20 million, with more than 40 percent living in urban areas. Approximately three million people (representing more than 14 percent of the national population) live in the Accra metropolitan area, which is growing at four percent per year. Another one million (about five percent of the national population) live in the Kumasi metropolitan area, which is growing at 5.6 percent per year.

In the last 15 years, Accra's population has doubled and its area has expanded almost threefold. Traffic in Accra is characterized by heavy congestion (particularly during the peak periods), heavy dependence on informal private bus services, weak implementation of traffic management measures, inadequate facilities for pedestrians and bicyclists, poor road safety arrangements, and high accident rates. Almost 70 percent of motorized person-trips in the city depend on some form of bus transport, which is the dominant mode, using about a third of road space. In contrast, private cars and taxis provide only a quarter of person-trips but occupy over half the road space.

Project Overview

The project addresses institutional, management, and regulatory issues in order to improve personal mobility in cities in Ghana, with an initial focus on the Accra and Kumasi metropolitan areas. Project activities are designed to:

- Strengthen the capacity of government ministries, local authorities, agencies, and operators responsible for urban transport
- Update the integrated urban and transport development plans for the greater Accra Metropolitan Area, resulting in better integration of urban development and transport planning while supporting growth that is more compatible with urban transport infrastructure and services
- Manage traffic in Accra and Kumasi by enforcing traffic rules and providing education
- Build BRT infrastructure in Accra (including segregated bus-ways, interchange facilities, and terminals and facilities for pedestrians and non motorized transport).

The project is expected to result in a direct reduction of 240 kt CO₂ eq during the project timeframe.



BRT (Bus rapid Transit) systems give exclusive right of way lanes to buses.

Looking to the Future

Transportation is a driver of economic and social development for the developing world. Promoting sustainable transport contributes to environmental protection (e.g., reduction of GHG emissions), economic growth, and energy security.

To protect the global commons, the GEF has invested considerable resources in sustainable urban transport in developing countries and transition economies. The GEF's transport-related financing has grown more than four times, from \$30 million in GEF-2 to \$126 million in GEF-4. In GEF-5, the GEF has expanded its scope to include integrated approaches to promoting energy efficient, low-carbon cities.

Through this program, the GEF has significant accomplishments, not only reducing GHG emissions, but also contributing to sustainable urban transport in developing countries and transition economies, reducing local air pollution, reducing traffic congestion, and increasing access

of populations to affordable public transport. These achievements could not have been realized without the cooperation of our partners, especially local and national governments of developing countries and transition economies. Going forward, the GEF and its partners will increasingly focus on integrated urban systems.

Future challenges are enormous. The GHG emissions from the transport sector are growing rapidly. To protect the global commons, the GEF will need to scale up its efforts in sustainable urban transport and focus more on comprehensive and integrated intervention, especially in urban systems. Moving forward, GEF's investments should reflect the successes and lessons learned from its experiences over the past twenty years. Together with its partners in the international community, the GEF will continue to work toward ensuring that economic development and expanding transport networks around the world do not lead to ever-increasing GHG emissions.



CNG three-wheeler in Delhi, India

ENDNOTES

- 1 Resources for the GEF Trust Fund are replenished every four years when countries that wish to contribute to the GEF Trust Fund pledge resources through a process called the 'GEF Replenishment.' For example, the second replenishment of the GEF Trust Fund (GEF-2) covered GEF operations and activities for the four years from July 1, 1998 through June 30, 2002.
- 2 Out of the 50 projects, four projects include components in addition to sustainable transport.
- 3 Emerging economies are used to describe nations in the process of rapid economic growth, as China, India and Brazil.
- 4 The Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) prepared the second synthesis report in 2009. It compiles technology needs identified by Parties not included in Annex I to the Convention (non-Annex I Parties) in their Technology Needs Assessments (TNAs), second national communications and other national reports. Most TNAs were conducted with funding provided under the enabling activity projects of the GEF.
- 5 In some cases, elements of Life Cycle Analysis need to be taken into account while introducing cleaner vehicles. For example, if electricity for electric cars will be supplied through old coal plants, the environmental benefit of the introduction of those vehicles might be reduced.
- 6 Emissions of black carbon (BC), which refers to light-absorbing carbonaceous particles formed through incomplete combustion of fuels, could be reduced through those efforts as well. BC is not covered under the UNFCCC but arguably contributes significantly to global warming.
- 7 The STAP is an advisory body to the GEF with a mandate to provide objective, strategic, scientific and technical advice on policies, operational strategies, programs, and projects.

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ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ASI	Avoid, Shift and Improve
ASTUD	Asian Sustainable Transport and Urban Development Program
BC	Black Carbon
BRT	Bus Rapid Transit
CCM	Climate Change Mitigation
CO ₂ eq	Carbon Dioxide Equivalent
CSO	Civil Society Organization
FCB	Fuel-Cell Bus
GEA	Global Energy Assessment
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIS	Geographic Information Systems
IDB	Inter-American Development Bank
IEA	International Energy Agency
IGES	Institute for Global Environmental Strategies
IPCC	Intergovernmental Panel on Climate Change
IPCC AR4	Intergovernmental Panel on Climate Change Fourth Assessment Report
ITS	Intelligent Transport System
LRT	Light Rail Transit
MBPD	Million Barrels Per Day
NMT	Non-Motorized Transport
NO _x	Nitrogen Oxides
PM	Particulate Matter
SGP	Small Grants Programme
STAP	Scientific and Technical Advisory Panel
TNA	Technology Needs Assessments
TDM	Transport Demand Management
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN-HABITAT	United Nations Human Settlements Programme
WBCSD/SMP	World Business Council for Sustainable Development / Sustainable Mobility Project

UNITS OF MEASURE

Gt	Giga (10 ⁹) tonnes
kt	Kilo (10 ³) tonnes
Mt	Mega (10 ⁶) tonnes
t	metric tonne

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ABOUT THE GEF

The GEF unites 182 countries in partnership with international institutions, civil society organizations (CSOs), and the private sector to address global environmental issues while supporting national sustainable development initiatives. An independently operating financial organization, the GEF provides grants for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants.

Since 1991, the GEF has achieved a strong track record with developing countries and countries with economies in transition, providing \$10.5 billion in grants and leveraging \$51 billion in co-financing for over 2,700 projects in over 165 countries. Through its Small Grants Programme (SGP), the GEF has also made more than 14,000 small grants directly to civil society and community based organizations, totaling \$634 million.

The GEF partnership includes 10 agencies: the UN Development Programme (UNDP); the UN Environment Programme (UNEP); the World Bank; the UN Food and Agriculture Organization (FAO); the UN Industrial Development Organization (UNIDO); the African Development Bank (AfDB); the Asian Development Bank (ADB); the European Bank for Reconstruction and Development (EBRD); the Inter-American Development Bank (IDB); and the International Fund for Agricultural Development (IFAD). The Scientific and Technical Advisory Panel (STAP) provides technical and scientific advice on the GEF's policies and projects. The GEF partnership also includes other accredited agencies at the national and global level.

For more information, visit www.thegef.org

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